

from the 6th level to make connections to the 5th level drifts.

SIXTH LEVEL.

A large program of development work in rock has been under-way during 1920 on the 6th level. During the year there was 1200 feet of rock drifting on the main level, exclusive of turn-outs for raises. In addition, nine raises were put up from the 6th, through to the 5th, or to the 1st sub level above the 5th. At the end of the year there was approximately 1,800 feet additional rock drifting to complete the development of the 6th level, Stephenson property, and from 50 to 60 raises still to be put up. From one to six gangs have worked in rock on this level during the year. At the end of the year there were two gangs drifting, one in the main North-east haulage drift, and one in No. 3 cross-cut, also two gangs putting up raises. In addition to the above rock work, a drift 100 feet in length was driven on a sub-level 60 feet above the 6th level, in order to provide a second outlet from the 6th level. This out-let is entirely in rock, and holes to the 5th level at a point from which other rock raises lead to the Austin Mine.

From the above paragraph it is seen that, although considerable development work has been done during the past year on the 6th level, there still remains at least two years work in rock to complete the opening of this level. In addition to continuing the drifts on the main level, it will be necessary to keep a number of gangs raising for the next several months in order to prepare for mining the 1st sub level above the 5th. As stated before, the greater part of the ore from this sub will have to be sent through the 6th level.

The Armstrong loader has been used during the greater part of the year on the 6th level; although no big advances have been made in the drifts, yet it has been possible to make fair progress considering the labor shortage. At no time has it been possible to hire trammers, and without the loader it would have been necessary for the miners to have done all the shoveling. The loader has kept the dirt cleaned up in two breasts, with the shovel runner and one extra man, permitting the miners to drill, blast and timber.

C. & N. W. LEASE - SEC. 29

The product for the year was as follows:

Northdale, 8,477 tons.

The 1920 shipments and balance on hand December 31st, 1920, were as follows:

	<u>SHIPMENTS</u>	<u>BALANCE ON HAND</u>
Northdale,	3,256	5,221

The estimated ore in sight December 31st, 1920 was as follows:

	<u>NORTH BESSEMER</u>	<u>NORTH- WESTERN</u>	<u>NORTHDALE</u>	<u>TOTAL</u>
Developed ore above 5th Level,	5,700	1,900	15,220	22,820
" " below "	6,300	2,100	18,170	26,570
Total developed ore,	12,000	4,000	33,390	49,390
Prospective ore below 5th Level,	89,724	29,906	239,250	358,880
TOTAL,	101,724	33,906	272,640	408,270

Estimated tonnage in mine, sub-divided as required by the Tax Commission:

Bessemer Ore:

Developed	1. North Bessemer,	12,000	
Prospective		<u>89,724</u>	101,724

Non-Bessemer Ore:

Developed	1. Northwestern,	4,000	
	2. Northdale,	<u>33,390</u>	37,390
Prospective:	1. Northwestern,	29,906	
	2. Northdale,	<u>239,250</u>	<u>269,156</u>
	T O T A L,		408,270

The above estimate shows a decrease of 56,470 tons as compared with the previous estimate, made in December, 1917.

There is practically no information available of the size of the ore body below the 2nd sub below the 5th level. Two or three drill holes give some information, but not enough to permit of making an accurate estimate. It is still necessary to use the old estimate of probable ore figured from the surface diamond

drill holes.

During the past year work has been done on this lease at the following points:

5TH LEVEL
1ST SUB BELOW 5TH LEVEL
2ND SUB BELOW 5TH LEVEL
3RD SUB BELOW 5TH LEVEL
2ND AND 3RD SUBS ABOVE 6TH LEVEL
6TH LEVEL.

- - - -

FIFTH LEVEL

Only a comparatively small amount of work has been done on this level during the past year. After cleaning up and re-timbering the drifts which had caved, mining of some pillars on the main level, outside the limit of mining, was started. There is only a small area in ore outside the limit of mining, and by the end of the year one gang had removed all the available pillars here.

1ST SUB BELOW 5TH LEVEL

This sub was opened in 1920, and by the end of the year an area 120 feet in length by 50 feet in width had been mined. All of the ore on this sub-outside of the limit of mining, has been removed with the exception of two small pillars which are now being mined.

2ND SUB BELOW 5TH LEVEL.

Late in the year the 2nd sub below 5th level was opened, and at the close of the year two gangs were drifting. One gang is driving back along the foot to make a connection for bringing in timber; the other gang is developing the ore body towards the hanging. It is hoped that the ore body will be larger on this level. The greater part of the ore on these two sub-levels comes within the limit of mining, so is not now available for mining.

3RD SUB BELOW 5TH LEVEL

The last of the year this sub-level was opened and a drift is now being driven from the top of a 6th level raise back towards the foot. A raise will later be put up from this drift to the 5th level to provide a way for bringing in timber to this sub-level.

3RD SUB ABOVE SIXTH LEVEL.

Some work was done on this sub level in the summer, above No. 6 cross-cut. This cross-cut is the one in which ore was encountered on the 6th level, and which, due to running of the ore, it was impossible to advance across the ore body. It was thought that by opening out on the 3rd sub above the 6th at this point that the water might be drained away from the hanging, making it possible to finish No. 6 cross-cut. No ore was found on this sub-level after drifting about 40 feet, and it was decided to drop down a sub and try to encounter the ore on the 2nd sub above the 6th.

2ND SUB ABOVE SIXTH LEVEL.

There was about 130 feet of drifting done on this sub-level, but owing to the shortage of men, work was stopped at this point. The drift was driven in rich hanging material, towards the point where it was thought that ore would be encountered, but the main ore body had not yet been reached when work was stopped. The material encountered here ran about 48.00% in Iron. It is expected to resume work at this point in 1921.

SIXTH LEVEL.

There was practically no repairs necessary after the mine was unwatered, as the 6th level is all in rock. Early in 1920, No. 6 cross-cut was driven 57 feet in ore. The cross-cut caved, and although it has been re-timbered twice, it has not been possible to keep it open, so as to permit of continuing it through the ore. No. 5 cross-cut advanced 160 feet during the year; this cross-cut is still in foot-wall material. There remains 100 feet to be driven on this lease; the balance of this cross-cut will be driven on Stephenson property. During the year No. 4 cross-cut advanced 35 feet, and a raise has been put through from this cross-cut to the 5th level.

In addition to the above, a drift has been driven 585 feet in the hanging from the end of the main haulage drift, near No. 6 cross-cut. This drift was driven in hanging material over to a point near No. 11 diamond drill hole, which is the point where No. 66 drill hole from surface is being put down to drain the water from the deep basin on Section 29. At a point about 200 feet from the breast of

the drift a concrete dam was put in, in order to hold back any water which might come when the drill hole is completed through to the drift. It had been hoped to complete No. 66 drill hole by the end of the year, but owing to difficulty in drilling, it will not be completed until in January, 1921. It is planned to conduct the water from the dam above referred to through a 10" pipe up to the suction of the pumps in the main pump house on 5th level. Advantage will thus be taken of the head of water which alone will be able to raise the water in the discharge line to a point within approximately 300 feet of surface. The pipe for the 10" line from the dam to the pump house was purchased during the past year, and a ditch has been made through the Section 29 drift and the Stephenson drift, back to the shaft.

From the above description of work on this lease, it will be seen that comparatively little work has been done during 1920. It was impossible to produce much ore, as mining must proceed very slowly until the water problem is solved. No. 5 cross-cut is being extended with the idea of putting up raises and starting mining a section of the ore body under the hanging, in order to permit of increasing the product from this lease. If No. 66 drill hole is successful, and a large volume of water enters the mine at this point, it will eventually result in the drying up of the stream which now enters the mine at the point where the cave occurred at the time the mine was flooded. As soon as the water stops coming in at this point it will be possible to start mining a large area which is now within the limit of mining. Nothing has been done during 1920 towards developing the Sec. 29 ore body below the 6th level. It was not thought advisable to attempt this development work until after the water problem is solved. Another factor that has decreased the amount of development work during 1920 on this lease was that of the labor shortage. The development work on Stephenson property was imperative, and it was not possible to obtain sufficient men to carry on a development program on both these properties. Now that labor is more abundant, it will be possible to do more development work on this lease, and as additional territory is opened, put more gangs on ore.

DIAMOND DRILL HOLE NO. 66

In order to safe-guard the Stephenson Mine from a re-occurrence of the accident of December 5th, 1917, which resulted in the drowning out of this property for a period of approximately two years, it was finally decided to put down a large stand pipe to ledge in the deepest part of the basin on Section 29, and drill as large a hole as possible through the ledge down to the 6th level. It was thought possible that the water could be drained through this hole into the mine, and thus gradually lower the water level in the deep basin on Section 29. It was first planned to connect directly to the casing pipe in this hole, with a pipe line running on the 6th level up to the main pump house on 5th, where it would connect with the suction of the pumps. Advantage would thus be taken of the head of water in the hole, which would decrease the cost of pumping the water. It was later decided, however, to put in a concrete dam on the 6th level, which would hold back the water, and to conduct the water through pipes from the dam to the pumps on 5th level.

Sinking of the standpipe on Section 29 was started June 25th, an 8" pipe being sunk to ledge; this pipe reached ledge in August at a depth of 276 feet. After anchoring the pipe in ledge, drilling was started, using a bit of sufficient size to permit of installing a 6" casing pipe in the hole in the ledge. There was no particular difficulty experienced in sinking the 8" pipe until it reached a point near the ledge where boulders were encountered. Considerable work was necessary to get the pipe through the boulders, and it later developed that this had battered the pipe out of shape, making it difficult to use the drilling tools. Slow progress was made in drilling during August and September, the hole being down to a depth of 342 feet at the end of September. Owing to the slow progress, it was decided to temporarily stop work and get a different style of bit, in the hope that better progress could be made. Drilling was resumed with a "Star" bit in October, but as very slow progress was made, it was decided to get an expert driller from the Keystone Drill Company. On his arrival in November, drilling was resumed, but he was not able to get any

better results. He advised the use of a smaller size bit, stating, that in his opinion, it was impossible to complete the hole with the large bit. Accordingly, a 6" bit was ordered, and on its arrival, drilling was resumed, a depth of 482 feet being reached in December. Drilling was temporarily stopped at this point, as the bottom of the hole was within 24 feet of the back of the 6th level drift. Work of reaming the hole out to sufficient size to permit of installing 6" casing pipe was then started, but slow progress was made, the hole being reamed a distance of only about 25 feet in two weeks. It was then decided to resume drilling with the smaller bit on the 1st of January, and put the hole through to the drift, after which reaming would be tried again. It is possible that the hole has deviated, which may account for the difficulty experienced in drilling. The friction on the tools, if the hole deviated, would be very heavy, and would decrease the cutting power of the tools. Owing to the large size of the hole, however, it is not thought that the deviation would be sufficient to cause any difficulty in holing to the drift. It had been hoped to complete this work by the end of the year, but owing to difficulty in drilling, it will require at least another month to complete the hole.

There is water standing in the hole within 124 ft. of surface, which corresponds fairly closely with the hydraulic gradient of the water at this point. It is not thought, however, that there is a great deal of water entering the pipe, as it has been driven over five feet in ledge and has also been cemented. If sufficient water enters the pipe, it will not be necessary to install a casing pipe below ledge. If, however, only a small volume of water enters, it will be necessary to put in a casing pipe with a weinbore on the top just above the ledge, and then pull the stand pipe out of the ledge so as to permit the water to have free access to the casing pipe.

If this scheme proves successful, the water will be gradually lowered, and in time the water which now enters the mine at the point where the break occurred in December, 1917, will dry up. This will permit mining operations to be resumed in this territory, and if the general water level is being constantly lowered by this hole on Section 29, the surface can be caved, with no danger of another flood.

STEPHENSON SURFACE

The old timber bulkhead at the end of the fill at the coal dock, Stephenson Mine, was found to be in bad condition due to rotting, and it was decided to install a concrete bulkhead here. This work was completed early in the summer.

On re-opening the mine, it was decided to install some system that would permit of loading lagging directly on timber trucks and do away with teaming, which had been necessary before. By grading down the ground between the timber tunnel to the shaft and the approach to the coal dock, it was found possible to install a track on the incline leading to the lagging piles which are behind the approach. By carrying the track across level ground, and up another embankment, it is possible to put on a counter-weight so that no difficulty has been experienced in controlling the loaded cars down the incline. This arrangement has done away with all teaming of both 5-ft. and 8-ft. lagging, and has made it possible to do the work at the Stephenson Mine with one team, whereas two teams were necessary before.

Tracks for loading out Stephenwood ore were installed in the summer. The Stephenwood ore was shipped, but only a portion of the Stephenson. The trestle had been dismantled, as the sales were such that it was expected the entire pile would be shipped, but owing to postponement of shipments late in the season, only a portion of the Stephenson Ore was shipped. This made it necessary to rebuild the trestles under very difficult conditions, as short legs had to be used and the pile levelled off to hold them. When dumping started on this pile, it was necessary to install a number of guy lines and to do considerable bracing, as the trestles are very unstable, but by the end of the year the trestle was firmly anchored in the ore, and no further trouble is anticipated.

During the summer and fall, a number of the top tram cars have been taken to the shops and thoroughly overhauled. It is hoped to increase the product to 1,000 tons per day, which will necessitate a rapid handling of ore on the trestles, so that it is necessary to have all the equipment in the best possible condition.

STEPHENSON MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1920.

GRADE	IRON	PHOS.	SILICA	MANG.
Stephenson Bessemer,	61.92	.053	5.99	
Stephenson No. 1,	62.28	.067	5.59	1.037
Stephenson,	61.61	.238	4.98	1.071
Stephenwood,	60.43	.706	4.15	1.072

(Cargoes all mixed).

ORE STATEMENT - DECEMBER 31ST, 1920.

	STEPHENSON BESSEMER	STEPHEN- SON.	STEPHEN- SON No.1	STEPHEN- WOOD.	TOTAL	TOTAL LAST YEAR
On hand Jan. 1, 1920,	0	437	0	45907	46344	45907
Output for year,	24140	115032	0	27133	166305	437
Transferred,	11381	5295	6086			
Total,	12759	120764	6086	73040	212649	46344
Shipments,	8773	68768	6086	24041	107668	0
Balance on hand,	3986	51996	0	48999	104981	46344
Increase in output-379%					165868	
Increase in ore on hand-126%					58637	
1920 - 1-8 Hour Shift for year						
1919 - Mine idle account of water.						

STEPHENSON MINE.

STEPHENSON MINE

SHIPMENTS FOR YEAR - 1920.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YR.
Stephenson Bessemer,	8,773		8,773	0
Stephenson,	50,602	18,166	68,768	0
Stephenson No. 1,	6,086		6,086	0
Stephenwood,	17,110	6,931	24,041	0
Total,	82,571	25,097	107,668	0
Total last year,			0	
Increase-100%			107,668	

Damascus
Bond
MADE IN U.S.A.

STEPHENSON MINE.

Dannacord Bond
STEPHENSON MINE.
 COMPARATIVE MINING COST FOR YEAR.

	1 9 2 0.	1 9 1 7.	INCREASE.	DECREASE.
PRODUCT	174,782	253,265		78,484
General Expense	.215	.154	.061	
Maintenance	.377	.134	.243	
Mining Expense	2,383	1,148	1,235	
Cost of Production	2,975	1,436	1,539	
<u>DEPRECIATION.</u>				
Original Purchase	.001	.001		
Plant Account	.003	.008		.005
Equipment		.005		.005
Uncompleted Construction	.026	.008	.018	
Total Depreciation	.030	.022	.008	
Taxes	.139	.098	.041	
Central Office	.084	.060	.024	
Fire Loss	.012		.012	
Miscellaneous	.023	.052		.029
Sundry Expense	.037	.008	.029	
Cost on Stockpile	3,300	1,676	1,624	
Loading & Shipping	.077	.129		.052
Total Cost on Cars	3,377	1,805	1,572	
No. Days Operating	302	282	20	
No. Shifts and Hours	1-8hr	1-8hr		
Avg. Daily Product	575	898		323
<u>COST OF PRODUCTION.</u>				
Labor	1,933	.919	1,014	
Supplies	1,042	.517	.525	
Total	2,975	1,436	1,539	

Mine did not produce in 1918 and 1919 on account of being flooded.

