

The following table shows the amount of new ore developed each year since the mine was opened.

	1917	1918	1919	1920
Ore in sight, January 1st,	329,935	255,354	213,940	181,806
Product,	74,581	123,675	70,914	93,529
Balance,	255,354	131,679	143,026	88,277
Ore in sight, December 31st,	255,354	213,940	181,806	124,639
Developed during year,		82,261	38,780	36,362

NORTH LENS.

845' SUB-LEVEL:-

The ore at this elevation is being mined by the shrinkage stope method. During the year, the stope was carried up 40 feet in height over the North and middle areas of the lens but at the South end the stope was only carried up about 20 feet. This ore body which had a regular inclination from the first level up to about the 835' level, suddenly changed. The hanging became flat and rock appeared all over the back of the stope. There was however, a good showing of ore on the foot and we found the ore running back from 20' to 30' back into the foot. At the close of the year, this stope had every indication of extending up to the sand. It will be necessary to leave about 25 feet of ore under the sand as a safe guard.

FIRST LEVEL:-

Due to favorable developments in the North end of the shrinkage stope above the level, it was necessary to put up another raise near the breast of the North drift. This raise was put up in lean material.

A cross-cut was also driven due West opposite Diamond Drill hole #39 to look for a possible ore body out in the hanging.

SECOND LEVEL:-

Some ore left along the foot of the shrinkage stope between the First and Second Levels was blasted down and trammed to the shaft. There is still a little fair grade material left here but we were unable to hoist it because we had no good ore to mix it with.

THIRD LEVEL:-

The shrinkage stope above this level at the North end was carried up within 15 feet of the Second Level. A floor pillow was left under the latter level to maintain the travelling road.

There is still considerable ore left in the North end of this stope which can not be mined until additional raises are put up.

At the South end of this stope raises were put up from the level for a distance of about 16 feet. The tops of these raises were then coned out and the ore broken from foot to hanging. The width of the ore is about 35 feet. At the extreme South end of the stope, we have holed into the main stope finding only a small seam of rock on the footwall of the main stope. The ore in this stope was lean at the start but improved in quality as the stope was carried up.

MAIN STOPE.

900' SUB-LEVEL:-

This is the top sub and mining was conducted about 10 feet above the floor of the sub which leaves a pillar of ore 35 feet thick under the sand. In order to be certain as to the position of the top of the ore under the sand, a raise was put up from this sub 30 feet high and a long drill hole kept ahead of the breast. We found no evidence of any water in the sand over-lying the ore.

From #60 raise to the South end of the stope, all the ore has been mined up to within 35 feet of the juncture of the sand and ore. At the North end of the ore body, it is probable that the ore will extend over to the North lens shrinkage stope.

875' SUB-LEVEL:-

This sub level was opened up during the year and all the ore at this elevation mined except a strip along the footwall back of the travelling road connecting the footwall raises and a pillar of ore left at the North end between #10 and #20 raises.

There is still a showing of ore at the North end near #10 raise and the ore will probably extend over to the North lens.

845' SUB-LEVEL:-

All of the ore at this elevation is mined out. When the mine was unwatered, there remained only a strip of ore about 25 feet wide along the foot and a pillar of ore between the foot and hanging opposite Diamond Drill hole #16.

825' SUB-LEVEL:-

This sub level is completely mined out. Two small pillars near #30 raise and a pillar along the foot opposite #40 raise were mined. The rest of the ore had been taken before the mine was closed down in 1919.

FIRST LEVEL:-

The only mining done on the First Level during the year 1920 was the removal of a pillar of ore opposite #40 and #60 raises.

Four raises, #8, #9, #10 and #20, were put up along the main drift spaced 20 feet apart. These raises are needed to tap the North extension of the main stope. As mining operations were carried up above the First Level, we found the ore extending over towards the North lens, as remarked previously in this report. If we actually find the ore extending the entire distance of about 100 feet, it will add considerably to our ore reserves. So far, the

ore has extended 40 feet in that direction.

784' SUB-LEVEL:-

Considerable tonnage was taken off the footwall back of #30 raise. We found the ore running back quite a distance back of this raise and we took all the ore possible without under-mining the main drift on the first level.

We have left all the ore between #40 and #60 raises from foot to hanging as a brace to support the hanging. This ore will probably never be recovered.

764' SUB-LEVEL:-

Some ore was taken North of #30 raise along the footwall. Only a small tonnage had been left here when operations closed in 1919.

As mentioned above, a pillar of ore was left from foot to hanging at this elevation to help prevent the hanging rock from slabbing off and mixing with the ore drawn from the 3rd level raises.

WEST ORE BODY.

The drift which had been breasted on the Virgil Boundary was driven Westerly across the line and we mined 233 tons of ore by the close of the year. The ore was lean, however, but indications were favorable for developing ore of the regular Spies grade as the material in the breast was getting better each succeeding blast.

We also tried to prove up the downward extension of this ore body by Diamond Drilling.

Hole #1 was put down vertically from the North end of North-South cross-cut in this ore body and proved up 70 feet of ore averaging about 55.92 Iron, which analysis, I believe is a little high because we have never been able to check the Diamond Drill analysis when raising on a drill hole and taking samples.

We find the drill hole samples to average higher than the mine samples. Evidently, there is some concentration of the sludge.

Hole #2 drilled horizontally and North 10° East from the breast of the same cross-cut in which hole #1 was located, proved up nothing but lean ore.

Hole #3 drilled vertically below the 3rd level on the boundary between the Spies and Virgil mines showed up only 15 feet of lean ore.

Holes #4 and #5 drilled North and South towards foot and hanging, parallel and practically on the boundary, proved up nothing.

Hole #6 drilled vertically below the 3rd level at the end of the straight drift leading out from the shaft on the 3rd level, showed up 56 feet of ore averaging 55.10 Iron. This ore was bottomed 170 feet below the 3rd level.

Hole #7 was a short hole drilled on the 3rd level to look for a deposit parallel and West of the North lens, but nothing was discovered.

SPIES MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1920.

GRADE	IRON	PHOS.	SILICA
Spies,	55.19	.511	7.01
Virgil,	51.34	.558	11.12

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1920.

GRADE	Mine			Lake Erie	
	IRON	PHOS.	SILICA	IRON	MOIST.
Spies,	55.33	.505	6.97	55.23	5.61

ORE STATEMENT - DECEMBER 31ST, 1920.

	SPIES	TOTAL LAST YEAR
On hand Jan. 1st, 1920,	100,909	143,429
Output for year,	92,296	70,914
Stockpile Overrun,	8,176	
Total,	201,381	214,343
Shipments,	186,901	113,434
Balance on hand,	14,480	100,909
Increase in output-23%	21,382	
Decrease in ore on hand-85%	86,501	

1920 - Idle Jan. 1st to May 28th
 2-8 Hour Shifts May 28th to Dec. 31st
 1919 - 1-8 " " Jan. 1st to June 30th
 Mine idle June 30th to Dec. 31st.

SPIES MINE.

SPIES MINE

SHIPMENTS FOR YEAR 1920.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR	
Spies,	77,816	109,085	186,901	113,434	
Last Year,			113,434	48,781	
Increase-65%			73,467		

SPIES MINE.

SPIES MINE.

COMPARATIVE MINING COST FOR YEAR.

	1 9 2 0.	1 9 1 9.	INCREASE.	DECREASE.
PRODUCT	100,705	70,914	29,791	
General Expense	.068	.077		.009
Maintenance	.103	.116		.013.
Mining Expense	1.143	1.231		.088
Cost of Production	1.314	1.424		.110
Exploratory	.045		.045	
Plant	.575	.564	.011	
Total Depreciation	.575	.564	.011	
Taxes	.089	.026	.063	
Central Office	.040	.050		.010
Supply Inventory	.001		.001	
Miscellaneous	.010		.010	
Idle Expense	.071	.183		.112
Sundry Expense	.030	.006	.024	
Cost on Stockpile	2.182	2.253		.071
Loading & Shipping	.178	.261		.083
Total Cost on Cars	2.360	2.514		.154
No. Days Operating	179	150	29	
No. Shifts and Hours	2-8hr	1-8hr		
Avg. Daily Product	563	473	90	
<u>COST OF PRODUCTION.</u>				
Labor	.955	1.008		.053
Supplies	.359	.416		.057
Total	1.314	1.424		.110

Mine closed June 30, 1919.
Started producing again May 28, 1920.

SPIES MINE

COMPARATIVE WAGES AND PRODUCT

	1920	1919	INCREASE	DECREASE
PRODUCT	100,705	70,914	29,791	
No. Shifts and Hours 2-8hr				
AVERAGE NO. MEN WORKING				
Surface	13	11	2	
Underground	41	32	9	
Total	54	43	11	
AVERAGE WAGES PER DAY				
Surface	5.51	4.88	.63-12.9%	
Underground	6.43	5.72	.71-12.4%	
Total	6.20	5.51	.69-12.5%	
WAGES PER MONTH OF 25 DAYS				
Surface	137.75	122.00	15.75	
Underground	160.75	142.00	17.75	
Total	155.00	137.75	17.25	
PRODUCT PER MAN PER DAY				
Surface	24.76	20.28	4.48	
Underground	8.05	6.87	1.18	
Total	6.08	5.13	.85	
LABOR COST PER TON				
Surface	.223	.241		.018
Underground	.799	.832		.030
Total	1.022	1.073		.041
AVG. PRODUCT BRK'G & TRM'G	10.98	9.58	1.40	
" WAGES CONTRACT MINERS	6.81	Ch. Acct		
" " " TRAMMERS	6.81	"		
" " " LABOR	6.93	"		
TOTAL NUMBER OF DAYS				
Surface	4,066 $\frac{1}{2}$	3,500 $\frac{1}{2}$	565 $\frac{2}{2}$	
Underground	12,508 $\frac{3}{4}$	10,323 $\frac{1}{2}$	2,185 $\frac{2}{2}$	
Total	16,575	13,823 $\frac{1}{2}$	2,751 $\frac{1}{2}$	
AMOUNT FOR LABOR				
Surface	22417.12	17091.44	5325.68	
Underground	80425.37	59029.88	21395.49	
Total	102842.49	76121.32	26721.17	

Proportion Surface to Underground Men;

1920 - 1 to 3.1
 1919 - 1 to 2.91
 1918 - 1 to 2.86
 1917 - 1 to 3.2

SPIES MINE

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE

KIND	QUANTITY	AVERAGE PRICE	AMOUNT 1920	AMOUNT 1919
40% Powder - - - - -	59,525	.1754	10,442.18	9,130.65
60% " - - - - -	2,750	.1940	533.50	
Total Powder -	62,275	.1762	10,975.68	9,130.65
Fuse - - - - -	163,900	9.25	1,516.31	959.65
Caps - - - - -	19,575	14.88	291.26	241.29
Cap Crimpers - - - - -	9	.55	4.95	2.84
Tamping Bags - - - - -	2,000	2.26	4.52	7.50
Total Fuse, Etc. -			1,817.04	1,211.28
Total Explosives -			12,792.72	10,341.93
Product - - - - -			92,529	70,914
Pounds Powder per ton of Ore			.67	.75
Cost per ton for Powder			.119	.128
" " " " Fuse, Caps, etc.			.0196	.018
" " " " All Explosives			.1386	.146
Avg. Price per Lb. for Powder			.1762	.172

SPIES MINE

CROSBY MINE
ANNUAL REPORT FOR 1920.

The production of wash ore from the Crosby Mine during the year 1920 amounted to 200,443 tons, of which 88,619 tons were secured from underground operations and 111,824 tons from the open pit. The washing plant was operated from May 10th to July 23rd on double shift and from July 24th to October 23rd on day shift only. The double shift work was discontinued when the stockpile had been loaded out, the production from the mine not warranting a night shift.

The mill treated 190,815 tons of crude ore and turned out 116,407 tons of concentrates.

We had no ore in stock at the opening of navigation in 1919, whereas our stockpile on May 10th, 1920, when washing operations were started, amounted to 73,370 tons.

Underground mining was discontinued on May 8th and arrangements made on the 9th for loading the output into railway cars and drawing the production from the open pit. Underground mining was resumed October 25th and we had placed in stockpile by December 31st. 30,621 tons.

Based on the phosphorus content of our stockpile on January 1st, 1921, we feel that approximately 40% of the concentrates derived from a treatment thereof will be Bessemer and there should be no question of our being able to forward the 25,000 tons of Bessemer concentrates estimated for 1921 shipment.

The general labor situation in the Nashwauk District improved considerably toward the end of 1920, although it had not been as bad as in other localities during the forepart of the year. We are now securing ample men for our underground work and we have been able to raise the standard and secure better results. The present cost of producing underground ore, aside from any reduction in wages, should be materially under that of a year ago. We will not be able to secure any appreciable tonnage from our open pit during 1921, however, as the available steam shovel ore is practically exhausted.

GROSBY MINE ORE ESTIMATE OF JANUARY 1ST.
1 9 2 1.

Following is an estimate of the ore in sight at the Crosby Mine on January 1st. 1920, the tonnage mined during the past year and our estimate of January 1st. 1921, 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. 1920---	153,000	624,000	777,000
Mined During 1920-----	56,221	60,186	116,407
Estimate of January 1st. 1921---	135,000	314,000	449,000

Operations during the year 1920 disclosed the fact that a considerable quantity of ore in the east pit bottom is of such character that we will be unable to concentrate it to advantage. The drill holes and test-pits missed a large tonnage of partly decomposed taconite, which cannot be benefited by washing.

The phosphorus content of the underground ore developed during 1920 is lower than anticipated and as a result we have increased the proportion of Bessemer concentrates by 38,000 tons, as compared to the 1919 estimate. The Non-Bessemer tonnage has been decreased 250,000 tons, however, making a decrease from the total 1919 figures of 212,000 tons.

On a 60% ratio of concentration, it will require 736,000 tons of crude ore to yield 449,000 tons of concentrates.

Following is the average analysis that we expect to secure in concentrating the ore remaining in the Crosby Mine on January 1st. 1921:

	<u>Tons.</u>	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>	<u>Mois.</u>	<u>Fe.Nat.</u>
Bessemer Ore-----	135,000	59.50	.045	8.90	7.50	55.04
Non-Bessemer Ore-----	314,000	59.00	.060	9.00	7.75	54.43

The Crosby Mine has been thoroughly explored and we do not anticipate showing up any additional tonnage from future operations. In fact, it is very questionable whether we will be able to mine a considerable part of the tonnage shown, due to the fact that it is almost entirely underground ore and the mining cost would be high. It depends entirely on the market price of the ore being sufficiently high to warrant mining the low grade crude ore by underground methods.

GROSBY MINE.

The estimate of production from the Crosby Mine from November 15th, 1920, to November 15th, 1921, with the expected analysis, is as follows:

	<u>Tons</u>	<u>Fe.</u>	<u>Phos</u>	<u>Mn.</u>	<u>Sil.</u>	<u>Fe.Nat.</u>
Bessemer Concentrates-----	25,000	60.00	.045	.80	7.50	55.35
Non-Bessemer Concentrates-----	53,000	60.00	.065	1.00	7.00	55.35

GENERAL SURFACE

An extra effort was made during the spring of 1920 to clean up the debris around the mine buildings and the location. The result was that the premises showed a much improved appearance.

The winter's accumulation of cinders was spread over the mine roads and a fence was built between the road and the open pit. The caves from underground operations had extended back from the east pit bank and it was necessary to move the road back onto solid ground. This roadway is used for the delivering of coal to the east pit shovels and timber and supplies for the underground operations at this end of the mine.

A crew of from 5 to 10 men were engaged during the winter months in overhauling the steam shovels, locomotive and washing plant machinery. The repairs on the locomotive and steam shovels were rather extensive, but those at the washing plant were somewhat less than usual.

The rock which had accumulated from sorting operations around the stockpile was carted away and dumped into the caves at the north end of the property. Due to the heaving from frost, a leak developed along the edge of our concrete dam at our impounding basin. Quite a quantity of water seeped through a crack here and on account of the York Mine culvert being too small to take care of the flow, the water dammed back in the surface ditch and started to overflow the banks. Employees of the York and Crosby Mines blew out the fill over the culvert and cut a channel through the ice, the water upon being dammed back having frozen solid to the top of the ditch bank. It required several days to block the leak at the dam. We do not anticipate any further difficulty with the leak and the ditch is now open and will take care of any flood waters from either the dam or from melting snow.

The waste rock sorted on the grizzlies was dumped into the open pit for a fill to the west of the shaft. In order to mine a part of the track pillar, it will be necessary to shift our tracks to the westward and it is also cheaper to dump the rock here than to haul it out to the waste pile near the washing plant. We secured permission to dump rock into the old pit from the Fee Owners' Agent.

GROSBY MINE.

Due to the caving of the subs north of the shaft and at the west end of the underground workings, it was necessary to shift our suction pipe line from the dam and the discharge pipe line between the shaft and the drainage ditch.

