

ANGELINE MINE.

COMPARATIVE MINING COST FOR YEAR.

	1 9 2 0.	1 9 1 9.	INCREASE.	DECREASE.
PRODUCT	47,995	42,080	5,915	
General Expense	.237	.199	.038	
Maintenance	.231	.194	.037	
Mining Expense	2,949	2,638	.311	
Cost of Production	3,417	3,031	.386	
Exploratory		.016		.016
<u>DEPRECIATION.</u>				
Plant Account	.430		.430	
Equipment	.001	.008		.007
Construction		.119		.119
Total Depreciation	.431	.127	.304	
Taxes	.087	.094		.007
Central Office	..119	.094	.025	
Miscellaneous	0	.035	.035	
Sundry Expense	.033	.007	.026	
Cost on Stockpile	4,102	3,334	.768	
Loading & Shipping	.082	.175		.093
Cost on Cars	4,184	3,509	.675	
No. Days Operating	299	298	1	
No. Shifts & Hours	2-8hr	1-10hr 1 - 8hr		
Avg. Daily Product	161	141	20	
<u>COST OF PRODUCTION.</u>				
Labor	2,647	2,194	.453	
Supplies	.770	.837		.067
Total	3,417	3,031	.386	

ANGELINE MINE

COMPARATIVE WAGES AND PRODUCT

	1 9 2 0	1 9 1 9	INCREASE	DECREASE
PRODUCT	47,995	42,080	5,915	
No.Shifts and Hours	2-8hr	1-10hr 1- 8hr		
AVERAGE NO.MEN WORKING				
Surface	16	24		8
Underground	53	39	14	
Total	69	63	6	
AVERAGE WAGES PER DAY				
Surface	5.38	4.97	.41-8.4%	
Underground	6.34	5.38	.96-17.8	
Total	6.12	5.23	.89-17 %	
WAGES PER MONTH OF 25 DAYS				
Surface	134.50	124.25	12.25	
Underground	158.50	134.50	24.00	
Total	153.00	140.75	12.25	
PRODUCT PER MAN PER DAY				
Surface	9.78	6.43	3.35	
Underground	2.57	3.71		1.14
Total	2.34	2.35		.01
LABOR COST PER TON				
Surface	.551	.773		.222
Underground	2.066	1.451	.615	
Total	2.617	2.224	.393	
AVG.PRODUCT BRK'G & TRM'G	4.92*	15.20		10.28
" WAGES CONTRACT MINERS	6.98	co.acct		
" " " TRAMMERS	Co.Acct	"		
" " " Labor	6.98	"		
TOTAL NUMBER OF DAYS				
Surface	4,906	6,545 $\frac{3}{4}$		1,639 $\frac{3}{4}$
Underground	15,638 $\frac{1}{4}$	11,354	4,284 $\frac{1}{4}$	
Total	20,544 $\frac{1}{4}$	17,899 $\frac{3}{4}$	2,644 $\frac{3}{4}$	
AMOUNT FOR LABOR				
Surface	26428.07	32534.28		6106.21
Underground	99194.36	61,066.72	38127.64	
Total	125622.43	93601.00	32021.43	

PROPORTION Surface to Underground Men:

1920 - 1 to 3.3

1919 - 1 to 1.62

1918 - 1 to .88

* - 15.20 for 1919 is for tramping only.

ANGELINE MINE

TIMBER STATEMENT FOR THE YEAR ENDING DECEMBER 31, 1920.

KIND	LINEAL FEET	AVG. PRICE PER FOOT	AMOUNT 1920	AMOUNT 1919
6" to 8" Timber	26,022	.034	894.90	306.65
8 to 10 "	12,312	.075	932.81	100.24
10 to 12 "	11,877	.09	1065.26	767.82
12 to 14 "	4,457	.105	465.21	250.00
Total - 1920	54,668	.061	3358.18	
Total - 1919	31,990	.045		1434.71
	LINEAL FEET	PER 100'		
5' Lagging	140,250	1.03	1442.68	736.50
7' "	74,523	.71	527.67	148.96
8' "				162.06
Total Lagging	214,773	.912	1970.35	1047.52
Poles	31,856	1.40	445.59	32.30
Lagging & Poles	246,629		2415.94	1079.82
Product			47,995	42,080
Ft. Timber per ton of ore			1.14	1.31
Ft. Lagging "			4.41	4.31
Ft. " per ft. of timber			3.93	5.73
Cost per ton for timber			.069	.034
" lagging			.041	.025
" poles			.009	.008
" timber, lagging & poles			.119	.067
Equivalent of stull timber to bd. measure			97,119	63,116
Ft. Bd. measure per ton of ore			2.02	1.50

Total Cost of timber, lagging & Poles - 1920	5774.12
1919	2514.53

Handwritten: ~~Cost~~ Board

MADE IN U.S.A.

ANGELINE MINE

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE

KIND	QUANTITY	AVERAGE PRICES	AMOUNT 1920	AMOUNT 1919
40% Powder - - - - -				8.95
50% " - - - - -	18,600	.182	3,391.54	3,286.32
60% " - - - - -	70	.253	17.73	
Total Powder -	18,670	.183	3,409.27	3,295.27
Fuse - - - - -	46,000	8.58	394.80	261.42
Caps - - - - -	12,000	14.89	178.65	96.57
Crimpers - - - - -	16	.80	12.75	2.35
Exploders - - - - -				76.59
Total Fuse, Etc.-			586.20	436.93
Total Explosives-			3,995.47	3,732.20
Product - - - - -			47,995	42,080
Pounds Powder per ton of Ore			.389	.448
Cost per ton for Powder -			.071	.0783
" " " " Fuse, Etc.			.012	.0102
" " " " Explosives			.083	.0885
Avg. Price per lb. for Powder			.183	.175

ANGELINE MINE

ANNUAL REPORT

OF THE

HOLMES MINE

(1920)

Production and Shipments.

The Holmes Mine worked 299 days in 1920, and produced 225,392 tons of ore, an average of 753 tons per day, to which is added 6,515 tons of ore obtained from the Section 16 Mine in settlement of trespasses, bringing the total production credited to the mine to 231,807 tons. The mine worked on double-shift throughout the year.

The production of rock was large on account of development on the third and fourth levels, but was less than in 1919. A total of 29,157 tons of rock was produced, giving an average of 98 tons per day.

The Junction Bessemer pile was cleaned up, and a large part of the Junction pile was shipped. A fair amount of Holmes Bessemer was also shipped from stock-pile, but the Holmes pile was not touched.

There was little labor shortage during the year.

Wages were increased 10% on February 1st.

Table I.

Production by Grades.

Grade	1920 Tons	1919 Tons
Holmes Bessemer Lump		420
Holmes Bessemer Crushed	76,977	59,899
Holmes Crushed	21,736	35,944
Junction Bessemer	15,229	889
Junction	<u>117,863</u>	<u>35,979</u>
Total Ore	231,807	133,131
Rock	<u>29,157</u>	<u>41,708</u>
Total Ore and Rock	260,964	174,839

Table II.

Shipments.

Grade	Pocket Tons	Stock-Pile Tons	Total Tons
Holmes Bessemer	23,328	25,930	47,258
Holmes	3,806		3,806
Junction Bessemer	7,255	5,898	13,153
Junction	<u>69,130</u>	<u>51,939</u>	<u>121,069</u>
Total	103,519	83,767	187,286

Table III.

Stock-Pile Balances, Dec. 31st, 1920.

Grade	Tons
Holmes Bessemer	48,085
Holmes	58,368
Junction Bessemer	2,494
Junction	<u>39,328</u>
Total	148,275

Table IV.

Division of Product by Levels.

Level	Holmes Bessemer Tons	Holmes Tons	Junction Bessemer Tons	Junction Tons	Total Ore Tons	Rock Tons	Total Ore and Rock Tons
First	39,435	12,453		75,574	127,462	5,453	132,915
Second	16,560	3,490	1,950	6,844	28,844	764	29,608
Third	14,467	5,210	8,203	19,447	47,327	16,289	63,616
Fourth		585	5,076	15,998	21,659	6,651	28,310
Total	70,462	21,738	15,229	117,863	225,292	29,157	254,449

Table V.

Production by Months.

Month	Days	Ore Per Day Tons	Holmes Bessemer Tons	Holmes Crushed Tons	Junction Bessemer Tons	Junction Tons	Total Ore Tons	Rock Tons	Total Ore and Rock Tons
January	26	704	5,102	3,860	536	8,802	18,300	2,756	21,056
February	23	723	3,788	3,686	262	8,904	16,640	2,146	18,786
March	27	776	7,342	3,375	1,822	8,421	20,960	2,213	23,173
April	24	696	4,816	2,782	2,161	6,956	16,715	2,914	19,629
May	25	803	5,574	2,120	3,457	8,916	20,067	2,204	22,271
June	25	782	5,230	1,252	820	12,257	19,559	2,865	22,424
July	26	688	4,509	1,347	1,037	10,986	17,879	4,047	21,926
August	24	706	6,157	816	510	9,473	16,956	2,762	19,718
September	24	812	6,890	906	857	10,835	19,488	2,560	22,048
October	26	785	7,537	713	2,051	10,108	20,409	2,124	22,533
November	24	798	6,988	386	2,173	9,603	19,150	1,038	20,188
December	25	729	6,485	495	1,581	9,661	18,222	1,528	19,750
	299	750	70,418	21,738	17,267	114,922	224,345	29,157	253,502
Overrun from Stock-Pile		3			947		947		947
Total	299	753	70,418	21,738	18,214	114,922	225,292	29,157	254,449
Transfers			+44		-2,985	+2,941			
Section 16		22	6,515				6,515		6,515
Total	299	775	76,977	21,738	15,229	117,863	231,807	29,157	260,964

Table VI.

Delays.

Date	Hours	Tons Lost	Cause	Repair Cost
Jan. 31	$\frac{1}{2}$	50	Crusher belt broken.	\$ 12.69
Feb. 17	$\frac{1}{2}$	50	Car off track on top tram.	9.30
Feb. 19	$\frac{1}{2}$	50	Switchboard out of order.) Car off track on top tram.)	14.35
April 12	1	60	Pump cable on fire in engine-house.	16.08
June 7	2	100	No current. Main line.	
June 28	$3\frac{1}{2}$	100	No current. Main line.	
July 27	$2\frac{1}{2}$	100	No current. Main line.	
Sept. 8	8	400	No current. Main line.	
Sept. 15	16	850	Lightning set fire to switchboard in engine-house.	113.25
Nov. 3	8	450	Switchboard burnt out in engine-house.	34.11
Nov. 9	8	450	Switchboard burnt out in engine-house.	104.93
Dec. 22	$3\frac{1}{2}$	100	Coils on compressor motor started to burn out.	98.78
Dec. 31	<u>2</u>	<u>200</u>	No current.	<u> </u>
Year	56	2,960		\$ 403.49

Table VII.

Delays Due to Lack of Electric Current.

Date	Hours	Tons Lost
June 7	2	100
June 28	$3\frac{1}{2}$	100
July 27	$2\frac{1}{2}$	100
Sept. 8	8	400
Dec. 31	<u>2</u>	<u>200</u>
Year	18	900

Table VIII.

Estimate of Ore Reserves.

Developed Ore.

Level	Holmes Bessemer Tons	Holmes Tons	Junction Bessemer Tons	Junction Tons	Total Tons
First				14,000	14,000
Second	38,000	7,000	38,000	210,000	293,000
Third	150,000	50,000	100,000	553,000	853,000
Fourth	<u>50,000</u>	<u>22,000</u>	<u>120,000</u>	<u>743,000</u>	<u>935,000</u>
Total	238,000	79,000	258,000	1,520,000	2,095,000
Less 10% Rock & 10% Loss in Mining	<u>48,000</u>	<u>16,000</u>	<u>51,000</u>	<u>304,000</u>	<u>419,000</u>
Net Total	190,000	63,000	207,000	1,216,000	1,676,000

Prospective Ore.

	Holmes Bessemer Tons	Holmes Tons	Junction Bessemer Tons	Junction Tons	Total Tons
Below Fourth			50,000	344,000	394,000
Less 10% Rock & 10% Loss in Mining			<u>10,000</u>	<u>69,000</u>	<u>79,000</u>
Net Total			40,000	275,000	315,000
Total Ore	190,000	63,000	247,000	1,491,000	1,991,000

Factors Used:- Hard Ore 9 cu. ft. per ton.

Soft Ore 11 cu. ft. per ton.

The estimate of ore has been largely increased on account of the development of the third and fourth levels. The hard ore extends down to a point 50 feet above the fourth level, and the probable depth of the soft ore below the fourth level is 100 feet. It will not be necessary to develop the ore below the fourth level for some years to come.

GENERAL.

Labor.

There was no shortage of labor during the year, although skilled miners were scarce during the summer months. Many men were taken on from the Lake Mine during the year, and about 50 single men were laid off on December 1st to give places to married men from the Cliffs Shaft Mine. This change caused a temporary loss of efficiency.

New Construction.

On account of the caving of Excelsior Street on the Section 16 Mine property and near the south-east corner of the Holmes Mine a new street was built further north close to the end of the Holmes Mine stock-pile ground. The cost was paid by both mines, most of the work being done by the Board of Public Works of the City.

The pump-house on the fourth level was completed.

Accidents to Equipment.

The power-line was struck by lightning on September 15th, burning out the switch-board and part of one window-casing in the engine-house. The mine was shut down for two shifts at this time, and there were other delays from the same cause at intervals afterwards.

Surface.

The floor for the Holmes Bessemer stock-pile was extended 150 feet during the summer and four new bents were erected. A new trestle was also erected for the Holmes stock-pile, as there were no stock-pile shipments of this grade. The trestles for Junction and Junction Bessemer had not been entirely completed at the end of the year.

UNDERGROUND.

Development.

At the first of the year the cross-cuts on the third and fourth levels had entered the ore on both levels a short distance. These two levels had been almost completely developed by October, and work was transferred to the 240 and 340 foot sub-levels, half-way between the third and fourth, and between the second and third levels respectively.

On the third level the ore has been developed for a total length of 1250 feet, with a maximum width of 250 feet between the foot and hanging-walls in the middle. The actual width of clean ore at this point is hardly more than 160 feet. Drifts were driven south-east and north-west near the foot and hanging-walls, and these have been connected by five cross-cuts. Three other cross-cuts have been driven, one of which connects with a corresponding level of the Section 16 Mine, and affords a second outlet and air-way for this part of the mine.

The ore-body on the fourth level contains no hard ore, and is smaller than on the third level, but the dikes in the ore are not as large or as numerous as on the third level. There is some chance of finding more ore further west, but it cannot be counted upon. Four cross-cuts have been driven across the ore-body, and drifts have been driven near the foot-wall on both sides of the main cross-cut and along the hanging-wall on the east side. The maximum distance between the ends of the ore is 850 feet, and the maximum width 220 feet.

On the 240 foot sub-level the ore has been followed for a length of 1000 feet. The west end of the sub-level is in hard ore for nearly 200 feet, the balance being soft ore. The end of the ore has been reached on the west, and there is only 50 feet more to go at the east end, before the boundary-line is reached. The width of the ore at this elevation has not been determined, except at one place, nearly over the main (or No. 5) cross-cut on the fourth level, where it is 100 feet.

On the 340 foot sub-level drifts have been driven near the foot and hanging-walls in both hard ore and soft ore veins for a length of 400

feet, and a small sub-level has been opened 10 feet lower down at the west end of the hard ore, where the ore is barely wide enough for a drift.

Numerous raises have been put up, so that there are many connections now between the upper and lower levels. The ventilation is good throughout the mine.

Stoping.