STEPHENSON MINE

COMPARATIVE WAGES AND PRODUCT

	1 9 2 0	1 9 1 9	INCREASE	DECREASE
PRODUCT	174,732	2,402	172,380	
No. Hours and Shifts 2-8hr				
AVERAGE NO. MEN WORKING				
Surface	43	17	26	
Underground	129	16	113	
Total	172	33	139	
AVERAGE WAGES PER DAY				
Surface	5.54	5.22	.32-6.1%	
Underground	6.51	5.71	.80-14%	
Total	6.27	5.47	.80-14.6	
WAGES PER MONTH OF 25 DAYS				
Surface	138.50	130.50	8.00	
Underground	162.75	142.75	20.00	
Total	156.75	136.75	20.00	
PRODUCT PER MAN PER DAY				
Surface	13.13			
Underground	4.43			
Total	3.31			
LABOR COST PER TON				
Surface	.422			
Underground	1.470			
Total	1.892			
AVG. PRODUCT BRK'G & TRM'G	8.26			
" WAGES CONTRACT MINERS	7.18			
" " " TRAMMERS				
" " " LABOR	7.18			
TOTAL NUMBER OF DAYS				
Surface	13,306	5,437	7,869	
Underground	39,434 ³ / ₄	5,510 ¹ / ₂	33,924 ¹ / ₂	
Total	52,740 ³ / ₄	10,947 ¹ / ₂	41,793 ¹ / ₂	
AMOUNT FOR LABOR				
Surface	73696.13	28397.87	45298.26	
Underground	256904.12	31479.55	225424.57	
Total	330600.25	59877.42	270722.83	

Proportion Surface to Underground Men:

1920 - 1 to 3.
 1919 - 1 to 1
 1917 - 1 to 2.9
 1916 - 1 to 3.07
 1915 - 1 to 2.73

No mining done during 1918 and 1919
 on account of mine being flooded.

STEPHENSON MINE

TIMBER STATEMENT FOR THE YEAR ENDING DECEMBER 31, 1920.

KIND	LINEAL FEET	AVG. PRICE PER FOOT	AMOUNT	AMOUNT
			1 9 2 0	1 9 1 7
6" Timber	85,024	.0282	2398.69	374.76
6" to 8" "	64,399	.024	1598.93	75.74
8 to 10 "	121,283	.066	8036.42	2502.04
10 to 12 "	26,646	.060	1774.71	3836.29
12 to 14 "	12,496	.090	1211.75	1287.64
Total - 1920	309,848	.0485	15020.50	8076.47
Total - 1917	164,941	.0490		8076.47
	LINEAL FEET	PER 100'		
5' lagging	551,650	.981	5416.32	2354.23
7' "				2.53
8' "	429,960	.804	3459.47	2544.67
Total	981,610	.8925	8875.79	4901.43
Poles	129,053	.852	1100.21	1111.73
Total - 1920	1110,663		9976.00	
Total - 1917	1074,903	.559	24996.50	6013.16
Product			174,782	253,266
Feet of timber per ton of ore			1.773	.651
Feet lagging "			5.617	3.77
" " per foot of timber			3.168	5.79
Cost per ton for timber			.0860	.0319
" lagging			.0507	.0193
" poles			.0063	.0044
" timber, lagging & poles			.1430	.0556
Equivalent of stull timber to bd.measure			497,368	381,548
Feet bd.measure per ton of ore			2.845	1.506
Total cost for timber, lagging & poles - 1920				24996.50
1917				14089.63
1916				16540.20
1915				9643.88
1914				12362.13
1913				15053.54
1912				11897.82

STEPHENSON MINE.

STEPHENSON MINE

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE

KIND	QUANTITY	AVERAGE PRICES	AMOUNT 1920	AMOUNT 1917
40% Powder - - - - -	17,650	.1707	3,014.37	3,548.14
50% " - - - - -	21,650	.1838	3,979.66	6,331.06
60% " - - - - -	2,200	.2135	469.80	310.53
80% " - - - - -				75.38
Total Powder -	41,500	.1893	7,463.83	10,265.11
Fuse - - - - -	153,700	9.13	1,404.60	1,236.26
Caps - - - - -	36,700	16.43	603.18	629.16
Cap Crimpers - - - - -	46	.372	17.14	23.15
Tamping Bags - - - - -	12,500	.301	37.65	
Total Fuse, Etc. -			2,067.57	1,888.57
Total All Explosives			9,531.40	12,153.68
Product - - - - -			174,782	253,266
Pounds Powder per ton of Ore			.243	.238
Cost per ton for Powder			.0484	.0405
" " " " Fuse, Caps, etc.			.0118	.0075
" " " " All Explosives			.0602	.0480
Avg. Price per Lb. for Powder			.1893	.1701

Mine idle from Dec. 4th, 1917, to Jan. 1st, 1920, account of being flooded with water.

C. & E. W. SECTION 29 MINE

SHIPMENTS FOR YEAR 1920.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
North Bessemer,	0	0	0	
Northwestern,	0	0	0	
Northdale,	3,256		3,256	1,965
Total,	3,256	0	3,256	1,965
Total last year,			1,965	
Increase - 66%			1,291	

C. & N.W. SECTION 29 MINE.

C. & N. W. SECTION 29 MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1920.

GRADE	IRON	PHOS.	SILICA	MANG.
Northdale,	58.99	.273	6.97	.861

(Cargoes all mixed).

ORE STATEMENT - DECEMBER 31ST, 1920.

	NORTH BESS.	NORTHDALE	TOTAL	TOTAL LAST YEAR
On hand Jan. 1st, 1920,	0	0	0	0
Output for year,	3	8,474	8,477	0
Transferred,	3	3		1,965
Total,	0	8,477	8,477	1,965
Shipments,		3,256	3,256	1,965
Balance on hand,		5,221	5,221	0
Increase in output-100%			8,477	
Increase in ore on hand-100%			5,221	
1920 - 1-8 Hour Shift for year				
1919 - Mine idle account of water				

PRINCETON MINE.

The Princeton Mine was operated on two 8-hr. shifts during January and February. On March 1st, it went on one 8-hr. shift, but ore was hoisted on two shifts. The product by months for the year was as follows: (This includes ore hoisted from both the Princeton property and G. & N. W. Lease, Section 19):

January,	13,822
February,	11,890
March,	13,836
April,	11,344
May,	12,760
June,	12,014
July,	13,438
August,	14,313
September,	14,050
October,	14,485
November,	11,496
December,	<u>13,298</u>

TOTAL, 156,746 tons.

The above table of monthly products shows that the hoist was fairly uniform throughout the year; the lowest product being obtained in April and the largest in October. In January, a number of the men were transferred to the Stephenson and a number of contracts that had worked double shift were put on single shift. Additional rock work was started in order to provide more working places, so that all the contracts could be put on single shift as soon as possible, which would release additional men for the Stephenson Mine, and at the same time improve the working conditions at the Princeton through operating on one shift. The product was further reduced in February on account of the influenza epidemic, which caused considerable loss of time during the first two weeks of the month. There has been a labor shortage at the Princeton Mine at times during the year, but it has not been as severe as at some of the other mines in the district.

For the past several months preparations have been under-way which will permit of moving a number of contracts, now producing Cambridge ore near No. 3 shaft, to No. 1 and No. 2 shaft territory, where Princeport ore will be mined. This change is being made for two reasons:

1st. The available stocking grounds for Cambridge ore are rapidly

being filled, and from the standpoint of probable ore sales, it is advisable to produce a grade which is more likely to be sold during the coming year.

2nd. It is considered desirable to decrease the number of gangs operating in No. 3 shaft territory. It is planned to open a sub-level at a lower elevation, in order to drain the water from the subs above. At the same time mining of different-sized areas will be done in order to find the approximate area which can be mined from a raise, without retimbering on the sub-level. It is hoped to get information which will later permit of a lower timbering cost on these sub-levels.

The Ore Statement for 1920 is as follows: (This includes Princeton and Section 19 ores):

	<u>PRINCEPORT</u>	<u>SEC.19 PRINCEPORT</u>	<u>CAMBRIDGE</u>	<u>SEC.19 CAMBRIDGE</u>	<u>TOTAL</u>
On hand Jan. 1st, 1920	18,952	25,995	117,102	5,040	167,089
Output for year,	<u>2,782</u>	<u>14,680</u>	<u>106,816</u>	<u>32,468</u>	<u>156,746</u>
TOTAL,	21,734	40,675	223,918	37,508	323,835
Shipments,	<u>21,579</u>	<u>40,405</u>	<u>74,168</u>	<u>17,633</u>	<u>153,785</u>
In stock Jan. 1st, 1921,	155	270	149,750	19,875	170,050

The product for 1920 decreased 36,482 tons over that of the previous year. There were 47,148 tons mined in 1920 on the C. & N. W. Lease, Section 19, and 109,598 tons on the old Princeton properties. This was a decrease of 6,685 tons on the C. & N. W. Lease, Sec. 19, as compared with the previous year, and a decrease of 29,797 tons as compared with 1919 on the old Princeton properties.

The delays during 1920 amounted to 138 hours as compared with 214 hrs. in 1919. It must be remembered that the Princeton hoist is operating near capacity so that it is virtually impossible to make up any loss in product due to accidents. In this connection it should be borne in mind that E. & A. No. 401, covering alterations to the existing equipment, and also new equipment, is intended to correct this condition, and it is expected that when the changes covered by this E. & A. are completed that better results will be obtained at the Princeton Mine.

During a part of 1919 there was a let-up in the amount of development work, which permitted an increased product. In January, 1920, when labor con-

ditions became such that it was advisable to go on single shift, it was necessary to increase the development work on the 6th level in order to provide working places for the men, as it was necessary to have more working places when the mine operated on single shift than when working on double. This extra development work has, in a large measure, been continued throughout the year. In addition to the above work, drifts have been extended on the 7th level across the Princeton property and on Section 19 to the limit of the ore body; this work was completed at the end of the year. This will permit the mining of the balance of the Section 19 ore body and has also completed considerable of the development work necessary to mine the Princeton ore body near the Section 19 boundary line. The preliminary work necessary in order to mine the pillars at No. 1 shaft has also been completed. Over 1,500 feet of the old drift connecting Nos. 1 and 2 shafts has been widened and straightened, and electric haulage installed. By the end of the year, several raises had been put up and some ore was being produced from the No. 1 shaft pillars. The development work of the past year at the Princeton Mine has been constructive in that it has made available a considerable tonnage of ore, but the real benefits of the work, however, will not be apparent in the cost per ton until later.

During the early part of the past year there were from 27 to 30 contracts working in the Princeton Mine; after the mine went on single shift, on March 1st, the number of contracts were gradually increased until they reached a maximum of 36 in December. There has been an average of three contracts repairing drifts throughout the year, and an average of 5-1/2 gangs per month working on rock. From the above it is seen that the output per man per day from the number of gangs actually engaged in the production of ore has averaged fairly high. It has not, however, been as high as it will be when the changes covered by E. A. & No. 401 have been completed.

During the past year the cave near No. 3 shaft has increased on two different occasions, when a considerable area broke down from surface, causing heavy crushing of the drifts in the ore body beneath. At two different occasions during the year it has been necessary to spend from one to two weeks retimbering in this section, at the expense of a decreased product and increased cost.

At the end of the year there was 170,050 tons of ore in stock, practically all of which was Cambridge, as compared with a total of 122,000 tons of Cambridge the previous year. The increase for 1920 of this grade of ore in stock was approximately 48,000 tons. There was, however, only 425 tons of Princeport ore in stock on December 31st, 1920, as compared with 44,947 tons a year ago. The Cambridge stocking grounds are filled, and ore is now being stocked by side-dumping on the pile. The stocking grounds to the East will be completely filled within three weeks, after which some additional ore can be stocked on the West side of these grounds. During October and November, two drill holes were put down on the West side of the stocking grounds in order to determine if this ground was safe for stocking ore. If it were safe it was planned to put up a double stocking trestle which would have permitted the ore to be stocked at a considerably lower cost than would be the case if side-dumping had to be used. Unfortunately, these holes showed that the old stopes above the 4th level had not filled with broken ground, as there was an opening fifty feet in height between the capping and the loose ground in the stope. The ground from surface down in these holes was cracked, and as there was only 86 feet of capping in one of the holes, and 105 feet in the other, it was not considered safe to use it for stocking ore. As a result, it has been necessary to stock all Cambridge ore by side-dumping on the stockpile. At the present rate of hoisting, the Cambridge stocking grounds will be entirely filled by the time shipping starts in the spring of 1921.

The ore in sight at the Princeton Mine on Dec. 31st, 1920 is as follows:

<u>PRINCETON MINE - SECTION 20:</u>	<u>PRINCEPORT</u>	<u>CAMBRIDGE</u>	<u>TOTAL</u>
Ore above 2nd level,	2,552		2,552
Ore above 4th level,		78,325	78,325
Ore above 5th level,	20,000	63,111	83,111
Ore above 6th level,	<u>52,448</u>	<u>473,142</u>	<u>525,590</u>
Total developed ore, Section 20,	75,000	614,578	689,578
Prospective ore below 6th level,	20,000	432,763	<u>452,763</u>
Grand Total Ore, Section 20,			1,142,341
<u>PRINCETON MINE - SECTION 18:</u>			
Shaft pillars,	17,222	34,446	<u>51,668</u>
Grand Total Princeton Mine Sections 20 and 18,			1,194,009

Estimated tonnage in Mine, sub-divided as required by Tax Commission:

Non-Bessemer Ore:

Developed	Sec. 20-	1. Princeport,	75,000
		2. Cambridge,	614,578
Developed	Sec. 18-	1. Princeport,	17,222
		2. Cambridge,	34,446
Prospective	Sec. 20-	1. Princeport,	20,000
		2. Cambridge,	<u>432,763</u>
TOTAL,			1,194,009

The above estimate does not include the ore on C. & N. W. Lease, Section 19. For the first time it has been possible to make an estimate of probable ore below the 6th level, which is based on the drill holes in this territory in conjunction with the actual floor area of the ore body on 6th level. All the ore between the 5th and 6th levels is now developed ore, whereas in the previous year it was estimated that there was approximately 100,000 tons of prospective ore in this territory. The total developed and prospective ore shows an increase of 306,884 tons over that of the previous year. This estimate, however, is still under the figures used by the State Tax Commission.

There was a large decrease in the output of Princeport ore in 1920 as compared with 1919. It is expected, however, that in the coming year the output of Princeport ore will show a material increase due to mining operations in the vicinity of No. 1 shaft and also in the pillars above the 6th level to the West of No. 2 shaft.

Mining operations for 1920 were largely confined to No. 3 shaft territory, where practically all the ore was of Cambridge grade. The rock work during 1920 was confined to the 5th, 6th and 7th levels. During 1920, work was carried on in the following territories:

SUBS ABOVE 5TH LEVEL
 5TH LEVEL
 SUBS BELOW 5TH LEVEL
 6TH LEVEL
 7TH LEVEL

The work in detail for the year was as follows:

SUBS ABOVE 5TH LEVEL.

272-FT. SUB:

This sub-level was opened in January, 1919, and mining was completed in January, 1920.

282-FT. SUB:

This sub level was opened in July, 1919, and mining completed in February, 1920. However, there is a portion of this sub-level which is now being mined from the main 5th level, as the ore did not have sufficient thickness in this territory to warrant opening a sub-level.

All the ore obtained from these two sub-levels was of Cambridge grade.

FIFTH LEVEL.

There were eleven contracts working on the 5th level in No. 3 shaft territory during the first three months of the year. This number gradually decreased so that there were only four working at the end of December. For eight months of the year there was one gang working on rock, driving drifts in the foot-wall in order to provide for bringing timber into the contracts. There was a total of 350 feet of rock drifting done here during 1920. Approximately 95% of the ore on the 5th level in No. 3 shaft territory had been mined by the end of 1920. The ore has also been removed along the foot towards No. 2 shaft to a point almost exactly midway between No. 2 and No. 3 shafts. There is approximately 600 feet of ore left along the 5th level on the foot-wall towards No. 2 shaft, but it is very narrow, running from 15 feet in width at the North end, near No. 2 shaft, to a width of 30 feet at the present limits of mining near No. 3 shaft.

