

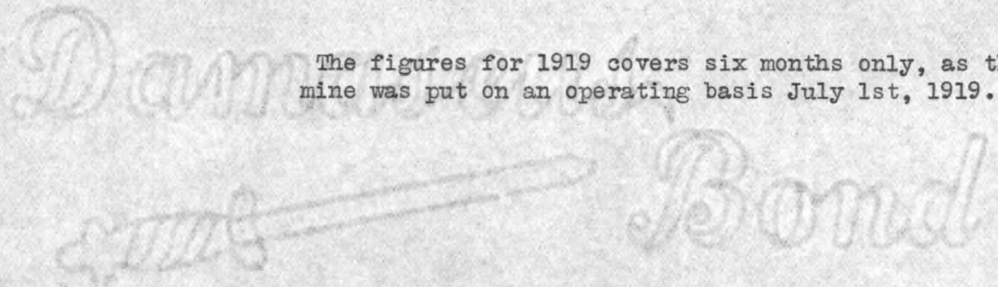
MADE IN U.S.A.

GARDNER-MACKINAW MINE

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE

KIND	QUANTITY	AVERAGE PRICES	AMOUNT 1920	AMOUNT 1919
40% Powder - - - - -	200	.1640	32.80	
50% " - - - - -	133,700	.1819	24,320.60	6,991.59
60% " - - - - -	1,050	.2065	216.81	7,926.74
Total Powder -	134,950	.18207	24,570.21	14,918.33
Fuse - - - - -	277,200	9.51	2,635.65	1,443.07
Caps - - - - -	35,800	15.06	539.01	248.38
Cap Crimpers - - - - -	9	.356	3.21	9.67
Tamping Bags - - - - -	6,000	1.900	11.40	10.70
Total Fuse, Etc.			3,189.27	1,711.82
Total Explosives -			27,759.48	16,630.15
Product - - - - -			128,162	55,829
Pounds Powder per ton of Ore			.9497	1.352
Cost per ton for Powder			.1917	.267
" " " " Fuse, Caps, Etc.			.0248	.031
" " " " All Explosives			.2165	.298
Avg. Price per Lb. for Powder			.18207	.1976

The figures for 1919 covers six months only, as the mine was put on an operating basis July 1st, 1919.



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GARDNER-MACKINAW

GENERAL SURFACE

Gwinn District Crusher:

The crusher was over-hauled in the spring and went into operation on May 4th. Very few repairs were necessary as most of this work was done in the previous year after the plant closed down in November.

Owing to the large amount of ore to crush, the plant was operated on double shift throughout the year. In August, 80,058 tons were crushed, an average of 2,760 tons per day. This was the largest tonnage ever crushed in one month. Owing to delays in unloading boats at the lower lake ports, the product crushed during several months was considerably below the capacity of the crusher.

The following is a summary of operations in 1920:

<u>NAME OF MINE:</u>	<u>TONS CRUSHED:</u>
Princeton,	60,010
Stephenson,	73,573
Gwinn,	197,022
Francis,	34,199
Gardner-Mackinaw,	<u>49,051</u>
TOTAL,	413,855

The following table gives a comparison of operations for the years 1920-1919:

		<u>DECREASE</u>	<u>INCREASE:</u>	
Year 1920 - Tons crushed,	152,847			
" 1919 - " "	413,855		261,008	
		<u>PER</u>		
		<u>TON</u>	<u>DECREASE</u>	<u>INCREASE:</u>
Year 1920 - General Expense,	1728.51	.004		
" 1919 - " "	612.85	.004		
Year 1920 - Maintenance,	2242.51	.005	.012	
" 1919 - " "	2574.52	.017		
Year 1920 - Operating,	16432.74	.040		
" 1919 - " "	4587.50	.030		.001
Year 1920 - Total Expense,	37118.02	.089	.002	
" 1919 - " "	13748.53	.091		

Gwinn District Crusher: (continued)

Average tons crushed per day	-	2,351
Number of days operated,		176
Shifts - No. hours,		2- 10-hrs.
Number of days idle,		38
Rated capacity per 10 hrs.		1,000 tons.

The cost per ton for "General Expense" was the same as in 1919.

The "Maintenance" cost per ton was much lower in 1920 than in 1919, but the actual expenditures were practically the same. These charges covered renewal of plates in chutes under grizzly and crusher, and in the unloading and loading pockets; also the maintenance of the railroad tracks at the Crusher, which are owned by The Cleveland-Cliffs Iron Company.

The "Operating Expense" is one cent higher per ton in 1920; this was principally due to operating two shifts instead of one. Wages were also higher in 1920 than in 1919; the operating cost was also higher due to lack of ore at times on both day and night shift.

On single shift in 1919, 1,428 tons were crushed per shift; in 1920, on double shift - 2,351 tons.

Gwinn Townsite:

During the past year one house was built in Gwinn on a lot which had been sold. The store building, started in 1919, was completed and is now in use.

The company bought the house on Lot 24 of Block 6, and sold it to an employee.

Flint Street, in the business section, was widened during the past year. The new curbing was built at company expense, while the township bore the greater part of all other expenses. This was a much needed improvement and it materially adds to the appearance of the business section.

Gwinn Club House:

The Club House has continued to be the community center for social, athletic and other activities. The secretary, Mr. Miller, who was employed in September, 1919, has proven very satisfactory, and has made the Club House very popular with all classes. The following is a brief summary of the years activities:

Total Attendance at building and grounds	88605
Average Monthly Attendance,	7388
Membership - January 1st, 1920	526
Membership - January 1st, 1921	515
High Membership - October 1920	572
Low Membership - December 1920	515

(Note:-- Decrease in December is due to closing down Gardner-Mackinaw Mine)

General Organizations using Building:

- 61 - Rehearsals held by Band, Orchestra and Carol Singers
- 5 - Parties held in Ladies' room
- 7 - Sales of Fancy Work articles and other materials by local church organizations.
- 2 - Community Sings held
- 4 - Special Entertainments held in Gymnasium
- 8 - Dancing Classes under supervision of High School Teachers for students.
- 22 - Regular dances held by different club organizations.
- 112 - Visitors shown through the Building during June, July, August and September.
- 20 - Meetings held by Board of Directors and special committees.

Special Events:

- Junior Reception by School
- Easter Monday Ball
- Reception and Dance by Association Baseball Team for Francis Mine Team--winners of Mine League.
- Parents-Teachers-Musical and Reception
- American Legion Dance
- Charity Ball by the Association
- Masonic Dance
- New Year's Ball by Local Firemen
- 205 - Different Moving Pictures Shown
- 628 - Shows held during Year.
- 53116 - Total paid attendance at movies.

Special Free Movies:

- Moving pictures on community work
- Moving pictures and health lecture
- Moving pictures of Marquette's Historical Pageant
- 5 - Free shows held December 21st, as Xmas treat for children.

Gwinn Club House (continued)

Library and Reading Room.

Number of Books in Library,	1,223
" of books drawn during year,	3,325
" " " " per month,	277
" " New Books added during year	110

All books in library re-catalogued and at present are in very good condition.

The following number of Current Magazines and Newspapers are received for the reading tables:

Weekly Newspapers,	4
Daily " "	4
Weekly Magazines,	13
Monthly " "	17

- - - - -

A mine baseball league was organized for twilight games, six teams being entered. The championship was won by the Francis Mine. After the series were over a reception was held at the Club House, at which time the Wm. G. Mather Trophy Cup was presented to the winners. A total of forty-six games were played and the total attendance at all games was estimated at 5,100.

One full troop of Boy Scouts have been active during the past year. Two troops of Girl Scouts were organized in the fall.

The Gwinn Band, with twenty-two members, has been active during 1920 and is rapidly becoming one of the best bands in Marquette County. Five free concerts were given in the Gwinn Park during the summer, which were largely attended. All the members are company employees.

It is hoped that lower building costs will permit of an addition to the motion picture room in 1921. The seating capacity of the present room is entirely too small for the population of the district, and there is a constant demand from the people for more room. This improvement would be appreciated by all the employees. At the present time the room is filled twenty minutes before each show and many are turned away.

Considerable new equipment has been purchased during the past year. The exterior woodwork of the building was painted during the summer, and the tar and

gravel roof was thoroughly overhauled.

Central Power Plant:

The worst fire in the history of the Gwinn District occurred at the Central Power Plant on Friday evening, May 28th. It started at the East end of the coal dock and in twelve minutes from the time it was noticed the entire coal dock was in flames. The fire spread from the coal dock to the boiler room of the Central Power Plant, which was soon a mass of ruins. The laboratory was practically destroyed; also a part of the cooling tower. For a time it seemed impossible to save any of the buildings, but due to hard work and the dying down of the wind, the fire was finally checked. In addition to the buildings destroyed, it also spread from the coal dock into the timber yard at Princeton No. 3 Shaft, where several hundred cords of 5-ft. and 8-ft. lagging and several skidways of mining timber were burned. For a time it seemed impossible to save the compressor room of the Central Power Plant, where the switchboards and turbine are also located. All the hose lines were used at this point until the danger was over, otherwise, it would have been possible to save the laboratory. The electric transmission lines fell, due to insulators breaking on the last steel tower near the sub-station, and live wires on the ground added to the danger of accidents. The district was without current during the night of the 28th, but temporary repairs were completed on the 29th, in time to prevent any of the mines flooding.

The work of rebuilding the destroyed buildings was started immediately. Arrangements were made for doing the laboratory work at the Athens Mine Laboratory at Negaunee, until the Gwinn District Laboratory was rebuilt. Work was resumed at the Gwinn District Laboratory shortly after the middle of June. It was necessary to tear down the walls of the boiler plant and build them up again from the ground. The steel girders of the roof were twisted out of shape by the intense heat and it was necessary to order new steel. Owing to the scarcity of masons, and the slow delivery of material, the rebuilding of the boiler plant was not completed until in November. A fireproof roof was decided on; this, however, was not completed owing to weather conditions. Considerable expense was

also incurred in overhauling the boilers, condensers, feed pumps, forced-draft equipment and pipe lines. The lack of rainfall made it imperative to get this plant in operation to help out the water power plants. Owing to the non-arrival of the coal-handling machinery, a temporary arrangement was installed and the plant went into operation the last of November. It has been operated intermittently since, depending on the water supply of the electric plants.

The cooling tower was in poor condition, due to rotting of lumber, and as fully one-half of it was burned, it was decided to install an open tank for cooling the water. A large concrete tank was built and the water is now cooled by a spray system.

A short single-track coal dock was built and several thousand tons of coal unloaded by using a locomotive crane to move it away from the dock. In this way it was possible to unload sufficient coal to operate the boiler plant during the winter.

The locomotive crane was also used to move the large ash-pile which had accumulated back of the boiler house.

District Office:

A new roof was put on the Central Office building in the fall. The old tar and gravel roof was in bad condition, and leaked in a number of places. A built-up roof of layers of special roofing material was put on by the Johns-Manville Company.

PRINCETON MINE

COST DATA FOR YEARS 1920-1919.

	YEAR 1920	YEAR 1919	INCREASE	DECREASE
Shifts and Hours,	2, 8-Hr. Jan-Feb. 1, 8-Hr. Mar-Dec.	2, 8-Hr.		
Product,	156,746	193,228		36,482
Average Daily Product,	517	655		138
Number of Days Operated,	303	295	8	
Number of Days Idle,	11	18		7
Number of Men - Surface,	41	35	6	
Average Rate Per Day - Surface,	\$5.44	\$4.69	0.75	
Tons per Man - Surface,	12.28	18.69		6.41
Number of Men - Underground,	126	162		36
Average Rate Per Day - Underground,	\$6.48	\$5.94	0.54	
Tons per Man - Underground,	4.05	3.99	0.06	
Total Average Men,	167	197		30
Total Average Rate,	\$6.22	\$5.72	0.50	
Tons Per Man Per Day,	3.04	3.29	0.25	
General Expense - Per Ton	.238	.195	0.43	
Maintenance - " "	.324	.202	.102	
Mining Expense - " "	2.309	2.034	.275	
Cost of Production- " "	2.871	2.431	.440	
Average Daily Cost - Labor,	\$1085.26	\$1172.33		\$87.07
" " " - Supplies,	400.17	419.10		18.93
" " " - Total,	1485.43	1591.43		106.00
Stopping,	11.13 tons	9.12 tons	2.01 tons	

<u>COST OF PRODUCTION:</u>	<u>YEAR 1920</u>	<u>YEAR 1919</u>	<u>INCREASE</u>	<u>DECREASE</u>
Labor,	328,824.45	345,837.39		17,012.94
Per Ton,	2.097	1.790	.307	
Supplies,	121,254.29	123,634.51		2,380.22
Per Ton,	.774	.641	.133	
Total,	450,078.74	469,471.90		19,393.16
Per Ton,	2.871	2.431	.440	

WAGE RATES, Increased February 1st, 1920.

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PRINCETON MINE
ANALYSIS OF MINING COSTS FOR 1920--1919.

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	YEAR 1920	YEAR 1919
Product for Year,	156,746	193,228
Average Daily Product,	517	655
Number of Shifts and Hours,	2,8-Hr. Jan-Feb.	1,8-Hr. Mar-Dec.

	1920 AMOUNT	PER TON	1919 AMOUNT	PER TON	PER TON INCREASE	PER TON DECREASE
<u>MAINTENANCE:</u>						
150-Air Pipes,	4,816.36	.031	3,818.12	.020	.011	
166-Ventilation,			25.47			
Total,	4,816.36	.031	3,843.59	.020	.011	
<u>SUPERINTENDENCE:</u>						
160-Captain & Bosses,	13,496.75	.087	14,983.05	.078	.009	
161-Dry House,	7,001.89	.044	6,303.19	.033	.011	
Total,	20,498.64	.131	21,286.24	.111	.020	
<u>POWER:</u>						
151-Compressors,	17,334.88	.110	29,636.72	.153		.043
152-Hoisting,	8,673.62	.055	8,014.76	.042	.013	
153-Pumping,	8,270.18	.054	8,306.73	.043	.011	
Total,	34,278.68	.219	45,958.21	.238		.019
<u>MINING:</u>						
156-Breaking Ore,	109,279.09	.697	114,225.97	.746		.049
157-Tramming,	32,149.73	.204	37,949.69	.197	.007	
159-Timbering,	81,832.09	.522	86,965.90	.450	.072	
164-Sorting Ore,	25.77	.001	361.62	.002		.001
Total,	223,286.68	1.424	269,503.18	1.395	.029	
<u>DEVELOPMENT:</u>						
154-Sinkg. & Shft. Reps.	2,334.17	.015	4,892.22	.025		.010
155-Rock Drifting,	59,042.31	.377	32,001.20	.166	.211	
Total,	61,376.48	.392	36,893.42	.191	.201	
<u>HANDLING OUTPUT:</u>						
162-Top Ldg. & Tramming,	12,619.21	.080	8,919.09	.046	.034	
163-Stocking Ore,	5,069.40	.032	6,419.28	.033		.001
Total,	17,688.61	.112	15,338.37	.079	.033	
TOTAL MINING EXPENSE,	361,495.45	2.309	392,823.01	2.034	.275	

PRINCETON MINE
ANALYSIS OF COST SHEETS EXPLAINING INCREASE OR DECREASE
IN VARIOUS ACCOUNTS BETWEEN YEARS 1920 AND 1919.

GENERAL EXPENSE:			
Engineering, (Acct. #27)	Year 1920	4136.44	Cost per ton .026
	Year 1919	<u>3614.76</u>	" " " <u>.019</u>
	INCREASE	521.68	INCREASE <u>.007</u>

One engineer works full time at the Princeton Mine and a helper about half time. The increase in expenses is due mainly to increased salaries paid in 1920. During part of 1919, the Princeton engineer did some of the Francis Mine work, which reduced the expense against the Princeton Mine.

Analysis, (Acct. #28)	Year 1920	11100.73	Cost per ton .071
	Year 1919	<u>11409.12</u>	" " " <u>.059</u>
	DECREASE	308.39	INCREASE <u>.012</u>

In 1920, there were 22,999 determinations costing .313¢ each; in 1919 - 30,236, costing .272¢ each. The laboratory expense in 1920 was higher on account of burning of the laboratory in May and to higher salaries and wages paid. The increase in cost per ton was due to decreased product.

Personal Injury Expense, (Acct. #30)	Year 1920	2362.57	Cost per ton .015
	Year 1919	<u>2478.10</u>	" " " <u>.013</u>
	DECREASE	115.53	INCREASE <u>.002</u>

The compensation paid account of personal injuries was slightly lower in 1920. The increased cost per ton was due to the decreased product.

Mine Office, (Acct. #30-a)	Year 1920	7346.82	Cost per ton .047
	Year 1919	<u>6817.55</u>	" " " <u>.035</u>
	INCREASE	529.27	INCREASE <u>.012</u>

The increase is due to advance in salaries effective February 1st, and to purchase of a Burroughs adding machine.

District Office, (Acct. #30-b)	Year 1920	12022.70	Cost per ton .077
	Year 1919	<u>12884.16</u>	" " " <u>.067</u>
	DECREASE	861.46	INCREASE <u>.010</u>

There was a decrease in the labor cost in 1920, due to less men employed, on account of the mine going on single shift March 1st. The 1920 payroll decreased 11%. District Office expense increased 25% in 1920; this increase was largely taken up by the Stephenson, which resumed operations in 1920. The increase in cost per ton was due to lower product in 1920.

MAINTENANCE:

Tracks and Yards, (Acct. #125)	Year 1920	2193.74	Cost per ton	.014
	Year 1919	<u>5481.18</u>	" " "	<u>.029</u>
	DECREASE	3287.44	DECREASE	.015

The expense was lower in 1920 due to charge of \$3,154.00 in 1919 from the C. & N. W. Ry. Co., for putting in pocket tracks to the new C. & N. W. Ry. Co., loading pocket.

Docks, Tres. & Pockets, (Acct. #126)	Year 1920	6816.97	Cost per ton	.043
	Year 1919	<u>1596.70</u>	" " "	<u>.008</u>
	INCREASE	5220.27	INCREASE	.035

The increase is due to erecting new permanent double stocking trestle on the North side of the shaft, and new loading pocket at the shaft. This work was part of E. & A. #401, all of which is being charged out directly to operating expense.

Buildings, (Acct. #127)	Year 1920	3538.10	Cost per ton	.023
	Year 1919	<u>973.97</u>	" " "	<u>.005</u>
	INCREASE	2564.13	INCREASE	.018

The increase is due to building new brick engine house, covered by E. & A. #401.

Boiler Plant, (Acct. #129)	Year 1920	1294.77	Cost per ton	.008
	Year 1919	<u>775.05</u>	" " "	<u>.004</u>
	INCREASE	519.72	INCREASE	.004

This increase is on account of new water line from the main line to the mine, to supply water to heating plant, dry and for fire protection. The old pipe line was rusted and clogged.