STOCKING

The average analysis of the stockpile on hand May 10th, 1920, was as follows:

	<u>Tons</u>	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>
In Stock May 10th-----	73,370	44.95	.039	27.79

The tonnage and analysis of the stockpile as loaded out follows:

	<u>Tons</u>	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>
Shipped from Stockpile---	78,991	45.65	.038	28.91

Following is the tonnage and analysis of the ore in stock January 1st. 1921:

	<u>Tons</u>	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>
In Stock Jan. 1st. 1921--	30,621	45.68	.043	26.99

The 1920 stockpile was loaded out between May 10th and July 24th and we resumed stocking operations October 25th and continued throughout the balance of the year.

MINING OPERATIONS

Mining operations were confined to underground work during the period from January 1st. to May 8th and resumed on October 25th and continued to the balance of the year. From May 10th to October 23rd our output was secured from open pit operations.

The tonnage produced by months during the past year was as follows:

	<u>Tons</u>
January-----	12,558
February-----	12,495
March-----	13,233
April-----	11,115
May-----	14,215
June-----	20,200
July-----	22,368
August-----	22,744
September-----	21,149
October-----	17,226
November-----	11,811
December-----	15,708
Overrun from stockpile----	<u>5,621</u>
TOTAL-----	200,443

Our underground force consisted of an average of 15 gangs and in the open pit we operated one Model "28" shovel. Both of the shovels were operated during the year, but only one at a time.

"FIRST LEVEL"

During the forepart of the year, two gangs, Nos. 1 and 2, were engaged in development work along the east edge of the west pit bank.

Upon encountering the taconite, No. 2 began stoping and gouging operations. Upon resuming underground work in October, No. 2 went into their old stope and continued the work of gouging. By January 1st. No. 2 had mined out and caved a room 150' long, averaging 80' in width and varying from 10' to 20' in height. This ore averages close to 50% iron and the method of mining was quite economical.

Contract No. 1 developed the ground to the south and east from their breast on January 1st. 1920, for a distance of 490'. The deposit apparently pinched out upon several occasions, but upon undertaking gouging operations, a seam of ore was found to continue. At the end of the year, No. 1 had started slicing and caving back the deposit on either side of their development drift. The ore averages below 45% in iron, but we are able to secure a good tonnage and the costs are well below those for the average contract at the Crosby Mine.

Upon the resumption of underground activities in October, Contract No. 7 started a crosscut 40' north of No. 1. The gang drifted through 42% ore for 210', where rock was encountered and they are now developing the ground to the north of the crosscut.

Contract No. 3 spent the months of November and December in developing and gouging out the ore along the edge of the open pit to the southwest of No. 1. This work was carried to the open pit frost line, and the gang is now starting to slice out the ground between this drift and the old main haulageway to the east.

Contract No. 10 was engaged during the time that underground operations were in progress, in slicing, gouging and caving back the deposit to the north and one set above No. 162 raise. This ore has averaged close to 50% iron and the tonnage secured has been quite satisfactory.

Nos. 1, 2, 3, 7 and 10 will be engaged in their present working places for the first half of 1921.

Contract No. 11 cut out from No. 68 raise the forepart of November and has drifted north and east for 310', where a holing was effected with No. 4's workings. No. 11 will now slice back the ore between this drift and the Mace Mine boundary, an average distance of 40'. The ore being mined here averages about 45% iron and .050 phosphorus.

Contracts Nos. 4 and 14 were employed during April, the forepart of May, the latter part of October and November and December, in developing the ground at the elevation of the main level to the southeast of No. 40 raise. Until the latter part of December, all of the ore was dumped to the 1435' Sub and trammed thereon to 312 raise, a distance of 350'. Now that No. 11 has holed to these workings, at least part of the ore will be trammed directly to the shaft on the first level.

The ore secured by Nos. 4 and 14 has averaged about 45% iron and .040 phosphorus.

"1435 Foot Sub-Level"

At the beginning of the year, eight gangs were engaged in development work and slicing to the east and north of Nos. 303, 304, 305, 306, 307, 308, 309, 310, 311 and 312 raises. The deposit at this sub, which is just east of the open pit, was found to have an average width of 150' and was 550' in length.

As the pillars were mined out, the gangs were transferred to the south workings, or dropped down in their raises and started development work below. At the end of the year, but three gangs remained at this elevation, Nos. 5 and 6, slicing back the pillars at the north end of the sub and No. 9 robbing the few small pillars remaining between 309 and 312 raises. Nos. 5 and 6 will continue operations on this sub for at least four or five additional months.

The average grade of ore secured on the 1435' Sub has been about 45% iron and .039 phosphorus.

Contracts Nos. 8 and 12 cut out from Nos. 500 and 501 raises and had mined out a block of ore 220' long, averaging 60' in width and 18' in height between the track pillar and the first level haulageway. This ore has run only

about 40% iron, but the product has been high. All the pillars on the 1435' Sub had been exhausted by the end of the year and the gangs had dropped down in their raises and started development work on the 1420' Sub.

There was a rock capping over Nos. 8 and 12 rooms and it was very difficult to get it to cave until a considerable opening had been effected.

"1420 Foot Sub"

Development work at this elevation had just been started at the end of the year, three gangs being engaged from Nos. 301, 302, 304 raises and Nos. 8 and 12 from Nos. 500 and 501 raises. While we have done comparatively little development work to date, we are positive that the 1420' Sub will be much less extensive than the one 15' above.

OPEN PIT OPERATIONS

Open pit steam shovel operations were carried on from May 10th to October 23rd and were confined entirely to the east pit bottom and south bank. The "36" revolving shovel had been sold to the Hill Mine in 1919 and the two Model "28" machines were used the past year.

It was necessary to do considerable blasting and preparatory work for shovel operations this year and for this reason a gang of men was employed steadily in preparation for either the No. 1 or 2 machines. Only one shovel was operated at a time and the daily output was much lower than at any time since we started shovel work in the open pit.

The south bank was carried back to the stripping limits and the ore in the bottom of the pit was either cast directly into the second level chutes by the shovels or loaded into 4-yard tram cars and hauled thereto. At the end of the season, the only ore remaining was some very low grade material along the west bank and a few pockets of fair grade wash ore along the east bank. The bottom ore had been cleaned down to the rock.

We handled a very considerable quantity of blocky and partly decomposed taconite during the season. The material was dumped on the cleaned out portions of the pit, the quantity sent to the shaft and hoisted being much lower than for several years. Heretofore we had been obliged to hoist all the rock encountered

in mining in the east pit, on account of there being ore below and the prohibitive expense entailed in piling and handling from two to three times.

One of the Model "28" machines was dismantled and taken to surface subsequent to the closing of the shipping season. This machine will be overhauled and sold to one of the other mines, as there is no further use for it at the Crosby. Necessary repairs will be made on the second shovel and we will use it during the coming summer in mining the few remaining pockets of ore in the pit.

WASHING OPERATIONS

The washing plant operated on double shift from May 10th to July 23rd and on day shifts only from July 24th to October 23rd. The mill closed down for the season October 23rd and a few men were retained in dismantling certain parts of the machinery before cold weather set in.

The mill will require comparatively little repairs to put it in shape for 1921 operations, due largely to the fact that it was very thoroughly overhauled last year and the service during 1920 was lighter than usual. It will not be necessary to make many replacements to the machinery and launder lining.

The Great Northern car service was very poor during the 1920 shipping season and we suffered a number of delays in consequence. While the mill was being operated on single shift, we filled our six railway cars, the mill receiving bin, the shaft pocket and used Great Northern cars for storing crude ore, when they were available.

We had very little trouble in operating the mill during the past year and there were no serious delays on account of breakdowns. The weather conditions were very favorable during the fall months and we could have continued operations somewhat beyond October 23rd, if it had been necessary.

During the fall of 1919, we had considerable difficulty in operating our mill during the latter part of October, due to the severe freezing conditions.

The conveyor belt, which was installed August 15th, 1919, held out very well and it is quite likely that it will carry us through the coming season.

We made some adjustments on the Deister tables and when the quantity

of fines was excessive, we were able to operate the tables to good advantage. The five Overstrom tables, however, were usually adequate to take care of the fines in the mill feed.

A considerable quantity of partly decomposed taconite was sent to the mill and it was necessary to employ from one to two extra men on the picking belt from time to time to sort out this undesirable material.

There was also considerable frost in the stockpile and it was necessary to break down the chunks in order to wash the material to advantage.

Following is the tonnage treated at the mill during 1920, the concentrates produced and the analysis of same as obtained from mine and Lake Erie sampling:

	<u>Tons.</u>	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>
Crude Ore-----	190,815	44.08	.039	30.16

CONCENTRATES
(MINE SAMPLING).

	<u>Tons</u>	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>
Bessemer-----	56,221	58.38	.044	9.68
Non-Bessemer-----	<u>60,186</u>	<u>58.63</u>	<u>.055</u>	<u>9.45</u>
TOTAL AND AVERAGES-----	116,407	58.51	.050	9.04

CONCENTRATES
(Lake Erie Sampling)

	<u>Tons</u>	<u>Fe.</u>	<u>Phos</u>	<u>Mois.</u>	<u>Fe.Nat.</u>
Bessemer-----	55,659	58.85	.041	7.74	54.29
Non-Bessemer-----	<u>59,584</u>	<u>58.37</u>	<u>---</u>	<u>8.15</u>	<u>53.61</u>
TOTAL AND AVERAGES-----	115,243	58.60	---	7.95	53.94

The ratio of recovery for the season of 1920 was 61% and compares with 61.82% for 1919, 62.20% for 1918 and 63.43% for 1917. The iron content of the crude ore treated during 1920 was a little over a point better than that for 1919, but several points lower than the ore handled prior to 1919. The ratio of gross recovery for 1920 was quite seriously affected by the large amount of decomposed taconite mixed with the ore. It is necessary to sort this all out on the picking belt and the gross recovery was lessened thereby.

The recovery of iron units for 1920 was 80.97% and compares with 85.84% for 1919, 81.20% for 1918 and 79.41% for 1917. We encountered some paintrock in the bottom of the east pit and the loss in iron units in washing this material was relatively high. If anything, our mill practice was better during 1920 than for

any previous year.

The approximate percentage of product obtained from the several machines was as follows: Screen, or picking belt, 19%, log 63%, turbo 13% and tables 5%. The average analysis of the product from the machines for the past four seasons was as follows:

1 9 1 7 .

	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>
Screen-----	53.73	.042	16.14
Log-----	61.16	.038	7.34
Turbo-----	60.62	.029	9.49
Tables-----	65.47	.019	4.45
Tailings-----	24.60	---	----

1 9 1 8 .

	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>
Screen-----	56.69	.049	12.96
Log-----	60.61	.045	8.17
Turbo-----	59.03	.032	11.52
Tables-----	65.53	.019	4.54
Tailings-----	26.00	---	----

1 9 1 9 .

	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>
Screen-----	58.13	.060	10.60
Log-----	59.63	.050	9.11
Turbo-----	57.15	.035	13.92
Tables-----	65.12	.023	5.67
Tailings-----	23.46	---	----

1 9 2 0 .

	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>
Screen-----	53.97	.049	14.91
Log-----	58.91	.049	8.65
Turbo-----	59.07	.034	10.65
Tables-----	65.72	.020	4.36
Tailings-----	29.02	---	----

A comparison of the 1920 analytical results shows that the product from the screen and log were low as regards the iron content, but the turbo and tables were higher, also the tailings. The low iron content of the screen and log product was due largely to the quantity of decomposed material handled. The fine material in the east pit concentrates better than that from the west pit and as we had no west pit tonnage during 1920, we secured a higher iron in our turbo and table product. The paintrock encountered in the bottom of the east pit was responsible for the higher iron content in the tailings for 1920, as compared to the previous years.

Following are the cargoes of Crosby concentrates shipped during the 1920 season and the analysis of same as obtained at the Mine and by the Lower Lake Chemists:

	<u>Fe.</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mois.</u>	<u>Fe.Nat.</u>	<u>Tons.</u>
<u>GRAND ISLAND</u> -----						9,021
Mine-----	58.56	.044	9.19	----	-----	
Cremer & Case-----	58.60	.039	----	7.96	53.935	
<u>MARQUETTE</u> -----						7,455
Mine-----	58.14	.042	10.19	----	-----	
Crowell & Murray-----	59.90	.040	----	7.88	55.18	
Emmerton-----	58.02	.040	----	7.63	53.59	
<u>J. H. SHEADLE</u> -----						6,989
Mine-----	58.73	.043	9.45	----	-----	
Crowell & Murray-----	60.30	.037	8.22	8.22	55.343	
Oscar Textor-----	59.08	.042	----	8.27	54.194	
<u>MUNISING</u> -----						3,676
Mine-----	57.77	.049	9.84	----	-----	
Oscar Textor-----	58.50	---	----	7.82	53.93	
<u>WILPEN</u> -----						6,152
Mine-----	58.53	.044	9.63	----	-----	
Oscar Textor-----	59.00	.041	----	7.52	54.563	
Cremer & Case-----	58.40	.039	----	7.36	54.102	
<u>WM. G. MATHER</u> -----						11,031
Mine-----	57.94	.043	9.94	----	-----	
Cremer & Case-----	58.40	.040	----	7.54	53.990	
Crowell & Murray-----	58.53	.039	----	7.98	53.860	
<u>WM. G. MATHER</u> -----						11,416
Mine-----	58.17	.045	9.95	----	-----	
Crowell & Murray-----	58.67	.045	----	7.52	54.260	
Oscar Textor-----	58.10	.042	----	7.59	53.690	
<u>MICHIGAN</u> -----						4,157
Mine-----	59.39	.044	8.86	----	-----	
Crowell & Murray-----	60.70	.042	----	7.36	56.232	
Cremer & Case-----	60.00	.041	----	7.16	55.700	
<u>ISHPEMING</u> -----						11,065
Mine-----	58.17	.047	9.91	----	-----	
Crowell & Murray-----	58.75	---	----	7.97	54.070	
Cremer & Case-----	58.40	---	----	7.21	54.190	
<u>ISHPEMING</u> -----						3,716
Mine-----	58.50	.052	9.01	----	-----	
Crowell & Murray-----	58.30	---	----	8.40	53.403	

	<u>Fe.</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mois.</u>	<u>Fe.Nat.</u>	<u>Tons.</u>
<u>J. H. SHEADLE</u> -----						9,110
Mine-----	58.51	.054	9.01	----	-----	
Cremer & Case-----	58.60	---	----	7.57	54.164	
Oscar Textor-----	58.08	---	----	7.45	53.753	
<u>MARQUETTE</u> -----						5,692
Mine-----	59.16	.060	7.84	----	-----	
Oscar Textor-----	58.35	---	----	8.19	53.571	
Crowell & Murray-----	58.97	---	----	8.48	53.969	
<u>ISHPEMING</u> -----						4,188
Mine-----	58.55	.061	7.59	----	-----	
Cremer & Case-----	59.10	---	----	8.07	54.531	
Crowell & Murray-----	58.90	---	----	8.09	54.135	
<u>NEGAUNEE</u> -----						5,036
Mine-----	59.86	.052	6.85	----	-----	
Oscar Textor-----	57.85	---	----	8.54	52.910	
Cremer & Case-----	58.20	---	----	8.43	53.294	
<u>WM. G. MATHER</u> -----						9,135
Mine-----	59.27	.057	7.63	----	-----	
Crowell & Murray-----	58.35	---	----	8.08	53.635	
<u>PETER WHITE</u> -----						8,535
Mine-----	58.04	.067	7.77	----	-----	
Oscar Textor-----	57.70	---	----	9.34	52.311	
Cremer & Case-----	57.90	---	----	9.42	52.446	

ACCIDENTS

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

PETE BARAVICH

Injured-----January 19th, 1920.
Occupation-----Miner.
Nationality-----Austrian.
Time Lost-----70 Days.
Compensation Paid-----\$400.00 (Settlement).

Remarks: Baravich and his partner, Melich, were baring down a large piece of taconite, which rested on a pile of ore in the breast of their drift. When the large chunk moved it must have loosened other chunks in the back of the untimbered ground. Some ten tons of ore caved, crushing one set of timber and burrying Baravich, causing a triangular cut between his left eye and nose, a cut 3/4" long on the left eye lid, an abrasion on his nose and face, three small cuts on his scalp, abrasion of the left leg and general soreness. It took one and one-half hours to liberate Baravich.

JOE MELICH

Injured-----January 19th, 1920.
Occupation-----Miner.
Nationality-----Servian.
Time Lost-----70 Days.
Compensation Paid-----\$300.00 (Settlement).

Remarks: Melich and his partner, Baravich, were baring down a large piece of taconite which rested on a pile of ore in the breast of their drift. When the large chunk moved on the pile it must have loosened other chunks in the back of the untimbered ground. Some ten tons of ore caved, crushing one set of timber and caught Melich. Although liberated immediately and there were no visible signs of injury, Melich complained of soreness around the abdomen, back and left knee.

PAUL KORCH

Injured-----January 30th, 1920.
Occupation-----Skiptender.
Nationality-----Servian.
Time Lost-----7 Days.
Compensation Paid-----None.

Remarks: Korch was working in the skip picking at frozen ore when a chunk fell from above, striking him on the head and causing a lacerated wound on the mid-parietal scalp.

AUGUST LASSILA

Injured-----March 10th, 1920.
Occupation-----Miner.
Nationality-----Finnish.
Time Lost-----10 Days.
Compensation Paid-----\$10.00.