1ST SUB BELOW 5TH LEVEL.

This sub-level was opened in 1920, when three contracts dropped down from the main level. The number of gangs working here gradually increased to fourteen during the latter months of the year. About 75% of the main ore body near No. 3 shaft has been mined. Mining of the ore along the foot-wall towards No. 2 shaft had also been completed for a length of 500 feet along the foot-wall. The area remaining to be mined lies to the South of No. 3 shaft along the foot-wall, where mining is still in progress on the 5th level. All the ore produced here has been plastic and of Cambridge grade. Directly

opposite No. 3 shaft mining has been completed near the hanging and a new sub-level will soon be opened here. It is expected that when the hanging caves, due to mining on the next lower sub, that considerable water, which now causes trouble in handling the ore, will drain away and improve mining conditions on the sub above.

2ND SUB BELOW 5TH LEVEL.

In November, 1920, two gangs dropped down from the 1st sub below the 5th to the 2nd, and started to open out from raises. At the end of the year 175 feet of drifting had been done here, in connecting raises and driving drifts back to the footwall to make connections for bringing in timber.

4TH SUB BELOW 5TH LEVEL.

A small area North and West of No. 2 shaft near the Section 19 boundary line was mined out during the past year. No further mining is being done at this particular point at this time, as the main 6th level haulage drift to No. 1 shaft passes through this territory, and the ore here must be left as a pillar until the ore is removed from No. 1 shaft.

SIXTH LEVEL.

Considerable rock work was done during 1920 developing the 6th level in the vicinity of No. 3 shaft; the hanging wall drift was continued and connections were made through cross-cuts to the foot-wall drift. The foot-wall drift South and West of No. 3 shaft was also extended until the ore was reached and the ore was then followed until it pinched out. There was a total of 605 feet of rock drifting on the 6th level in this territory, and 140 feet of ore drifting, or a grand total of 745 feet. During the year there has been twelve raises put up from the 6th to the 5th level in this territory, one of which was not quite completed at the end of the year. Some additional raises will be required in this territory later on, but as the number of gangs working here are now being decreased, these raises will not be needed until later. Two additional cross-cuts remain to be driven to completely develop the 6th level at this end of the ore body. At some future time, it is also planned to continue the drift along the contact South and West of No. 3 shaft, as there is a possibility of additional ore being discovered in this territory. No. 24 drill

hole shows ore at a lower elevation, and it is possible that the ore has merely pinched out in the breast of the drift along the contact, and at some point further on it will again widen out.

On the 6th level, near the Section 19 boundary line, there has been about 180 feet of drifting in ore in order to reach the hanging of the ore body on Section 19. Two of these drifts crushed soon after they were driven, and a third one was then driven which, by retimbering and propping, has been kept open. There is a considerable amount of water passing through this drift that comes from the hanging of the Section 19 ore body.

SEVENTH LEVEL.

On January 1st, 1920, the 7th level had been developed for a distance of 400 feet, from the shaft. A run-a-round had been driven at the shaft so as to permit of handling cars to the best advantage. In addition to the above, ground had been removed for a pump house, a permanent pumping plant installed, and also a sump, of sufficient capacity to permit of pumping all Princeton Mine water on day shift. During 1920 the main haulage drift on 7th level was extended a distance of 630 feet at which point it passed over on C. & N. W. Lease, Sec. 19 property. There were also two cross-cuts turned off, one of which advanced 65 feet, at which point it passed on to Section 19; the other cross-cut was driven in a distance of 16 feet. Near the point where the haulage drift turned to go towards the Section 19 property, it was made double width and a double track installed for a distance of 80 feet. Opposite this point on the foot-wall side, a room was cut 15 feet square, from which point a raise was put up on a 45° angle, to the 6th level. This raise has since been used for bringing timber to the 7th level. All the timber needed for the mining of the ore body on Section 19 below the 6th level will be handled through this raise, as it will not be possible to complete the rock drift from No. 2 to No. 3 shaft and make a connection with No. 3 shaft before this ore will have been mined.

It is expected that an order will be placed in a short time for a rotary dump for the 7th level, and also twenty cars. This will provide equipment for handling ore from the Section 19 ore body and for the development

of the 7th level on Section 20. A ditch has been constructed the greater part of the distance from the Section 19 property back to No. 2 shaft in order to handle the water which will soon come from No. 1 shaft territory on this level. Electric haulage tracks and trolley have also been installed on this level in anticipation of motor haulage, which will go into commission as soon as the equipment for handling ore is installed.

NO. 1 SHAFT TERRITORY.

The bottom of No. 1 shaft was used as a pump station, and the drift towards No. 2 shaft as a sump until in the latter part of 1919, when the new pumping plant at No. 2 shaft went into commission. The water coming in at No. 1 shaft and from the old workings adjacent to it has since been pumped over to No. 2 shaft, as the original drift from No. 1 to No. 2 had been driven up-grade from No. 1. It has been necessary to pump this water over a rise of approximately 13 feet. Early in 1920, the work of cleaning up this old drift and increasing its size so that electric haulage could be installed, was started, and completed over to No. 1 shaft in November. There was 1530 feet of this drift over-hauled during 1920. In addition to widening and raising the back of this drift, several bad curves were straightened out, and the mud which had accumulated when this drift was used for a sump was also cleaned out. Electric haulage has been installed over to No. 1 shaft, and in the latter part of the year raises were put up. At the end of December two gangs were already drifting in the shaft pillars, and two gangs were raising, one of which had reached the ore and one was still working in rock.

In order to mine all the pillars it will be necessary to continue the footwall drift beyond No. 1 shaft a distance of approximately 500 feet, and to put up eight raises. It is planned to push this work to an early completion in order that more gangs may be transferred from No. 3 shaft over to this territory. When this rock work is completed, it will be possible to work twelve gangs here.

In addition to the above outlined work, the two electric pumps at No. 1 shaft were moved to surface. A 4" air line has been installed from No. 2 over to No. 1 shaft, and a 3" discharge line from No. 1 the greater part of the

distance over to No. 2.

The ore in these shaft pillars is semi-plastic, and it is estimated that one-third of it is of Princeport grade and two-thirds Cambridge. However, the gangs now working here have thus far encountered only Princeport ore, so that it is hoped the greater part of it will prove to be Princeport. The completion of mining work near No. 1 shaft will permit of concentrating mining on Section 20. At the present time mining operations are being conducted on three Sections over a territory over three-fourths of a mile long. The hoisting shaft, however, is located midway between the two ends, the extreme limits of the workings at each end being approximately three-eighths of a mile away.

C. & N. W. LEASE - SECTION 19.

The Ore Statement for the year 1920 is as follows:

	<u>SECTION 19 PRINCEPORT</u>	<u>SECTION 19 CAMBRIDGE</u>	<u>TOTAL</u>
On Hand January 1st, 1920,	25,995	5,040	31,035
Output for Year,	<u>14,680</u>	<u>32,468</u>	<u>47,148</u>
TOTAL,	40,675	37,508	78,183
Shipments,	<u>40,405</u>	<u>17,633</u>	<u>58,038</u>
In Stock January 1st, 1921,	270	19,875	20,145

The estimate of ore in sight on December 31st, 1920, was 125,303 tons as compared with 72,400 tons a year ago. The increase is 52,903 tons, to which must be added the hoist of 1920, or 47,148 tons, making a total of 100,051 tons developed on this lease during the past year. The ore body is much larger than was indicated by the surface drilling. The original estimate from the diamond drill holes showed 108,000 tons of ore. This figure was in reality only about one-half the actual tonnage on the lease.

The estimate of ore in sight on December 31st, 1920, was as follows:

Non-Bessemer:

Developed	1. Sec. 19 Princeport,	10,000
	2. Sec. 19 Cambridge,	63,665
Prospective	1. Princeport,	5,000
	2. Cambridge,	<u>46,638</u>
TOTAL,		125,303

The work on Section 19 during 1920 has been confined to the 1st, 2nd and 3rd subs above the 6th, to the 6th level, and to the 7th level.

Mining was completed on the 3rd sub above the 6th early in the year. The area of this sub-level was considerably larger than had been anticipated from the drill holes, due to the hanging flattening more rapidly than the foot-wall.

On the 2nd sub above the 6th level, about 60% of the ore was mined out in 1919. Mining of the balance of this ore was completed during 1920. On Section 19, the ore has, therefore, been mined out down to the back of the 1st sub

above the 6th, or approximately within 20 feet of the floor of the 6th level.

The latter part of the year the development of the 1st sub above the 6th was started and an area approximately 70 x 150 feet in size mined out by the end of the year. The ore body on this level has an approximate length of 400 feet and an average width of 140 feet. It has been necessary to leave a pillar near the foot-wall on this sub-level in order to protect the haulage drift going to No. 1 shaft. This temporarily decreased the product from Section 19 during the latter months of the year. At the end of the year there were four gangs drifting and mining on this sub-level.

On the 6th level, a drift was driven during 1920 a distance of 280 feet following the hanging. It was expected that this drift would assist in draining the water so as to make mining operations more desirable on the 1st sub above the 6th. It has proven more successful than was anticipated; in fact, there was so much water coming in that it has been very hard to keep the drift open. The last of the year two short raises were put up under the hanging to the elevation of the 1st sub, which has resulted in concentrating the water and drying up the greater part of the drift along the hanging. It is planned to continue this drift the entire length of the ore body, due to the advantage gained in draining the water from the ore.

The main 7th level haulage drift from No. 2 shaft was extended a distance of 555 feet on Section 19 property during 1920. This is as far as it is considered that this drift will have to be carried in order to mine all the ore on this lease. In December, a raise was started near the breast of this drift, which will be put up to the elevation of the 6th level and a cross-cut driven from the top over to the 6th level drift to No. 1 shaft. The water now being pumped from No. 1 shaft over to a point near No. 2 will be taken down through this raise to the 7th level. This will materially decrease the head required in pumping this water, and will also decrease the water running through the ditches on the 6th level.

The plan of development of the 7th level on Section 19 calls for three cross-cuts from the main haulage drift; all three of these cross-cuts have already been turned off and a total length of 110 feet of drifting done. There is

approximately 320 feet of rock drifting necessary to complete the cross-cuts. This is an estimated figure, however, as it will be necessary to put up a number of raises in order to determine the actual limits of the ore body. It will be recalled that the Section 19 ore body pinches out at some point between the 6th and 7th levels, which point is, however, yet undetermined. All of the raises for mining the ore below the 6th level have yet to be put up. It is expected that all development work on 7th level, Section 19, will be completed during the coming year.

PRINCETON SURFACE

Aside from the new construction work authorized by E. & A. No. 401, there has been comparatively little surface work during the past year.

The loading tracks to the Chicago & North-Western pocket were completed in the spring. Material for these tracks had been delivered in the fall of 1919, but the work had not been completed on account of freezing weather. Owing to the agreement effective in May, 1919, it has not been necessary to ship ore from C. & N. W. Lease, Sec. 19 by loading through this new railroad pocket.

During the past summer all Princeport ore was loaded in railroad cars through the Chicago & North-Western pocket.

A large part of the old Princeton coal dock was torn down in the spring of 1920. This part of the dock had not been used since the change from steam to electric power was made, and it was considered dangerous due to the rotting of the timber.

In October, it was decided to drill a hole on Section 20, West of the present stocking ground, to determine if this ground was safe for stocking ore. Some ore had been mined above the 4th level in this territory, and before using this ground it was considered advisable to find how far the cave had extended above the old workings.

HOLE NO. 48:

The first hole, known as No. 48, was started in October, and completed in November. The log of the hole is as follows:

0 to 4 - Sand and broken ledge
4 to 86 - Jasper
Cave at 86-
Open space in cave - 54 ft.

The ground encountered in drilling this hole was broken, and although it was cemented several times, it was not possible to get the water used in the drill hole to return to surface. As a result of the drilling, it was considered that the ground in the immediate vicinity of this hole was not safe to be used for stocking ore. It was then decided to drill another hole nearer the mine to determine if all the ground over the old stopes was dangerous. The log of the

second hole (No. 49) is as follows:

HOLE NO. 49:

0 to 6 - Sand and gravel
6 to 105 - Jasper
Cave at 105
Open space in cave - 50 ft.

This hole also indicated that it would be unsafe to use this ground for stocking ore, but that there was comparatively little danger of the cave extending through to surface in the immediate future. It had been hoped that this ground could be used, as it would have permitted the erection of a double stocking trestle parallel with the present pile, from which ore could have been stocked at a very much lower cost than is possible under the present method of side-dumping from the pile.

When the fire occurred at the Central Power Plant on the 28th of May, a considerable quantity of lagging, both 5-ft. and 8-ft., also some mining timber in stock at No. 3 timber yard was destroyed. The ground in No. 3 timber yard was levelled off during the summer, so as to permit of stocking timber to better advantage.

The Princeport stocking trestle was torn down in the summer, and practically all ore of this grade shipped. Under the new improvements authorized by E. & A. No. 401, a double stocking trestle was erected here in December, 1920.

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E. & A. NO. 401.

This E. & A. covers certain improvements in equipment which, it is expected, will lower the cost of production. It also covers the removal of the present engine house, which will render available for mining a considerable quantity of ore which it is now impossible to mine, due to danger of a cave extending through to surface and wrecking the engine house. The work on surface consists in the erection of a new engine house, raising the shaft house, building new loading pocket at the shaft and changing trestles and top tram equipment. This new construction work was started in the fall and by the end of the year the new engine house had been practically completed; one new trestle had been erected and also the work of building the new pocket at the shaft was about 50% completed.

It is planned to install a new hoist in the new engine house, and when this work is completed, to close the mine down for from one to two weeks while the shaft house is being raised and the new chutes built for handling the ore from skip to landing floor. It is planned to operate two skips in balance instead of skip and cage, as is now being done. This will permit of more rapid hoisting of ore and an increased product if desired; it is also expected that it will be possible to hoist the present tonnage on day shift which will cut off the expense of hoisting on night shift. With the present hoisting equipment it is not possible to make up for any delays due to accidents during the day. The new arrangement will permit of making up any short delays that may occur during the day.

It is expected that the order for the underground rotary dump and other equipment in connection with this E. & A., will be placed shortly, and that it will be in commission by the first of May.

PRINCETON MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1920.

GRADE	IRON	PHOS.	SILICA	MANG.
Princeport,	60.87	.262	4.17	.706
Cambridge,	60.28	.854	3.68	1.097

(Cargoes all mixed)

ORE STATEMENT - DECEMBER 31ST, 1920.

	PRINCE- PORT.	CAMBRIDGE SEC. 19.	CAMBRIDGE	PRINCE- PORT SEC.19.	TOTAL	TOTAL LAST YEAR
On hand Jan.1, 1920,	18952	5040	117102	25995	167089	85478
Output for year,	2782	32468	106816	14680	157746	193228
<i>Manufactured,</i>						
Total,	21734	37508	223918	40675	323835	278706
Shipments,	21579	17602	74023	40405	153609	111617
Balance on hand,	155	19906	149895	270	170226	167089
Decrease in output-13%					35482	
Increase in ore on hand-1%					3137	
1920 - 2-8 Hour Shifts Jan. 1st to May 1st, 1920						
1-8 " " May 1st to Dec. 31st, 1920						
1919 - 2-8 " " for year.						

MADE IN U.S.A.
Princeton Mine
PRINCETON MINE

SHIPMENTS FOR YEAR - 1920.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Princeport,	2,049	19,530	21,579	8,777
Princeport Sec. 19,	6,424	33,981	40,405	6,528
Cambridge Sec, 19,	14,135	3,467	17,602	21,332
Cambridge,	45,279	28,744	74,023	74,980
Total,	67,887	85,722	153,609	111,617
Total last year,			111,617	
Increase in shipments,			41,992	

PRINCETON MINE.

PRINCETON MINE.

COMPARATIVE MINING COST FOR YEAR.

