

ATHENS MINE
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7. UNDERGROUND:

c. Stoping: (Cont)

6th Level - South side of dike:

No. 620 crosscut to develop the ore proved up on Mitchell Lots 8 and 9 by diamond drill hole #11 was advanced 30' in ore and 70' into the slate and quartzite footwall, being completed in May. The following raising was done from this crosscut during the year:

#621	advanced 10'	in ore to completion in January.	Total height 165'
#622	" 160'	" " " " " " March.	" " 175'
#623	" 165'	" " " " " " April	" " 180'
#624	" 190'	" " " " " " July	" " 205'
#625	" 40'	in rock and 125' in ore; total height 165 in December;	

not completed.

#626 advanced 90' in rock to total height of 90' in December; raise now in ore; not completed.

Subs above the 8th Level:

-685' Sub Level - South side of dike:

Mining of the East portion of the ore area on this side of the dike was started late in 1930. Pillars East and West of the traveling road connecting the raises were removed during the first five months of the year and work was finished at this elevation in May.

-695' Sub Level - South side of dike:

Mining was started in November 1930 and at the end of the year one contract was mining the last remaining pillar in the Northeast corner of the ore area. Each successive sub level on this side of the dike is diminishing in size because of the Northerly dip of the slate footwall.

-710' Sub Level - North side of dike:

The mining of pillars in the South central portion of the ore area was completed in June. The narrow East-West dike which joins the fault dike in this vicinity breaks up into many stringers at the junction, contaminating the ore Westward along the North side of the fault dike. This probably indicates that the slate footwall displaced by fault is being approached in this corner, the dike stringers being forced into the ore by the impervious slate beneath.

-710' Sub Level - South side of dike:

This sub level was cut out in July and because of the heavy flow of water in the Western portion of the area, and the reduced working schedule, little progress had been made at the end of the year. Four contracts were working here in December.

-720' Sub Level - North side of dike:

Mining started at this elevation in April 1930 and with the exception of three small pillars in the South central portion of the ore area was completed in 1931. The jasper hanging wall at the South end of the old mining limit dipped to the West, adding to the size of the ore area being mined between present limits. Two contracts were mining here at the end of the year.

-720' Sub Level - South side of dike:

One double contract and one single contract cut out raises to start mining in the West half of the ore area in December. It is hoped that an ore pillar left in place at the West end of the sub level above will serve as an aid to complete extraction of the ore at this elevation in spite of the heavy flow of water.

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7. UNDERGROUND:

c. Stoping: (Cont)

-730' Sub Level - North side of dike:

This sub level was started in February and at the end of the year eleven contracts were mining here. The ore adjacent to the large diorite dike forming the North boundary of the ore body has been mined and raises in the East and South portion of the ore area are being connected so that mining will be well under way early in 1932.

-745' Sub Level - North side of dike:

The single contract working here in December cut out #807 raise in November to start mining operations at this elevation. This sub level is 50' above the 8th level.

8th Level - North side of dike:

One raise, #810, was put up from the main drift because of the increasing size of the ore pillar adjacent to the Westerly retreating mining limit on sub levels above. The raise was completed in August at a total height of 75 ft. The raise was in ore.

8th Level - South side of dike:

One raise was put up from the West side of #831 crosscut to aid mining in the wet territory above. The raise was started in January and completed in February at a total height of 105 ft. The first 40 ft. was in mixed ore and dike and the remaining 65 ft. in ore.

9th & 10th Levels:

The usual repair work necessary to keep these levels and connecting drifts and raises in good condition for ventilation purposes and for future use was continued at intervals throughout the year. Much of the 10th level timber was replaced in 1930 so that maintenance here was lighter than usual.

Shaft:

Early in the year steel rail chairs were placed in both skip compartments at the 8th level. The hoisting rope was shortened at the drum, without cutting, to bring one skip at rest on the chair while the other is dumping. This reduced spillage due to the stretch of the rope and reduced the length of travel of the two skips, thereby increasing hoisting efficiency.