Remarks: Lassila was making a wooden wedge with an axe. The handle of the axe struck the side of the drift, diverting the course of the axe and striking him on the left hand. He sustained a laceration of the dorsal surface of the first and second fingers of the left hand.

LOUIS WUOVICH

Injured-----April 6th, 1920.
Occupation-----Miner.
Nationality-----Montenegrin.
Time Lost-----5 Days.
Compensation Paid-----None.

Remarks: Wuovich was picking down the back of #2 drift and some dirt struck him, causing a laceration beneath the right eye, over the left eye, and also slight scratches over the right cheek.

ANALYSIS OF COST SHEET

In analysing the cost sheet of the Crosby Mine between the years 1919 and 1920, the proportion of the product from underground operations, as compared to the open pit, is the controlling factor. During 1919, 20,993 tons were mined underground and 188,867 tons were secured from the open pit, compared with an underground output of 88,619 tons and 111,824 tons of open pit ore in 1920. Affecting the fixed charges, the total production for 1919 was 9,417 tons in excess of that for 1920.

We worked 159 shifts in the open pit during 1919 and 173 shifts in 1920. The 1919 underground shifts amounted to 49, compared with 136 for 1920. The production per shift for 1919 was 1,009 tons, against 649 tons in 1920. The underground conditions were very similar for the two years, but the open pit operations for 1920 were conducted under much less favorable circumstances.

The following statement shows the charges under the several main captions for the years 1919 and 1920:

	<u>1920.</u>	<u>1919</u>
Tonnage-----	200,443	209,860
General Expense-----	\$.096	\$.063
Maintenance-----	.109	.115
Mining Expense-----	<u>1.127</u>	<u>.752</u>
TOTAL-----	\$1.332	\$.930

"GENERAL EXPENSE"

Considerably more engineering work was required at the Crosby Mine in 1920, on account of the comparatively large amount of underground opening work undertaken. The increase in the engineers' salaries was also an item. This account was \$.007 per ton higher for 1920 than for 1919.

The decrease of \$.005 per ton for the 1920 "Analysis" was the result of combining our samples. The rate per determination was 10¢ higher for 1920, but we only ran 12-hour samples on the crude ore, instead of 3-car samples.

The amount of compensation paid for "Personal Injury" cases was greater during 1920 and this item showed an increase of \$.003 per ton.

On account of handling the shipping in the District Office, the charge per ton against "Mine Office" was reduced by \$.003 per ton for 1920.

The establishment of the District Office in 1920 resulted in a charge of \$.029 per ton for that year. There was no charge against District Office for 1919.

"MAINTENANCE"

The total 1920 charge per ton for "Maintenance" was \$.006 less than for the previous year. Some of the items under this caption were higher and some lower, but the difference was not large in any case.

There was an increase of \$.005 per ton for "Tracks & Yards" in 1920. This was due to the large amount of cleaning work undertaken around the mine premises.

It was necessary to make some general repairs on the "Compressor & Power Drills" during 1920 and this item showed an increase of \$.003.

The 1920 charge to "Electric Tram Plant" showed an increase of \$.008 per ton. This is explained by the large amount of cleaning work undertaken to put the underground tracks in shape for tramping.

Very little repair work was necessary on the "Mine Buildings" during 1920, with the result that this item shows a decrease of \$.007 per ton.

The top tram cars and motor were thoroughly overhauled during 1919, whereas in 1920 the repair work was nominal. This resulted in showing a decrease of \$.004 per ton in this item for 1920.

We lost a pile of lagging by fire in 1919 and a charge of \$.004 per ton was made in consequence thereof. There was no charge to this account in 1920.

"MINING EXPENSE"

Long air lines were carried into the west underground workings during the fall of 1920. The extensions were comparatively small in 1919. This item showed an increase of \$.006 per ton in 1920.

The accounts "Hoisting" and "Pumping" showed a 1920 increase of \$.011 and \$.009 respectively. This was due to the increase in our rate for current. The larger production for 1919 was also a factor.

While the rate of wages was higher in 1920, considerably less rock drifting was undertaken, and this account showed a 1920 decrease of \$.011.

The increase of \$.258 for the account "Breaking Ore" is explained by the fact that a considerably larger proportion of our product during 1920 came from underground operations, and the scale of wages was higher.

The 1920 "Tramming" account was \$.028 higher than for 1919. The rate for current was higher and the average length of tram somewhat longer during 1920. The larger proportion of underground product for 1920 was also a factor here.

The increase of \$.048 in 1920 against "Timbering" was due to the higher price paid for the material and the greater amount of underground work undertaken.

The 1920 charge to "Captain & Bosses" showed an increase of \$.016 per ton over that for 1919. This is explained by the increase in the wages and the fact that the bosses worked more overtime.

The 1920 increase of \$.008 per ton against "Dryhouse" was the result of increased wages and higher price paid for coal.

A larger proportion of our tonnage was mined underground and stocked during 1920 and the item "Top Landing & Tramming" showed an increase of \$.023 as a result thereof. The increase in wages was also a factor.

Less ore was secured from the open pits during 1920 and we were able to cut down the force engaged on the headframe grizzlies in sorting out rock. The 1920 charge to this account showed a decrease of \$.024 per ton.

CONCENTRATING COSTS

We produced 116,407 tons of concentrates in 1920, as compared with 116,753 tons in 1919. The washing plant operated 143 ten-hour shifts during 1920, against 144 shifts in 1919. We had a stockpile to draw from during the past year and we operated on two shifts until this was exhausted. Operations during 1919 were conducted on day shifts only, with the exception of the time required to clean-up the small pile of ore accumulated in stock while the Dock strike was in effect.

The following statement shows the charges to the several main captions, covering the expense of concentrating Crosby Ore for the years 1919 and 1920:

	<u>1920.</u>	<u>1919.</u>
Tonnage-----	116,407	116,753
General Expense-----	\$.048	\$.048
Transportation Maintenance---	.027	.029
Transportation Cost-----	.160	.122
Maintenance Washing Plant----	.025	.056
Operating Washing Plant-----	<u>.193</u>	<u>.211</u>
TOTAL-----	\$.401	\$.381

The average tonnage of concentrates turned out per 10-hour shift in 1920 was 808 tons, as against 811 tons for 1919.

The items "General Expense" and "Transportation Maintenance" were practically the same for the two years, the increase in wages being offset by less time charged off from the mine office and a smaller amount of work being required to keep our tracks and transportation equipment in shape.

The 1920 increase of \$.038 to the account "Transportation Cost" was the result of higher wages and the material increase in the price of coal.

The charges to "Maintenance of Washing Plant" were much lower for 1920. The mill was very thoroughly overhauled in 1919 and the amount of replacements and the necessary repair work during 1920 was much reduced as a result thereof.

The cost of "Operating Washing Plant" during the past season was \$.018 per ton less than for the previous year, the increase in wages being more than offset by the fact that we operated the mill with an average of from one to two less men.

CROSBY MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1920.

GRADE	IRON	PHOS.	SILICA
Crosby Crude,	45.06	.040	27.63
Crosby Concentrates,	58.43	.050	9.18

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1920.

GRADE	Mine			Lake Erie		
	IRON	PHOS.	SILICA	IRON	PHOS.	MOIST.
Crosby Bessemer,	59.62	.044	8.46	59.75	.042	7.54
Crosby,	58.59	.056	8.51	58.40		8.03

ORE STATEMENT AND SHIPMENTS FOR YEAR 1920.

	CRUDE ORE	CONCENTRATES.	SHIPMENTS	PERCENTAGE OF RECOVERY	TOTAL LAST YEAR
On hand Jan. 1st, 1920,	20,993				
Output for year,	194,822	116,407	116,407	69%	208,832
Stockpile Overrun,	5,621				1,028
Total,	221,436	116,407	116,407		209,860
Crude Ore Treated,	190,815				188,867
Balance on hand,	30,621	0	0		20,993
Total last year,		209,860	209,860		

Decrease in output-4% 9,417

Increase in ore on hand-46% 9,628

1920 - 2-8 Hour Shifts for year

1919 - 2-8 " " May 2nd to Dec. 31, 1920.

CROSBY MINE.

CROSBY MINE.

COMPARATIVE MINING COST FOR YEAR.

	1 9 2 0.	1 9 1 9.	INCREASE.	DECREASE.
PRODUCT	200,443	209,860		9,417
General Expense	.096	.063	.033	
Maintenance	.109	.115		.006
Mining Expense	1.127	.752	.375	
Cost of Production	1.332	.930	.402	
<u>DEPRECIATION.</u>				
Original Purchase	.026	.026		
Plant Account	.042	.042		
Equipment	.009	.010		.001
Total Depreciation	.077	.078		.001
Taxes	.137	.065	.072	
Central Office	.050	.029	.021	
Supply Inventory		.001		.001
Miscellaneous	.006	.006		
Winter Expense	.028	.382		.354
Sundry Expense	.030	.007	.023	
Cost on Stockpile	1.660	1.498	.162	
Loading & Shipping	.078	.038	.040	
Total Cost on Cars	1.738	1.536	.202	
No. Days Operating	2-8hr-136 2-10 -173	2-8-159 2-10-49		
Avg. Daily Product	649	1009		360
<u>COST OF PRODUCTION.</u>				
Labor	1.043	.697	.346	
Supplies	.289	.233	.056	
Total	1.332	.930	.402	

Crude ore basis.

CROSBY MINE

COMPARATIVE WAGES AND PRODUCT

	1920	1919	INCREASE	DECREASE
PRODUCT	200,443	209,860		9,417
No. Shifts and Hours	2-8-136 2-10-173	2-10-159 2- 8- 49		
AVERAGE NO. MEN WORKING				
Surface	36	31	5	
Underground	68	46	22	
Total	104	77	27	
AVERAGE WAGES PER DAY				
Surface	6.24	5.92	.32-5.4%	
Underground	6.77	6.24	.53-8.4%	
Total	6.59	6.11	.48-7.8%	
WAGES PER MONTH OF 25 DAYS				
Surface	156.00	148.00	8.00	
Underground	169.00	156.00	13.25	
Total	164.75	152.75	12.00	
PRODUCT PER MAN PER DAY				
Surface	17.86	21.28		3.42
Underground	9.40	14.34		4.94
Total	6.16	8.57		2.41
LABOR COST PER TON				
Surface	.349	.278	.071	
Underground	.721	.435	.286	
Total	1.070	.713	.357	
AVG. PRODUCT BRK'G & TRM'G BASED ON CRUDE ORE	12.89	38.02		25.13
TOTAL NUMBER OF DAYS				
Surface	11,220	9,858 $\frac{1}{4}$	1,361 $\frac{3}{4}$	
Underground	21,337 $\frac{1}{4}$	14,633 $\frac{1}{2}$	6,703 $\frac{1}{2}$	
Total	32,557 $\frac{1}{4}$	24,491 $\frac{3}{4}$	8,065 $\frac{1}{2}$	
AMOUNT FOR LABOR				
Surface	70,021.29	58340.46	11680.83	
Underground	144,475.82	91303.64	53172.18	
Total	214,497.11	149644.10	64853.01	

Proportion Surface to Underground Men;

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

CROSBY MINE.

TIMBER STATEMENT FOR THE YEAR ENDING DECEMBER 31, 1920.

KIND	LINEAL FEET	AVG. PRICE PER FOOT	AMOUNT 1920	AMOUNT 1919
6" to 8" Timber	15,582	.0887	1382.62	432.16
8 to 10 "	25,968	"	2304.26	721.94
10 to 12 "	5,194	"	461.71	144.39
12 to 14 "	2,597	"	231.35	86.83
14 to 16 "	2,596	"	231.26	57.76
Total - 1920	51,937	.0887	4611.20	
Total - 1919	25,080	.05757		1443.88
	LINEAL FEET	PER 100'		
6' Lagging	430,500	.00526	2267.09	806.00
Poles	-	-	-	-
Total - 1920	430,500	.00526	2,267.09	
Total - 1919	124,400	.647		806.00

Product	200,443	209,860
Feet timber per ton of ore	.2591	.1195
Feet lagging "	2.147	.5929
Feet lagging per foot of timber	8.288	4.9601
Cost per ton for timber	.023	.0068
" lagging	.0113	.0038
" poles	-	-
" Timber, lagging & poles	.0343	.0107
Equivalent of stull timber to bd.measure	102,154	48,707
Ft.board measure per ton of ore	.509	.2320

Total cost for timber, lagging & poles - 1920	7978.29
1919	2249.88
1918	1348.36
1917	2157.85
1916	1492.65
1915	4068.66
1914	1318.84
1913	3550.21

CROSBY MINE

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE

KIND	QUANTITY	AVERAGE PRICE	AMOUNT 1920	AMOUNT 1919
30% Powder - - - - -	73,100	.1566	11,446.74	5,626.93
40% " - - - - -	1,950	.1742	339.80	737.95
XXXX " (Black) - -	21,050	.0770	1,620.78	3,002.30
Total Powder - -	96,100	.1395	13,407.32	9,367.18
Fuse - - - - -	108,700	9.73	1,058.34	529.79
Caps - - - - -	33,950	18.19	616.05	238.37
Cap Crimpers - - - - -				3.17
Tamping Bags - - - - -				1.71
Connecting Wire - - -	9.4#	.514	4.83	
Electric Exploders - -	3,000	.1422	426.64	433.23
Total Fuse, Etc.-			2,105.86	1,206.27
Total Explosives-			15,513.18	10,573.45
Product - - - - -			200,443	209,860
Pounds Powder per ton of Ore			.479	.382
Cost per ton for Powder			.0668	.0446
" " " " Fuse, Caps, Etc.			.0105	.0057
" " " " All Explosives			.0773	.0503
Avg. Price per Lb. for Powder			.1395	.1168

MADE IN U.S.A.

MEADOW AND FOWLER MINES

ANNUAL REPORT FOR 1920.

The production from the Meadow-Fowler Mines for the year 1920 amounted to 76,496 tons, of which 43,976 tons came from the Meadow and 32,520 tons from the Fowler.

The average analysis of the ore produced from the Meadow and Fowler Mines during 1920 was as follows:

	<u>Tons</u>	<u>Fe.</u>	<u>Phos</u>	<u>Mn.</u>	<u>Sil.</u>
Meadow Mine-----	43,976	56.68	.070	2.22	9.67
Fowler Mine-----	<u>32,520</u>	<u>56.48</u>	<u>.058</u>	<u>1.39</u>	<u>11.55</u>
TOTAL AND AVERAGES-----	76,496	56.60	.065	1.86	10.48

The scarcity of labor in the Aurora District prevailed during the entire year of 1920, but did not handicap our operations to as great an extent as in 1919. The number of gangs that could be employed was limited by the available working places and except during the influenza epidemic in January and the forepart of February, a full crew was maintained for the mostpart. The efficiency of the men showed some improvement in December, subsequent to the curtailing of operations at several properties in the Aurora District. From present indications, labor conditions during 1921 should show a marked improvement, both as regards the number of men available and the efficiency of the workers.

The estimated production from November 15th, 1920, to November 15th, 1921, with the expected analysis, is as follows:

		<u>Fe.</u>	<u>Phos</u>	<u>Mn.</u>	<u>Sil.</u>	<u>Fe.Nat.</u>
Meadow-----	42,000)	56.50	.065	2.00	10.50	49.00
Fowler-----	15,000)					

The estimated production for 1921 shows a decided decrease, as compared to the tonnage mined in 1920, due to the fact that the number of available working places is gradually becoming more limited, as the ore is being exhausted. We now anticipate that the limit of our profitable operations will be reached before the end of the 1921 shipping season, and it is quite likely that this condition will be realized earlier.

Meadow Mine Ore Estimate of January 1st. 1921

Following is an estimate of the ore in sight at the Meadow Mine on January 1st. 1921, the tonnage reported January 1st. 1920, and the amount mined during the past year.

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

	<u>Tons.</u>
Ore In Sight January 1st. 1920-----	148,000
Ore Mined During 1920-----	<u>43,976</u>
BALANCE FROM THESE FIGURES-----	104,024

ORE IN SIGHT JANUARY 1ST. 1921

<u>Tons</u>	<u>Fe.</u>	<u>Phos</u>	<u>Mn.</u>	<u>Sil.</u>	<u>Mois.</u>	<u>Fe.Nat.</u>
77,000	57.00	.075	2.00	10.20	12.00	50.16

The mining of the deposit on the main level and development work on the 1330', 1320' and 1300' Sub-Levels have resulted in our showing a decrease of 27,000 tons. The decrease is due to eliminating several areas now found too lean to mine.

Of the 77,000 ton ore reserve, 12,000 tons remains on and above the main tramming level and 65,000 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. 1921

Following is an estimate of the ore in sight at the Fowler Mine on January 1st. 1921, the tonnage reported January 1st. 1920 and the amount mined during the past year.

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

Ore In Sight January 1st. 1920-----	36,000 Tons.
Ore Mined During 1920-----	<u>32,520 "</u>
BALANCE FROM THESE FIGURES-----	3,480 "

ORE IN SIGHT JANUARY 1ST. 1921

<u>Tons</u>	<u>Fe.</u>	<u>Phos</u>	<u>Mn.</u>	<u>Sil.</u>	<u>Mois.</u>	<u>Fe.Nat.</u>
25,000	57.00	.060	1.30	11.00	11.00	50.73

The mining of the deposit on the main level and development work on the 1330', 1320' and 1300' Sub-Levels has proven up 21,600 tons additional ore. This figure is the result of a very careful joint engineers' estimate between the Fee Owners and ourselves. This estimate was made during December, 1920, according to the terms of our lease as a basis for determining our minimum tonnage requirements for 1921.