	1 9 2 0.	1 9 1 9.	INCREASE.	DECREASE.
PRODUCT	156,746	193,228		36,482
General Expense	.238	.195	.043	
Maintenance	.324	.202	.122	
Mining Expense	2.309	2.034	.275	
Cost of Production	2.871	2.431	.440	
Exploratory		.047		.047
<u>DEPRECIATION.</u>				
Original Purchase	.248	.256		.008
Plant		.035		.035
Construction	.039	.040		.001
Total Depreciation	.287	.331		.044
Taxes	.154	.070	.084	
Central Office	.097	.074	.023	
Supply Inventory		.008		.008
Miscellaneous	.034	.021	.013	
Fire Loss	.038		.038	
Sundry Expense	.032	.007	.025	
Cost on Stockpile	3.513	2.989	.524	
Loading & Shipping	.114	.054	.060	
Cost on Cars	3.627	3.043	.584	
No. Days Operating	303	295	8	
No. Shifts and Hours	2-8hr-26 1-8hr-277	2-8hr		
Avg. Daily Product	517	655		138
<u>COST OF PRODUCTION.</u>				
Labor	2.097	1.790	.307	
Supplies	.774	.641	.133	
Total	2.871	2.431	.440	

Mine not producing in 1917.

PRINCETON MINE
COMPARATIVE WAGES AND PRODUCT

	1920	1919	INCREASE	DECREASE
PRODUCT	156,746	193,288		36,482
No. Shifts and Hours	2-8hr26 1-8-277	2-8hr		
AVERAGE NO. MEN WORKING				
Surface	41	35	6	
Underground	126	162		36
Total	167	197		30
AVERAGE WAGES PER DAY				
Surface	5.44	4.69	.75-16%	
Underground	6.48	5.94	.54- 9%	
Total	6.22	5.72	.50-8.7%	
WAGES PER MONTH OF 25 DAYS				
Surface	136.00	117.25	18.75	
Underground	162.00	148.50	13.50	
Total	155.50	143.00	12.50	
PRODUCT PER MAN PER DAY				
Surface	12.28	18.70	6.42	6.42
Underground	4.05	3.99	6	
Total	3.04	3.29		.25
LABOR COST PER TON				
Surface	.443	.251	.092	
Underground	1.601	1.491	.110	
Total	2.044	1.742	.202	
AVG. PRODUCT BRK'G & TRM'G	7.45	6.37	1.08	
" WAGES CONTRACT MINERS	6.98	6.23	.75	
" TOTAL " TRAMMERS				
" TOTAL " LABOR	6.98	6.23	.75	
TOTAL NUMBER OF DAYS				
Surface	12,767 $\frac{1}{2}$	10,336	3,431 $\frac{1}{2}$	
Underground	38,724 $\frac{3}{4}$	48,479 $\frac{3}{4}$		9,755
Total	51,492 $\frac{1}{4}$	58,815 $\frac{3}{4}$		6,323 $\frac{1}{2}$
AMOUNT FOR LABOR				
Surface	69417.87	48501.14	20916.73	20916.73
Underground	251048.31	288020.78		36972.47
Total	320466.18	336521.92		16055.74

Proportion Surface to Underground Men:

1920 - 1 to 3.1
 1919 - 1 to 4.63
 1918 - 1 to 3.48
 1917 - 1 to 1. not producing
 1916 - 1 to 1.29 " "

PRINCETON MINE

TIMBER STATEMENT FOR THE YEAR ENDING DECEMBER 31, 1920.

KIND	LINEAL FEET	AVG. PRICE PER FOOT	AMOUNT	AMOUNT
			1 9 2 0	1 9 1 9
4" to 6" Timber	7,241	.0208	150.84	8.96
6 to 8 "	75,558	.0356	2693.41	2480.10
8 to 10 "	76,250	.0818	6240.38	3693.69
10 to 12 "	31,679	.1063	3367.84	3395.05
12 to 14 "	9,163	.1336	1224.49	905.92
14 to 16 "	1,970	.1492	293.99	
16 to 18 "	116	.21	24.36	
Total	201,977	.0692	13995.31	10483.72
	LINEAL FEET	PER 100'		
5' Lagging	538,050	.9505	5113.98	5079.66
5½' "				203.85
8' "	336,912	.8126	2735.59	3138.71
Total	874,962	.897	7849.57	8422.22
Poles	82,855	1.224	1014.32	184.81
Total - 1920	957,817	.925	8864.00	
Total - 1919	1037,761	.8302	8607.03	
Product			156,746	193,228
Feet timber per ton of ore			1.28	1.02
" lagging "			5.58	5.29
" " per foot of timber			4.33	5.17
Cost per ton for timber			.089	.054
" lagging			.050	.044
" poles			.006	.001
" timber, lagging & poles			.145	.099
Equivalent of stull timber to bd. measure			356,853	314,545
Total cost for timber, lagging & Poles - 1920				22859.31
1919				19090.75

PRINCETON MINE

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE

KIND	QUANTITY	AVERAGE PRICE	AMOUNT 1920	AMOUNT 1919
40% Powder - - - - -	22,900	.17336	3,929.99	4,321.05
50% " - - - - -	10,400	.18884	1,963.93	3,120.55
60% " - - - - -	1,650	.21261	350.85	258.21
Total Powder - -	34,950	.1786	6,244.77	7,699.81
Fuse - - - - -	127,000	8.293	1,053.24	1,091.13
Caps - - - - -	32,600	14.80	481.55	546.14
Cap Crimpers - - - - -	25	.3476	8.69	7.25
Tamping Bags - - - - -	2,500	.22	5.50	13.59
Total Fuse, Etc.-			1,548.98	1,658.11
Total All Explosives			7,793.75	9,357.92
Product - - - - -			156,746	193,228
Pounds Powder per Ton of Ore			.2102	.229
Cost per Ton for Powder			.0398	.040
" " " " Fuse, Caps, etc.			.0099	.008
" " " " All Explosives			.0497	.048
Avg. Price per Lb. for Powder			.1786	.174

PRINCETON MINE

GWINN MINE

The Gwinn Mine was operated on one 8-hr. shift during the year 1920.

The product by months for the year was as follows:

January,	10,710 tons
February,	8,718
March,	10,104
April,	7,343
May,	8,797
June,	7,702
July,	6,992
August,	6,291
September,	7,315
October,	7,538
November,	7,102
December,	<u>7,983</u>

TOTAL, 96,595 tons.

The product by grades for the year was as follows:

Bessemer,	166 tons
Gwinport,	<u>96,429</u> "

TOTAL ORE, 96,595 tons.

Rock, 19,839 "

TOTAL ORE AND ROCK, 116,434 "

In 1919 there was 137,847 tons of ore produced, the decrease in 1920 amounts to 41,252 tons. The decrease was principally due to a shortage of miners throughout the year. The product was decreased for a couple of months in the summer on account of a shortage of working places in ore. The product showed a gradual decrease during the spring months and reached its lowest point in August, after which it showed a gradual increase to the end of the year.

The shortage of miners seriously interfered with the output of the mine. The number of contracts employed dropped from 23 in January to 16 in August. At the end of the year it had risen to 24; the largest increase occurred in December after the closing of the Gardner-Mackinaw Mine, which released a large number of men. Due to the small output, the cost of the product had shown a considerable increase over that of the previous year.

Development work on the 11th level was about 75% completed by the end of the year, and the drift from the Gwinn to Francis Mine, to provide ventilation and a second outlet, was about 80% completed. During part of the year, the

proportion of men employed on rock to ore was very high, as there were thirteen gangs working on ore on single shift, and three gangs on rock, two of which were on double shift. At the end of the year, the extraordinary development work which has been necessary at the Gwinn Mine since it was opened, had been largely completed. The program of sinking and developing new levels and conducting mining operations on alternate levels has always made it necessary to do twice as much development work at this property as is required at the other properties operated by the company. The bottom of the deposit has now been reached, or at least the bottom as indicated by diamond drilling, and with the development of the 11th level, which, as stated before, is now 75% completed, the balance of ore to be mined will be obtained with very little development work. It is, therefore, possible to expect a lower cost of production at this property from now on.

In October, an attempt was made to produce some Bessemer ore, but it did not grade low enough in Phosphorus, and was shipped as "Gwinn Ore". There were only two contracts which showed ore low enough for Bessemer grade, and this continued for only about a week.

The last of the year, the ore produced showed an increase in content of Sulphur - the weekly output running over .1%. Analyses were made of all contracts in the mine in order to locate the Sulphur, which showed that it was all coming from one contract mining on a sub-level between the 9th and 10th levels. It is planned to thoroughly sample the ore on this sub level, and abandon mining in the territory where the Sulphur is too high. Individual samples taken of the ore here for the last few days of the year showed some ore running as high as 1% in Sulphur. There is evidently a concentration of Sulphur at this point, the reason for which is unknown. There is a flattening of the foot-wall at this point, which may account for the concentration. This particular ore body lies North-East of the shaft in the line of the North and South fold, and it is not expected that the area effected will contain, at the outside, over 2,000 or 3,000 tons of ore.

Auger drill machines have been used exclusively on all ore below the 8th level during the past year, as the deposit is much softer at depth; at one place on the 11th level a raise was lost due to a run of ore.

The ore statement for 1920 is given below:

	<u>GWINN BESSEMER</u>	<u>GWINN</u>	<u>GWINNPORT</u>	<u>TOTAL</u>
On hand Jan. 1st, 1920	0	0	116,352	116,352
Output for year,	166		96,429	96,595
Transfer,	166	166		
TOTAL,	0	166	212,781	212,947
Shipments,	0	166	196,767	196,933
In stock Jan. 1st, 1921,	0	0	16,014	16,014

An accurate estimate was made of the balance of ore in stock in November, which showed that there were approximately 18,000 tons over-run in the stock-pile on surface.

The ore in sight at the Gwinn Mine on December 31st, 1920, was 783,495 tons; this is a decrease of approximately 73,325 tons over the amount of ore shown a year ago. During the past year there were only 23,270 tons developed.

The estimate of ore in sight is as follows:

	<u>GWINNPORT</u>	<u>GWINNWOOD</u>	<u>TOTAL</u>
Ore above 5th Level,	25,258		25,258
" " 6th "	171,002		171,002
" " 7th "	21,617		21,617
" " 8th "	116,220		116,220
" " 9th "	105,915		105,915
" " 10th "	162,310		162,310
Total Developed Ore,	602,322		602,322
Prospective Ore above 11th level,	120,782	60,391	181,173
GRAND TOTAL,	723,104	60,391	783,495

Estimated tonnage in Mine, sub-divided as required by the Tax Commission:

Non-Bessemer:		
Developed, 1. Gwinnport,	602,322	
Prospective 1. Gwinnport,	120,782	
2. Gwinnwood,	60,391	
TOTAL,	783,495	

During 1920 work was carried on in the following territories:

FIFTH LEVEL
SEVENTH LEVEL
SUBS ABOVE EIGHT LEVEL
SUBS BELOW EIGHT LEVEL
NINTH LEVEL
SUBS BELOW NINTH LEVEL
TENTH LEVEL
ELEVENTH LEVEL.

From the above it will be observed that work has been done at a number of different points in the Gwinn Mine. The area of the ore body from the 9th level down is small, and it is, therefore, necessary to conduct work on a number of levels in order to maintain the product. The work in detail for the year was as follows:

FOURTH LEVEL.

This level has been kept open during 1920 in order to permit of making monthly examinations of the caving ground in the stopes. There has been no falls of ground of any consequence during the past year. Examinations will be continued at least every two weeks during the next several months while mining is under-way on the 5th, in order to determine if this mining work is causing an extension of the cave.

FIFTH LEVEL.

When the number of working places in the mine decreased so that it was no longer possible to maintain a product of even 300 tons per day, it was decided to mine out the sill floor of the 5th level. The ore body is narrow at this point, between the foot and hanging, and it was not considered that the removal of this ore would, in any way, endanger the mine. It would provide working places for at least three gangs of miners, and would permit of maintaining a product above 300 tons during the time that it would require to open the 11th level, and start mining on the sub levels above. In August, the work of installing electric haulage wire on the 6th level was started, also retimbering of the haulage drift on 6th and 5th levels. By the end of September this work had been completed and three gangs were engaged in mining ore. Three gangs have worked here during the balance of the year. Mining was started by two of the gangs near the West end of the ore body, and the other gang started working about in the middle of the deposit. The product obtained here will assist in keeping up the output of the mine over a considerable period of time.

SEVENTH LEVEL.

At the first of the year there were three gangs mining the pillars left between the old square set rooms on the 7th level. During 1919 they had mined these pillars down to the sill floor of the 7th, and had started mining

on the 7th, the last of 1919. Three gangs worked here until the last of May, at which time the mining of two pillars was finished. One gang finished mining the last pillar in September. This completed the mining of all the ore between the 7th and 6th levels, except a small amount in the shaft pillar.

SUBS ABOVE EIGHT LEVEL.

A considerable amount of ore has been produced from these sub-levels during the past year. The work on the 4th sub, which had been opened in September, 1918, was completed in May, 1920, one gang having worked here five months in 1920. Mining was practically completed on the 3rd sub above the eight in 1920, only one gang working here in December, 1920. There was one gang working on the 2nd sub above the 8th, on the first of the year, and at the end of the year, there were three. The deposit here has proven considerably larger than was anticipated. It will be remembered that mining operations on these sub-levels is being conducted in an isolated body of ore lying between the 7th and 8th levels. Between the 2nd and 4th subs, the deposit is very flat, which accounts for the increased area of the ore body over that originally thought to be in this territory. The greater part of all the ore on these sub-levels had been removed by the end of the year; there will, however, be work for several gangs here for a part of 1921.

SUBS BELOW EIGHT LEVEL.

1ST SUB BELOW EIGHT:

In January, there were three gangs working on this sub-level completing the mining of the ore above the flat foot wall near the center of the main 8th level ore body. The number of gangs employed here gradually decreased to one in April, and mining was completed at this elevation in August. The only ore left on this sub-level is in the shaft pillars.

3RD SUB BELOW EIGHT:

This sub-level was opened at the North-east end of the deposit, in February, and mining has been continued here by one contract during the year. There has evidently been a roll in the foot-wall at this point, which made quite a large flat area. The ore was found to extend much further to the North than had been indicated by mining operations on the 2nd sub below the 8th.

A considerable area was stoped out here during the year, and quite a quantity of ore produced. In December, it was noted that the Sulphur content of the ore being stocked had risen to nearly double the normal Sulphur in the product. Analyses were made for Sulphur in all the contracts, and it was found that the Sulphur was coming entirely from this contract. It is planned to thoroughly sample the ore body here, and abandon that portion which runs high in Sulphur. Some individual samples taken here show over 1% Sulphur. It is, however, expected that the area carrying the high Sulphur will be found to be limited in extent, so that it will not be necessary to entirely abandon this sub-level.

NINTH LEVEL.

At the first of the year there were three gangs mining pillars under the hanging on the 9th level. During the first week of August, work on the available pillars on the 9th level was completed. There is still a small pillar left near the old winze from 9th to 10th level, which will be mined later.

1ST SUB BELOW NINTH LEVEL.

During the early part of the year there were three gangs mining on this sub-level; later in the year, due to the shortage of miners, there were only two. However, in December, when men became more abundant, a third gang worked here. In 1919, approximately one-quarter of the ore on this sub was mined; at the end of 1920 approximately one-quarter of the sub-level remained. Work will be completed on this sub in about four months.

2ND SUB BELOW NINTH LEVEL.

Mining was started on this sub-level in October, 1919, and in January, 1920, there were two gangs working here. This number gradually increased, until there were five in the month of April; as mining was completed, however, the number of gangs employed here decreased, so that there were only two working at the end of the year. Approximately 33-1/3% of the ore on this sub level was mined during 1920. It has been fully developed, and a timber road has been driven to permit of timber being brought in for mining the entire sub-level.

3RD SUB LEVEL BELOW NINTH.

This sub level was opened in May, and at the end of the year there were three gangs mining here. There was approximately 20% of this sub level mined at the end of the year.

5TH SUB LEVEL BELOW NINTH

Some exploratory work has been done under the hanging on this sub-level. A raise was put up in February, and a drift driven across the hanging over towards the ore body. Owing to the shortage of men, work was stopped, and resumed again in October. At the end of the year the ore had been followed under the hanging to the South for a distance of approximately 100 feet. This development work has been done to the South of the territory where mining is in progress on the subs above. It indicates a probable local lengthening of the deposit at this elevation, and may result in additional ore being found here. It is planned to continue drifting here until the South limits of the ore body are reached.