All the hard ore and nearly all the soft ore has been mined above the first level. The 570, 555, 545, 535 and 520 foot sub-levels have been finished, and the 510 and 500 foot sub-levels are nearly done. In December there were four gangs working on the 510 foot sub-level, four on the 500 foot sub and two on the first level. Below the first level there were four each on the 470 and 460 foot subs, three on the 445 foot sub-level, and one on the second level. There are six gangs drifting and raising on the lower levels.

In the soft ore the gangs stoping at the lowest elevation are on the first level, although some stoping has been done on the 460 and 470 foot sub-levels near the boundary; and the working sub-levels are higher successively towards the west. The ore-body gets larger as we go down, so that more gangs can be employed in the soft ore as the hard ore gets smaller. The output of soft ore will increase as the hard ore diminishes.

In the hard ore vein the ore has all been mined down to the first level and there are now three sub-levels, the 470, 460 and 445, as noted above, on which stoping is being done. The ore is worked down lowest at the east end of the vein, and the working-places are on successively higher sub-levels as they approach the shaft. The vein is very small below the 445 foot sub-level, because the eastern end was mined from the second level by the Oliver Iron Mining Company on our account, and nearly half of the rest of the ore was mined in shrinkage stopes the first year that the mine was operated.

The average number of contracts worked during the year was 26,
which were divided as follows:-

Stoping	14
Drifting and Raising in Ore	9
Repairing	1
Rock Drifting and Raising	<u>2</u>
Total	26

The 24 contracts working in ore were divided evenly between the
hard and soft ore. On this basis the average output per ore-contract was
7,683 tons in hard ore and 11,091 tons in soft ore.

Damaricus
~~and~~ *Bond*

HOLMES MINE.

COMPARISON OF COST SHEETS FOR 1919 AND 1920.

The Holmes Mine worked on double-shift throughout 1920. The amount of rock-work was large, but was not as great as in 1919. The proportion of drifting to stoping was also large, on account of the development of the third and fourth levels.

Wages were increased 10% on Feb. 1st, 1920, making the average rate for 1920 9.2% higher than in 1919.

Production.

	<u>1919</u>	<u>1920</u>
Days Worked	299	299
	Tons	Tons
Ore	133,131	231,807
Rock	<u>41,708</u>	<u>29,157</u>
Ore and Rock	174,839	260,964
Ore Per Day	445	775
Rock Per Day	<u>139</u>	<u>98</u>
Ore and Rock Per Day	584	873

Labor.

	<u>1919</u>	<u>1920</u>
Average number of men	201	232
Average rate per day	\$ 5.60	\$ 6.09

Tons Per Man Per Day.

	<u>1919</u>	<u>1920</u>
Surface	9.96	11.94
Underground	<u>2.85</u>	<u>4.36</u>
Total	2.22	3.20

Damaricus
~~and~~ *Bond*

Cost of Production.

	<u>1919</u>	<u>1920</u>
Labor	\$ 2.507	\$ 1.854
Supplies	<u>1.162</u>	<u>.780</u>
Total	\$ 3.669	\$ 2.634

GENERAL EXPENSE.

No. 26 - Insurance.

1919	\$ 829.30	\$.006
1920	<u>26.16</u>	<u>.000</u>
Decrease	\$ 803.14	\$.006

The decrease is in Riot Insurance, which was discontinued in 1920.

No. 27 - Engineering.

1919	\$ 2183.97	\$.017
1920	<u>2119.77</u>	<u>.009</u>
Decrease	\$ 64.20	\$.008

No. 28 - Analysis.

1919	\$ 5194.26	\$.039
1920	<u>5875.20</u>	<u>.026</u>
Increase	\$ 680.94	
Decrease		\$.013

The increase is due to larger shipments and more analyses.

No. 30 - Personal Injury Expense.

1919	\$ 6029.20	\$.045
1920	<u>7448.53</u>	<u>.032</u>
Increase	\$ 1419.33	
Decrease		\$.013

The principal charges were as follows:-

	<u>1919</u>	<u>1920</u>
Medical & Hospital Exp.	\$ 1221.24	\$ 1173.00
Compensation Payments	2209.39	2135.47
Hospital Deficit	<u>2598.57</u>	<u>4140.06</u>
Total	\$ 6029.20	\$ 7448.53

No. 30a - Mine Office.

1919	\$ 8949.66	\$.067
1920	<u>10180.57</u>	<u>.044</u>
Increase	\$ 1230.91	
Decrease		\$.023

In 1920 an adding machine cost \$ 200, calendars increased \$ 55.81, exchange \$ 64.25, and wages and salaries \$ 155.57. Superintendent's choreman was also higher. Balance is Central Office charge.

MAINTENANCE.

No. 125 - Tracks and Yards.

1919	\$ 2910.56	\$.022
1920	<u>4189.65</u>	<u>.018</u>
Increase	\$ 1279.09	
Decrease		\$.004

The new road replacing Excelsior St. cost \$ 966.20, and new plants for the grounds cost \$ 91.87. Balance is labor on tracks and grounds.

MAINTENANCE. (Continued)

No. 126 - Docks, Trestles and Pockets.

1919	\$	796.15	\$	.006
1920		<u>3685.93</u>		<u>.016</u>
Increase	\$	2889.78	\$	.010

The increase in 1920 is for sollar plank and for preparing extensions of stocking-sollars.

No. 127 - Buildings.

1919	\$	206.18	\$	.002
1920		<u>219.65</u>		<u>.001</u>
Increase	\$	13.47		
Decrease			\$	.001

No. 128 - Shop Machinery.

1919	\$	635.33	\$	.005
1920		<u>510.55</u>		<u>.002</u>
Decrease	\$	124.78	\$	.003

In 1919 a circular saw was rigged up in the carpenter shop and a hack-saw in the machine shop.

No. 129 - Boiler Plant.

1919	\$	2.70	\$	.000
1920		<u>12.17</u>		<u>.000</u>
Increase	\$	9.47	\$	.000

No. 130 - Hoisting Machinery.

1919	\$	2609.06	\$	.020
1920		<u>1686.28</u>		<u>.007</u>
Decrease	\$	922.78	\$	.013

In 1919 the principal items were counter-weight pipe to fourth level, \$ 470.31, wire-rope \$ 1128.60, overwind switch \$ 52.98 and hoist regulator \$ 423.84.

In 1920 new ropes cost \$ 861.06; new bearings for hoist \$ 125.73, and 6 disc switches cost \$ 69.69. Balance is labor.

No. 131 - Compressors and Power Drills.

1919	\$	165.08	\$	.001
1920		<u>12.00</u>		<u>.000</u>
Decrease	\$	153.08	\$	.001

The air-pipe to the fourth level was the principal item in 1919, and repairs to compressor.

No. 132 - Pumping Machinery.

1919	\$	9052.69	\$	.068
1920		<u>3893.21</u>		<u>.017</u>
Decrease	\$	5159.48	\$	.051

In 1919 charges included part of the cost of installing the big centrifugal pump on the second level, the cost of a dam, cutting sump inside, and the first cost and installation of two smaller pumps as well as the removal of the large pump later in the year. The pump-house was finished in 1920, the Cameron pump was repaired, and the two small pumps were sent to surface.

No. 133 - Top Tram Engines and Cars.

1919	\$	1131.05	\$	.008
1920		<u>2542.08</u>		<u>.011</u>
Increase	\$	1411.03	\$	.003

In 1920 3000 feet of 1/2" wire-rope cost \$ 225.63; Hard Ore shop bills were \$ 320.82 higher; castings and wheels increased \$ 257.57. Labor repairing cars increased and top-tram butterfly cost \$ 606. - Total \$ 1410.

MAINTENANCE. (Continued)

No. 134 - Skips and Skip-Roads.

Repairs to skips and shaft-runners were higher in 1919.

1919	\$	1681.67	\$	.013
1920		<u>1147.71</u>		<u>.005</u>
Decrease	\$	533.96	\$	.008

No. 135 - Underground Tracks and Cars.

The increase is in rail and new sub-level cars and trucks.

1919	\$	4476.98	\$	.033
1920		<u>7715.98</u>		<u>.033</u>
Increase	\$	3239.00	\$	.000

No. 136 - Electric Tram Plant.

In 1920 one new locomotive cost \$ 4300, and overhauling cars increased \$ 2507. Rail on the third and fourth levels increased \$ 3272.90, trolley installation \$ 463.00 and labor on tracks \$ 2225.40. Total \$ 12,768.30.

1919	\$	9745.21	\$	.073
1920		<u>22539.48</u>		<u>.097</u>
Increase	\$	12794.27	\$	.024

No. 137 - Telephones and Safety Devices.

There were two new telephones put in during 1919.

1919	\$	467.43	\$	.004
1920		<u>352.77</u>		<u>.002</u>
Decrease	\$	114.66	\$	.002

No. 138 - Crushing and Screening.

In 1920 crushing ore was transferred from Acct. No. 183 to Nos. 138 and 168.

1919	\$		\$	
1920		<u>915.56</u>		<u>.004</u>
Increase	\$	915.56	\$	.004

MINING EXPENSE.

No. 150 - Air-Pipes.

The increase is due to pipes and hoses used in new contracts, especially those opening the third and fourth levels.

1919	\$	5277.50	\$	.040
1920		<u>6020.73</u>		<u>.026</u>
Increase	\$	743.23		
Decrease			\$	.014

No. 151 - Compressors.

During much of 1919, while the shaft was being sunk and the plats cut, the air-compressor was run 24 hours a day. It now runs only 16 hours a day.

1919	\$	21791.52	\$	.164
1920		<u>21043.95</u>		<u>.091</u>
Decrease	\$	747.57	\$	.073

No. 152 - Hoisting.

Wages were 9.2% higher in 1920, and ore and rock hoisted increased 86,125 tons, or nearly 50%.

1919	\$	17100.66	\$	.128
1920		<u>20192.39</u>		<u>.087</u>
Increase	\$	3091.73		
Decrease			\$	.041

MINING EXPENSE. (Continued)

No. 153 - Pumping.

1919	\$	14719.19	\$	.111
1920		4625.65		.020
Decrease	\$	10093.54	\$	.091

In 1919 pumping was high on account of the emergency pump on the second level early in the year. The new pumping plant is much more economical.

No. 154 - Sinking and Shaft Repairs.

1919	\$	36066.17	\$	.271
1920				
Decrease	\$	36066.17	\$	.271

The shaft was sunk to the fourth level in 1919. There was no sinking in 1920.

No. 155 - Rock Drifting.

1919	\$	51708.40	\$	.389
1920		28564.23		.123
Decrease	\$	23144.17	\$	.266

In 1919 the third and fourth levels were opened from the shaft to the ore-formation, and in 1920 these levels were opened in the ore-formation. The amount of drifting decreased from 2853 feet in 1919 to 2183 feet in 1920.

No. 156 - Breaking Ore.

1919	\$	169928.22	\$	1.276
1920		245596.47		1.059
Increase	\$	75668.25		
Decrease			\$	.217

The amount of ore mined increased from 133,131 tons in 1919 to 225,292 in 1920. The percentage of soft ore mined was also largely increased.

No. 157 - Trimming.

1919	\$	24747.78	\$	.186
1920		63752.99		.275
Increase	\$	39005.21	\$	.089

Wages were 9.2% higher in 1920, and trimming was done on four levels instead of one. Production of ore increased 92,161 tons.

No. 158 - Filling.

1919	\$	4924.83	\$	.037
1920		2018.80		.009
Decrease	\$	2906.03	\$	.028

There was less rock dumped underground in 1920.

No. 159 - Timbering.

1919	\$	57987.85	\$	.435
1920		80728.52		.348
Increase	\$	22740.67		
Decrease			\$	.087

The cost of mine-timber increased \$ 3163.79. The balance is labor for handling and framing, and repairing underground. Wages were 9.2% higher in 1920.

No. 160 - Captain and Bosses.

1919	\$	8104.08	\$	.061
1920		12591.34		.054
Increase	\$	4487.26		
Decrease			\$	.007

The wages of the shift-bosses on the third and fourth levels in 1919 were charged to shaft-sinking and drifting. Wages were 9.2% higher in 1920.

No. 161 - Dry-House.

1919	\$	4581.40	\$	.034
1920		4318.40		.019
Decrease	\$	263.00	\$	.015

Fuel charges were \$ 495 less in 1920, and most of this decrease occurred in this account.

MINING EXPENSE. (Continued)

No. 162 - Top Landing and Trimming.

1919	\$	8296.95	\$	.062
1920		<u>13685.37</u>		<u>.059</u>
Increase	\$	5388.42		
Decrease			\$	.003

During most of 1919 only rock was hoisted at night. In 1920 there were two full shifts working on the top landing.

No. 163 - Stocking Ore.

1919	\$	4445.52	\$	.033
1920		<u>7577.56</u>		<u>.033</u>
Increase	\$	3132.04		\$
				.000

The cost increased in 1920 on account of taking down and erecting stocking trestles, of which two were new.

No. 164 - Sorting Ore.

1919	\$	1777.68	\$	.013
1920		<u>1826.59</u>		<u>.008</u>
Increase	\$	48.91		
Decrease			\$	.005

Surface Drainage.

1919	\$		\$	
1920		<u>1558.59</u>		<u>.007</u>
Increase	\$	1558.59		\$
				.007

In 1920 the Holmes Mine paid for half the pumping on surface at the Section 16 Mine.

No. 168 - Crushing and Screening.

1919	\$		\$	
1920		<u>6423.98</u>		<u>.028</u>
Increase	\$	6423.98		\$
				.028

In 1920 the cost of crushing and screening was taken from Acct. No. 183 and charged to Nos. 138 and 168.

Trespass Ore Cost.

1919	\$		\$	
1920		<u>14925.86</u>		<u>.064</u>
Increase	\$	14925.86		\$
				.064

6,515 tons of ore in payment of trespass was received from the Section 16 Mine in 1920, and we paid the cost of mining.

RECAPITULATION.

	Year 1919		Year 1920		Increase		Decrease	
	Total	Per Ton	Total	Per Ton	Total	Per Ton	Total	Per Ton
General Expense	23186.39	.174	25650.23	.111	2463.84			.063
Maintenance	33879.89	.255	49423.02	.213	15543.13			.042
Mining Expense	<u>431457.75</u>	<u>3.240</u>	<u>535452.42</u>	<u>2.310</u>	<u>103994.67</u>			<u>.930</u>
Cost of Production	488524.03	3.669	610525.67	2.634	122001.64			1.035

HOLMES MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1920.

GRADE	IRON	PHOS.	SILICA
Holmes Bessemer,	62.24	.033	6.15
Holmes Crushed,	60.53	.063	8.28
Junction Bessemer,	63.94	.035	4.16
Junction,	57.58	.087	8.80

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1920.

GRADE	Mine		Lake Erie		
	IRON	PHOS.	IRON	PHOS.	MOIST
Holmes Bessemer,	61.70	.032	62.13	.034	3.35
Holmes Crushed,	(All Mixed)				
Junction Bessemer,	"	"			
Junction,	"	"			

ORE STATEMENT - DECEMBER 31ST, 1920.

	BESS. CR.	HOLMES CR.	JUNCTION BESS.	JUNCTION	TOTAL	TOTAL LAST YEAR
On hand Jan.1st,1920,	20,366	40,436	418	42,534	103,754	18,427
Output for year,	76,933	21,738	17,267	114,922	230,860	131,741
Transferred,	44		2,985	2,941	2,985	
Stockpile Shortage and Overrun,			947		947	1,390
Total,	97,343	62,174	15,647	160,397	335,561	151,558
Shipments,	49,258	3,806	13,153	121,069	187,286	47,804
Balance on hand,	48,085	58,368	2,494	39,328	148,275	103,754
Increase in output-75%					99,119	
Increase in ore on hand-30%					44,521	
1920 - 2-8 Hour Shifts for year						
1919 - 2-8 " " " "						

HOLMES MINE.

