

the rock bucket. It is wise, however, to continue the shaft sinking, as we are catching up on the development work that has always been way behind at this property.

ROCK DEVELOPMENT:-

The rock drifting fell a little behind during the year. We drifted for all the known ore bodies, except on the 1950' Level which was unaccessable from May until December, due to the Shaft wreck. There is a fine showing of ore here and this drift is now being pushed as rapidly as possible in the hard Jasper formation. It took the drill thirty-six shifts to penetrate 238 feet of this ground which includes the footage in the ore. In the rock, the drill averaged about six feet per shift, which attests as to the hardness of the formation.

The rock drift West on the 2370' Level, Pascoe Shaft, was also discontinued. This was being driven for exploratory purposes and the ground on the foot and hanging side of the drift was drilled by the Diamond Drill.

ORE DRIFTING & RAISING:-

This is a new subdivision of breaking ore found on the old Cost Sheets, and serves to bring out clearly the amount of development necessary before stoping operations begin. The total footage of ore drifts and raises driven in 1921 was 1149 feet. The total expenditure was \$23,325.36, so that the cost per foot would run \$20.30. The cost per foot, apparently, is almost as high as that for driving rock drifts, but actually that is not so. Almost 40% of the ore drifting and raising was done early in the year before there were any wage reductions, and over 80% was done prior to August 1st, when the second reduction took effect. In other words, the bulk of the ore development work was done during the period of high wages.

STOPING:-

There is no way to compare the actual stoping costs for 1921 with 1920, because the account Breaking Ore in 1920 included all the development work as well as the cost of stoping the ore. Although we have records that show the expense charged to contracts drifting or raising in 1920 that is but a proportion of the total cost; to that must be added the cost of sharpening steel, tempering, repairing drills, teaming, labor handling powder, etc.

In 1921 to the cost of stoping the ore, we also include the expense of sorting the rock from the ore and cost of handling this rock. This includes wages of underground ore sorters and a proportion of the tramping expense commensurate with the time required to tram the rock. To sort the ore adds about 12¢ per ton to the cost.

TIMBERING:-

The unit cost for timbering was considerably reduced during the year. The output for 1921 was 51.7% of last year but the timbering expense was only 35.6%. This reduction was due to a change in the system of timbering first tried out in 1920 on the 2370' Level. Instead of putting in stulls in the stopes, we now build cribs and fill them with ore. These cribs are built about 10 feet high and 8 feet apart and 16 foot caps reaching from crib to crib form the back of the passage way between the cribs. It takes much less timber to build these cribs than it did to put in the old system of stulls.

TRAMMING:-

The trammers wages at the Republic Mine have been cut more than any other class of labor. During the month of January, the rate paid per car was 53¢. On October 1st, the rate was 31.5¢, a reduction of 40.6%.

Surface laborers in that same period were cut 33.4%, and the base rate for contract miners was reduced 33.4%.

The average monthly wages paid trammers follow:-

Jan., 1921,	\$11.15	per day,
Feb., "	8.53	do.
Mar., "	7.65	"
Apr., "	7.38	"
May, "	6.88	"
Jun., "	6.54	"
Jul., "	6.44	"
Aug., "	4.71	"
Sep., "	4.65	"
Oct., "	4.87	"
Nov., "	5.09	"
Dec., "	5.12	"

Although wages were again reduced on October 1st, 1921, the trammers actually earned more per day due to more cars filled per gang each day.

The following table shows the cars trammed and loaded per trammer per day:-

	CARS PER TRAMMER PER DAY
Year 1914,	12.6
1915,	12.4
1916,	12.3
1917,	13.1
1918,	15.1
1919,	18.2
1920,	20.5
Jan., 1921,	21.8
Feb., "	19.1
Mar., "	17.0
Apr., "	15.3
May, "	16.4
Jun., "	14.8
Jul., "	14.4
Aug., "	13.4
Sep., "	13.3
Oct., "	15.4
Nov., "	16.2
Dec., "	16.2

You will note that the average number of cars trammed per day shows a steady increase until the peak was reached in 1921. As trammers became scarce in the period 1918 - 1920, we had to crowd the trammers hard to keep the output up. The result was they made very high wages.

As men became more plentiful, we put more gangs of trammers to work in the early part of 1921 with the result that the gangs filled fewer cars per day. For instance, we frequently put two gangs in one stope on the upper levels, Pascoe Shaft. When one gang was out at the shaft, the others were inside at the stope. The both day and night shift at the Water Power Plant, partly to act as watchmen at the plant and dam and also to regulate the gates and came out with the loaded car. This had a tendency to keep down the number of cars filled by each gang and yet kept the output higher from that particular stope. As a result of cutting wages and making it more difficult to fill cars, the trammers daily wage dropped from \$11.15 in January to \$4.65 in September. Towards the close of the year, the trammers recovered a little from the low point, due to better chances to fill cars on the 2470' Level, Pascoe Shaft. We can't work over three gangs here and the tram is short. However, as we open up the footwall drift, the trams will become longer and the rate per day will probably drop again.

PUMPING:-

The unit cost for pumping will be considerably increased over last year due to employing pumpman's helper on the shifts the mine is not working. Normally there are sixty to sixty-two shifts in a month and the mine operates about fifty-two shifts. A pumpman's helper is then employed from eight to ten shifts a month. Since June 1st, we have operated only thirteen shifts a month and there have been both a pumpmen and helper inderground on an average of forty-eight shifts a month. In a mine the size of the Republic where the four main pumps are located, two at the bottom of both shafts and two about half way down No. 9 and Pascoe Shafts, it would not be safe to leave one man alone underground. repair drill machines in use. Very few new repair parts had to be purchased outside the Company's supplies at the Cliffs Shaft and Mesabi Range properties.

COMPRESSORS & AIR PIPES:-

The unit cost under the above account for 1921 will show an increase compared with 1920 for the reason that when the curtailment went into effect, it was still necessary to have engineers both day and night shift at the Water Power Plant, partly to act as watchmen at the plant and dam and also to regulate the gates and run the compressors when air was needed for the pumps. The total cost of course shows a reduction of nearly 40%, due to the fact that very little coal was burned to operate the steam compressor. If we had been operating normal with the low stage of water prevailing last summer due to drought, we would have been compelled to run the steam compressor day and night after the middle of June.

UNDERGROUND SUPERINTENDENTS:-

This account shows a big decrease. For the first five months of the year, it averaged \$1059.40 per month, representing supplies and wages for Captain, Ass't Captain and four bosses. On June 1st, we cut the force to two, namely: Captain and one shift Boss. Captain Peter W. Pascoe was retired on a Pension and the Ass't Captain put in charge of the mine.

MAINTENANCE ACCOUNTS.

COMPRESSORS & POWER DRILLS:-

Maintenance on the power drills was reduced to approximately one-quarter its former cost. We purchased no new machines for replacements and by laying off some of the contractors employed in No. 9 Shaft, their machines became spares and could be robbed to repair drill machines in use. Very few new repair parts had to be purchased outside the Company's supplies at the Cliffs Shaft and Mesabi Range properties.

These latter mines supplied many of the drill parts necessary to repair the #248 Ingersoll-Rand Machines.

HAND TRAM. EQUIPMENT:-

This account corresponds to underground tracks and cars previous to 1921. The unit cost shows a considerable decrease due to the fact that the only expense incurred in 1921 was maintenance of the old tracks. We built no new cars, relayed no rails nor purchased any rails or supplies for cars. The extensions on the lower levels are being supplied with old rail taken off the abandoned skip-road in the Pascoe Shaft and also from the old Pascoe Smart Top Tram. This is all 30 lb. rail. We probably will not have to purchase any new rail for another year.

ELECTRIC TRAM EQUIPMENT:-

One new battery at a cost of \$1380 was purchased for the underground locomotives. This is approximately half the entire cost of maintenance for this equipment. The balance of the expense covers the cost of drive wheels and brake shoes for the locomotives, two sets of pinions and gears, meters for the charging set and several smaller items.

PUMPING MACHINERY:-

In 1921, we spent approximately one-quarter less than in 1920 to keep the pumps in first class order. In addition to the ordinary supplies used, we purchased two transformers for the Third Level, No. 9 Pump, at a cost of \$273.00 and the Pascoe Shaft Pump motor was repaired in the General Shops in Ishpeming at a cost of \$82.00.

SURFACE COSTS.

HOISTING:-

The unit cost under this heading shows an increase over last year due to the same reason as shown above under other accounts, namely: curtailment. When the mine is idle three-quarters of the month, the hoisting engineers have to be employed anyway and consequently, the out-lay for labor is just the same whether the mine is idle or working. The total cost of course is only half that of the previous year, and a great deal of this reduction was brought about by discontinuing hoisting to surface through the Pascoe Shaft.

STOCKING ORE:-

This account includes three items on the old cost sheet, namely: stocking ore, top landing & tramming and a proportion of the sorting ore expense. The unit cost for 1921 will show an increase due to fact that two top landers are necessary to handle rock on the night shift when no ore is hoisted. We also employ a rock picker at the stockpile on the day shift. No picker can be employed at night when ore is hoisted both day and night and so producing on only one shift makes that particular cost twice normal expense.

SCREENING - CRUSHING AT MINE:-

This account shows a big decrease because the crushing & screening plant was not operated during the summer. The only expense was due to operation of new screen at No. 9 Shaft, which separates the lumps and fines. The biggest expense in connection with this plant was due to replacing the screen segments with new ones in less than two months after the screen was put into operation. The screen was designed too light and there were an unnecessary number of perforations. We installed new segments twice as thick and with only half the openings and have had no trouble for the last eleven months.

DRY HOUSE:-

We are still using the old Dry which is in very poor shape and I question whether it will ever be advisable to repair it. The building is pretty well sheltered which is fortunate as in its present condition, it would be difficult to keep it warm enough for comfort.

GENERAL SURFACE EXPENSE:-

This account includes part of the old Tracks & Yards Account in addition to the salaries of the surface boss, watchman and policeman. The latter were carried under the old mine office expense. The cost sheet shows that the expense for 1921 was greater than 1920. As a matter of fact, it is less as we did very little work around surface in 1921. Usually, we employ men at least part time to clean up, using the Steam Shovel or Crusher crew when they are idle due to shortage of cars. This year we had no such crews and no regular men were employed except for a few shifts repairing fences around the open pits. We did nothing except what was absolutely necessary for safety and operation of the mine.

MAINTENANCE.

HOISTING EQUIPMENT:-

The expense of keeping the hoisting equipment in shape was halved. This item in the 1921 Card of Accounts includes not only repairs and replacements for hoists, such as wire rope, cages, skips, etc., but also the expense incurred under the old account, Skips & Skip-Roads. The maintenance of the Pascoe Shaft skip-road was very heavy in the years 1917 - 1920. Hoisting to surface through this shaft was discontinued during the latter part of 1920. The following table shows the cost of maintaining the hoisting equipment and shafts for previous years:-

Year	1917	-	\$26,740.39
	1918	-	18,882.94
	1919	-	26,693.79
	1920	-	20,316.49
	1921	-	9,849.90

You will note that the first reduction in this expense occurred in 1920, due to operating new No. 9 Shaft Electric Hoist. The new hoist being placed only 300 feet from No. 9 Shaft required much less rope than the old No. 5 Plant, distant 2,000 feet further from the Shaft. The ropes also wore rapidly going through the sheave stands between the shaft and the No. 5 Plant.

Routing the Pascoe Shaft ore over to No. 9 Shaft and discontinuing hoisting to surface through the Pascoe Shaft further decreased the maintenance expense.

SHAFT:-

The Pascoe Shaft wreck described previously in this report covers 90% of the expense incurred under this heading.

TOP TRAM EQUIPMENT:-

The two new top tram units installed at No. 9 Shaft operated perfectly after their installation late in 1920. The only maintenance expense in connection with this plant was in replacing top tram rope and putting in one new set of rubber liners in the drive sheave. One top tram car that ran off the end of the rock trestle into the lake was recovered and repaired.

DOCKS, TRESTLES & POCKETS:-

A new railway pocket was built at the Crushing & Screening Plant in the spring. We expect to have to operate the old Screening Plant when conditions become normal to clean up the old run-of-mine stockpiles. We will probably also have to handle more or less run-of-mine ore from No. 9 Shaft through this plant during ensuing shipping season when Bessemer Lump ore is wanted.

MINE BUILDINGS:-

A new roof was built on the barn and a portion of the Central Plant roof rebuilt. A new Picking Belt was installed at No. 9 Shaft. These belts usually wear out in one season.

GENERAL MINE ACCOUNTS.

INSURANCE:-

The premium on insurance policies was practically identical for the two years.

ENGINEERING:-

The Engineering work is handled by the Central Office engineers and as no new construction was carried on in 1921, the engineers had little to do except to make the monthly surveys. In an effort to cut expenses, the Republic Mine chemist acted as helper on all the surveys, so that only one man was sent from the Ishpeming Office to conduct the survey.

ANALYSIS:-

Due to but little ore shipped during 1921, the analysis expense was smaller than usual. Ordinarily, we employ a sampler from May 1st to December 1st, taking samples from railroad cars.

PERSONAL INJURY EXPENSE:-

There were thirty-six accidents during the year compared with sixty-six in 1919 and seventy-three in 1920. In 1921 the total number of days worked by the men was 41,582, and in 1920, 73,951 days. Our accident rate was one per 1152 days in 1921 compared with one per 1012 days in 1920, showing some improvement for the past year.

TELEPHONES & SAFETY DEVICES:-

The expense under this head was one-quarter less than the previous year.

In the early part of the year, we built screens and gratings around the two new top tram units at No. Shaft. Fences were also built around the slack rope take-ups and the angle sheaves near the shaft house.

We have cut the expense charged to this account by installing low voltage transformers for the lights. All of the underground electric lights are 55 volts now instead of 220 and as shown elsewhere in this report, dropping the voltage decreased the lamp consumption amazingly.

MINE OFFICE:-

The Mine Office expense shows a decrease, due to cutting wages. At that our mine office expense is too high due to carrying Master Mechanic's salary under office expense. His salary has been included under this heading for years. After October, 1921, his salary was distributed to various accounts.

SUPPLIES.

GENERAL SUPPLIES:-

The amount of these supplies used was approximately half the consumption for 1920, so that the unit cost is about the same for the two years. With the machinery supplies, Explosives and Electric Power, these supplies constitute 75% of the total amount of supplies used.

Of the total of \$11,108.30 charged out during 1921, the following items cover the large charges:-

Wire rope for hoists and top trams,	\$1,186.61
Carbon for Diamond Drill,	3,053.78
Coke & Blossburg Coal,	876.42
Hay, Oats & Corn for barn,	1,165.68

IRON & STEEL:-

We show a big decrease in the amount of Iron and Steel used. The total for 1921 is \$3,074.79 compared with \$14,789.58 for 1920. In 1920 we had a great deal of new construction work that called for considerable iron and steel.

OIL & GREASE:-

There is a decrease in the total amount of oils used but the unit cost shows an increase due to the fact that only decreased demand came from the miners who are not working full time. For the pumps, hoists, sheaves, etc., we are using just about the same amount of grease as the previous year.

MACHINERY SUPPLIES:-

The cost per unit for Machinery supplies shows a decrease due to big decrease in the consumption of rock drill parts. This latter item is bound to increase when we go back to operating full time, because we have been robbing the spare drill machines to keep the others in shape.

EXPLOSIVES:-

Although we have been producing ore only three shifts a week, we have carried on the Rock Development and Shaft Sinking six shifts. The cost per ton of ore for explosives naturally shows an increase. Actually, we have used less powder to break the ore than for the previous two years as shown by the following statement showing explosives used for breaking ore

YEAR	PRODUCT	LBS.OF POWDER USED	PRICE PER LB.	LBS.OF POWDER PER TON OF ORE
1919	155,315	155,315	.2143	1.00
1920	153,951	155,850	.1968	1.01
1921	73,014	67,162	.1964	.92

LUMBER & TIMBER:-

We only used one-quarter of the timber and plank that was charged out in 1920. Discontinuing the old system of stulls underground and putting in cribs cut down the consumption of timber. Formerly, access to the shrinkage stopes was through cribbed mills maintained in the broken ore. The new scheme is to put up a raise through the ore body before stoping commences and access to the stope is then made through the raise and the cribbed mills are unnecessary. We have used but little hardwood timber since discontinuing the building of the cribbed mills.

FUEL:-

The coal consumption at this property has shown a steady decline for the last four years. The following table shows the coal burned at the boiler plants:-

YEAR	TONS COAL BURNED
1917	8,567
1918	6,617
1919	5,446
1920	3,748
1921	1,265

The decline is mainly due to three reasons: Electrifying the No. 9 Shaft hoist, discontinuing hoisting through the Pascoe Shaft and generating electric power at the local Water Power Plant when the mine is idle.