TENTH LEVEL

Aside from the drift from the Gwinn to Francis Mine, there has been comparatively little work done on the 10th level during the past year. One raise was put up from the 10th to the 2nd sub below the 9th, and one raise from the 10th up to the 5th sub below the 9th. At the last of the year a raise from the 11th level holed through to the 9th, near the hanging, and during December, a drift was driven from the top of this raise to the South-east following the hanging.

The drift from the Gwinn to the Francis Mine was started the last of April from the end of the old 10th level drift, about ten feet West of the Wadsworth boundary line. The drift had been driven in a South-easterly direction across the Wadsworth lands a distance of 1205 feet up to the end of December, 1920. The breast of this drift is now 284 feet from the breast of the drift from the Francis Mine. It is planned to continue the drift for the first fifteen days of January, after which a raise will be started. There is a difference in the elevation of approximately 120 feet between the two drifts. The balance of drifting necessary to reach the top of the raise will be done by the Francis Mine. The connection should be made early in March. This drift has been driven on double shift; for several months, while the 11th level was being developed on

double shift, the rock from the 10th and 11th level drifts was hoisted on night shift. When the 11th level drift went on single shift, sufficient motor cars were transferred to the 10th level, so that they could be filled during the night and hoisted on day shift. Two miners and one motorman have worked on night shift on the 11th level since hoisting was discontinued.

ELEVENTH LEVEL.

Work on the 11th level proper was started the first of February, by which time new hoisting ropes had been put on, and all work in the shaft completed. Good progress was made during February, March and April, but in May, black chert was encountered in the drift, and slow progress was made until this material had been passed through. A small amount of chert was found on the 10th level, but on the 11th, owing to the flattening of the foot-wall, it extended for over 200 feet in the drift. At some points the ground was so hard that it required one and one-half shifts, with two No. 248 Leyner drill machines, to drill a round of holes. This retarded the development of the level, and also increased the cost. As the location for the various raises were reached, they were started, and timber installed. At the end of the year the drift had advanced a distance of 1040 feet from the shaft, and ten raises had been started. Of these raises, one had to be put through to the 10th level, and two had to be put up to the top of the ore body about 85 feet above the 11th level. At the end of the year, two other raises were being put up, one of which had just encountered the ore. A drift was driven from the top of one of these raises a distance of 80 feet to the footwall, at the elevation of the 4th sub below the 10th level. An incline raise was put up from this drift to the 10th level, to be used for bringing timber to this sub-level. It is planned to open this sub-level under the hanging, and start mining operations. Indications are that the ore body at this elevation will be comparatively small, probably not exceeding 200 feet in length.

In addition to the main haulage drift, ground was removed for a tail drift at the shaft, 60 feet of drifting being done here. The development work on the 11th level was approximately 85% completed at the end of the year. A very small amount of ore has been obtained from the raises, and from the drifts driven on the 4th sub below the 10th.

GWINN MINE SURFACE

All the ore on the West stocking grounds was shipped in 1920. This trestle was not put up again in the fall, as it was figured there was sufficient room on the East stocking grounds for the product of the winter 1920-1921. It was necessary to dismantle part of the East stocking trestle as the greater part of this pile was also shipped in 1920. At the close of the shipping season, the records showed approximately 8,000 tons in stock. A careful estimate was made of the ore in stock which showed approximately 26,000 tons. The over-run of the ore in stock was in excess of 18,000 tons. There is, therefore, 18,000 tons available in excess of the figures shown by the records.

When the Kidder boiler house was torn down, the lumber was used in building a storage shed, 20 x 60 ft. in size, at the Gwinn Mine. This shed was erected back of the dry; it is divided into three compartments: In one is stored all of the electricians' heavy supplies for the district, such as cross-arms and insulators for the transmission lines, heavy copper wire, scrap copper, motors not in use, etc. In another is stored wood water pipe for repair of water lines of main pumping plant, also salt for Gwinn and Francis Mines. In the third compartment the extra heavy pipe fittings of the entire district are stored.

The concentration of seldom-used supplies in one well-lighted warehouse has made it possible to materially decrease the stock of this class of material.

In order to reduce the consumption of coal, it was decided to put in steam traps to return the condensed water to the heating plant boiler. Two new traps were put in back of the dry and new lines laid to bring the water back to these traps. Owing to delay in the arrival of the traps, this system did not go into commission until the last of November, since which time there has been a decrease in the amount of coal used for heating.

GWINN MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1920.

GRADE	IRON	PHOS.	SILICA	MANG.
Gwinn Crushed,	61.98	.113	5.00	.237
Gwinport,	59.44	.212	7.44	.300

(Cargoes all mixed).

ORE STATEMENT - DECEMBER 31ST, 1920.

	GWINN BESSEMER	GWINN	GWINNPORT	GWINNWOOD	TOTAL	TOTAL LAST YEAR
On hand Jan. 1, 1920,	0	0	116,352	0	116,352	45,171
Output for year,	166	0	96,429	0	96,595	137,847
Transferred,	166	166				
Total,	0	166	212,781	0	212,947	183,018
Shipments,	0	166	196,767	0	196,933	66,666
Balance on hand,	0	0	16,014		16,014	116,352
Decrease in output-30%					41,252	
Decrease in ore on hand-86%					100,338	
1920 - 1-8 Hour Shift for year						
1919 - 1-8 " " " "						

MADE IN U.S.A.

Handwritten signature

GWINN MINE

SHIPMENTS FOR YEAR 1920.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Gwinn Bessemer,				685
Gwinn,	166	0	166	5,339
Gwinnwood,				1,905
Gwinnport,	42,589	154,178	196,767	58,737
Total,	42,755	154,178	196,933	66,666
Total last year,			66,666	
Increase - 195%			130,267	

GWINN MINE.

MADE IN U.S.A.

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GWINN MINE.

COMPARATIVE MINING COST FOR YEAR.

	1 9 2 0.	1 9 1 9.	INCREASE.	DECREASE.
PRODUCT	96,595	137,847		41,252
General Expense	.261	.220	.041	
Maintenance	.250	.157	.093	
Mining Expense	2.526	2.258	.268	
Cost of Production	3.037	2.635	.402	
Exploratory	.159	.092	.067	
<u>DEPRECIATION.</u>				
Plant Account	.570	.570		
Equipment	.001		.001	
Original Purchase	.002	.003		.001
Total Depreciation	.573	.573		
Taxes	.181	.087	.094	
Central Office	.102	.077	.025	
Fire Loss	.012		.012	
Miscellaneous	.004		.004	
Sundry Expense	.031	.007	.024	
Cost on Stockpile	4.099	3.471	.628	
Loading & Shipping	.357	.080	.277	
Total Cost on Cars	4.456	3.551	.905	
No. Days Operating	301	300	1	
No. Shifts and Hours	1-8hr	1-8hr		
Avg. Daily Product	321	459		138
<u>COST OF PRODUCTION.</u>				
Labor	2.023	1.745	.278	
Supplies	1.014	.890	.124	
Total	3.037	2.635	.402	

GWINN MINE

COMPARATIVE WAGES AND PRODUCT

	1 9 2 0	1 9 1 9	INCREASE	DECREASE
PRODUCT	96,995	137,847		41,252
No.Shifts and Hours	1-8hr	1-8hr		
AVERAGE NO.MEN WORKING				
Surface	29	36		7
Underground	73	95		22
Total	102	131		29
AVERAGE WAGES PER DAY				
Surface	5.43	5.09	.34-6.7%	
Underground	6.81	6.25	.56-8.9%	
Total	6.42	5.93	.49-8.2%	
WAGES PER MONTH OF 25 DAYS				
Surface	135.75	127.25	8.50	
Underground	170.25	156.25	14.00	
Total	160.50	148.25	12.25	
PRODUCT PER MAN PER DAY				
Surface	10.60	12.36		1.76
Underground	4.27	4.65		.38
Total	3.05	3.38		.33
LABOR COST PER TON				
Surface	.512	.412	.100	
Underground	1.595	1.344	.251	
Total	2.107	1.756	.351	
AVG.PRODUCT BRK'G & TRM'G	8.01	8.07		.06
" WAGES CONTRACT MINERS	7.46	6.59	.87	
" " " TRAMMER				
" " " LABOR	7.46	6.59	.87	
TOTAL NUMBER OF DAYS				
Surface	9,110	11,151 $\frac{1}{2}$		2,041 $\frac{1}{2}$
Underground	22,604 $\frac{1}{4}$	29,654		7,049 $\frac{3}{4}$
Total	31,714 $\frac{1}{4}$	40,805 $\frac{1}{2}$		9,091 $\frac{1}{4}$
AMOUNT FOR LABOR				
Surface	49496.60	56780.77		7284.17
Underground	154028.21	185241.06		31212.85
Total	203524.81	242021.83		38497.02

Proportion Surface to Underground Men:

1920 - 1 to 2.5
 1919 - 1 to 2.64
 1918 - 1 to 3.57
 1917 - 1 to 3.63
 1916 - 1 to 3.50

GWINN MINE

TIMBER STATEMENT FOR THE YEAR ENDING DECEMBER 31, 1920.

KIND	LINEAL FEET	AVG. PRICE PER FOOT	AMOUNT 1920	AMOUNT 1919
4" to 6" Timber	3,116	.0183	56.79	
6 to 8 "	21,176	.0302	639.70	2462.36
8 to 10 "	24,056	.0932	2242.76	4228.18
10 to 12 "	15,496	.1062	1646.07	2180.13
12 to 14 "	5,944	.1349	801.88	542.40
Total - 1920	69,788	.0772	5387.20	
Total - 1919	148,254	.0635		9413.07
	LINEAL FEET	PER 100'		
5' Lagging	210,269	.8600	1808.31	1443.96
7' "				88.55
8' "	484,906	.8366	4056.63	4848.90
Total -	695,175	.8437	5864.94	6381.41
Poles	7,736	1.363	105.46	1921.00
Total - 1920	702,911	.8494	5970.40	8302.41
Total - 1919	1146,890	.7239	8302.41	
Product			96,595	137,418
Feet timber per ton of ore			.722	1.079
Feet lagging "			7.197	5.982
Feet lagging per foot of timber			9.961	5.544
Cost per ton for timber			.056	.069
" lagging			.061	.046
" poles			.001	.014
" timber, lagging & poles			.118	.129
Equivalent of stull timber to bd.measure			139,625	223,873
Feet of bd.measure per ton of ore			1.45	1.63

Total cost for timber, lagging & Poles - 1920	13357.60
1919	17715.48
1918	14307.71
1917	11775.63
1916	6297.88

GWINN MINE.

GWINN MINE

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE

KIND	QUANTITY	AVERAGE PRICES	AMOUNT 1920	AMOUNT 1919
40% Powder - - - - -				26.10
50% Powder - - - - -	17,600	.2018	3,551.20	5,695.69
60% " - - - - -	22,675	.2150	4,875.91	7,614.39
<u>Total Powder -</u>	<u>40,275</u>	<u>.2095</u>	<u>8,427.11</u>	<u>13,336.18</u>
Fuse - - - - -	130,400	9.223	1,202.48	1,617.76
Caps - - - - -	25,600	14.699	376.19	541.84
Cap Crimpers - - - -	11	.334	3.67	5.66
Tamping Bags - - - -	3,700	.198	7.33	13.05
<u>Total Fuse, Etc.</u>			<u>1,589.67</u>	<u>2,178.31</u>
<u>Total All Explosives</u>			<u>10,016.78</u>	<u>15,514.49</u>
Product - - - - -			95,695	137,418
Pounds Powder Per ton of Ore			.421	.462
Cost per ton for Powder			.088	.097
" " " " Fuse, Caps, Etc.			.017	.016
" " " " All Explosives			.105	.113
Avg. Price per Lb. for Powder			.210	.210

GWINN MINE

JOPLING MINE.

As a result of the exploratory work of 1918 and 1919, the main ore body found on this property by diamond drilling from surface was eliminated from consideration. It only extended down approximately 400 ft. below the ledge, and there was from 100 to 150 ft. of quick sand above the ledge. With the elimination of this ore body, there was only one possibility left on this property, namely: to find ore at greater depth below surface further to the Southeast along the strike of the formation, beyond the limits of previous explorations. In 1919, it was recommended that a drift be driven 400 ft. to the Southeast along the strike of the formation at the elevation of the 7th level drift from the Gwinn Mine, or 906 ft. below surface. This work was authorized, the drift being started in August, 1919, and completed in December, 1919. A drill station was cut out at the end of this drift and drilling started on January 14th, 1920. Two holes were drilled to the South-west across the formation and one to the East, but no ore was found. There was a total of 570 feet of drilling done. It was then recommended that the lease be surrendered. The rail, ties, pipe, etc., were removed from the drifts on Jopling property, and in April a concrete dam was built on the Gwinn Mine property near the Jopling boundary line, to seal off the Jopling water. An easement was obtained covering the transmission lines across the Jopling property. The old boiler house, located near the concrete shaft to ledge was torn down and the material used to build a storage house at the Gwinn Mine.

The Kidder Lease was formally surrendered May 16th, 1920.

FRANCIS MINE

The Francis Mine was operated on single shift during the year 1920.

The product by months for the year was as follows:

January,	8,498
February,	8,659
March,	9,299
April,	7,133
May,	6,946
June,	5,282
July,	5,321
August,	5,512
September,	5,137
October,	5,373
November,	5,249
December,	<u>7,647</u>

TOTAL, 80,056 tons.

The product by grades for the year was as follows:

Franport.....	78,473 tons.
Franwood.....	<u>1,583</u> "
TOTAL ORE,.....	80,056 "
Rock.....	<u>13,492</u> "
TOTAL ORE & ROCK	93,548 "

The hoist by months shows clearly the conditions existing during the past year. During the first three months of the year a good product was obtained. In April, however, a number of men left the Francis, and until December, when the Gardner-Mackinaw Mine closed down, there was a shortage of men. The product for December shows an increase due to more men working on ore. The total product for the year is practically the same as in 1919.

Practically all of the ore produced during 1920 was of Franport grade. There was a small tonnage of Franwood produced at the East end of the 4th level, above the flat footwall, in the center of the trough. Mining has been completed at this point, and it is not expected that much additional ore of this grade will be obtained from the mine. Approximately, only 10,000 tons of Prospective Ore below the 5th level is figured as Franwood grade.

The Ore Statement for 1920, is as follows:

	<u>FRANPORT</u>	<u>FRANWOOD</u>	<u>TOTAL</u>
On hand Jan. 1st, 1920	66,124	6	66,130
Output for year,	78,467	1,589	80,056
Transfer,	6	6	
TOTAL,	144,597	1,589	146,186
Shipments,	<u>34,199</u>	0	<u>34,199</u>
In stock Jan. 1st, 1921,	110,398	1,589	111,987

The ore in sight on December 31st, 1920, was 241,530 tons; a year ago there were 227,301 tons. This shows that during the past year 94,285 tons of ore has been developed.

The estimate of ore in sight Dec. 31st, 1920, is as follows:

	<u>FRANPORT</u>	<u>FRANWOOD</u>	<u>TOTAL</u>
Ore above 4th level,	1,389		
Ore " 5th "	<u>150,141</u>		
Total Developed Ore,	151,530		151,530
Prospective ore below 5th level,	<u>80,000</u>	<u>10,000</u>	<u>90,000</u>
GRAND TOTAL,			241,530

Estimated tonnage in mine sub-divided as required by the Tax Commission:

Non-Bessemer:

Developed	1. Franport,	151,530
Prospective	1. Franport,	80,000
	2. Franwood,	<u>10,000</u>
	TOTAL,	241,530

As a result of diamond drilling in 1919-1920, it has been possible to make cross-sections of the ore below the 5th level, and to estimate the tonnage. A considerable increase has been shown in the amount of prospective ore over that estimated a year ago, but the estimate is conservative.

During the past year some development work has been done on the 3rd level. The 3rd level is not connected to the shaft, the exploration work being conducted from a raise put up from the 4th level. The West half of the 3rd level ore body thus far proven up is narrow, averaging only slightly more than drift wide. The East half, where some exploratory work had recently been done, is from fifteen to twenty feet in width. Work will be continued near No. 2

diamond drill hole, and on the West half of the 3rd level ore body to determine if it would be profitable to later mine some of the ore above the 3rd level.