Hoisting Machinery, (Acct. #130)	Year 1920	5231.83	Cost per ton	.033
	Year 1919	<u>1916.02</u>	" " "	<u>.010</u>
	INCREASE	3315.81	INCREASE	.023

The increase is due to charging off E. & A. #401, covering cost of new hoist for mine. A new skip rope was also charged out in 1920.

Compr. & Pwr. Drills, (Acct. #131)	Year 1920	3223.60	Cost per ton	.021
	Year 1919	<u>1556.92</u>	" " "	<u>.008</u>
	INCREASE	1666.68	INCREASE	.013

In 1919, three auger drills, two #248 Leyners and two stopping drills were purchased; in 1920, seventeen auger drills and one #248 Leyner.

Pumping Machinery, (Acct. #132)	Year 1920	3722.86	Cost per ton	.024
	Year 1919	<u>1512.15</u>	" " "	<u>.008</u>
	INCREASE	2210.71	INCREASE	.016

The increase is due to purchase of new electric pump for Princeton No. 1 shaft; to cost of removing old pumping plant from No. 1 shaft and to ^{new} discharge line on 6th level.

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MAINTENANCE:

Top Tram Eng. & Cars, (Acct. #133)	Year 1920	3900.21	Cost per ton	.025
	Year 1919	<u>9068.60</u>	" " "	<u>.047</u>
	DECREASE	5168.89	DECREASE	.022

In 1919 the expense was unusually high due to building new top tram car and to charging out new top tram engine, new haulage ropes, etc. The expense in 1920 was high due to extensive repairs to top tram cars, new haulage ropes, new resistance grids, etc. The expense for both years is high due to side-dumping on stockpile.

Skips and Skip Roads, (Acct. #134)	Year 1920	1165.69	Cost per ton	.007
	Year 1919	<u>2324.08</u>	" " "	<u>.012</u>
	DECREASE	1158.39	DECREASE	.005

The decrease is due to less repairs to skips and skip roads in 1920.

U. G. Tracks and Cars, (Acct. #135)	Year 1920	1727.60	Cost per ton	.011
	Year 1919	<u>2097.41</u>	" " "	<u>.011</u>
	DECREASE	369.81	-----	

The decrease is due to less new sub-level cars made in 1920, and to less 12-lb. rail charged out.

Electric Tram Plant, (Acct. #136)	Year 1920	17845.41	Cost per ton	.114
	Year 1919	<u>11059.76</u>	" " "	<u>.057</u>
	INCREASE	6785.65	INCREASE	.057

The detail of charges for 1920 and 1919 is as follows:

	<u>1920</u>	<u>1919</u>	<u>INCREASE</u>	<u>DECREASE</u>
Locomotives,	1899.01	1548.66	350.35	
Wiring,	2132.26	826.79	1305.47	
Main Line Tracks,	10458.27	6526.62	3931.65	
" " Cars,	2551.16	1187.54	1363.62	
Spotting Engines,	<u>804.71</u>	<u>970.15</u>		<u>165.44</u>
	17845.41	11059.76	6785.65	

A detail of the increases, as shown above, is given herewith:

- Locomotives - 3 Armatures rewound - one motor overhauled, new wheels, gears, fittings, etc., for 7th level.
 - Wiring, Extensions of trolley line to #1 shaft, bonding rails, also material for wiring 7th level, charged out.
 - Main Line Tracks - Extensions of track to #1 shaft and new track on 7th level.
 - Main Line Cars - New car wheels and axles put on during year.
- The charges for "Rotary Dump" decreased due to less repair parts required.

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MAINTENANCE:			
Tel. & Safety Devices, (Acct. #137)	Year 1920	214.05	Cost per ton .001
	Year 1919	<u>585.58</u>	" " " <u>.003</u>
	DECREASE	371.53	DECREASE .002

The decrease is due to less expense for extension of lighting system and to installation of safety devices.

MAINTENANCE:			
	Year 1920	50874.83	Cost per ton .324
	Year 1919	<u>38949.42</u>	" " " <u>.202</u>
	INCREASE	11925.41	INCREASE .122

The increase is due mainly to charging out E. & A. No. 401 directly to operating expense. There was also an increase account of purchase of a number of drill machines in 1920. When the Stephenson Mine was drowned out in 1917 and the Princeton Mine reopened, the Stephenson drill machines were transferred to the Princeton. When the Stephenson resumed operations in 1920, the Princeton Mine paid for a number of the new drill machines that were purchased for the Stephenson. The balance of increase was in Acct. No. 136, Electric Tram Plant. This increase was due to extension of haulage to No. 1 Shaft, to installation of haulage on the 7th level, and to greater expense for repairs to cars.

MINING EXPENSE:			
Air Pipes, (Acct. #150)	Year 1920	4816.36	Cost per ton .031
	Year 1919	<u>3818.12</u>	" " " <u>.020</u>
	INCREASE	998.24	INCREASE .011

The increase is due to new air line to No. 1 Shaft, and on the 7th level. The raise in wages, effective February 1st, 1920, also increased the expense.

Compressors, (Acct. #151)	Year 1920	17334.88	Cost per ton .111
	Year 1919	<u>29636.72</u>	" " " <u>.153</u>
	DECREASE	12301.84	DECREASE .042

The decrease is due to lower charge for air from the Central Power Plant compressor. The charge against Princeton decreased, as the Central Power Plant compressor furnished air for three mines in 1920, as compared with two in 1919.

Hoisting, (Acct. #152)	Year 1920	8673.62	Cost per ton .055
	Year 1919	<u>8014.76</u>	" " " <u>.042</u>
	INCREASE	658.86	INCREASE .013

The increase was due mainly to the increase in wages, effective February 1st, 1920. On account of lower product, the power cost decreased.

Damascus

MINING EXPENSE:

Pumping,	Year 1920	8270.18	Cost per ton	.053
(Acct. #153)	Year 1919	<u>8306.73</u>	" " "	<u>.043</u>
	DECREASE	36.55	INCREASE	.010

The detail of charges for 1920 and 1919 is as follows:

	<u>1920</u>	<u>1919</u>	<u>INCREASE</u>	<u>DECREASE</u>
Pumpmen,	4778.68	5902.42		1130.74
Other Labor,	<u>18.51</u>	<u>6.16</u>	12.35	
Total Labor,	4797.19	5909.42		1118.39
Oil, Waste, etc.,	210.55	74.31	136.24	
Tools and Mis. Supplies,	121.26	50.16	71.10	
Electric Light,	70.77	22.50	48.27	
" Power,	<u>3070.41</u>	<u>2244.27</u>	<u>826.14</u>	
Total Supplies,	<u>3472.99</u>	<u>2391.24</u>	<u>1081.75</u>	
TOTAL OPERATING,	8270.18	8306.73	36.55	

The labor cost of pumping in 1920 shows a decrease, due to elimination of pumping by air, brought about by new pumping plant at No. 2 shaft, and closing down of plant at No. 1 shaft. Supply costs show increases due to pumping water from greater depth in 1920. The increase in cost per ton was due to lower product in 1920.

Sinkg. & Shaft Repairs,	Year 1920	2334.17	Cost per ton	.015
(Acct. #154)	Year 1919	<u>4892.22</u>	" " "	<u>.025</u>
	DECREASE	2558.05	DECREASE	.010

The decrease is due to less expense in 1920 for repairing shaft. In 1919 a number of steel sets were taken out of the shaft and replaced by wood sets, as the steel had buckled, due to swelling ground. Several wood sets were replaced in 1920 and a number jacked back into position, but the repairs were not nearly so extensive as in 1919.

Rock Drifting,	Year 1920	59042.31	Cost per ton	..377
(Acct. #155)	Year 1919	<u>32001.20</u>	" " "	<u>.166</u>
	INCREASE	27041.11	INCREASE	.211

In 1920, there was 4,539 ft. of rock drifting and raising, as compared with 2,166 ft. in 1919, an increase of 2,373 ft. More rock work was necessary in 1920 on account of opening the 7th level.

Breaking Ore,	Year 1920	109279.09	Cost per ton	.697
(Acct. #156)	Year 1919	<u>144225.97</u>	" " "	<u>.746</u>
	DECREASE	35046.88	DECREASE	.049

The large decrease is due to less men mining ore in 1920, on account of operating mine on single shift from March 1st on. The product decreased and the cost per ton also decreased.

MINING EXPENSE:			
Tramming, (Acct. #157)	Year 1920	32149.73	Cost per ton .205
	Year 1919	<u>37949.69</u>	" " " .197
	DECREASE	5799.96	INCREASE .008

Tramming expense decreased in 1920 due to fewer chutemen and motormen employed on account of mine operating on single shift the last nine months of the year. Only one motor was operated during part of the year, however, two have been working since mining of the No. 1 shaft pillars was started.

Timbering, (Acct. #159)	Year 1920	81832.09	Cost per ton .522
	Year 1919	<u>86965.90</u>	" " " .450
	DECREASE	5133.81	INCREASE .072

More timber was used in the mine in 1920, the totals being 201,977 ft. of stulls, as compared with 197,469 ft. in 1919. The cost per foot increased in 1920 from .053 to .0692. The amount of lagging and poles used in 1920 decreased, but the price increased so that the cost was greater. More timber is now required in No. 3 shaft territory, as the pressure on this ground is increasing with depth. There was also more raising in 1920 and more cribbing used. The cost per ton increased due to decreased product in 1920. The cost per ton for timber, lagging and poles increased from .099 in 1919 to .145 in 1920. Labor cost for timbering increased in 1920, due to higher wages and more expense for retimbering on the sub-levels near No. 3 Shaft.

Captain & Bosses, (Acct. #160)	Year 1920	13496.75	Cost per ton .086
	Year 1919	<u>14983.05</u>	" " " .078
	DECREASE	1486.30	INCREASE .008

The decrease was due to less shift bosses employed on account of the mine working on single shift after March 1st. This decrease would have been greater if wages had not advanced 10% on February 1st.

Dry House, (Acct. #161)	Year 1920	7001.89	Cost per ton .045
	Year 1919	<u>6303.19</u>	" " " .035
	INCREASE	698.70	INCREASE .010

The increase is due to advance in wages, February 1st, and to advance in price of coal.

Top Landing & Tramming, (Acct. #162)	Year 1920	12619.21	Cost per ton .080
	Year 1919	<u>8919.09</u>	" " " .046
	INCREASE	3700.12	INCREASE .034

The increase is due to more men employed on the landing on account of side-dumping on Cambridge stockpile and to advance in wages, effective February 1st, 1920.

Stocking Ore, (Acct. #163)	Year 1920	5069.40	Cost per ton .032
	Year 1919	<u>6419.28</u>	" " " .033
	DECREASE	1349.88	DECREASE .001

The decrease is due to less expense in 1920 for erection of stocking trestles. During the greater part of 1920 Cambridge ore was stocked by side-dumping on stockpile, due to ore not being shipped. For the above reason, less trestles were required in 1920.

Sorting Ore,
(Acct. #164)

MINING EXPENSE:			
Year 1920	25.77	Cost per ton	.000
Year 1919	<u>361.62</u>	" " "	<u>.002</u>
DECREASE	335.85	DECREASE	.002

The decrease is due to less expense in 1920 for sorting wood and rock from ore stocked.

MINING EXPENSE:			
Year 1920	361945.45	Cost per ton	2.309
Year 1919	<u>392823.01</u>	" " "	<u>2.034</u>
DECREASE	30877.56	INCREASE	.275

The decrease in mining expense is due to less men employed in 1920 account of mine working on single shift after March 1st. This explains the decreases in five accounts. There was also a decrease in expense for repairing the shaft. There was more expense for rock drifting in 1920, on account of more footage, also more expense for top landing on account of side-dumping on the Cambridge stock-pile. In 1920, nine accounts show decreases and five - increases. The increase in cost per ton is due to decrease in product.

COST OF PRODUCTION.

Year 1920	450078.74	Cost per ton	2.871
Year 1919	<u>469471.90</u>	" " "	<u>2.431</u>
DECREASE	19393.16	INCREASE	.440

The decrease is in "Mining Expense". "General Expense" for 1920 and 1919, was practically equal - "Maintenance" increased nearly \$12,000.00, while "Mining Expense" decreased over \$30,000.00.

GWINN MINE

COST DATA FOR YEARS 1920-1919.

	YEAR 1920	YEAR 1919	INCREASE	DECREASE
Shifts and Hours,	1, 8-hour Jan. 1, 1920 Dec.31, 1920	1, 8-hour Jan. 1, 1919 Dec.31, 1919.		
Product,	96,595	137,847		41,252
Average Daily Product,	321	458		137
Number of Days Operated,	301	300	1	
Number of Days Idle,	13	13		
Number of Men - Surface,	29	36		7
Average Rate per Day - Surface	\$5.43	\$5.09	.34	
Tons per Man - Surface,	10.60	12.32		1.72
Number of Men - Underground,	73	96		23
Average Rate per Day - Underground,	\$6.81	\$6.25	0.56	
Tons per Man - Underground,	4.27	4.63		0.26
Total Average Men,	102	132		30
Total Average Rate,	\$6.42	\$5.93	0.49	
Tons per Man Per Day,	3.05	3.37		0.32
General Expense - Per Ton,	.261	.220	0.41	
Maintenance - Per Ton,	.250	.157	0.93	
Mining Expense - Per Ton,	2.526	2.258	.268	
Cost of Production " "	3.037	2.635	.402	
Average Daily Cost - Labor,	\$649.38	\$802.00		\$152.62
" " " - Supplies,	325.21	408.93		83.72
" " " - Total,	974.59	1210.93		236.34
Stopins,	10.91 tons	10.62 tons	.29 tons	

<u>COST OF PRODUCTION</u>	<u>YEAR 1920</u>	<u>YEAR 1919</u>	<u>INCREASE</u>	<u>DECREASE</u>
Labor,	195,463.68	240,601.71		45,138.03
Per Ton,	2.023	1.745	.278	
Supplies,	97,888.41	122,678.23		24,789.82
Per Ton,	1.014	.890	.124	
Total,	293,352.09	363,279.94		69,927.85
Per Ton,	3.037	2.635	.402	

WAGE RATES, Increased February 1st, 1920.

GWINN MINE

ANALYSIS OF MINING COSTS FOR 1920-1919.

	<u>YEAR 1920</u>	<u>YEAR 1919</u>
Product for Year,	96,595	137,847
Average Daily Product,	321	458
Number of Shifts and Hours,	1, 8-Hr.	1, 8-Hr.

	1920 AMOUNT	PER TON	1919 AMOUNT	PER TON	PER	PER
					TON INCREASE	TON DECREASE
<u>MAINTENANCE:</u>						
150-Air Pipes, 166-Ventilation, Total,	2,623.05	.027	3,322.59	.024	.003	
<u>SUPERINTENDENCE:</u>						
160-Captain & Bosses, 161 Dry House, Total,	8,251.07 12,413.86 20,644.93	.085 .129 .214	10,341.31 12,312.22 22,653.53	.075 .089 .164	.010 .040 .050	
<u>POWER:</u>						
151-Compressors, 152-Hoisting, 153-Pumping, Total,	17,219.29 11,767.63 11,400.46 40,387.38	.178 .122 .118 .418	27,480.08 14,078.20 12,582.99 54,141.27	.200 .102 .091 .393		.022
<u>MINING:</u>						
156-Breaking Ore, 157-Tramming, 158-Filling, 159-Timbering, 164-Sorting Ore, Total,	75,962.90 14,900.05 161.87 43,421.63 1,212.69 135,659.14	.786 .155 .002 .449 .013 1.405	105,389.63 19,603.11 138.15 49,059.87 2,384.57 176,575.33	.765 .142 .001 .356 .013 1.277	.021 .013 .001 .093 .000 .128	
<u>DEVELOPMENT:</u>						
154-Sinkg. & Shft.Reps. 155-Rock Drifting, Total,	5,980.02 28,532.72 34,512.74	.062 .295 .357	31,585.62 10,792.10 42,377.72	.229 .078 .307		.167
<u>HANDLING OUTPUT:</u>						
162-Top Langing, 163-Stocking Ore, Total,	9,486.39 584.59 10,070.98	.097 .007 .104	10,215.78 1,708.69 11,924.47	.074 .013 .087	.023 .017	.006
TOTAL MINING EXPENSE,	243,965.24	2.526	310,994.91	2.252	.274	

GWINN MINE.
ANALYSIS OF COST SHEETS EXPLAINING INCREASE OR
DECREASE IN VARIOUS ACCOUNTS BETWEEN YEARS
1920 AND 1919.

GENERAL EXPENSE:			
Engineering, (Acct. #27)	Year 1920	1810.17	Cost per ton .018
	Year 1919	<u>2287.05</u>	" " " .017
	DECREASE,	476.98	INCREASE, .001

The decrease in expense was due to less engineering work required in 1920. There was one more operating mine in the district, with no increase in the engineering force, which also tended to decrease the expense. The cost per ton increased on account of a decreased product in 1920.

Analysis, (Acct. #28)	Year 1920	5861.65	Cost per ton .061
	Year 1919	<u>6915.54</u>	" " " .050
	DECREASE,	1053.89	INCREASE, .011

In 1920 there were 13,854 determinations costing .307 each; in 1919, 20,613, costing .275 each. There was a decrease of 6,759 determinations in 1920, which accounts for the decreased expenditures. The increased cost per ton in 1920 is due to the decreased product.

Personal Inj. Exp. (Acct. #30)	Year 1920	773.36	Cost per ton .008
	Year 1919	<u>2740.64</u>	" " " .020
	DECREASE,	1967.28	DECREASE, .012

There were less accidents in 1920, requiring compensation payments.

Mine Office, (Acct. #30a)	Year 1920	8967.18	Cost per ton .093
	Year 1919	<u>8136.39</u>	" " " .059
	INCREASE,	830.79	INCREASE, .034

The increase is due to higher salaries paid the mine and supply clerks in 1920, and to purchase of a Burroughs Adding Machine.

District Office, (Acct. #30b)	Year 1920	7662.87	Cost per ton .079
	Year 1919	<u>9376.54</u>	" " " .068
	DECREASE,	1713.67	INCREASE, .011

The decreased expense in 1920 is due to lower proportion of District Office expense against the Gwinn Mine on account of re-opening the Stephenson Mine; also there was a reduction in the working force in 1920, due to the labor shortage. The increased cost per ton is due to a decrease in product.

GENERAL EXPENSE:			
Total 1920		25246.65	Cost per ton .261
Total 1919		<u>30322.94</u>	" " " .220
DECREASE,		5076.29	INCREASE, .041

The increase in cost per ton in 1920 is due to lower product, which was the result of the labor shortage.

MAINTENANCE				
Tracks and Yards, (Acct. #125)	Year 1920	910.23	Cost per ton	.009
	Year 1919	<u>1454.82</u>	" " "	<u>.011</u>
	DECREASE,	544.59	DECREASE,	.002

The decrease is due to less expense in 1920 for cleaning surface.

Docks, Trestles and Pockets (Acct. #126)	Year 1920	101.80	Cost per ton	.001
	Year 1919	<u>863.38</u>	" " "	<u>.006</u>
	DECREASE,	761.58	DECREASE,	.005

The decrease is due to very few repairs required in 1920; also no grading for additional stocking grounds.