We feel that there is little likelihood of developing any further merchantable ore in the Fowler Mine. Our joint estimate shows approximately 32,000 tons of second class ore running between 50 and 55% iron content.

GENERAL SURFACE

The location premises were cleaned from time to time and the roads dressed with cinders. Some slight repairs were made on the sidewalks and fences. The accumulation of debris around the mine buildings and shaft was also removed during the summer.

The Meadow-Fowler caves have broken away around the outer edges, due to weathering. The fence around the south side of the Meadow cave had to be moved back onto solid ground and repairs made in several places.

Repairs to the upper portion of the shaft house were made on Sundays during August and September. The headframe was jacked up and a new sill placed on the west side, which materially aided in bringing the shaft house back into line, thereby subjecting it to the more natural stresses put upon it. All of the braces and several of the other members above the landing floor were replaced. The shaft house is now in good repair and will last the life of the property.

STOCKPILES

Following is the tonnage of Meadow-Fowler ore in stock April 13th, when shipping was started, and the average analysis of same:

	<u>Tons</u>	<u>Fe.</u>	<u>Phos</u>	<u>Mn.</u>	<u>Sil.</u>
Meadow Stockpile April 13th-----	34,404	56.55	.070	2.23	10.10
Fowler Stockpile April 13th-----	<u>21,206</u>	<u>56.77</u>	<u>.058</u>	<u>1.39</u>	<u>10.94</u>
TOTAL AND AVERAGES-----	55,610	56.63	.065	1.91	10.42

Following is the tonnage of Meadow-Fowler ore shipped from stockpile during the past season and the average analysis of same:

	<u>Tons</u>	<u>Fe.</u>	<u>Phos</u>	<u>Mn.</u>	<u>Sil.</u>
Meadow Stockpile Shipments-----	27,950	56.37	.077	2.22	9.64
Fowler Stockpile Shipments-----	<u>9,894</u>	<u>56.30</u>	<u>.059</u>	<u>1.65</u>	<u>11.69</u>
TOTAL AND AVERAGES-----	37,844	56.35	.072	2.07	10.18

The tonnage and average analysis of the Meadow-Fowler stockpiles as of January 1st., 1921, follow:

	<u>Tons</u>	<u>Fe.</u>	<u>Phos</u>	<u>Mn.</u>	<u>Sil.</u>
Meadow In Stock January 1st-----	15,490	56.63	.072	2.18	9.78
Fowler In Stock January 1st-----	<u>15,915</u>	<u>57.09</u>	<u>.060</u>	<u>1.45</u>	<u>10.84</u>
TOTAL AND AVERAGES-----	31,405	56.86	.066	1.81	10.32

We have not been able to ship our entire stockpiles for the past two seasons and we feel that if the piles had been cleaned up, we would have realized an overrun of close to 8% on the tonnage in question.

The iron content of the Meadow ore in stock is somewhat lower than we had anticipated, but the manganese is slightly higher. We believe that the ore mined during 1921 will bring our shipments for next season to approximately 57% iron and 2% manganese.

Although the Fowler ore in stock is up to grade, we are apprehensive as to whether it will be possible to hold it at this figure. The ore to be mined during the coming year will be gained from small pillars, which are cut by quartz seams. On account of the character of these seams, it is impossible to improve conditions by hand sorting.

UNDERGROUND

The underground ventilation conditions, especially on the Fowler side, have been quite satisfactory since June, when a new opening was put through just west of the old main drift between F-1 and F-3 raises, and the old drift repaired from F-3 raise to the McInnis Shaft. The Fee Interests questioned our being able to recover, at a future date, the pillars left to support the ventilation shaft and asked that we mine them while the new drift was in good repair. The shaft had pulled and was collapsing and, therefore, would have been of little benefit from the standpoint of ventilation by next spring. The mining of these shaft pillars is being pushed as rapidly as possible, as we anticipate that this source of ventilation will be entirely cut off with the spring break-up. As soon as the ventilation from the shaft is entirely cut off, it will be necessary to discontinue the use of our gasoline locomotives on account of the poisonous fumes resulting from their use. When our ventilation is cut off, we expect to use mules for tramming. This will increase our tramming costs somewhat.

The surface over the entire Meadow-Fowler ore bodies is caved. On account of the heavy snow fall of last winter and the extensive spring rains, the volume of water pumped at this property increased from about 700 gals. per min. in March to over 1,000 gals. per min. in July. With this large amount of

water, our pumping equipment had reached the limit of its capacity and a special No. 10 Prescott pump was sent from the Grosby Mine, but before it could be taken underground, the water began to decrease decidedly. There has been a steady falling off in the amount of water handled, the December pumping being back to normal, or approximately 700 gallons per minute.

Extensive repairs were made to the upper portion of the shaft during April and May, the work being conducted from 11 o'clock Saturday nights through Sunday, so as not to interfere with mining operations. The work was started at an elevation of 100' below the collar of the shaft, where the timber had suffered to the greatest extent from dry rot. Eighteen sets, including lath, stuttles and runners, were replaced and the shaft is now in good condition and should need no additional repairs during the coming year.

During the first three months of the year, five contracts were employed in the Meadow workings and five in the Fowler. In April and May there were four gangs each on the Meadow and Fowler sides, when conditions became such that it was necessary to transfer one of the Meadow gangs to the Fowler. By August 1st. it was possible to work only two contracts on the Fowler side and four in the Meadow and during the last four months of the year, from five to six gangs were employed in the Meadow workings and two in the Fowler.

Mining operations during the first six months of the year on the Meadow side consisted of attacking the pillars along the main tramming level, and in development work on the 1330' and 1320' Sub-Levels. The deposit on the main tramming level (1345' Elevation) was very narrow and it was impossible to employ more than three gangs here at any one time. By July the force employed at this elevation was reduced to one gang.

The Fowler operations during the first six months were confined to mining on the main tramming level and in developing and mining on the 1330' and 1320' Sub-Levels. The deposit is extremely narrow at these elevations and the available ore was removed within a short time. Subsequent to July, only two contracts were engaged on the Fowler side, in attacking the pillars left around the old McInnis shaft.

Both the Meadow and Fowler deposits become very restricted in extent toward the bottom and it will be extremely difficult to maintain an operating

force of more than eight gangs during 1921. We cannot carry on an economical operation with a crew reduced below this and in consequence every effort is being made to develop and mine the remaining tonnage as rapidly as possible.

MEADOW WORKINGS

"1365 Foot Sub-Level"

Contract No. 4 raised from the main tramming level, 60' south of No. 7 raise, during October. By the middle of December, they had mined out the small pillar of ore remaining at this elevation and started a new sub, 10' below. The ore gained here was of fair grade only, the pillar being small and surrounded by old workings, which were filled with surface material. It was difficult to mine clean.

"1355 Foot Sub-Level"

A small deposit at this elevation, 200' north of the shaft, was developed and sliced out during the first three months of the year. The ore produced from this sub averaged 56% iron and under 2% manganese.

In December No. 4 contract cut out on this sub from their raise 300' north of the shaft and drifted 40' east to the rock. Although the deposit is narrow in this vicinity, there is a possibility of its extending to the south for some distance.

"1345 Foot Level"

A force of three gangs was employed in slicing and caving back the pillars from both sides of the main tramway to No. 7 raise. One crew started in the pillar north of No. 14 raise, the second north of No. 10 and the third sliced to the west of the main drift south of No. 201 raise.

From No. 10 raise south, the deposit only averaged 40' in width, being bounded by a rock wall both on the east and west sides. The ore gained from the pillars on the west side of the drift averaged about 57.6% iron and 1.8% manganese. That mined on the northeast side near Nos. 200 and 201 raises was low in iron, but carried high manganese, averaging 53% iron and 2.5% manganese.

"1330 Foot Sub-Level"

This sub-level was developed from the 1320' elevation and was started early in April by No. 1 contract. The force was increased as the level above was worked back, 4 gangs being engaged here in October.

Three raises were put up from the 1320' Sub by contracts Nos. 3, 5, and 6 respectively. By the end of the year, that portion north of No. 3's raise was mined out, excepting a pillar 10' wide, which was left to protect the tramming drift on the 1320' Sub-Level.

All ore produced from this elevation had to be transferred and dumped into Nos. 10 and 4 raises to the 1260' level. The ore has been above the average of that on the 1345' level, running about 58% iron and 1.5% manganese.

"1320 Foot Sub-Level"

Contracts Nos. 1 and 11 were engaged during the months of February and March in developing and slicing out the deposit north of No. 11 raise. The ore in this pillar is very lean and operations had to be discontinued. No. 1 then started slicing and caving the ground to the east and by the end of the year had removed all the ore west of No. 10 raise, excepting a small pillar.

This ore was of a satisfactory grade, averaging 57% iron and slightly over 2% manganese.

"1300 Foot Sub-Level"

This sub was developed from No. 5 raise in March by No. 10 contract in connection with the Fowler workings. Contract No. 8 was engaged here in October in developing the deposit to the north and west of the second level transfer raise.

We were in hopes of proving up some merchantable ore along the Fowler boundary, but were disappointed, both as to the character and extent of the body. The drift west from the raise was lost and a second cross-cut is being driven to the shore line fifty feet to the north. We must push the opening of this sub-level, in order to have places for the gangs as the 1320' level is exhausted.

FOWLER WORKINGS

"1370 Foot Sub-Level"

Contract No. 2 developed and started slicing operations in October. They removed a 40' X 40' pillar immediately south of the McInnis shaft. The blasting down of this room did not collapse the shaft as we had anticipated and we are now of the opinion that on account of the frost in the ground, there will not be any great movement here until the spring break-up.

The ore gained from the 1370' sub-level was of a very satisfactory grade, being over the average mined from the Fowler in some time, and running 59% iron and about 1% manganese.

"1360 Foot Sub-Level"

Contract No. 8 conducted mining operations on this elevation from 3-F raise during the first two months of the year. They sliced out a pillar 35' X 40' north of their raise during January and one to the south, 40' X 45', in February. The ore from these two pillars averaged 58% iron and 1% manganese.

No. 2 contract was transferred to this elevation the forepart of November, having mined out the small pillars adjacent to the old McInnis Shaft, 10' above. The pillar at this elevation is 60' x 120' and was well outlined by the end of the year. Although we are very anxious to exhaust the ore as rapidly as possible, now that we have started mining here, it will take the one gang several months to draw it back. Two contracts could not operate to advantage. This ore is not as high grade as that on the sub above, averaging about a point lower in iron.

"1350 Foot Sub-Level"

Only a very limited amount of work was done at this elevation, by No. 6 contract and it was mostly in the nature of exploration drifting. This work was done from the first and second crosscuts northwest of the Meadow boundary. The ore is mixed with quartz seams and we were unable to secure a product running above 52% iron.

"1340 Foot Level"

Mining operations on this main tramming level were conducted almost entirely by No. 2 contract at the north end of the level. They sliced out a pillar 40' x 60' to the east of the McInnis shaft. It was our intention to remove all the ore to the east of the tramway and retreat to the south, but considerable weight developed between 1-F and 3-F raises, and the gang had to be put on repair work. No. 2 was engaged in retimbering between Nos. 1-F and 2-F raises for two weeks, but the weight was so extensive that the new sets crushed. No. 2 came back to a point 50' south of 1-F raise and started a new drift to the north, leaving a pillar of about 25' between. This drift holed into the old drift just ahead of 3-F raise, the job being completed July 1st. The ore recovered from this work was shot with quartzite and ran down to 52% iron.

The repairing of the old drift to the McInnis shaft was finished in September.

Contract No. 7 drove a cross-cut to the northwest from the Meadow boundary workings. They did some gouging here for about one month, but the grade of the ore was so poor that operations were abandoned.

"1350 Foot Sub-Level"

This sub-level was developed and mined by contracts Nos. 7 and 8 from the 1300' level. The deposit is very narrow and at the southwest end is cut off by taconite. There is a seam of quartzite along the west wall, which broke and mixed with the ore, the grade running off decidedly as a result thereof.

No. 8 put up two small raises from the breasts of the 1320' sub drifts. Development work from these raises has proven that the deposit pinches out at this elevation.

"1320 Foot Sub-Level"

Contract No. 9 continued the development of this level to the north. They followed the east rock wall to the north for 55' in high grade ore, then passed into a lean formation. Development work here failed to cut any further high grade material and gouging and caving operations were soon concluded.

"1300 Foot Sub-Level"

No. 10 contract started development work at this elevation in March. It was the intention to push a drift to the northerly limits of the ore at this elevation and to install one of the gasoline locomotives for transferring the ore mined from the subs above to the second level raises. A drift was started from No. 5 raise and pushed easterly 155 feet, the last 50' being in very lean material. An effort was made to intersect a high grade ore seam, so that a heading could be pushed northward in minable material. The gang failed to encounter any merchantable ore in their crosscuts, and as the tonnage on the sub above was very limited in extent, we decided to abandon work at this elevation.

SHIPMENTS

Following are the cargoes of Meadow-Fowler ore shipped during the past year and the analysis of same as obtained at the Mine and by the Lower Lake Chemists:

	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>	<u>Mn.</u>	<u>Mois.</u>	<u>Fe.Nat.</u>	<u>Tons.</u>
<u>PENOBSCOT</u> -----							6,762
Mine-----	55.00	.065	12.18	2.20	-----	-----	
Crowell & Murray---	54.95	---	-----	---	12.43	48.120	
<u>MUNISING</u> -----							6,868
Mine-----	56.07	.061	11.31	1.80	-----	-----	
Oscar Textor-----	54.65	---	-----	---	13.00	47.550	
<u>WILPEN</u> -----							5,461
Mine-----	56.47	.060	10.89	1.76	-----	-----	
Cremer & Case-----	54.50	---	-----	---	12.11	47.900	
Crowell & Murray---	54.85	---	-----	---	12.29	48.110	
<u>PETER WHITE</u> -----							10,065
Mine-----	56.26	.069	10.28	2.20	-----	-----	
Crowell & Murray---	55.18	---	-----	---	12.64	48.205	
Oscar Textor-----	55.23	---	-----	---	12.77	48.195	
<u>MUNISING</u> -----							6,977
Mine-----	56.20	.068	10.90	1.78	-----	-----	
Cremer & Case-----	55.50	---	-----	---	12.05	48.810	
Crowell & Murray---	55.58	---	-----	---	12.10	48.850	
<u>CADILLAC</u> -----							6,757
Mine-----	57.31	.066	9.45	1.79	-----	-----	
Cremer & Case-----	56.60	---	-----	---	12.37	49.590	
Oscar Textor-----	55.90	---	-----	---	12.33	49.010	
<u>PIONEER</u> -----							9,782
Mine-----	56.34	.068	10.15	2.05	-----	-----	
Crowell & Murray---	55.00	---	-----	---	11.92	48.444	
Emmerton-----	54.90	---	-----	---	12.00	48.312	
<u>WM. P. SNYDER, JR.</u> -----							13,076
Mine-----	56.73	.073	9.47	2.13	-----	-----	
Cremer & Case-----	55.90	---	-----	---	11.53	49.455	
Crowell & Murray---	56.00	---	-----	---	11.68	49.459	
<u>ISHPEMING</u> -----							10,509
Mine-----	56.04	.064	10.30	1.76	-----	-----	
Oscar Textor-----	56.05	---	-----	---	12.72	48.920	
Crowell & Murray---	56.00	---	-----	---	12.74	48.866	

Shipments from the Meadow-Fowler Mines were started April 13th and were discontinued for the year on October 29th.

The average analysis of the season's shipments as sampled at the Mine and by the Lower Lake Chemists were as follows:

	<u>Tons.</u>	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>	<u>Mn.</u>	<u>Mois.</u>	<u>Fe.Nat.</u>
Sampled at Mine-----	76,256	56.37	.067	10.42	1.96	-----	-----
Sampled at Lake Erie-----	75,494	55.43	---	-----	-----	12.30	48.61

The following is a complete analysis of the ore forwarded from the Meadow and Fowler Mines during 1920:

	<u>Tons.</u>	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>	<u>Mn.</u>	<u>Al.</u>	<u>Lime</u>	<u>Magnesia</u>	<u>Sulphur</u>	<u>Loss By</u>
Meadow-	49,414	56.15	.074	9.30	2.23	1.96	.23	.30	.012	4.36
Fowler-	26,842	55.60	.058	11.65	1.47	1.92	.21	.36	.013	4.07
TOTAL--	76,256	55.96	.068	10.13	1.96	1.95	.22	.33	.012	4.26

James H. Board
General Chemist

ACCIDENTS

Following is a list of the accidents, where the injured parties lost time, which occurred at the Meadow-Fowler Mines during the past year:

TONY ZEITZ

Injured-----January 20th, 1920.
Occupation-----Miner.
Nationality-----Austrian.
Time Lost-----153½ Days.
Compensation Paid-----\$366.25.