During the year, some experiments were conducted in picking the lean ore from the high grade ore underground; the results were so favorable that this plan has been adopted and followed since. It has been possible, by sorting underground, to bring the grade of the product from about 55% up to 58% or better. This has been done at the expense of a slightly decreased output from the contracts, with a consequent higher cost per ton, but it is fully warranted by the improvements shown in the grade of the output.

As labor is now plentiful, it will be possible to increase the product to 100,000 tons per year. With this output, the life of the mine will be approximately 2-1/2 years; however, it is possible that some additional tonnage will be developed, so that the life will be three years.

During 1920 there has been considerable rock work done; viz: sinking the shaft from 5th to 6th level, and driving a drift from the Francis towards the Gwinn Mine. By the end of the year shaft sinking had been completed, and the work of opening the new level was ready to be started. It will require only one month more to complete the drift to the Gwinn Mine, although the connection will not be made until probably sometime in March. The Francis drift is about 120 feet higher than the Gwinn drift, so that the raise to make the connection will be put up from the Gwinn side. A second outlet will prove of great value to these mines; it will result in an immediate improvement in ventilation, which will not only increase the efficiency of the men, but will also prevent the excessive rotting of timber. The content of oxygen in the air at these mines is considerably below normal, and also the excessive rotting of timber causes a decided rise in the temperature, making poor working conditions.

There is approximately 1,350 feet of rock drifting required to develop the 6th level, and it is planned to put up thirteen raises. This will practically complete the rock work in the Francis Mine. It therefore follows that the balance of ore to be mined at this property will be produced at a lower cost than it has been possible to obtain heretofore. Your attention is directed to

this point in order that it may be fully understood that future results at this property will be materially better.

During the past year work has been done at the following points:

THIRD LEVEL
SUBS ABOVE FOURTH LEVEL
FOURTH LEVEL
SUBS ABOVE FIFTH LEVEL
FIFTH LEVEL

SHAFT SINKING-

- - - - -

THIRD LEVEL

Some work was done on the 3rd level in the early part of the year, but when the shortage of men occurred in the spring, work was stopped here and was not resumed until in the fall, when a few more men were obtained. During the past year there has been a total of 170 feet of ore drifting at the elevation of the 3rd level, following the ore along the footwall; of this drifting, 110 feet was driven near the East end of the ore body in the vicinity of diamond drill hole No. 2. In order to prove up No. 2 diamond drill hole, a raise was put up 20 feet above the elevation of the 3rd, a sub-level opened from the top of this raise, and a drift driven 60 feet to the North, this being at right angles to the strike of the formation on the 3rd level. The footwall was encountered dipping in its regular direction, at the end of this drift. Indications are that there is a fold in the footwall at this point which accounts for the apparent width of the ore here as compared with a width of approximately nine feet on the 3rd level below. Further explorations will be conducted at this point to definitely prove the width of this fold, which will determine the probable amount of ore here. It is extremely doubtful that there is a deposit of any size at this point. It is probable that the drill hole happened to be located directly over this fold in the foot, which would account for the unusual thickness of the ore through deviation of the hole in the line of the fold.

To the West of the top of the raise to the 3rd level, which is located in about the center of the ore body, a drift has been driven a distance of 60 feet following the foot. The ore here is approximately 20 feet in width,

and if it continues for the balance of the length of the ore body to the West, or approximately 400 feet, there will undoubtedly be sufficient ore shown up here to warrant putting up several raises from the 4th level, and mining out 50 feet or more of the ore body above the 3rd level. The ore would be handled thru raises to the 4th, and no connection would be made to the shaft on 3rd level, as there is evidently not sufficient ore to warrant this expense. There should be in excess of 30,000 tons of ore here, which, it is thought, can be mined. It will, however, be advisable to postpone the mining of this ore until the ore is practically exhausted on the lower levels.

SUBS ABOVE FOURTH LEVEL.

3RD SUB ABOVE FOURTH:

Ore was mined on this sub-level during the first three months of the year, when work was completed. The work done here during 1920 consisted in finishing the mining of ore at the East end of the deposit on both the North and South footwalls. The ore body on this sub-level was small, and although of good grade, ran rather high in Phosphorus.

2ND SUB ABOVE FOURTH:

Mining on this sub-level was started in November, 1918, and completed in the summer of 1920. The main part of the sub-level was mined out early in 1919, except at the East end of the deposit in the trough between the North and South footwalls. This ore was removed in 1920, and proved to have a much larger area than was anticipated; the ore here was approximately 175 ft. in length by 30 ft. in width. It, however, ran from .6% to 1% in Phosphorus.

1ST SUB ABOVE FOURTH:

As soon as mining was completed on the 2nd sub, in the territory at the East end of the mine, this sub was opened; the ore body was much smaller, having an area approximately 100 feet in length by 20 feet in width. Mining was finished here in the fall; the ore here also averaged high in Phosphorus.

FOURTH LEVEL.

Mining had been completed over practically the entire 4th level in 1919. A small area near the shaft was mined out in the early part of 1920, five gangs working here in January. At the end of the year the foot-wall haulage drift at

the East end of the mine was being retimbered preparatory to taking out a little ore left here on the main level.

During the year the foot-wall drift on this level had been completely retimbered; although the mine has only been opened a comparatively short time, the timber has rotted very rapidly due to poor air. It has been necessary to keep this drift open on account of mining at the East end of the deposit, where work has been conducted during the greater part of the year. After mining operations are completed at this point it will be necessary to keep at least part of this drift open on account of exploratory work underway on the 3rd level, as the ore broken on the 3rd is sent through raises to the 4th and trammed to the shaft.

SUBS BELOW FOURTH LEVEL.

During the past year mining has been done on all the sub-levels, between the 4th and 5th level.

During the past year mining has been completed on the 1st sub below the 4th; by the end of the year it had also been practically completed on the 2nd sub, except a small area where three gangs were working at the West end of the ore body on the North foot-wall. At the East end of the deposit the ore has been mined out from the 2nd sub up to a point near the 4th level. The deposit is thin here and would not warrant the rock drifting necessary to open a sub-level at the regular interval of eleven feet. It was possible to obtain practically all the ore at this point, as the footwall is quite flat and the ore only about ten feet in thickness.

On the 3rd sub below the 4th, all the ore has been mined except at the West end of the deposit on the North footwall where three gangs were opening out from their raises at the end of the year, as there is an area here about 220 feet in length which has not been mined out as rapidly as in the other parts of the mine, due to the ore here having a greater width. Over the greater part of this length of 220 feet the ore averages 40 feet in width.

Mining has been carried on on the 4th sub below the 4th, and the ore removed over the greater part of the North footwall, and also on the South footwall. The latter part of the year a new area was opened on the South footwall, where the ore was found to be drift width for a length of 130 feet. A raise was put up on the foot, following the ore upward, where it has been found to extend nearly to the

elevation of the 4th level. It has been mined out at this point by stoping without timber, as the footwall is steep enough to permit of the ore all coming down to the sub-level. Work has been conducted in such a way that it is not necessary for the miners to go into the open stopes; they are always working under the protection of the solid ground. The ore area here is small, being a local enrichment on the South footwall, the mining of which will only require a few months with one gang of miners.

The 5th sub below the 4th level was opened in 1918 in order to gain some idea of the extent and size of the ore body between the 4th and 5th level. At the East end of the mine the ore has been mined out down to this sub-level; also on the North footwall two-thirds of the length of the ore body. A considerable area has also been mined out on the South footwall. During 1920, a new area was opened on the South footwall near the West end of the ore body, and mining completed along the footwall for a distance of 210 feet. At the end of the year three gangs were working on this sub-level.

On the 6th sub below the 4th, the mining of two areas on the South footwall and one on the North, was under-way at the end of the year. A small area at the West end of the North footwall was mined out early in the year.

On the 7th sub below the 4th, three areas have been mined out during the past year on the South footwall and two areas on the North footwall. The amount of ore mined at each one of the points referred to above was comparatively small, as the ore body was narrow. There was one gang working on this sub-level at the end of the year, on the South footwall.

On the 8th sub below the 4th, which is the first sub above the 5th, mining was done at one point on the South footwall during the past year. At this place a pillar 60' x 100' in size was mined. A small seam of ore was followed to the South of this area to the footwall, and then along the footwall to the West for a distance of 120 feet; the ore here was good grade, and about 15 feet in width. It was then decided to drive a drift on the main 5th level to this ore, which was done, and then raises were put up following this ore up on the footwall. It was proven later that this ore extended along the footwall connecting with the ore that had been proven up by diamond drilling at the West end of the deposit. The

seam of ore found on this sub-level lead to the development of approximately 30,000 tons of additional ore on the 5th level.

FIFTH LEVEL.

The main work of the past year on the 5th level consisted in driving a drift to the West towards the Gwinn Mine. This drift was started the last of April from the end of the exploratory drift which had been driven in 1919 on the NE $\frac{1}{4}$ of the NE $\frac{1}{4}$ - Section 28. During the year, it was driven a distance of 984 feet. It was worked on single shift during the first several months; the drilling, blasting and mucking was done by the miners. The Armstrong loader, bought for the Princeton Mine, was sent here in the summer in order to increase the progress of the drift, as the Princeton Mine was not able to use the loader until electric haulage was installed on the 7th level. An advance of from 140 to 150 feet per month has been made since the loader has been used. At the end of the year, the breast of this drift was 284 feet from the drift from the Gwinn Mine. By the middle of January, 1921, it is planned to have the crew working on the Gwinn Mine side start a raise, while the Francis drift will be continued through the entire month of January, by which time it will have reached the point to which the raise will hole. This rock work has been under-way for eight months of the past year, and will be completed by the end of January, 1921. The holing of this drift will provide ventilation and a second out-let for the Francis Mine.

In addition to the above rock drift, there has been approximately 75 feet of rock drifting, and 400 feet of ore drifting on the 5th level. This covers the drifting done along the South footwall in the development of a thin seam of ore which was discovered by drifting on sub-levels and also by diamond drill holes drilled in the latter part of the year 1919. During the year, four raises were put up in this ore on the South foot-wall and sub-levels have been opened from three of the raises. It is figured that approximately 30,000 tons of ore have been added to the ore in sight in the mine on account of developing this ore body.

It has been necessary to retimber nearly all of the drifts which were opened on the 5th level in 1918. This has added considerably to the expense of timbering during the past year.

SHAFT SINKING

During 1920 the shaft was sunk from the 5th to the 6th level. Work was started on June 8th, one crew working on night shift so as not to interfere with the operation of the mine. On June 18th, a second night shift crew started working, and until sinking was completed in November, it was carried on with two shifts working from 5:00 P.M., to 12:30 A.M., and from 12:30 A.M., to 8:00 A.M., or 7-1/2 hours to each shift. Slow progress was made during the first month, as it was necessary to start sinking directly under the steel sets and care also had to be taken so as not to wreck the skip pit pocket at the bottom of the shaft. The 6th level was opened at a point 80 feet below the 5th, which was approximately 13 feet below the point where sinking started. The shaft has been sunk in hard granite, so that no timbering will be necessary around the shaft on the new level. After cutting the plat on 6th level, sinking was resumed, and ground removed at the same time for the pocket at the shaft. On account of the small tonnage available above the 6th level, approximately 90,000 tons, it was decided to merely install a slide for handling ore from motor cars to skips. With this system of operation, the ore is dumped directly from motor cars into the skips; this gives no storage capacity at the shaft, but it is not figured that it would be of any advantage to have storage on the 6th level. After sinking was completed, ground for installation of skip pit pocket was excavated at a point 50 feet below the 6th level, and a drift driven for 40 feet, so that cars could be loaded from the skip pit pocket and trammed to the cage. This work was all completed in 1920, as well as all timbering in the shaft. Early in December, the sinking cage which had been in use since June, was taken off, and the regular standard cage put on again. At the end of the year the pocket on the new 6th level had been installed and everything completed, ready for drifting to the ore body.

FRANCIS SURFACE.

There has been comparatively little surface work except the ordinary routine during the past year at the Francis.

Six additional stocking bents were put up on the rock trestle, as it was necessary to keep extending this trestle as the stocking grounds filled.

As very little ore was shipped from the Francis in 1920, it was necessary to prepare additional stocking grounds to take care of the product of the winter of 1920-1921. During the year, a new stockpile sollar, 130 feet in width by nearly 600 feet in length was made of lean ore. This lean ore was obtained from a pile which had been made near the stockpile grounds, of ore averaging from 48.00 to 50.00% in Iron. On the completion of the sollar in the fall, a stocking trestle of 17 bents was erected. This will be of ample size to take care of the winter's hoist even if the product is increased to 9,000 tons per month.

FRANCIS MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1920.

GRADE	IRON	PHOS.	SILICA	MANG.
Franport,	57.63	.332	6.20	.636
Franwood,	56.95	.702	5.39	.869

(Cargoes all mixed).

ORE STATEMENT - DECEMBER 31ST, 1920.

	FRANPORT	FRANWOOD	TOTAL	TOTAL LAST YEAR
On hand Jan. 1st, 1920,	66,124	6	66,130	12,538
Output for year,	78,467	1,589	80,056	80,528
Transferred,	6	6		
Total,	144,597	1,589	146,186	93,066
Shipments,	34,199	0	34,199	26,936
Balance on hand,	110,398	1,589	111,987	66,130
Decrease in Output-.01%			472	
Increase in ore on hand-69%			45,857	
1920 - 1-8 Hour Shift for year				
1919 - 108 " " " "				

FRANCIS MINE.

Damascus
~~1917~~ Bond

MADE IN U.S.A.
FRANCIS MINE

SHIPMENTS FOR YEAR 1920.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YR.
Franport, Franwood,	23,424	10,775	34,199	26,936
Total,			34,199	26,936
Total last year,			26,936	
Increase - 27%			7,263	

FRANCIS MINE.
Damascus
~~1917~~ Bond
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FRANCIS MINE.

COMPARATIVE MINING COST FOR YEAR.

	1 9 2 0.	1 9 1 9.	INCREASE.	DECREASE.
PRODUCT.	80,056	80,528		472
General Expense	.253	.256		.003
Maintenance	.231	.329		.098
Mining Expense	2.274	1.970	.304	
Cost of Production	2.758	2.555	.203	
Exploratory Ore in Development	.212	.066	.146	
<u>DEPRECIATION.</u>				
Original Purchase	.212		.212	
Plant Account	.600	.600		
Total Depreciation	.812	.600	.212	
Taxes	.117	.049	.068	
Central Office	.098	.077	.021	
Miscellaneous	.012	.005	.007	
Fire Loss	.004		.004	
Sundry Expense	.035	.008	.027	
Cost on Stockpile	3.836	3.360	.476	
Loading & Shipping	.072	.055	.017	
Cost on Cars	3.908	3.415	.493	
No. Days Operating	301	299	2	
No. Shifts and Hours	1-8hr	1-8hr		
Avg. Daily Product	266	269		3
<u>COST OF PRODUCTION.</u>				
Labor	1.979	1.826	.153	
Supplies	.779	.729	.050	
Total	2.758	2.555	.203	

Mine started on producing basis May 1, 1918.

FRANCIS MINE

COMPARATIVE WAGES AND PRODUCT

	1 9 2 0	1 9 1 8	INCREASE	DECREASE
PRODUCT	80,056	80,528		472
No. Shifts and Hours	1-8hr	1-8hr		
AVERAGE NO. MEN WORKING				
Surface	25	25		
Underground	64	58	6	
Total	89	83	6	
AVERAGE WAGES PER DAY				
Surface	5.46	4.97	.49-9.8%	
Underground	6.55	6.16	.39-6.3%	
Total	6.24	5.79	.45-7.7%	
WAGES PER MONTH OF 25 DAYS				
Surface	136.50	124.25	12.25	
Underground	163.75	154.00	9.75	
Total	156.00	144.75	11.25	
PRODUCT PER MAN PER DAY				
Surface	10.75	10.50	.25	
Underground	4.21	4.61	.40	
Total	3.02	3.21	.19	
LABOR COST PER TON				
Surface	.508	.473	.035	
Underground	1.558	1.334	.224	
Total	2.066	1.807	.259	
AVG. PRODUCT BRK'G & TRM'G	7.97	7.70	.27	
" WAGES CONTRACT MINERS	6.50	6.27	.23	
" " " TRAMMERS	6.42	5.93	.49	
" " " LABOR	6.61	6.26	.35	
TOTAL NUMBER OF DAYS				
Surface	7,450	7,669	219	
Underground	19,032 $\frac{3}{4}$	17,454 $\frac{3}{4}$	1,578	219
Total	26,482 $\frac{3}{4}$	25,123 $\frac{3}{4}$	1,359	
AMOUNT FOR LABOR				
Surface	40662.59	38115.70	2546.89	
Underground	124758.22	107446.71	17311.51	
Total	165420.81	145562.41	19858.40	

Proportion Surface to Underground Men:

1920 - 1 to 2.56

1919 - 1 to 2.32

1918 - 1 to 2.20

Mine started on producing basis May 1, 1918.