HOLMES MINE

SHIPMENTS FOR YEAR - 1920.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Holmes Bessemer Lump,				420
Holmes Bessemer Crushed,	23,271	25,967	49,258	46,913
Holmes Crushed,	3,806		3,806	
Junction Bessemer,	7,255	5,898	13,153	423
Junction,	69,130	51,939	121,069	48
Total,	103,462	83,824	187,286	47,804
Total last year,	26,340	21,464	47,804	
Increase - 299%			139,482	

HOLMES MINE.

COMPARATIVE MINING COST FOR YEAR.

	1 9 2 0.	1 9 1 9.	INCREASE.	DECREASE.
PRODUCT	231,807	133,131	98,676	
General Expense	.111	.174		.063
Maintenance	.213	.255		.042
Mining Expense	2.310	3.240		.930
Cost of Production	2.634	3.669		1.035
<u>DEPRECIATION.</u>				
Original Purchase	.002	.002		
Plant	.500	.500		
Total Depreciation	.502	.502		
Taxes	.127	.147		.020
Central Office	.085	.104		.019
Miscellaneous	.004	.001	.003	
Sundry Expense	.030	.008	.022	
Total Cost on Stockpile	3.382	4.431		1.049
Loading & Shipping	.057	.069		.012
Total Cost on Cars	3.439	4.500		1.061
No. Days Operating	299	299		
No. Shifts & Hours	2-8hr	1-8hr		
Avg. Daily Product	775	445	330	
<u>COST OF PRODUCTION.</u>				
Labor	1.854	2.507		.653
Supplies	.780	1.162		.382
Total	2.634	3.669		1.035

HOLMES MINE

COMPARATIVE WAGES AND PRODUCT

	1 9 2 0	1 9 1 9	INCREASE	DECREASE
PRODUCT	231,807	133,131	98,676	
No.Shifts and Hours	2-8hr	1-8hr		
AVERAGE NUMBER MEN WORKING				
Surface	60	42	18	
Underground	172	153	19	
Total	232	195	37	
AVERAGE WAGES PER DAY				
Surface	5.34	4.96	.38-7.6%	
Underground	6.36	5.78	.58-10%	
Total	6.03	5.60	.43-8.6%	
WAGES PER MONTH OF 25 DAYS				
Surface	133.50	124.00	9.50	
Underground	159.00	144.50	15.50	
Total	152.00	140.00	12.00	
PRODUCT PER MAN PER DAY				
Surface	12.34	8.83	3.51	
Underground	4.51	3.36	1.15	
Total	3.30	2.43	.87	
LABOR COST PER TON				
Surface	.433	.562		.129
Underground	1.410	1.776		.366
Total	1.843	2.338		.495
AVG. PRODUCT BRK'G & TRM'G	5.97	4.16	1.81	
" WAGES CONTRACT MINERS	6.73	5.63	1.10	
" " " TRAMMERS	5.47	5.50		.03
" " " LABOR	6.66	5.91	.75	
TOTAL NUMBER OF DAYS				
Surface	18,795 $\frac{1}{2}$	13,222 $\frac{1}{2}$	5,572 $\frac{3}{4}$	
Underground	51,419 $\frac{1}{4}$	46,195 $\frac{1}{4}$	5,224	
Total	70,214 $\frac{3}{4}$	59,417 $\frac{3}{4}$	10,796 $\frac{3}{4}$	
AMOUNT FOR LABOR				
Surface	100316.29	65637.61	34678.68	
Underground	327077.85	267416.91	59660.94	
Total	427394.14	333054.52	94339.62	

Proportion Surface to Underground Men;

1920 - 1 to 2.87
 1919 - 1 to 3.64
 1918 - 1 to 2.55
 1917 - 1 to 2.5

MADE IN U.S.A.

HOLMES MINE.

TIMBER STATEMENT FOR THE YEAR ENDING DECEMBER 31, 1920.

KIND	LINEAL FEET	AVG. PRICE PER FOOT	AMOUNT	
			1920	1919
4" to 6" Timber	27,057	.016	432.94	684.76
6" to 8" "	92,212	.04	3687.93	1867.20
8" to 10" "	60,762	.08	4871.02	2078.57
10" to 12" "	25,748	.11	2805.02	1601.58
12" to 14" "	18,323	.133	2442.39	819.68
Total - 1920	224,102	.0635	14239.30	
Total - 1919	186,849	.0377		7051.79
5' Lagging	681,600	.65c'	4441.69	4051.41
7' "	74,900	.65c'	486.85	210.50
Total - 1920	756,500	.65c'	4928.54	4261.91
Poles	135,600	1.27c'	1722.12	541.91
Total - 1920	892,100	.746c'	6650.66	
Total - 1919	513,052	.93c'		4803.63
Product			231,807	133,131
Feet Timber per ton of ore			.967	1.403
" Lagging "			3.26	3.68
" " per ft. of timber			3.38	2.51
Cost per ton for Timber			.0614	.053
" Lagging			.0212	.032
" Poles			.0074	.0047
" Timber, Lagging & Poles			.09	.09
Ft. Bd. Measure per ton of ore			2.04	2.72

Total Cost for Timber, Lagging & Poles	- 1920	20,889.96
	1919	11,855.42

Damascus

Bond

MADE IN U.S.A.

HOLMES MINE

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE

KIND	QUANTITY	AVERAGE PRICES	AMOUNT 1920	AMOUNT 1919
50% Powder - - - - -	60,450	.18	10,879.31	15,316.50
60% " - - - - -	89,000	.206	18,338.81	1,296.76
80% " - - - - -	18,300	.258	4,728.45	
Total Powder -	167,750	.2024	33,946.57	16,613.26
Fuse - - - - -	350,400	9.038	3,167.02	1,513.85
Caps - - - - -	76,400	14.88	1,136.88	597.42
Crimpers - - - - -	15	.573	8.60	6.75
Total Fuse, Etc.			4,312.50	2,118.02
Total Explosives			38,259.07	18,731.28
Product - - - - -			231,807	133,131
Pounds Powder per ton of Ore			.724	.70
Cost per ton for Powder			.146	.124
" " " " Fuse, Caps, Etc.			.0186	.016
" " " " All Explosives			.165	.140
Avg. Price per Lb. for Powder			.2024	.1772

MADE IN U.S.A.

NEGAUNEE MINE - 1920.

The product for the year, 554,609 tons, was the largest in the history of the mine, this being about 11,000 tons more than the year 1917 which was its previous high record. The product for 1919 was 498,162 tons. The 1920 record did not include any overruns from stockpile and might have been much larger had it not been for a scarcity of men during the first nine months of the year. The mine is in excellent shape for a large tonnage and thirty or forty extra miners could have been worked to advantage. Very little rock development work was required during the year which helped in our production.

The operations in the mine were in the main ore body where work has been in progress for a number of years; in the East end of the mine North of #2 shaft and Northwest end near the Maas Mine in the American Mining Company tract and supporting pillar, and in the development of the eleventh level. Little exploratory work was done during the year except on the eleventh level where one horizontal diamond drill hole was drilled to test the formation.

The product for the year was graded as follows:- Bessemer 31,386 tons, Negaunee 523,223 tons. This shows a very great falling off in the amount of Bessemer. Previous to this year Bessemer had been graded at .060 phosphorous. In 1920 we changed the phosphorous limit to .048 which caused the great reduction in tonnage. Most of the Bessemer ore in the mine has come from a roll in the hanging above the tenth level. As most of this has been mined the Bessemer areas have been greatly reduced.

UNDERGROUND.

TERRITORY NORTHWEST OF #2 SHAFT.

THIRD LEVEL.

During the latter part of 1919 this old level was reopened for a distance of 400'. The ore was in pillars between old rooms where mining had been done years ago. We found some of these pillars badly crushed, however the available ore was taken, and mining was completed early in the year.

825' SUB LEVEL.

This sub level was opened several years ago and was used as a tramping level for the ore between this elevation and the 918' sub level which was the old 400' level. The development started five or six years ago was taken up again in 1919 and completed in that year. Mining operations were carried on throughout the whole of the present year and have just been completed.

810' SUB LEVEL.

This is also Northwest of #2 shaft and is opened in the shaft pillar from a point 200' North of #2 shaft to the old cave 300' beyond. Work started near the middle of the year and it was found that the territory available for mining was much smaller than the sub levels above. Most of the territory is badly crushed and a large dike extends through the sub level in a Northeast-Southwest direction, cutting the ore into two separate bodies. In December two contracts took the pillars North of this dike South of the old caved area.

795' SUB LEVEL.

This sub level was opened in November from #16 raise which was put up during the year from the ninth level rock foot wall drift. In December drifts were extended to the Northwest from the dike and also to the East towards the foot. A drift was started to the South which encountered crushed jasper at 15' and was abandoned. A small timber raise has holed from the fourth level 40' East of #16 raise. Considerable difficulty was had in getting raise #16 to this elevation on account of the crushed ground. This raise and #17 were planned to reach this territory to provide an outlet at the Northwest end of the sub level in the badly crushed ground. The timber raise to the fourth level gives an outlet to #2 shaft.

FOURTH LEVEL.

This level was reopened from #12 and #13 raises back to #2 shaft. A drift was driven to the West to connect with the old foot wall drift which it found crushed. A new drift was driven in virgin ground which holed to the shaft crosscut which was also crushed. This required considerable time in reopening

back to the shaft, however, it is now in good shape and is used for storing timber for the workings in this territory during the winter months. An exploratory drift has been driven to the Northwest from #16 raise. At 80' cave and broken jasper was encountered. The entire mineable area here is more or less broken evidently due to pulling from previous mined areas to the West or possibly from fifth level rooms.

SUBS ABOVE THE NINTH LEVEL.

690' SUB LEVEL.

South Foot.

This sub level was opened at #19C and #19D raises a year ago and finished in January of this year. This sub was mined wholly from #19C raise.

673' SUB LEVEL.

South Foot.

This sub level was opened at #19C raise a year ago and was held up until the mining was completed on the 690' sub level above. The pillars remaining were mined early in the year.

North Foot.

This sub level was opened in the American Mining Company strip and supporting pillar a year ago and was completed by the mining of a few pillars left near #58 and #59 raises during the first few months of the year.

663' SUB LEVEL

South Foot.

A new sub level between #19C and #19D raises was developed and mined during the year.

653' SUB LEVEL.

North Foot Wall.

The development of this sub level started in December 1919 and the mining was completed by October 1st of the present year. This whole area was crushed badly due to mining of the 646' sub level several years ago at the time of the sand runs. The territory comprises an area along the Maas boundary in the American Mining Company Lease and the supporting pillar adjoining it.

640' SUB LEVEL.

North Foot.

A new sub level was opened in the American Mining Company strip and in the supporting pillar in June. Development drifts have been driven to the East, North and South and the pillars blocked out ready for stoping. In December two gangs were developing in the American Mining Company pillar, one to the Northeast, the other to the Southwest of #59 raise. In the supporting pillar five gangs were employed on the foot and hanging sides.

South Foot.

A sub level was opened between #149 and #19D raises and entirely mined during the year. Along the East side of the old eighth level, pillars between the rooms were mined two years ago. In December the few remaining pillars just to the East of #149 raise were taken, part of which had to be used for filling.

620' SUB LEVEL.

South Foot.

This sub level was opened in December 1919 from #17A and #17B raises from the ninth level. During the present year raises #101, #148 and #149 from the tenth level tapped the area South of the dike. The only ore that remains is to the East where a limit was established to protect #1 shaft pillar. The area North of the dike blocked out a year ago was mined also during the year. In December five gangs were employed along the foot to the Northeast of #148 raise.

NINTH LEVEL.

South End of Mine.

Ten raises were put up into this area from the tenth level and development and mining has been in progress all year. This territory is cut in two by a dike running to the Northeast-Southwest. North of the dike there remains about two months' work to complete mining. South of the dike the work has been wholly development. Mining will start shortly. In December North of the dike, eight gangs were employed taking pillars, while South of the dike nine gangs were developing.

Raises #16 and #17 from the ninth level foot rock drift were put up to

the East and extended through to the old fourth level making a means of outlet from the sub levels North of #2 shaft other than #2 shaft.

SUBS BETWEEN THE NINTH AND TENTH LEVELS.

595' SUB LEVEL.

In this area between the large dikes in the North end of the mine, mining was completed to the supporting pillar on the West. This was finished early in the year, the development and most of the mining have been previously done.

588' SUB LEVEL.

South End.

The development of this sub level was started in October on the North and South sides of the dike which runs through this territory. The development has been from #156 raise to the North, South and East. In December this work was continued to the East by three contracts and to the North by two contracts. Mining will start as soon as the ninth level above is completed.

580' SUB LEVEL.

On the North side between the dikes, a new sub level has been started below the 595. This sub level was opened early in the year from #26 raise West of the supporting pillar. It is considerably smaller than the sub level above. The development was completed early in the year and mining will be finished within two or three months. In December six gangs were engaged in mining pillars.

565' SUB LEVEL.

North Side.

In the area between the large dikes a new sub level was started in November from #26 raise. In December a drift was extended to the Southwest and crossed the ore formation, while a second drift was driven to the Northwest paralleling the foot.

South Side.

West of the winze a few remaining pillars were removed North of the dike in January. Work is now in progress South of the dike. An exploratory drift to the West and South from the top of the winze, found nothing but jasper.

555' SUB LEVEL.

In the area under the hanging North of the dike near the winze an area 75' by 150' was completely mined during the year.

545' SUB LEVEL.

In the main ore body in the Northwest end of the mine four small pillars were removed near #210 raise, also a small area was stoped under the hanging at #172 raise. In the South side of the mine three exploratory drifts were driven to test the foot in the area under the hanging North of the dike near the winze. The development was completed and mining is now in progress. In December two contracts were employed here.

530' SUB LEVEL.

In the main ore body several pillars were taken in the Northwest section through new raises put up from the eleventh level.

In the narrow strip North of the dike under the hanging, mining was in progress throughout the year. In December three gangs worked here, two at the extreme West end and a third to the Southeast at #227 raise.

TENTH LEVEL.

The development of this level for stoping was started last year. During 1920 practically everything was mined between the main East and West dike, that is, from #165 and #214 raises to the supporting pillar at the West, with the exception of the area between the jasper hanging and the North side of the dike to the West of the winze crosscut. In December ten gangs worked in this latter area while three gangs took pillars near #207 raise.

Raises.

Four raises were put up to the ninth level during the year, #148, #149, #151-A and #160-A.

SUB BETWEEN THE TENTH AND ELEVENTH LEVELS.

500' SUB LEVEL.

This large sub level in the main ore body was opened in the middle of the year on the foot side and development is progressing towards the hanging, mining having started on the foot. In December nine gangs mined between #208 and

#214 raises, while ten gangs blocked out the sub level on the hanging side of these same raises.

ELEVENTH LEVEL.

The development of the eleventh level continued throughout the year.

No. 3 crosscut was advanced to the Northwest 395' where it has just cut lean material. Further development will be necessary to prove whether this is the hanging. At a point where it cut through the North dike a new crosscut, #2, was started to the Northwest. After drifting 120' it was stopped on encountering the hanging.

No. 5 crosscut to the Northwest was started at a point just North of the winze. It first cut the dike and then foot rock, 180' being drifted before ore was encountered. By the end of the year the drift had advanced 460'. Work here is still in progress.

No. 7 crosscut was advanced 200' and holed to #6 crosscut.

No. 8 crosscut advanced 145' and holed into #6 crosscut.

No. 9 crosscut advanced 100' and holed to #6 crosscut which was continued to the Northeast 95', 60' of which was in foot rock.

No. 11 crosscut was driven to the Southeast and South from the main North-South crosscut from a point between #8 and #9 crosscuts. This drift is 200' long and taps the ore in the triangular territory lying between the main North-South drift and #10 foot wall crosscut.

Raises.

No. 11 crosscut. Here raises #227 and #228 were put up to the tenth level.

No. 8 crosscut. Raises #233 and #234 in this crosscut were extended through to the tenth level.