Our fuel bill for 1921 was \$9,399.84 compared with \$28,088.05 in 1920 and \$30,739.16 in 1919.

ELECTRIC POWER:-

When hoisting through the Pascoe Shaft to surface was discontinued and the ore from the lower levels in the Pascoe Shaft was hoisted by the underground electric hoist, we naturally consumed more power.

The load on the main electric No. 9 Shaft hoist was also increased. Due to curtailment it is difficult to compare the yearly cost of hoisting by steam in 1919 and 1920 and with electricity in 1921, but the first five months of each year show the comparison.

In 1919 both No. 9 Shaft and Pascoe Shaft hoists were steam driven. In 1920 only the Pascoe Shaft hoist was operated by steam. In 1921, all of the ore was being handled by the electric hoists except a little tonnage lowered down the Pascoe Shaft to the motor haulage level.

FIVE MONTH PERIOD	OPERATING HOISTING COSTS		
	LABOR	SUPPLIES	TOTAL
1919	4265.41	15360.42	\$19,625.83
1920	6422.64	11926.49	18,349.13
1921	6314.79	8218.68	14,533.47

You will note that the supplies have been cut in half in the last two years.

UNDERGROUND.

We have been both discouraged and encouraged by the developments underground in the past year. The No. 9 Shaft territory has proven up nothing new and work in that territory was abandoned because we had nothing but Pascoe grade ore in sight. On the other hand, the bottom levels in the Pascoe Shaft never looked better, as the main ore body seems to be getting larger on each succeeding level. Even in its present size, the stope develops nearly a normal year's production. As it takes less than a year to develop a new level, we confidently expect to show a large increase in the ore reserves next year. As mentioned before, we developed over twice as much new ore as was mined in 1920.

PASCOE SHAFT.

1710' LEVEL:-

On January 1st, we had one stope of good ore opened up 400 feet South-West of the Shaft plat. A drill hole was drilled South-Westerly from the West side of this stope near the South breast and two good sized runs of ore were cut. A drift was driven parallel to the drill hole and two more stopes opened up. The centre one, however, showed up quite a few seams of Jasper and after we had stoped out the ore about 15 feet high, mining was stopped. At the South-East corner of this stope, the ore was clean but we did not follow the ore up as we calculated to raise up on the inside and outside stopes, both of which show good ore. If the horse of Jasper does not clean up, we can test the formation in between higher up with a Diamond Drill.

Not much progress was made in this territory during the year because no work was done from May 23rd to October 1st, while the Pascoe Shaft was being repaired.

1850' LEVEL:-

We trammed out some of the broken ore in old No. 3 Stope near the Pascoe Shaft during the first four and half months of the year. After October 1st, when hoisting was resumed in the Shaft, we did not believe it advisable to disturb the ground near the Shaft and so considerable broken ore is left in this stope to be taken later.

1950' LEVEL:-

In February, Diamond Drill hole #469 was drilled South-West from the breast of the hanging wall drift about 250 feet South-West of the Shaft plat. This hole cut 42 feet of ore averaging 64.80 Iron. Drifting was immediately started from the breast and carried on until the shaft wreck occurred.

We could not get back into this drift until shortly before the end of the year. Although hoisting was resumed in the Shaft on October 1st, there were still repairs to be finished. It was close onto the middle of December before the plat was reconstructed and rails were laid to the breast.

We have a very fine showing of ore here in the drill holes and hope to be able to open up a good sized stope.

2050' LEVEL:-

A rock drift was driven to explore the ore found in Diamond Drill holes Nos. 431 and 450, but the ore proved to be only a narrow seam, too small to permit economical mining. So this territory has been temporarily abandoned. There should be more ore in this region as we have a good showing on the 1950' Level above. We will shortly have the ore on the latter level opened up which will give us a better line as to where to look for it on the 2050' Level.

2270' LEVEL:-

We drifted for and opened up the ore found in Diamond Drill holes Nos.: 463, 464 and 465. Although this ore body is not large, developing about 17,000 tons per level, it is big enough to warrant exploring for on the lower levels.

2370' LEVEL:-

The #2 or footwall stope was practically all mined out in the past year. This stope which is part of the Pascoe Shaft pillar runs from above the 1640' Level to the 2270' Level and then pinches out rapidly. This one lens produced approximately 300,000 tons and from the 2050' Level down was the largest stope in the mine until the present hanging wall stope was developed.

On the West side of the shaft, a drift was driven in rock for 300 feet for exploring purposes only.

This drift was stopped on June 1st. We encountered a few seams of ore. The ground towards the foot and hanging was drilled and a few of ore discovered, but nothing large enough to warrant drifting for.

2470' LEVEL:-

This level has produced so far one of the largest ore areas ever found in the mine. The prospects are that this area will be considerably enlarged in the coming year. The ore is only a short distance from the shaft so that drifting for it can be done quickly. The ore is high grade Bessemer and free from rock. At the end of the year, the North breast was still 24 feet wide and considerable Magnetite was coming in along the hanging. To date, this ore body develops 125,000 tons to the level.

A raise was put up to the 2370' Level for ventilation and a passage-way into the stope at the South end.

No timber stulls were built in this stope but instead we placed timber cribs, 16 ft. square, along the hanging wall of the stope. A passage-way was left between the cribs and also along the hanging wall so that the surplus broken ore can be removed at the end of the passage-way nearest the stope.

Back of the footwall side of the stope, a drift was driven in the rock and cross-cuts put through to the foot side of the stope through which the broken ore can be drawn.

2570' LEVEL:-

The plat was cut at this elevation and shaft was sunk 25 feet below the level for a skip-pit. At the close of the year we were just about ready to put in the skip-road and ladder-way from the 2470' to the 2570' Level.

NO. 9 SHAFT.

2170' LEVEL-WINZE:-

The Pascoe grade ore body at the North end of the level was opened up for the entire distance and stulls put in. The ore was stoped out for a vertical distance of about 30 feet when we received orders to curtail. As there was no likely demand for this Siliceous ore, no further work was done on this level.

2270' LEVEL-WINZE:-

As on the level above, we opened up the Pascoe grade ore body at the North end of the level. On June 1st, when orders came to cut down the number of men employed, we stopped all mining operations here.

2370' LEVEL-WINZE:-

Not enough work has been done at this elevation to open up any ore bodies. We followed the hanging to the North-West and ran into some bunches of ore but nothing of any size was developed. We will have to drift farther North undoubtedly to get the ore because there was ore in the shaft nearly all the way to the level and the general trend of the ore bodies in this territory is always to the North-West.

The big hanging wall stope on the 2470' Level, Pascoe Shaft, is only about 800 feet South of the Winze along the strike of the formation.

EXPLORING.

As heretofore, the Diamond Drill is still used to explore the areas where there is a possibility of ore bodies. In the early months of the year, we were successful in discovering a number of ore bodies with the drill, but during the last half of the year we encountered nothing worth while.

A summary of the holes follows:-

SUMMARY OF ORE DISCOVERIES IN DIAMOND DRILL HOLES.

NO. OF HOLE	LOCATION		ORE ENCOUNTERED			
			FIRST CLASS		SECOND CLASS	
	LEVEL	SHAFT	FOOTAGE	IRON ANALYSIS	FOOTAGE	IRON ANALYSIS
468	1710'	Pascoe				
469	1950'	"	4' 6"	59.60		
			5' 0"	59.50		
			42' 0"	64.80		
470	2070'	"				
471	2070'	"				
472	2070'	"				
473	2370'	"			2'	57.20
474	2470'	"				
475	2370'	"				
476	2370'	"	7' 6"	65.80		
			4' 0"	66.60		
477	2370'	No. 9,	3' 0"	67.70		
			5' 0"	60.90		
			4' 0"	61.40		
478	2370'	"	2' 6"	64.40		
479	2370'	"	3' 0"	60.70		
			3' 0"	63.20		
480	2370'	Pascoe,				
481	2370'	"				
482	2370'	"	3' 0"	65.00		
			4' 0"	64.60		
483	2370'	"				
484	2370'	"				
485	2370'	"				
486	2370'	"	6' 0"	60.50		
487	2370'	"	3' 0"	63.50		
488	2370'	"				
489	2370'	"				

REPUBLIC MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1921.

	IRON	PHOS.
Republic Bessemer,	63.52	.040
Republic Basic,	63.47	.041
Republic Pascoe,	54.81	.044

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1921.

	Mine		Lake Erie			
	IRON	PHOS.	SILICA	IRON	MOIST.	SILICA
Republic Bessemer Lump,			(All Mixed)			
Republic Basic Lump,	63.33	.048	8.20	62.65	.42	8.85
Republic Pascoe Lump,			(All Mixed)			
Republic Bessemer Crushed,			(All Mixed)			
Republic Basic Crushed,			(All Mixed)			
Republic Pascoe Crushed,			(All Mixed)			

REPUBLIC MINE

ORE STATEMENT - DECEMBER 31ST, 1921.

	RUN-OF-MINE			BESS. LUMP	BASIC LUMP	PASCOE LUMP	BESS. CRUSHED	BASIC CRUSHED	PASCOE CRUSHED	BESSEMER	BASIC	TOTAL	TOTAL LAST YEAR
	BESS.	BASIC	PASCOE							P.I.ST.P.	P.I.ST.P.		
On hand Jan.1,1921,	27,994	10,527	12,045	0	7,924	0	7,251	5,117	0	226	189	71,273	105,072
Output for Year,		491			41,716	1,765		25,373	3,669			73,014	153,951
Transferred,	2,117		524	195	46	46	2,035	67	478				
Total,	25,877	11,018	11,521	195	49,594	1,811	9,286	30,423	4,147	226	189	144,287	259,023
Shipments,				195	3,092	46	2,072	49	478			5,932	187,750
Balance on Hand,	25,877	11,018	11,521	0	46,502	1,765	7,214	30,374	3,669	226	189	138,355	71,273
Decrease in Output,												80,937	
Increase in Ore on Hand,												67,082	

1921 -- 2-8 Hour Shifts, 6 days per week, Jan. 1st to Feb. 8th, 1921.
 2-8 Hour Shifts, 5 days per week, Feb. 8th to June 1st, 1921.
 1-8 Hour Shift, 3 days per week, June 1st to Dec. 31st, 1921.

1920 -- 2-8 Hour Shifts for Year.

308

REPUBLIC MINE.

REPUBLIC MINE
SHIPMENTS FOR YEAR 1921.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Republic Bessemer Lump,	0	195	195	46,274
Republic Basic Lump,	0	3,092	3,092	15,519
Republic Pascoe Lump,	0	46	46	11,452
Republic Bessemer Crushed,	0	2,072	2,072	72,746
Republic Basic Crushed,	0	49	49	17,776
Republic Pascoe Crushed,	0	478	478	23,983
Total,	0	5,932	5,932	187,750
Total Last Year,	100,650	87,100	187,750	
Decrease,			181,818	

MADE IN U.S.A.

Republic Mine
Product

REPUBLIC MINE

COMPARATIVE MINING COST FOR YEAR

	1 9 2 1	1 9 2 0	INCREASE	DECREASE
PRODUCT	73,014	153,951		80,937
Underground Costs	2,948	3,088		.140
Surface Costs	.880	.870	.010	
General Mine Accounts	.344	.216	.128	
Cost of Production	4.172	4.174		.002
Plant Account	.136	.100	.036	
Equipment	.017	.008	.009	
Uncompleted Construction		.020		.020
Taxes	.416	.200	.216	
Central Office	.238	.139	.099	
Contingent Expense	.188		.188	
Cost Adjustment	.092	.038	.054	
Cost on Stockpile	5.259	4.679	.580	
Loading & Shipping	.021	.124		.103
Total Cost on Cars	5.280	4.803	.477	
No. Days Operating	200	297		97
No. Shifts and Hours	2-8;1-8	2-8		
Avg. Daily Product	365	518		153
<u>COST OF PRODUCTION</u>				
Labor	3.017	3.009	.008	
Supplies	1.155	1.165		.010
Total	4.172	4.174		.002

REPUBLIC MINE

COMPARATIVE WAGES AND PRODUCT

	1 9 2 1	1 9 2 0	INCREASE	DECREASE
PRODUCT	73,014	153,951		80,937
No.Shifts and Hours	2-8;1-8	2-8hr		
AVERAGE NO.MEN WORKING				
Surface	53	68		15
Underground	133	181		48
Total	186	249		63
AVERAGE WAGES PER DAY				
Surface	5.02	5.86		.84
Underground	5.29	6.47		1.18
Total	5.21	6.31		1.10
WAGES PER MONTH OF 25 DAYS				
Surface	125.50	146.50		21.00
Underground	132.25	161.75		29.50
Total	130.25	157.75		27.50
PRODUCT PER MAN PER DAY				
Surface	5.95	7.70		1.75
Underground	2.54	2.87		.33
Total	1.78	2.09		.31
LABOR COST PER TON				
Surface	.844	.761	.083	
Underground	2.087	2.253		.166
Total	2.931	3.014		.083
AVG.PRODUCT BRK'G & TRM'G	5.91	6.02		.11
" WAGES CONTRACT MINERS	5.37	6.25		.88
" " " TRAMMERS	7.39	11.11		3.72
" " " LABOR	5.88	7.30		1.42
TOTAL NUMBER OF DAYS				
Surface	12,278	19,989		7,711
Underground	28,772 $\frac{1}{2}$	53,666		24,893 $\frac{3}{4}$
Total	41,050 $\frac{1}{2}$	73,655		32,604 $\frac{1}{2}$
AMOUNT FOR LABOR				
Surface	61630.11	117172.10		55541.99
Underground	152381.24	346983.42		194602.18
Total	214011.35	464155.52		250144.17

Proportion Surface to Underground Men:

1921 - 1 to 2.51	2-8hr 6 days a week Jan. 1 to Mar. 5th;
1920 - 1 to 2.67	2-8hr, 5 " " Mar. 5 to June 1st;
1919 - 1 to 2.81	1-8hr 3 " " June 1 to Dec. 31.
1918 - 1 to 2.58	
1917 - 1 to 2.56	
1916 - 1 to 3.02	

Dynamite
Bond
MADE IN U.S.A.

REPUBLIC MINE

STATEMENT OF EXPLOSIVES USED FOR STOPPING & DEVELOPING IN ORE (BREAKING ORE)

KIND	QUANTITY	AVERAGE PRICES	AMOUNT 1921	AMOUNT 1920
50% Powder - - - - -	67,162	.1964	13,196.52	30,675.74
Total Powder - -	67,162	.1964	13,196.52	30,675.74
Fuse - - - - -	85,950	7.439	639.42	1,852.33
Caps - - - - -	18,925	14.110	267.03	627.31
Tamping Bags - - - - -	9,941	2.182	21.69	42.15
Cap Crimpers - - - - -	3	.77	2.31	2.95
Connecting Wire - - - - -	-	-	-	4.60
Battery Caps - - - - -	50	6.48	3.24	-
Fuse Ignitors - - - - -	150	9.98	14.97	-
Total Fuse, Etc.			948.66	2,529.34
Total All Explosives -			14,145.18	33,205.08
Product - - - - -			73,014	153,951
Pounds Powder per ton of ore			.92	1.01
Cost per ton for Powder			.1808	.1993
" " " " Fuse, Caps, Etc.			.0129	.0164
" " " " All Explosives			.1937	.2157
Avg. Price per Lb. for Powder			.1964	.1968

Republic Mine on 5 day a week basis on Feb. 12th, 1921.

" " " 3 single shifts basis on June 1st, 1921.

Dynamite
Bond
MADE IN U.S.A.

SPIES MINE.

PRODUCTION:-

The Spies Mine was only operated the first five months of 1921, and the total product for those months aggregated 44,514 tons. The following table shows how the monthly product suddenly decreased due to exhaustion of the main ore body in the mine.

The following table shows the amount of ore taken out of the Spies Mine since it was opened up:-

<u>PRODUCT.</u>	
	<u>TONS</u>
Year 1916,	314
1917,	74,581
1918,	123,675
1919,	70,914
1920,	100,705*
Jan., 1921,	9,040
Feb. 1921,	8,906
Mar. 1921,	10,610
Apr. 1921,	9,112
May, 1921,	6,846
Total,	414,903

*Includes stockpile over-run.

On December 31st, there were also approximately 48,700 tons of ore available above the 3rd Level.

The present known ore bodies in the Spies Mine proper above the 3rd Level are nearly exhausted. The territory drilled below the 3rd level has not been found very productive and all the indications point to the probable existence of a large ore body on the neighboring or Virgil lease below the elevation of the 3rd Level in the Spies property.

But very little additional tonnage can be expected to be produced from the Spies Mine lease, but the Virgil property gives promise of yielding a tonnage in excess of the total produced so far from the Spies Mine.

DELAYS:-

We had no delays in the five months the mine operated that caused any loss of production.