FRANCIS MINE

TIMBER STATEMENT FOR THE YEAR ENDING DECEMBER 31, 1920.

KIND	LINEAL FEET	AVG. PRICE PER FOOT	AMOUNT 1920	AMOUNT 1919
4" to 6" Timber	11,408	.02	228.27	425.31
6 to 8 "	22,381	.0357	800.20	862.79
8 to 10 "	26,522	.0763	2023.93	1468.43
10 to 12 "	12,316	.1021	1257.63	956.87
12 to 14 "	2,678	.1168	312.59	495.87
14 to 16 "				4.00
Total - 1920	75,305	.0614	4622.62	
Total - 1919	108,221	.0389		4212.44
	LINEAL FEET	PER 100'		
5' Lagging	123,250	.9362	1153.65	1106.21
8' "	306,320	.8654	2650.95	2719.45
Total	429,570	.8857	3804.60	3825.66
Poles	3,560	.8121	28.91	79.05
Total - 1920	433,130	.8851	3833.51	
Total - 1919	609,650	.6405		3904.71
Product			80,056	80,528
Feet timber per ton of ore			.9406	1.344
" lagging "			5.365	7.448
" " per foot of timber			5.704	5.54
Cost per ton for timber			.0577	.0523
" lagging			.0475	.0475
" poles			.0004	.0010
" timber, lagging & Poles			.1056	.1008
Equivalent of stull timber to board measure			129,524	177,590
Feet of board measure per ton of ore			1.619	2.205

FRANCIS MINE

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE

KIND	QUANTITY	AVERAGE PRICES	AMOUNT 1920	AMOUNT 1919
40% Powder - - - - -	25,950	.1705	4,424.32	4,368.22
50% " - - - - -	150	.1850	27.75	
60% " - - - - -	650	.2190	142.35	247.80
Total Powder-	26,750	.1718	4,594.42	4,616.02
Fuse - - - - -	106,700	9.535	1,017.41	942.87
Caps - - - - -	22,300	13.43	299.50	274.57
Cap Crimpers - - - - -	2	.64	1.28	6.07
Tamping Bags - - - - -	10,000	2.0235	20.23	28.58
Connecting Wire - - - - -				1.65
Total Fuse, Etc.			1,338.42	1,253.74
Total Explosives			5,932.84	5,869.76
Product - - - - -			80,056	80,528
Pounds Powder per ton of Ore			.334	.337
Cost per ton for Powder			.0574	.0573
" " " " Fuse, Caps, etc.			.0167	.0156
" " " " All Explosives			.0741	.0729
Avg. Price per Lb. for Powder			.1718	.1699

FRANCIS MINE

GARDNER-MACKINAW MINE.

These two properties were operated for eleven months of the year 1920, closing down on November 30th. They operated on double shift, as there was not sufficient working places available in ore to put these mines on single shift. About the time they closed, however, sufficient territory had been opened, and if they had continued in operation it was planned to put them on single shift the first of January, 1921.

The product by months from these mines for the year was as follows:

January,	12,572
February,	11,523
March,	13,769
April,	12,443
May,	12,020
June,	12,335
July,	12,119
August,	13,679
September,	10,757
October,	9,502
November,	<u>9,669</u>

TOTAL, 130,388 tons.

The product by grades for the two mines was as follows:

Gardner Ore,	25,189
" High Sulphur.....	<u>32,209</u>

TOTAL,..... 57,398 tons.

Mackinaw Ore,.....	41,177
" High Sulphur,.....	<u>31,813</u>

TOTAL 72,990 "

TOTAL ORE,..... 130,388 "

Rock.....	<u>8,687</u> "
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TOTAL ORE AND ROCK, 139,075 "

The product for the 11 months of 1920 shows an increase of 61,062 tons over that for the year 1919. A product of 12,000 tons or more was obtained up to the month of August. The product then dropped to 9,502 tons in October, a slight gain being made in November over the October product. The reason for the decreased product in the latter months of operation was due to all the ore having been mined on the Mackinaw property, and all reserve ore drawn from the

completed stopes, while on the Gardner nearly all the contracts were engaged in putting up raises preparatory to opening stopes. At the time the mine closed down, stoping was in progress over the entire ore body between the 2nd and 1st levels, while the ore body on the 1st was rapidly being prepared for stoping. It is estimated, at the time the mine closed down, that there was 20,000 tons of broken ore in the stopes between the 2nd and 1st levels.

There has been no change in mining methods during the past year. The work of the year showed up a horse of rock which has been traced from above the 1st level to the 4th level. This rock runs diagonally across the ore practically on the boundary line between the two properties. It has decreased the expected tonnage in this territory, as it is sixty feet in width, extending from the 1st level down to the 4th.

Very little ore running low in Sulphur was mined in 1920; in fact, practically all the ore produced at the Mackinaw Mine ran high in Sulphur. The ore between the 3rd and 2nd levels on the Gardner also ran high in Sulphur. The ore obtained on the Gardner above the 2nd level, however, has run lower and a greater part of the product obtained above the 2nd level is grading "Gardner Ore". As stated in previous years, the Sulphur is not uniform through the ore, and it is therefore impossible to determine what the Sulphur will run in any stope until the stope has been finished, by which time the average of the ore drawn out to make room for mining gives the accurate Sulphur content for the ore in this particular stope.

The cost per ton for breaking ore during the year 1920 has averaged higher than was expected from the system of mining followed. In explanation of this higher cost, however, it may be said that it has largely been due to the development work which has been under-way at all times throughout the year. As this development work has been largely in ore, the breaking cost of any month has had to include the cost of the ore obtained from the development work. When it is stated that the entire ore body on Gardner property above the 2nd level, as also on the 1st level, has been opened by drifts and raises, preparatory to stoping operations, it can readily be seen that a large amount of the ore hoisted from the Gardner property has come from development work. It should be borne

in mind that on the completion of stoping on the Gardner, there should be in excess of 50,000 tons of broken ore in the stopes, which will be available at practically the cost of loading from stopes and hoisting.

In reporting last years work, it seems advisable to call attention to the fact that all the ore on the Gardner mine will be exhausted in about eighteen months of operation of this property. The pillars left between the stopes should not be mined until after mining is completed on the Mackinaw. Practically all available ore was mined at the Mackinaw in August, 1920; in order to obtain additional ore from this property it is necessary to sink and develop levels at greater depth. Before attempting this new development work, however, it was considered advisable to put down some drill holes below the 4th level in order to gain some information as to the Sulphur content of the ore at greater depth. Two holes were completed in this territory and results showed much lower Sulphur than had been expected. The second hole drilled, averaging the core and sludge analyses, showed less than .300 Sulphur.

The above gives a brief outline of conditions existing at the property at the time it closed down, in respect to future operations.

The majority of the married men employed at the Gardner-Mackinaw Mine were transferred to the Francis and Gwinn Mines, and a number of the single men were paid off and left the district. At the end of the year all the location houses were occupied. During the time the mine is idle there will only be three men employed, viz: the captain, to act as watchman on day shift, a night watchman and one pumpman. The idle expense at this property, is, therefore, very low.

Although these properties are operated as one mine, owing to the fact that they cover separate leases, each mine is reported separately.

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MACKINAW MINE

The product for the year 1920 was as follows:

Mackinaw Ore,	41,177 tons
" High Sulphur,	<u>31,813 "</u>
TOTAL,	72,990 tons.

This shows an increase of approximately 10,000 tons over the product obtained from this mine in 1919. The total product to date from this lease is 135,851 tons. It is estimated that there is approximately 76,000 tons of ore which can be robbed from the pillars left on the Mackinaw property above the 4th level, which makes a total of approximately 211,000 tons of available ore developed on Mackinaw property above the 4th level. This figure is much less than indicated by the original estimate from diamond drill holes.

The ore statement for 1920 is as follows:

	<u>ON HAND JAN. 1, 1920</u>	<u>SHIPMENTS</u>	<u>BALANCE OF ORE IN STOCK</u>
Mackinaw Ore,	2,289	37,809	5,567
Mackinaw High Sulphur,	<u>17,910</u>	<u>11,242</u>	<u>38,481</u>
TOTAL,	20,199	49,051	44,048

The following is an estimate of the ore above 4th level, as also the prospective ore below the 4th:

Non-Bessemer Ore:		
1. Mackinaw		10,000
2. Mackinaw High Sulphur,		60,285
Prospective:		
1. Mackinaw		92,198
2. Mackinaw High Sulphur,		<u>276,594</u>
TOTAL,		439,077 tons.

It will be noted that there is an increase in the amount of ore shown as developed above the 4th level, as compared with the previous year. This is due to the fact that the available ore in pillars is included this year, on the assumption that approximately 70% of this ore can later be mined. The prospective ore below the 4th level is increased over that of the previous year for the same reason.

The work in detail on this lease for the year was as follows:

SECOND LEVEL

The main level drift on this property was driven in 1919 to the end of the ore body. In 1920 it was continued a distance of 60 feet across the formation towards the footwall, but as no ore was encountered, or any decided change in the formation, which might indicate ore, work was discontinued at this point. There has been a decided over-turn of the foot in this territory, which has been

closely outlined by the work done above the 2nd level. Two raises were put up on the Mackinaw property in preparation for opening stopes here; rock was encountered in the first raise at an elevation of 60 feet and in the second raise at an elevation of 30 feet. The ore was followed from the second raise over to the first. After making the connection, a drift was driven back to the East following the ore towards the footwall, which soon carried the drift over on to the Gardner property. Another sub-level was opened at an elevation of 55 feet above the 2nd level, and a drift driven back to the East following the ore across the Mackinaw property over on the Gardner. From the work done here it is evident that on the North side of the over-turn the ore rises again towards the 1st level. The actual displacement of the ore, due to the over-turn, has not as yet been determined. It is planned to develop the upward extension of this ore by drifting into this territory on the 1st level; this work was under-way at the end of the year. The drift, however, was still 60 feet from the Mackinaw boundary line when the mine closed down. There is a possibility that from 5,000 to 10,000 tons of ore may be developed on the Mackinaw property in this territory. The above comprises all the work done on and above the 2nd level on this lease during 1920.

THIRD LEVEL.

The main haulage drift on the 3rd level was extended a distance of 75 feet early in 1920 on the Mackinaw property to the end of the ore body. At the close of the year 1919 four stopes were being operated above the 3rd level on this lease; five more were opened in the early part of 1920, and mining entirely completed between the 3rd and 2nd levels about the middle of the year. The stopes near the North-west end of the ore body - four in number, did not yield over 50% of the normal amount of ore ordinarily obtained from a stope. In this territory the horse of rock which occurs in the ore body is apparently a continuation of the over-turn in the foot above the 2nd level. One stope was put through from the 3rd to the 2nd on the North side of this rock, while two stopes were stopped entirely by the rock and one stope on the South side was carried through to the 2nd level, but it was small in size. The pillars left in this territory are small, as most of the ore was mined near the rock, which acts as a support for the hanging.

FOURTH LEVEL.

The greater part of the ore on the 4th level was mined out during 1919. Work, however, was under-way in two stopes at the end of 1919, and work preliminary to opening four stopes further to the North was under-way. During 1920 mining was completed in these stopes in the summer, and all the broken ore drawn out and hoisted. Considerable trouble was experienced in keeping the grade of the ore up in two of these stopes, due to the fact that there were several seams of rock running through the ore. Part of this ore was a banded limonite and hematite, with an occasional seam of jasper, which ran from 53.00 to 56.00% in Iron. Mining was stopped as soon as the lean material was encountered, but in some cases it was necessary to bar down considerable of this material to make the back secure, resulting in a lowering of the grade of the ore in the stopes.

The main part of the available ore left on the Mackinaw, which later can be recovered from pillars, lies between the 4th and 3rd levels, where practically the entire ore body is on Mackinaw property.

A drift was driven a short distance to the North-west of the ore body on the 4th level in an endeavor to find a continuation of the ore; it was then decided to do some diamond drilling here in an endeavor to encounter the ore and determine the best direction in which to continue the drift. Three holes were drilled, a report on which will be found elsewhere, after which the drift was driven a distance of 90 feet. It was constantly expected that ore will be encountered in the breast, but aside from the enriched formation no ore was found, and it was decided to abandon work at this point. As a result of the work done here in 1920 it appears certain that the ore body has pinched out.

Late in the year it was decided to drive a drift into the hanging on the 4th level a distance of 300 feet, in order that holes might be drilled to determine the Sulphur content of the ore below the 4th level. This drift was completed and three drill stations cut, drilling being started in October and continued until the middle of December.

The above two paragraphs cover the rock work for the year on the Mackinaw. It is very unfortunate that the condition of the ore market made it necessary to close down this property before more information was gained of the

ore below the 4th level, so that definite plans could be made in regard to opening levels at greater depth. When the mine reopens, the first work will be a continuation of the diamond drilling program until sufficient information is available for a decision to be made as to whether to open levels at greater depth. As stated elsewhere in this report, it will only require about eighteen months to complete mining on the Gardner property, so that if operations are to be continued here without interruption, it will be necessary to sink and develop new levels as rapidly as possible, provided the future diamond drill work shows the ore below the 4th level to be saleable.

GARDNER MINE.

The product for the year was as follows:

Gardner Ore,	25,189 tons
" High Sulphur,	<u>32,209 "</u>
TOTAL,	57,398 tons.

The Ore Statement for the year is as follows:

	ON HAND <u>JAN. 1ST, 1920</u>	SHIPMENTS	BALANCE OF <u>ORE IN STOCK</u>
Gardner Ore,	2,955	0	28,144
" High Sulphur,	<u>16,245</u>	0	<u>48,454</u>
TOTAL,	19,190		76,598

No ore has been shipped from this property since it was opened. There are no railroad tracks to the loading pockets at the shaft. In 1919 the Chicago & North-Western Railway Company put in a steam shovel track to the stockpile grounds. However, the Mackinaw property has been able to supply all ore for shipments, so that it has not been necessary to make any shipments from the Gardner. The tracks of the Munising, Marquette & South-Eastern Railway Co., are only a few hundred yards distant from the Gardner property. It is hoped that some arrangement will be made whereby these tracks can be extended and a connection made to the Chicago & North-Western tracks on the Gardner property. This would permit the ore to be handled over the Munising, Marquette & South-Eastern tracks where the charge for bringing ore in to the Crusher is very much less than the charge which the Chicago & North-Western will make for the same service.

The estimate of ore in sight is as follows:

Non-Bessemer:

1. Developed, Gardner Ore,	80,000 tons
2. " High Sulphur,	<u>106,348 "</u>
TOTAL,	186,348 "

All the ore in the Gardner Mine is now considered as developed ore. The limit of mining is estimated to be 400 feet below surface, or within 300 feet of the sand. Development work above the 1st level was under-way at the

time the mine closed down; it has been carried to an elevation of 120 feet above the 1st level, or within 30 feet of the limit of mining, which permitted an accurate estimate of the tonnage above the 1st level. The area of the ore above the 1st is not as large as was originally thought, owing to the horse of rock which cuts the ore off on the North-west end.

At the time the mine closed down the 1st level had been opened by a drift practically the entire length of the ore body, and nearly all of the stopes had been started above the level. It is estimated that all the ore on the Gardner property would have been mined in eighteen months, although it would have required some additional time to hoist all the broken ore from the stopes. There will be a considerable tonnage of ore left in the pillars between the stopes, which it is not considered will be available until after the ore on the Mackinaw property has been mined. The following is an outline of the work of 1920.