Buildings, (Acct. #127)	Year 1920	1336.87	Cost per ton	.014
	Year 1919	<u>2182.06</u>	" " "	<u>.016</u>
	DECREASE,	845.19	DECREASE,	.002

The storage shed built in 1920 at the Gwinn Mine cost \$981.28. In 1919, the main item of expense was the enclosing of the shaft house, which cost \$918.00. The normal expenditures for maintenance of buildings in 1920 were less than in the two previous years.

Shop Machinery, (Acct. #128)	Year 1920	1458.31	Cost per ton	.015
	Year 1919	- --	" " "	<u>.000</u>
	INCREASE,	1458.31	INCREASE,	.015

The increase is due to the purchase of a new drill sharpener in May, 1920, costing \$1458.31. The old sharpener was damaged in the fire which destroyed the shop building in 1915; this, combined with natural wear, made it necessary to purchase a new sharpener.

Boiler Plant, (Acct. #129)	Year 1920	977.99	Cost per ton	.010
	Year 1919	<u>252.75</u>	" " "	<u>.002</u>
	INCREASE,	725.24	INCREASE,	.008

New steam traps to elevate the condensed water to the boiler, account for the increase in 1920. These traps cost \$275.50; installation and new lines to return the condensed water brought the total cost to \$833.67. The balance of 1920 charges cover repairs to old traps and steam lines prior to the installation of the new traps.

Hoisting Machinery, (Acct. #130)	Year 1920	2307.14	Cost per ton	.024
	Year 1919	<u>3967.06</u>	" " "	<u>.029</u>
	DECREASE,	1659.92	DECREASE,	.005

The 1919 charges were high due to charging out counterbalance pipe and a new over-winding device. In 1920, the charges cover new sheaves, two new hoisting ropes, rope-oiling device and extension of signal system from 10th to 11th levels.

Compr. & Pwr. Drills, (Acct. #131)	Year 1920	7038.01	Cost per ton	.073
	Year 1919	<u>1338.09</u>	" " "	<u>.010</u>
	INCREASE,	5699.92	INCREASE,	.063

The large increase in 1920 is due to cost of 6" air line from Francis to Gwinn Mines. In 1919, five auger drill machines, costing \$500.00, were charged out; in 1920, four #248 Leyner drill machines, costing \$1460.00.

MAINTENANCE:				
Pumping Machinery, (Acct. #132)	Year 1920	2308.72	Cost per ton	.024
	Year 1919	<u>680.55</u>	" " "	<u>.005</u>
	INCREASE	1628.17	INCREASE	.019

The increased cost in 1920 was due to expense of installing dam on 7th level of the Gwinn Mine, to shut off the Jopling water. The dam cost approximately \$1750.00. The regular maintenance expense for 1920 was a little lower than in 1919.

Top Tram. Eng. & Cars, (Acct. #133)	Year 1920	581.59	Cost per ton	.006
	Year 1919	<u>1237.28</u>	" " "	<u>.009</u>
	DECREASE,	655.69	DECREASE,	.003

The decrease in 1920 was due to less general repairs. In 1919, this item amounted to \$941.02; in 1920 to \$581.59. The balance of 1919 charges were for wire rope; this rope was used through 1920.

Skips and Skip Roads, (Acct. #134)	Year 1920	2183.65	Cost per ton	.023
	Year 1919	<u>1575.65</u>	" " "	<u>.011</u>
	INCREASE,	608.00	INCREASE,	.012

The increase is due to more expense for repairing skips and for new runners in skip road.

U. G. Trax and Cars, (Acct. #135)	Year 1920	533.31	Cost per ton	.006
	Year 1919	<u>1190.34</u>	" " "	<u>.008</u>
	DECREASE,	657.03	DECREASE,	.002

There was less rail charged out in 1920; also less repairs to sub-level cars.

Electric Tram Plant, (Acct. #136)	Year 1920	3870.73	Cost per ton	.040
	Year 1919	<u>6409.64</u>	" " "	<u>.046</u>
	DECREASE,	2538.91	DECREASE,	.006

The detail of charges for 1920 and 1919 is as follows:

	<u>1920</u>	<u>1919</u>	<u>INCREASE</u>	<u>DECREASE</u>
Locomotives,	436.21	944.05		507.84
Wiring,	1305.71	1502.08		196.37
Main Line Tracks,	1256.75	3440.79		2184.04
Main Line Cars,	872.06	522.72	349.34	
Spotting Engines,	<u>33.51</u>	<u>33.51</u>		<u>33.51</u>
	3870.73	6409.64		2538.91

There was a lower cost for repair of locomotives in 1920; a small decrease in the cost for wiring and a large decrease in the cost for main line tracks. Tracks were installed on the 10th level in 1919; in 1920, on the 11th level. There was a small increase in 1920 in the cost of repairing main line cars.

MAINTENANCE:

Year 1920	24120.20	Cost per ton	.250
Year 1919	<u>21661.59</u>	" " "	<u>.157</u>
INCREASE	2458.61	INCREASE	.093

The increased cost in 1920 occurred in four accounts, while eight showed decreases. The increase was almost entirely due to installation of 6" air line from Francis to Gwinn Mine, to dam on 7th level to shut off Jopling water and to purchase of new drill sharpener. All these expenses might properly be termed extraordinary expenses.

MINING EXPENSE:

Air Pipes, (Acct. #150)	Year 1920	2623.05	Cost per ton	.027
	Year 1919	<u>3322.59</u>	" " "	<u>.024</u>
	DECREASE	699.54	INCREASE	.003

The decrease is due to less expense for air pipes in 1920, account of less gangs working, while the increased cost per ton is due to the lower product.

Compressors, (Acct. #151)	Year 1920	17219.29	Cost per ton	.178
	Year 1919	<u>27480.08</u>	" " "	<u>.200</u>
	DECREASE	10260.79	DECREASE	.022

In 1920, air from the Central Power Plant compressor cost the Gwinn Mine \$12,294.03; in 1919, \$27,155.30 - the decrease in 1920 amounting to \$14,861.27. This large decrease was due to operation of the Stephenson Mine which divided the cost for air from the Central Power Plant compressor by three, instead of by two, as in the previous year, when all the cost was charged to the Gwinn and Princeton Mines. The Gwinn Mine paid the Francis \$3,865.00 for air in 1920 as compared with \$3,600.00 in 1919. If the Austin Mine is operated it will be necessary for the Gwinn to get air from the Francis; while at present they only get air on Sundays and holidays, also whenever the pressure drops on the air furnished by the Central Power Plant compressor.

Hoisting, (Acct. #152)	Year 1920	11767.63	Cost per ton	.122
	Year 1919	<u>14078.20</u>	" " "	<u>.102</u>
	DECREASE,	2310.57	INCREASE	.020

A comparison of the cost for 1920 and 1919 is as follows:

	<u>1920</u>	<u>1919</u>	<u>INCREASE</u>	<u>DECREASE</u>
Engineers,	6485.22	6992.66		507.44
Other Labor,	48.20	70.58		22.38
Total Labor,	6533.42	7063.24		529.82
Oil, waste and Packing	97.54	41.45	56.09	
Miscellaneous	43.35	114.27		70.92
Electric Light,	28.72	31.50		2.78
Electric Power,	4455.60	6293.30		1837.70
Heating Expense,	609.00	534.44	74.56	
Total Supplies,	5234.21	7014.96		1780.75
Tons Ore and Rock Hoisted-	112,968	150,202		37,234

Hoisting (continued)
(Acct. #152)

The main decrease is due to less cost for electric power, due to a decrease of 37,234 tons rock and ore hoisted in 1920, while the increased cost per ton is due to the same cause.

Pumping, (Acct. #153)	Year 1920	11400.46	Cost per ton	.122
	Year 1919	<u>12582.99</u>	" " "	<u>.091</u>
	DECREASE,	1182.53	INCREASE	.031

The following table gives detail of pumping expense for 1920 and 1919:

	<u>1920</u>	<u>1919</u>	<u>INCREASE</u>	<u>DECREASE:</u>
Pumpmen,	4836.75	5399.57		562.82
Other Labor,	19.90	3.01	16.89	
Total Labor,	<u>4856.65</u>	<u>5402.58</u>		545.93
Oil, Waste and Packing,	301.17	490.66		189.49
Tools and Misc. Supplies,	97.82	126.17		28.35
Electric Light,	32.67	39.03		6.36
Electric Power,	<u>6112.15</u>	<u>6524.55</u>		<u>412.40</u>
Total Supplies,	<u>6543.81</u>	<u>7180.41</u>		<u>636.60</u>
Total Operating,	11400.46	12582.99		1182.53

Note:- In 1919 Jopling Mine charged \$5175.00 for pumping water.
In 1920 " " " 2600.00 " " "

Gals water pumped - 1920	165,004,020
" " " - 1919	<u>194,799,450</u>
Decrease - 1920	29,795,430

The actual pumping expense in 1920 was lower both in labor and supplies, but the cost per ton increased, due to the lower product.

Sinkg. & Shft. Repairs, (Acct. #154)	Year 1920	5980.03	Cost per ton	.062
	Year 1919	<u>31844.65</u>	" " "	<u>.229</u>
	DECREASE,	25864.62	DECREASE,	.167

The large decrease is due to no shaft sinking in 1920, while in 1919 the shaft was sunk from the 10th to 11th levels, a distance of 124 feet. The 1920 expense covered expense of cutting skip pit pocket and drift at bottom of shaft, expense of completing loading pocket on 11th level and general shaft repairs.

Rock Drifting, (Acct. #155)	Year 1920	28532.72	Cost per ton	.295
	Year 1919	<u>10792.10</u>	" " "	<u>.078</u>
	INCREASE	17740.62	INCREASE	.217

In 1920 there was 1802 feet of rock drifting and raising as compared with 909 feet in 1919. The cost per foot was \$3.96 higher in 1920, due to advance in wages February 1st, 1920, and to hard ground in 11th level haulage drift. The 1920 expense for drifting and raising was incurred in opening the 11th level.

MINING EXPENSE:				
Breaking Ore, (Acct. #156)	Year 1920	75962.90	Cost per ton	.786
	Year 1919	<u>105389.63</u>	" " "	<u>.765</u>
	DECREASE,	29426.73	INCREASE	.021

The product decreased 40,823 tons in 1920, while the number of men employed underground per day decreased from an average of 96 in 1919 to an average of 75 in 1920. Explosives cost \$10,016.78 in 1920 as compared with \$15,514.49 in 1919, a decrease of \$5,497.71. The balance of decrease is mainly labor, due to decrease in the number of men breaking ore. The increase in cost per ton is due to the increase in wages, effective February 1st, 1920.

Tramming, (Acct. #157)	Year 1920	14900.05	Cost per ton	.154
	Year 1919	<u>19603.11</u>	" " "	<u>.142</u>
	DECREASE	4703.06	INCREASE	.012

The decreased product of 1920, made it possible to handle the ore underground with less labor cost; there was also a decrease in the power cost due to less ore trammed. The increased cost per ton was due to increased wages and to some hand tramming to shaft on 7th level after the motor haulage equipment was removed to the 11th level.

Timbering, (Acct. #159)	Year 1920	43421.63	Cost per ton	.450
	Year 1919	<u>49059.87</u>	" " "	<u>.356</u>
	INCREASE	5638.24	INCREASE	.104

The following table gives the labor and supplies - lagging and poles, for the years 1920 and 1919:

	<u>1920</u>	<u>1919</u>	<u>INCREASE</u>	<u>DECREASE</u>
Timber, Lagging & Poles,	11357.60	17715.48		6357.88
Labor,	<u>32064.03</u>	<u>31344.39</u>	719.64	
	43421.63	49059.87		5638.24

This shows that the decrease in 1920 all occurred in the timber used, while there was a slight increase in the labor cost. The price of timber increased 1.37¢ per ft. in 1920, and lagging 6.73¢ per 100 ft. The decrease in amount of timber used was due to the decreased product of 1920. The labor cost increased due to advance in wages, February 1st, 1920 and to retrimbering of main levels, due to timber rotting on account of poor ventilation in mine.

Capt. & Bosses, (Acct. #160)	Year 1920	8251.07	Cost per ton	.085
	Year 1919	<u>10341.31</u>	" " "	<u>.075</u>
	DECREASE	2090.24	INCREASE	.010

The decrease is due to less shift bosses employed in 1920, on account of less men working. The increase in cost per ton is due to the lower product and to the increase in wages effective February 1st, 1920.

MINING EXPENSE:			
Dry House, (Acct. #161)	Year 1920	12413.86	Cost per ton .129
	Year 1919	<u>12312.22</u>	" " " .089
	INCREASE	101.64	INCREASE .040

The following table gives a comparison of costs for 1920 and 1919:

	<u>1920</u>	<u>1919</u>	<u>INCREASE</u>	<u>DECREASE</u>
Heating Plant Labor,	1510.21	2294.74		784.53
Dry " "	1854.99	744.28	1110.71	
Miscellaneous " "	28.94	45.96		17.02
Htg. Plant Supplies,	6598.54	5167.76	1430.78	
Shop Labor & Teaming,	21.51	10.03	11.48	
Water,	2253.35	3102.52		849.17
Light,	32.12	62.48		30.36
Miscellaneous Supplies,	114.20	108.33	5.87	
Fuel Adjustment,		776.12		776.12
	<u>12413.86</u>	<u>12312.22</u>	101.64	

The increase occurs in labor, account of the 10% increase effective February 1st, 1920 and in supplies, due to higher cost of coal. The charge for water is lower, also for light, while there was no fuel adjustment as in the previous year.

Top Ldg. & Trammng, (Acct. #162)	Year 1920	9486.39	Cost per ton .098
	Year 1919	<u>10215.78</u>	" " " .074
	DECREASE	729.39	INCREASE, .024

During a part of 1920, as also 1919, landers were employed night shift to handle rock from development work. There was less time by landers night shift in 1920, which explains the decrease in expense in 1920, in spite of the advance in wages, effective February 1st, 1920. The increased cost per ton is due to a lower product in 1920.

Stocking Ore, (Acct. #163)	Year 1920	584.59	Cost per ton .006
	Year 1919	<u>1708.69</u>	" " " .013
	DECREASE	1126.10	DECREASE .007

The decrease in 1920 is due to erecting of less stocking trestles. Although the greater part of the ore in stock was shipped, it was possible to leave one trestle standing which is being used this winter.

Sorting Ore, (Acct. #164)	Year 1920	1212.69	Cost per ton .013
	Year 1919	<u>2384.57</u>	" " " .017
	DECREASE	1171.88	DECREASE .004

The decrease in 1920 is due to less expense for miners picking rock from ore underground and also less expense on surface at stockpiles. The ore hoisted in 1920 was higher in iron, than in the previous year.

Ventilation, (Acct. #171)	Year 1920	67.02	Cost per ton .001
	Year 1919	<u>300.50</u>	" " " .002
	DECREASE	233.48	DECREASE .001

The cost in 1920 is for expense of removing fan pipe from mine; in 1919, partly for same work; balance for doors sealing off old workings in an effort to improve air in mine.

MINING EXPENSE:

Year 1920	243,985.24	Cost per ton	2.526
Year 1919	<u>311,295.41</u>	" " "	<u>2.258</u>
DECREASE	67,310.17	INCREASE	.268

The decrease in expense is principally due to less men employed underground on account of the labor shortage. Only one account - "Rock Drifting" shows an increase which was due to opening the 11th level. The cost per ton increased on account of the decreased product.

COST OF PRODUCTION

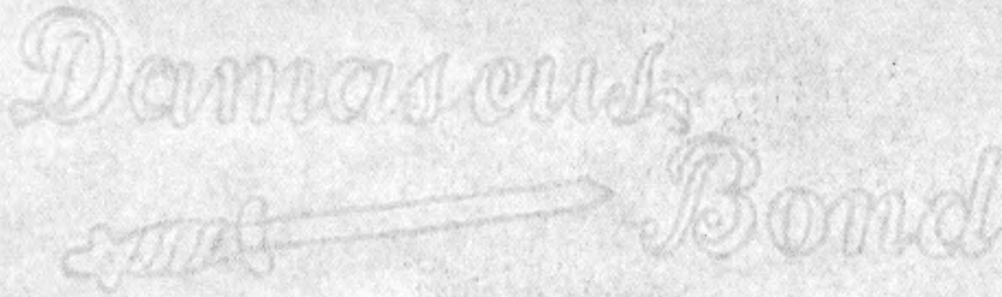
Year 1920	293,352.09	Cost per ton	3.037
Year 1919	<u>363,279.94</u>	" " "	<u>2.635</u>
DECREASE	69,927.85	INCREASE	.402

The decrease in expense in 1920, and the increase in cost per ton was due entirely to the labor shortage.

Extraordinary Drifting,
(Acct. #177)

Year 1920	15,310.42	Cost per ton	.159
Year 1919	<u>000.00</u>	" " "	<u>.000</u>
INCREASE	15,310.42	INCREASE	.159

The above expenditure represents the 1920 cost of the drift being driven from the Gwinn to Francis Mine, across the Wadsworth lands, for ventilation and second outlet.



FRANCIS MINE

COST DATA FOR YEARS 192-1919.

	YEAR 1920	YEAR 1919	INCREASE	DECREASE
Shifts and Hours,	1, 8-hr.	1, 8-hr.		
Product,	80,056	80,528		472
Average Daily Product,	266	269		003
Number of Days Operated,	301	299	2	
Number of Days Idle,	13	14		1
Number of Men - Surface,	25	24	1	
Average Rate Per Day - Surface,	\$5.46	\$4.97	0.49	
Tons per Man - Surface,	10.75	10.50	0.25	
Number of Men - Underground,	64	60	4	
Average Rate Per Day - Underground,	6.55	6.16	0.39	
Tons Per Man - Underground,	4.21	4.61		0.40
Total Average Men,	89	84	5	
Total Average Rate,	\$6.24	\$5.79	0.45	
Tons Per Man Per Day,	3.02	3.21		0.19
General Expense, Per Ton,	.253	.256		.003
Maintenance, " "	.231	.329		.098
Mining Expense, " "	2.274	1.970	.304	
Cost of Production, " "	2.758	2.555	.203	
Average Daily Cost - Labor,	\$526.30	\$491.75	\$34.55	
" " " - Supplies,	207.34	196.40	10.94	
" " " - Total,	733.64	688.15	45.49	
Stoping,	9.39 tons	9.56 tons		.17 tons

<u>COST OF PRODUCTION</u>	<u>YEAR 1920</u>	<u>YEAR 1919</u>	<u>INCREASE</u>	<u>DECREASE</u>
Labor,	158,416.96	147,034.94	11,382.02	
Per Ton,	1.979	1.826	.153	
Supplies,	62,410.11	58,722.93	3,687.18	
Per Ton,	.779	.729	.050	
Total,	220,827.07	205,757.87	15,069.20	
Per Ton,	2.758	2.555	.203	

WAGE RATES, Increased February 1st, 1920.

FRANCIS MINE

ANALYSIS OF MINING COSTS FOR 1920-1919.