No. 7 crosscut. Raises #242, #243, #244, and #245 were pushed through towards the tenth level until they encountered the hanging which varied in height from 110' at #242 raise to 75' at #245.

No. 6 crosscut. Raises #253, #254, #255 and #256 were raised to the hanging which varied in height from 110' at #253 down to 60' at #256.

No. 5 crosscut. Raises #259, #260 and #262 were put up during the year. No. 262 holed to the 530' sub level. Raises #259 and #260 are now completed. At #259 the back is 105' above the eleventh level, while #260 is 25' above the eleventh level.

No. 3 crosscut. Raise #274 was put up to a height of 70' where it encountered hanging jasper.

In December the only main level drifting was at #3 and #5 crosscuts. In the former the drift is being timbered; in the latter, the breast was advanced 35'.

Raising is still in progress at #260 raise.

UNDERGROUND IN GENERAL.

Mining will continue the coming year in the areas where work is now in progress.

The development of the eleventh level has been nearly completed and has found the hanging cutting in from the Northwest more than was expected. There is practically no ore to the West of #3 crosscut and indications are that both #3 and #5 crosscuts will be cut off by jasper. No. 4 crosscut will be driven during the coming year by means of a switch back from #3.

Nothing was done during the year in #1 shaft pillar and I would recommend that work here be deferred until the mining in the main deposit is completed, unless more working places are desired. This area can be reached any time as the main level drifts in this territory will remain open indefinitely. At present there are working places available for our present force and more could be found on short notice without attacking new areas.

The #2 shaft pillar will shortly be worked down to the elevation of the old fourth level.

WATER.

The average number of gallons per minute pumped during the year as compared with last year follows:-

	<u>1920</u>	<u>1919</u>
January	991	1099
February	1045	1033
March	1000	940
April	858	958
May	1034	973
June	978	1076
July	948	1034
August	922	1015
September	961	1045
October	950	1008
November	934	1038
December	955	949
Average	965	1014

It will be noticed that the quantity is considerably less than it was before the Maas Mine hanging broke through to surface in March 1918.

GRADING PRODUCT.

As mentioned last year it was desired to change the grading of the Bessemer from .060 phosphorous to .048. It was known that the product of this grade would be less, however, the Bessemer price is paid for .048, while there is no premium on the ore graded at .060; there was also the further advantage of getting more low phosphorous ore in the Negaunee grade.

The total product graded as Bessemer was 31,386 tons, of this amount 13,186 tons were shipped from pocket, of which 4,128 tons were off grade, the balance 9,058 tons averaging .045 phosphorous. From the stockpile 15,301 tons were transferred as off grade. This with the pocket off grade made 19,429 tons. Deducting ^{this} from the total made, leaves 11,957 tons Bessemer for the year or approximately 2.2%.

We expect an increased tonnage of Bessemer ore from the eleventh level but to date little has been developed under the hanging.

NO. 2 SHAFT.

No. 2 shaft was repaired from the 400' level or 918' sub level to the fourth level early in the summer. The shaft was connected with the new workings to the Northwest early in the fall and the crosscut is being used as winter storage for timber for this section of the mine.

MAYNE SHOVEL.

In April a mechanical loading device for use in sub levels was installed in the mine. This was designed by one of the Negaunee miners, was built at the mine and has been in constant use since installation. In the contract where the shovel has been used, the product per man per day has been greatly increased. There are possibilities that this machine may develop into a very useful device for sub level loading.

ELEVENTH LEVEL PUMP STATION.

During the year a few finishing touches were put on the eleventh level pump station which had been practically completed a year ago. Both Aldrich pumps are fully equipped and ready to operate at any time. The station is isolated so that it can be shut off in case of a flood. The pumpmen on the tenth level can reach the eleventh level station through a raise which connects the two stations.

ACCIDENT TO EQUIPMENT.

On the morning of April 8th an accident occurred in the North skip compartment in #3 shaft due to the skip getting out of North guides, probably due to a broken runner. The full skip was hoisted hitting each set from the tenth level to within three sets from surface when finally the clevis broke, permitting the skip to fall to the bottom of the shaft. This compartment was quite badly wrecked and several sets were knocked out at the bottom of the shaft. It required three days to make repairs so that hoisting could start. The loss in product due to the accident was 5,200 tons.

EXPLORATION.

Hole #27 located on the eleventh level, #3 shaft, co-ordinates South 1062.90 East 78.60; dip 0°; course South 33° 50' West; elevation of collar 403. This hole was located in #2 crosscut, contained soft ore jasper 0 to 70', mixed lean ore and soft ore jasper from 70' to the bottom 245'. The soft ore jasper averaged between 45 and 46% iron and was low in phosphorous.

SURFACE.

The North end of the change house which was damaged by fire in November

1919 was repaired in August of this year. New windows, door frames and a new roof were required. The whole interior was repainted.

ADDITION TO DRY HOUSE.

An addition 11' by 13' was added to the Southwest end of the dry to enlarge the shiftbosses's change room. This has been needed for several years. The addition was of brick.

STOCKING TRESTLE.

A new floor of 5" fir was installed on the permanent trestle in July.

ESTIMATE OF PROBABLE ORE IN NEGAUNEE MINE DECEMBER 31, 1920.

On North Foot above 9th level	- - -	121,668	net tons,
On South Foot & No. 1 Shaft Pillar	- -	1,252,827	" "
In No. 2 Shaft Pillar	- - - - -	<u>157,950</u>	" "
Total above 9th Level	- - - - -	1,532,445	net tons.
Total between 9th & 10th Levels	- - -	1,460,701	net tons,
Total between 10th & 11th Levels	- -	<u>2,528,550</u>	" "
Total ore above 11th Level	- - - -	5,521,696	net tons.

Percentage of Bessemer = 5%.

GRADED AS FOLLOWS:

<u>Bessemer Ore</u>	<u>Trade Name</u>	<u>Tons</u>
Developed	Negaunee-Bessemer	276,085
<u>Non-Bessemer Ore.</u>		
Developed	Negaunee	<u>5,245,611</u>
Total Bessemer and Non-Bessemer	- -	5,521,696

ASSUMPTION;

12 Cu. ft. equals one ton. 10% deduction for Rock.
 10% " " Loss in Mining.

ESTIMATED ANALYSIS.

		IRON	PHOS.	SILICA	ALUM.	MANG.	LIME	MAG.	SUL.	LOSS BY	MOIST
										IGNITION	
Negaunee	Dried 212°	59.10	.094	7.70	2.64	.324	.900	.306	.009	3.10	
	Natural	52.00	.083	6.78	2.32	.285	.792	.269	.008	2.73	12.00
Negaunee Bess.	Dried 212°	60.00	.048	7.04	2.72	.237	.644	.307	.009	2.07	
	Natural	52.80	.042	6.20	2.39	.209	.567	.270	.008	1.82	12.00

PRODUCTION

Month	Bessemer	Negaunee	Total	Rock
January	4,140	39,624	43,764	1,712
February	3,180	37,845	41,025	1,932
March	4,928	44,758	49,686	1,708
April	2,576	35,423	37,999	1,108
May	2,474	45,949	48,423	1,032
June	832	45,067	45,899	1,148
July	1,853	46,342	48,195	1,088
August	3,134	43,109	46,243	1,160
September	2,643	45,094	47,737	624
October	1,976	48,894	50,870	1,104
November	1,434	44,955	46,389	888
December	2,216	46,163	48,379	1,392
Total	31,386	523,223	554,609	14,896
Transferred from	19,429	to 19,429		
Total	11,957	542,652	554,609	14,896

ANALYSIS OF PRODUCTION.

Production of 1920	554,609 tons,
" 1919	498,162 "
Increase 1920	56,447 tons.
Cost of production 1920	\$885,289.79 - Cost per ton \$1.596
" " " 1919	869,367.98 1.745
Increase 1920	\$ 15,921.81 Decrease \$.149

During the year 1920 the mine worked one eight-hour shift for 300 days. The average number of men employed during the year was 334, for a total of 100,212 days. In 1919 an average of 352 men was employed for a total of 105,469 days. A decrease in labor for 1920 of 18 men and 5,257 days.

The increased cost of production in 1920 over 1919 was \$15,921.81. During the year 1919 the mine purchased and installed a new compressor and provided an addition to the Engine House which cost \$21,636.12. To get the years 1919 and 1920 on the same basis, this amount should be deducted from the 1919 cost, while the 10% increase in wages effective February 1st should be deducted from the 1920 cost. In the former the \$21,636.12 amounted to \$.043 per ton; in the latter, the change in wages amounted to \$61,129.32 for the year, \$.61 per man per day or \$.11 per ton. We then have for comparison:-

1919	-	\$1.745	minus	\$.043	equals	\$1.702	-	Cost per ton.
1920	-	\$1.596	"	\$.110	"	<u>\$1.486</u>	"	"
Decrease						\$.216	-	Cost per ton.

This decrease in 1920 was due to less development work and a higher degree of efficiency.

The average tons per man underground in 1920 was 6.63 or an increase of .99 tons per man over 1919, when the average tons per man was 5.64. The total tons per man in 1920 was 5.53, while in 1919 it was 4.77, an increase of .76 tons per man.

In 1920 the total supply cost was \$256,790.59 as compared with \$273,827.55 for 1919 or a decrease of \$17,036.96 or 6.22%, which based on the production equals a decrease of \$.0307 for supplies.

GENERAL EXPENSE

No. 26 Insurance,

1920 Amount	\$37.29	- Cost per ton	\$.000
1919	1397.29		.003
Decrease	1359.99		.003

This decrease due to Riot Insurance premium \$1,302.05 in 1919.

No. 27 Engineering,

1920 Amount	\$3,438.50	- Cost per ton	\$.006
1919	3,978.00		.008
Decrease	540.49		.002

Decrease in engineer's time at Negaunee Mine.

No. 28 Analysis,

1920 Amount	\$19,513.86	- Cost per ton	\$.035
1919	18,185.69		.036
Increase	1,328.17	Decrease	.001

This includes operating Laboratory and sampling in 1920. The total cost for the laboratory was \$19,218.18 and the total number of determinations was 133,938. In 1919 the cost was \$17,086.05 and the total determinations 134,165, an increase in expenditures of \$2,132.13, and a decrease in determinations of 227. Cost greater due to 10% further increase in wages 1920.

Cost per determination	1920	\$.14350
" " "	1919	.11562
Increase		.02788

No. 30 Personal Injury Expense,

1920 Amount	\$5,762.17	- Cost per ton	\$.011
1919	9,823.38		.020
Decrease	4,061.21		.009

No serious or fatal accidents in 1920.

No. 30-A Mine Office,

1920	Amount	\$19,364.87	- Cost per ton	\$.035
1919		18,048.68		.036
Increase		1,316.19	Decrease	.001

	Sub Division	
	Direct Charges	Central Office
1920	7,676.08	11,688.79
1919	6,855.74	11,192.94
Increase	821.74	495.85

Increase Direct Charge due to purchase new adding machine and 10% increase in wages.

MAINTENANCE

No. 125 Tracks & Yards,

1920	Amount	\$2,559.46	- Cost per ton	\$.005
1919		2,924.25		.006
Decrease		364.79		.001

Decrease due to less work, general surface.

No. 126 Docks, Trestles & Pockets,

1920	Amount	\$3,497.99	- Cost per ton	\$.006
1919		1,123.73		.002
Increase		2,374.26		.004

Increase due to replacing trestles stringers and ties, and repairing trestle.

No. 127 Buildings,

1920	Amount	\$2,212.76	- Cost per ton	\$.004
1919		3,646.37		.007
Decrease		1,433.61		.003

High in both years, 1919 increase due to addition to Engine House and Crusher House buildings. 1920 increase due to addition to Dry House for shift bosses room and final payment on Engine House building.

No. 128 Shop Machinery,

1920	Amount	\$751.89	- Cost per ton	\$.001
1919		187.73		.000
Increase		564.16		.001

High in both years. In 1919 due to repairs to shop motor. In 1920 due to repair parts for lathe and for drill sharpener and one new shanking device.

No. 129 Boiler Plant,

1920 Amount	\$626.75	- Cost per ton	\$.001
1919	93.63		.000
Increase	533.12		.001

Increase due to new hot water tank installed in Dry House and one new smoke stack for #3 Boiler House.

No. 130 Hoisting Machinery,

1920 Amount	\$2,687.95	- Cost per ton	\$.005
1919	3,967.22		.008
Decrease	1,279.27		.003

	Sub Division	
	Wire Rope	Machinery Repairs
1920	1,538.59	1,149.36
1919	1,073.56	2,893.66
Increase	465.03	Decrease 1,744.30

Decrease in Machinery Repairs due to less repairs than in 1919.

Increase in Wire Rope due to three new ropes put on in 1920, one on North and one on South skip roads, also one new counter balance rope. In 1919 two new ropes were put on, one on North and one on South skip roads.

No. 131 Compressor & Power Drills,

1920 Amount	\$818.66	- Cost per ton	\$.001
1919	19,920.91		.040
Decrease	19,102.25		.039

	Sub Division		
	Rep. Comp.	Installing Comp.	Power Drills
1920	818.66		
1919	714.66	18,741.90	464.35

Increase in Repairing Compressors due to installing new compressor valves.

Decrease in Installing Compressor due to purchasing new compressor and motor, also installing and freight on same in 1919.

Decrease in Power Drills due to two new machines purchased in 1919, none in 1920.

No. 132 Pumping Machinery,

1920 Amount	\$4,208.26	- Cost per ton	\$.008
1919	4,313.37		.009
Decrease	105.11		.001

Cost of repair 1919 greater than in 1920.

One 8" Turbo Pump charged in 1920.

No. 133 Top Tram Engine & Cars,

1920 Amount	\$3,092.81	- Cost per ton	\$.006
1919	4,115.33		.008
Decrease	1,022.52		.002

	Sub Division		
	General Repairs	Wire Rope	
1920	2,608.09	484.72	
1919	2,409.73	1,705.60	
Increase	198.36	Decr. 1,220.88	

Increase in General Repairs due to new top tram rotor. Decrease in Wire Rope due to three new top tram ropes put on in 1919 and only one in 1920.

No. 134 Skips & Skip Roads,

1920 Amount	\$5,974.44	- Cost per ton	\$.011
1919	3,115.27		.006
Increase	2,859.17		.005

Increase due to accident of April 8th. North skip out of guides hitting each set from tenth level to three sets below surface, finally breaking clevis, causing much damage to skip roads and completely destroying skip.

No. 135 Underground Tracks & Cars,

1920 Amount	\$6,731.97	- Cost per ton	\$.012
1919	4,653.82		.009
Increase	2,078.15		.003

Increase due to 20 sets of roller bearing trucks charged out, more general repairs, also increase in wages.

No. 136 Electric Tram Plant,

1920 Amount	\$33,914.26	- Cost per ton	\$.061
1919	37,245.84		.075
Decrease	3,331.58		.014

	Sub Division		
	Eng. & Dynamos	Locomotives	Wiring
1920	40.12	5,753.86	4,053.25
1919	156.85	5,406.55	5,750.28
Decre.	116.75	Incr. 347.31	Dec. 697.03
	M. L. Tracks.	M. L. Cars	
1920	18,310.26	5,756.77	
1919	19,120.75	6,811.41	
Decrease	810.49	Decr. 1,054.64	

Decrease Engine & Dynamos due to less charges.

Increase to Locomotives due to more repairs.

Decrease Wiring due to opening 11th level in 1919.

Decrease M. L. Tracks due to 35,600# rail for \$1,248.61, more used in 1919 than in 1920.

Decrease M. L. Cars due to less repairs to motor cars in 1920.

No. 137 Telephones & Safety Devices,

1920 Amount	\$102.51	- Cost per ton	\$.000
1919	301.34		.001
Decrease	198.83		.001

Decrease due to less repairs to phones and less safety appliances installed.