SHIPMENTS:-

The only shipments were from the stockpile and loading was not started until very late in the season. We shipped 27,448 tons that averaged 56.20 Iron, .505 Phosphorus and 5.35 Silica. All of this ore went to the C. & N. W. Dock at Escanaba. The above tonnage was loaded into four boats and the mine analysis and results from the Lake Erie chemists show very fair checks for the different cargoes.

BOAT	MINE ANALYSIS	LAKE ERIE ANALYSIS
Grand Island,	56.68 Iron,	56.50 Iron,
Lewiston,	57.20 "	57.20 "
Pioneer,	55.07 "	54.60 "
Sheadle,	56.79 "	56.95 "

COSTS:-

The cost of production was higher during the short period we operated in 1921 compared with the costs for 1920, due entirely to the decreased production after the main stope was mined out.

COST OF PRODUCTION.			
	LABOR	SUPPLIES	TOTAL
Year 1917,	.933	.633	1.566
Year 1918,	.954	.418	1.372
Year 1919,	1.004	.420	1.424
Year 1920,	.955	.359	1.314
Jan. 1921,	1.503	.576	2.079
Feb. 1921,	1.224	.566	1.790
Mar. 1921,	1.135	.483	1.618
Apr. 1921,	1.247	.544	1.791
May, 1921,	1.458	.785	2.243

You will note that notwithstanding the many wage increases in the years 1917 - 1920, inclusive, that the cost of production remained approximately the same in the four years.

UNDERGROUND.

We found but little new ore in the past year. The ore reserves were being depleted rapidly and the last two months we operated, we had great difficulty in keeping the product up to normal on only the day shift. Miners were being employed both day and night and ore hoisted only on the day shift. Contrast this with the conditions in the previous year when we were able to keep the trammers busy on both shifts by only breaking ore on the day shift.

EXPLORING.

The Diamond Drill was used to explore the ground on the Virgil property but no ore body sufficiently large to permit mining was discovered. The following holes were drilled:-

No. 8, Dip -45° strike S. 55° 46' W. location North end of boundary cross-cut. No ore found.

No. 9, drilled vertically from same set-up as above. Struck footwall at 150'. No ore encountered.

No. 10, drilled at an angle of -45° S. 45° East, cut through a few feet of 57% ore and approximately 120 feet of lean ore, averaging 52% Iron.

No. 11, No. 12 and No. 13, drilled near the North-East corner of the Virgil property: No. 12 encountered 10 feet of ore running 55.70 Iron; the other two holes were blanks.

ROCK DRIFTING.

In five months operated, more than twice as much rock drifting was done than during the entire year of 1920. Footage for 1921 totaled 510 at a cost of \$6.33 per foot compared with 250 feet in 1920 at \$12.54 per foot.

The cost per foot was halved due largely to using No.248 I.- R. drills instead of the lighter Jackhammers formerly used in all the rock drifts at this property.

The bulk of this drifting was done on the 3rd Level exploring the North footwall and driving over into the Virgil Mine.

ORE DRIFTING.

There is no way to compare the footage drifted or raised in ore with the previous year, due to the fact that formerly all this work was charged to breaking ore and no subdivisions made on the cost sheet. It is a fact, however, that more raises were put up in proportion to the amount of ore stoped than in previous years due to exhaustion of the main ore body. In order to keep the product up to somewheres near normal, the smaller lenses in the mine were mined out which required additional raising and drifting.

STOPING.

The cost per unit for stoping in 1921 ran .764 which is in excess of the unit cost of .557 for 1920. The 1920 cost includes ore drifting and raising, which must be added to the 1921 cost to make a comparison. The 1921 figure then becomes .834 per unit. The increase was caused by more ore broken in the North lens and 3rd Level shrinkage stopes and a smaller proportion of ore mined in the main stope. The main stope was practically mined out early in the year which wiped out all prospects of mining the ore economically for the balance of the year.

TRAMMING.

No change was made in the system of tramming other than no ore was trammed to the shaft on the night shift in April or May. As long as it was impossible to keep the skip busy on both shifts, obviously, it was cheaper to hoist only on one shift, thereby laying off one crew of skip tenders, chutemen and top landers.

PUMPS.

The water supply for the location was pumped from a sump located just below the point where the ledge water ran into the shaft. The water supply for the boilers and dry was taken from the over-flow tank into which the 3rd Level pump discharged the mine water. As a result, the boilers quickly filled with sediment and the men were using unclean water for washing, besides the method was unsanitary.

For the last three years we have sought a clean water supply that would be ample for all requirements. Two test pits were dug on surface to the ledge on the Virgil property and a water supply sought East of the Spies Shaft but with no success.

When Diamond Drill Hole No. 9 was drilled on the 3rd Level, we ran into a heavy flow of water as soon as the hole was finished. Samples of this water were sent away to the State Laboratory to be tested. The results being favorable, we installed a pump and pipe line and relayed this water to the first level sump where in turn, it was pumped into the supply tank, thereby providing clean water for all purposes.

COMPRESSORS & POWER DRILLS.

No new power drills were purchased in 1921.

One of the cylinders on the Air Compressor cracked and was repaired with an Oxy-Acetylene outfit.

HOIST.

The electric hoist gave us no serious trouble. One of the pedestals carrying the right hand main bearing cracked but we repaired this without interfering with the hoisting.

A second hand hoisting rope that was still in good condition was sent down from the Republic Mine to replace the skip rope.

STOCKING ORE.

The Stocking Ore Account includes Top Landing & Trimming expense on the new Cost Sheet. The only unusual expense was incurred when the top landers shanty and puffer was moved to the new location. Previously, all the rock was brought to surface on the cage and trammed out by hand. This meant delays when the cars were brought up, so we decided to re-arrange the top tram to permit bringing up rock in the skip and dumping same into the regular top tram car. To make this change, we had to move the top tram puffer which was located close to the dump in the centre of the track opposite the skip-road. The old rock track ran out from the centre of the cage compartment and this was shifted over to come in line with the centre of the skip compartment.

ACCIDENTS.

We had five accident at the Spies Mine during the year and, unfortunately, one of those was fatal. On March 2nd, Ben Lubowichi was killed in the 3rd Level, North lens shrinkage stope. The accident was classified as preventable.

ORE RESERVES.

All of the ore in the Spies and Virgil properties is Non-Bessemer.

	NET TONS AVAILABLE	NET TONS UNAVAILABLE	PROBABLE
<u>MAIN ORE BODY.</u>			
Ore above First Level,	1,460	15,800	
" " Third "	4,940		
<u>NORTH LENS.</u>			
Ore above First Level,	13,118		
" " Second "	14,520		
" " Third, "		5,696	
" below Third "			3,584
<u>WEST ORE BODY.</u>			
Ore above Third Level,	13,672		
" below Third "			22,540
" above Third " Virgil drift,	1,000		
Total,	48,716	21,496	26,124

The following table shows the ore developed each year since the mine was opened up:-

	1918	1919	1920	1921
Ore in sight, Jan. 1st,	255,354	213,940	181,806	124,639
Product,	123,675	70,914	100,705	44,514
Balance,	131,679	143,026	81,101	80,125
Ore in sight, Dec. 31st,	213,940	181,806	124,639	96,336
Developed during year,	82,261	38,780	43,538	16,211

NORTH LENS.

875' SUB-LEVEL:-

Mining in this portion of mine was carried up from the 845' Sub at the end of 1920 to the 875' elevation on June 1st. This stope has not shown up the ore we expected to find.

At the South end of the stope, there seems to be a layer of Jasper interbedded in the ore lens which forms the present back of the stope and between the sand and this layer of Jasper there is another body of ore. This latter ore can not be mined.

At the North end of the stope, the foot and hanging are only 20 feet apart with a narrow seam of ore between. Just before the mine was closed down, a small drift was driven due East in ore from about the centre on the footwall side of the stope. This drift is in 40 feet and the breast is still in ore.

662' SUB-LEVEL:-

At the North end of this sub, the ore was mined out to Jasper hanging. All of the ore at this elevation has been mined.

682' SUB-LEVEL:-

All of the ore was mined out up to within 15 feet of the Second Level leaving a floor pillar to support the main level.

Before the mine closed, we planned on putting up a raise to the ore body found around Diamond Drill Hole #9 at the North-West end of the Second Level.

MAIN STOPE.

900' SUB-LEVEL:-

The main stope ore body has been practically all mined out up to within 15' or 20' of the sand. There is only a small pillar left between Diamond Drill Hole #14 and the North limit of the ore body.

642' SUB-LEVEL:-

At the South end of the North lens, the ore was followed South and at a point opposite Diamond Drill Hole #20, the foot swung sharply to the West and the ore was followed to the foot of the main stope. All of this ore is now mined out up to the 682' Sub-Level.

682' SUB-LEVEL:-

The ore lying between the North lens and the main stope has been mined up to within 20 feet of the Second Level. The shrinkage stope is filled with broken ore which can not be drawn off until the back is mined out up to the Second Level. A pillar will have to be left in place under the main Second Level drift leading out from the shaft.

WEST ORE BODY.

622' SUB-LEVEL:-

A short cross-cut was driven North from the raise put up from the 3rd Level on the North side of the drift halfway between Diamond Drill Hole #22 and #25.

642' SUB-LEVEL:-

Some of the ore left in the hanging of the main stope near Diamond Drill Hole #22 was mined out. This could not be mined when the stope was first developed, because there were no raises in that territory through which to draw off the ore. Five raises were put up from the main West drift leading over to the Virgil property. These are intended to tap the ore left on the West side of the main stope, and we expect to explore the ore found in Diamond Drill Hole #5.

THIRD LEVEL NORTH.

At the North end of the Third Level, the ground was pretty thoroughly explored. The slate footwall was followed for 200 feet and drill holes drilled into the foot and hanging. Only one hole showed ore at the extreme North-East corner of the Virgil Mine Lease. Here we cut 10 feet of ore averaging 55.70 Iron.

VIRGIL DRIFT.

The Third Level drift on the Spies property was extended South-Westerly over into the Virgil Lease. The first 50 feet was lean material. Then we had a full drift width of good ore until the 1200 West co-ordinate line was reached. The ore in the back of the drift looked very promising and two raises were put up, one in the footside and one on the hanging. These raises went up 20 feet and struck rock. The drift was then driven further West and we had mixed ore and Jasper for the next 150 feet. The last few feet of the main level drift was in slate.

The best prospects for developing ore on the Virgil lease lie on the West side of the forty near the Sherwood lease. Here three Diamond Drill Holes, distant from 100 feet to 200 feet away from the West line, show a prospective tonnage of approximately 575,000 tons. Further drilling is necessary, however, to actually prove the existence and grade of this tonnage.

MADE IN U.S.A.

SPIES MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1921.

GRADE	IRON	PHOS.	SILICA
Spies,	55.70	.526	5.98
Virgil,	55.25	.587	3.92

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1921.

GRADE	Mine			Lake Erie	
	IRON	PHOS.	SILICA	IRON	MOIST.
Spies,	57.20	.515	4.41	57.20	4.35
Virgil,	(No Shipments)				

ORE STATEMENT - DECEMBER 31ST, 1921.

	VIRGIL	SPIES	TOTAL	TOTAL LAST YEAR
On hand January 1, 1921,	233	14,480	14,713	100,909
Output for Year,	602	43,912	44,514	92,296
Stockpile Overrun,	0	0	0	8,176
Total,	835	58,392	59,227	201,381
Shipments,	0	28,467	28,467	186,901
Balance on Hand,	835	29,925	30,760	14,480
Decrease in Output,			55,958	
Increase in Ore on Hand,			16,280	

1921 -- 2-8 Hour Shifts, 6 days per week, Jan. 1st to April 18th, 1921.
 1-8 Hour Shift, 6 days per week, April 18th to June 1st, 1921.
 Mine closed May 31st, 1921.

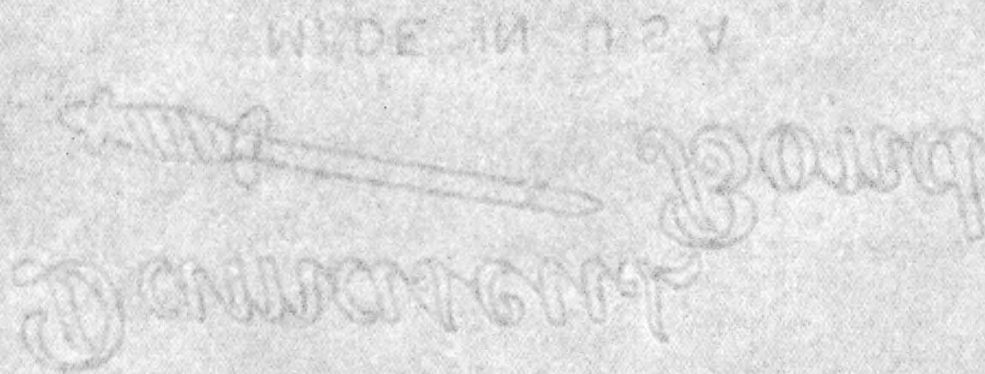
1920 -- Idle Jan. 1st to May 28th, 1920.
 2-8 Hour Shifts May 28th to Dec. 31st, 1920.

Handwritten signature
 Bond

MADE IN U.S.A.

SPIES MINE
SHIPMENTS FOR YEAR 1921.

	GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Spies,		0	28,467	28,467	186,901
Virgil,		0	0	0	0
	Total,	0	28,467	28,467	186,901
Total Last Year,		77,816	109,085	186,901	
Decrease,				158,434	

MADE IN U.S.A.


SPIES MINE

COMPARATIVE MINING COST FOR YEAR

	1 9 2 1	1 9 2 0	INCREASE	DECREASE
Product	44,514	100,705		56,191
Underground Costs	1.561	1.147	.414	
Surface Costs	.237	.154	.083	
General Mine Accounts	.082	.056	.026	
Cost of Production	1.880	1.357	.523	
Plant Account	.375	.575		.200
Taxes	.101	.089	.012	
Central Office	.063	.040	.023	
Contingent Expense	.007	.002	.005	
Idle Expense	.382	.078	.304	
Cost Adjustment	.060	.041	.019	
Cost on Stockpile	2.868	2.182	.686	
Loading & Shipping	.015	.178		.168
Total Cost on Cars	2.883	2.360	.523	
Number Days Operating	126	179		53
No. Shifts & Hours	2-8-39 1-8-37	2-8		
Average Daily Product	353	563		210
<u>COST OF PRODUCTION</u>				
Labor	1.300	.982	.318	
Supplies	.580	.375	.205	
Total	1.880	1.357	.523	

Operated 2-8 hr. shifts 6 days a week Jan. to Apr. 17, 1921;
 " 1-8 hr. " 6 " " Apr. 18 to May 31;
 Mine closed May 31, 1921.

MADE IN U.S.A.

SPIES MINE

COMPARATIVE WAGES AND PRODUCT

	1 9 2 1	1 9 2 0	INCREASE	DECREASE
PRODUCT	44,514	100,705		56,191
No. Shifts and Hours	2-8;1-8	2-8hr		
AVERAGE NO. MEN WORKING				
Surface	10	13		3
Underground	28	41		13
Total	38	54		16
AVERAGE WAGES PER DAY				
Surface	4.76	5.51	.75-13.61%	
Underground	5.64	6.43	.79-12.28	
Total	5.42	6.20	.78-12.58	
WAGES PER MONTH OF 25 DAYS				
Surface	119.00	137.75		18.75
Underground	141.00	160.75		19.75
Total	135.50	155.00		19.50
PRODUCT PER MAN PER DAY				
Surface	15.49	24.76		9.27
Underground	5.32	8.05		2.73
Total	3.96	6.08		2.12
LABOR COST PER TON				
Surface	.307	.223	.084	
Underground	1.060	.799	.261	
Total	1.367	1.022	.345	
AVG. PRODUCT BRK'G & TRM'G	8.01	10.98		2.97
" WAGES CONTRACT MINERS				
" " " TRAMMERS	6.61	6.81		.20
" " " LABOR	6.61	6.93		.32
TOTAL NUMBER OF DAYS				
Surface	2,874 $\frac{1}{4}$	4,066 $\frac{1}{4}$		1,192
Underground	8,361 $\frac{3}{4}$	12,508 $\frac{3}{4}$		4,147
Total	11,236	16,575		5,339
AMOUNT FOR LABOR				
Surface	13691.34	22417.12		8725.78
Underground	47177.95	80425.37		33247.42
Total	60869.29	102842.49		41973.20

PROPortion Surface to Underground Men:

1921 - 1 to 2.8
 1920 - 1 to 3.1
 .1919 - 1 to 2.91
 1918 - 1 to 2.86
 1917 - 1 to 3.2

Operated 2-8hr shifts 6 days a week Jan. to April 17, 1921;
 " 1-8hr " 6 " " Apr. 18 to May 31;
 Mine closed May 31, 1921.

SPIES MINE.

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE.