	YEAR 1920	YEAR 1919
Product for Year,	80,056	80,528
Average Daily Product,	266	269
Number of Shifts and Hours,	1, 8-Hr.	1, 8-Hr.

	1920 AMOUNT	PER TON	1919 AMOUNT	PER TON	PER	PER
					TON	TON
<u>MAINTENANCE:</u>						
150-Air Pipes,	1,730.71	.022	2,899.90	.036		.014
166-Ventilation,						
<u>Total,</u>	<u>1,730.71</u>	<u>.022</u>	<u>2,899.90</u>	<u>.036</u>		<u>.014</u>
<u>SUPERINTENDENCE:</u>						
160-Captain & Bosses,	5,930.02	.074	5,400.99	.067	.007	
161-Dry House,	3,560.74	.044	1,706.27	.021	.023	
<u>Total,</u>	<u>9,490.76</u>	<u>.118</u>	<u>7,107.26</u>	<u>.088</u>	<u>.030</u>	
<u>POWER:</u>						
151-Compressors,	12,077.02	.150	7,562.61	.094	.056	
152-Hoisting,	9,631.13	.120	7,710.16	.094	.026	
153-Pumping,	3,738.54	.048	4,430.67	.057		.009
<u>Total,</u>	<u>25,446.69</u>	<u>.318</u>	<u>19,703.44</u>	<u>.245</u>	<u>.073</u>	
<u>MINING:</u>						
156-Breaking Ore,	63,254.88	.790	60,829.49	.755	.035	
157-Tramming,	10,606.29	.132	9,931.81	.126	.006	
159-Timbering,	34,918.16	.436	27,327.37	.340	.096	
164-Sorting Ore,	2,144.24	.027	409.95	.001	.026	
<u>Total,</u>	<u>110,923.57</u>	<u>1.385</u>	<u>98,498.62</u>	<u>1.222</u>	<u>.163</u>	
<u>DEVELOPMENT:</u>						
154-Sinkg. & Shft. Reps.	21,693.08	.271	906.73	.011	.260	
155-Rock Drifting,	3,899.41	.049	24,124.94	.300		.251
<u>Total,</u>	<u>25,592.49</u>	<u>.320</u>	<u>25,031.67</u>	<u>.311</u>	<u>.009</u>	
<u>HANDLING OUTPUT:</u>						
162-Top Ldg. & Tramming,	7,256.02	.091	4,078.06	.051	.040	
163-Stocking Ore,	1,209.08	.015	1,361.82	.017		.002
<u>Total,</u>	<u>8,465.10</u>	<u>.106</u>	<u>5,439.88</u>	<u>.068</u>	<u>.038</u>	
TOTAL MINING EXPENSE,	182,036.32	2.274	158,680.77	1.970	.304	

FRANCIS MINE
ANALYSIS OF COST SHEETS EXPLAINING INCREASE OR
DECREASE IN VARIOUS ACCOUNTS BETWEEN YEARS
1920 AND 1919.

GENERAL EXPENSE:			
Engineering, (Acct. #27)	Year 1920	2011.63	Cost per ton .025
	Year 1919	<u>2026.75</u>	" " " <u>.025</u>
	INCREASE	15.12	

The expense for the two years was practically the same. On account of the increase in wages, effective February 1st, there was actually a small decrease in the amount of engineering work required in 1920.

Analysis, (Acct. #28)	Year 1920	5174.24	Cost per ton .065
	Year 1919	<u>6749.27</u>	" " " <u>.084</u>
	DECREASE	1575.03	DECREASE <u>.019</u>

In 1920, there were 13,377 determinations, costing \$4,115.64, or .307 each; in 1919, 17,178 determinations, costing \$4,426.36 or .258 each. The decreased expense in 1920, account of decrease in number of analyses, was \$310.72. The balance of decrease is due to an underground sampler having been employed during 1919, but only for 2-1/2 months in 1920.

Personal Injury Expense, (Acct. #30)	Year 1920	1117.49	Cost per ton .014
	Year 1919	<u>1079.30</u>	" " " <u>.013</u>
	INCREASE	38.19	INCREASE <u>.001</u>

There was a small increase in the amount of compensation payments for personal injuries in 1920.

Mine Office, (Acct. #30-a)	Year 1920	5636.10	Cost per ton .070
	Year 1919	<u>4518.52</u>	" " " <u>.056</u>
	INCREASE	1117.58	INCREASE <u>.014</u>

The increase is due to 10% advance in wages, February 1st, 1920; purchase of Burroughs Adding Machine; increase in exchange and increase in charges account of Safety Department.

District Office, (Acct. #30-b)	Year 1920	6143.36	Cost per ton .077
	Year 1919	<u>5605.50</u>	" " " <u>.070</u>
	INCREASE	537.86	INCREASE <u>.007</u>

There was an increase of \$9,430.88 in the total district office expense in 1920. The Francis payroll increased \$21,000.00 as compared with 1919, which accounts for the increase in the amount charged the mine.

GENERAL EXPENSE:			
	Year 1920	20266.68	Cost per ton .253
	Year 1919	<u>20629.95</u>	" " " <u>.256</u>
	DECREASE	363.27	DECREASE <u>.003</u>

The product for the two years was practically equal. Three of the six accounts show decreases, the main decrease occurring in Analysis - Acct. #28. Three accounts show increases, the main increase occurring in Mine Office, Acct. #30-a.

MAINTENANCE:			
Tracks and Yards, (Acct. #125)	Year 1920	830.14	Cost per ton .010
	Year 1919	<u>1091.04</u>	" " " <u>.014</u>
	DECREASE	260.90	DECREASE .004

The decrease is due to less expense in 1920 for keeping the surface at mine in a clean and orderly condition.

Docks, Tres. & Pockets, (Acct. #126)	Year 1920	3594.98	Cost per ton .045
	Year 1919	<u>2993.45</u>	" " " <u>.037</u>
	INCREASE,	601.53	INCREASE .008

The increase is due to making a new stockpile ground and erecting new stocking trestle. A lean ore collar, 130' by 500', 6" thick, was made after the ground had been cleared of stumps and levelled off. This expenditure was necessary on account of practically no ore shipped from stockpile in 1920.

Buildings, (Acct. #127)	Year 1920	239.35	Cost per ton .003
	Year 1919	<u>2164.84</u>	" " " <u>.027</u>
	DECREASE	1925.49	DECREASE .024

The 1920 expense represents necessary repairs to mine buildings, while in 1919 there was an unusual expense due to enclosing the shaft house.

Hoisting Machinery, (Acct. #130)	Year 1920	2068.38	Cost per ton .026
	Year 1919	<u>866.47</u>	" " " <u>.011</u>
	INCREASE	1201.91	INCREASE .015

The increase is due to charging out two new hoisting ropes for skips; two new rheostats, and 80 ft. of counter-balance pipe and hangers, in 1920; in addition to the ordinary cost for repairs. In 1919, an over-winding device was installed, which increased the ordinary repair cost.

Compr. & Pwr. Drills, (Acct. #131)	Year 1920	1424.15	Cost per ton .018
	Year 1919	<u>1193.70</u>	" " " <u>.015</u>
	INCREASE	230.45	INCREASE .003

The increase is due to more expense for purchase of drill machines. In 1920, three auger and two No. 248 Leyner drills were charged out.

Pumping Machinery, (Acct. #132)	Year 1920	499.97	Cost per ton .006
	Year 1919	<u>2556.13</u>	" " " <u>.032</u>
	DECREASE	2056.16	DECREASE .026

The decrease is due to less expense for repairs to pumps. In 1919, the expense was unusually high, due to repairing centrifugal pump motor on which the coils had burned out.

Top Tram Eng. & Cars, (Acct. #133)	Year 1920	1855.84	Cost per ton .023
	Year 1919	<u>6608.64</u>	" " " <u>.082</u>
	DECREASE,	4752.80	DECREASE .059

The expense in 1920 covers new haulage rope, general supplies and repairs. In 1919 the cost was unusually high due to charging out roller bearing trucks for top tram cars, new cable for tram plant and two new top tram plants.

MAINTENANCE:			
Skips and Skip Roads, (Acct. #134)	Year 1920	2546.71	Cost per ton .032
	Year 1919	<u>1720.60</u>	" " " <u>.021</u>
	INCREASE	826.11	INCREASE <u>.011</u>

The increase is due to more expense for repair of skip roads. A skip rope broke on January 7th and unusual repairs were necessary to the skip roads. The shaft was given a thorough overhauling before sinking was started in June, which also increased the expense.

U. G. Tracks and Cars, (Acct. #135)	Year 1920	760.64	Cost per ton .010
	Year 1919	<u>2326.84</u>	" " " <u>.029</u>
	DECREASE	1566.20	DECREASE <u>.019</u>

The 1920 charges cover repairs to underground sub-level cars and new rail charged out. The decrease is due to charges being abnormally high in 1919 on account of building eleven sub-level cars, also more rail charged out.

Electric Tram Plant, (Acct. #136)	Year 1920	4277.62	Cost per ton .053
	Year 1919	<u>4161.39</u>	" " " <u>.052</u>
	INCREASE	116.23	INCREASE <u>.001</u>

A detail of charges for 1920 and 1919 is as follows:

	<u>1920</u>	<u>1919</u>	<u>DECREASE</u>	<u>INCREASE</u>
Locomotives,	487.63	358.78		128.85
Wiring,	683.83	1055.06	371.23	
Main Line Tracks,	2309.20	2678.72	369.52	
" " Cars,	<u>795.96</u>	<u>68.83</u>		<u>727.13</u>
	4277.62	4161.39		115.23

The expense for the two years was practically the same. There was less expense for wiring and main line tracks, but more repairs to main line cars.

Tel. & Safety Devices, (Acct. #137)	Year 1920	253.66	Cost per ton .003
	Year 1919	<u>588.80</u>	" " " <u>.007</u>
	DECREASE	335.14	DECREASE <u>.004</u>

There was less expense in 1920 for extensions of underground lighting and for installation of safety devices.

MAINTENANCE:			
Year 1920	18524.07	Cost per ton	.231
Year 1919	<u>26447.15</u>	" " "	<u>.329</u>
DECREASE	7923.08	DECREASE	<u>.098</u>

Seven accounts show decreases in 1920, and five, increases. The main increases are in Acct. #126, account of new stocking trestles and grounds; in Acct. #130 account of new hoisting ropes and counterbalance pipe, and in Acct. #134 account of repairs to skips and skip roads. The decreases were much greater than the increases, however. The main ones occur in Acct. #127 Buildings; #132, Pumping Machinery; #133, Top Tram Engines & Cars and #135 Underground Trax and cars.

MINING EXPENSE:

Air Pipes, (Acct. #150)	Year 1920	1730.71	Cost per ton	.022
	Year 1919	<u>2899.90</u>	" " "	<u>.036</u>
	DECREASE	1169.19	DECREASE	.014

The decrease is due to less pipe used for extensions of air lines and to lower labor charge.

Compressors, (Acct. #151)	Year 1920	12077.02	Cost per ton	.151
	Year 1919	<u>7562.61</u>	" " "	<u>.094</u>
	INCREASE	4514.41	INCREASE	..057

The increase is due to sinking the shaft from 5th to 6th levels. This work was started in June and completed in December, during which time the compressor was operated nearly twenty-four hours per day. In 1920, 294,238,000 cu. ft., of air was used, as compared with 198,456,750 cu. ft., in 1919.

Hoisting, (Acct. #152)	Year 1920	9631.13	Cost per ton	.120
	Year 1919	<u>7710.16</u>	" " "	<u>.096</u>
	INCREASE	1920.97	INCREASE	.024

The increase is due to sinking shaft from 5th to 6th levels, during which time an extra hoisting engineer was employed. The advance in wages on February 1st, 1920, account for a part of the increase. The detail of charges for 1920 and 1919 is as follows:

	<u>1920</u>	<u>1919</u>	<u>INCREASE</u>	<u>DECREASE</u>
Operating Expense,	4234.42	3044.45	1189.97	
Other Labor,		30.26		30.26
Total Labor,	<u>4234.42</u>	<u>3074.71</u>	<u>1159.71</u>	
Oil, Waste & Packing,	46.46	40.68	5.78	
Tools & Misc. Supplies,	15.70	95.88		80.18
Electric Light,		5.00		5.00
" Power,	4245.00	3540.00	705.00	
Heating Expense,	<u>1089.55</u>	<u>953.89</u>	<u>135.66</u>	
Total Supplies,	<u>5396.71</u>	<u>4635.45</u>	<u>761.26</u>	
Total Operating,	9631.13	7710.16	1920.97	

Pumping, (Acct. #153)	Year 1920	3738.54	Cost per ton	.047
	Year 1919	<u>4430.67</u>	" " "	<u>.055</u>
	DECREASE	692.13	DECREASE,	.008

The main decrease is in electric power, due to operating the plunger pump more, and the centrifugal pump less, in 1920. A detail of the charges for 1920 and 1919 is as follows:

	<u>1920</u>	<u>1919</u>	<u>INCREASE</u>	<u>DECREASE</u>
Pumpmen,	1994.73	2143.19		148.46
Other labor,	2.98		2.98	
Total Labor,	<u>1997.71</u>	<u>2143.19</u>		<u>145.48</u>
Oil, Waste & Packing,	117.85	125.10		7.25
Tools and Misc. Supplies,	39.58	11.44	28.14	
Electric Light,	23.40	22.44	.96	
Electric Power,	<u>1560.00</u>	<u>2128.50</u>		<u>568.50</u>
Total Supplies,	<u>1740.83</u>	<u>2287.48</u>		<u>546.65</u>
Total Operating,	3738.54	4430.67		692.13

Gals. pumped	45855040	45865547	10,507
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MINING EXPENSE:				
Sinkg. & Shft. Reps. (Acct. #154)	Year 1920	21693.08	Cost per ton	.271
	Year 1919	<u>906.73</u>	" " "	<u>.011</u>
	INCREASE	20786.35	INCREASE	.260

The great increase is due to expense of sinking the shaft from 5th to the 6th levels; to cutting plat and pocket on 6th level; to cutting skip pit drift at bottom of shaft and to cost of pocket on 6th level and skip pit pocket at bottom of the shaft.

Rock Drifting, (Acct. #155)	Year 1920	3899.41	Cost per ton	.049
	Year 1919	<u>24124.94</u>	" " "	<u>.300</u>
	DECREASE	20225.53	DECREASE	.251

The decrease is due to only 376 feet of drifting in 1920 as compared with 3284 $\frac{1}{2}$ ft. in 1919. The cost per foot in 1920 was higher due to 10% increase in wages February 1st, 1920.

Breaking Ore, (Acct. #156)	Year 1920	63254.88	Cost per ton	.790
	Year 1919	<u>60829.49</u>	" " "	<u>.755</u>
	INCREASE	2425.39	INCREASE	.035

The division of charges between labor and supplies is as follows:

	<u>1920</u>	<u>1919</u>	<u>INCREASE</u>	<u>DECREASE</u>
Labor:	56,361.80	53,509.51	2852.29	
Cost per ton	.704	.664	.040	
Supplies,	6,893.08	7,319.98		426.90
Cost per ton	.086	.091		.005

The increase in labor expense is due to the 10% advance in wages, February 1st, 1920. The tons per man per day breaking ore show a decrease of 0.15 which is due to time lost by miners in sorting out lean ore underground. It, however, has raised the grade of the output nearly 3%. The decrease in supply cost is due to more careful supervision of powder which has been given out, by shift boss during the past year.

Tramming, (Acct. #157)	Year 1920	10606.29	Cost per ton	.132
	Year 1919	<u>9931.81</u>	" " "	<u>.123</u>
	INCREASE	674.48	INCREASE	.009

The increase is due to the 10% advance in wages, February 1st, 1920.

Timbering, (Acct. #159)	Year 1920	34918.16	Cost per ton	.436
	Year 1919	<u>27327.37</u>	" " "	<u>.339</u>
	INCREASE	7590.79	INCREASE	.097

The increase is due to expense of repairing main level haulage drifts on 4th and 5th levels. The timber has rotted very rapidly, due to poor air.

Captain & Bosses, (Acct. #160)	Year 1920	5930.02	Cost per ton	.074
	Year 1919	<u>5400.99</u>	" " "	<u>.067</u>
	INCREASE	529.03	INCREASE	.007

The increase is due to the 10% advance in wages, effective February 1st, 1920.

Dry House,
(Acct. #161)

MINING EXPENSE:			
Year 1920	3560.74	Cost per ton	.044
Year 1919	<u>1706.27</u>	" " "	<u>.021</u>
INCREASE	1854.47	INCREASE	.023

Coal adjustment in 1919 gave a credit of \$1530.75; the price of coal and the amount consumed increased in 1920, also the wages.

Top Landing & Trammig,
(Acct. #162)

Year 1920	7256.02	Cost per ton	.091
Year 1919	<u>4078.06</u>	" " "	<u>.051</u>
INCREASE	3177.96	INCREASE	.040

The large increase is due to extra landers on night shift on account of sinking the shaft from 5th to 6th levels and to increase in wages, effective February 1st, 1920.

Stocking Ore,
(Acct. #163)

Year 1920	1209.08	Cost per ton	.015
Year 1919	<u>1361.82</u>	" " "	<u>.017</u>
DECREASE	152.74	DECREASE	.002

There was less expense for repair and dismantling portable trestles in 1920. Part of the trestles were dismantled for loading ore; they were not rebuilt as only a few thousand tons were shipped. A new stocking trestle was erected in the fall of 1920, the cost of which was charged to Account No. 126-.

Sorting Ore,
(Acct. #164)

Year 1920	2144.24	Cost per ton	.027
Year 1919	<u>409.95</u>	" " "	<u>.005</u>
INCREASE	1734.29	INCREASE	.022

The increase is due to more expense for sorting lean ore and rock from the ore both on surface and underground. The grade of the ore has been materially increased as a result of this work.

MINING EXPENSE:

Year 1920	182063.32	Cost per ton	2.274
Year 1919	<u>158680.77</u>	" " "	<u>1.970</u>
INCREASE	23382.55	INCREASE	.304

There were increases in eleven accounts and decreases in four. The expense for sinking shaft from 5th to 6th levels was nearly offset by the decrease in expense for rock drifting. The largest increase was in timbering cost, account of retimbering on main levels; in operating compressor account of sinking shaft on night shift; the increase in other accounts was due to increased wages paid in 1920 and increased cost of supplies.

COST OF PRODUCTION

Year 1920	220827.07	Cost per ton	2.758
Year 1919	<u>205757.87</u>	" " "	<u>2.555</u>
INCREASE	15069.20	INCREASE	.203

The increase occurs entirely in "Mining Expense", as both "General Expense" and "Maintenance" show decreases. The reasons of the increase in "Mining Expense" is explained in previous paragraph.

REPUBLIC MINE.

PRODUCTION.