No. 140 Fire Expense & Damage,

1920 Amount	\$2,161.52	- Cost per ton	\$.004
1919	703.58		.002
Increase	1,457.94		.002

Increase due to permanent repairs made to Dry House 1920, temporary repairs in 1919.

Total Maintenance,

1920 Amount	\$69,341.23	- Cost per ton	\$.125
1919	86,312.39		.173
Decrease	16,971.16		.048

MINING EXPENSE.

No. 150 Air Pipes,

1920 Amount	\$8,082.04	- Cost per ton	\$.015
1919	8,693.83		.018
Decrease,	611.79		.013

Decrease due to less charges to air lines.

No. 151 Compressor,

1920 Amount	\$27,511.05	- Cost per ton	\$.050
1919	22,603.64		.045
Increase	4,907.41		.005

Air made by Negaunee compressor,
 1920 898,920,000 cu. ft.
 1919 633,172,500 "
 Incr. 265,747,500 cu. ft.

Electric power for compressor cost \$8,856.75 more in 1920 than 1919. Electric power rate \$.01½ per K.W. hour. Increase in labor.

Cost per 1,000 cu. ft. air compressed,
 1920 - \$.0306
 1919 - .0357

Sold to Maas Mine 169,836,000 cu. ft. air for \$5,826.00.

No. 152 Hoisting,

1920 Amount	\$30,321.98	- Cost per ton	\$.055
1919	27,739.42		.056
Increase	2,582.56	Decrease	.001

Increase due to more electric power used account of more product, also increase in wages.

Electric Power 1920	-	\$20,718.00
" " 1919	-	18,969.30
Increase		\$ 1,748.70

No. 153 Pumping,

1920 Amount	\$40,955.10	- Cost per ton	\$.074
1919	41,972.97		.084
Decrease	1,017.87		.010

Decrease due to less water pumped.

	Sub Division	Sub Division
Op'g. Elec. Pumps	1920	1919
Operating Electric Pumps	40,930.17	41,874.14
Cleaning Sump	24.93	98.83
	40,955.10	41,972.97

Total gals. of water pumped	508,169,060	534,281,216
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Gals. pumped per minute	963	1,014
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There has been a gradual decrease in water pumped at Negaunee Mine since the cave to surface at the Maas in 1918.

No. 154 Sinking & Shaft Repairs,

1920 Amount	\$1,301.29	- Cost per ton	\$.002
1919	1,704.92		.004
Decrease	403.63		.002

Decrease due to more shaft repairs in 1919.

No. 155 Rock Drifting,

1920 Amount	\$17,352.91	- Cost per ton	\$.031
1919	31,518.20		.063
Decrease	14,165.29		.032

	Sub Division			
	Drifting	Per Ft.	Raising	Per Ft.
1920	2162	5.20	809	3.53
1919	2866	5.40	1459	4.37
Decrease	704	.20	650	.84

Decrease due to less rock work in 1920.

No. 156 Breaking Ore,

1920 Amount	\$384,431.50	- Cost per ton	\$.693
1919	353,330.81		.709
Increase	31,100.78	Decrease	.016

Decrease 1920 due to greater efficiency.

	Explosives	
	1920	1919
Total lbs. of Powder	216,900	209,200
Average price per lb.	.1948	.181
Total Amount	42,245.46	37,867.03
Fuse, Caps, Etc.	7,200.81	6,840.67
Grand Total	49,446.27	44,707.70
Lbs. powder per ton of ore	.3911	.4199
Cost per ton for powder	.0762	.0760
" " " All explosives	.0892	.0897

Increase in Explosives due to greater product.

No. 157 Trammig,

1920 Amount	\$59,747.48	- Cost per ton	\$.108
1919	55,856.45		.112
Increase	3,891.03	Decrease	.004

	SUB Division	
	1920	1919
Trammig	52,958.24	47,872.53
Skip Tender & Bellman	3,826.22	4,165.32
Cleaning Sump	2,963.02	3,818.60

Increase due to increase in cost of labor.

No. 158 Filling,

1920 Amount	\$8,203.01	- Cost per ton	\$.015
1919	8,317.74		.017
Decrease	114.73		.002

Decrease due to less filling.

No. 159 Timbering,

1920 Amount	\$149,431.26	- Cost per ton	\$.269
1919	140,050.26		.281
Increase	9,381.00	Decrease	.012
		1920	1919
Timber Cost	21,462.14	18,143.05	
Lagging & Poles	15,472.05	17,477.68	
	36,934.19	35,620.73	

		<u>1920</u>	<u>1919</u>
Ft. Timber per ton of ore		.5052	.6333
Ft. Lagging " " " "		2.4635	2.5746
Cost per ton for Timber		.0387	.03642
Do. Lagging		.0218	.0256
" Tbr. Lagging & Poles		.06660	.07151

The increase in cost of timber was due largely to increase price of timber in 1920 over 1919. The average price per foot for timber in 1920 was 33% greater than the same for 1919. The average price for poles and lagging in 1920 was 12% less than the same for 1919.

No. 160 Captain and Bosses,

1920 Amount	\$20,209.65	- Cost per ton	\$.036
1919	20,640.41		.041
Decrease	430.76		.005

Decrease due to less boss time.

No. 161 Dry House,

1920 Amount	\$9,470.40	- Cost per ton	\$.017
1919	8,509.04		.017
Increase	961.36		.000

Increase due to increase in labor and cost of coal.

No. 162 Top Landing & Trimming,

1920 Amount	\$9,297.12	- Cost per ton	\$.017
1919	9,295.27		.019
Increase	1.85	Decrease	.002

No. 163 Stocking Ore,

1920 Amount	\$436.10	- Cost per ton	\$.001
1919	81.54		.000
Increase	354.56		.001

Increase due to more labor shoveling snow, etc. from stocking grounds.

No. 164 Sorting Ore,

1920 Amount	\$780.14	- Cost per ton	\$.001
1919	767.94		.002
Increase	12.20	Decrease	.001

No. 166 Cave In,

1920 Amount	00.00	- Cost per ton	\$.000
1919	14.30		.000

No. 171 Ventilation,

1920 Amount	\$155.75	- Cost per ton	\$.000
1919	399.83		.000
Decrease	244.08		.000

Decrease due to installing 310' 10" spiral pipe in 1919.

Flooding Land Rental,

1920 Amount	\$125.00	- Cost per ton	\$.000
1919	125.00		.000

Total Mining Expense,

1920 Amount	\$767,811.87	- Cost per ton	\$1.384
1919	731,621.57		1.469
Increase	36,190.30	Decrease	.085

DELAYS - ELECTRICAL.

March 24th	One-half hour delay, day shift, account of no current.
April 28th	One hour delay account of no current.
May 11th	Two and one-quarter hours delay account of no current, trouble on Maas-Negaunee line.
June 7th	One and one-half hours delay account of no current.
June 10th	One hour delay account of no current.
June 28th	One hour delay account of no current.
July 9th	One hour delay account of no current.
July 28th	One hour forty minutes delay account of underground current off account of broken cable on ninth level.
August 6th	One and one-quarter hours delay account of no current.

DELAYS - ELECTRICAL, Continued.

September 8th Night shift idle account of low current.
September 4th One-half hour delay account of no current.
November 29th One hour delay nine to ten o'clock P.M. account of no
current.
December 15th Forty minutes delay account of no current.

DELAYS - NON ELECTRICAL.

April 7th Two hours delay account of skip clamp breaking and skip
dropping to bottom of shaft.
April 8th Mine idle - Repairing skip and shaft account of accident
on April 7th.
April 9th Do.
April 10th "
September 1st Delayed nine to ten o'clock A.M. account of one motor
broken down.
December 3rd Two and one-half hours delay account of breaking down of
timber on tenth level.

NEGAUNEE MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1920.

GRADE	IRON	PHOS.	SILICA
Negaunee Bessemer,	61.66	.050	6.68
Negaunee,	59.47	.097	7.97

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1920.

GRADE	Mine		Lake Erie		
	IRON	PHOS.	IRON	PHOS.	MOIST.
Negaunee Bessemer,	61.61	.057	61.28	.058	11.98
Negaunee,	59.43	.094	59.30		11.72

ORE STATEMENT - DECEMBER 31ST, 1920.

	NEGAUNEE BESSEMER	NEGAUNEE	TOTAL	TOTAL LAST YEAR
On hand Janusry 1st, 1920,	26,763	116,974	143,737	69,687
Output for year,	31,386	523,223	554,609	498,162
Transferred,	19,429	19,429		
Total,	38,720	659,626	698,346	567,849
Shipments,	35,396	514,902	550,298	424,112
Balance on hand,	3,324	144,724	148,048	143,737
Increase in output-11%			56,447	
Increase in ore on hand-3%			4,311	
1920 - 1-8 Hour Shift for year				
1919 - 1-8 " " " "				

MADE IN U.S.A.
NEGAUNEE MINE

SHIPMENTS FOR YEAR -- 1920.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Negaunee Bessemer,	9,058	26,338	35,396	42,092
Negaunee,	301,399	213,503	514,902	382,020
Total,	310,457	239,841	550,298	424,112
Total last year,			424,112	
Increase - 30%			126,186	

NEGAUNEE MINE.

NEGAUNEE MINE.

COMPARATIVE MINING COST FOR YEAR.

	1 9 2 0 .	1 9 1 9 .	INCREASE.	DECREASE.
PRODUCT	554,609	498,162	56,447	
General Expense	.087	.103		.016
Maintenance	.125	.173		.048
Mining Expense	1.384	1.469		.085
Cost of Production	1.596	1.745		.149
Exploratory	.002	.003		.001
Plant Account	.031	.030	.001	
Total Depreciation	.031	.030	.001	
Taxes	.293	.300		.007
Central Office	.048	.046	.002	
Supply Inventory	.006		.006	
Fire Loss		.003		.003
Miscellaneous	.001	.054		.055
Cost on Stockpile	1.975	2.181		.206
Loading & Shipping	.052	.042	.010	
Administrative		.010		.010
Total Cost on Cars	2.027	2.233		.206
No. Days Operating	300	299	1	
No. Shifts & Hours	1-8hr	1-8hr		
Avg. Daily Product	1,849	1,666	183	
<u>COST OF PRODUCTION.</u>				
Labor	1.133	1.179		.046
Supplies	.463	.566		.103
Total	1.596	1.745		.149

NEGAUNEE MINE

COMPARATIVE WAGES AND PRODUCT

	1 9 2 0	1 9 1 9	INCREASE	DECREASE
PRODUCT	554,609	498,162	56,447	
No.Shifts and Hours	1-8hr	1-8hr		
AVERAGE NO. MEN WORKING				
Surface	53	55		2
Underground	273	294		21
Total	326	349		23
AVERAGE WAGES PER DAY				
Surface	5.42	4.92	.50-10.16%	
Underground	6.53	5.85	.68-11.6%	
Total	6.34	5.70	.64 -11.2%	
WAGES PER MONTH OF 25 DAYS				
Surface	135.50	123.00	12.50	
Underground	173.25	146.25	17.00	
Total	158.50	142.50	16.00	
PRODUCT PER MAN PER DAY				
Surface	33.60	29.08	4.52	
Underground	6.63	5.63	1.00	
Total	5.53	4.72	.81	
LABOR COST PER TON				
Surface	.161	.169		.008
Underground	.985	1.038		.053
Total	1.146	1.207		.061
AVG.PRODUCT BRK'G & TRM'G	9.92	8.43	.49	
" WAGES CONTRACT MINERS	6.95	6.14	.81	
" " " TRAMMERS				
" " " LABOR	6.95	6.14	.81	
TOTAL NUMBER OF DAYS				
Surface	16,503 $\frac{1}{2}$	17,128		624 $\frac{1}{2}$
Underground	83,708 $\frac{1}{2}$	88,341 $\frac{1}{2}$		4632 $\frac{1}{2}$
Total	100,212	105,469 $\frac{1}{2}$		5257 $\frac{1}{2}$
AMOUNT FOR LABOR				
Surface	89418.37	84203.14	5215.23	
Underground	546377.52	517229.96	29147.56	
Total	635795.89	601433.10	34362.79	

Proportion Surface to Underground Men;

1920 - 1 to 5.15
 1919 - 1 to 5.35
 1918 - 1 to 5.10
 1917 - 1 to 5.20
 1916 - 1 to 5.63

NEGAUNEE MINE

TIMBER STATEMENT FOR THE YEAR ENDING DECEMBER 31, 1920.

KIND	LINEAL FEET	AVG. PRICE PER FOOT	AMOUNT	
			1920	1919
4" to 6" Timber	3,360	.0170	57.26	13.00
6" to 8" "	60,564	.0367	2223.85	3177.49
8" to 10" "	129,816	.0802	10408.65	10180.85
10 to 12 "	83,420	.1005	8384.07	2170.07
12 to 14 "	3,024	.1284	388.31	2601.64
Total - 1920	280,184	.0766	21462.14	
Total - 1919	315,496	.0575		18143.05
	LINEAL FEET	PER 100'		
7' Lagging	1366,260	.884	12078.79	12749.31
Poles	255,142	1.330	3393.26	4728.37
Total - 1920	1621,402	.954	15472.05	
Total - 1919	1635,124	1.07		17477.68
Product			554,609	498,162
Feet timber per ton of ore			.5052	.6333
Feet lagging "			2.4635	2.5746
Feet lagging per foot of timber			4.876	4.0653
Cost per ton for timber			.0387	.03642
" lagging			.0218	.0256
" poles			.00612	.00949
" timber, lagging & poles			.06660	.07151
Equivalent of stull timber to board measure			436,929	604,926
Ft. of board measure per ton of ore			.788	1.214
Total cost for timber, lagging & Poles - 1920				37934.19
				1919 35620.73
				1918 21403.96
				1917 22137.51
				1916 21510.67

NEGAUNEE MINE

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE

KIND	QUANTITY	AVERAGE PRICES	AMOUNT 1920	AMOUNT 1919
40% Standard Powder - -	60,200	.170	10,235.52	
40% Gelatin " - -	28,550	.179	5,107.36	24,930.14
50% " " - -	54,350	.2023	10,998.07	27.85
60% " " - -	73,800	.2155	15,903.01	12,876.44
35% " " - -			1.50	32.60
<u>Total Powder - -</u>	216,900	.1948	42,245.46	
Total Powder, 1919 -	209,200	.181		37,867.03
Fuse - - - - -	575,900	.9297	5,353.92	4,942.62
Caps - - - - -	110,400	14.927	1,647.97	1,635.46
Cap Crimpers - - - - -	89	.441	39.28	52.50
Tamping Bags - - - - -	47,800	1.824	87.20	121.74
Connecting Wire - - - - -	72	.450	32.39	19.57
Electric Exploders - -	161	6.863	11.05	5.86
Powder Bags - - - - -	25	1.160	29.00	62.92
<u>Total Fuse, Etc. -</u>			7,200.81	6,840.67
<u>Total Explosives -</u>			49,446.27	44,707.70
Product - - - - -			554,609	498,162
Pounds Powder per ton of ore			.3911	.4199
Cost per ton for Powder			.0762	.0760
" " " " Fuse, Caps, etc.			.0130	.0137
" " " " All Explosives			.0892	.0897
Avg. Price per Lb. for Powder			.1948	.181

MAAS MINE - 1920.

The product for the year was 335,221 tons which was practically the same as for the year 1919. This ore came from the same territory that we have been mining during the past several years, that is, from the East end of the mine towards the Negaunee boundary between the first and third levels and in the South end near the Negaunee boundary between the third and fourth levels. Most of the Bessemer ore came from this latter territory. The product for the year by grades was 76.2% Maas and 23.8% Bessemer, as against 63% Maas and 37% Bessemer for the year 1919. This reduction in Bessemer started early in the year and during the last few months the proportion was as low as 20% of our product. The territory immediately above the third level under the hanging and in the extreme South end of the mine above the fourth level gave considerable trouble on account of weight, both places requiring frequent retimbering. In the area above the third level this weight required the reopening of the main level drifts several times and to obviate this, a new transfer level was planned to tap this territory. Development of this transfer sub level is now under way.