Remarks: Zeitz and his partner had trammed a car of dirt to the chute. They could not raise the car to dump it, owing to the fact that there was too much of the load in the rear. Zeitz got into the car to shovel some of this to the front end of the car, and while in the act, the car dumped and pinned his legs between the box and the safety bar.

GERON KRIZE

Injured-----March 30th, 1920.
Occupation-----Miner.
Nationality-----Slavonian.
Time Lost-----23½ Days.
Compensation Paid-----\$41.25.

Remarks: Krize was lifting a cap, when the staging on which he was standing collapsed and he fell with the cap on top of him. He bruised his right thigh.

PETER PETERSON

Injured-----April 10th, 1920.
Occupation-----Swamper.
Nationality-----American.
Time Lost-----22½ Days.
Compensation Paid-----\$38.75.

Remarks: A chunk of ore fell off the skip, and dropped down the shaft, striking Peterson on the left hand. He sustained a severe laceration.

RICHARD RICHARDS

Injured-----July 23rd., 1920.
Occupation-----Blacksmith Helper.
Nationality-----American.
Time Lost-----14 Days.
Compensation Paid-----\$17.50.

Remarks: Richards was using an axe to make a wooden wedge. The handle struck his leg and deflected the blade, cutting his left hand.

DAVID NIEMI

Injured-----August 11th, 1920.
Occupation-----Miner.
Nationality-----Finnish.
Time Lost-----4 Days.
Compensation Paid-----None.

Remarks: Niemi's working place started taking weight and in hurrying to get away, his pick wedged against the side of a tram car, driving the point into his right thigh.

ALEX DEAKOVICH

Injured-----August 23rd, 1920.
Occupation-----Miner.
Nationality-----Russian.
Time Lost-----6½ Days.
Compensation Paid-----None.

Remarks: While engaged in timbering, a piece of rock fell from the breast of the drift and struck Deakovich's left foot, slightly bruising it.

TOIVO LEHTO

Injured-----September 7th, 1920.
Occupation-----Timber framer.
Nationality-----Finnish.
Time Lost-----13 Days.
Compensation Paid-----\$15.00.

Remarks: While engaged in framing timber, Lehto's axe glanced off the wood and inflicted a cut on his right leg.

ANALYSIS OF COST SHEET

In comparing the cost sheets for the Meadow-Fowler Mine for the years 1919 and 1920, the most important items are the production, and cost of supplies and wages. We produced 100,081 tons in 1919, whereas in 1920 the output was only 76,496 tons. The smaller tonnage realized in 1920 resulted in showing an appreciable increase in the fixed charges. The higher price paid for coal and other supplies during 1920 raised the price per ton for most of the headings under "Mining Expense". The average wages during 1920 were materially higher than for 1919 and the underground working conditions were somewhat less favorable. There was a scarcity of labor in the Aurora District during both years.

The following statement shows the charges under the three main captions for the years 1920 and 1919.

	<u>1920</u>	<u>1919</u>
Tonnage-----	76,496	100,081
General Expense----	\$.206	\$.122
Maintenance-----	.160	.139
Mining Expense----	<u>2.303</u>	<u>1.816</u>
TOTAL-----	\$2.669	\$2.077

"GENERAL EXPENSE"

There was a slight increase in the cost per ton for "Engineering" and "Analysis" during 1920, due to the higher wages paid the engineers and the increase in the rate per determination.

"Personal Injury Expense" for 1920 was \$.06 per ton higher. This was due to the settlement during 1920 of the two fatal accidents which occurred in September, 1918.

The establishing of the District Office and the charges made against the Meadow-Fowler Mine under this heading for 1920 amounted to \$.058 per ton. There was no District Office charge during 1919.

"MAINTENANCE"

The maintenance charges for both the 1919 and 1920 operations were comparatively high, that for 1920 showing an increase of \$.051 per ton. There

was an increase in all the headings under this caption, with the exception of "Docks, Trestles & Pockets" and "Buildings". Comparatively little repair work was undertaken on the Docks, Trestles, Pockets or other buildings in 1920, whereas in 1919 our dry house and garage were remodeled and general repairs were made on the shaft pocket.

The charges to "Tracks & Yards", "Compressor & Power Drills" and "Top Tram Engines & Cars" were nominal each year, the higher price paid for labor and supplies being responsible for a slight increase per ton for the first two items.

The 1920 charge to "Boiler Plant" showed an increase of \$.005 per ton, as compared with 1919. This was due to a number of replacements and a general overhauling during the past year. The 1919 expense was unusually light.

Our compound steam pump was thoroughly overhauled and a number of worn-out parts were replaced in 1920. This resulted in increasing the cost per ton for this heading by \$.005.

A greater amount of track repairing was necessary during 1920, resulting in an increase of \$.007 per ton for "Underground Tracks & Cars". The rail on the main tramming levels has now been in use sometime and the cost of the upkeep will continue to increase. The gasoline locomotives, two of which were in service during the entire year, showed considerable wear and it was necessary to renew a large number of parts. The price paid for these parts and the higher wages was responsible for showing an increase of \$.006 per ton in this item.

"MINING EXPENSE"

With the exception of "Air Pipes", "Rock Drifting", "Stocking Ore" and "Sorting Ore", all headings under this caption showed an increased cost per ton for 1920 as compared to 1919.

Less extensions of air lines were necessary in 1920 and the cost per ton showed a decrease of \$.003.

No rock drifting was undertaken in 1920. During 1919 the job of extending the second level tramway was completed, and a charge of \$.014 per ton was made against that year's production.

The 1920 decrease of \$.003 per ton for "Stocking Ore" is explained by the fact that new 30 lb. rails were laid on the stockpile in 1919. Stocking operations were carried on for a greater number of shifts in 1919, due largely to the strike at the Docks during the month of August. This also had an effect on the above decrease.

It was necessary to pick out a large quantity of rock from the stockpile during 1919, while in 1920 the piles were not cleaned up and much less rock was handled. This resulted in showing a decrease of \$.003 per ton for the 1920 charges to "Sorting Ore".

The higher price paid for fuel and labor during 1920 was responsible for an increase of \$.034 per ton to the item "Compressors", \$.036 per ton for "Hoisting" and \$.165 per ton for "Pumping".

The shaft repairs during 1919 were nominal, whereas during 1920 the top 100' of the shaft was relined and a number of new sets placed. There was an increase of \$.015 per ton under this caption.

The higher wages paid during 1920 and the increase in the price of supplies, together with somewhat less favorable working conditions, were responsible for raising the charge per ton for "Breaking Ore" by \$.096.

The average length of tram during 1920 was somewhat in excess of that for 1919, due largely to the mining carried on along the north boundary of the Fowler Mine. It was necessary to transfer the ore to the second level raises on the two lower Fowler subs on account of rather poor conditions of ventilation and the comparatively short distance. This product was trammed by hand. The 1920 increase per ton for "Tramming" amounted to \$.060.

On account of the excessive weight developed along the Meadow and Fowler main tramways, it was necessary to do considerable retimbering, and the 1920 cost per ton under this heading shows an increase of \$.035.

The 1920 increase of \$.035 to the heading "Captain & Bosses" was the result of the increase in wages and the fact that the bosses worked more overtime and Sundays during 1919.

The increase of \$.006 per ton in the 1920 "Dryhouse Expense" was caused by an increase in the cost of fuel and lighting.

The higher wages paid during 1920 resulted in an increase of \$.026 per ton to the item "Top Landing & Trimming".

MEADOW MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1920.

GRADE	IRON	PHOS.	SILICA	MANG.
Meadow,	56.67	.072	9.68	2.23

(Cargoes all mixed).

ORE STATEMENT - DECEMBER 31ST, 1920.

	MEADOW	TOTAL LAST YEAR
On hand Jan. 1st, 1920,	20,928	4,026
Output for year,	43,976	47,296
Total,	64,904	51,322
Shipments,	49,414	30,394
Balance on hand,	15,490	20,928
Decrease in output-7%	3,320	
Decrease in ore on hand-26%	5,438	

1920 - 2-8 Hour Shifts for year

1919 - 2-8 " " " "

SHIPMENTS FOR YEAR 1920.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YR.
Meadow,	21,464	27,950	49,414	30,394
Total,			49,414	30,394
Total last year,			30,394	
Increase - 62%			19,020	

FOWLER MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1920.

GRADE	IRON	PHOS.	SILICA	MANG.
Fowler,	56.48	.058	11.55	1.39

(Cargoes all Mixed).

ORE STATEMENT - DECEMBER 31ST, 1920.

	FOWLER	TOTAL LAST YEAR
On hand Jan. 1st, 1920,	10,237	7,392
Output for year,	32,520	52,765
Total,	42,757	60,177
Shipments,	26,842	49,940
Balance on hand,	15,915	10,237
Decrease in output-38%	20,265	
Increase in ore on hand-55%	5,678	
1920 - 2-8 Hour Shifts for year		
1919 - 2-8 " " " "		

SHIPMENTS FOR YEAR 1920.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Fowler,	16,948	9,894	26,842	49,940
Total,			26,842	
Total last year,			49,940	
Decrease - 46%			23,098	

MEADOW MINE.

COMPARATIVE MINING COST FOR YEAR.

	1 9 2 0.	1 9 1 9.	INCREASE.	DECREASE.
<u>PRODUCT</u>	76,496	100,081		23,585
General Expense	.206	.122	.084	
Maintenance	.160	.139	.021	
Mining Expense	2.303	1.816	.487	
Cost of Production	2.669	2.077	.592	
<u>DEPRECIATION.</u>				
Plant		.008		.008
Equipment	.005	.003	.002	
Total Depreciation	.005	.011		.006
Taxes	.190	.117	.073	
Central Office	.089	.064	.025	
Miscellaneous	.020	.013	.007	
Sundry Expense	.032	.007	.025	
Cost on Stockpile	3.005	2.289	.716	
Loading & Shipping	.136	.024	.052	
Total Cost on Cars	3.141	2.373	.768	
No. Days Operating	309	307	2	
No. Shifts and Hours	2-8hr	2-8hr		
Avg. Daily Product	248	326		78
<u>COST OF PRODUCTION.</u>				
Labor	1.838	1.506	.332	
Supplies	.831	.571	.260	
Total	2.669	2.077	.592	

MEADOW MINE

COMPARATIVE WAGES AND PRODUCT

	1 9 2 0	1 9 1 9	INCREASE	DECREASE
PRODUCT	76,496	100,081		23,585
No.Shifts and Hours	2-8hr	2-8hr		
AVERAGE NO. MEN WORKING				
Surface	21	23		2
Underground	47	57		10
Total	68	80		12
AVERAGE WAGES PER DAY				
Surface	5.92	5.42	.50-9.2%	
Underground	6.96	6.42	.54-8.4%	
Total	6.63	6.14	.49-8. %	
WAGES PER MONTH OF 25 DAYS				
Surface	148.00	135.50	12.50	
Underground	176.50	160.50	16.00	
Total	165.75	153.50	12.25	
PRODUCT PER MAN PER DAY				
Surface	11.32	14.10		2.78
Underground	5.21	5.63		.42
Total	3.57	4.02		.45
LABOR COST PER TON				
Surface	.523	.385	.138	
Underground	1.335	1.139	.196	
Total	1.858	1.524	.334	
AVG. PRODUCT BRK'G & TRM'G	7.42	7.63		.21
" WAGES CONTRACT MINERS	7.38	6.84	.54	
" " " TRAMMERS				
" " " LABOR	7.38	6.84	.54	
TOTAL NUMBER OF DAYS				
Surface	6,758½	7,092		333½
Underground	14,675	17,758½		3,083½
Total	21,433½	24,850½		3,417
AMOUNT FOR LABOR				
Surface	40,032.58	38478.67	1553.91	11753.97
Underground	102,100.68	114066.75		11966.07
Total	142,133.26	152545.42		10412.16

Proportion Surface to Underground Men:

1920 - 1 to 2.3
 1919 - 1 to 1.84
 1918 - 1 to 2.31
 1917 - 1 to 2.8
 1916 - 1 to 3.

Damascus

MEADOW MINE

Board

TIMBER STATEMENT FOR THE YEAR ENDING DECEMBER 31, 1920.

KIND	LINEAL FEET	AVG. PRICE PER FOOT	AMOUNT 1920	AMOUNT 1919
6" to 8" Timber	24,400		1930.60	310.00
8 to 10 "	51,200		4054.30	5554.50
10 to 12 "	21,960		1737.60	2387.50
Total - 1920	97,600	.079	7722.50	
Total - 1919	125,500	.069		8752.00
	LINEAL FEET	PER 100'		
5' Lagging	299,200	.911	2728.00	232.50
6' "				2720.00
Total	299,200	.911	2728.00	2952.50
Poles	33,040	1.25	413.00	109.80
Total - 1920	332,240	.945	3141.00	
Total - 1919	360,684	.849		3062.30
Product			76,497	100,081
Feet timber per ton of ore			1.275	1.254
Feet lagging "			3.911	3.516
Feet lagging per foot of timber			3.065	2.804
Cost per ton for timber			.100	.087
" lagging			.035	.030
" poles			.005	.001
" timber, lagging & poles			.142	.118
Equivalent of stull timber to board measure			164,651	182,225
Ft. board measure per ton of ore			2.15	1.82
Total cost for timber, lagging & poles -				
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 1920	AMOUNT 1919
30% Powder - - - - -				169.00
40% " - - - - -	22,950	.1693	3,886.15	5,565.55
Total Powder - - -	22,950	.1693	3,886.15	5,734.55
Fuse - - - - -	49,100	9.399	461.40	615.84
Caps - - - - -	19,000	14.80	281.31	406.09
Cap Crimpers - - - - -				9.00
Total Fuse, Etc.-			742.71	1,030.93
Total Explosives-			4,628.86	6,765.48
Product - - - - -			76,496	100,081
Pounds Powder per ton of Ore			.300	.352
Cost per ton for Powder			.051	.057
" " " " Fuse, Caps, Etc.			.009	.010
" " " " All Explosives			.060	.067
Avg. Price per Lb. for Powder			.169	.162

MEADOW MINE

HILL-TRUMBULL MINE
ANNUAL REPORT FOR 1920.

The production of wash ore from the Hill-Trumbull Mine during the year 1920 amounted to 191,863 tons and 27,582 tons of direct shipping ore was forwarded. We secured 29,084 tons of Bessemer concentrates from a treatment of the wash ore. The total shipments over the Great Northern amounted to 171,166 tons.

We started shipments of our Direct Ore on August 11th and Concentrates from the mill on August 23rd.

Our estimate of production for the 1921 season is as follows:

	<u>Tons.</u>	<u>Fe.</u>	<u>Phos</u>	<u>Mn.</u>	<u>Sil.</u>	<u>Fe.Nat.</u>
Direct Ore-----	100,000	58.00	.055	.30	13.00	53.36
Non-Bessemer Concentrates----	200,000	61.00	.055	.50	6.50	56.43
Bessemer Concentrates-----	300,000	61.00	.045	.50	6.50	56.43

HILL-TRUMBULL ORE ESTIMATE OF JANUARY 1ST. 1921

Following is an estimate of the ore in sight at the Hill-Trumbull Mine on January 1st. 1920, the tonnage mined during this year and an estimate as of January 1st. 1921:

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. 1920

	<u>Tons.</u>
Hill Bessemer Direct Shipping Ore-----	1, 123,000
Hill Non-Bessemer Direct Shipping Ore-----	1, 123,000
Hill Bessemer Concentrates-----	2, 215,000
Hill Non-Bessemer Concentrates-----	<u>813,000</u>
TOTAL HILL ORE IN SIGHT JANUARY 1ST. 1920-----	5,274,000
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. 1920-----	4,552,000
GRAND TOTAL HILL AND TRUMBULL ORE IN SIGHT JANUARY 1ST. 1920----	9,826,000

ORE MINED DURING 1920

Hill Non-Bessemer Direct Shipping Ore-----	27,582
Hill Bessemer Concentrates-----	29,084
Hill Non-Bessemer Concentrates-----	<u>114,500</u>
TOTAL ORE MINED DURING 1920-----	171,166

ORE ESTIMATE OF JANUARY 1ST. 1921

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

The tonnages are all reduced to a direct shipping or concentrated basis, a factor of 60% being used for the expected gross recovery.

No ore was mined from the Trumbull property during 1920 and as no

exploratory or development work was undertaken, the estimate remains the same as on January 1st. 1920.

While the total estimate of Hill ore on January 1st. 1921, has only been reduced by the tonnage mined during the year, our operations, including the test-pitting, have led us to increase the amount of Direct Shipping Non-Bessemer by 377,000 tons and reducing the Direct Shipping Bessemer by a like amount. It may be possible for us to conduct our open pit Direct Ore operations in such a manner that we can secure a larger proportion of Bessemer grade, but we do not feel that it is safe to figure on any larger tonnage than shown by our estimate.