In the year 1920, the Republic Mine produced the following ore:-

Bessemer, Run-of-Mine ore,	86,412 tons,
Basic, " "	30,886 "
Pascoe, " "	23,612 "
Basic Lump (Stocked),	7,924 "
Basic Crushed, (Stocked),	5,117 "
	<hr/>
	153,951 "

This total is a little less than last year, but exceeds the tonnage for 1917 and 1918.

Year 1917,	Product,	153,425 tons,
" 1918,	"	142,476 "
" 1919,	"	155,315 "

The production was very good during January, February, March and April, in which months we hoisted 63,425 tons or 41% of the total. During the last eight months, we failed to develop any sizable Bessemer or Basic ore lenses in time to help out the daily product. It was not until the last week in the year that the development work showed up anything promising, but the last three drill holes put in proved up considerable ore.

As mentioned in last year's Annual Report, the whole crux of the situation lies in the speed with which new ore bodies are found and mined. Unfortunately, we developed nothing but Pascoe grade ore until the very end of the year. The prospects for 1921 are much more favorable.

The following table shows how dependent we are on the ore broken each day in new development work, as the stull ore reserves are practically exhausted.

ORE RESERVES ON HAND ON JANUARY 1ST.			
YEAR	AVAILABLE BROKEN ORE ON STULLS.	AVAILABLE ORE IN PLACE IN SIGHT	TOTAL
1916	177,934 tons	184,550 tons	362,484 tons
1917	132,630 "	63,390 "	196,020 "
1918	73,538 "	100,926 "	174,464 "
1919	53,657 "	153,838 "	207,495 "
1920	40,127 "	179,600 "	219,727 "
1921	36,612 "	179,060 "	215,672 "

You will note that the total tonnage in sight has not changed materially in the last three years. We are going to have difficulty in maintaining a satisfactory product and getting good results until we get our ore reserves back to where they were in 1916. It is not necessary to have a large tonnage of broken ore on stulls but if we can develop and work three or four good sized stopes at one time, we can make a satisfactory showing. I am very hopeful of attaining that end in 1921. At the close of 1920, we were just opening up two new levels and had just cut the ore on each level. We were also sinking both the winze and the Pascoe Shaft, so that by the end of 1921, we should have two more levels opened up in good shape.

Explorations were also being conducted on three other levels in the Pascoe Shaft and if we have any luck at all on the seven levels all told, our ore reserves will show a material increase.

The following table shows the monthly product and the tons per man per day, etc.:-

MONTH	MONTHLY PRODUCTION AND TONS PER DAY, ETC.							
	Y E A R 1919				Y E A R 1920			
	PRODUCT	TONS PER DAY	NO. MEN	TONS PER MAN PER DAY	PRODUCT	TONS PER DAY	NO. MEN	TONS PER MAN PER DAY
Jan.,	14,719	566	216	2.57	15,573	599	258	2.42
Feb.,	13,010	542	229	2.35	13,525	564	237	2.38
Mar.,	13,933	536	237	2.26	19,768	732	251	2.92
Apr.,	14,263	594	238	2.49	14,559	607	253	2.40
May,	12,681	507	238	2.13	10,690	428	246	1.73
Jun.,	13,922	579	243	2.38	11,696	468	248	1.89
Jul.,	12,361	492	237	2.09	10,668	427	241	1.78
Aug.,	14,014	539	239	2.26	11,649	469	252	1.85
Sep.,	11,786	471	255	1.85	12,087	483	249	1.94
Oct.,	13,047	483	262	1.85	10,549	459	253	1.81
Nov.,	11,019	459	253	1.81	10,578	481	257	1.86
Dec.,	10,558	440	241	1.95	12,609	485	241	2.01

The mine broke all records in March, 1920. The tons per man per day was the highest since the property was opened up. It so happened that we had four good stopes breaking ore all at the same time and the only thing that limited production was the scarcity of trammers.

COST OF PRODUCTION.

MONTH	1919			1920		
	COST OF PRODUCTION			COST OF PRODUCTION		
	LABOR	SUPPLIES	TOTAL	LABOR	SUPPLIES	TOTAL
Jan.,	2.266	.704	2.970	2.411	.985	3.396
Feb.,	2.442	.817	3.259	2.684	1.174	3.858
Mar.,	2.487	.970	3.457	2.207	.691	2.898
Apr.,	2.270	.807	3.077	2.549	.811	3.360
May,	2.651	.880	3.531	3.426	1.364	4.790
Jun.,	2.374	.934	3.308	3.231	1.277	4.508
Jul.,	2.706	.997	3.703	3.277	1.297	4.574
Aug.,	2.539	1.213	3.752	3.184	.986	4.170
Sep.,	2.839	.974	3.813	3.064	.977	4.041
Oct.,	2.829	1.257	4.096	3.295	1.448	4.743
Nov.,	3.023	1.083	4.106	3.249	1.493	4.742
Dec.,	2.916	1.134	4.050	3.103	1.154	4.257
Average	2.589	.975	3.564			3.997

You will note that the average cost of production for 1920 increased 12%, a part of which is accounted for by the 10% increase in wages effective February 1st, 1920, and the rest by the increased cost of supplies. Our supply account increased greatly due to new construction in connection with the new crushing & screening plant. About \$26,000.00 was charged to this account for that purpose during 1920. The amount of supplies used and the increase or decrease over the previous year is discussed later in this report.

SHIPMENTS.

The tonnage shipped in 1920 totalled 187,750 tons. Of this amount, 73,245 tons was Lump ore. The shipments were subdivided as follows:-

Bessemer Lump mixture shipped to dock,	31,216 tons,
Basic " " " " "	42,010 "
Bessemer Lump ore " " Mesabi Range	19 "
Total,	73,245 "
Bessemer Crushed mixture shipped to dock,	6,504 "
Basic " " " " "	93,408 "
Pascoe " " " " "	14,099 "
Bessemer Crushed ore to House of David,	16 "
Total,	114,027 "

GRADING CARGOES.

We used the same system of dumping the ore at the Marquette docks as in the previous year. We rarely dumped over 20% Pascoe ore into any of the mixtures.

We had considerable variation between the mine and Lake Erie analysis, especially on the Lump ore, at the beginning of the season. Towards the close of the year, the checks were much closer.

Following are the average of the mine and Lake Erie analysis:-

	LUMP ORES				CRUSHED ORES			
	BESSEMER		BASIC		BESSEMER		BASIC PASCOE	
	IRON	PHOS.	IRON	IRON	PHOS.	IRON	IRON	
Lake Erie Analysis,	64.01	.039	64.10	62.16	.0367	61.74	56.11	
Mine Analysis,	64.03	.040	63.84	62.40	.0355	61.70	55.47	

You will note that the average analysis of the cargoes agrees closely on the Bessemer Lump and Basic Crushed mixtures. The Basic Lump and Pascoe Crushed cargoes would indicate that the mine sampling was not so well done, but if we examine the individual cargoes, it is apparent that the Lake Erie results are too high. For instance, the Steamer Michigan on July 4th, loaded with Lump ore, on which the mine analysis showed 62.92 Iron, Lower Lake chemists returned 66.00 on that cargo. There were 47 cars of ore dumped and the highest analysis on any car was 65.50. One car of Pascoe Lump ran as low as 53.90. The average of all the Bessemer cars was 63.72 and the Pascoe, 58.49. Still the Lower Lake chemists showed the entire cargo to average 66.00 which of course is not possible.

The following table shows how the ores were mixed:-

	BESSEMER ORE		BASIC ORE		PASCOE ORE	
	TONS	%	TONS	%	TONS	%
Bessemer Lump mixture,	23,462	75	2,130	7	5,624	18
Basic " "	22,793	54	13,389	32	5,827	14
Bessemer Crushed mixture,	5,732	88			772	12
Basic " "	66,196	71	17,626	19	9,586	10

You will note that we mixed in less than 20% Pascoe ore into any of the mixtures. As a matter of fact, the Basic Crushed mixture did contain in excess of 10% Pascoe Crushed ore because we had mixed approximately 20% Pascoe ore in with 16,648 tons of Bessemer Crushed ore included in 66,196 tons shown above. This 16,648 tons was a part of the Crushed ore stockpile accumulated the year before when we had to re-stock the Fine ore and ship out the Lump only.

FARM.

The crops from the farm were better than last year. We harvested 27 tons of hay compared with 21 the previous year and 15 tons the year before that.

TOWNSHIP LIGHTING & POWER.

The Republic Mine used to furnish the Republic Township with light and power, but since the Republic-Ishpeming transmission line has been in commission, the Carp River Water Power derives the revenue from this source. The Township is becoming a larger consumer each year as the following table shows:-

YEAR	K. W. H.
1915	33,637
1916	36,789
1917	43,246
1918	43,080
1919	136,196
1920	149,900

The sudden increase in current consumption in 1919, was due to putting electric pump into commission at Township pumping station.

ESTIMATED PRODUCTION.

We have estimated 500 tons daily product for the year 1921. In 1919, we averaged 518 tons per day and in 1920, 520 tons per day. The prospects are that we will be able to keep the output up as estimated.

DELAYS.

We had some bad delays during the year as the following table shows:-

DATE	HRS. LOST	SHAFT	CAUSE OF DELAY	PRODUCT LOST	COST
Jan. 2	16	Pascoe & #9,	Transmission line broken,	300	35.29
" 3	4	#9,	Skip hoisted too high and caught in sheave,	100	164.21
Mar. 4	8	Pascoe,	Car off track a/c snow storm,	200	42.68
May 5	5	"	Repairing hoisting drum,	100	10.28
" 16	16	#9,	No. 9 skip wrecked,	275)	282.33
" 17	8	"	do.	150)	
" 17	8	Pascoe,	Top tram motor out of order,	150)	
" 18	16	"	do.	300)	642.84
" 19	8	"	"	150)	
Jun. 28	8	#9,	No electric power,	125	26.02
Jul. 27	3	Pascoe,	do.	50	-----
Aug. 17	2½	"	Repairing skip-road,	50	7.86
Sep. 22	8	"	" Sullivan hoist,	200)	57.03
" 23	16	"	do.	375)	
Oct. 16	12	"	Repairing Sullivan Hoist,	150)	
" 18	16	"	do.	250)	319.32
" 19	8	"	"	150)	
" 20	16	#9,	Repairing wreck, #9 Skip-road	400)	
" 21	16	"	do.	550)	417.25
" 22	16	"	"	550)	
Nov. 1	5	"	Repairing No. 9 Skip-road,	275	14.84
" 18	16	"	Repairing wreck, #9 Skip-road	500)	369.22
" 19	16	"	do.	500)	
" 22	4	"	Repairing brake-shoes, No. 9 hoist,	125	420.14
Dec. 17	4	Pascoe,	Repairing Central Plant smoke stack accidentally pulled down by DSS&A freight train, (Repairs not complete as yet)	75	-----

We have eliminated the source or cause of half of these delays by diverting all the ore over to No. 9 Shaft. No hoisting is now being done through the Pascoe Shaft to surface.

The No. 9 Shaft wrecks were the delays that gave us the most trouble. The first one on May 16th was caused by the skip running out of the guides due probably to a broken runner. This shaft is inspected regularly, the cage-road one week and the skip-road the following week, but the inspectors failed to notice any defect. On October 20th, the wreck was caused by the skip running out of the guides near the 3rd level. If we continue to have trouble from this source, we will undoubtedly be compelled to install a new set of runners in the skip-road.

NEW CONSTRUCTION.

NEW REVOLVING SCREEN:-

This is covered by E. & A. #389, which is sub-divided into eight separate headings. Some of the items have over-run and others still show an unexpended balance. The total shows \$4,973.61 unexpended.

The revolving screen itself was installed piece meal. We poured the foundation early in the year and then assembled the screen as we had time with the steam shovel and Crusher crews. Underneath the screen, two pockets were built, one for Lump ore and the other for Fine ore. Air lifts were installed to handle the doors and the whole installation housed over with corrugated iron. The cost of the screen and material for the pockets and building alone equalled the cost estimated to completely install this equipment which allowed nothing for labor. The screen itself cost \$6,489.00. The motor and lining plates for the pockets, timber, plank, corrugated roofing, air lifts, etc., exceeded the estimated cost. The balance of the deficit amounting to \$4295.28 was due to labor.

TOP TRAM PLANTS:-

Two new top tram units were installed just North of No. 9 Shaft. The estimated cost of these was \$7,000.00 and we expended \$10,134.96. The two units together with motors and switchboards cost a little in excess of \$6,000.00. Then we charged out to this account 5,600 feet of 5/8" rope, sheaves, pulleys, rollers, material for building housing the top trams, all of which ran the cost up in excess of the \$7,000.00 estimated. The labor installing the units and erecting the building ran the cost up to \$10,134.96.

The two units were installed close together so that one man can operate both units if necessary at the same time. We have wired the trestles so that in case the car is run out too far, a circuit is broken which extinguishes a warning light in the top tram house. We have also equipped both units with an indicator which enables the operator to spot the car anywhere. The reason for the warning light is that there is more or less slippage of the rope on the drive sheaves which has to be corrected for twice a shift, and in case we are dumping close to the end of the trestle the car might be run out too far. We have so arranged our indicators that we can reset them in less than a minutes time.

The building housing the top trams was built of corrugated iron and the interior is lined with Transite board.

TRACKS & TRESTLES FOR LUMP ORE:-

The Lump ore is being stocked on the old No. 9 Shaft stocking area, North-West of the shaft. A new trestle was put up running on a 0.25% down grade, which is just about the grade of the stocking floor. The old trestle had a drop of 6" in 20 feet, so that at the far end of the stocking ground, the tracks were only about 22 feet above the ground. The new trestle averages about 38 feet in height. We still show an unexpended balance of \$2,451.55.

TRACKS & TRESTLES FOR FINE ORE:-

The fine ore from the screen is being stocked on the new stocking area on the site of the old barns and the first three dwellings. We tore these buildings down and then graded and filled in along the shore line. We still have some filling to do and must provide for a new road along the edge of the lake. We figure on doing this in the Spring of 1921. The trestle is 40 feet high and can be extended if needs be by tearing down one barn and moving the other.

We have built a snow shed or tunnel over the first 700 feet of the fine ore tracks which run along back of the Dry and at the foot of the big bluff on which the new Engine House is constructed. This area is ordinarily covered with five or six feet of snow and as the tracks run along on the surface of the ground, we would have difficulty keeping the tracks open, especially at night. The cost of this snow shed was not included in E. & A. #389, because we had not planned on building our tracks in this location as it was supposed that a new Dry House would be built in 1920 and the tracks were to run just West and parallel with the side wall of the old Dry. Due to high cost of construction, the building of the new Dry was postponed.. We still however show an unexpended balance of \$3,237.90.

We also lagged the face of the railway embankment which runs along the East side of the stocking area, to prevent the sand from mixing with the ore.

UNDERGROUND HOISTS:-

The Pascoe Shaft underground electric hoist was put into commission in October, 1920. We operate two - 4 ton skips in balance from the bottom of the shaft to the 2050' or motor haulage level. The unexpended balance shows a deficit of only \$136.78 on E. & A. #367, which covers this work.

The total expense for the Pascoe Shaft and No. 9 winze hoists aggregate \$18,396.78.

LABOR & WAGES.

There was a 10% increase in wages effective February 1st, 1920. We had no labor trouble and as a general rule had as many men as we could find places for. There are periods in the Spring and Fall when we are short handed because so many of our men own farms or lease them and they spend from a week to two weeks planting their crops and harvesting the same.

INSURANCE.

The expense under this heading showed a decrease in 1920. The cost in the previous year was larger due to Use and Occupancy & Riot Insurance Premium.

ENGINEERING.

The engineering expense for 1920 was about 15% greater than in the previous year because more engineering work had to be done in connection with the new stocking ground, trestles and screen. The increased scale of wages also swelled the total.

ANALYSIS.

The cost of operating the Laboratory decreased during the year notwithstanding the increase in wages. This is accounted for by a big reduction in the supply account. The following table shows the cost for the last two years:-

	YEAR 1919	YEAR 1920
No. of determinations,	5,417	5,752
Operating Laboratory, (Supplies),	\$921.03	\$499.71
Cost per determination,	.17	.087
Mine Sampler, (Labor),	665.61	891.45
Chemist,	<u>1,731.69</u>	<u>1,905.84</u>
Total Cost,	\$3,318.33	\$3,297.00
Cost per determination,	.61	.57

The cost per determination is high due to the fact that the number per day is considerably less than at other mines. Stope samples are taken only twice a week.

PERSONAL INJURY EXPENSE.

We were unfortunate in having a fatal accident, the first since 1914, which is a very good record for a hard ore mine that has as treacherous a hanging as the Republic Mine. As a result, the personal injury expense for the year was double that of 1919.

We had 66 minor accidents in 1919 and 73 in 1920.

MINE OFFICE.

The Mine Office expense includes considerable outside the office expense itself. This account is split up under the various headings as follows:-

	YEAR 1920	YEAR 1919
Salaries (includes besides office force, the watchman, policeman & choreman),	\$16,899.03	\$14,742.02
Printing & Stationary,	136.62	99.23
Postage,	94.15	77.03
Janitress,	281.00	282.74
Fuel & Lights,	211.24	165.30
Telephone,	182.88	113.44
Stable expense,	1,187.51	872.85
Master Mechanic,	3,311.00	3,036.00
Miscellaneous, (Exchange, supplies, travelling expense, etc.,)	895.15	734.13
Total,	\$23,178.58	\$20,122.74

Nearly every item on the above subdivision shows an increase for the year. Increased wages and cost of supplies are responsible.

TRACKS & YARDS.

Under this heading is charged off the cost of building and maintaining stockpile loading tracks. This has been a large item in the last two years. The cost for 1920 was only about one-third of what it was in 1919, due to charging off the construction of the tracks leading to the new stocking grounds in the latter year.

DOCKS, TRESTLES & POCKETS.

At No. 9 Shaft, new Lump and Fine ore pockets were built under the revolving screen. These pockets were constructed of wood and lined with $\frac{3}{4}$ " steel plates. We also installed air lifts and fingers for stoppers.

We had considerably less expense on our rock trestles because we stopped handling rock through the Pascoe Shaft and hoisting it to surface by arranging to dump it underground.

The maintenance cost of the trestles and pockets is only half what it was the previous year because in 1919 we charged off all the material for the new stocking trestles and a considerable portion of these trestles were erected in the previous year.

BUILDINGS.

We expended \$2279.74 in 1920 compared with \$1326.69 in 1919. The increase was partially due to fixing up the carriage shed for a stable. The old stable was on the site of the Fine ore stockpile grounds. It cost \$512.49 to rebuild the carriage shed. The roof of this building is still in poor shape and will have to be repaired before the Spring of 1921. The Picking Belt was also repaired late in the year by putting on a new set of rollers, wheels, bushings and pans. Repairs cost \$502.30. Outside of repairing the Belt and rebuilding the stable, the maintenance on the mine buildings was about the same as the previous year.

SHOP MACHINERY.

We made no changes in the shops. We should, however, equip the Blacksmith Shop with oil furnaces for heating and tempering because experiments have proven that the bits from oil furnaces are far superior to those heated and tempered in coke furnaces.