The mine operated on day and night shift throughout the year. The contracts on the night shift were employed to hurry the work along the Negaunee boundary in the East end of the mine and also to give us additional Bessemer ore. During the latter part of the year the number of contracts on the night shift was reduced and early in 1921 practically all night shift work will be discontinued with the possible exception of hoisting that ore which cannot be handled on the day shift.

UNDERGROUND.

SUBS ABOVE THE SECOND LEVEL

675' SUB LEVEL.

Three pillars were mined in the Roman Catholic Cemetery tract South of #43 raise in the early part of the year, completing the mining in that

territory.

655' SUB LEVEL.

During the year 1919 this sub level was developed and most of the mining done along the foot side in the American Mining Company strip, the Cleveland-Cliffs Iron Company strip at the Railroad pillar, and in the Roman Catholic Cemetery tract. The work was continued during the first half of the present year and the sub level completed on the hanging side near the dike in the above three tracts. A strip 130' long and a little over a drift wide, South of the dike, was mined near the West end of the Roman Catholic Cemetery tract.

645' SUB LEVEL.

The development of this sub level was started in 1919, a drift being driven from #67 to #68-A raise. This development was continued, the raises being connected on the North side of the dike and drifts pushed to the North foot wall for mining. The sub level was completely mined during the present year with the exception of an area along the dike West of #67 raise. In December three contracts were employed in the Roman Catholic Cemetery tract Northwest of #67 raise, while one mined to the Southeast of #68 raise, completing the work in that territory.

630' SUB LEVEL.

This sub level was started early in the year with operations at #67, #68 and #68-A raises. The development had been towards the foot and slicing has started in the American Mining Company and The Cleveland-Cliffs Iron Company strips. A drift has been driven on the South side of the dike outlining the ore there. This drift has extended in an East-West direction approximately 170', the ore averaging about 30' in width. In December seven contracts were employed in this sub level, five in the Roman Catholic Cemetery tract, two mining and three developing; one mining in the American Mining Company strip, and one mining in the Cleveland-Cliffs Iron Company strip.

618' SUB LEVEL.

The only work done in this sub level during the year was driving a

development drift from a point 65' Northwest of #67 raise for a distance of 88' to the West. From this drift two small transfer raises were put up to the 645' sub level to get a pillar left there. This work was done in August and September.

565' SUB LEVEL.

West End.

In 1919 development started here between #70 and #72 raises when 125' of drifting was done. The development was continued and the mining of the sub level was practically completed during the year. Two small pillars remaining opposite #70 raise are now being mined.

East End.

A small pillar was mined to the Northeast of #67 raise in the Roman Catholic Cemetery tract early in the year.

550' SUB LEVEL.

West End.

Work at this elevation started early in the fall of this year at #70 raise from which a drift was driven to the South for a distance of 60' where it met the jasper. At this point development drifts were pushed to the East and West. During the month of December contracts were employed in these two drifts which have advanced 65' and 90' respectively, from the crosscut opposite the raise. This territory is directly under the cave which broke through to surface March 1st, 1918. It is extremely wet making mining here extremely difficult.

SECOND LEVEL.

A new main level drift to the East from a point opposite #62 raise was started about the middle of the year and extended a distance of 185'. This territory is cut with dikes, one of which crossed the drift from the Northwest to the Southeast. The object of this drift was to provide raises to reach the 656, the 630 and the sub levels below near the West end of the Roman Catholic Cemetery where the raises which originally tapped this territory, had crushed so badly that they could not be reopened. Two raises have started from this main level drift, namely #42-A and #44-A. The back of the former is now 72' from the rail of the

level, while the latter is 42' from the second level. Each raise is of two compartments and timbered. In December work was in progress in these raises. No. 42-A having holed to the 575' sub level.

SUBS ABOVE THE THIRD LEVEL.

375' SUB LEVEL.

The East end of this sub level South of the mining limit and under the hanging was completed early in the year with the mining of three pillars to the East and four pillars to the West of H crosscut.

365' SUB LEVEL.

West End.

A small pillar was mined directly over the winze to the fourth level and a larger pillar South of #82 raise, completing the work on this sub level in this territory.

355' SUB LEVEL.

West End.

This sub level was opened for a distance of 160' to the West of #82 raise where it was cut off by jasper. During the year mining has been conducted South of this drift by slicing back towards the raise. Three pillars remain which are now being mined. Mining is also in progress at a small pillar to the Southeast of #83 raise and at #93 raise where six small pillars remain.

East End.

The area along the Negaunee boundary was partially developed and mined a year ago. During 1920 mining was continued, however, a few small pillars still remain in the vicinity of #2H and #105 raises where mining was in progress during December.

345' SUB LEVEL.

The work on this sub level was all in the East end of the mine near the Railroad pillar from #107 raise where development was carried on to the North, South and East. A limit of 80' to the West of I crosscut has been established, beyond which point raises from the new transfer sub will extend. During December

contracts were employed in the American Mining Company strip along the Negaunee boundary, one in the Cleveland-Cliffs Iron Company strip parallel to this and three in the Maas interests. The latter in the vicinity of 1-I raise.

325' SUB LEVEL.

Three pillars were mined near the South end of G crosscut under the hanging, early in the year, completing the work in that territory.

THIRD LEVEL.

A great deal of work was done on this level during the year. The principal developments being a new rock foot wall drift 1,000' in length due East from the shaft crosscut, which holed to the old main level foot drift 190' East of #93 raise. This drift was started in May and completed in November. The drift was necessary to mine the ore between the second and third levels on the foot side, North of the present mining limit. The present main level drift runs through the ore body and shows considerable weight due to mining above, requiring continual retimbering. With the completion of this new foot wall drift, the old drift can be abandoned whenever necessary, however, it is desirable to keep it open until raises from the new transfer sub between the third and fourth levels reach the sub levels above the third level.

Raise #109 located in the Cleveland-Cliffs Iron Company's strip in the Railroad pillar is being put up to the 355' sub level, while two other raises from the 270' sub level holed to the third level in G and H crosscuts.

The first raise from the new 245' transfer sub level, #3W, holed to the third level just East of #C drift. This will be pushed to the sub levels above.

THIRD LEVEL SUMP.

A sump for the third level pump station was excavated during the year. This I have taken up elsewhere in this report under third level pump station.

SUBS BETWEEN THIRD AND FOURTH LEVELS.

335' SUB LEVEL.

A small sub level was opened along the Negaunee boundary to the Southwest of #705 raise and completed during the year. The elevation of this sub

level is actually about 20' above the third level, but as it was on the South side of the syncline, it was not connected with any of the drifts of the third level proper.

The size of the deposit here was 20' by 70' surrounded by hanging jasper. Mining was done by transferring the ore through to the 285' sub level and thence to the fourth level.

315' SUB LEVEL.

This sub level which is directly under the 335' sub just mentioned, was opened and completely mined during the year. It is located to the East of #705 raise, which holed to it; the ore being transferred through this raise to the fourth level. Early in November a cave occurred near the hanging making it necessary to abandon the sub level. Two small pillars were left which will be mined from the 300' sub level.

300' SUB LEVEL.

This sub level is now being opened by a drift from the Southwest of #705 raise. The breast is at present 70' from the raise, the first 34' of the drift being in rock, the balance in ore. This drift will be extended to the Negaunee boundary and development drifts pushed as rapidly as possible.

280' SUB LEVEL.

A sub level at this elevation was started last year at #425 raise. The development was continued during the present year outlining the ore body along the Negaunee boundary. As a portion of this sub level was under the hanging, with no ore above, mining was started to the North of the raise in October and two contracts are now engaged in this territory.

270' SUB LEVEL.

Practically no work was done at this elevation in 1920 except at a point where #705 raise from the fourth level holed to this elevation and extension raises were pushed through to the 315' sub level.

260' SUB LEVEL.

Most of this sub level was mined last year, but during the present year a pillar to the Southeast of #500-502 raise, in the Bessemer area, was taken.

245' SUB LEVEL (MOTOR HAULAGE SUB LEVEL).

This sub level was planned to tap the ore on the third level between the winze and the Negaunee boundary. In that area crushing has made it almost impossible to maintain the main level drifts on the third level. A large territory was opened under the hanging which was originally cut through with rooms. During the past few years mining has been in progress in the pillars between these rooms. In 1918 and 1919 a settlement of the hanging occurred which crushed this area and has made it extremely expensive to retimber. This new transfer sub level was planned to save a tremendous amount of rock drifting and rock raising which would have been required to reach this territory from the fourth level. The development started at #224 raise from the fourth level and extended to the West 440' where it holed to the incline winze. To the East and Southeast the development drift has been driven 300' where it met the foot rock. Work has been suspended here until a new three compartment raise from the fourth level holed to this level, that the rock could be kept separate from the ore. This raise is now finished and the drift in the foot rock can be started at any time. At a point 120' East of #224 raise, a drift was started to the Southwest and by the end of the year had extended 230' with the breast still in ore. This drift will tap the ore under the hanging on the North side of the syncline.

Raises have been planned to extend from this new transfer drift to the territory above the third level. No. 3-W raise located 170' West of #224, has reached the height of the third level and holed just East of C crosscut.

The drifts are of the same size as main level drifts and will accommodate motors for haulage. The ore will be transferred to the fourth level through the new three compartment raise, #223.

240' SUB LEVEL.

This sub level was opened a year ago in the territory adjoining the Negaunee boundary in the Bessemer area. It was completed in December when the last pillar near #500-502 raise was mined.

230' SUB LEVEL.

This sub level, also located in the South end of the mine near the

Negaunee boundary, was opened in the Bessemer area. Considerable trouble was experienced on account of crushing. Mining is still in progress, but work should be completed early in 1921.

215' SUB LEVEL.

A new sub level at this elevation was opened in the Bessemer area in the South end of the mine near the Negaunee boundary at #602 raise in December. A drift to the Northeast was advanced 22', while one to the West was advanced 25'. Development of this sub level will be from raises which will be put up from the new fourth level main drift which extends longitudinally through the American Mining Company strip. This should permit the mining of the ore with a minimum amount of retimbering.

200' SUB LEVEL.

During the year a small area about 100' square, North of #410-412 raise, was completely mined, also two small pillars in the Southeast end near the Railroad pillar. The Drift East of #505-507 raise was repaired. No mining was done on this sub level in December.

185' SUB LEVEL.

In the center of the ore body, in the mining pillar, near #406 and #408 raises, development was started the latter part of the year and that small area mined. Three contracts are now working in this territory.

FOURTH LEVEL.

Considerable main level drifting was done during the year on this level. Early in the year #400 crosscut was advanced to the North and made a connection with #200 crosscut or winze drift after drifting 240'. This provided a better circulation of air and permitted the motors to reach this territory from either direction. No. 500 crosscut was extended to the East to the Negaunee boundary and along the boundary in the foot wall, the total drifting amounting to 240'. No. 600 crosscut was started along the Negaunee boundary and by the end of the year had advanced 160'. This will be extended to the Northeast until it holes to the #500 crosscut. A rock drift was started from the shaft crosscut to the

East to hole to the #200 crosscut near the foot of the winze from the third level. This was advanced 90'. The object of this drift is to permit the handling of the ore from the new transfer sub without reversing the train as is now necessary. The connection with the old foot wall drift will be completed early in January.

Bulkhead.

Last year a concrete bulkhead was built in the main crosscut about 300' from the shaft. During the year this was changed so as to permit the entire shutting off of the crosscut to the South of this point, which will greatly increase the quantity of water which can be dammed back.

Sump.

Northeast of the shaft a sump, 60' long by 10' in width and 9' in depth having a capacity of 40,000 gallons, was excavated. This sump was started in April and completed in June, permitting the Aldrich electric pump to be transferred from the foot of the winze on this level to the fourth level shaft plat. A bilge pump transfers the water from the bottom of the winze to the main shaft crosscut.

Raises.

Three compartment raise #223 from the #200 crosscut, was extended from the fourth level to the 245' transfer sub level.

Raise #705 was extended to the 270' sub level and later to the 315'.

Raise #508-510 from the #500 crosscut was extended to the 240' sub level.

UNDERGROUND IN GENERAL.

During the year a great deal of development work was done. This might be summarized as follows:-

Second level - New main drift, East end of mine, 185'.

Third level - New foot wall drift 1,000'.

Fourth Level - Main level drift extensions 740'.

In addition to this work the sump drifts were driven for the third and fourth level pump stations. This work was all necessary, however, it was extremely expensive and made a material showing in the cost per ton.

The mining between the second and third levels was principally along the Eastern end of the ore body near the Negaunee Mine, while between the third

and fourth levels was principally in the mining of pillars where work started a year ago. In the latter area with each succeeding year, these sub levels will grow smaller, as the fourth level is approached, and the percentage of Bessemer ore will grow correspondingly less. During the coming year the principal development will be in the territory tributary to the new transfer sub level above the fourth level. A considerable amount of raising will have to be done from this level through a territory above the third level which is very much cut up by old workings and third level rooms, which will make the progress slower than through virgin ground.

WATER.

The water pumped for the year averaged 967 gallons per minute.

FATAL ACCIDENT.

A fatal accident occurred in #71 contract on Friday morning June 11th, John Kusisto being killed by a fall of ground.

Kusisto and his partner, John Jarvi, were driving one of the main drifts on the fourth level. The day previous they had cleaned up all of the broken ore and had cut hitches for a set. The night shift did not work in this contract. On the morning of the accident when the men went to their workplace, instead of putting the set in place, they first tested the back with their picks and then started laying sollar. While Kusisto was in the act of picking up a little ore in the bottom of the drift to make room for one of the sollar boards, a small chunk fell from the back striking him across the neck and shoulders, breaking his neck, death resulting in a few minutes. It is the practice in some mines to permit men to lay the sollar before putting in the timber sets as it is often necessary to pick down some of the ground in order to get the cap or leg in place. If this broken material falls on the sollar, it is much easier to shovel into the cars. The ground in this drift was not considered treacherous. The committee that investigated the accident was of the opinion that Kusisto and his partner did not thoroughly test the back which was "drummy". If they had done so, they would have taken down the loose piece which later fell. Kusisto was an experienced miner, single, aged 25 years.

SUMP FOR THIRD LEVEL PUMP STATION.

The main pump station located just East of the shaft on the third level has always been handicapped on account of small sump capacity. In February a sump was started at a point about 300' South of the shaft on the East side of the main crosscut. An incline was sunk to a point 10' below the level and a drift driven and connected with the present sump at the pump station. This work was completed in May. Later a drift will be driven below the sump, connecting with the third level pocket so as to permit the cleaning of the sump. The sump now has a capacity of 218,000 gallons.

FOURTH LEVEL PILLARS.

As I have mentioned in my last two reports, pillars are being left above the fourth level to support the surface. The tonnage in these pillars this year is estimated at 1,500,000 tons, all of which is temporarily unavailable for mining. These pillars are left to support the surface in what is known as the Race Course property which adjoins the Maas Mine to the West, and which is under lease to the Oliver Iron Mining Company. No ore can be removed from these pillars until the houses on the Race Course Tract have been removed. The total ore in the mine available for mining above the fourth level as shown December 31, 1920 was 4,089,000 tons. If the estimated yearly product is to be maintained, something should be done shortly towards removing the houses on the Race Course property, if not, in a period of five years or thereabouts, the yearly product will be diminished, as practically all of the available ore in the area between the third and fourth levels will have been mined and nothing will be left except the territory above the third level which will be too small to accommodate the contracts necessary for a product of 500,000 tons per year.

SURFACE.

NEW CAGE HOIST.