The average analysis of the ore in the Hill and Trumbull properties on January 1st. 1921, 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----	746,000	58.00	.045	13.00	53.36
Non-Bess. " " ----	1,472,000	58.00	.055	13.00	53.36
Bessemer Concentrates-----	2,186,000	61.00	.045	6.50	56.43
Non-Bessemer Concentrates---	<u>698,000</u>	<u>61.00</u>	<u>.055</u>	<u>6.50</u>	<u>56.43</u>
TOTAL AND AVERAGES-----	5,102,000	59.70	.049	9.32	55.10
<u>TRUMBULL MINE</u>					
Direct Shipping Bessemer----	85,000	56.40	.040	12.79	51.32
Direct Shipping Non-Bessemer	365,000	58.04	.060	9.85	52.82
Bessemer Concentrates-----	3,453,000	60.00	.043	8.00	55.50
Non-Bessemer Concentrates---	<u>649,000</u>	<u>60.00</u>	<u>.080</u>	<u>8.00</u>	<u>55.50</u>
TOTAL AND AVERAGES-----	4,552,000	59.78	.050	8.34	55.21

The Hill and Trumbull mines have been thoroughly explored and we do not anticipate developing any appreciable tonnage by future operations.

STRIPPING

Stripping operations, which were started in November, 1919, were carried forward during 1920, excepting the months of September and October. A small yardage was handled the forepart of September. The following table shows the yardage moved to January 1st., 1920, that handled by months during 1920, the total reported by car tally and the quantity estimated by the engineers from their surveys:

Previous to January 1st. 1920-----	32,688	Cu. Yds.
January-----	44,535	" "
February-----	41,582	" "
March-----	58,932	" "
April-----	66,734	" "
May-----	59,010	" "
June-----	49,547	" "
July-----	51,092	" "
August-----	50,062	" "
September-----	11,190	" "
October-----	-----	-----
November-----	68,866	" "
December-----	91,751	" "
TOTAL REPORTED BY CAR TALLY-----	625,989	" "
Engineers' Estimate-----	661,080	" "
OVERRUN-----	35,091	" "

We felt that we were very conservative in our car tally of yardage handled and this was borne out by the engineers' estimate, which showed an overrun of better than 5%.

The stripping during the winter months was conducted with the second-hand 85-C Bucyrus shovel along the north bank of the Hill pit, all cuts but one being stopped approximately one-quarter of a mile from the east line. The bank varied from 50' to 70' in height and it was very difficult to handle in one cut. We put in 25' horizontal gopher holes just above the ore and vertical holes to a depth of 25' from the top of the bank. Our worst condition was occasioned by a slide of the bank, this being especially bad at the west end of the pit, where there is a clay seam varying in width from 15' to 25' and lying directly over the ore. The heavy bank above would slide out along the clay and we were forced to dig out our jack arms by hand and move the shovel back upon a number of occasions.

During the spring, the "36" revolving shovel was taken down the pit and made a casting cut from the approach to the surface of the ground, approximately 1,000' to the east. The 85-C was then transferred to the top bench and started benching down from the top, in order to reduce the height of the bank to workable limits.

After completing the casting cut, the "36" shovel was moved down onto the ore berm and spent several months in clean-up work.

A new 88-C machine was received and put in service the first of July and stripping operations were divided between the two 100-ton machines during the balance of the year. These two shovels were engaged in ore service almost entirely from the latter part of August until the close of the shipping season. Upon the resumption of stripping in November, the 85-C was placed on the upper bench and the 88-C machine on the heavy cut just above the ore. The 88-C was in much better condition and is quite a little faster in its operation. We, therefore, gave it the heavier work.

The 85-C shovel will be taken to the shops for a thorough overhauling early in 1921. This machine operated steadily for better than a year and it was second-hand and had some worn parts when we received it. We intend to complete our winter stripping program with the 88-C machine.

The Model "36" revolving shovel was sent to the shops for overhauling in December, after completing an excavation in connection with our new coal dock.

We find that we will be unable to push our stripping as rapidly as necessary and handle the ore with our present equipment. The cost of new equipment, including a "300" type shovel, would be very high at this time and it was, therefore, decided to let a stripping contract for 3,000,000 cubic yards, to be moved during the next three years. Our equipment will be used during this time for clean-up work on the ore and in handling the ore. This winter's program, however, must include sufficient stripping to put the pit in shape for the A. Guthrie & Company. The Contractors will have to push their operations far enough back by the opening of navigation so as not to interfere with our ore operations. The Contractors intend to use a "300" ton machine and they will

dig a 50' bank, 90' wide in the bottom, with one cut, loading the material into cars on the upper bench. After taking this initial cut, the "300" shovel will be moved onto the upper bench and the stripping operations during the balance of the year should not interfere with our handling of ore. The Contractors are laying a second track. The new track will be used by both the Contractor and ourselves for the movement of empty trains and our present track will serve for loads.

Our stripping operations at the east end of the north bank cut out the old surface drainage ditch and it was necessary to dig over 600' of new ditch. This work was done by contract during the summer.

"DUMPS"

Approximately 350,000 yards of overburden was dumped along the trestle leading from the old Hill dump to the washing plant. When this fill was completed, we started fanning the dump northward between the high ground near the washing plant and Mud Lake Creek. Two dumps were started toward the south, one extending the shoulder at the elevation of our first trestle, which averaged better than 20' in height, and the second from the finished fill. It was necessary to push the bottom dump out ahead and due to the fact that we encountered some muskeg, and several bad slides resulted, we were not able to do as much fanning on this side of the dump as we desired. The bulk of the A. Guthrie & Company yardage will be wasted on the south side of the washing plant fill.

ORE OPERATIONS

Our clean-up work on the ore was practically completed the early part of August and we began loading Direct Ore on the 11th of that month. We were rather skeptical of being able to maintain a desired grade of Direct Ore and for this reason, shipments were limited, pending the completion of our washing plant. The washing plant was completed and put in operation on August 23rd and the two large shovels were engaged in loading out wash material during the balance of the shipping season.

Our ore berm for 1920 operations was somewhat narrow and we were obliged to dig through two substantial horses of taconite. The rock conditions

made it necessary to operate both shovels, in an endeavor to keep up our output. One of the shovels could supply the capacity of the mill, when it is digging in clean wash ore.

Cuts were taken along the entire length of the north ore bank, but the bulk of the wash material came from the west one-half of this bank. The Direct Ore came from the easterly part of the bank.

We intend to have sufficient ore cleaned by the opening of navigation in 1921, so as to enable us to keep at least one of the large shovels in clean material at all times. This will give us a much more uniform operation at our washing plant.

WASHING PLANT

The erection of the steel work for the washing plant was started on the 25th of May and the job was finished July 21st. The Worden-Allen Company then put up the steel for the belt conveyor, completing the work August 1st.

The Worthington Pump Company installed the 5' and 8' pan conveyors and erected the jaw crusher. These jobs were started on July 27th and finished August 20th.

We kept a small crew of carpenters and mechanics to put the finishing touches on the plant, but we were ready to run a test on the 22nd. We found that a number of adjustments had to be made and very little ore was put through the mill the first week.

The pumping station building was erected and the plunger pump installed during July and August. The Chicago Bridge & Iron Company had erected our 20,000 gallon pressure tank, and our 20" pipe line from the pump station to the tank had been tested out and all leaks taken up during the summer.

Our washing plant equipment includes an 8' pan conveyor, 5' pan conveyor, 42" x 46" jaw crusher, a 6' x 12' cylindrical trommel screen with 1", 1½" and 2" perforations, two 25' logs, four 18' turbos, 18 Deister-Overstrom tables, two centrifugal sand pumps and a Door Classifier for de-watering the table product.

We put 191,863 tons of crude ore through the plant and secured 143,564 tons of concentrates from a treatment thereof. The mill was started August 23rd

and was closed down November 6th. Very little ore was handled during the first week, as we were obliged to make a number of alterations.

Our automatic weighing device was not adjusted to take care of the maximum load and we, therefore, were unable to use it. We estimated the weight of our crude ore by car tally. We now have all of the adjustments for the automatic recorder and we will be able to weigh our crude ore very accurately during 1921.

We encountered considerable rock in the pit at times and as our electric rock tram installation was not completed, we had some difficulty in handling waste material. We used horse cars to dispose of the discarded taconite. All of our rock will be trammed with an electric motor during the coming year and this installation will be completed early in 1921.

We had considerable difficulty with the fine ore blocking in our receiving bin and our product was limited to the quantity we could take care of here. We will make some alterations to the receiving pocket and we should be able to handle on the average of close to 6,500 tons of crude ore per day (two 10-hour shifts). We have always figured the capacity of our mill at 4,000 tons of concentrates per day (two 10-hour shifts), or 100,000 tons per month. We had to make some adjustments on our turbos and tables and we will change our launder spouts before next season, so as to distribute the feed to the logs to better effect. We will also make some changes on the feed and discharge of our trommel screen to reduce the wear and increase the amount of material that the machine can handle. Further than this, instead of using screen sections with 2" perforations, we will install sections of 1" perforations for the upper one-third, $1\frac{1}{2}$ " for the middle third and 2" on the lower third. The amount of material passing through the screen will then be distributed more uniformly over its length. This year the bulk of the material passed through the screen in the proximity of the feed end.

We are to make some changes on the bearings of the logs and turbos, to secure a more uniform wear. We are also putting heavier motors to drive the 25' logs and the 36" belt conveyor.

Operations during 1920 demonstrated our ability to handle the anticipated tonnage in our washing plant, namely, 100,000 tons of concentrates

per month. When the adjustments have been made, we expect to be able to reduce our force to about 18 to 20 men per shift and turn out on the average of 2,000 tons of concentrates per 10-hour shift.

Following is the tonnage and analysis of the crude ore treated and the concentrates produced during the past season:

	<u>Tons.</u>	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>
Crude Ore Treated During 1920-----	191,863	50.03	.045	20.91
Concentrates Produced in 1920-----	143,584	62.08	.053	5.60

Our Direct Shipping Ore was mixed with the concentrates and the following analysis is from the Lake Erie sampling of the mixed product:

	<u>Tons</u>	<u>Fe.</u>	<u>Phos</u>	<u>Mois.</u>	<u>Fe.Mat.</u>
Bessemer Ore-----	28,793	61.55	.045	7.16	57.12
Non-Bessemer Ore-----	<u>140,661</u>	<u>61.09</u>	---	<u>6.92</u>	<u>56.86</u>
TOTAL AND AVERAGES-----	169,454	61.17	---	6.96	56.90

The composite samples of our 1920 shipments from the Hill Mine were as follows:

	<u>Tons</u>	<u>Fe.</u>	<u>Phos</u>	<u>Mn.</u>	<u>Sil.</u>	<u>Al.</u>	<u>Lime</u>	<u>Mag-</u>	<u>Sul-</u>	<u>Loss By</u>
								<u>nesia</u>	<u>Phur</u>	<u>Ignition</u>
Bessemer Concentrates--	29,084	61.67	.046	.10	6.11	.70	.13	.20	.014	4.53
Non-Bessemer "	-- 114,500	62.15	.055	.11	5.65	.78	.10	.15	.015	4.28
Direct Shipping Ore----	<u>27,582</u>	<u>58.80</u>	<u>.055</u>	<u>.09</u>	<u>10.90</u>	<u>1.75</u>	<u>.12</u>	<u>.17</u>	<u>.016</u>	<u>2.80</u>
TOTAL AND AVERAGES-----	171,166	61.53	.053	.10	6.57	.92	.11	.16	.015	4.08

Based on estimated weights for our crude ore, the gross recovery realized at the mill during 1920 amounted to 74.83%. The iron content was raised from 50.03% in the crude to 62.08% in the concentrates and we would expect to obtain around a 70% recovery. The estimated weights of the crude ore were too low, if anything, and our ratio of recovery will probably average between 65 and 70% in the future. The average grade of the crude ore is better than that at the Crosby and is not as badly mixed with rock and taconite.

The recovery of iron units for the year was 92.86%. This result is probably higher than it should be, due to the under estimating of our crude ore. The bulk of our Hill-Trumbull wash ore, however, is quite clean and we will be able to secure a better recovery of iron units than we have ever done at the Crosby. Our tailings loss is quite low.

The following is the season's analysis of the product from the several machines:

	<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	---	----

As compared to our results at the Crosby Mine, it is interesting to note that the screen product runs the highest in iron, with the log, turbo and tables following in order. At the Crosby our tables have always given us the highest iron, with the log, turbo and screen following in the order named. The Hill ore treated last season was of a much coarser structure than that at the Crosby.

Our estimate of product from the several machines is as follows:
Screen 20%, log 75%, turbo 4% and tables 1%.

The product from the screen and log is much larger than at the Crosby and the turbo and tables correspondingly less. We feel that the average ore to be treated at the Hill-Trumbull Mine will hardly be in line with the above. We mined very little of the finer grade wash ore during 1920 and for this reason the recovery of the turbo and tables was exceptionally low.

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:

JOS. JOGRANIVICH

Injured-----January 17th, 1920.
Occupation-----Pitman.
Nationality-----Serbian.
Time Lost-----36 Days.
Compensation Paid-----\$90.00.

Remarks: A piece of frozen ground, falling from the bank, struck Jogradivich on the side while he was at work removing a piece of frozen dirt which had lodged against the shovel jack block. He sustained bruises on the upper left arm, left side, right leg below knee, and lacerations on the chin and hands.

LOUIS STEVEOLL

Injured-----March 2nd, 1920.
Occupation-----Laborer.
Nationality-----Bulgarian.
Time Lost-----19½ Days.
Compensation Paid-----\$26.25.

Remarks: Stevoll was engaged in raising track on the washing plant fill. The catch on the track jack slipped, letting the rail fall and jamming his left foot between it and trestle stringer. This caused contusions to his left foot.

JOHN KOHLOFF

Injured-----March 4th, 1920.
Occupation-----Laborer.
Nationality-----Bulgarian.
Time Lost-----Fatal Injury.

Remarks: Kohloff, after having delivered oil for use of dumpmen at trestle fill, was returning to mine on Locomotive No. 19. The engine stopped in the yards for the purpose of transferring trains. Kohloff stepped off and began to walk in direction of pit, walking directly behind engine and in the middle of the track. The engineer received a signal to move back toward the pit. The crew could not see Kohloff, as he was but a few feet from back of engine, and Kohloff evidently did not hear the ringing of the bell. The locomotive struck him, knocking him down, and his body was crushed underneath the tender brake rigging. Death occurred within one-half hour.

EMIL JANOVICH

Injured-----June 10th, 1920.
Occupation-----Laborer.
Nationality-----Serbian.
Time Lost-----5 Days.
Compensation Paid-----None.

Remarks: While attempting to turn over one of a pile of three rails with a crow bar, one of the other two rails fell on his bar and knocked it forward. The center of bar struck Janovich on the left temple, inflicting a small puncture.

E. A. ERICKSON

Injured-----April 12th, 1920.
Occupation-----Pitman.
Nationality-----American.
Time Lost-----180 Days.
Compensation Paid-----\$450.00.

Remarks: Erickson was engaged in laying ties underneath steam shovel. His hand was on end of tie, when one of the other workmen, intending to force the tie under the rail, struck at the tie with his sledge. The sledge, however, hit Erickson's hand, crushing the terminal phalange of his left middle finger.

WALDO PUPICH

Injured-----July 10th, 1920.
Occupation-----Dump Foreman.
Nationality-----Serbian.
Time Lost-----6 Days.
Compensation Paid-----None.

Remarks: A 12-yd car of dirt had been dumped. Pupich was righting the body of the car in order to hook the locking chains on the opposite side. The body only went up part way, when a rod under the car caught on the piston of the air cylinder and prevented it going further. He then crawled under the car, entering from the low, or dumped side. When he released the piston, the car dumped back again, instead of righting. Pupich was caught between the car body and wheel, sustaining a contusion and abrasion to his chest and back.

RADDI VEKICH

Injured-----July 17th, 1920.
Occupation-----Pitman.
Nationality-----Serbian.
Time Lost-----17 Days.
Compensation Paid-----\$20.00.

Remarks: Vekich was carrying a section of rail with three other workmen. He lost his grip on the rail, which fell and struck him on the back of his foot just above the heel. Contusion of heel resulted.

FRANK CORR

Injured-----July 26th, 1920.
Occupation-----Laborer.
Nationality-----American.
Time Lost-----104 Days.
Compensation Paid-----\$207.50.

Remarks: While unhooking locomotive crane chain from a casting, which had just been unloaded from car, a large roller lying on the ground behind him rolled forward and pinched his foot. There was a serious abrasion of the right heel.

JOHN KINNUNEN

Injured-----September 7th, 1920.
Occupation-----Laborer.
Nationality-----Finnish.
Time Lost-----5 Days.
Compensation Paid-----None.

Remarks: Kinnunen scratched his hand on a bar used to loosen dirt in the washing plant receiving bin. An abscessed hand resulted.

FRANK NIKICH

Injured-----September 16th, 1920.
Occupation-----Laborer.
Nationality-----Austrian.
Time Lost-----5 Days.
Compensation Paid-----None.

Remarks: Two crews were engaged in carrying tie sections to a steam shovel. The second crew came up too fast with a section and jammed Nikich's left thumb.

LOUIS KARAKICH

Injured-----September 17th, 1920.
Occupation-----Pitman.
Nationality-----Austrian.
Time Lost-----6 Days.
Compensation Paid-----None.

Remarks: Karakich and another man were engaged in lifting an extra rail for a shovel section. The man at the other end of the rail jerked it forward before Karakich had secured a good hold, and it fell, striking him on the left foot. Contusion and abrasion of his foot resulted.