The experience at the Company's Cliffs Shaft mine bears out the above statement. There is no mine on the range where it is more essential to have good bits than here at Republic due to the hard nature of the ground.

BOILER PLANT.

Maintenance on the boiler plant is low of course because we are only operating the Central Plant; the No. 5 Plant going out of commission when the new electric hoist was put into operation. The maintenance cost is about one-third of what it used to be.

HOISTING MACHINERY.

This account shows a considerable reduction and will show a still further decline in 1921, due to diverting all the ore to be hoisted over to No. 9 Shaft which eliminates the long haul up the Pascoe Shaft. We used to have five 5,000 foot rope lines service; now we have two 3,000 foot long. The saving in rope will be considerable because the Pascoe Shaft ropes used to be replaced at the end of eight or ten months, and the No. 9 rope formerly ran about eighteen to twenty months. Now we ought to get from two to three years service.

This account for the last few years totalled as follows:-

Year 1920	-	\$ 9,193.79
Year 1919	-	13,674.13
Year 1918	-	11,350.34
Year 1917	-	15,117.16

In 1920, we spent \$1,420.33 for wire rope and in 1919, \$5,870.26. Another big item that we will save in the future is purchase and machining and oiling of the hundreds of 14" sheaves that guide the hoisting rope through the turns in the Pascoe Shaft.

COMPRESSORS & POWER DRILLS.

This account shows a decrease over the previous year.

Year 1920 -	\$3,245.06
Year 1919 -	\$4,217.44
Year 1918 -	\$4,359.81
Year 1917 -	\$5,163.17

We have the mine fairly well equipped with Ingersoll-Rand machines of the #18 and #248 types, but we have to keep replacing them as a machine will not last more than four years in this mine. The prices of drills have increased from \$250.00 to \$365.00 in the last four years, which is not an excessive increase, and we have cut our costs by buying as few drills as possible. It has come to the point, however, that we must purchase from four to six new machines to replace our old worn out machines.

PUMPING MACHINERY.

The cost of maintaining our pumps shows little change, there being a slight increase in 1920 due to completely overhauling two pumps. We have no air pumps in the mine except a small pump on the bottom level in the No. 9 winze that is used to handle the water from the shaft and drilling machines. It operates but a short time each day.

We have four main electric pumps, one at the bottom of each main shaft and one each about midway to surface. The pumps are large enough so that either installation in each shaft will handle all the water.

TOP TRAM ENGINE & CARS.

We installed two new top tram units to handle the cars operating from the Lump and Fine ore pockets at the new screen to the new stocking grounds. These two units were manufactured by the Lake Shore Engine Works and have a 50 H.P. motor geared to drive a six foot sheave that is lined with rubber to grip the rope fastened onto the cars. The rope speed is about 600 feet per minute.

The building to house the units together with the cost and installation of the motors, switch-boards, transformers, etc., ran the total expense up to a little over \$10,000.00.

SKIPS & SKIP-ROADS.

The Pascoe Shaft has always been an expensive proposition to keep in shape. We have usually spent from \$6,000.00 to \$7,000.00 a year repairing the 15,000 feet of runners, rails and sleepers. Then we usually had one or more bad wrecks in the shaft that would take from a few days to two weeks to repair, and that usually meant two skips to rebuild also. In 1920, the maintenance cost was \$11,122.70 and in 1919, \$13,019.66. We closed the Pascoe Shaft down in October and expect that the year 1921 will show considerably reduced expenses under this head. I expect to cut this item in half.

UNDERGROUND TRACKS & CARS.

For the last two years, this expense has been heavy due to changing over from hand to motor haulage, which meant the building of thirty new cars and relaying of approximately 7,000 feet of rail on the motor haulage level. The old ties were replaced and as they were spaced too far apart, we also had to put in new ties in between. There were also places where the curves were too sharp and these were eased off.

ELECTRIC TRAM PLANT.

The maintenance expense on the underground motors increased because we had two locomotives in service during the latter part of the year. In October, 1920, all the ore from the Pascoe Shaft was diverted over to No. 9 Shaft.

We have had no trouble with the motors other than the wheels and brakes do not seem to last any length of time. We have put two new sets of wheels in service. One of the motors also jumped the track smashing the starting rheostat.

TELEPHONES & SAFETY DEVICES.

There is very little change in the total expended for Safety Devices in the last two years. As the new machinery was installed during the year, we built protective screens and railings as fast as possible. We have not finished work in the new Top Tram building or planked over the Fine ore trestle where it crosses the railway tracks, but in every other case, have complied with the recommendations of the Safety Inspector.

CRUSHING & SCREENING PLANT.

As explained earlier in this report under the heading, New Construction, we installed a new screen at No. 9 Shaft at a cost of a little over \$12,000.00.

MAINTENANCE.

The total maintenance expense for 1920 foots up to \$73,068.66 compared with \$64,579.99. Of the 1920 total, about \$26,000.00 was due to new construction on E. & A. #389, leaving a balance of approximately \$47,000.00 for maintenance. I look for a considerable decrease in the maintenance cost in 1921 because we have finished installing the new screening plant and top trams, the motor haulage level is fully equipped and the constant repair work in the Pascoe Shaft is done away with.

In the coming year, we will have to buy a new battery for one of our underground locomotives and equip the new revolving screen with new perforated plates.

MINING EXPENSE.

AIR PIPES.

The cost per unit for air hose fittings and pipes was a little less in the past year compared with the previous year. The labor expense was greater due to increase in wages effective February 1st, 1920, but this was more than offset by a smaller Consumption of hose and pipe.

COMPRESSORS.

The following table shows the comparison between the last two years:-

	YEAR 1920	YEAR 1919
Engineers Wages,	\$ 4,262.50	\$2937.05
Boiler House Expense,	7,450.63	6626.67
Miscellaneous supplies,	716.89	470.81
Total,	12,430.02	10034.53
Cost per 1000 cu. ft.,	.009	.009
M. of cu. ft. of air made,	1,347,129	1228,202
Air made by steam,	328,509	268,229
AIR made by water power,	1,018,620	959,973

The reason for the increased total cost of compressing air in 1920, is due to a greater proportion of air made by steam as shown by the table. The large increase in the price of coal and 10% increase in wages boosted the expense. The cost per M. of air compressed, however, was the same.

For sake of comparison, the following table is interesting:-

AIR CONSUMPTION BY YEARS.

		NO. OF DRILLS OPERATED
1915	1,716,837	42
1916	1,841,863	30
1917	1,577,113	30
1918	1,143,454	34
1919	1,228,202	42
1920	1,347,129	42

The amount of air used is increasing slowly due to replacing all of the old drilling machines with the new #248 Ingersoll-Leyner drill. The old machines used about 85 cu.ft. of air per minute compared with 115 for the latest design. I don't look for any further increase in air consumption because at the close of the year, we just installed an electric pump at the bottom of the Pascoe Shaft which replaced a battery of three air pumps. The saving in air ought to compensate for any additional #248 drills we might put into service.

Notwithstanding the installation of the new machines, you will note that the air consumed in 1920 is considerably less than that for 1915 with the same number of drills operating. This is due entirely to the substitution of electric pumps for air pumps, and also due to scrapping the old #7 Water Leyner machines, which were very inefficient.

HOISTING.

The yearly cost of operating our hoists shows little change, notwithstanding shutting down the old No. 5 Hoisting Plant, due to the fact that whereas formerly we had only two hoists on surface, we now operate two above ground and two underground, so that we have eight brakemen, which is double the force of two years ago. The expense of operating the four hoists though, is actually less than the cost of operating the two old steam hoists.

We have one electric hoist that handles the ore and rock from the lower levels in the Pascoe Shaft bringing all the dirt to the motor haulage level. In the No. 9 Shaft territory we have a winze out in the ore body that handles the product from the three levels, delivering same to the motor haulage level. The old Pascoe Shaft steam plant is still in commission and the ore from the top levels in the Pascoe Shaft is lowered down to the motor haulage level in bottom dump skips, which requires very little steam as the loaded skip going down pulls the empty one up. All of the ore then goes over to No. 9 Shaft where it is hoisted to surface by the electric hoist.

The following table shows the expense subdivided:-

	1920	1919
Engineers labor,	\$15,448.71	\$11,007.28
Oils, waste & packing,	921.74	990.57
Boiler House Expense,	20,296.42	28,450.37
Electric Power,	7,712.25	3,397.89
Miscellaneous,	905.27	531.65
	<u>45,284.39</u>	<u>44,377.76</u>
Average depth hoisted:-		
No. 9 Shaft,	2050'	2076'
Pascoe "	2133'	2077'

The Boiler House Expense in 1921 will be considerably reduced as in 1920 we did not stop hoisting through the Pascoe Shaft until the middle of October. The average monthly expense for November and December was approximately \$1,400.00 for coal and firemen.

PUMPING.

The cost of keeping the water out of the mine increased due to buying power from the Carp River Water Power. Formerly, when we made our own power at the Republic Water Power Plant, our cost per K.W.H. was considerably lower than the 1.5% rate charged by the Mechanical Department, so that the increased cost is only a matter of book-keeping.

	1920	1919
Pumpmen & Helpers wages,	\$5,557.61	\$5,062.01
Electric power,	3,440.34	2,390.62
Gallons of water pumped,	35,561,450	34,770,380
Gallons per minute,	68	66

You will note that the 10% increase in wages increased the labor cost but the biggest increase is the charge for electric power. Previous to June, 1919, the average monthly cost for power was only \$88.63 compared with \$286.70 for 1920.

SINKING & SHAFT REPAIRS.

We have kept the Pascoe Shaft and No. 9 winze sinking going steadily. Both were in hard Jasper although the winze did run through a seam of lean ore. Progress was exceedingly slow. We sank 270.5 feet for the year compared with 189.5 for 1919; 190 feet for 1919; 148 feet in 1917; 187 feet in 1916 & 150 feet in 1915.

As will be shown under rock drifting account, we also doubled the footage for the last three years in addition to keeping a Diamond Drill going steadily. These three factors keep our costs up. We spent \$200,704.00 breaking ore and \$110,183.00 looking for new ore bodies, or about 72¢ per ton hoisted in 1920.

The cost per foot for sinking was \$161.95 in 1920 compared with \$165.30 in 1919, showing a slight reduction.

Two new levels were opened up in the year, one at the bottom of the Pascoe Shaft and one in the No..9 winze.

ROCK DRIFTING.

The same story applies to rock drifting as in the case of Shaft Sinking. We drifted 2017.5 feet at a total cost of \$47,196.33 compared with 1085.5 feet in 1919 at a cost of \$20,390.84. All of the rock drifts with only one exception were in Jasper.

BREAKING ORE.

The unit cost for breaking ore was exactly the same as last year, being \$1.304. For the first four months in the year, we showed an average cost of \$1.127, but beginning with the month of May, we only had two good sized stopes to break ore in, which was reduced to only one stope during the last four months. Conditions did not change for the better until the very end of the year. Prospects for 1921 are very much better.

TRAMMING.

We made no change in the system of tramming or paying the men other than we cut the trammers' pay in No. 9 Shaft on November 1st from 58¢ to 53¢, to correspond with the rate paid the Pascoe Shaft trammers. The cost of tramming increased during the year in the direct proportion to the rise in wages. The ore trammed on the different levels follows:-

<u>PASCOE SHAFT</u>	<u>YEAR 1920</u> <u>TONS</u>	<u>TO DATE FROM</u> <u>MAY 1ST-1914</u> <u>TONS</u>
1710' Level,	2,560	14,320
1780' "	1,745	4,810
1850' "	33,860	100,681
1950' "		63,926
2050' "		83,482
2172' "		39,883
2272' "	5,220	80,669
2372' "	38,177	40,377
2472' "	422	422
<u>NO. 9 SHAFT</u>		
1640' Level,		20,610
1815' "	6,390	144,182
1935' "	18,290	203,944
2082' "	30,435	101,597
<u>NO. 9 WINZE</u>		
2172' Level,	13,272	18,612
2272' "	7,453	11,456
2372' "	415	

You will note the large tonnages trammed from the 1815, 1935' and 2082' Levels, No. 9 Shaft, compared with the small totals for the two levels in the No. 9 winze. That shows how hard pressed we have been for ore. We will probably get 35,000 tons of Pascoe grade ore from each one of these levels, but at that the tonnage will only be one-fourth of what the 1935' Level produced.

We are not discouraged, however, because the indications for ore are more favorable on the 2372' Level than they were on the other two levels.

TIMBERING.

We have changed our system of mining somewhat on some of the stopes, and as a result are using less timber and cribbing. This is reflected in the decreased timbering cost.

DRY HOUSE.

The old Dry is still being used but is in very poor shape. Nothing was done towards building the new Dry even though it was authorized due to high cost of construction materials.

TOP LANDING & TRAMMING.

The Pascoe Shaft top tram plant was closed down in October and all the ore stocked is now handled by the two new top tram units installed at No. 9 Shaft. We employ two men on each shift, one to take care of the pockets and the other to operate the cars.

SORTING ORE.

The ore is still being sorted as before. A rock-picker is employed with each gang of trammers in the Pascoe Shaft and the rock sorted out is hoisted to the motor haulage level and dumped underground into a stope only 75 feet away from the shaft. The rock picked out of the ore on the upper levels is dumped on the 1850' Level into an old stope.

In the No. 9 Shaft territory, the ore and rock mixed is hoisted to surface and the rock sorted out on the Picking Belt. We have no open stopes handy to dump rock into in this area and so all the material must be hoisted to surface.

TOTAL MINING EXPENSE.

For sake of comparison, the following table shows the actual increase in mining expense and the large amount expended for development work:-

YEARS	TOTAL MINING EXPENSE PER TON.	INCREASE OVER PREVIOUS YR.	MINING EXPENSE ONLY PER TON	INCREASE OVER PREVIOUS YR.	DEVELOPMENT EXPENSE	INCREASE OVER PREVIOUS YR.
1916	1.709		1.076		.317	
1917	2.108	.399-23.4%	1.292	.216-20.2%	.445	.128 or 40%
1918	2.719	.611-29.0%	1.843	.551-42.6%	.297	DECREASE
1919	2.958	.239- 8.8%	2.027	.184-10.0%	.456	.159 or 53%
1920	3.292	.334-11.3%	2.053	.026- 1.3%	.715	.259 or 57%
TOTAL INCREASE FOR FIVE YEARS		1.583-93.0%		.977-910%		.398 or 125%

You will note that our mining expense which includes all the operating accounts on the cost sheet has increased 93% in five years. On January 1st, 1916, the average rate of wages per day was \$2.72 and on December 31st, 1920, it was \$6.32 or an increase of 129%. Supplies have increased in proportion. Explosives in the five year period have gone from 11¢ to 21¢ per lb. Coal sold for \$3.20 in 1916 was charged out at \$9.32 in 1920, and inferior coal at that.

DEVELOPMENT COSTS.

We expended a greater portion of our total costs for development work looking for new ore bodies than ever before in the history of the mine. This fact together with the high maintenance costs, is responsible for our high costs. On the other hand, if we let up on this work, we are going to suffer quickly because we have never been able to open up ore far enough ahead to maintain a product of only 500 tons daily for even six months.

If we can only keep on the same pace we have set in 1920, we are bound to increase our ore reserves rapidly if we have average sized stopes on the new levels at the bottom of the mine.

The table under the previous heading shows the expense in connection with opening up new ore bodies. You will note that the unit cost for 1920 was .715 or 22% of our total cost.

The cost sheet does not tell the whole story either, because we have contracts drifting in ore on the main levels that are lumped in with the miners stoping in ore. The new cost sheet gives us a chance to subdivide this into stoping and ore development. Some months we have had as high as 80% of our miners raising, sinking or drifting.

SUPPLIES.

GENERAL SUPPLIES:-

The year 1920 showed a decreased expenditure under this heading compared with the year previous. This is due to less hoisting rope charged out during the year. Closing down the Pascoe Shaft and the old No. 5 Hoisting Plant is responsible for a smaller consumption of rope.

IRON & STEEL:-

Under this head there is an increase of about 8% which is due to the increased price of steel.

OILS, GREASE & CANDLES:-

Although the amount spent for oils and grease shows an increase in 1920, still we show a large decrease in the last two months, due to closing down the Pascoe Shaft. The average monthly expense for the first ten months was \$173.15. In November, this dropped to \$78.98 and December shows \$87.89. This account will show a decrease therefore of approximately 50% in 1921.

MACHINERY SUPPLIES:-

The total cost for the supplies for 1920 was \$35,267.31, which is about \$9,500.00 in excess of last year. The increase is accounted for by E. & A. #389 covering revolving screen and top tram plants. These two items added \$11,942.00 to the cost under this heading.

The totals for the year 1921 will show a considerable reduction.

EXPLOSIVES:-

Our explosives cost was a little larger in 1920. The following table shows the average price and consumption:-

BREAKING ORE.

	1920	1919	1918
Explosives lbs. used,	155,850	155,315	142,746
Lbs. of powder per ton of ore,	1.01	1.00	1.10
Cost per ton for explosives,	.216	.229	.269
Average price of powder per lb.,	.1968	.2143	.2293

ROCK DRIFTING.

YEAR	FOOTAGE	LBS. OF EXPLO-SIVES USED.	LBS. PER FOOT
1916	2,603	46,829	17.9
1917	2,138	34,272	16.1
1918	960	19,000	19.8
1919	1,085	16,675	15.4
1920	2,018	37,700	18.6
<u>SINKING.</u>			
1920	270.5	9,850	36.5
1919	189.5	6,515	32.6
1918	190.0	6,850	36.0
1917	148.0	6,600	44.6

The increased cost of explosives is due to the shaft sinking and rock drifting, both of which were practically doubled during the year.

MINE TIMBER:-

The consumption was actually less during the year but the price increases raised the total cost a little in excess of last year.

FUEL:-

The tons of coal burned showed a decrease which is not reflected in the total cost due to the unprecedented high price per ton.

The following table shows how the coal consumption has been decreased in the last five years.

COAL BURNED IN BOILER PLANTS.

YEAR	TONS	AVERAGE PRICE
1916	8435	\$3.34
1917	8567	4.86
1918	6618	5.96
1919	5446	5.36
1920	3749	6.91

ELECTRIC POWER:-

We are purchasing more power each year from the Carp River Water Power due to putting two underground electric hoists into commission and also by hoisting all the ore to surface by electricity. Since October, no ore has been hoisted by steam. In 1919, we paid the Hydro-Electric System \$8,577.00 and in 1920, \$14,446.50.

UNDERGROUND.

The ore reserves in the Republic Mine stand practically unchanged. We are developing ore at just about the same pace that it is being hoisted. We have very little broken ore on stulls, in fact we have had none to speak of for the last three years because we have mined and hoisted the ore just as fast as it has been broken. From the time we open up an ore body in this mine until the stope is abandoned is rarely over a year and a half even in the case of the biggest stopes.