The new electric cage hoist from the Lake Shore Engine Works was erected in the fall of 1919. The motor arrived in February and the hoist started operating March 11th. This hoist is equipped with a 10' drum which has an 8' face with 72 grooves for 1 1/4" diameter rope, giving it a capacity of 2260'. The

motor is operated by a 2200 volt alternating current and is of 400 horsepower. It operates at 350 revolutions per minute at full load. This is equipped with a Lily hoist control.

NEW SKIP HOIST.

The new electrically operated skip hoist was received at the mine in March and erected in April and May. A delay of three months was had awaiting the liquid rheostat control. The hoist went into operation August 30th. This hoist was built by the Lake Shore Engine Works, has an 8' face and 10' drum, has 72 grooves for 1 1/4" rope, giving it a capacity of 2260'. It is equipped with a 700 horsepower alternating current motor, 2300 volts, which will operate at 390 revolutions per minute at full load.

OLD STEAM CAGE HOIST.

This hoist was dismantled in March and stored in the yard ready for shipment when sold.

OLD STEAM SKIP HOIST.

This hoist was dismantled in September and stored in the yard ready for shipment when sold.

OLD STEAM COMPRESSOR.

The old 4000' Sullivan compressor was dismantled in August and September to make room for two Ingersoll-Rand electrically driven compressors. It was stored in the yard and can be shipped on short notice if sold.

ELECTRIC COMPRESSORS.

The foundations for the two Ingersoll-Rand electric compressors were started in September. The one from the Lake Mine was erected and started operating in September. The second, which had been temporarily installed in the old transfer engine house West of the headframe, was dismantled and set up in the engine room in October. These compressors each have a capacity of 2440 cubic feet per minute.

COAL DOCK.

A small fire occurred in the coal dock in the fall of 1919. The dock was repaired in April.

ROCK TRAM PLANT.

A new rock tram plant was received in the fall of 1919 and installed in a concrete plaster house built South of the shaft. The fifty horsepower motor was received and installed in March but the operation of the plant was delayed until September, on account of the electric control. The plant went into operation the later part of September after a delay of nearly a year.

NEW HEATING PLANT.

Heretofore the heat for the various buildings has been furnished by the main boiler plant, but the electrification of the hoists and compressors make it necessary to find other means of furnishing heat. A new heating plant was authorized late in the fall. An extension of 26' was added to the East end of the dry in which will be installed a fifty horsepower boiler. The change in the heating system also necessitated a change in the sewer. A new cess pool was dug to the West of the dry and an 8" sewer line laid to accomodate the dry and other buildings.

MAAS CRUSHER.

Repairs to the Maas Crusher were started in March and completed in April. Operation started in May. The product handled during the year by grades is as follows:-

Morris-Lloyd Ore,	36,322 tons,
Lake Ore,	41,398 "
South Jackson Ore,	69,222 "
Salisbury,	2,475 "
Angeline,	<u>1,047</u> "
TOTAL -	150,464 tons.

ESTIMATE OF ORE RESERVES IN MAAS MINE DECEMBER 31, 1920.

Assumption 12 cu. ft. equals one ton.

10% deduction for rock.

10% deduction for loss in mining.

AVAILABLE ORE

Ore reserve above the 2nd level - - - - -	384,874 tons,
Ore reserve between 2nd and 3rd levels - - - - -	1,547,418 "
Ore reserve between 3rd and 4th levels - - - - -	<u>2,156,900</u> "
Total available - - - - -	4,089,192 tons.

NON-AVAILABLE ORE.

Between 3rd and 4th levels - - - - - 1,501,425 tons.

Percentage of Bessemer equals 10%.

<u>BESSEMER ORE</u>	<u>TRADE NAME</u>	<u>TONS</u>
Developed.	Maas-Bessemer	408,919
 <u>NON BESSEMER ORE</u>		
Developed.	Maas	<u>3,680,273</u>
Total Bessemer and Non-Bessemer		4,089,192 tons.

ESTIMATED ANALYSIS.

	<u>IRON</u>	<u>PHOS.</u>	<u>SILICA</u>	<u>ALUM.</u>	<u>MANG.</u>	<u>LIME</u>	<u>MAG.</u>	<u>SUL.</u>	<u>IGNI.</u>	<u>MOIST</u>
Dried 212°										
Maas-Bessemer	60.30	.043	9.30	1.88	.265	.625	.216	.007	1.50	
Natural	53.06	.038	8.18	1.65	.233	.550	.190	.006	1.32	12.00
Dried 212°										
Maas	59.00	.091	8.90	2.34	.309	1.02	.288	.009	2.20	
Natural	52.06	.080	7.85	2.06	.273	.90	.254	.008	1.94	11.75

PRODUCTION

Month	Bessemer	Maas	Total	Rock
January	10,908	21,608	32,516	528
February	10,688	17,712	28,400	1,012
March	11,256	20,176	31,432	2,288
April	6,348	19,764	26,112	1,908
May	8,250	20,156	28,406	1,100
June	7,611	21,462	29,073	1,196
July	7,517	20,074	27,591	1,800
August	3,752	21,394	25,146	1,440
September	5,203	19,815	25,018	2,048
October	6,101	20,917	27,018	1,908
November	5,980	20,197	26,177	720
December	6,560	21,772	28,332	632
Total	90,174	245,047	335,221	16,580
Transferred from	10,487 to	10,487		
Total	79,687	255,534	335,221	16,580

Bessemer Ore Shipped in 1920 105,855 tons,

Maas " " " " 273,277 "

Total Ore Shipped 379,132 tons.

Bessemer Ore on Hand Dec. 31, 1920 9,505 tons,

Maas " " " " 102,898 "

Total Ore on Hand 112,403 tons.

ANALYSIS OF PRODUCTION.

Production of 1920	335,221 tons,
" 1919	337,030 "
Decrease 1920	1,809 tons.
Cost of production 1920	\$785,213.23 - Cost per ton \$2.343
" " " 1919	746,593.60 " " " 2.215
Increase 1920	\$ 38,619.63 \$.128

During the year 1920 the mine worked two eight hour shifts for 303 days. The average number of men employed during the year was 287 for a total of 85,988 days.

In 1919 an average of 288 men were employed for a total of 89,923 days. A decrease in labor in 1920 of 1 man and 3,935 days.

The average tons per man per day underground in 1920 was 4.81 or an increase of .13 tons per man per day over 1919, when the average tons per man was 4.68.

There was a 10% increase in wages in February 1920, which made an increase of \$.52 per day over the 1919 costs.

The actual amount paid due to eleven months of 1920 working at a 10% increase is \$44,713.76; which based on the production mined equals \$.133 per ton.

In 1920 the total supply cost was \$254,403.35 or \$.759 per ton.

The cost in the two years has been unusually high due to an excessive amount of new construction work, and the cost being diverted monthly to the cost of production.

A detail of the New Construction for the two years is as follows:-

	<u>1919</u>	<u>Labor</u>	<u>Supplies</u>
E.&A. #370 Electric Compressor		\$1,660.55	\$18,347.82
" 377 Elec. Cage & Skip Hoist		2,642.97	15,839.16
" 390 Electric Rock Tram		396.43	164.61
		<u>\$4,699.95</u>	<u>\$34,351.59</u>
Total 1919 E.&A.	-	\$39,051.54	

	1920	Labor	Supplies
E.&A. #370 Electric Compressor		\$556.13	\$373.62
" 377 Elec. Cage & Skip Hoist		3,842.10	34,086.64
" 390 Elec. Rock Tram		311.85	2,220.59
" 394 New Heating System		1,930.37	2,538.52
Dismantling Old Steam Compressor		<u>2,101.77</u>	<u>111.13</u>
		\$8,742.22	\$39,330.50

Total 1920 E.&A. - \$48,072.72

There is an increase of \$9,021.18 in the New Construction cost of 1920 compared with 1919 cost, which based on the production mined equals \$.027 per ton.

The total amount of E.&A. charges against the ore in 1920 is \$48,072.72, which based on the production shows \$.143 per ton increase above regular working conditions.

The increase of \$.133 per ton for labor account of increase in wages and increase of \$.027 per ton in supplies due to increase in the New Construction cost equals an increase of \$.16 per ton, which shows that if conditions were similar during the two years, the 1920 cost would have been \$.032 per ton less than the year 1919.

GENERAL EXPENSE

No. 26 Insurance,

1920 Amount	\$217.48	- Cost per ton	\$.001
1919	1,429.38		.004
Decrease	1,211.90		.003

This decrease due to 1919 cost charged with premium on Use and Occupancy and Riot Insurance in November 1919 - Amount \$1,290.65.

No. 27 Engineering,

1920 Amount	\$3,542.83	- Cost per ton	\$.011
1919	2,688.29		.008
Increase	874.65		.003

No. 28 Analysis,

1920 Amount	\$12,563.12	- Cost per ton	\$.037
1919	11,165.14		.033
Increase	1,397.98		.004

This includes the operating laboratory charge.

In 1920 the total number of determinations was 39,530 at \$.1431 per det. or a total of \$5658.26. In 1919, 37,978 dets. were worked at \$.1273 per det. or a total of \$4828.54; showing an increase of \$829.72. The balance of the increase is sampling at the mine, the increase due to increase in wages.

No. 30 Personal Injury Expense,

1920 Amount	\$4,417.33	- Cost per ton	\$.013
1919	4,326.21		.013
Increase	91.12		

There was one fatal accident in 1919, Tom Mazar fatally injured in March 1919; and one fatal in 1920, John Kusisto fatally injured June 1920.

No. 30-A Mine Office,

1920 Amount	\$19,105.87	- Cost per ton	\$.057
1919	18,228.78		.054
Increase	877.09		.003

Increase due to Central Office charges. A decrease of \$809.83 in cost of Mine Office labor, due to reduction of one clerk at mine office in 1920.

Total General Expense,

1920 Amount	\$39,846.63	- Cost per ton	\$.119
1919	37,837.80		.112
Increase	2,008.83		.007

Accounted for in 26, 27, 28 and 30.

MAINTENANCE.

No. 125 Tracks and Yards,

1920 Amount	\$3,694.13	- Cost per ton	\$.011
1919	2,659.87		.008
Increase	1,034.26		.003

The increase is due to surface improvement. A gardner put in full time on the premises for five months during the summer of 1920.

No. 126 Docks, Trestles & Pockets,

1920 Amount	\$2,922.01	- Cost per ton	\$.009
1919	990.11		.003
Increase	1,931.90		.006

Increase due to erection of new rock trestle in 1920 also repairs made to the Bessemer permanent trestle, renewing decking plank.

No. 127 Buildings,

1920 Amount	\$6,762.19	- Cost per ton	\$.020
1919	2,458.16		.008
Increase	4,304.03		.012

The increase is due to:-
Installing new concrete floor in Engine House, \$1,086.85; Closing off E.&A. #394, New Heating Plant \$4,468.89.

No. 128 Shop Machinery,

1920 Amount	\$ 244.81	- Cost per ton	\$.001
1919	151.00		.000
Increase	93.81		

This increase due to one air riveter purchased in 1920.

No. 129 Boilers,

1920 Amount	\$2,182.04	- Cost per ton	\$.006
1919	2,069.69		.006
Increase	112.35		.000

Increase due to increase in wages.

No. 130 Hoisting Machinery,

1920 Amount	\$41,789.32	- Cost per ton	\$.125
1919	20,540.31		.061
Increase	21,249.01		.064

	Sub-division		Incr.	Decr.
	1920	1919		
Steam Hoist	\$1203.28	\$2410.25		\$1206.97
Electric "	38240.77	16824.45	\$21416.32	
Wire Rope	2345.27	1305.61	1039.66	

The old steam cage hoist and skip hoist were replaced during 1920 by new electric hoists.

No. 131 Compressor & Power Drills,

1920 Amount	\$5,535.76	- Cost per ton	\$.016
1919	21,447.24		.064
Decrease	15,911.48		.048

	Sub-Division.		Incr.	Decr.
	1920	1919		
Steam Compressor	\$98.23	\$343.43		\$245.20
Elec. "	4666.81	20433.81		15767.00
Power Drills	770.72	670.00	\$100.72	

In 1919, one P.R.E.-2 Rand electric compressor was purchased and installed in a temporary building under E.&A. #370.

In 1920, the old steam compressor was dismantled and the Rand compressor was transferred from the temporary building to the main engine house. Also one P.R.E.-2 Rand electric Compressor was transferred from the Lake Mine and installed in the main Engine House.

The charges were all transferred from E.&A. #370 to maintenance.

Four new machines were added to equipment in 1920. 4 No. NA90 Waugh Auger Drills for \$770.00

No. 132 Pumping Machinery,

1920 Amount	\$11,587.87	- Cost per ton	\$.035
1919	5,040.63		.015
Increase	6,547.24		.020

	Sub-Division		Incr.	Decr.
	1920	1919		
Electric Pumps	\$4956.04	\$5040.63		\$84.59
Sumps	6631.83		\$6631.83	

In 1920 the third and fourth levels sumps were cut costing \$6631.83.

No. 133 Top Tram Engine & Cars,

1920 Amount	\$5,250.65	- Cost per ton	\$.016
1919	1,813.07		.005
Increase	3,437.58		.011

The increase is due to closing off charges of E.&A. #390 Electric Rock Tram, amount transferred to maintenance \$2542.44.

No. 134 Skip and Skip Roads

1920 Amount	\$3,943.56	- Cost per ton	\$.012
1919	3,046.18		.009
Increase	897.38		.003

This increase is due to repairs to skips and repairs made to skip road.

No. 135 Underground Tracks & Cars,

1920 Amount	\$2,636.61	- Cost per ton	\$.008
1919	3,431.62		.010
Decrease	795.01		.002

Decrease due to more 12# rail used in 1919 than in 1920.

No. 136 Electric Tram Plant,

1920 Amount	\$24,485.28	- Cost per ton	\$.073
1919	19,107.31		.057
Increase	5,377.97		.016

	Sub-Division.		
	Eng. & Dyn.	Locomotives	Wiring
1920	436.88	5413.24	1752.45
1919	24.85	3701.34	2127.98
Incr.	412.03	Incr. 1711.90	Decr. 375.53
	M.L.Tracks	M. L. Cars	
1920	12064.81	4817.90	
1919	9805.83	3447.31	
Incr.	2258.98	1370.59	

Increase in Eng. & Dyn. due to labor re-installing Haulage Generator in main power house.

Increase in Locomotives due to increase in general repairs to the locomotives.

Decrease in Wiring due to less labor and supplies on extension to trolley lines.

Increase in M. L. Tracks due to more 30# rail used in 1920, account of the increase in development work.

Increase in M. L. Cars due to upkeep of the cars.

No. 137 Telephones & Safety Devices,

1920 Amount	\$1,166.98	- Cost per ton	\$.003
1919	1,115.69		.003
Increase	51.29		

No. 140 Fire Expense & Damage,

1920 Amount	\$41.61	- Cost per ton	\$.000
1919	-		
Increase	41.61		

Total Maintenance,

1920 Amount	\$112,242.82	- Cost per ton	\$.335
1919	83,870.88		.249
Increase	28,371.94		.086

MINING EXPENSE

No. 150 Air Pipes,

1920 Amount	\$ 6,235.62	- Cost per ton	\$.019
1919	7,367.60		.022
Decrease	1,131.98		.003

1919 cost included a large amount of 4" pipe for main lines on levels.

No. 151 Compressors,

1920 Amount	\$21,207.60	- Cost per ton	\$.063
1919	24,017.71		.071
Decrease	2,810.11		.008

	1920	1919
Air made by Maas Steam Comp.	89638659	584404549
" " " " Elec. "	311850000	
" " " Neg. Mine "	<u>174780000</u>	<u>32067900</u>
Total cubic feet -	576268659	616472449

Cost of operating Maas Compressors	\$15,381.60
Amount charged by Negaunee Mine	<u>5,826.00</u>
Total -	\$21,207.60

The Sullivan Steam Compressor was dismantled in 1920 and since May the mine has been furnished with air made by the electric Compressors.