FIRST LEVEL.

The work of opening the 1st level was started in April, 1919, and practically completed on November 30th, 1920 when the mine closed down. During 1920 there was 420 feet of ore drifting on the main level and 70 feet of rock drifting. One cross-cut was driven from the foot to hanging near the North end of the ore body which showed the ore to be 60 feet in width at this point. The 1st level drift has been widened and timbered in preparation for opening stopes. After mining was completed on the Mackinaw about the middle of the year, contracts were transferred to the Gardner and the putting up of raises above the 1st level started. By the end of the year gangs were working in ten raises. As there will be no level opened above the 1st it was decided to put up two traveling roads to be used by the men in going to and from their stopes; also for air lines. The system of mining now followed at this property provides for putting up the raises in the line of the stopes and connecting them all at the top. Stopping is then started at the bottom, the men traveling to the stopes from the top. Owing to the horse of rock which cuts off the ore body at the North side near the Mackinaw boundary line, the stopes in this territory are of variable height. The first one at this end only went up about 40 feet when it struck the rock; the second one went up about 80 feet, and the fourth

one, which is a traveling road, struck rock at an elevation of 120 feet. The majority of the other raises were up from 60 to 80 feet at the time the mine closed down. The raises are connected at intervals of 28 feet on the incline, so that the men will have a place to store tools when blasting, and also to provide better ventilation in the stopes. The 1st level was about 70% developed, in preparation for stoping, at the time the mine closed down. From two to three months would be required to completely develop this level and start stopes over the entire area.

SECOND LEVEL.

The 2nd level Gardner was developed from raises put up from the 3rd level in 1919. There is no connection to the Gardner shaft on the 2nd level, the ore from the stopes being transferred through two raises to the 3rd. This saved about 900 feet of rock drifting on this level. At the close of 1919 the work of preparing the 2nd level for stoping was under-way. The main drift was widened and timber installed, raises being started at 35-ft. intervals. On the completion of stoping operations above the 3rd level, gangs were transferred to the 2nd, and raises put up to the 1st level. Five of these raises were carried through; three of them encountered the horse of rock and stopped between the levels. By the end of November, when the mine closed down, two stopes had been completed, while the others were practically two-thirds completed. It is estimated that there are 20,000 tons of broken ore in these stopes. The total length of the ore body on the 3rd level is 300 feet. The South-east end of the ore body runs high in Sulphur, having an area equal to one-third of the ore body; the balance, or two-thirds of the ore above the 2nd, grades as "Gardner" Ore, running approximately .500 in Sulphur. By the end of the year 70% of the ore body above the 2nd had been mined out. It will require approximately three months to complete the mining of the balance of the available ore here. The limits of the ore to the South-east have not been reached, but owing to the high Sulphur ore encountered here it was decided to stop development work in this direction.

THIRD LEVEL.

At the end of 1919 there were six gangs working in stopes above the

3rd level. Due to the completion of stopes there were only four gangs working at the end of January. In March, this had been further reduced to two and stoping was finally completed here in August. By the end of the year the ore broken in these stopes had all been drawn out and hoisted.

FOURTH LEVEL.

In the early part of the year one gang worked several months mining the available ore between the 4th and 3rd levels on the Gardner property. One stope from the Mackinaw crossed over on to Gardner property when about half-way between the levels; as there was only a comparatively small amount of ore available below the 3rd level on the Gardner property.

The above brief description covers all the work of 1920 on the Gardner property.

GARDNER-MACKINAW MINE

DIAMOND DRILLING

In April, three holes were drilled underground on the 4th level, Mackinaw. They were put down to determine if there was any ore on the North end of this level, where the ore had apparently pinched out. The following is a brief record of the drilling done here in April:

HOLE NO. 1

This hole is a horizontal hole, located at the North end of the 4th level haulage drift. It was drilled to the North-east towards the foot-wall, crossing the strike of the ore body at an angle. The material encountered was as follows:

Jasper,	0 to 10
Ore,	10 to 15
Jasper,	15 to 40
Slate,	40 to 150

HOLE NO. 2

This was a horizontal hole, drilled to the South-west from a point about 45 feet West of Hole No. 1. The material encountered was as follows:

Jasper,	0 to 25
Second-Class Ore,	25 to 30
Ore,	30 to 40
Second-Class Ore,	40 to 45
Jasper,	45 to 108
Chert,	108 to 111

HOLE NO. 3

This was a horizontal hole, drilled to the North from a point 18 feet North-east of Hole No. 2; the material encountered was as follows:

Jasper,	0 to 39
Chert,	39 to 43
Black Slate,	43 to 90
Chert,	90 to 100
Slate,	100 to 105

It was decided to drift to the ore shown up by No. 2 diamond drill hole and to stop drilling.

On October 12th, following the completion of the drift into the hanging on 4th level, and cutting of drill station, two holes were drilled:

HOLE NO. 4

This was a vertical hole, drilled at a point 200 feet West of the hanging of the 4th level ore body. The material encountered was as follows:

Slate,	0 to 53
Jasper,	53 to 57
Slate,	57 to 97
Slate & Jasper	97 to 105
Jasper,	105 to 117
Chert,	117 to 133
Jasper,	133 to 139
Ore,	139 to 185
Lean Ore and	
Jasper,	185 to 210
Ore,	210 to 215
Jasper,	215 to 219
Slate,	219 to 238

The analyses of core and sludge samples from Hole #4 are as follows:

<u>DEPTH</u>	<u>SLUDGE ANALYSES</u>			<u>DEPTH</u>	<u>CORE ANALYSES</u>	
	<u>IRON</u>	<u>PHOS.</u>	<u>SULPHUR.</u>		<u>IRON</u>	<u>PHOS.</u>
140-145	59.50	.537	.019	139-155	57.50	.328
145-150	61.00	.183	.037	155-175	55.50	.040
150-155	60.80	.111	.037	175-187	47.80	.398
155-160	56.90	.132	.041			
160-165	57.30	.072	.065	213-219	60.20	.498
165-170	63.40	.053	.238			
170-175	66.00	.055	.172			
175-180	64.70	.044	.067			
180-185	64.70	.056	.072			
210-215	59.10	.510	.042			

COMBINED ANALYSES:

<u>DEPTH</u>	<u>IRON</u>	<u>PHOS.</u>
139-165	59.10	.207
165-185	64.70	.047
210-215	58.71	.529

Very little core was obtained from this hole, and as the Sulphur determinations from Sludge samples are of no value, except in conjunction with core samples, this hole failed to give correct information of the Sulphur in the ore. It, however, showed over 40 feet of ore 200 feet below the 4th level. In order to get more core, it was decided to use the double core barrel on the next hole

and also to take water samples to get the Sulphur which went into solution.

HOLE NO. 5

This was an incline hole, drilled on a dip of 45° and a course of S. 30° E. It was planned to cut the ore at a depth of 200 feet below the 4th level, at a point approximately 200 feet to the South-east of Hole No. 4.

The material encountered was as follows:

Slate,	0 to 210
Slate and Chert,	210 to 214
Chert and Jasper,	214 to 248
Jasper,	248 to 305
Ore,	305 to 320
Jasper,	320 to 331

The analyses of core and sludge samples are as follows:

<u>DEPTH</u>	<u>SLUDGE ANALYSES</u>			<u>DEPTH</u>	<u>CORE ANALYSES</u>		
	<u>IRON.</u>	<u>PHOS.</u>	<u>SULPHUR</u>		<u>IRON</u>	<u>PHOS.</u>	<u>SUL.</u>
305-310	61.20	.094	.023	307-311	61.30	.059	.215
310-315	62.20	.059	.044	311-320	59.80	.046	.280
315-320	59.00	.063	.043				

This hole was finished in December after the mine closed down, The double-core barrel worked out very successfully, as practically 13 feet of core was obtained. The analyses of water samples showed that some Sulphur went into solution. The combined results of all Sulphur determinations gave the actual Sulphur in the ore. This hole showed the ore body to be at least 200 feet long and to run low in Sulphur at the point cut by the drill hole.

Before sinking the shaft, a number of holes should be drilled, in order that fairly complete information may be available both of the size and Sulphur content of the ore body.

GARDNER-MACKINAW SURFACE.

An addition was built to the dry in the summer, and completed in the fall. It gives an additional change room and a hospital room, both of which were badly needed. It was planned to put the mine on single shift January 1st, 1921, as there would have been sufficient stopes opened by that time, also the addition to the dry provided room for the men when all were working on one shift.

Two small storage sheds were built during the year, one for storage of ropes and other carpenter supplies; the other for electric supplies.

Additional stocking grounds was made at the Gardner which would have taken care of the product for another year. A new stocking trestle was erected in the fall, extending across the new ground.

A new frame building was built in the fall enclosing the heating plant boiler. The old building had rotted so that it was necessary to replace it.

The water tank which was purchased in 1919 was erected in 1920. It is 26 feet above ground and provides a storage for use in case of fires at the mines or location.

Fencing at the location was completed in the summer.

The township started to build a rock road from the locations to the main state trunk road, a distance of 1-1/2 miles, but owing to lack of funds, this work was only 20% completed in 1920.

MACKINAW MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1920.

GRADE	IRON	PHOS.	SILICA	MANG.	SULPH.
Mackinaw,	57.89	.183	3.30	.378	.626
Mackinaw High Sulph.,	58.84	.122	3.16	.408	.736

(Cargoes all mixed).

ORE STATEMENT - DECEMBER 31ST, 1920.

	MACKINAW	MACKINAW H.SUL.	TOTAL	TOTAL LAST YEAR
On hand Jan. 1st, 1920,	2,289	17,910	20,199	2,363
Output for year,	41,004	31,986	72,990	50,168
Transferred, Total,	173	173		
Total,	43,466	49,723	93,189	52,531
Shipments,	37,809	11,242	49,051	32,332
Balance on hand,	5,657	38,481	44,138	20,199
Increase in output-45%			22,822	
Increase in ore on hand-118%			23,939	
1920 - 2-8 Hour Shifts Jan. 1st to Dec. 1, 1920				
Idle Dec. 1st to Dec. 31st, 1920				
1919 - 2-8 Hour Shifts for year.				

MACKINAW MINE.

MACKINAW MINE

SHIPMENTS FOR YEAR 1920.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Mackinaw,	24,972	12,837	37,809	28,634
Mackinaw High Sulph.,		11,242	11,242	3,698
Total,	24,972	24,079	49,051	32,332
Total last year,			32,332	
Increase - 51%			16,719	

MACKINAW MINE.

GARDNER MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR 1920

GRADE	IRON	PHOS.	SIL.	MANG.	SULPH.
Gardner,	58.00	.123	2.97	.286	.515
Gardner High Sul.	58.92	.109	3.26	.303	.802

(No shipments during 1920)

ORE STATEMENT - DECEMBER 31ST, 1920.

	GARDNER	GARDNER H. SUL.	TOTAL	TOTAL LAST YEAR
On hand Jan. 1st, 1920,	2,955	16,245	19,200	42
Output for year,	25,189	32,209	57,398	19,158
Balance on hand,	28,144	48,454	76,598	19,200
Increase in output-199%			38,240	
Increase in ore on hand-299%			57,398	
1920 - 2-8 Hour Shifts Jan. 1st to Dec. 1st, 1920 Mine idle Dec. 1st to Dec. 31st, 1920				
1919 - 2-8 Hour Shifts for year.				

GARDNER-MACKINAW MINE.

COMPARATIVE MINING COST FOR YEAR.

	1 9 2 0.	1 9 1 9.	INCREASE.	DECREASE.
PRODUCT	130,388	69,326	61,062	
General Expense	.198	.163	.035	
Maintenance	.209	.141	.068	
Mining Expense	2.087	1.920	.167	
Cost of Production	2.494	2.224	.270	
Exploring	.061		.061	
Ore in Development		.544		.544
<u>DEPRECIATION.</u>				
Plant Account	.450	.	.450	
Taxes	.040	.045		.005
Central Office	.084	.053	.031	
Fire Loss	.004		.004	
Miscellaneous	.012	.005	.007	
Idle Expense	.025		.025	
Sundry Expense	.007	.008		.001
Cost on Stockpile	3.177	2.879	.298	
Loading & Shipping	.064	.079		.015
Cost on Cars	3.241	2.958	.283	
No. Days Operating	275	151	124	
No. Shifts and Hours	2-8hr	2-8hr		
Avg. Daily Product	474	459	15	
<u>COST OF PRODUCTION.</u>				
Labor	1.792	1.493	.299	
Supplies	.702	.731		.029
Total	2.494	2.224	.270	

Mine started on operating basis July 1, 1919.

GARDNER-MACKINAW MINE

COMPARATIVE WAGES AND PRODUCT

	19 2 0	6 Mos. 1 9 1 9	INCREASE	DECREASE
PRODUCT	130,388	69,326	61,062	
No. Shifts and Hours	2-8hr	2-8hr		
AVERAGE NO. MEN WORKING				
Surface	29	16	13	
Underground	97	46	51	
Total	126	62	64	
AVERAGE WAGES PER DAY				
Surface	5.47	5.02	.45-9%	
Underground	6.33	5.73	.60-10	
Total	6.13	5.55	.58-10.5	
WAGES FOR MONTH OF 25 DAYS				
Surface	136.75	125.50	11.25	
Underground	158.25	143.25	15.00	
Total	153.25	138.75	13.50	
PRODUCT PER MAN PER DAY				
Surface	14.83	14.78	.05	
Underground	4.45	5.12	.67	
Total	3.43	3.80	.37	
LABOR COST PER TON				
Surface	.369	.340	.029	
Underground	1.423	1.120	.303	
Total	1.792	1.460	.332	
AVG. PRODUCT BRK'G & TRM'G	6.24	5.81	.43	
" WAGES CONTRACT MINERS	6.44	5.88	.56	
" " " TRAMMERS				
" " " LABOR	6.44	5.88	.56	
TOTAL NUMBER OF DAYS				
Surface	8,792 $\frac{1}{4}$	4,688	4,104 $\frac{1}{4}$	
Underground	29,267	13,552 $\frac{1}{4}$	15,714 $\frac{3}{4}$	
Total	38,059 $\frac{1}{4}$	18,240 $\frac{1}{4}$	19,819	
AMOUNT FOR LABOR				
Surface	48089.74	23547.61	24542.13	
Underground	185523.07	77668.37	107863.70	
Total	233621.81	101215.98	132405.83	

Proportion Surface to Underground Men:

1920 - 1 to 3.3

1919 - 1 to 3.

This mine started on operating basis July 1, 1919.

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GARDNER-MACKINAW MINE

TIMBER STATEMENT FOR THE YEAR ENDING DECEMBER 31, 1920.

KIND	LINEAL FEET	AVG. PRICE PER FOOT	AMOUNT 1920	AMOUNT 1919
4" to 6" Timber	440	.023	10.20	
6 to 8 "	12,755	.030	382.74	175.08
8 to 10 "	504	.05 $\frac{1}{2}$	28.46	93.08
10 to 12 "	2,480	.032	79.88	219.25
12 to 14 "	4,414	.110	487.65	219.20
14 to 16 "	48	.110	5.28	3.52
Total - 1920	20,641	.048	994.21	
Total - 1919	14,023	.0506		710.13
	LINEAL FEET	PER 100'		
5' Lagging	31,875	.006	197.50	157.50
7' "	20,474	.006	128.20	43.35
8' "	54,688	.013	731.12	212.46
Total	107,037	.009	1056.82	413.31
Poles	700	.008	5.95	11.01
Total - 1920	107,737	.0098	1062.77	
Total - 1919	75,995	.0558		424.32
Product			128,162	55,829
Feet timber per ton of ore			.161	.251
Feet lagging "			.835	1.338
" " per foot of timber			5.19	5.33
Cost per ton for timber			.0077	.013
" lagging			.0083	.007
" poles			.0000	.000
" timber, lagging & poles			.0160	.020
Equivalent of stall timber to bd.measure			48,615	31,345
Feet of bd.measure per ton of ore			.378	.561

Total cost for timber, lagging & poles - 1920	2056.98
1919	1134.45

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