KIND.	QUANTITY.	AVERAGE PRICE.	AMOUNT 1921.	AMOUNT 1920.
40% Powder	50,425	.1725	8,698.32	10,442.18
60% "	1,375	.1975	271.56	533.50
Total Powder	51,800	.1732	8,969.88	10,975.68
Fuse	152,650	7.67	1,170.81	1,516.31
Caps	17,050	14,614	249.16	291.26
Cap Crimpers	4	.50	2.00	4.95
Tamping Bags				4.52
Total Fuse, Etc.			1,421.97	1,317.04
Total Explosives			10,391.85	12,792.72
Product			44,514	92,529
Pounds Powder per ton Ore			1.163	.67
Cost per Ton for Powder			.202	.119
" " " Fuse, Caps, Etc.			.0319	.0196
" " " All Explosives			.2339	.1386
Average Price per Lb. for Powder			.1732	.1762

NOTE;

Mine closed down May 31, 1921.
Some development work carried on during the year.

CROSBY MINE

ANNUAL REPORT FOR 1921

The production of wash ore from the Crosby Mine during the year 1921 amounted to 59,133 tons, all of which was secured from underground operations. All mining operations were suspended May 7th.

There was 30,621 tons of ore in stock on January 1st. and the output during 1921 raised this to 89,754 tons. This ore is comparatively free from rock, due to careful sorting underground and on the stockpile. Based on our past experience with Crosby stockpiles, we feel that there should be an overrun of between 8% and 10%. Should this overrun be realized, we should obtain approximately 60,000 tons of concentrates, of which we estimate 20,000 tons will run .045 phosphorus and the balance Non-Bessemer. If the phosphorus content of the Bessemer ore is raised to .047, we would undoubtedly be able to ship around 28,000 tons of this grade.

CROSBY MINE ORE ESTIMATE

Following is an estimate of the ore in sight at the Crosby Mine on January 1st., 1921, the tonnage mined during the year and our estimate of January 1st., 1922, figuring the ore on a concentrated basis. The ratio of concentration is placed at 60%.

	<u>BESSEMER</u>	<u>NON-BESSEMER</u>	<u>TOTAL</u>
Estimate of January 1st., 1921----	135,000	314,000	449,000
Mined During 1921-----	<u>11,827</u>	<u>23,653</u>	<u>35,480</u>
ESTIMATE OF JANUARY 1ST., 1922----	123,000	290,000	413,000

We might be able to produce upwards of 100,000 tons of crude ore, 70,000 tons from underground and 30,000 tons from hand scrambling in the pit, provided the cost could be made to meet market conditions. On account of the rocky structure of the wash ore and the excessive cost entailed in mining and sorting the material, there is no question of our being able to mine a larger tonnage profitably. There is no open pit steam shovel ore remaining and it is not practical to strip the track and shaft pillar, on account of the expense.

No additional ore was developed at the Crosby Mine during the year

and we do not believe that there is any chance of showing any further tonnage by drilling or other exploratory work.

The tonnage in sight (Concentrated Basis) at the Crosby Mine on January 1st., 1922, is divided between the two forties as follows:

	<u>BESSEMER</u>	<u>NON-BESSEMER</u>	<u>TOTAL</u>
NE $\frac{1}{4}$ of NE $\frac{1}{4}$ of Section 31, 57-22----	103,000	236,000	341,000
NW $\frac{1}{4}$ of NW $\frac{1}{4}$ of Section 32, 57-22----	20,000	52,000	72,000
TOTAL- - - - -	123,000	290,000	413,000

GENERAL SURFACE

The accumulation of rock around the edge of the open pit was hauled and dumped into the caves to the east of the pits and the mine premises were cleaned of ashes and other debris.

As a means of guarding against cattle and people falling into the pits and to comply with the request of the County Mine Inspector, a fence was constructed around the east and north sides of the east pit and north side of the west pit.

A force of from four to eight men were employed during January, February and March in overhauling the washing plant machinery and repairing steam shovels and locomotive. The repair work was comparatively light, as the equipment had been thoroughly overhauled the previous water.

When the mine was shut down May 7th, the force was cut down to the minimum. We carried four men for a time in order to keep the mine unwatered and do the necessary policing. The force was reduced to two men in October. These men have been able to do the policing and what little pumping was necessary. At the present time, we are only operating the pump a few hours each week.

MINING OPERATIONS

Mining operations were confined to underground work entirely. The mine was closed down May 7th and no work was done during the balance of the year.

The tonnage produced by months and the analysis of same was as follows:

	<u>Tons</u>	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>
January-----	13,878	43.73	.040	29.18
February-----	13,563	45.27	.040	27.97
March-----	14,373	45.08	.042	28.62
April-----	14,454	45.71	.041	27.96
May-----	2,865	46.22	.043	25.54
In Stock January 1st. 1921-----	<u>30,621</u>	<u>45.68</u>	<u>.043</u>	<u>26.99</u>
TOTAL- - - - -	89,754	45.24	.042	27.87

The underground force consisted of 17 gangs. During January, 13 contracts were slicing and scrambling and four were engaged on development work, in February 12 gangs were slicing and 5 on development work, in March, April and May, 15 gangs were employed slicing and 2 developing.

"1490 Foot Sub-Level"

A double contract, No. 10, was engaged during the time the mine operated in slicing, scrambling and caving in the vicinity of Nos. 188 and 188-A raises. These workings were more or less open and the ore was frozen to quite an extent. While this required more blasting, it was not necessary to timber, and the saving here more than offset the powder cost. The grade of ore was quite satisfactory, averaging around 50% iron. The deposit had been about cleaned up at this elevation and No. 10 would have dropped down to the next sub within a short time.

Contracts Nos. 15 and 17 were employed from the first of February until the mine closed in scrambling and robbing to the south and west of No. 130 raise. A satisfactory tonnage of 49% ore was obtained from these gangs. The deposit had about been exhausted when the mine was shut down.

"FIRST LEVEL"

Contract No. 2, who had opened up and were stoping at the northwest end of the mine during 1920, continued this operation in 1921. The gang

mined out the pillar along their tramway and stoped out a piece of ground 30' wide, 110' in length and 25' in height. No. 2's workings were blasted in and the cave extended through the surface. There was rock in the back here and we were unable to get the ground to cave until a considerable room had been opened. The grade of ore mined by No. 2 contract averaged under 45% iron. There is sufficient ground here to furnish employment to one contract for several months.

Contracts Nos. 1 and 7 were employed in stoping along No. 1's 1920 development drift. These two gangs mined out and caved a room 240' long and averaging 60' in width and 25' in height. This ore was rather low grade, averaging only about 40% iron, but the tonnage realized was comparatively satisfactory.

No. 3 spent four months in slicing and caving back from the edge of the open pit toward Nos. 124 and 125 raises. These are in the same general area as Nos. 1 and 7 and the material is about the same grade.

There is sufficient ground here to furnish employment to the three contracts for a period of several months.

Contracts Nos. 4, 14 and 11 spent the four months in developing and slicing out the deposit immediately north of the east pit. This ore was loaded into motor cars and trammed through the northwest heading to the shaft. There was considerable weight encountered here and the timbering item was a considerable one. The ore averaged about 48% iron and the tonnage realized was about the average for the mine. Nos. 4 and 14 would have been transferred very shortly, but there is sufficient ground for several months operations with one gang.

"1435 Foot Sub"

At the beginning of the year, four contracts were engaged in slicing and caving operations in the vicinity of Nos. 307, 308, 309, 310, 311 and 312 raises. As the deposit was exhausted, the gangs were moved down to the 1420' sub. When the mine was closed May 7th, but one gang, No. 6, remained at this elevation, slicing and caving the ground to the north of No. 312 raise. There is sufficient ore to furnish employment to the one gang for several months.

The average grade of ore produced from this sub during 1921 was about 48% iron and .035 phosphorus. There are several pillars that could be mined in case the first level tramway to the west forty is abandoned. The product from Nos. 1, 2, 3 and 7 is trammed here, however, and the pillars could not be taken until the west deposit was cleaned up.

"1420 Foot Sub-Level"

At the beginning of the year, four gangs, Nos. 8, 9, 12 and 16, were employed in development work from Nos. 300, 301, 302, 303 and 304 raises. The ore was found to be of lower grade and more mixed with rock than was the case on the 1435' sub. Slicing operations were started 140' in from the raises and the deposit had been pretty well mined back when the mine was closed. Contracts Nos. 5, 8, 12, 13 and 16 were employed here when the mine shut down, No. 5 having been moved down in No. 310 raise the first of April. The five gangs would clean up the deposit at this elevation within four to five months. There is an area that has not been opened between Nos. 305 and 309 raises. This ore will only average about 40% iron and the mining cost is comparatively high, due to the compactness of the material and the presence of rock seams.

ACCIDENTS

Following is a list of the accidents, where the injured parties lost time, which occurred at the Crosby Mine during the past year:

SAM WUKOVICH

Injured-----March 28th, 1921.
Occupation-----Track Cleaner.
Nationality-----Montenegrin.
Time Lost-----23½ Days.
Compensation Paid-----\$43.75.

Remarks: Due to icy track, Wukovich slipped and fell, spraining his right wrist.

KEO RUOHA

Injured-----April 16th, 1921.
Occupation-----Miner.
Nationality-----Finnish.
Time Lost-----100 Weeks.
Compensation Paid-----\$1,571.37.

Remarks: Ruoha was engaged in placing a rail in No. 3 Contract. In striking the rail with a sledge hammer, a piece of the hammer broke off, and flew upwards, striking Ruoha's right eye. This accident resulted in the entire loss of vision of the right eye and settlement was made with Ruoha on this basis. The amount of \$1,571.37 shown as "Compensation Paid" includes \$132.00 to cover expenses for medical attention received at the Rochester Clinic.

MARKO WUKISOVICH

Injured-----May 5th, 1921.
Occupation-----Miner.
Nationality-----Montenegrin.
Time Lost-----40½ Days.
Compensation Paid-----\$86.25.

Remarks: Wukisovich and his partner were preparing to blast in No. 4 contract and had lit the fuse in the four holes they were about to fire in the breast of their working place. Wukisovich, violating the Safety Rules, attempted to tamp the powder in the lower left hole, after lighting the fuse. This hole went off, blowing ore into Wukisovich's eyes and striking his arms. He suffered abrasion of the arms and conjunctivitis of both eyes.

NICK VUJOVICH

Injured-----May 7th, 1921.
Occupation-----Miner.
Nationality-----Montenegrin.
Time Lost-----20½ Days.
Compensation Paid-----\$36.25.

Remarks: Vujovich and his partner were putting in a set of timber. Vujovich accidentally dropped the cap, which was resting on a post. The cap struck and severely bruised the second finger of his right hand.

CROSBY MINE.

ANALYSIS OF COST SHEET

For the purposes of analysis, the cost sheet covering the four operating months of 1921 will be compared with that for the same period during 1920. We operated until May 7th, but only produced 2,865 tons during that month and the cost of same was rather out of line, due to expenses incident to closing.

The production and costs per ton under the several main captions for the first four months of 1921 and 1920 follow:

Tonnage-----	<u>1920</u> 49,401	<u>1921</u> 56,268
Underground Costs-----	\$1.622	\$1.442
Surface Costs-----	.328	.187
General Mine Accounts-----	<u>.139</u>	<u>.078</u>
COST OF PRODUCTION- - - - -	\$2.089	\$1.707

The only accounts under the caption "Underground Costs" to show an increase in the cost per ton for 1921 were, "Development in Ore", "Timber", "Compressor & Power Drills" and "Pumping Machinery".

There was no charge made in 1920 for "Development Work in Ore", whereas in 1921 this amounted to \$.129 per ton. Contract 11 drove the old northwest first level heading to the Mace Iron Mining Company's boundary in 1921 for development purposes.

The account "Compressors & Power Drills" shows an increase of \$.003 per ton in 1921, due to the rather extensive repairs necessary. These were old drills and were in bad shape.

There was an increase of \$.002 per ton for "Pumping Machinery", the result of extensive repairs to the skip pit pump.

In 1920 there was a charge of \$.103 per ton for "Development in Rock", the result of drifting out under the east pit on the second level. There was no rock work done in 1921.

The account "Stoping" was \$.153 per ton less in 1921 and this is explained by the reduction in wages on February first, 1921, and to more efficient work on the part of the miners.

"Tramming" showed a decrease of \$.012 per ton in 1921. The long transfer tram on the 1435' sub was discontinued early in the year, and as the product from several gangs was handled here, this was quite an appreciable item.

There was a 1921 decrease of \$.015 per ton in "pumping". This was due to the larger tonnage secured and the reduction in pumpmen's wages.

"Compressors & Air Pipes" was \$.008 per ton lower in 1921, the result of decreased wages and less extensions of air lines being necessary.

The decrease of \$.011 in "Underground Superintendence" in 1921 is explained by the larger tonnage secured and the reduction in wages.

"Electric Tram Equipment" showed a decrease of \$.019 per ton in 1921. Less repairs were put on the underground locomotives and it was not necessary to do as much track work as in the same period of 1920.

"SURFACE COSTS"

All the items under this caption showed a decrease over those for 1920.

The 1921 "Hoisting" was lower by \$.002 in 1921, the result of the wage reduction, larger tonnage and improved load factor.

Stocking operations were conducted under more favorable conditions in 1921, due to the comparatively mild weather, with the result that one less man was employed. Further than this, the reduction in wages and the larger tonnage handled were important factors. There was a reduction of \$.040 per ton in this 1921 account.

"Dry house" was lower by \$.023 per ton in 1921, the result of reduced wages and the larger tonnage to absorb the expenses. During 1920, two dryhousemen were employed, whereas in 1921 the night watchman devoted part of his time to this work and the night man was let out.

Less men were carried against the account "General Surface" in 1921. This, together with the reduction in wages resulted in a decrease of \$.059 per ton to this account.

There were very slight reductions in "Hoisting Equipment", "Shaft", "Top Tram Equipment", "Docks, Trestles & Pockets", "Mine Buildings" and "Shop Machinery". Repair work was held to a minimum in 1921, wages were lower and there was a larger tonnage to absorb the charges.

CROSBY MINE.

"GENERAL MINE ACCOUNTS"

"Insurance" was \$.001 per ton less in 1921, the result of the larger tonnage.

Due to a reduction in salaries, the account "Engineering" showed \$.002 per ton less in 1921.

"Personal Injury Expense" was \$.01 per ton lower in 1921. The settlement of two accident cases, due to a cave-in, during the forepart of 1920, made this account rather high for that year.

The account "Mine Office" was \$.05 per ton lower in 1921. This was the result of employing but one man in the office, whereas we had two in 1920, the reduction in wages, and heating the office with stoves, in place of steam from the dry. The larger tonnage also affected this somewhat.

There was an increase of \$.005 per ton in "District Office" for 1921. We did not establish the District Office until March 1st., 1920, and no charges were made until that time. This more than offset the reduction in wages and the somewhat smaller proportion charged to the Crosby Mine in 1921.

CROSBY MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1921.

GRADE	IRON	PHOS.	SILICA
Crosby Crude,	45.02	.041	28.27

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1921.

GRADE	IRON	Mine PHOS.	SILICA
Crosby Bessemer,		(No Shipments)	
Crosby,		(No Shipments)	

ORE STATEMENT AND SHIPMENTS FOR YEAR 1921.

	CRUDE ORE	CONCEN- TRATES	SHIPMENTS	PERCENTAGE OF RECOVERY	TOTAL LAST YEAR
On hand January 1, 1921,	30,621				20,993
Output for Year,	59,133	0	0	0	194,882
Stockpile Overrun,					5,621
Total,	89,754	0	0	0	221,436
Crude Ore Treated,	0				190,815
Balance on Hand,	89,754	0			30,621
Total Last Year,	200,443	116,407	116,407		
Decrease in Output,	110,689				
Increase in Ore on Hand,	59,133				

1921 -- 2-8 Hour Shifts Jan. 1st to May 8th, 1921.
 Mine closed May 7th, 1921.

1920 -- 2-8 Hour Shifts for Year.

CROSBY MINE
COMPARATIVE MINING COST FOR YEAR

	1 9 2 1	1 9 2 0	INCREASE	DECREASE
Product	59,133	200,443		141,310
Underground Costs	1.462	1.005	.457	
Surface Costs	.194	.244		.050
General Mine Accounts	.088	.083 _m	.005	
Cost of Production	1.744	1.332	.412	
Original Cost	.026	.026		
Plant Account	.044	.042	.002	
Equipment		.009		.009
Taxes	.169	.137	.032	
Central Office	.071	.050	.021	
Contingent Expense	.008		.008	
Idle Expense	.425		.425	
Cost Adjustment	.038	.036	.002	
Winter Expense	.006	.028		.022
Cost on Stockpile	2.531	1.660	.871	
Loading & Shipping		.078		.078
Total Cost on Cars	2.531	1.738	.793	
No. Days Operating	.108	.309		201
No. Shifts & Hours	2-8hr	2-8hr-136 2-10hr-173		
Average Daily Product	548	649		101
<u>COST OF PRODUCTION</u>				
Labor	1.329	1.043	.286	
Supplies	.415	.289	.126	
Total	1.744	1.332	.412	

Mine closed May 7, 1921.