No. 152 Hoisting,

1920 Amount	\$42,567.04	- Cost per ton	\$.127
1919	48,960.99		.145
Decrease	6,393.95		.018

Both the cage hoist and skip hoist are now running electrically. The old steam cage hoist was dismantled in March 1920 and the steam skip hoist in June 1920.

153 Pumping,

1920 Amount	\$39,281.86	- Cost per ton	\$.117
1919	41,785.34		.124
Decrease	2,503.48		.007
Gallons water pumped per minute	1920, 967		
" " " " "	1919, 1070		
Decrease			103

No. 154 Sinking and Shaft Repairs,

1920 Amount	\$ 1,916.08	- Cost per ton	\$.006
1919	15,359.15		.046
Decrease	13,443.07		.040

The 1919 charge to this account was for completing the new lift from the 3rd to 4th levels.

The 1920 charge is for repairing the ore pockets in the shaft.

No. 155 Rock Drifting,

1920 Amount	\$28,639.18	- Cost per ton	\$.085
1919	20,482.87		.061
Increase	8,156.31		.024

There was 2726 ft. of rock work in 1920 @ \$10.51 per foot; and 2728 ft. in 1919 @ \$7.51 per foot.

A large amount of the footage in 1920 was for main level drifts on the fourth level.

No. 156 Breaking Ore,

1920 Amount	\$285,727.87	- Cost per ton	\$.852
1919	268,132.83		.795
Increase	17,595.04		.057

This increase due to increase in wages and explosives.

	Explosives.	
	1920	1919
Total lbs. of powder	142,050	130,000
Average price per lb.	.1797	.1729
Total Amount	25524.47	22530.23
Fuse, Caps, Etc.	5028.48	3558.16
Grand total	30552.95	26088.39
Lbs powder per ton of ore	.424	.387
Cost per ton for powder	.0761	.0668
Cost per ton all explosives	.0911	.0773

No. 157 Tramming,

1920 Amount	\$54,332.60	- Cost per ton	\$.162
1919	51,476.65		.153
Increase	2,855.95		.009

	Sub Division.	
	1920	1919
Tramming	40761.00	37466.39
Skip Tender & Bellman	9693.71	11184.39
Clean Skip Pit	3877.89	2825.87

In 1919 and part of 1920 a crew of four to six men were employed on night shift to clean skip pit. Since then the timber foreman crew of three men clean the skip pit in two to three hours in the afternoon.

No. 158 Filling,

1920 Amount	\$806.45	- Cost per ton	\$.002
1919	855.90		.003
Decrease	49.45		.001

No. 159 Timbering,

1920 Amount	\$109,643.99	- Cost per ton	\$.327
1919	104,311.40		.309
Increase	5,332.59		.018

		1920	1919
Timber Cost		15220.24	14866.44
Lagging & Poles		9882.88	12417.64
Total		25103.12	27284.08
Ft. of tbr. per ton of ore	.652		.602
Cost per ton for tbr.			
Lagging & Poles		.0749	.0808

The increase is due to increased wages.

No. 160 Captain and Bosses,

1920 Amount	\$19,583.28	- Cost per ton	\$.059
1919	15,637.50		.046
Increase	3,945.78		.013

This increase due to increase in wages.

No. 161 Dry House,

1920 Amount	\$8,178.67	- Cost per ton	\$.025
1919	8,007.51		.024
Increase	171.16		.001

No. 162 Top Landing & Trimming,

1920 Amount	\$8,347.08	- Cost per ton	\$.025
1919	10,484.97		.031
Decrease	2,137.89		.006

Prior to August 1920 a proportion of the Boiler House cost was charged to this account for operation of the steam rock transfer engine. Since August 1920 the new electric rock tram has been in operation.

No. 163 Stocking Ore,

1920 Amount	\$5,969.85	- Cost per ton	\$.018
1919	7,431.46		.022
Decrease	1,461.61		.004

Due to irregular shipping orders, several bents of the stocking trestle were dismantled and rebuilt on several occasions in the fall of 1919. This increased the 1919 cost.

No. 164 Sorting Ore,

1920 Amount	\$651.38	- Cost per ton	\$.002
1919	573.04		.002
Increase	78.34		

This increase due to increase in wages.

No. 171 Mine Ventilation,

1920 Amount	\$35.23	- Cost per ton	\$.000
1919	No charge		
Increase	35.23		

Total Mining Expense,

1920 Amount	\$633,123.78	- Cost per ton	\$1.889
1919	624,884.92		1.854
Increase	8,238.86		.035

DELAYS -ELECTRICAL.

April 27th	One and one-half hours delay account of no current, 12:30 to 2:00 o'clock P.M.
June 28th	Two hours delay account of no current.
July 9th	Two hours delay day shift account of no current.
September 8th	Night shift idle account of no current.
September 21st	Two hours delay account of switch board on skip hoist out.
November 9th	No current until 8:45 A.M.

DELAYS - NON ELECTRICAL.

January 10th	Four hours delay account of skip off track. No hoist-on night shift.
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March 6th Rail broken in dump from 8:30 A.M. to 1 P.M.

July 9th Two and one-half hours delay night shift account of North skip off track and pulling off three rails in skip road.

July 10th Eight hours idle account of repairs to skip road.

July 13th Two and one-half hours delay account of no Railroad cars at pocket from 8 to 10:30 P.M., unable to stock as trestles were dismantled.

August 30th Three hours delay from two to five o'clock A.M. account of electric skip hoist out of commission.

October 9th Three hours delay account of no Railroad cars from 7:30 to 10:30.

November 9th One and one-half hours delay account of plates on South side of pocket pulled out by skip.

November 12th Seven hours delay from 9 P.M. to 5 A.M. account of no Railroad cars.

MAAS MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1920.

GRADE	IRON	PHOS.	SILICA
Maas Bessemer,	60.87	.047	8.69
Maas,	58.93	.100	8.71

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1920.

GRADE	Mine		Lake Erie	
	IRON	PHOS.	IRON	MOIST.
Maas Bessemer,	(All mixed)			
Maas,	59.40	.097	59.44	11.96

ORE STATEMENT - DECEMBER 31ST, 1920.

	MAAS BESSEMER	MAAS	TOTAL	TOTAL LAST YEAR
On hand January 1st, 1920,	35673	120641	156314	63227
Output for year,	90174	245047	335221	337030
Transferred,	10487	10487		
Total,	115360	376175	491535	400257
Shipments,	105855	273277	379132	243943
Balance on hand,	9505	102898	112403	156314
Decrease in output-.5%			1809	
Decrease in ore on hand-29%			43911	
1920 - 2-8 Hour Shifts for year				
1919 - 1-8 " " " "				

MAAS MINE.

MAAS MINE

SHIPMENTS FOR YEAR 1920.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Maas Bessemer,	32,271	73,584	105,855	97,588
Maas,	144,754	128,523	273,277	146,355
Total,	177,025	202,107	379,132	243,943
Total last year,			243,943	
Increase - 55%			135,189	

MAAS MINE.

MAAS MINE.

COMPARATIVE MINING COST FOR YEAR.

	1 9 2 0.	1 9 1 9.	INCREASE.	DECREASE.
PRODUCT	335,221	337,030		1,809
General Expense	.119	.112	.007	
Maintenance	.335	.249	.086	
Mining Expense	1.889	1.854	.035	
Cost of Production	2.343	2.215	.128	
Exploratory		.013		.013
DEPRECIATION.				
Original Purchase	.066	.078		.012
Plant Account	.251	.251		
Equipment	.006	.004	.002	
Total Depreciation	.323	.333		.010
Taxes	.249	.228	.021	
Central Office	.074	.063	.011	
Miscellaneous	.006	.007		.013
Fire Loss		.002	.002	
Sundry Expense	.031	.007	.024	
Cost on Stockpile	3.014	2.864	.150	
Loading & Shipping	.067	.038	.029	
Total Cost on Cars	3.081	2.902	.179	
No. Days Operating	303	299	4	
No. Shifts & Hours	2-8hr	1-8hr		
Avg. Daily Product	1,106	1,127		21
<u>COST OF PRODUCTION.</u>				
Labor	1.584	1.499	.085	
Supplies	.759	.716	.043	
Total	2.343	2.215	.128	

MAAS MINE

COMPARATIVE WAGES AND PRODUCT

	1 9 2 0	1 9 1 9	INCREASE	DECREASE
PRODUCT	335,221	337,030		1,809
No.Shifts and Hours	2-8hr	1-8hr		
AVERAGE NO.MEN WORKING				
Surface	50	56		6
Underground	228	237		9
Total	278	293		15
AVERAGE WAGES PER DAY				
Surface	5.50	4.95	.55-11.11%	
Underground	6.27	5.76	.51- 8.8	
Total	6.12	5.60	552- 9.46%	
WAGES PER MONTH OF 25 DAYS				
Surface	137.50	123.75	13.75	
Underground	156.75	144.00	12.75	
Total	153.00	140.00	13.00	
PRODUCT PER MAN PER DAY				
Surface	20.50	18.75	1.75	
Underground	4.81	4.69	.12	
Total	3.90	3.75	.15	
LABOR COST PER TON				
Surface	.268	.264	.004	
Underground	1.303	1.230	.073	
Total	1.571	1.494	.077	
AVG.PRODUCT BRK'G & TRM'G	7.31	7.86		.55
" WAGES CONTRACT MINERS	6.50	5.81	.69	
" " " TRAMMERS				
" B " " LABOR	6.50	5.81	.69	
TOTAL NUMBER OF DAYS				
Surface	16,351	17,975		1,624
Underground	69,637	71,947 $\frac{3}{4}$		2,310 $\frac{3}{4}$
Total	85,988	89,922 $\frac{3}{4}$		3,934 $\frac{3}{4}$
AMOUNT FOR LABOR				
Surface	89939.41	88909.69	1029.72	
Underground	436666.00	414719.59	21946.41	
Total	526605.41	503629.28	22976.13	

Proportion Surface to Underground Men:

1920 - 1 to 4.56
 1919 - 1 to 4.23
 1918 - 1 to 4.08
 1917 - 1 to 4.50
 1916 - 1 to 4.24

MAAS MINE

TIMBER STATEMENT FOR THE YEAR ENDING DECEMBER 31, 1920.

KIND	LINEAL FEET	AVG. PRICE PER FOOT	AMOUNT 1 9 2 0	AMOUNT 1 9 1 9
6" to 8" Timber	108,258	.0419	4531.07	2497.60
8 to 10 "	72,664	.0849	6168.58	6240.71
10 to 12 "	25,352	.1081	2740.89	6066.53
12 to 14 "	12,130	.1467	1779.70	61.60
Total - 1920	218,404	.0697	15220.24	14866.44
Total - 1919	202,977	.07324		14866.44
	LINEAL FEET	PER 100'		
7' Lagging	1,019,607	.937	9559.62	11742.26
Poles	30,390	1.06	323.26	675.38
Total - 1920	1,049,997	.941	9882.88	
Total - 1921	1,128,890	1.10		12417.64
Product			335,221	377,020
Feet Timber per ton of ore			.652	.602
Feet Lagging "			3.04	3.14
Feet Lagging per foot of Timber			4.66	5.21
Cost per ton for Timber			.0454	.044
" Lagging			.0285	.0348
" Poles			.001	.002
" Timber, Lagging & Poles			.0749	.0808
Equivalent of stull timber to Board Measure			349,739	305,077
Ft. of Board measure per ton of ore			1.04	.91
Total Cost of Timber, Lagging & Poles - 1920				25103.12
				1919 27284.08
				1918 17426.96
				1917 14762.71
				1916 12709.85

MAAS MINE

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE

KIND	QUANTITY	AVERAGE PRICES	AMOUNT 1920	AMOUNT 1919
40% Powder - - - - -	117,200	.1715	20,097.02	21,489.56
60% " - - - - -	24,550	.2181	5,354.25	
80% " - - - - -	300	.244	73.20	1,040.67
<u>Total Powder - -</u>	<u>142,050</u>	<u>.1797</u>	<u>25,524.47</u>	<u>22,530.23</u>
Fuse - - - - -	408,600	.9196	3,757.36	2,501.96
Caps - - - - -	86,200	1.43	1,232.89	1,020.48
Cap Crimpers - - - - -	38	1.006	38.23	21.00
Tamping Bags - - - - -				14.72
<u>Total Fuse, Etc. -</u>			<u>5,028.48</u>	<u>3,558.16</u>
<u>Total All Explosives -</u>			<u>30,552.95</u>	<u>26,088.39</u>
Product - - - - -			335,221	337,030
Pounds Powder per ton of ore			.424	.387
Cost per ton for Powder -			.0761	.0668
" " " " Fuse, Caps, Etc.			.015	.0105
" " " " All Explosives			.0911	.0773
Avg. Price per Lb. for Powder			.1797	.1729

MAAS MINE

ATHENS MINE - 1920.

The production for the year was as follows:-

Athens Ore,	199,090 tons,
Rock,	17,244 "

The ore from the various leases was as follows:-

Athens,	174,797 tons,
Mitchell Lease,	22,283 "
Corbit Lease,	1,976 "
Bunker Hill,	34 "

The product came from the development on the South side of the fourth level, the driving of main level drifts on the sixth and ninth levels, and in the regular mining areas above the fourth and eighth levels.

UNDERGROUND.

During the latter part of last year, it was found that the ore on the North side of the dike which cut through the subs above the eighth level in a Northeast-Southwest direction, extended to the height of the fourth level. The North foot wall drift on the fourth had been driven West, had cut through this dike and found ore on the North side. It was then turned to the Southwest parallel with this dike with an idea of reaching the ore above the eighth level found by the stub raises from the 515' sub. As the drift advanced in this direction, it was found to be in the very peak of the ore, as jasper and ore were cut alternately for a distance of 400' when solid jasper was encountered and the drift stopped. In the meantime, a raise from the 515' sub holed through to the fourth level elevation and connected with this drift, making an outlet from the sub levels below to the fourth level, permitting a good circulation of air, shortening the traveling road into this sub level and also furnished means of getting timber into the sub level without hoisting from the eighth level.

As soon as this was completed, the ore found at the height of the

fourth level farther to the West was attacked in earnest and several small sub levels were mined during the year in that territory.

The development along the South foot of the fourth level which was started a year ago was continued this year. Practically no ore was found farther to the Southwest, but a second crosscut 100' to the East was driven and sub levels opened above this drift under the hanging. This territory was opened to provide more workingplaces.

In the East end of the mine on the Corbit Lease very little work was done, as during the year there developed a scarcity of men and it was impossible to keep workmen, where they were isolated from the rest of the mine and where it was necessary to climb 300' to their workingplace. However, in the latter part of the year, development was again started in an attempt to find the limits of the high sulphur zone.

The sixth level crosscut from the shaft was opened through to the ore formation during the year and connected with the workings started from #852 raise a year ago. In August tramping to the shaft was started from this level. Previous to this time, the ore from the development in the Southwest end of the mine was handled through raises to the eighth level, in some places a height of nearly 400'. This was extremely expensive and required continual repairing of raises.

The stoping under the hanging in the West end of the mine above the eighth level during the year was carried down to the eighth level proper. In order to facilitate the handling of ore below this point, a new main level drift was started paralleling the North dike on the ninth level. Raises from the ninth to the eighth were also opened.

DEVELOPMENT OF THE VARIOUS LEVELS AND SUBLEVELS THROUGHOUT THE YEAR.

-95' SUB LEVEL.

Development work was in progress at this elevation near the North foot in the Corbit Lease above the fourth level. In January a drift to the North from #410 raise was advanced 25' in mixed ore and jasper and encountered slate foot wall in the breast. Work was then abandoned.