E. M. HOBBS

Injured-----October 10th, 1920.
Occupation-----Shovel Fireman.
Nationality-----American.
Time Lost-----8 $\frac{1}{2}$ Days.
Compensation Paid-----\$3.11.

Remarks: Hobbs was engaged in repairing the swinging engine on steam shovel No. 27 (The new 100-ton Bucyrus) and had thrown back the safety guard, which is hinged to engine frame. When in this position it stands almost upright, leaning only slightly toward the cylinders and rests against the throttle stem as a support. He was tightening a nut on the engine, bracing himself with his foot against the engine frame just behind the crank shaft. While pulling on the wrench, his arm touched the guard and pushed the throttle stem that controls the steam valves and started the engine. The back of the connecting rod caught his foot against the engine frame, causing contusion and abrasion of his right foot.

ELMER IKOLA

Injured-----October 13th, 1920.
Occupation-----Laborer.
Nationality-----Finnish.
Time Lost----- (Did not return to work).
Compensation Paid-----None.

Remarks: A rocker dump car is used for handling the waste rock from the mill. The track is extended as the fill is made by spiking a rail length to ties and supporting it at 10 or 12 foot intervals on bents. Due to the manner in which the car dumps, it is necessary to chain it to the rail. Ikola was dumping a car of sticky dirt over one of the supporting bents. A large amount of dirt hanging to the box of the car caused quite a jar, which pulled the track loose from the bent. Ikola fell and was pinched between the ties and the top of the bent. He suffered a contusion of the right lumbar region and wrenched his left knee.

JOHN WINTERS

Injured-----October 22nd, 1920.
Occupation-----Laborer.
Nationality-----American.
Time Lost-----Still In Hospital.
Compensation Paid-----\$136.25 to Dec. 31st.

Remarks: Winters had tied a rope around a rock for the team to drag away from the edge of the pit. Just as he finished, the rock rolled back and coiled the rope around his leg. Winters sustained broken right leg and sprained ankle.

PETER MAY

Injured-----November 21st, 1920.
Occupation-----Electrician.
Nationality-----American.
Time Lost-----7 Days.
Compensation Paid-----None.

Remarks: The engineer of Locomotive No. 17 threw kerosene into the fire, which was started, but not burning well. The door was closed quickly, but the force of the combustion forced it open and the flames filled the inside of the cab, burning May about the face. He was standing at the left side of the boiler, testing defective wiring. May sustained first and second degree burns on his face.

GEORGE VREELAND

Injured-----December 11th, 1920.
Occupation-----Laborer.
Nationality-----American.
Time Lost-----Not yet returned to work.
Compensation Paid-----\$28.75 to December 31st.

Remarks: While brushing out a road Vreeland attempted to cut down a stump. His axe glanced off the stump, striking and splitting the great toe of his right foot.

NICK PIRTANO

Injured-----December 14th, 1920.
Occupation-----Locomotive Fireman.
Nationality-----Italian.
Time Lost-----19 Days.
Compensation Paid-----\$21.40.

Remarks: Fearing that Locomotive No. 19, which he was firing, would be hit by the train of Locomotive No. 103 before the No. 19 could get into the clear, he jumped from the cab window. Engineer of Locomotive No. 19 thought he had time to back out of low line and side-track on high line before the train approaching from the pit arrived. Seeing that he could not make it, he went ahead again on the low line track. He states there was no danger of a collision, as there was a 20-yrd car length between trains when closest to each other. Pirtano's injuries consisted of bruises and contusion of left heel.

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:

	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>	<u>Mois.</u>	<u>Fe.Nat.</u>	<u>Tons.</u>
<u>GRAND ISLAND</u> -----						6,010
Mine-----	60.27	.055	9.64	----	-----	
Cremer & Case-----	58.80	---	----	7.53	54.372	
<u>MARQUETTE</u> -----						2,130
Mine-----	60.75	.056	8.51	----	-----	
Oscar Textor-----	60.80	---	----	7.09	56.489	
<u>MARQUETTE</u> -----						7,683
Mine-----	60.53	.055	7.29	----	-----	
Crowell & Murray-----	60.12	---	----	7.02	55.900	
<u>GRAND ISLAND</u> -----						9,070
Mine-----	60.96	.053	5.69	----	-----	
Oscar Textor-----	60.30	---	----	7.97	55.494	
<u>ISHPEMING</u> -----						6,564
Mine-----	60.65	.052	6.17	----	-----	
Cremer & Case-----	60.60	---	----	8.94	55.182	
<u>J. H. SHEADLE</u> -----						3,221
Mine-----	62.10	.045	3.28	----	-----	
Cremer & Case-----	61.30	.049	----	7.86	56.482	
Oscar Textor-----	61.30	.050	----	7.83	56.500	
<u>PETER WHITE</u> -----						9,340
Mine-----	61.28	.054	7.18	----	-----	
Emmerton-----	60.88	---	----	7.61	56.247	
<u>PIONEER</u> -----						5,928
Mine-----	61.75	.055	7.97	----	-----	
Cremer & Case-----	61.20	---	----	7.05	56.865	
<u>GRAND ISLAND</u> -----						3,571
Mine-----	62.87	.053	5.12	----	-----	
Oscar Textor-----	63.75	---	----	5.22	60.422	
<u>SHENANGO</u> -----						8,058
Mine-----	62.14	.045	4.63	----	-----	
Emmerton-----	61.72	.048	----	8.22	56.647	
Crowell & Murray-----	61.93	.049	----	8.46	56.691	
<u>PIONEER</u> -----						9,426
Mine-----	62.42	.053	4.26	----	-----	
Crowell & Murray-----	62.35	---	----	7.47	57.692	

	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>	<u>Mois.</u>	<u>Fe.Nat.</u>	
<u>WILPEN</u> -----						5,910
Mine-----	62.25	.043	5.89	----	-----	
Cremer & Case-----	61.70	.042	----	6.73	57.548	
<u>GRAND ISLAND</u> -----						9,268
Mine-----	61.12	.056	6.82	----	-----	
Oscar Textor-----	60.15	---	----	7.98	55.350	
<u>PETER WHITE</u> -----						9,507
Mine-----	61.48	.058	6.63	----	-----	
Cremer & Case-----	61.50	---	----	6.19	57.693	
<u>WM. G. MATHER</u> -----						1,524
Mine-----	63.24	.059	4.69	----	-----	
Crowell & Murray-----	62.88	---	----	6.20	58.981	
<u>J. H. SHEADLE</u> -----						7,401
Mine-----	60.95	.057	7.18	----	-----	
Crowell & Murray-----	60.50	---	----	6.74	56.422	
<u>PONTIAC</u> -----						1,772
Mine-----	62.87	.044	5.90	----	-----	
Crowell & Murray-----	62.62	.042	----	5.77	59.007	
Cremer & Case-----	62.40	.042	----	5.74	58.818	
<u>PIONEER</u> -----						9,738
Mine-----	61.52	.057	7.45	----	-----	
Crowell & Murray-----	60.75	---	----	6.40	56.862	
<u>ISHPEMING</u> -----						10,768
Mine-----	61.41	.054	7.65	----	-----	
Oscar Textor-----	61.40	---	----	6.30	57.532	
<u>PETER WHITE</u> -----						1,105
Mine-----	61.30	.053	4.40	----	-----	
Cremer & Case-----	60.00	---	----	7.65	55.410	
<u>MEGAUNEE</u> -----						-6,575
Mine-----	61.38	.055	5.24	----	-----	
Oscar Textor-----	60.70	---	----	6.22	56.924	
<u>W. P. SNYDER, JR</u> -----						13,227
Mine-----	62.85	.054	5.58	----	-----	
Emmerton-----	62.10	---	----	6.03	58.355	
<u>MICHIGAN</u> -----						4,261
Mine-----	60.72	.056	6.35	----	-----	
Cremer & Case-----	59.90	---	----	6.81	55.821	

	<u>Fe.</u>	<u>Phos</u>	<u>Sil.</u>	<u>Mois.</u>	<u>Fe.Nat.</u>	<u>Tons.</u>
<u>J. H. SHEADLE</u> -----						10,123
Mine-----	61.60	.047	8.30	----	-----	
Growell & Murray-----	61.24	.043	----	6.67	57.155	
Oscar Textor-----	60.91	.044	----	6.36	57.036	
<u>PETER WHITE</u> -----						8,740
Mine-----	62.96	.051	6.33	----	-----	
Growell & Murray-----	62.65	---	----	6.14	58.803	
<u>MICHIGAN</u> -----						245
Mine-----	60.34	.052	9.23	----	-----	
Cremer & Case-----	60.30	---	----	7.78	55.609	

Following are the charges to E. & A. No. 381, Opening and Equipping Hill-Trumbull Mine and Washing Plant from September, 1919, to December 31st., 1920.

<u>SUPERINTENDENT'S DIVISION</u>			
<u>GENERAL EXPENSE</u>	<u>ESTIMATE</u>	<u>TOTAL TO-DATE</u>	<u>UNEXPENDED BALANCE.</u>
Engineering		\$2988.79	
Analysis		42.00	
Mine Office		1198.87	
Central Office		345.31	
Taxes		144779.99	
Legal		57.50	
Personal Injury		106.00	
TOTAL	232200.00	149518.46	82681.54
<u>MAINTENANCE</u>			
Tracks & Cars		2335.42	
Locomotives		1066.44	
Steam Shovels		5224.27	
TOTAL	8500.00	8626.13	126.13
<u>PREPARING SITE</u>			
Building Roads		385.91	
Clearing Land		1520.87	
Grading & Ditching		541.16	
TOTAL	11500.00	2447.94	9052.06
<u>TEMPORARY EQUIPMENT</u>			
Miscellaneous		184.20	
Rental of Equipment		5382.00	
Tools in General Use		1534.37	
Locomotives 2-45 Ton		19708.87	
Twelve 12-yd. cars		12451.92	
TOTAL	37500.00	39261.36	1761.36
<u>PERMANENT CONSTRUCTION AND EQUIPMENT</u>			
Auto Truck		3963.45	
Three 67-70 Locomotives		74815.40	
Sixteen 20-yd. cars		59884.05	
One Locomotive Crane		21575.53	
Two 100-Ton Steam Shovels		45403.37	
One Model "36" Shovel from Grosby		8862.76	
Shop Tracks		12582.73	
Flat Car		675.00	
Tracks In Pit		21025.84	
Tracks from Pit to Dump		33839.00	
Bridge and Culverts		3481.48	
Pit Ditching for Drainage		873.82	
Coal Dock Tracks		8627.57	
TOTAL	275075.00	295610.00	20535.00
<u>WATER SUPPLY</u>			
Water Supply, Inc. Loco.			
Stand Pipe		4433.18	
Sewers		576.57	
TOTAL	8550.00	5009.75	3490.25
<u>OFFICE FURNITURE</u>	<u>750.00</u>	<u>734.69</u>	<u>15.31</u>

HILL-TRUMBULL MINE.

	<u>ESTIMATE</u>	<u>TOTAL TO-DATE</u>	<u>UNEXPENDED BALANCE.</u>
EXPLORING		\$1,242.20	1242.20
TOTAL EQUIPMENT	574025.00	502450.53	71574.47
10% For Contingencies	57402.00		57402.00
GRAND TOTAL EQUIPMENT	631427.00	502450.53	128976.47
<u>WASHING PLANT</u>			
Preliminary Work, Clearing Site, Etc.		2018.85	
Tracks from Dump to Washer		39037.93	
Trestle to Washing Plant		35100.00	
Spur Track from G.N. Main Line		60600.00	
Handling Waste Rock from Washer Track Work		4833.49	
WASHING PLANT TOTAL	154600.00	141590.27	13009.73
10% for Contingencies	15460.00		15460.00
GRAND TOTAL WASHING PLANT	170060.00	141590.27	28469.73
TOTAL SUPERINTENDENT'S DIVISION	801487.00	644040.80	157446.20

MASTER CARPENTER'S DIVISION

	<u>ESTIMATE</u>	<u>TOTAL TO-DATE</u>	<u>UNEXPENDED BALANCE.</u>
<u>TEMPORARY BUILDINGS</u>			
Total	2500.00	865.98	1634.02
<u>TEMPORARY COAL DOCKS</u>	500.00		500.00
<u>TEMPORARY BOARDING HOUSES</u>			
Buildings		6.65	
Water & Sewer Lines		8.30	
Electric Wiring		130.74	
Furnishings		2496.28	
Rental of Temp. Boarding Houses		575.00	
TOTAL		3216.97	3216.97
<u>OFFICE & WAREHOUSE BLDG.</u>			
Building		11867.04	
Piping		408.82	
Electric Wiring		103.80	
Water & Sewer Lines		112.50	
TOTAL	8725.00	12492.16	3767.16
<u>SHOP BUILDING</u>	40000.00	84213.07	44213.07
<u>LOCO. & S. SHOVEL SHOP</u>	15000.00		15000.00
<u>OIL STORAGE BUILDING</u>	1000.00	122.16	877.84
<u>BARN</u>	2000.00	2339.00	339.00
<u>BOARDING HOUSE</u>			
Buildings		17065.83	
Water & Sewer Lines		310.17	
Outbuildings		939.07	
Storm Sash & Doors		332.79	
Electric Wiring		161.94	
Heating		4.34	
TOTAL	29300.00	18813.54	10486.46

HILL-TRUMBULL MINE.

<u>CAPTAIN'S HOUSE</u>	<u>ESTIMATE</u>	<u>TOTAL TODATE</u>	<u>UNEXPENDED BALANCE.</u>
Building		14836.98	
Water & Sewer Lines		360.22	
Electric Wiring & Fixtures		155.34	
Storm Sash and Doors		145.17	
Heating		1216.91	
TOTAL	6450.00	16714.62	10264.62
<u>FOUR 6-ROOM COTTAGES</u>			
Buildings		17676.48	
Water & Sewer Lines		478.55	
Electric Wiring		226.32	
Storm Sash & Doors		383.80	
Heating		1759.84	
TOTAL	20750.00	20524.99	225.01
<u>COAL TRESTLE & POCKETS</u>	6500.00	5810.94	689.06
<u>HEATING PLANT BUILDING</u>	3500.00	4101.57	601.57
<u>GARAGE</u>	2000.00		2000.00
<u>HOUSES PURCHASED AT MARBLE</u>	6100.00	6077.08	22.92
<u>STORAGE WAREHOUSE</u>	6000.00	7070.39	1070.39
TOTAL	150325.00	182362.47	32037.47
10% for Contingencies	15032.00		15032.00
TOTAL MASTER CARPT. DIVISION	165357.00	182362.47	17005.47

CHIEF MECHANICAL ENGINEER'S DIVISION

<u>WASHING PLANT</u>	<u>ESTIMATE</u>	<u>TOTAL TO-DATE</u>	<u>UNEXPENDED BALANCE.</u>
Washer Bldg. Trestle & Crusher Building		51482.44	
Probable Extras		13410.91	
Doors, Floors, Windows, Etc.		10284.34	
Foundations		9924.12	
Receiving Bins - 600 yds.		13562.38	
Receiving Bins - Linings, Etc.		1374.38	
TOTAL	90000.00	130038.57	40038.57
<u>GARETAKER'S COTTAGE & SHED</u>	4000.00	7134.79	3134.79
<u>MACHINERY IN WASHING PLANT</u>			
Machinery		66579.02	
Freight		1656.79	
Erection		14031.03	
TOTAL	75000.00	82266.84	7266.84
<u>CRUSHING PLANT</u>			
Crushing Machinery		35846.78	
Freight		325.22	
Motors, Inc. Wiring & Instlg.		11392.19	
Belts & Weightometer		4409.14	
TOTAL	45300.00	51973.33	6673.33
<u>WATER TANK</u>			
Water Tank, erected		5294.35	
Foundation		1040.46	
Pipe In Mill		1576.81	
TOTAL		7911.62	988.58

	<u>ESTIMATE</u>	<u>TOTAL TO-DATE</u>	<u>UNEXPENDED BALANCE.</u>
<u>WIRING PLANT IN CONDUIT</u>	500.00	1176.32	676.32
<u>PUMPING PLANT AND PIPE LINE</u>			
Plunger Pump, Freight Foundation and Erecting Motor		13350.64 63.38	
Freight, Foundation & Erecting Station Piping		1048.89 5169.36	
3000' 20" Pipe, Freight & Installing		9337.82	
Brick Building		5385.07	
TOTAL	27300.00	34355.16	7055.16
<u>DIVERTING STREAM AND DAM</u>	7200.00	8929.74	1729.74
<u>TELEPHONE LINE</u>	1000.00	2025.68	1025.68
<u>TRANSMISSION LINE</u>		1824.88	1824.88
<u>TEMPORARY BUILDING</u>	2000.00	856.16	1143.84
<u>HANDLING WASTE ROCK</u>			
Electric Locos. & 4 cars	8000.00	4980.00	3020.00
<u>SUB-STATION - COMPLETE</u>	7500.00	5692.22	1807.78
<u>TOTAL WASHING PLANT</u>	<u>276700.00</u>	<u>339165.31</u>	<u>62465.31</u>
10% For Contingencies	27670.00		27670.00
<u>GRAND TOTAL WASHING PLANT</u>	<u>304370.00</u>	<u>339165.31</u>	<u>34795.31</u>
<u>SHOP EQUIPMENT</u>	25000.00	22461.40	2538.60
<u>HEATING SYSTEM</u>	5000.00	5079.60	79.60
<u>FIRE PROTECTION</u>		254.00	254.00
<u>OIL STORAGE TANK</u>		532.36	532.36
<u>TOTAL EQUIPMENT</u>	<u>30000.00</u>	<u>28327.36</u>	<u>1672.64</u>
10% For Contingencies	3000.00		3000.00
<u>GRAND TOTAL EQUIPMENT</u>	<u>33000.00</u>	<u>28327.36</u>	<u>4672.64</u>
<u>TOTAL CHIEF MECH. ENGR'S DIVISION</u>	<u>337370.00</u>	<u>367492.67</u>	<u>30122.67</u>