CROSBY MINE

COMPARATIVE WAGES AND PRODUCT

	1 9 2 1	1 9 2 0	INCREASE	DECREASE
PRODUCT	59,133	200,443		141,310
No.Shifts and Hours	2-8	2-8-136 2-10-173		
AVERAGE NO.MEN WORKING				
Surface	9	36		27
Underground	36	68		32
Total	45	104		59
AVERAGE WAGES PER DAY				
Surface	5.33	6.24		.91-14.58%
Underground	5.98	6.77		.79-11.66
Total	5.85	6.59		.74-11.23
WAGES PER MONTH OF 25 DAYS				
Surface	133.25	156.00		22.75
Underground	149.50	169.00		19.50
Total	146.25	164.75		18.50
PRODUCT PER MAN PER DAY				
Surface	20.81	17.86	2.95	
Underground	5.53	9.40		3.87
Total	4.37	6.16		1.79
LABOR COST PER TON				
Surface	.256	.349		.093
Underground	1.082	.721	.361	
Total	1.338	1.070	.268	
AVG.PRODUCT BRK'G & TRM'G BASED ON CRUDE ORE	7.05	12.89		5.84
TOTAL NUMBER OF DAYS				
Surface	2,841	11,220		8,379
Underground	10,693 $\frac{1}{2}$	21,337 $\frac{1}{4}$		10,643 $\frac{3}{4}$
Total	13,534 $\frac{1}{2}$	32,557 $\frac{1}{4}$		19,022 $\frac{1}{4}$
AMOUNT FOR LABOR				
Surface	15141.99	70021.29		54879.30
Underground	63961.97	144475.82		80513.85
Total	79103.96	214497.11		135393.15

Proportion Surface to Underground Men:

1921 - 1 to 4.
 1920 - 1 to 1.9
 1919 - 1 to 1.50
 1918 - 1 to 1.66
 1917 - 1 to 2.35
 1916 - 1 to 2.14

Mine closed May 7, 1921.

CROSBY MINE.

TIMBER STATEMENT FOR THE YEAR ENDING DECEMBER 31, 1921.

KIND	LINEAL FEET	AVG. PRICE PER FOOT.	AMOUNT	
			1 9 2 1	1 9 2 0
6" to 8" Timber	12,241	.1039	1,271.84	1,382.62
8 to 10 "	24,483	.1039	2,546.50	2,304.26
10 to 12 "	6,365	.1039	661.32	461.71
12 to 14 "	3,428	.1039	356.17	231.35
14 to 16 "	2,449	.1039	254.45	231.26
Total - 1921	48,966	.1039	5,090.28	
Total - 1920	51,937	.0887		4,611.20
	LINEAL FEET	PER 100'		
8' Lagging	185,730	.681	1,264.57	2,267.09
Poles	-	-	-	-
Total - 1921	185,730	.681	1,264.57	
Total - 1920	430,500	.526		2,267.09
Product			59,133	200,443
Feet timber per ton of ore			.828	.2591
" lagging "			3.141	2.147
" " per foot of timber			3.794	8.288
Cost per ton for timber			.0861	.0230
" " lagging			.0214	.0113
" " poles			-	-
" " timber, lagging & poles			.1075	.0343
Equivalent of stull timber to bd. measure			102,471	102,154
Ft. board measure per ton of ore			1.733	.509
Total cost for timber, lagging & poles - 1921				6354.85
1920				7978.29
1919				2249.88
1918				1348.36
1917				2157.85
1916				1492.65
1915				4068.66

CROSBY MINE.

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE.

KIND.	QUANTITY.	AVERAGE PRICE.	AMOUNT 1921.	AMOUNT 1920.
30% Powder	36,950	.1633	6,035.60	11,446.74
40% "	600	.1844	110.64	339.80
XXXX " (Black)				1,620.78
<u>Total Powder</u>	37,550	.1637	6,146.24	13,407.32
Fuse,	55,500	.7445	413.76	1,058.34
Caps,	16,800	1.388	233.19	616.05
Connecting Wire,	-	-	-	4.83
Electric Exploders,	-	-	-	426.64
<u>Total Fuse, Etc.,</u>			646.95	2,105.86
<u>Total Explosives,</u>			6,793.19	15,513.18
Product, Crude Ore,			59,133	200,443
Pounds Powder per Ton of Ore,			.635	.479
Cost per Ton for Powder,			.1039	.0668
" " Fuse, Caps, Etc.			.0109	.0105
" " All Explosives,			.1148	.0773
Avg. Price per Pound for Powder			.1637	.1395

NOTE: For operating conditions, see "Comparative Wages and Product."

MEADOW AND FOWLER MINES

ANNUAL REPORT FOR 1921.

The production from the Meadow and Fowler Mines for the five months' operating period of 1921 amounted to 34,671 tons; of which 23,615 tons came from the Meadow and 11,056 tons from the Fowler.

The average analysis of the ore produced from the Meadow and Fowler Mines during 1921 was as follows:

	<u>Tons</u>	<u>Fe.</u>	<u>Phos</u>	<u>Mn.</u>	<u>Sil.</u>
Meadow Mine-----	23,615	57.06	.072	1.80	9.51
Fowler Mine-----	<u>11,056</u>	<u>55.94</u>	<u>.059</u>	<u>1.95</u>	<u>11.05</u>
TOTAL AND AVERAGES-----	34,671	56.70	.068	1.85	10.00

The labor conditions in the Aurora District during 1921 showed a marked improvement over that in 1920, both as regards the number of men available and the efficiency of their work. This was due to extensive curtailment at other properties in this district, as well as over the entire Mesaba Range. The number of gangs that could be employed was limited to eight, on account of restricted mining conditions. We were able to keep the eight contracts filled and also to operate several wet places that the men would not work in when labor was scarce. The greater efficiency of the miners is very plainly shown by the increased tons per man, - the working conditions being about the same at these properties. In December, 1920, the tons per man amounted to 3.54; in January, 1921, 3.61; February 3.78; March 3.91; April 4.37; and in May, 4.03. The decrease in May as compared to April was due to restricted minable ground.

In April, 1921, we made a careful survey of the mining conditions at the Meadow-Fowler properties and estimated that a profitable operation could be conducted to July 1st. or 15th. The Meadow-Fowler properties were ordered closed on June 3rd., due to a general depression in the ore market, which necessitated extensive curtailment on the part of the Company.

Notice of cancellation of the Meadow Mine lease was served on the Fee Owners May 31st., 1921, and mining operations were discontinued at the end of the day shift of June 3rd. According to an agreement reached with the Fee Owners, as

set forth in a letter of June 30th from Mr. Wilbur VanEvera to Mr. S. L. Mather, we were compelled to continue pumping for a period of 90 days from date of notice (May 31st. 1921).

MEADOW MINE ORE ESTIMATE OF JANUARY 1ST. 1922

The following is an estimate of ore in sight at the Meadow Mine on January 1st., 1921, the tonnage mined during the year and the balance remaining at the time of the surrender of the lease.

A factor of 13 cubic feet per ton was used in this estimate, a 10% deduction being made for rock and 10% to cover mining loss.

Ore in Sight January 1st. 1921-----	77,000 Tons.
Ore Mined During 1921-----	<u>25,615 "</u>
BALANCE- - - - -	53,385 "

This tonnage is all on the NE $\frac{1}{4}$ of NW $\frac{1}{4}$ of Section 3, 58-15.

The average analysis of the ore left in the mine follows:

<u>Tons</u>	<u>Fe.</u>	<u>Phos</u>	<u>Mn.</u>	<u>Sil.</u>	<u>Mois.</u>	<u>Fe.Nat.</u>
53,385	57.00	.075	2.00	10.00	12.00	50.16

The mining and development work on the 1330', 1320' and 1300' Sub-Levels did not show any additional tonnage over that estimated January 1st. 1921.

Of the 53,385 tons, about 8,000 tons remains on and above the main tramming level and 45,385 tons below this elevation.

We do not consider that there is any prospect of developing additional ore of a shipping grade at the Meadow Mine, as all work done at lower elevations demonstrates a pinching out of the deposit and the presence of low grade painty material.

FOWLER MINE ORE ESTIMATE OF JANUARY 1ST. 1922

Following is an estimate of the ore in sight at the Fowler Mine on January 1st., 1921, the tonnage mined during the year and the balance remaining at the time the lease was surrendered.

A factor of 13 cubic feet per ton was used in this estimate, a 10% deduction being made for rock and 10% to cover mining loss.

Ore in Sight January 1st. 1921-----	25,000 Tons.
Ore Mined During 1921-----	<u>11,056 "</u>
BALANCE- - - - -	13,944 "

This tonnage is all on the NW $\frac{1}{4}$ of NE $\frac{1}{4}$ of Section 3, 58-15.

The average analysis of the tonnage left in the mine follows:

<u>Tons</u>	<u>Fe.</u>	<u>Phos</u>	<u>Mn.</u>	<u>Sil.</u>	<u>Mois.</u>	<u>Fe.Nat.</u>
14,000	56.00	.060	1.30	11.00	11.00	49.74

There was little or no development work done in 1921, operations being confined to the pillars around the McInnis shaft. We feel very positive that there is little likelihood of developing any additional merchantable ore in the Fowler Mine.

In addition to the merchantable grade, we estimate approximately 32,000 tons of second class ore, running between 50 and 55% iron content.

GENERAL SURFACE

The location premises were cleaned and the accumulation of debris around the mine buildings and shaft was removed early in the spring. Aside from this, no other work was done on surface, as the mine was closed down on June 3rd and the lease given up.

During June, all underground equipment, including gasoline locomotives, drills, small tools, cars, rails and pipes were brought to surface. The drills, small tools and pipe fittings were stored in the warehouse and afterward were transferred to the Boeing Mine, together with all supplies that could be used at our other Mesaba properties. Only repairs and material for the boilers, hoist, compressor, pumps and gasoline locomotives were left at the Meadow warehouse.

All the mine timber and lagging was loaded and shipped to the Boeing Mine.

After pumping operations were discontinued on August 31st. and all equipment had been removed from underground, the skips were removed and the shaft collar carefully covered over. The windows of all the mine buildings and vacant location houses were boarded up.

A caretaker is employed to look after the buildings and equipment until disposed of, or removed to one of our other properties. We have permission from the Fee Owners to allow this property to remain on Meadow land. They are to give us 60 days notice of removal.

The Meadow Mine equipment and buildings were offered to the Fee Owners for \$20,000.

The majority of the location houses are still occupied by former employees. The ruling that men out of work be charged no rent is being carried out at the Meadow location.

Captain Wivell moved his family to the Wade location on September 1st. and is living in the house formerly occupied by Captain Easterbrook, who left our employ in July.

STOCKPILES

Following is the tonnage of Meadow and Fowler ore in stock June 3rd., when the mine was closed down, and the average analysis of same:

	<u>Tons</u>	<u>Fe.</u>	<u>Phos</u>	<u>Mn.</u>	<u>Sil.</u>
Meadow Ore in Stock June 3rd-----	39,105	56.89	.072	1.95	9.61
Fowler Ore in Stock June 3rd-----	<u>26,971</u>	<u>56.62</u>	<u>.059</u>	<u>1.66</u>	<u>10.92</u>
TOTAL AND AVERAGES-----	66,076	56.78	.067	1.83	10.14

Following is the tonnage shipped from stockpile during the season of 1921 and the average analysis of same:

	<u>Tons</u>	<u>Fe.</u>	<u>Phos</u>	<u>Mn.</u>	<u>Sil.</u>
Meadow Stockpile Shipments-----	9,573	56.47	.069	1.94	10.31
Fowler Stockpile Shipments-----	<u>10,655</u>	<u>55.65</u>	<u>.059</u>	<u>2.03</u>	<u>11.43</u>
TOTAL AND AVERAGES-----	20,228	56.03	.064	1.99	10.91

The tonnage and average analysis of the Meadow-Fowler stockpiles as of January 1st., 1922, follows:

	<u>Tons</u>	<u>Fe.</u>	<u>Phos</u>	<u>Mn.</u>	<u>Sil.</u>
Meadow Stockpile on January 1st----	29,532	56.89	.072	1.95	9.61
Fowler Stockpile on January 1st----	<u>16,316</u>	<u>56.62</u>	<u>.059</u>	<u>1.66</u>	<u>10.92</u>
TOTAL AND AVERAGES-----	45,848	56.79	.067	1.85	10.08

The original lease of the Meadow Mine states that all property, including stockpiles must be removed within 90 days after its cancellation. According to a supplementary agreement reached with the Fee Owners of the Meadow Mine, we were granted permission to allow our stockpiles to remain on their land after the ninety day period had expired, provided that 20,000 tons be shipped by September 1st., 1921, and the balance prior to September 15th, 1922.

By removing 20,000 tons and granting the Fee Owners permission to stock ore on our lots in the Stein-O'Rourke Addition, a space was made available for stocking upward of 30,000 tons, should they desire to re-open the mine.

These stockpiles have not been cleaned up since 1918 and we estimate that there will be an overrun of close to 5,000 tons.

Orders were received on July 20th for the loading of the 20,000 tons of Meadow-Fowler ore. The Wade Mine 70-ton Bucyrus stockpile shovel was shipped to the Meadow Mine, arriving on July 25th. Loading operations were begun on July 26th and completed on August 10th. The shovel was laid up here as the balance of the stockpile ore must be loaded out prior to September 15th, 1922, and we

will not need it for work at the Wade before this time.

The iron and manganese content of the Meadow ore in stock is somewhat lower than we had anticipated. This is due almost entirely to the painty material encountered in the development of the 1300' Sub-Level.

Although the Fowler ore in stock on January 1st., 1921, was up to grade, it was impossible to hold it there. The pillars around the old McInnis shaft were cut with seams running low in iron and high in manganese. The Fee Owners required us to mine this class of ore as long as the iron content did not run much under 54%. Nearly the entire 1921 tonnage came from this territory.

UNDERGROUND

The underground ventilation was very good during the five months we operated. We knew that the ventilating condition was dependent entirely on maintaining an opening to the old McInnis shaft. As our mining on the Fowler side was confined to removing the pillars about this shaft, we were very apprehensive that as soon as the first sub-level was caved, the shaft would collapse and cut off our ventilation. Due to the frost condition, which extended down to the main level, the rooms did not entirely fill when blasted in and a good circulation was maintained. This allowed us to use our gasoline locomotives until work was suspended. On account of the poisonous fumes resulting from the gasoline locomotives, we would have had to discontinue their use as soon as the ventilation was cut off and tram with mules. This would have increased our tramping cost somewhat and was taken into consideration when estimating the length of time the mine could be operated on a profitable basis.

The water pumped during January, February, March and April amounted to about 700 gallons per minute, which has always been the normal flow from the underground workings. With the spring break-up and heavy rains, there was a decided increase and we averaged 850 gallons per minute for the month of May. During May the compound pump was overhauled and its efficiency improved to care for the increased flow of water, which by June had reached approximately 1,000 gallons per minute. There was no noticeable decrease in the amount of flow up to the time pumping was discontinued on August 31st.

Mining operations were discontinued at the end of the day shift of June 3rd. A crew of eight to ten men was employed underground for removing the underground equipment, including gasoline locomotives, drills, small tools, cars, rails and pipes. The concrete bulkhead on the second level, which dammed off the water from the south drift, was blasted out, at the request of the Fee Owners in order that they might inspect the south workings of the mine.

The force was reduced to six men on the 18th and consisted of two pumpmen, two firemen and two watchmen. During August, several extra men were employed to prop and brace the timber sets in the main drift to the north ore body and sub-levels. Although the drifts were in pretty good shape when we discontinued underground operations, some weight developed and this work was done to satisfy the Fee Owners.

A force of eight contracts was employed from the first of the year to the last week in May, when it became necessary to reduce to seven, on account of a lack of working places. Up to the first week of May, six gangs were engaged on the Meadow side and two on the Fowler, when one Meadow contract was transferred. During the last week of May one Meadow gang was laid off, due to restricted conditions.

Mining operations during the five months the Meadow was worked, consisted in attacking the pillars on the 1330 and 1320' sub-levels and development work on the 1300' sub. One gang was employed on the 1355' sub until the middle of April, when work had to be suspended on account of the proximity of the Fowler tramway. The development of the 1300' sub-level demonstrated that the deposit had narrowed to such an extent at this elevation that only two gangs could be worked to advantage.

The Fowler operations were carried on with two gangs up to May, when one of the Meadow contracts was transferred. The mining of the pillars left around the old McInnis shaft was completed in March and then the pillars just south of the shaft were attacked. There was only about three to four more weeks work in the locality when the mine was closed.