The prospects for ore for the next few years are encouraging. The big stope on the 2272' and 2372' Levels, Pascoe Shaft, continues strong and we now develop about a half year's production on each level in this one stope as it is opened up. We are finding additional ore on the top levels, Pascoe Shaft, and the prospects in the winze are improving. The two levels so far opened in the winze are sure to produce 50,000 tons of ore each. The ore on the new level is coming in and indications are that it will be cleaner than the corresponding ore lenses on the two upper levels. We have gone through a lean zone from the 1935' level down and if history repeats itself as it has done three or four times in this mine, we are due to find some good Bessemer ore stopes in this territory.

We have our shaft gangs well organized and are catching up on the development work. Both the Pascoe Shaft and No. 9 winze sinking must be kept up without a break for two or more levels at least, in order to open up ore ahead.

As remarked in every Annual Report by myself and predecessor, the DEVELOPMENT WORK in this mine has always been too far behind.

In 1920, we exceeded the yearly footage sunk for the last fifteen or twenty years, practically doubling the sinking for any year since the Cleveland-Cliffs Iron Company had the property. It is a heavy expense but must be borne if the mine is to be operated at all.

The following statement shows the ore reserves and the new tonnage developed during the year.

	1917	1918	1919	1920
Ore in place Jan. 1st,	291,980	315,479	350,183	397,845
Ore on Stulls " 1st,	171,580	112,203	90,962	77,432
Total ore in sight, Jan.1st,	463,560	427,682	441,145	475,277
Product,	153,425	142,476	155,315	153,951
Balance,	310,135	285,206	285,830	321,326
Ore in place, Dec. 31st,	315,479	350,183	397,845	363,820
Ore broken, " 31st,	112,203	90,962	77,432	57,552
Total ore in sight, Dec.31,	427,682	441,145	475,277	421,372
Developed during the year,	117,541	155,939	189,447	100,046

The new tonnage developed appears to be the least for the last four years. This does not mean that the life of the mine has grown appreciably shorter, but unfortunately no new ore was uncovered until the end of the year and very little tonnage could be actually estimated. If the ore estimate was made the day this report was written, the tonnage would have shown a considerable increase.

ORE IN SIGHT.

NO. 9 SHAFT.

LEVEL	ORE BROKEN AVAILABLE	ON STULLS NOT AVAILABLE	ORE IN PLACE	SHAFT PILLARS	PROSPECTIVE ORE	TOTAL
911' - 1153'				14,720		14,720
1665'	4,933					4,933
2082'	6,190					6,190
2172'			25,760			25,760
2272'	1,145		13,480	12,950		27,575
2372'					22,860	22,860
TOTAL,	12,268		39,240	27,670	22,860	102,038

PASCOE SHAFT.

1640'				2,700		2,700
1710'	12,515		28,700	24,000		65,215
1780'	500	20,940	29,210			50,650
1850'	8,704			13,200		21,904
1950'				58,570		58,570
2050'	610		2,300	18,960		21,870
2372'	2,015		22,300			24,315
2472'			57,310			57,310
2572'					16,800	16,800
TOTAL,	24,344	20,940	139,820	117,430	16,800	319,334
GRAND TOTAL,	36,612	20,940	179,060	145,100	39,660	421,372

The ore in sight exclusive of shaft pillars subdivided into grades is as follows:-

GRADE	DEVELOPED	PROSPECTIVE	TOTAL
Bessemer,	85,680	35,000	120,680
Basic,	79,629		79,629
Pascoe,	50,363	4,660	55,023
Total,	215,672	39,660	255,332

UNDERGROUND MINING OPERATIONS.

NO. 9 SHAFT.

1815' LEVEL:-

We were hard pressed for ore during the year and there being a small ore body at the end of the first footwall cross-cut that was never mined, miners were employed there for three or four months. We also trammed a small tonnage from the old broken ore pile that came down from the 1665' Level. This ore was badly mixed with rock and we arranged to dump this rock underground into old No. 6 stope nearby. This level produced 6,390 tons for the year and is now exhausted completely.

1935' LEVEL:-

This level was mined out during the year. Miners were employed in No. 6 Stope near the shaft up until the month of April. This stope holed up to the 1815' Level and considerable broken ore that lay on the floor of the latter level was milled down to the lower level.

We also mined out the floor of Bessemer ore in the old No. 2 Stope. This was also the back of the #1 and #2 stopes on the 2082' or motor haulage level. A winze was sunk down from the 1935' Level to the back of the stope and all the floor blasted into the hole which gave us a chance to break a large tonnage cheaply. This stope was exhausted in April.

This entire level was one of the best in the mine producing approximately 204,000 tons in the last seven years.

2082' LEVEL:-

Stoping was finished in the North or #4 Stope. This stope did not go through to the 1935' Level because the ore in the back became too lean to mine.

The ore on the sill floor of the 1935' Level was pretty lean when the stope was first opened up and we figured it would not pay us to break this lean material down into the stope.

Practically all the broken ore was trammed from the #4 stope by the end of the year, the Stull Statement showing only 6190 tons on hand.

2172' LEVEL:-

The #1 Stope near the winze was completely mined out during the year. The South end of this stope went up about 60 feet above the level and then pinched out. A winze was sunk from the 2082' Level down 40 feet to hole into the back of this stope to provide better ventilation on the 2172' Level. The North end of the stope only went up about 25 feet, the back of the stope showing up very lean.

At the North end of the level, the Pascoe grade ore body was being opened up. We had drifted along the hanging for about half its probable length. This ore body is just about the same length and width on all the levels in the mine. It runs from 300 feet to 350 feet long and averages from 12 feet to 14 feet wide.

2272' LEVEL:-

Mining was finished in #1 Stope opposite the winze. This ore body vertically underneath the ore on the upper level was much cleaner at this elevation which encourages us to believe that we may have a still better stope on the 2372' Level. At the close of the year, trammers were loading the broken ore in the stope.

At the North end of the level, the Pascoe grade ore body was being opened up. The drift was in approximately 100 feet along the hanging which is just about one-third of its entire length.

2372' LEVEL:-

The plat was cut at this elevation but no drifting done. The winze was also sunk a few feet below the level.

PASCOE SHAFT.

1710' LEVEL:-

No. 26 contract drifted South towards the probable upward extension of #1 Stope from the 1780' Level. We found the stope as calculated but the ore body was not as large as anticipated.

A Diamond Drill hole was then drilled to the West from the breast of the stope and we found that there was a horse of Jasper between this stope and two other ore bodies that lay to the West. Drifting for these ore bodies was in progress at the close of the year.

All the rock broken in the drifts on this level was dumped into an old stope avoiding the hoisting of same to surface.

1780' LEVEL:-

After hoisting was discontinued through the Pascoe Shaft, mining was started in the Pascoe Shaft pillar. A stull had been erected some time ago and the pillar near the shaft was taken out for about half way up to the next level. We left a shell of ore about 10 feet thick to protect the ladder-road in the shaft.

1850' LEVEL:-

Mining in the #1 and #4 Stopes was carried up to within 30 feet of the 1710' Level. We left the 30 foot pillar in the back to support the upper level. The upward extension of this ore will be mined on the top level and after the stope is finished, the floor pillar will be blasted down and trammed out on the 1850' Level. This stope so far has produced 57,645 tons of ore.

During November and December we also trammed 3,620 tons of broken ore from the Pascoe Shaft pillar. This is a part of the ore that lies underneath the footwall of the shaft. So far, we have detected no movement of the shaft itself.

All of the rock picked out of the ore on this level is dumped into the raise that leads to the end of the #3 Stope on the 1950' Level. This stope is empty from the 2050' Level up giving us a fine place to dump the rock underground.

2050' LEVEL:-

Several changes were made on this level. A drift was driven from the main footwall drift back of the shaft connecting again with the main drift West of the shaft. A pocket was built underneath the skip-road and a dump constructed about 25 feet above the level. A rock dump was also built leading to the #1 East and #1 West Stopes on the 2172' and 2272' Levels. A puffer was installed to handle the cars loaded with rock at the shaft which were dumped underground. Not a pound of rock has been hoisted from any of the Pascoe Shaft workings for four months. This is a big item as usually about one-third of the cars in this shaft were filled with rock each day.

The motors bring the empties over from No. 9 Shaft and push them up into the footwall drift West of the shaft. The cars are then run down by hand to the shaft pocket where they are loaded. The skips handled by the electric hoist dump into this pocket in the regular fashion, but the skips lowered down from the upper levels are equipped with doors in the bottom which are tripped permitting the ore to slide down into the same pocket. The loaded cars are run by hand to the switch in the main drift where the loaded train is picked up by the motor and hauled to No. 9 Shaft. The cars loaded with rock are pulled by the puffer to the rock dump and emptied.

We have also done some exploring between the shaft plat and the hanging. Three lenses of ore which were cut by Diamond Drill hole #431, were drifted for. We mined out the first two, neither of which were over 35 feet long and 12 feet wide. One of these extended up 50 feet and the other pinched out just above the sill floor of the level. Drifting for the third ore lens near the hanging was in progress at the close of the year.

2272' LEVEL:-

No. 2 Stope was exhausted in March. This ore body produced 41,625 tons to date.

2372' LEVEL:-

The hanging stope provided working places for the miners up to the end of the year. We had sixteen miners employed here when opened to its full extent and by the end of the year, the force had dwindled down to eight men. There was still considerable broken ore in the stope at the end of the year.

The footwall drift was driven back to hit the downward pitch of the #1 Stope and after failing to find the ore, several drill holes were put in to locate this lens. We found the ore to pinch out 25 feet above the level. We estimate 22,500 tons between the two levels. A raise was first put up from the 2372' to the 2272' Level at the North end of this ore lens and stoping was just being started at the foot of the raise at the close of the year. A rock drift was also being driven West of the shaft for exploratory purposes. We intend to drive this drift Westerly following the hanging to the West Republic fault. Good progress was being made and Diamond Drill stations were being cut out every 100 feet, so that we can cross-cut the formation at regular intervals with the drill.

2472' LEVEL:-

This level was just being opened up at the close of the year. A Diamond Drill hole drilled East of the shaft showed 47 feet of ore about 25 feet ahead of the breast of the drift and drifting was resumed at the end of the year.

PASCOE SHAFT SINKING:-

The shaft was sunk 45 feet below the level and bottomed in hard Jasper. A little ore was showing up in the North-East corner.

DIAMOND DRILLING.

The following holes were drilled during the year:-

HOLE NO.	LOCATION	FOOTAGE OF ORE	
		LEAN ORE	GOOD ORE
440	2270' Level, No.9 Winze,	0'	10.5'
441	1850' " Pascoe,	18'	0'
442	1850' " "	0'	0'
443	1850' " "	0'	23.0'
444	2270' " "	0'	0'
445	2270' " "	0'	4.5'
446	2270' " "	0'	3.0'
447	2370' " "	0'	0'
448	2370' " "	0'	0'
449	2050' " "	0'	0'
450	2050' " "	0'	15.0'
451	1850' " "	15'	0'
452	1710' " "	0'	9.5'
453	2270' " No.9 Winze,	7'	7.0'
454	2070' " No.9 Shaft,	0'	0'
455	2170' " No.9 Winze,	0'	0'
456	2170' " " "	0'	0'
457	2170' " " "	0'	3.0'
458	2082' " No.9 Shaft,	0'	0'
459	2370' " Pascoe,	5'	0'
460	2370' " "	0'	0'
461	2370' " "	0'	0'
462	2370' " "	0'	28.0'
463	2270' " "	8'	14.0'
464	2270' " "	0'	26.0'
465	2270' " "	0'	8.0'
466	2470' " "	0'	48.0'
467	1710' " "	8'	47.0'

You will note that we drilled a number of holes that were blanks but that the last six holes showed up considerable ore. The last two were particularly good holes and added approximately 100,000 tons to the ore in sight at the close of the year.

The fact that we did not discover much ore in the drill holes previous to the last six raised havoc with the ore reserves. For seven months we did not seem able to make any progress at all in finding new ore and we had a hard time trying to keep the product up. We are going into the new year with better prospects but are going to be hard pressed for ore for three or four months until we are able to drift to the new stopes and open them up.

REPUBLIC MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1920.

<u>GRADE</u>	<u>IRON</u>	<u>PHOS.</u>	
Republic Bessemer,	63.95	.038	
Republic Basic,	63.49	.059	
Republic Pascoe,	55.95	.044	

REPUBLIC MINE.

REPUBLIC MINE.

REPUBLIC MINE

ORE STATEMENT - DECEMBER 31ST, 1920.

	RUN-OF-MINE			BESS. LUMP	BASIC LUMP	PASCOE LUMP	BESS. CRUSHED	BASIC CRUSHED	PASC. CRUSHED	BESS.CR. P.I.St.P.	BASIC CR. P.I.St.P.	TOTAL	TOTAL LAST YR.
	BESS.	BASIC	PASCOE										
On hand Jan.1st,1920,	44686	12106	23966				23899			226	189	105072	18792
Output for year,	86412	30886	23612		7924			5117				153951	155315
Transferred between grades,	103104	32465	35533	46274	15519	11452	56098	17776	23983				
Total,	27994	10527	12045	46274	23443	11452	79997	22893	23983	226	189	259023	174107
Shipments,				46274	15519	11452	72746	17776	23983			187750	69035
Balance on hand,	27994	10527	12045	0	7924	0	7251	5117	0	226	189	71273	105072
Decrease in output-9%												1364	
Decrease in ore on hand-32%												33799	

1920 - 2-8 Hour Shifts for year

1919 - 2-8 " " " "

REPUBLIC MINE.

REPUBLIC MINE.

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REPUBLIC MINE

SHIPMENTS FOR YEAR - 1920.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Republic Bessemer Lump,	23,211	23,063	46,274	29,702
Republic Basic Lump,	7,835	7,684	15,519	10,243
Republic Pascoe Lump,	8,615	2,837	11,452	8,444
Republic Bessemer Crushed,	40,418	32,328	72,746	16,078
Republic Basic Crushed,	8,335	9,441	17,776	321
Republic Pascoe Crushed,	12,236	11,747	23,983	4,427
Total,	100,650	87,100	187,750	69,035
Total last year,	39,917	29,118	69,035	
Increase - 141%			118,715	

REPUBLIC MINE.

REPUBLIC MINE.

REPUBLIC MINE.

COMPARATIVE MINING COST FOR YEAR.

	1 9 2 0.	1 9 1 9.	INCREASE.	DECREASE.
PRODUCT	153,951	155,315		1,364
General Expense	.230	.190	.040	
Maintenance	.475	.416	.059	
Mining Expense	3,292	2,958	.334	
Cost of Production	3,997	3,564	.433	
Exploratory	.120	.118	.002	
<u>DEPRECIATION.</u>				
Plant Account	.100		.100	
Equipment	.008		.008	
Construction	.020	.053		.033
Total Depreciation	.128	.053	.075	
Taxes	.200	.135	.065	
Central Office	.139	.113	.026	
Miscellaneous	.008	.001	.007	
Sundry Expense	.030	.007	.023	
Cost on Stockpile	4,622	3,991	.631	
Loading and Shipping	.181	.128	.053	
Total Cost on Cars	4,803	4,119	.684	
No. Days Operating	297	300		3
No. Shifts and Hours	2-8hr	2-8hr		
Avg. Daily Product	518	518		
<u>COST OF PRODUCTION.</u>				
Labor	2,899	2,590	.309	
Supplies	1,098	.974	.433	
Total	3,997	3,564	.433	

REPUBLIC MINE
COMPARATIVE WAGES AND PRODUCT

	1920	1919	INCREASE	DECREASE
PRODUCT	153,951	155,315		1,364
No. Shifts and Hours	2-8hr	2-3hr		
AVERAGE NO. MEN WORKING				
Surface	68	63	5	
Underground	181	177	4	
Total	249	240	9	
AVERAGE WAGES PER DAY				
Surface	5.86	5.35	.51-9.5%	
Underground	6.47	5.93	.54-9.1%	
Total	6.31	5.78	.53-9.1%	
WAGES PER MONTH OF 25 DAYS				
Surface	146.50	133.75	12.72	
Underground	161.75	148.25	13.50	
Total	157.75	144.50	13.25	
PRODUCT PER MAN PER DAY				
Surface	7.70	8.20		.50
Underground	2.87	2.92		.05
Total	2.09	2.16		.07
LABOR COST PER TON				
Surface	.761	.653	.108	
Underground	2.253	2.027	.226	
Total	3.014	2.680	.334	
AVG. PRODUCT BRK'G & TRM'G	6.02	5.57	.45	
" WAGES CONTRACT MINERS	6.25	5.98	.27	
" " " TRAMMERS	11.11	9.17	1.94	
" " " LABOR	7.30	6.78	.52	
TOTAL NUMBER OF DAYS				
Surface	19,989	18,950 $\frac{3}{4}$	1,038 $\frac{1}{4}$	
Underground	53,666	53,112 $\frac{3}{4}$	553 $\frac{1}{4}$	
Total	73,655	72,063 $\frac{1}{2}$	1,591 $\frac{3}{4}$	
AMOUNT FOR LABOR				
Surface	117172.10	101396.14	15775.96	
Underground	346983.42	314924.03	32059.39	
Total	464155.52	416320.17	47835.35	

Proportion Surface to Underground Men:

1920 - 1 to 2.67
 1919 - 1 to 2.81
 1918 - 1 to 2.58
 1917 - 1 to 2.56
 1916 - 1 to 3.02

MADE IN U.S.A.

REPUBLIC MINE

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE

KIND	QUANTITY	AVERAGE PRICE	AMOUNT 1920	AMOUNT 1919
50% Powder - - - - -	155,850	.1968	30,675.74	33,246.63
Total Powder - -	155,850	.1968	30,675.74	33,246.63
Fuse - - - - -	205,300	9.022	1,852.33	1,645.17
Caps - - - - -	42,250	14.848	627.31	643.08
Tamping Bags - - - -	19,636	2.147	42.15	42.75
Cap Crimpers - - - -	7	.421	2.95	1.25
Connecting Wire - - -	10	.46	4.60	
Battery Caps - - - -			14.58	14.58
Fuse Igniters - - - -			5.22	5.22
Total Fuse, Etc.-			2,529.34	2,352.05
Total All Explosives			33,205.08	35,598.68
Product - - - - -			153,951	155,315
Pounds Powder per ton of Ore			1.01	1.
Cost per ton for Powder			.1993	.2141
" " " " Fuse, Caps, Etc.			.0164	.0151
" " " " All Explosives			.2157	.2292
Avg. Price per Lb. for Powder			.1968	.2143

Dynamite
~~sub~~ Bond

REPUBLIC MINE

MADE IN U.S.A.

SPIES MINE.

PRODUCTION:-

The Spies Mine was unwatered during the year 1920 and started producing ore on Friday, May 28th. The product for the year totalled 93,529 tons.