S T R I P P I N G

	<u>ESTIMATE</u>	<u>TOTAL TO-DATE</u>	<u>UNEXPENDED BALANCE.</u>
Washer Dump-To-date 351,000 yds.	140400.00	154091.13	
Additional Stripping, To-Date 310,080 yds.	140000.00	157545.73	
TOTAL	280400.00	311636.86	31236.86
10% for Contingencies	28040.00		28040.00
<u>GRAND TOTAL STRIPPING</u>	<u>308440.00</u>	<u>311636.86</u>	<u>3196.86</u>

S U M M A R Y

<u>PLANT AND EQUIPMENT</u>	<u>ESTIMATE</u>	<u>TOTAL TO-DATE</u>	<u>UNEXPENDED BALANCE.</u>
Superintendent's Division	631427.00	502450.53	128976.47
Master Carpenter's "	165357.00	182362.47	17005.47
Chief Mech. Engr's "	33000.00	28327.26	4672.64
<u>TOTAL PLANT AND EQUIPMENT</u>	<u>829784.00</u>	<u>713140.36</u>	<u>116643.64</u>
Exploring (2)		278364.14	278364.14
<u>GRAND TOTAL PLANT & EQUIPMENT</u>	<u>829784.00</u>	<u>991504.50</u>	<u>161720.50</u>
 <u>WASHING PLANT</u>			
Supt. Division	170060.00	141590.27	28469.73
Chief Mech. Engr's Division	304370.00	339165.31	34795.31
<u>TOTAL WASHING PLANT</u>	<u>474430.00</u>	<u>480755.58</u>	<u>6325.58</u>
Amount Paid Arthur Iron M.Co. (3)		18824.30	18824.30
<u>GRAND TOTAL WASHING PLANT</u>	<u>474430.00</u>	<u>499579.88</u>	<u>25149.88</u>
 <u>GRAND TOTAL</u>	 <u>1304214.00</u>	 <u>1491084.38</u>	 <u>186870.38</u>
Depreciation		25.42	25.42
<u>GRAND TOTAL OPENING & EQUIPT.</u>	<u>1304214.00</u>	<u>1491109.80</u>	<u>186895.80</u>
Unclaimed Wages		169.24	
Reserve for Depreciation		34233.20	
<u>BALANCE</u>		<u>1456707.36</u>	
<u>GRAND TOTAL STRIPPING</u>	<u>308440.00</u>	<u>311636.86</u>	<u>3196.86</u>
 <u>GRAND TOTAL STRIPPING, OPENING AND EQUIPPING</u>	 <u>1612654.00</u>	 <u>1802746.66</u>	 <u>190092.66</u>

- (1) General Expense for year 1920 transferred to Operating Hill-Trumbull Mine, as per letter of C. D. Mason, dated 12/17/20.
- (2) Amount paid to Great Northern Ore Properties for explorations, drillings, etc.
- (3) Amount paid to Arthur Iron Mining Company for taxes in connection with lands for Hill-Trumbull washing plant.

HILL-TRUMBULL MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1920.

GRADE	IRON	PHOS.	SILICA
Hill Trumbull,	59.17	.053	11.03
Hill Concentrates,	62.18	.052	5.69

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1920.

GRADE	Mine			Lake Erie	
	IRON	PHOS.	SILICA	IRON	MOIST.
Hill Trumbull,	60.40	.055	9.34	59.32	7.41
Hill Concentrates,	(All mixed).				

ORE STATEMENT AND SHIPMENTS - DECEMBER 31ST, 1920.

	TRUMBULL	CONCENTRATES		TOTAL
		HILL BESS.	TRUMBULL	
On hand Jan. 1, 1920,	0	0	0	0
Output for year,	27,582	29,084	114,500	171,166
Transferred,	114,500		114,500	
Total,	142,082	29,084	0	171,166
Shipments,	142,082	29,084		171,166
Balance on hand,	0	0	0	0
Crude Ore Treated,	191,863			
Concentrates,	143,584			

Percentage of Recovery-74.9%

1920 - 2-10 Hour Shifts Aug. 11th to Oct. 28th, 1920.

HILL-TRUMBULL MINE.

COMPARATIVE MINING COST FOR YEAR.

	1920.
<u>PRODUCT</u>	
Direct Shipping	27,582
Concentrates	143,584
Total Production	171,166
<u>DIRECT SHIPPING ORE.</u>	
Labor operating	.371
Supplies	.279
Total Direct Shipping Ore	.650
<u>CONCENTRATED ORE.</u>	
Labor Total	.321
Supplies "	.242
Total Crude Ore	.563
Total Cost of Production	.577
<u>MISCELLANEOUS GROUP.</u>	
Superintendence	.021
Concentrating	.387
Stripping	.912
Insurance	.001
District Office	.071
Central Office	.072
Taxes	.897
Depreciation	.200
Total Cost on Cars	3.138
Royalty	1.182
Grand Total Cost	4.320
<u>DIRECT SHIPPING.</u>	
No. Shifts and Hours	2-10hr-62
Avg. Daily Product	445
<u>WASH ORE.</u>	
No. Shifts & Hours	2-10hr-67
Avg. Daily Product	2864

NOTE: 1920 was the first year this mine operated.

HILL-TRUMBULL MINE FOR YEAR 1920.

COMPARATIVE WAGES AND PRODUCT.

	CRUDE	STRIPPING	MERCHANTABLE
PRODUCT	191,863		27,582
No.Shifts and Hours	2-10hr	2-10hr	2-10hr
AVERAGE NO.MEN WORKING	18	51	5
AVERAGE WAGES PER DAY	6.66	6.27	6.54
PRODUCT PER MAN PER DAY	34.45		22.24
LABOR COST PER TON	.193		.294
TOTAL NUMBER OF DAYS	55,704	16,590 $\frac{1}{2}$	1,240
AMOUNT PAID FOR LABOR	37098.95	104037.24	8117.13

This is the first year this mine produced and is all open pit work.

HILL-TRUMBULL MINE

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE

KIND	QUANTITY	AVERAGE PRICES	AMOUNT 1920	AMOUNT 1919
40% Powder - - - - -	4,450	.20383	907.04	- -
60% " - - - - -	2,650	.21417	567.54	- -
Black " - - - - -	11,500	.0907	1,043.45	- -
Total Powder -	18,600	.1353	2,518.03	- -
Fuse - - - - -	250	10.00	2.50	- -
Connecting Wire - - -	2½#	.52	1.30	- -
Caps - - - - -	1,400	11.41	159.83	- -
Total Fuse, Etc.			163.63	- -
Total Explosives			2,681.66	- -
Product - - - - -			219,445	- -
Pounds Powder per ton of Ore			.0847	- -
Cost per ton for Powder			.01148	- -
" " " " Fuse, Caps, Etc.			.00075	- -
" " " " All Explosives			.01223	- -
Avg. Price per Lb. for Powder			.1353	- -

Mine started to operate in 1920.

HILL-TRUMBULL MINE

BOEING MINE

ANNUAL REPORT FOR 1920.

In the progress of our underground development work during the past year, we produced 1,989 tons of so-called No. 1 ore and 6,894 tons of No. 2 ore.

Following is an analysis of the ore hoisted and placed in stockpile:

	<u>Tons.</u>	<u>Fe.</u>	<u>Phos</u>	<u>Mn.</u>	<u>Sil.</u>	<u>Alumina</u>
Merchantable Ore-----	1,989	57.12	.076	1.38	8.81	2.31
Lean Ore-----	6,894	52.60	.083	1.09	13.13	2.39

We are now starting our development work at the north end of the ore body and we anticipate going on an operating basis April 1st. We expect to have about 12 contracts on ore April 1st and our estimated production from that time to November 15th is placed at 50,000 tons. Our expected analysis for the 50,000 tons is as follows:

<u>Fe.</u>	<u>Phos</u>	<u>Mn.</u>	<u>Sil.</u>	<u>Fe.Nat.</u>
58.00	.080	1.25	7.50	49.00

Our estimates of production from underground operations have always been based on 100,000 tons per year. We feel that this output can be realized and it is quite probably that we will be able to increase these figures somewhat, if an additional tonnage is desired.

BOEING MINE ORE ESTIMATE

Following is an estimate of the ore in sight at the Boeing Mine on January 1st., 1921, the figures submitted January 1st., 1920, and the ore mined during the year:

	<u>OPEN PIT ORE</u>	<u>MILLING ORE</u>	<u>UNDERGROUND ORE</u>	<u>TOTAL</u>
Estimate January 1st. 1920--	2,160,000	275,000	505,000	2,940,000
Mined 1920-----	-----	-----	1,989	1,989
Estimate January 1st. 1921--	1,638,000	521,000	577,000	2,736,000

The average analysis of the ore estimated in sight January 1st. 1921, is as follows:

	<u>Tons</u>	<u>Fe.</u>	<u>Phos</u>	<u>Mn.</u>	<u>Sil.</u>	<u>Mois.</u>	<u>Fe.Nat.</u>
Open Pit Steam Shovel Ore--	1,638,000	57.19	.086	.98	8.28	15.00	48.61
Open Pit Milling Ore-----	521,000	58.85	.080	1.24	7.12	15.00	50.02
Underground Ore-----	<u>577,000</u>	<u>58.46</u>	<u>.093</u>	<u>.90</u>	<u>6.64</u>	<u>15.00</u>	<u>49.69</u>
TOTAL AND AVERAGES-----	2,736,000	57.77	.086	1.01	7.71	15.00	49.10

A factor of 13 cubic feet per ton was used in making this estimate. A 10% deduction for rock was made in all cases and an additional 10% deduction was made to cover mining loss in the underground ore.

Development work underground has proven that some of our assumptions from the drill records were erroneous. The deep ore channel extending along the east side of the ore body is narrower than we had anticipated and the open-pit tonnage has been reduced as a result thereof. The development work of the north-west drift and raises has shown the existence of a second ore channel along the west side of the deposit. This channel is much shallower, but it has been the means of increasing our underground and milling ore to some extent. We had one drill hole along the west side of the deposit, No. 416, which showed a deeper pocket of ore, but we could not connect this with any other information available at that time.

Deducting the 1,989 tons mined during 1920, there is a net decrease in our estimate of January 1st, 1921, as compared to the previous year, of approximately 202,000 tons.

We do not anticipate attempting any exploratory work during the coming year, further than the development of the deposit. While we may develop some additional ore, the chances of this being an appreciable tonnage are very remote.

GENERAL SURFACE

The 125 HP boiler, which was purchased from the Helmer Mine, was bricked in and a temporary housing constructed by the 5th of January. Heat was turned into our temporary buildings on this date. The boiler occupies one end of the dryhouse building, but the permanent structure was not completed until the first of August. The steam, however, had been turned into all of our permanent buildings during the spring. The Contractor started work on the dry and boiler house on April 19th and the work was completed as stated above, August 1st.

The Worden-Allen Company, who had started the erection of our steel headframe in December, 1919, completed the job on January 17th. Our mine carpenters started placing the top landing floors and pocket linings in January and completed the work by March 15th.

The brick shop building was finished by Contractor Proksch early in the year and it was occupied and the machinery all installed by the first of February. Some heaving was noticed in the partition walls, but they settled back in place and the cracks were chinked. There has been no further movement of the walls.

Contractor Proksch turned over the brick power house to us on February 14th and our permanent electric hoist was installed and put in service April 10th. The compressor was installed in its permanent position and a temporary housing constructed early in the fall of 1919. The permanent brick structure was erected without interruption to the operation of the compressor. Our temporary electric hoisting plant was moved into the permanent power house during April and has been used for the operation of our frame cage, which is utilized only for the handling of timber and mining supplies, men not being allowed to ride on it.

The four stall frame barn was turned over to us by the Contractor on the first of March, the brick oil house April 1st., and we were able to move into the office April 14th.

The Winston-Dear Company completed their filling and grading contract for our stocking ground and timber yard on February 14th. The

contractor secured 25,193 cubic yards from the Webb and Susquehanna Mines and 29,543 yards from the Boeing, making a total of 54,736 cubic yards dumped. The material secured from the Boeing came from the approach to the Sellers dump. As the filling job was done during the winter, a considerable quantity of frost chunks were dumped and this resulted in more or less settlement during the spring. It was necessary for us to do some grading with teams and slushers and to fill a number of depressions. The stocking ground has been smoothed off with the very lean material from our underground work, which the Fee Owners would not allow us to place on the rock dump, and yet it was too low grade to stock as lean ore. This material ran between 40% and 50% in iron content.

In order to carry on our stripping and filling operations, it was necessary to move the Washington Street highway bridge. To accommodate the traffic between Brooklyn, we were obliged to construct a driveway along the north boundary line of the property. This roadway is only 12' in width and we kept down the construction cost as far as possible. It has been necessary from time to time to spread ashes along the road in order to fill up the deep ruts and make it passable. The Washington Street bridge was dismantled early in April and the new roadway opened up for traffic.

Following out the suggestions of Mr. Warren Manning, the grounds surrounding the mine buildings were graded and we did some planting of native shrubs. The roadways leading to the mine buildings were surfaced with rock from underground and gravel from the Boeing pit. We will complete the planting next spring with shrubs, which were ordered by Mr. Manning, but received too late to plant last year.

In order to safeguard the water drainage from the Susquehanna and Boeing shafts, it was necessary to dig a new ditch some distance back from the edge of our open pit. We were rather apprehensive that the muskeg would draw some distance back from the pit and for this reason, the ditch was carried along the edge of our timber yard fill. The movement of the muskeg was such that we considered it advisable to shift the drainage ditch further eastward than originally planned and a second contract was let for this job. We now feel

that there should be no danger of drawing the ditches from open pit operations in the muskeg.

All of the Winston & Dear buildings had been moved from the Boeing property by the middle of the summer and the Contractors had moved to their new site near the Sellers dump.

The Great Northern Railway Company did the necessary grading for our shaft and coal dock spurs during the fall. It was advisable to do this work during the fall of 1920 in order to assure us railway service upon the opening of navigation in 1921. The tracks will be laid and ballasted during March and April.

The old blacksmith shop was moved to the east of the shaft and is now being utilized as a storehouse.

A four stall garage was erected by the mine carpenters for the accommodation of our truck and Company automobiles. This job was started May 24th and finished June 15th.

As a precautionary measure, a fence was constructed around the west half of the open pit. The property extends right to the Village Limits and there is considerable traffic passing in this vicinity.

LOCATION

Contractor Proksch completed work on the second boarding house, captain's house and the four 5-room cottages during April and they were occupied by employees of the Boeing Mine May 1st.

We constructed a roadway and sidewalk around the front of the houses, fenced in the lots and did some filling. We anticipate doing some planting during 1921, in line with Mr. Manning's suggestions.

Sewer and water connections were made to the location houses from the Village of Hibbing mains.

STRIPPING

The Winston & Dear Company moved a 100-ton standard shovel onto the property the latter part of 1919. This shovel was engaged in cutting an approach onto the Sellers dump. The material from the cuts was wasted on the Sellers dump or used for filling on our stocking ground and timber yard. The Sellers approach work was finished February 15th.

Tracks were laid from the mine, along the Sellers dump to the property acquired by the Great Northern Interests for our Boeing stripping and a 300-ton revolving shovel was moved onto the Boeing property and assembled for stripping. These jobs were undertaken during January and February.

The Winston & Dear Company erected an office, warehouse, shop building, oil house, storehouse, water tank and a sand drying and salting station in connection with the Boeing stripping job. These buildings are located on the strip of land leased from the Sargent Land Company to the south of our east Boeing forty. They will be used exclusively in connection with the operations at the Boeing Mine. It was necessary to do some remodeling of the old Susquehanna coal dock. This structure has been used so far in connection with Winston-Dear work at the Boeing. When our approach is completed, a permanent coal dock will be erected along the site thereof.

In order to handle our stripping from the pit to the dump to the best advantage, arrangements were made with the Rogers-Brown Iron Company whereby their track was used in hauling loads from the Boeing and Susquehanna Mines and the returning trains ran over our track. We paid the Rogers-Brown Company \$250.00 per month rental and the cost of maintenance of the tracks is divided between the two Companies on the basis of yardage handled. The Rogers-Brown Company did not care to make this arrangement, but finally consented. We have never felt that the agreement with the Rogers-Brown Company was satisfactory to us and for this reason, the Contractor is now going ahead with the construction of a second track. Within a short time, our stripping operations will be handled entirely on our own tracks.