MEADOW WORKINGS

"1355 Foot Sub-Level"

A small deposit at this elevation, 50' north of the drift to the Fowler, was developed and sliced out by No. 4 contract. There is a possibility of this ore extending some distance to the south, but on account of protecting the tramways, work had to be discontinued here during April and No. 4 gang transferred to the 1300' Sub-Level. The ore produced from this territory was cut by seams of quartz and only averaged about 56% iron.

"1340 Foot Level"

The only work done on the main level was the mining of two very small pillars, 100' north of the drift to the Fowler, by No. 4 contract in February.

"1330 Foot Sub-Level"

Contracts Nos. 1 and 3 were engaged in mining the four pillars remaining at this elevation. All the ore produced had to be transferred to the 1320' Sub and dumped into Nos. 10 and 4, 1260' Level raises. The ore averaged 58% iron and 1.50% manganese. No. 1 contract was transferred to the 1320' Sub-Level in February and No. 3 in March.

"1320 Foot Sub-Level"

Contracts Nos. 5 and 6 started mining operations here in January and in February were joined by No. 1 and in March by No. 8. Except for a small tonnage mined by No. 1 gang in the vicinity of No. 10 raise, all the ore was trammed to No. 4 raise. No. 5 contract spent a large portion of its time repairing and retimbering the main tramway.

No. 3 contract was transferred to this elevation in March and drifted southwest from No. 4 raise. Several stub drifts were put in to test the width of the deposit. It was found to be very narrow and only of fair grade, being cut with small seams of quartz. In April they started attacking No. 1 pillar and by May 21st. had mined back as close to No. 4 raise as was deemed safe. The gang was then laid off.

During May, No. 5 and 6 exhausted the ore in the second pillar north of No. 4 raise. Contract No. 5 moved to the Fowler side and No. 6 started development work on the 1289' sub-level, drifting north from No. 4 raise.

No. 1 contract was mining the ore on the Meadow side along the Fowler line when the mine was closed. The deposit was only 8' high with a rock back.

The ore produced from this sub-level, although entirely free from quartz sand, was only slightly above the average for the mine, running 57.40% iron and 2.00 manganese.

"1300 Foot Sub-Level"

Development work was started here in January by No. 8 contract at the north end of the sub. The ground in this territory was in a very much crushed condition and a large quantity of water from the sub above seeped through, making working conditions bad and the openings difficult to keep open. Operations here were suspended early in March and were not resumed until the middle of April, when work on the sub above was completed.

During April, contracts Nos. 4 and 8 were transferred to this sub-level and were engaged in development drifting at the time the mine was abandoned.

The ore gained from this elevation was low grade, being cut by seams of painty material and carrying high moisture.

FOWLER WORKINGS

"1360 Foot Sub-Level"

Contracts Nos. 2 and 7 were engaged in mining the remaining ore at this elevation around the McInnis shaft. They completed this work early in February and dropped to the main level. The material mined on the sub averaged 58% iron and 2% manganese.

"1340 Foot Level (Main Level)"

The blasting down of the sub-levels above did not collapse the shaft, as we had anticipated and the ventilation continued to be satisfactory up to the time the mine was closed.

Nos. 2 and 7 contracts sliced the pillars along the north boundary and to the south of the McInnis shaft. This ore was exhausted during March. The ore in these pillars was cut by seams running as high as 5% manganese and under 55% iron. Our grade was running off very badly and it was necessary to leave several slices and drop back into better material.

These two gangs had sliced back 200' from the boundary and were

engaged in mining the ore from both sides of the main drift when the mine was abandoned.

SHIPMENTS

Following are the cargoes of Meadow-Fowler ore shipped during the past year and the analysis, as obtained from Mine and Lower Lake Chemists' sampling:

<u>"WM. G. MATHER"</u>							-10,579 Tons.
	<u>Fe.</u>	<u>Phos</u>	<u>Mn.</u>	<u>Sil.</u>	<u>Mois.</u>	<u>Fe.Nat.</u>	
Mine-----	55.87	.062	2.06	11.02	-----	-----	
Crowell & Murray-----	55.25	---	----	----	13.42	47.835	
<u>"PIONEER"</u>							-9,632 Tons.
	<u>Fe.</u>	<u>Phos</u>	<u>Mn.</u>	<u>Sil.</u>	<u>Mois.</u>	<u>Fe.Nat.</u>	
Mine-----	56.13	.065	1.85	10.87	-----	-----	
Oscar Textor-----	56.92	---	----	----	12.23	49.959	

Shipments were made from the stockpiles only and started on July 26th and were completed on August 10th.

The following is a complete analysis of the ore forwarded from the Meadow and Fowler Mines during 1921:

	<u>Tons</u>	<u>Fe.</u>	<u>Phos</u>	<u>Mn.</u>	<u>Sil.</u>	<u>Alumina</u>	<u>Lime</u>	<u>Magnesia</u>	<u>Sulphur</u>	<u>Loss By</u>
										<u>Ignition</u>
Meadow-	9,573	56.41	.069	1.85	10.30	1.91	.19	.24	.012	3.95
Fowler-	10,655	55.70	.061	2.03	11.29	1.80	.17	.26	.011	3.82
TOTAL--	20,228	56.04	.065	1.94	10.82	1.85	.18	.25	.011	3.88

ACCIDENTS

The following accidents were of a serious enough nature to report:

JOHN BRADACH, JR.

Injured-----February 5th, 1921.
Occupation-----Teamster Helper.
Nationality-----Austrian.
Time Lost-----None.
Compensation Paid-----\$50.00 to cover dental
work.

Remarks: Bradach was loading timber on a sleigh preparatory to hauling it to the shaft. He was using a pole for a pry, when the timber slipped, knocking the pole against his jaw and breaking several teeth.

JOHN SMOLICH

Injured-----September 7th, 1921.
Occupation-----Surface Laborer.
Nationality-----Slovanian.
Time Lost-----31 Days.
Compensation Paid-----\$72.33.

Remarks: Smolich, with others, was loading trestle timber on a railroad car. Smolich was standing near the pile of timber, and when removing one of the logs, another rolled against his left leg. He sustained a sprain and bruise of the left ankle.

ANALYSIS OF COST SHEET

For purposes of analysis, the cost sheet for the first five months of 1921 will be compared with the same period for 1920. The Meadow-Fowler Mines were shut down early in June, 1921.

The production and costs per ton under the several main captions for the first five months of 1921 and 1920 follow:

	<u>1920</u>	<u>1921</u>
Tonnage-----	34,305	34,106
Underground Costs-----	\$2.031	\$1.968
Surface Costs-----	.311	.271
General Mine Accounts-----	<u>.162</u>	<u>.145</u>
COST OF PRODUCTION-----	\$2.504	\$2.384

"UNDERGROUND COSTS"

There was a charge during 1920 of \$.025 per ton for "Sinking Shaft". No shaft work was done in 1921.

Due to the wage reduction February 1st., 1921, the account "Stoping" showed a decrease of \$.122 per ton for that year. The efficiency of the men was also an item.

The account "Timbering" was \$.081 per ton higher in 1921, due to the higher price paid for the timber and the necessity of doing an excessive amount of repair work in the Meadow subs.

The 1921 "Tramming" was \$.027 per ton lower. The reduction in wages and a somewhat shorter average tram explains this.

There was an increase of \$.053 per ton in 1921 to the account "Pumping", the result of a substantial advance in the price of coal and an increase in the flow of water underground.

The 1921 decrease of \$.01 to "Underground Superintendence" is explained by reduced salaries and wages.

The account "Gasoline Locomotives, Cars & Tracks" shows an increase of \$.002 per ton for 1921. Some of the badly worn track was replaced and rather extensive repairs were made on the gasoline locomotives in 1921.

There was a decrease of \$.027 per ton for "Hand Trimming Equipment" in 1921, the result of less repairs to sub-level tracks and cars. We realized that the mine was nearing the end and the minimum amount of repair work was done.

"Pumping Machinery" showed an increase of \$.011 per ton. The old compound pump had to be overhauled early in 1921 to last out the operation. Repairs during 1920 were very nominal.

"SURFACE COSTS"

"Hoisting" showed an increase in 1921 of \$.002 per ton, the result of advanced coal prices.

There was an increase of \$.004 to the account "Stocking Ore" in 1921. We did not clean up our stockpiles in 1920. This necessitated longer terms and we were obliged to put an extra man on this work for a part of the time.

The increased price of fuel resulted in the account "Dry House" showing \$.002 per ton higher for 1921.

The accounts "Hoisting Equipment", "Shaft" and "Top Tram Equipment", were less by \$.044 per ton in 1921. This was due to the fact that repairs were held at a minimum on account of the end of the life of the mine.

"GENERAL MINE ACCOUNTS"

"Engineering" was \$.004 per ton lower in 1921, due to somewhat less engineering work being required and the reduction in salaries.

There was a decrease of \$.024 per ton to "Mine Office" in 1921. The mine clerk employed in 1920 was replaced by a lower salaried man. The reduction in wages was also an item.

"District Office" showed an increased cost of \$.009 per ton in 1921. We did not establish the District Office until March 1st., 1920, and no charges were made until that time. This more than offset the reduction in wages and the somewhat smaller proportion charged to the Meadow-Fowler Mines in 1921.

MEADOW-FOWLER MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1921.

GRADE	IRON	PHOS.	SILICA	MANG.
Meadow,	57.07	.072	9.52	1.79
Fowler,	55.94	.059	11.06	1.95

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1921.

GRADE	IRON	PHOS.	SILICA	MANG.
Meadow,	(All Mixed)			
Fowler,	(All Mixed)			

ORE STATEMENT - DECEMBER 31ST, 1921.

	MEADOW	FOWLER	TOTAL	TOTAL LAST YEAR
On hand January 1, 1921,	15,490	15,915	31,405	31,165
Output for Year,	23,615	11,056	34,671	76,496
Total,	39,105	26,971	66,076	107,661
Shipments,	9,573	10,655	20,228	76,256
Balance on Hand,	29,532	16,316	45,848	31,405
Decrease in Output,	20,361	21,464	41,825	
Increase in Ore on Hand,	14,042	401	14,443	

1921 -- 2-8 Hour Shifts Jan. 1st to June 4th, 1921.
 Mine closed June 3rd, 1921.

1920 -- 2-8 Hour Shifts for Year.

MEADOW-FOWLER MINE
 SHIPMENTS FOR YEAR-1921.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Meadow,	0	9,573	9,573	49,414
Fowler,	0	10,655	10,655	26,842
Total,	0	20,228	20,228	76,256
Total Last Year,	38,412	37,844	76,256	
Decrease,			56,028	

MEADOW MINE

COMPARATIVE MINING COST FOR YEAR

	1 9 2 1	1 9 2 0	INCREASE	DECREASE
Product	34,671	76,496		41,825
Underground Costs	1.967	2.181		.214
Surface Costs	.273	.306		.033
General Mine Accounts	.156	.182		.026
Cost of Production	2.396	2.669		.273
Equipment		.005		.005
Taxes	.144	.190		.046
Central Office	.077	.089		.012
Contingent Expense	.009		.009	
Idle Expense	.461		.461	
Cost Adjustment	.060	.052	.008	
Cost on Stockpile	3.147	3.005	.142	
Loading & Shipping	.055	.136		.081
Total Cost on Cars	3.202	3.141	.061	
No. Days Operating	130	309		179
No. Shifts & Hours	2-8hr	2-8hr		
Average Daily Product	267	248	19	
<u>COST OF PRODUCTION</u>				
Labor	1.617	1.838		.221
Supplies	.779	.831		.052
Total	2.396	2.669		.273

Mine abandoned May 31, 1921.

MEADOW MINE

COMPARATIVE WAGES AND PRODUCT

	1 9 2 1	1 9 2 0	INCREASE	DECREASE
PRODUCT	34,671	76,496		41,825
No.Shifts and Hours	2-8	2-8		
AVERAGE NUMBER MEN WORKING				
Surface	10	21		11
Underground	22	47		25
Total	32	68		36
AVERAGE WAGES PER DAY				
Surface	5.07	5.92		.85-14.35
Underground	6.21	6.96		.75-10.77
Total	5.84	6.63		.79-11.91
WAGES PER MONTH OF 25 DAYS				
Surface	126.75	148.00		21.25
Underground	155.25	176.50		21.25
Total	146.00	165.75		19.75
PRODUCT PER MAN PER DAY				
Surface	10.70	11.32		.62
Underground	5.10	5.21		.11
Total	3.46	3.57		.11
LABOR COST PER TON				
Surface	.473	.523		.050
Underground	1.216	1.335		.119
Total	1.689	1.858		.169
AVG.PRODUCT BRK'G & TRM'G	7.63	7.42	.21	
" WAGES CONTRACT MINERS	6.69	7.38		.69
" " " TRAMMERS	6.69	7.38		.69
" " " LABOR	6.69	7.38		.69
TOTAL NUMBER OF DAYS				
Surface	3,239 $\frac{3}{4}$	6,758 $\frac{1}{2}$		3,518 $\frac{3}{4}$
Underground	6,792	14,675		7,883
Total	10,031 $\frac{3}{4}$	21,433 $\frac{1}{2}$		11,401 $\frac{3}{4}$
AMOUNT FOR LABOR				
Surface	16409.31	40032.58		23622.77
Underground	42150.74	102100.68		59949.94
Total	58560.55	142133.26		83572.71

Proportion Surface to Underground Men:

1921 - 1 to 2.2
 1920 - 1 to 2.3
 1919 - 1 to 1.84
 1918 - 1 to 2.31
 1917 - 1 to 2.3
 1916 - 1 to 3.

Mine abandoned May 31, 1921.

MEADOW MINE

TIMBER STATEMENT FOR THE YEAR ENDING DECEMBER 31, 1921.

KIND	LINEAL FEET	AVG. PRICE PER FOOT.	AMOUNT	
			1921	1920
6" to 8" Timber	14,948	.091	1,360.26	1,930.60
8" to 10 "	23,750	.091	2,161.25	4,054.30
10 to 12 "	9,672	.091	883.64	1,737.60
Total - 1921	48,370	.091	4,405.15	
Total - 1920	97,600	.079		7,722.50
	LINEAL FEET	PER 100'		
5' Lagging	124,700	.989	1,233.75	2,728.00
Poles	19,360	2.00	387.20	413.00
Total - 1921	144,060	1.125	1,620.95	
Total - 1920	332,240	.945		3,141.00
Product			34,671	76,497
Feet timber per ton of ore			1.395	1.275
" lagging "			3.596	3.911
" " " foot of timber			2.578	3.065
Cost per ton for timber			.127	.100
" " lagging			.036	.035
" " poles			.011	.005
" " timber, lagging & poles			.174	.142
Equivalent of stull timber to bd.measure			79,517	164,651
Ft.Board measure per ton of ore			2.29	2.15

Total Cost for timber, lagging & poles - 1921	6026.10
1920	10863.50
1919	11814.30
1918	7186.46
1917	7085.35
1916	2484.70

MEADOW MINE.

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE.

KIND.	QUANTITY.	AVERAGE PRICE.	AMOUNT 1921.	AMOUNT 1920.
40% Powder,	9,800	.1725	1,690.05	3,886.15
Total Powder	9,800	.1725	1,690.05	3,886.15
Fuse,	19,700	.8324	163.98	461.40
Caps	8,100	1.4586	118.15	281.31
Total Fuse, Etc.,			282.13	742.71
Total Explosives,			1,972.18	4,628.86
Product,			34,671	76,496
Pounds Powder per Ton of Ore,			.282	.300
Cost Per Ton for Powder,			.049	.051
" " Fuse, Caps			.008	.009
" " All Explosives,			.057	.060
Avg. Price per Pound for Powder			.1725	.1693

NOTE: FOR Operating conditions, see "Comparative Wages and Product."

HILL-TRUMBULL MINE-

ANNUAL REPORT FOR 1921

The production of wash ore from the Hill-Trumbull properties during the year 1921 amounted to 437,871 tons, yielding 277,954 tons of concentrates, and 21,945 tons of direct shipping ore. This compares with 191,863 tons of wash ore in 1920, yielding 143,584 tons of concentrates and 29,084 tons of direct ore.

Ore operations were started May 12th, 1921, and completed on September 24th.

Our estimate of production for the 1922 season is as follows:

	<u>Tons.</u>	<u>Fe.</u>	<u>Phos</u>	<u>Mn.</u>	<u>Sil.</u>	<u>Fe.Nat.</u>
Bessemer Concentrates-----	120,500	60.50	.045	.50	8.50	56.99
Non-Bessemer Concentrates-----	322,500	61.00	.061	.50	6.00	57.10
Non-Bessemer Direct Ore-----	<u>107,000</u>	58.00	.055	.30	13.00	53.36
TOTAL- - - - -	550,000					

We had figured at one time on shipping a part of our 1922 direct ore from the Trumbull property, but test pitting has shown that this Trumbull deposit is all of wash grade and we will, therefore, obtain all of our direct material from the east end of the Hill pit. This ore is all stripped and cleaned and will be available at any time during the season. It can be worked into our mixture as rapidly as the silica content will allow.