The following table shows the comparative product since January 1st, 1917:-

MONTH	YEAR 1917	YEAR 1918	YEAR 1919	YEAR 1920
Jan.,	1,004	9,273	11,504	
Feb.,	1,282	9,955	10,470	
Mar.,	2,068	11,095	12,095	
Apr.,	2,374	9,380	10,849	
May,	4,978	11,300	11,919	110
Jun.,	6,992	10,046	14,077	9,720
Jul.,	8,912	10,629		16,303
Aug.,	10,062	12,665		15,841
Sep.,	8,424	8,382		16,052
Oct.,	10,124	11,024		14,274
Nov.,	8,608	9,036		12,430
Dec.,	9,753	10,890		7,799
TOTAL,	74,581	123,675	70,914	93,529

In 1920 we also took up a stockpile over-run of 8,176 tons.

During the months of July to October, inclusive, the monthly product was the largest since the mine was opened up. After October, the hoist dropped off due to the exhaustion of the South end of the main ore body. During December most of the miners were put on development work, causing a further reduction in product. The tons per man increased as shown in the following table.

MONTH & YEAR	PRODUCT	AVERAGE NUMBER OF MEN	TONS PER MAN PER DAY
1917,	74,581	59	4.09
1918,	123,675	85	4.81
1919,	70,914	85	5.38
Jun., 1920,	9,720	67	5.44
Jul., 1920,	16,303	91	6.79
Aug., 1920,	15,841	96	6.32
Sep., 1920,	16,052	89	7.14
Oct., 1920,	14,274	81	6.66
Nov., 1920,	12,430	86	6.13
Dec., 1920,	7,799	86	3.63

You will note that the tons per man showed a steady increase until the maximum was reached in September, 1920. After that due to the limit of mining having been reached in the South end of the main stope, the tons per man began to show a decline.

DELAYS:-

The delays for the year were very few compared with previous years. The old steam hoist which was the cause of most of the delays and troubles in previous years was replaced by the former Chase Mine electric hoist, and as a result we were comparatively free from all interruptions to the hoist.

The following table shows the delays for the year compared with the two previous years.

Year 1918,	109 hrs. delay,	
Year 1919,	119 hrs. delay,	
Sep. 7, 1920,	2 hrs. delay,	Hoist motor out of order, Electric power off, Hot bearing on air compressor.
Sep. 15, 1920,	2½ hrs. delay,	
Oct. 11, 1920,	14 hrs. delay,	

The loss in production due to above delays in the year 1920 was only 525 tons, which is a very good record compared with the two previous years and shows the wisdom of scrapping the old steam equipment and replacing same with the electric hoist.

SHIPMENTS:-

All of the ore stocked was cleaned up except a few tons near the end of the permanent trestle. Some of the ore shipped via: C.M. & St.P. Ry. and the balance via: the C. & N. W. Ry. Of the two railways, the St. Paul gave the mine the best service.

The shipments totalled 186,901 tons. The stockpile over-run was 8,176 tons. 3,693 tons carried over in cars from last year was also shipped.

ANALYSIS, SAMPLING & GRADING:-

Most of the Spies ore shipped out during 1920 was shipped as straight Spies. At the beginning of the season, some Spies ore was mixed with Cambridge.

The mine analysis of the ores as shipped to the docks follow:-

	IRON	PHOS.	SILICA
Pocket ore to C. & N. W. Dock,	55.23	.505	6.61
Stockpile ore to " "	55.36	.500	6.76
Pocket ore to C. M. & St. P. Dock,	55.61	.514	7.21
Stockpile ore to " "	55.95	.489	6.67

The lower lake chemists and mine analysis on cargoes checked more satisfactorily this year than last. The real difficulty this season was to keep the Iron content up to guarantee. During the summer, our mining work was carried on in that portion of the ore body which was leaner than the previous years. We were also troubled by falls of hanging material in the main stope which resulted in low grade ore becoming mixed with the broken ore. The outlook for the 1921 season is not the best either because all the ore we have been able to develop recently averages from 55.00 to 56.00% Iron and just as soon as a little lean material gets into the product, the Iron content drops rapidly.

It is impossible to prevent a certain amount of slaty material from becoming mixed with the ore because the ore body has small seams of slate running all through it which can not help but be blasted down with the ore.

Following is the comparison between the mine and Lake Erie analysis for the season:-

	IRON	PHOS.	SILICA	MOISTURE	IRON NATURAL
Mine Analysis,	55.13	.505	6.97		
Lower Lake Analysis,	55.33	.480	7.80	5.61	52.23

The above analysis covers 161,591 tons shipped to Lake Erie ports.

COSTS:-

The cost of production for the year was lowered due to the high daily average hoist; due to the installation of the electric hoist just before the mine was closed down in 1919; due to changes made in heating the dry and mine buildings; due to adoption of bonus system in paying trammers and also due to a number of minor changes.

COST OF PRODUCTION.

	LABOR COST	SUPPLIES	TOTAL
Year 1917,	.933	.633	1.566
Year 1918,	.954	.418	1.372
Year 1919,	1.004	.420	1.424
Jun., 1920,	1.054	.439	1.493
Jul., 1920,	.888	.242	1.130
Aug., 1920,	.959	.311	1.270
Sep., 1920,	.824	.280	1.104
Oct., 1920,	.951	.362	1.313
Nov., 1920,	.971	.395	1.366
Dec., 1920,	1.717	.880	2.597

NOTE:-

You will note that the cost of production for the month of September was brought down to \$1.104 per ton, the cost on cars for that month being \$2.078. The comparative cost on cars since the mine started operating is as follows:-

Year 1917,	\$2.315	Cost on cars,
Year 1918,	2.168	" " "
Year 1919,	2.514	" " "
Year 1920,	2.360	" " "

ANALYSIS.

The various items on the Cost Sheet showing increases or decreases for the year compared with the previous year follow. The mine was operated for six months in 1919, and was unwatered and operated for seven months in 1920; consequently, comparisons between the two years are not exactly fair.

ENGINEERING.

The engineering expense was doubled in 1920, amounting to \$584.42. This was due to making new set of tracings for Captain, making geological maps of the Spies and Virgil properties and also due to closer engineering supervision because the top subs were near the sand.

ANALYSIS.

The sampling from mine and stockpile was simplified by taking ten cars as a unit instead of five, and also by combining the samples for the day and night shift and making only one determination for Phosphorus and Silica.

PERSONAL INJURY EXPENSE.

We were fortunate in having no serious accidents during the year. The total personal injury expense was only \$457.66.

MINE OFFICE EXPENSE.

This account shows a 38% increase over 1919 due partially to increase in wages, one extra month operated and also because of the expense incurred when Messrs. Drew and Bamford were sent to the Spies Mine to straighten out the old accounts and to instruct the new mine clerk.

MAINTENANCE.

TRACKS & YARDS.

In 1920 we expended \$1,484.28 compared with \$488.81 for 1919. The increased cost is due entirely to building and maintaining stockpile tracks and the bulk of this cost was incurred when we constructed the new stocking track serving the East pile. This track had to be built while we were still loading from the West pile to avoid delaying shipping when the steam shovel was transferred from one pile to the other.

DOCKS, TRESTLES & POCKETS.

The maintenance expense under this heading was .005 per unit compared with .001 in 1919, due to repairs to storage pockets in shaft house. A number of the wearing plates were badly worn and had to be replaced.

We also had to take down a bent at the end of the permanent stocking trestle in order to clean up the stockpile ore which had to be replaced before stocking could be resumed.

BUILDINGS.

We spent very little for repairs or alterations on the mine buildings, the total cost for the year being only \$206.15. Last year the expense was considerably higher due to the addition built onto the engine house for the electric hoist.

SHOP MACHINERY.

This account shows a small expenditure for the year amounting to only .002 per unit. We installed a new motor for the emery wheel, rigged up a drilling machine to be used as a forging hammer in the blacksmith shop and constructed a drill press for the machine shop.

BOILER PLANT.

Several changes were made in the boiler room. A small Diamond Drill boiler was installed to furnish heat and hot water for the Dry during the Spring, Summer and Fall. In the Winter, it is necessary to fire up one of the big boilers because steam is needed to operate the top tram engine in addition to heating all the buildings. The installation saved considerable coal as is shown by the following table:-

COAL CONSUMED IN BOILER ROOM.

	<u>1919</u>	<u>1920</u>
Jan.,	217	Mine closed
Feb.,	196	" "
Mar.,	217	" "
Apr.,	210	45
May,	60*	52
Jun.,	45	42
Jul.,	Mine closed	25**
Aug.,	" "	21
Sep.,	" "	20
Oct.,	" "	25
Nov.,	" "	54
Dec.,	" "	77

* Electric Hoist went into commission.

** Small boiler fired up. In November, the large boiler had to be used as explained above.

HOISTING MACHINERY.

This maintenance account shows a big reduction over the previous year. In 1919, we installed the old Chase Mine electric hoist at the Spies to replace the steam hoist that was giving so much trouble and also to reduce the coal consumption. The cost of installing this hoist and completely rewinding the motor together with the expense of constantly repairing the old steam hoist brought the 1919 charges up to \$4,212.19. In 1920, the expense was reduced to \$650.89.

COMPRESSORS & POWER DRILLS.

In 1920 the mine purchased three #248 Ingersoll-Leyner drills and two new B.C.R.W. #430 machines, which ran the expense up greatly in excess of 1919 when no new equipment was purchased. We needed the new #248 drills to speed up the development work. We have proven the wisdom of purchasing these drills because the footage driven in the ore formation has been tripled.

PUMPING MACHINERY.

This account shows an increase compared with the year 1919 due to unwatering the mine. We first installed an electric centrifugal pump on the cage and lowered the pump down about 20 feet at a time as the water receded in the shaft. Then the pump was installed on the 3rd Level and kept running until the Deane Triplex pump was installed in the main pump house. A steam pump to be used as a spare was also placed in the pump house. Then also repair parts were purchased for the Deane Triplex pump.

In the year 1919, the pumps needed only nominal repairs.

TOP TRAM ENGINE & CARS.

This account shows a large decrease because in the previous year, a new side dump car was purchased and the cost of two old end dump cars charged off. In the past year the only expense incurred was repairs to the cars and moving the top tram engine from the S.E. corner of the Shaft House to the N.W. corner in order to make it possible to handle both the rock and the ore cars with one engine.

SKIPS & SKIP-ROADS.

There is very little difference between the years 1919 & 1920 under this heading when the increased wages and cost of supplies for 1920 are considered. The biggest item of expense under this heading is for repairs to the skips.

UNDERGROUND TRACKS & CARS.

This account shows a large increase for 1920 being \$2,533.73 compared with \$468.59 for 1919. The reopening of the mine and relaying all the tracks accounts for the increase. On the 3rd Level, 30 lb. rail was also put down in place of the 20 lb. removed when the mine was closed down. This was done to make it possible to use mechanical haulage in place of hand tramping.

TELEPHONES & SAFETY DEVICES.

We expended more money for safety devices in 1920 than in the previous year. The Safety Inspector requested a number of changes and his recommendations were complied with.

CRUSHER.

Two new sections for the hopper apron were charged off in 1920.

MINING EXPENSE.

AIR PIPES.

Under this heading we expended just about twice the amount for the previous year for the same reason that some of the previous accounts showed increases. The mine was reopened in May and a great deal of the old pipe was badly corroded and had to be replaced with new pipe. The entire mine had to be repiped as all the air and water lines were removed when the mine was closed down.

COMPRESSORS.

The expense of running the Compressors increased for two reasons, namely, the operation of the old Jackson Mine Compressor in addition to running the regular Compressor on the day shift, and the operation of one Compressor on the night shift.

We had to install the second Compressor because it was not possible to run all the drilling machines and the Diamond Drill with one Compressor. Along in the middle of the Summer of 1920, we also had to put miners on the night shift to do development work, in order to keep the product up to 16,000 tons monthly. This necessitated operating the Compressor nights.

HOISTING.

This account shows a big improvement over 1919. The operating cost was only half that of the previous year and the tons hoisted increased nearly 45% over 1919. Unit costs for the last four years follow:-

YEAR	TONS HOISTED	UNIT COST
1917	74,530	.088
1918	123,675	.104
1919	70,714	.071
1920	100,705	.026

You will note that the cost has been reduced to approximately 25% of what it was in 1918, due to the operation of the electric hoist. The saving is actually greater than shown because the cost of fuel in 1920 was greater than in 1918, and if we were still operating the steam hoist, the unit cost would probably have been approximately 50% greater, as the price of coal increased 57% in the last two years, while labor cost increased only 34%. Calculated on that basis, the electric hoist reduced the operating expense approximately \$13,000.00 in the year 1920.

PUMPING.

The cost of pumping water increased considerably over the previous year, due to the fact that the mine had to be unwatered. We stopped pumping about July 15th, 1919, and the water level gradually raised in the shaft until we resumed operations. In other words, we pumped in 1920 the amount of water that would normally be handled in about 17½ months.

The cost increased about 60%, a certain proportion of which is due to increased wages, the balance being accounted for as above stated. The flow of water handled shows very little change for the last three years.

SINKING & SHAFT REPAIRS.

Doors have been built to cover over the shaft on the third level in case we decide to sink the shaft. It is very probable that the shaft will have to be sunk to handle the ore from the Virgil Mine as the geological conditions indicate ore below the elevation of the lowest level in the Spies Mine on the Virgil property.

ROCK DRIFTING.

There has been practically no rock drifting done in the mine since 1916 until December, 1920. The few feet drifted in 1918 and 1919 were not full size drifts. In December, 1920, the footage driven amounted to 250 feet. As remarked before, we have trebled the footage driven by the use of the #248 drills in place of the Jack Hammers. The Jack Hammer drills are ideal for slate but in the lean ore and Jasper, it is more economical to use the #248 Ingersoll-Leyner machines.

BREAKING ORE.

There has been no increase in the unit cost for breaking ore over last year, notwithstanding the 10% increase in wages, due to a change in routine of the miners daily work. The unit cost for 1920 was .557 and for 1919, .553 or practically no change.

Previous to July, 1920, the usual procedure for a miner was to rig up, drill, tear down and blast at noon and then repeat this operation after lunch. This was done to provide broken dirt for the trammers as the chutes were usually pretty well run out of dirt on the night shift and the morning shift completely emptied them. No mining was done on the night shift.

We changed this system and put two or three gangs to breaking dirt on the night shift and then did not blast on the day shift until quitting time. As a result, the drilling machines were only rigged up once a shift and the day shift miners drilled more holes per shift than by the previous method. This enabled us to increase our tonnage broken and kept the cost down.

TRAMMING.

I wish to call attention to the decreased tramping unit cost. The unit cost for 1918 was .357; for 1919, .362 and for 1920, only .281,-a reduction of approximately 8¢ per ton. This decrease is accounted for by the adoption of a bonus system for trammers. We figured 20 cars per gang as a days work and then paid a bonus of 5¢ per shift for the next 5 cars, 10¢ for the next additional 5, 15¢ for the next 5 and so on.

We found that whereas the trammers formerly averaged from 20 to 25 cars per gang per shift that the number of cars handled per day was increased to as high as 40. The bonus was so calculated as to actually reduce the cost per car trammed when the total exceeded 20 cars per shift.

TIMBERING.

The timbering expense doubled in the last year due entirely to building chutes in the new raises put up during the year. In 1919 no new development work was done except to drive a drift in the ore on the South end of the North lens on the 3rd level. In 1920, all the new raises were put up in this drift. On the first level a number of new raises were atarted on the North end of the main stope and several new chutes built at the extreme end of the North lens.

We also had to repair the old chutes after the mine was unwatered.

CAPTAIN & BOSSES.

There was no change in the number of bosses employed as we had one shift boss only on each shift.

DRY HOUSE.

Twenty second hand lockers from the Lake Mine were installed on the South end of the Dry.

It cost considerably less to heat and provide hot water for the Dry due to shutting down the large boilers and firing up the small Diamond Drill boiler. The average monthly expense for 1920 was \$270.00 compared with \$315.00 for 1919.

TOP LANDING & TRAMMING.

One change was made on the top landing to expedite the handling of rock. The old scheme was to hoist the rock to surface on the cage and tram the cars out and back by hand. We changed this so that the top tram engine that handles the ore stocking car also propelled the rock car which enabled us to hoist the rock in the skip. This simplified operations both underground and on surface.

STEAM SHOVEL LOADING.

The shovel cleaned up the stockpiles and the unit cost was less than last season.

<u>YEAR</u>	<u>TONS LOADED</u>	<u>COST PER TON</u>
1919	83,176	.148
1920	109,085	.113

Although the cost was reduced it is still too high due to intermittent operation of shovel. For instance, no loading was done for nearly five weeks in July and August and still the cranesman, runner and fireman were kept at the mine. Then there were times when no loading was done for a week and still these men were on the Pay-Roll. This condition was due to congestion at Lake Erie ports.

SUPPLIES.

The cost per unit for general supplies was .029 compared with .032 for 1919. This reduction was due to using second hand hoisting ropes from the Republic Mine in the year 1920.

Iron and Steel supplies increased considerably during 1920 due to replacing air and water pipes when the mine was unwatered and installing new 30 lb. rail on the 3rd level. We also had to purchase 50 bars of drill steel. Lining plates for the Shaft House pockets also ran up the total.

The cost per unit for oil, grease and candles was unchanged.

Machinery supplies were double in the past year. We purchased four new drilling machines and a new drill sharpener was installed.

The explosive account shows exactly the same cost per unit for the last two years, notwithstanding that we did considerable development work in 1920, whereas no drifting or raising was done in 1919 outside the limits of the main ore body.

The unit cost for timbering doubled that of 1919 due to building chutes in the new raises.

The fuel account shows a big reduction due to operation of electric hoist and closing down the big boilers and using the small Diamond Drill boiler for heating. Following table shows the yearly consumption of fuel and the saving is evident:-

YEAR	TONS OF COAL BURNED	AVERAGE MONTHLY CONSUMPTION
1917	3,799	316 tons
1918	2,168	180 tons
1919	945	157 tons
1920	361	40 tons

The number of Kilowatts purchased shows an increase over the previous year because the electric hoist was only operated two months before the mine was closed in 1919. The tonnage hoisted in 1920 also shows an increase of 43% which materially increased the current consumption.

Under the heading, "Sundries", we show a big decrease, the total for 1919 being \$7,430.50 and for 1920 \$4,642.74.

UNDERGROUND.

The development work done during the year did not increase our ore reserves materially. The ore in the Virgil drift was lean and the only new ore discovered was proven up by Diamond Drilling below the 3rd level. Two drill holes showed up a fair tonnage, #1 hole having 90 feet of ore averaging 55.92 Iron and #6 proving up 50 feet of ore running 55.33 Iron. The new ore developed totalled 36,362 tons. In 1918, we proved up 82,261 tons additional and in 1919, 38,780 tons.

ORE RESERVES:-

All of the ore is Non-Bessemer.

MAIN ORE BODY	NET TONS AVAILABLE.	NET TONS UNAVAILABLE	PROBABLE
Ore above the First Level,	9,130	15,800	
<u>NORTH LENS</u>			
Ore above the First Level,	22,198	9,800	
" " " Second "	6,150		
" " " Third "	22,581		
" below " Third "			2,768
<u>WEST ORE BODY</u>			
Ore above the Third Level,	13,672		22,540
" below " " "			
TOTAL,	73,731	25,600	25,308