In the production of 443,000 tons of concentrates from the Hill-Trumbull properties during 1922, 203,000 tons will come from the Hill and 240,000 tons from the Trumbull, according to our present plans.

HILL-TRUMBULL ORE ESTIMATE OF JANUARY 1ST., 1922

Following is an estimate of the ore in sight at the Hill-Trumbull properties on January 1st., 1921, the tonnage mined during the past year and our estimate as of January 1st., 1922.

A factor of 14 cubic feet per ton was used in the direct shipping ore and 18 cubic feet per ton for the wash material.

ORE ESTIMATE OF JANUARY 1ST., 1921

	<u>Tons.</u>
Hill Bessemer Direct Shipping Ore-----	746,000
Hill Non-Bessemer Direct Shipping Ore-----	1,472,000
Hill Bessemer Concentrates-----	2,186,000
Hill Non-Bessemer Concentrates-----	<u>698,000</u>
TOTAL HILL ORE IN SIGHT JANUARY 1ST., 1921-----	5,102,000
Trumbull Bessemer Direct Shipping Ore-----	85,000
Trumbull Non-Bessemer Direct Shipping Ore-----	365,000
Trumbull Bessemer Concentrates-----	3,453,000
Trumbull Non-Bessemer Concentrates-----	<u>649,000</u>
TOTAL TRUMBULL ORE IN SIGHT JANUARY 1ST. 1921-----	4,552,000
GRAND TOTAL HILL AND TRUMBULL ORE IN SIGHT JANUARY 1ST., 1921-----	9,654,000

ORE MINED DURING 1921

Hill Bessemer Direct Shipping Ore-----	4,130
Hill Non-Bessemer Direct Shipping Ore-----	17,815
Hill Bessemer Concentrates-----	85,877
Hill Non-Bessemer Concentrates-----	<u>192,077</u>
TOTAL ORE MINED DURING 1921-----	299,899

ORE ESTIMATE OF JANUARY 1ST., 1922

Hill Bessemer Direct Shipping Ore-----	642,000
Hill Non-Bessemer Direct Shipping Ore-----	1,484,000
Hill Bessemer Concentrates-----	1,444,000
Hill Non-Bessemer Concentrates-----	<u>1,204,000</u>
TOTAL HILL ORE IN SIGHT JANUARY 1ST., 1922-----	4,774,000
Trumbull Bessemer Direct Shipping Ore-----	85,000
Trumbull Non-Bessemer Direct Shipping Ore-----	310,000
Trumbull Bessemer Concentrates-----	2,417,000
Trumbull Non-Bessemer Concentrates-----	<u>1,718,000</u>
TOTAL TRUMBULL ORE IN SIGHT JANUARY 1ST., 1922-----	4,530,000
GRAND TOTAL HILL AND TRUMBULL ORE IN SIGHT JANUARY 1ST., 1922-----	9,304,000

The tonnages are all given as direct shipping, or in the case of the wash ore, reduced to a concentrated basis, a factor of 60% being used as our expected gross recovery.

HILL-TRUMBULL MINE.

On account of our experiences during the 1921 operations, we feel it is advisable to reduce the Hill Bessemer direct ore by 100,000 tons and increase the Non-Bessemer direct by a like amount.

As a result of the test pitting at the west end of the Hill pit, we have reduced the estimate of Hill Non-Bessemer direct ore by 70,000 tons and the Trumbull Non-Bessemer direct ore by 55,000 tons, including this material in our Non-Bessemer wash and reducing same to a concentrated basis.

Due to the fact that the phosphorus content in our concentrates is being raised so much beyond our expectations, we are very skeptical of being able to realize the tonnage of Hill and Trumbull Bessemer concentrates formerly estimated. We have, therefore, reduced our former estimate of Bessemer concentrates by **30 per cent** and increased the Non-Bessemer grade by a like amount.

Additional drilling will be required to fully determine the grade and character of the ore along the northerly limits of the properties. It is a question whether some of this ore is washable or not. No further stripping will be done in this area for several years and in the meantime, the drilling program should be carried out.

The total Trumbull estimate has been reduced by 22,000 tons, as a result of the test pitting showing that 55,000 tons of direct ore is of wash grade, necessitating the reduction of this tonnage to a concentrated basis.

We do not contemplate any additional exploration work at the Hill-Trumbull properties during 1922. The outline of the ore body is quite well established and we do not anticipate adding to our ore reserves by future explorations.

The average analysis of the ore in the Hill and Trumbull properties on January 1st., 1922, is as follows:

<u>HILL MINE</u>					
	<u>Tons.</u>	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>	<u>Fe.Nat.</u>
Bessemer Direct Shipping----	642,000	58.00	.045	13.00	53.36
Non-Bess. " "-----	1,484,000	58.00	.055	13.00	53.36
Bessemer Concentrates-----	1,444,000	60.50	.045	7.50	56.00
Non-Bessemer Concentrates---	<u>1,204,000</u>	<u>61.00</u>	<u>.059</u>	<u>6.50</u>	<u>56.43</u>
TOTAL AND AVERAGES-----	4,774,000	59.51	.052	9.70	54.93

TRUMBULL MINE

	<u>Tons</u>	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>	<u>Fe.Nat.</u>
Direct Shipping Bessemer-----	85,000	56.40	.040	12.79	51.32
Direct Shipping Non-Bessemer-----	310,000	58.04	.060	9.85	52.82
Bessemer Concentrates-----	2,417,000	60.00	.043	8.00	55.50
Non-Bessemer Concentrates-----	<u>1,718,000</u>	<u>60.00</u>	<u>.080</u>	<u>8.00</u>	<u>55.50</u>
TOTAL AND AVERAGES-----	4,530,000	59.80	.058	8.22	55.24

STRIPPING

A contract was entered into with the A. Guthrie Company for the removal of 3,000,000 yards of stripping during the years 1921, 1922 and 1923.

The Contractor was to begin work by March 1st., 1921, according to the agreement, and was to handle a minimum of 800,000 yards in any one season.

Our stripping benches were in such shape at the end of 1920, that it was necessary for us to continue operations and lower the top bench sufficiently so that the A. Guthrie Company could take the second bench down to the ore with one cut, loading on the upper bench. For this reason, we continued our stripping job into March, handling 77,163 cubic yards of material in January, 71,166 yards in February and 11,009 yards in March. It was necessary to lay up one of our 100-ton type shovels for repairs early in January and the balance of the work was done with the second 100-ton machine.

The A. Guthrie Company was delayed considerably in securing repair parts for their "300" type machine and it was April 17th before they actually started stripping operations. We had expected that they would be well along with their cut and clean-up work prior to the opening of navigation. Their cut did not progress sufficiently to allow us to attack the upper bench and our early ore operations were, therefore, confined to lower benches in the pit.

The following table shows the yardage moved by the A. Guthrie Company by months during the past year, the total handled by the Mesaba-Cliffs Iron Mining Company and the grand total as of January 1st., 1922.

	<u>Yards.</u>
March-----	13,305
April-----	13,077
May-----	178,915
June-----	150,516
July-----	168,563
August-----	155,541
September-----	62,640
October-----	<u>12,336</u>
TOTAL HANDLED BY A. GUTHRIE COMPANY DURING 1921-----	814,893
Handled by Mesaba-Cliffs Iron Co. (1921)-----	<u>159,338</u>
GRAND TOTAL STRIPPING REMOVED DURING 1921-----	974,231

The average price paid the Contractor for the 814,893 yards which he removed was \$.3352 per yard.

Our stripping operations had brought the top bench down to an elevation where the big 300-ton machine of the A. Guthrie Company could remove the material remaining to the ore, maintaining their loading track on the outside of our bench. Beginning at the approach end of the pit, The A. Guthrie Company took a cut along the entire north side of the pit. The bottom of this cut was approximately 80' in width, except at the east end, where it was narrowed down appreciably to some within our stripping limits. The A. Guthrie Company reached the east end of the pit on July 28th and the machine was then turned around and the balance of the season was spent in digging back the north one-half of the east end of the pit to the Hill-Annex boundary.

The surface of the ore at the east end of the pit was very irregular and as the Contractor was obliged to load at approximately the same elevation that he was digging, progress here was much slower. The Contractor used considerable pains in cleaning the irregular ore at the east end of the pit and the Fee Owners were entirely satisfied with the operation.

With the exception of the East area, Models "60" and "36" Marions were used for clean-up work.

Subsequent to July 1st., the Contractor's stripping was well ahead of our ore operations and we were not tied up in any way as a result thereof.

The joint use of our track out of the approach caused very little delay, except during August, when our operations were being conducted on a large scale. The Contractor will lay a second track in the approach for next season's operations.

The A. Guthrie Company will be engaged in stripping the corner of overburden to the south of the approach during March and April. This is known as Area "A" and the stripping will uncover a substantial tonnage of Trumbull ore, as well as Hill. The ratio of yards to tons is very favorable here and the sinking cuts from the Hill pit switch back can be pushed ahead at the elevation of the water level to good advantage. The test pitting in this vicinity showed that there is no direct ore in Area "A", but a very good grade wash ore, mostly Non-Bessemer.

HILL-TRUMBULL MINE.

When stripping operations on Area "A" are completed, the Contractor will move the equipment to the west side of the approach and the balance of the work, during the life of the contract, will be conducted here. In fact, according to our present plans, all stripping operations until 1927 will be to the west of the present open pit limits and will be pushed well ahead of mining activities.

The Contractor used our old dump for a time, fanning to the north and south thereof. In order to reserve space for the dumping of lean ores, which must be stocked separately according to the lease, we stopped the fanning to the north. The Contractor erected a trestle to the southeast from the old Oliver dump and the stripping for the last half of the year was placed here and along the south side of our dump. The trestle has now been filled and dumping operations will be fanned from here next summer. There is also considerable space to the south of our dump, but due to the swampy conditions, operations here must necessarily be rather slow. The fill settles and slides, due to muskeg holes in the swamp. The dumps are in very good shape to handle next season's stripping and we have space provided by the Fee Owners, and approved by them, for receiving any lean ores that may be encountered.

"TRACKS"

The Contractor laid a track from the yards to the dump, with the exception of a short distance under the Great Northern bridge. The Great Northern will alter their bridge, so that there will be sufficient span for a double track and this will be put in by the A. Guthrie Company next spring. The Contractor will also lay a track from the yards into the pit before we start mining in 1922.

We raised and relined our track from the yards to the washing plant and the A. Guthrie Company did considerable work on their line. There was an appreciable settlement along Mud Lake and the Contractor was obliged to fill and reline about 1,000' of track several times during the season. The Contractor joined with us in retieing one of the yard tracks. Generally speaking, the tracks are now in good shape and with some slight repair work between the yards and the pit, they should take care of the 1922 traffic to advantage.

REPAIR WORK

Winter repair work in our shops during 1921 consisted in overhauling the two Model "100" shovels, the "36" shovel, the twelve 12-yard cars and the No. 17 locomotive. Minor repairs were made on Nos. 19, 101, 102 and 103 locomotives and the sixteen 20-yard cars. The No. 85-C Bucyrus shovel was subjected to very severe service from November, 1919, to January 7th, 1921. It was necessary to thoroughly overhaul the machine and replace many worn parts. The 88-C shovel was overhauled and the repair work here was quite an item, although not nearly as much as was the case in the 85-C. The 88-C shovel was used for ore service in 1920 and in the winter's stripping of 1920-1921.

The No. 17 locomotive, which was purchased from Butler Brothers, was found to be in very bad shape and required extensive repairs and replacements.

The twelve 12-yard wooden air dump cars were badly battered in the severe winter stripping service and had to be rigged out with new doors and the bottoms relined.

Repairs on the three new locomotives, the No. 19 and our sixteen 20-yard cars, were light.

With the exception of the overhauling of No. 19 locomotive and the replacement work on the booms of the two "100" machines, our repairs will be comparatively light this winter. We are making some changes on the 20-yard cars to lessen the breakages to the dumping devices when in service. Last summer, from one to two of the cars were always out of commission on account of such breakages.

ORE OPERATIONS

Ore operations were started May 12th and continued until September 24th.

Due to the fact that the Contractor was delayed approximately $1\frac{1}{2}$ months in starting the stripping, we were obliged to begin mining operations on the second and third ore benches. The two 100-ton shovels were used in this work. When the bank was comparatively clean, one shovel could keep the mill going, but when we were in rocky material, it taxed the two shovels.

By July the stripping had progressed far enough ahead to allow us to attack the upper ore bench and successive cuts were taken along the entire

north side of the pit. In order to secure the maximum tonnage of Bessemer ore, the machines were operated extensively between the taconite island and the merchantable area at the east end of the pit. There was considerable rock in these cuts, which slowed up operations in the pit, as well as at the washing plant.

During the month of August, the machines were engaged to the west of the taconite island in the Non-Bessemer area and good results were obtained. In September one of the shovels was engaged here and the second was moved back into the Bessemer area to the east of the taconite island.

The Model "36" shovel was used in mining the fingers of direct shipping ore. It was often the case that there would be from 5' to 8' of merchantable ore and the balance of wash grade in a 15' to 20' cut. The revolving shovel could separate the material to much better advantage than the larger machines and the cost was lower.

On account of operating in the rocky Bessemer area, our silica ran quite high and we were unable to produce and mix any appreciable tonnage of direct ore.

During 1922 we will be working in a much better grade of wash material and the silica content of our concentrates should be such that we can forward a much larger proportion of direct ore.

The bulk of our wash ore for next season will come from the area between the taconite island and the approach, including Area "A". A track leads down to the third ore bench near the taconite island. A switch back will be placed here and cuts will progress eastward until the ore is worked down to the approximate elevation of the water level.

We expect to secure all of our direct ore from the east end of the Hill pit, now that the test pitting at the west end has shown that there is no merchantable ore in that area.

The tonnage and analysis of the direct and wash ore produced from the Hill pit during 1921 follows:

	<u>Tons</u>	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>
Direct Non-Bessemer-----	17,815	59.09	.055	10.98
Direct Bessemer-----	<u>4,130</u>	<u>58.66</u>	<u>.045</u>	<u>11.74</u>
TOTAL AND AVERAGES-----	21,945	59.01	.053	11.12
Wash Ore Produced-----	437,871	46.77	.042	26.34

WASHING PLANT

Winter repair work at the washing plant during 1921 consisted not alone in thoroughly overhauling the machinery, but in making many adjustments to our piping, launders and the receiving bin. We also installed the electric haulage plant for the disposal of the waste rock.

It was found that the volume of water desired at certain points was not sufficient and the piping arrangement was changed to correct this.

A number of our launders were too small and we were delayed frequently in 1920 by blockages. The launders were enlarged where necessary and buffer plates and boxes were used to minimize the wear on the machines.

The inside of the receiving bin was entirely remodeled. We experienced considerable difficulty in feeding the wash ore onto the 8' pan conveyor during 1920 and it was necessary to employ from four to six men here when we were in sticky material. The new bin worked to very good advantage and it was not necessary at any time during the past season to bar or scrape down the ore.

The electric haulage track was laid so that rock could be drawn from the picking belt and hopper at the mill and the 5' pan conveyor chutes in the crusher building and taken to the rock dump. The large tonnage of rock sorted out at the mill was handled to very good advantage with our electric locomotive and three steel dump cars.

The automatic weighing device was adjusted to take care of the maximum ribbon on our conveyor belt.

Operations during 1921 demonstrated our ability to turn out 100,000 tons of concentrates per month. We can secure this result with average wash ore, but, of course, the very rocky material that we were in during a part of last season, cuts down the capacity of the mill very decidedly. We can also operate the mill with a smaller force when the amount of rock is the average for the mine.

Following is the tonnage and analysis of the crude ore treated and the concentrates produced during the years 1920 and 1921:

	<u>Tons.</u>	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>
Crude Ore Treated During 1920----	191,863	50.03	.045	20.91
Crude Ore Treated During 1921----	437,871	46.77	.042	26.34

	<u>Tons.</u>	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>
Concentrates Produced During 1920-	143,584	62.08	.053	5.60
Concentrates Produced During 1921-	277,954	61.77	.055	7.01
Ratio of Concentration for 1920-----				74.83%
Ratio of Concentration for 1921-----				63.48%
Recovery of Iron Units for 1920-----				92.86%
Recovery of Iron Units for 1921-----				83.71%

The ratio of concentration and the recovery of iron units during 1920 was based on estimated weights of the wash ore. The estimated weights on the crude ore were decidedly too low during 1920. Our weightometer was not adjusted for the maximum load, so the machine could not be used.

The ore was accurately weighed during 1921. The ratio of concentration and also the recovery of iron units was lower than we may expect in the future, due to the large amount of rock sorted at the mill.

The composite samples of our 1921 shipments from the Hill Mine were as follows:

	<u>Tons</u>	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>	<u>Mn.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss By</u> <u>Igni-</u> <u>tion</u>
Bessemer Concentrates----	85,877	61.41	.042	8.70	.120	.56	.110	.120	.012	2.55
Non-Bess. " ----	192,077	61.67	.060	6.17	.100	.71	.100	.120	.018	4.50
Bessemer Direct Shipping-	4,130	58.70	.045	11.66	.130	1.48	.130	.100	.019	2.65
Non-Bess. " " -	<u>17,815</u>	<u>58.81</u>	<u>.055</u>	<u>11.20</u>	<u>.110</u>	<u>1.82</u>	<u>.120</u>	<u>.140</u>	<u>.022</u>	<u>2.60</u>
TOTAL & AVERAGES-----	299,899	61.38	.054	7.27	.107	.74	.104	.121	.017	3.80

The average analysis of the product from the several machines during 1920 and 1921 follows:

	<u>1 9 2 0</u>			
	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>	
Screen-----	62.27	.055	5.28	
Log-----	62.24	.052	5.06	
Turbo-----	58.97	.043	9.94	
Tables-----	55.95	.037	14.94	
Tailings-----	21.35	---	---	
	<u>1 9 2 1</u>			
	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>	
Screen-----	60.23	.059	8.56	
Log-----	61.60	.055	7.09	
Turbo-----	58.93	.043	11.35	
Tables-----	56.17	.037	16.06	
Tailings-----	18.18	---	---	

The large amount of rocky material handled in 1921, as the result of our endeavor to secure the maximum Bessemer product, lowered the iron and raised the silica, as compared to 1920. The iron in the turbo, tables was about in

line with the previous year, but in the tailings it was appreciably lower.

Our estimate of product from the several machines was as follows:

Screen-----25%.
Logs-----70%, Plus.
Turbo & Tables---- 5%, Minus.

"STORAGE BASIN"

The Jones & Laughlin Company objected to our using Little Pinacie Lake as a storage basin for our tailings, claiming that it would interfere with the supply of water, which they had figured on in the plans for their washing plant. In order to satisfy the Jones & Laughlin Company, we agreed to divert the drainage to the north of Little Pinacie Lake around the east side of this lake and to construct a dyke, so as to hold back, as far as possible, the wash of tailings into the lake. These jobs were done under contract by the Lawrence & Rossman Construction Company at a cost of \$31,597.98.

At the time the Jones & Laughlin Company raised their objections, we had already made arrangements to divert the Mud Lake drainage around the west and south sides of Little Pinacie Lake, into Big Pinacie Lake.

"DRAINAGE TUNNEL"

The Itasca County and State of Minnesota Highway Departments claimed that the culvert under our washing plant dump was not of sufficient capacity to take care of the flood waters through Mud Lake, with the result that it flooded the County Highway. This road has often been flooded, but the water had never reached the depth that it did last spring.

After considerable discussions and some negotiations, we decided to drive a tunnel through the dump and install a reinforced concrete pipe of 48" inside diameter. The State lowered the ditch from a point near Little Pinacie Lake to the south side of our dump and are to allow us \$5,000 toward the cost of the tunnel and reinforced concrete pipe installation.

The work of driving the tunnel was started October 24th and progressed over 200' by the first of the year. The tunnel is to be 240' long and the pipe when installed will be 2' below the old wooden culvert.

All of the material encountered in the tunnel has been a coarse sand and it was necessary to drive forepoling in the back and on the sides, also to

use 3" plank in the breast to keep the sand from running. While we have had no sand runs, considerable weight developed in places and it has been necessary to place a number of lining sets. The sets are placed originally at $3\frac{1}{2}$ ' centers.

We expect to complete the job early in February.

ACCIDENTS

Following is a list of the accidents which occurred at the Hill-Trumbull Mine during the past year and were of a nature serious enough to be reported:

NICK PIRTANO

Injured-----January 17th, 1921.
Occupation-----Shop Repairman.
Nationality-----Italian.
Time Lost-----40 Days.
Compensation Paid-----\$85.00.

Remarks: While engaged in repairing S.S.No. 26 in the shops, Pirtano attempted to step across the hoisting engine beds. He slipped and struck his head on a stud on the hoist drum box, sustaining a severe contused, lacerated head wound on left mastoid region.

DOUGLAS MCCORMICK

Injured-----March 23rd., 1921.
Occupation-----Electrician Helper.
Nationality-----American.
Time Lost-----4 Days.
Compensation Paid-----\$24.00 to cover dental work.

Remarks: McCormick attempted to slide down a rope from the turbo to the table floor. The rope was hung over a snatch block secured to an I-beam of the picking belt floor and was used only for hoisting machinery repair parts. The rope was not fastened securely and McCormick fell with it to the table floor, a distance of about 40'. He sustained contusions of the body and head and the upper left 2nd and 3rd mollars were broken off. The men were not supposed to slide down this, or any other rope, and they were instructed not to do so.

WALTER E. SIMS

Injured-----April 19th, 1921.
Occupation-----Laborer.
Nationality-----American.
Time Lost-----10 Days.
Compensation Paid-----\$10.00.

Remarks: Sims and several others were engaged in unloading rails from a flat car and skids had been placed against the side of the car for this purpose. Four lengths of rail were put on the skids, the bottom one of which Sims helped to remove from the skid. In so doing, the upper rails rolled onto his foot, crushing his right great toe.

THOMAS KNUTSON

Injured-----May 21st., 1921.
Occupation-----Machinist.
Nationality-----Scandinavian.
Time Lost-----5 Days.
Compensation Paid-----None.

Remarks: Knutson was assisting in repairing the Keystone drill. In trying to start the engine, a charge of gasoline exploded in the cylinder. The flame blew out through the priming hole, burning Knutson about the right eye and face.

PETE MAY

Injured-----June 1st., 1921.
Occupation-----Electrician.
Nationality-----American.
Time Lost-----21-2/3 Weeks.
Compensation Paid-----\$390.00.

Remarks: A rule had been made in the shops that no one except carpenters should use the power machines in the carpenter shop. May disregarded this rule, started the planer, and ran a short piece of board through. In so doing his fingers caught in the knives of the machine, resulting in his sustaining the loss of a portion of distal phalanx of the right index finger. Lack of knowledge and experience with the planer caused the accident.

RADE BLAMISICH

Injured-----July 22nd., 1921.
Occupation-----Driller & Blaster.
Nationality-----Serbian.
Time Lost-----Died from injuries
received - August
2nd, 1921.

Remarks: Blamisich was springing a hole and was using four buckets of water for tamping. It being necessary to act quickly before the water could run away, the blaster, Nick Skorich, stood ready with the dry cell battery. While Blamisich was pouring the second bucket of water and standing over the hole, the blaster accidentally made the contact and exploded the charge. A detail of the physician's report follows: "Entire destruction of right eye, loss of vision in left eye. Absolute loss of tissue to bone on right side of face, multiple punctate wounds left side of face and neck, both upper and lower teeth, (frontal) lost, destruction of upper lip and loss of portion of tongue.

Blamisich died August 2nd, 1921, as a result of the injuries received.

SHIPMENTS

Following are the cargoes of Hill-Trumbull ore shipped during the past season and the analysis of same as obtained at the Mine and by the Lower Lake Chemists:

NON-BESSEMER ORE

	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>	<u>Mois.</u>	<u>Fe.Nat.</u>	<u>Tons.</u>
<u>PETER WHITE</u> -----						9,514
Mine-----	60.56	.058	6.77	----	-----	
Oscar Textor-----	59.15	---	----	7.07	54.97	
<u>PRESCUE ISLE</u> -----						6,711
Mine-----	62.03	.061	4.36	----	-----	
Cremer & Case-----	60.65	---	----	6.91	56.41	
<u>WM. G. MATHER</u> -----						10,760
Mine-----	61.30	.060	5.81	----	-----	
Crowell & Murray-----	60.50	---	----	7.27	56.10	
<u>WM. G. MATHER</u> -----						10,803
Mine-----	60.65	.058	7.02	----	-----	
Oscar Textor-----	59.64	---	----	7.39	55.23	
<u>GRAND ISLAND</u> -----						9,159
Mine-----	61.19	.059	5.48	----	-----	
Crowell & Murray-----	59.45	---	----	6.22	55.75	
<u>WM. G. MATHER</u> -----						3,484
Mine-----	59.69	.057	9.05	----	-----	
Crowell & Murray-----	58.20	---	----	5.40	55.06	
Cremer & Case-----	58.50	---	----	5.46	55.31	
<u>MARQUETTE</u> -----						7,536
Mine-----	60.21	.060	7.62	----	-----	
Oscar Textor-----	60.05	---	----	6.89	55.91	
<u>GRAND ISLAND</u> -----						3,832
Mine-----	59.89	.058	8.56	----	-----	
Oscar Textor-----	60.30	---	----	6.91	56.13	
<u>NEGAUNEE</u> -----						6,563
Mine-----	59.92	.058	8.55	----	-----	
Crowell & Murray-----	60.05	---	----	6.32	56.26	
<u>GRAND ISLAND</u> -----						9,350
Mine-----	61.45	.061	6.37	----	-----	
Oscar Textor-----	61.05	---	----	6.23	57.247	

HILL-TRUMBULL MINE.

	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>	<u>Mois.</u>	<u>Fe.Nat.</u>	<u>Tons.</u>
<u>WM. G. MATHER</u> -----						3,682
Mine-----	61.71	.063	5.40	----	-----	
Crowell & Murray-----	61.57	---	----	5.10	58.430	
<u>PIONEER</u> -----						3,399
Mine-----	61.90	.059	5.38	----	-----	
Cremer & Case-----	61.40	---	----	5.43	58.066	
<u>MARQUETTE</u> -----						4,645
Mine-----	61.07	.055	7.98	----	-----	
Oscar Textor-----	60.20	---	----	6.01	56.582	
<u>PIONEER</u> -----						9,710
Mine-----	62.46	.062	5.80	----	-----	
Crowell & Murray-----	61.20	---	----	6.81	57.032	
<u>MARQUETTE</u> -----						7,533
Mine-----	61.72	.060	6.42	----	-----	
Oscar Textor-----	61.30	---	----	6.01	57.616	
<u>WM. G. MATHER</u> -----						4,090
Mine-----	61.49	.060	6.83	----	-----	
Cremer & Case-----	60.20	---	----	6.04	56.564	
<u>E. Y. TOWNSEND</u> -----						8,421
Mine-----	61.68	.059	6.63	----	-----	
Oscar Textor-----	60.90	---	----	6.00	57.246	
<u>ANGELINE</u> -----						7,152
Mine-----	62.03	.059	7.47	----	-----	
Cremer & Case-----	61.50	---	----	6.05	57.779	
<u>SHAUGHNESSY</u> -----						8,493
Mine-----	62.37	.059	6.77	----	-----	
Crowell & Murray-----	61.18	---	----	5.68	57.705	
<u>WM. G. MATHER</u> -----						-10,687
Mine-----	60.92	.059	7.53	----	-----	
Crowell & Murray-----	60.45	---	----	5.69	57.010	
<u>PIONEER</u> -----						3,643
Mine-----	63.11	.059	7.02	----	-----	
Crowell & Murray-----	61.58	---	----	5.60	58.132	
<u>GRAND ISLAND</u> -----						8,832
Mine-----	61.11	.060	8.12	----	-----	
Oscar Textor-----	60.20	---	----	5.99	56.594	
<u>WM. G. MATHER</u> -----						10,832
Mine-----	63.17	.060	6.21	----	-----	
Cremer & Case-----	62.40	---	----	5.89	58.725	

HILL-TRUMBULL MINE.

	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>	<u>Mois.</u>	<u>Fe.Nat.</u>	<u>Tons.</u>
<u>A.E.R.SCHNEIDER</u> -----						8,592
Mine-----	61.77	.062	7.20	----	-----	
Oscar Textor-----	60.60	---	----	5.87	57.043	
<u>PIONEER</u> -----						9,452
Mine-----	61.17	.059	7.61	----	-----	
Cremer & Case-----	61.00	---	----	5.61	57.578	
<u>J. A. CAMPBELL</u> -----						3,372
Mine-----	62.67	.059	5.81	----	-----	
Oscar Textor-----	62.35	---	----	5.86	58.696	
Crowell & Murray-----	62.33	---	----	5.30	59.027	
<u>WM. G. MATHER</u> -----						1,682
Mine-----	62.61	.056	5.23	----	-----	
Cremer & Case-----	62.28	---	----	5.77	58.586	
<u>GRAND ISLAND</u> -----						8,803
Mine-----	62.60	.057	5.54	----	-----	
Oscar Textor-----	62.05	---	----	5.38	58.712	
<u>MUNISING</u> -----						6,275
Mine-----	62.60	.057	4.89	----	-----	
Crowell & Murray-----	62.30	---	----	5.67	58.768	
<u>MUNISING</u> -----						2,836
Mine-----	62.53	.058	5.03	----	-----	
Oscar Textor-----	61.70	---	----	5.34	58.405	

BESSEMER ORE

	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>	<u>Mois.</u>	<u>Fe.Nat.</u>	<u>Tons.</u>
<u>WM. G. MATHER</u> -----						7,355
Mine-----	60.45	.045	9.03	----	-----	
Cremer & Case-----	60.60	.044	----	5.39	57.33	
Crowell & Murray-----	60.20	.044	----	5.25	57.04	
<u>GRAND ISLAND</u> -----						5,349
Mine-----	61.05	.045	9.24	----	-----	
Oscar Textor-----	61.50	.043	----	5.55	58.09	
Cremer & Case-----	61.60	.043	----	5.27	58.35	
<u>WM. G. MATHER</u> -----						6,925
Mine-----	61.11	.041	7.95	----	-----	
Crowell & Murray-----	60.20	.045	----	5.33	56.991	
Cremer & Case-----	60.00	.044	----	5.29	56.826	
<u>PIONEER</u> -----						6,355
Mine-----	60.43	.044	9.53	----	-----	
Oscar Textor-----	59.00	.045	----	5.62	55.684	
Cremer & Case-----	59.50	.043	----	5.75	56.079	

HILL-TRUMBULL MINE.

	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>	<u>Mois.</u>	<u>Fe.Nat.</u>	<u>Tons.</u>
<u>MARQUETTE</u> -----						-2,852
Mine-----	59.90	.044	10.26	----	-----	
Oscar Textor-----	60.00	.045	-----	5.52	56.688	
Crowell & Murray-----	59.55	.043	-----	5.26	56.418	
<u>WM. G. MATHER</u> -----						-6,410
Mine-----	62.39	.044	7.50	----	-----	
Cremer & Case-----	61.50	.042	-----	5.53	58.099	
Oscar Textor-----	61.05	.043	-----	5.84	57.485	
<u>NEGA UNEE</u> -----						6,595
Mine-----	61.34	.045	8.91	----	-----	
Crowell & Murray-----	61.60	.043	-----	6.12	57.830	
Cremer & Case-----	61.30	.043	-----	6.12	57.548	
<u>GRAND ISLAND</u> -----						8,995
Mine-----	61.52	.045	8.53	----	-----	
Cremer & Case-----	61.20	.045	-----	5.43	57.877	
Oscar Textor-----	61.06	.044	-----	5.51	57.696	
<u>PIONEER</u> -----						5,830
Mine-----	61.01	.045	8.89	----	-----	
Cremer & Case-----	60.20	.044	-----	5.67	56.787	
Crowell & Murray-----	60.13	.046	-----	5.78	56.654	
<u>PIONEER</u> -----						9,598
Mine-----	61.30	.045	8.59	----	-----	
Cremer & Case-----	60.90	.045	-----	6.07	57.234	
Oscar Textor-----	61.00	.046	-----	6.07	57.297	
<u>WM. G. MATHER</u> -----						10,702
Mine-----	61.88	.043	8.46	----	-----	
Cremer & Case-----	61.90	.043	-----	5.54	58.471	
Crowell & Murray-----	61.30	.043	-----	5.73	57.788	
<u>CLETUS SCHNEIDER</u> -----						3,272
Mine-----	62.49	.042	7.65	----	-----	
Oscar Textor-----	63.10	.041	-----	5.23	59.800	
Crowell & Murray-----	62.95	.039	-----	5.64	59.340	
<u>MUNISING</u> -----						1,236
Mine-----	62.05	.045	8.42	----	-----	
Oscar Textor-----	62.00	.043	-----	5.29	58.720	
Cremer & Case-----	62.20	.045	-----	5.37	58.860	
<u>WM. G. MATHER</u> -----						8,531
Mine-----	62.39	.042	8.54	----	-----	
Crowell & Murray-----	61.78	.040	-----	5.39	58.450	
Cremer & Case-----	61.80	.044	-----	5.49	58.407	

HILL-TRUMBULL MINE.