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7. UNDERGROUND:d. Timbering:

The cost per ton for timber was higher in 1931 than in any year since 1928. The increase was due to the shortened working schedule which decreased the product and at the same time increased the amount of timber used for making repairs. Less wire fencing was used for covering down on sub levels due to decision to use it only where the mat was poor, under new hanging, etc. Since the shortened operating schedule has been in effect larger timber has been used on the sub levels as they must be kept open a longer time. More poles were used per ton of ore mined due to more close covering down of sub levels near dikes, under new hanging, or where runs had occurred. More 9 ft. legs and caps were used in 1931

Statement of Timber Used:

	<u>LINEAR FEET</u>	<u>AVG. PRICE PER FOOT</u>	<u>AMOUNT 1931</u>	<u>AMOUNT 1930</u>
6 to 8" Cribbing	91,795	.0459	4,215.35	2,708.44
8 to 10" Stulls	28,286	.0611	1,728.58	7,257.96
10 to 12" "	54,288	.0954	5,177.93	5,539.58
12 to 14" "	31,247	.1445	4,514.75	3,806.39
14 to 16" "	5,810	.1484	861.98	-
Total - 1931	211,426	.0780	16,498.59	
Total - 1930	262,308	.0736		19,312.37
		<u>Per 100'</u>		
Lagging - 7 ft.	662,666	.7290	4,830.80	7,146.12
Poles - 9½'	512,120	1.3290	6,806.17	10,109.20
Total - 1931	1,174,786	.9906	11,636.97	
Total - 1930	1,748,258	.9870		17,255.32
Wire Fencing - sq. ft.	46,283 *		569.12	1,433.97
Grand Total - 1931			28,704.68	
Grand Total - 1930				38,001.66

* Wire fencing used only last 6 months 1930.

Product	251,580	385,461
Feet of timber per ton of ore	.840	.681
" " lagging " " " "	2.634	2.605
" " poles " " " "	2.036	1.930
Feet of lagging per foot of timber	3.134	3.829
Feet of wire fencing per ton of ore	.0466	.6554
Cost per ton for timber	.0656	.0501
" " " " lagging	.0192	.0185
" " " " poles	.0270	.0262
" " " " wire fencing	.0023	.0037
Total Cost per ton	.1141	.0985
Equivalent of stull timber to board measure	472,951	479,091
Feet of board measure per ton of ore	1.880	1.243

Total Cost for timber, lagging, poles, etc. and Cost per ton:

<u>Year</u>	<u>Amount</u>	<u>Cost per ton</u>
1931	28,704.68	.1141
1930	38,001.66	.0985
1929	35,086.43	.1015
1928	29,160.74	.1207
1927	23,288.37	.1001
1926	21,637.70	.0956

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7. UNDERGROUND:e. Drifting and Raising:

The following table gives comparative figures of raising and drifting for the years 1931 and 1930:

	Raising		Drifting		Total
	Ore	Rock	Ore	Rock	
1931	1,065'	78'	99'	142'	1,384'
1930	833'	-	527'	91'	1,451'
Increase	232'	78'		51'	
Decrease			428'		67'

Rock drifting in 1931 was confined to the new crosscut on the 6th level as was also the rock raises. There was more raising in 1931 on account of developing the ore body on the South footwall above the new crosscut on the 6th level.

f. Explosives, Drilling and Blasting:Statement of Explosives Used:

	Quantity	Average Price	1931 Amount	1930 Amount
50% Am. Gel.	36,550	12.50	4,568.75	4,749.00
60% " "	49,800	13.75	6,847.52	12,462.71
Total Powder - 1931	86,350	13.22	11,416.27	
Total Powder - 1930	125,650	13.70		17,211.71
Fuse - feet	300,200	5.95	1,786.24	2,597.30
Caps - No. 6	46,800	11.59	542.29	841.03
Fuse Lighters	2,000	8.78	17.55	-
Connecting Wire	-	-	-	23.28
Tamping Bags	12,700		24.79	-
Total Fuse, etc. - 1931			2,370.87	
Total Fuse, etc. - 1930				3,461.61
Total All Explosives - 1931			13,787.14	
Total All Explosives - 1930				20,673.32
Product			251,580	385,461
Pounds of powder per ton of ore			.3432	.3260
Tons of ore per pound of powder			2.913	3.069
Cost per ton - powder			.0454	.0446
" " " - fuse, caps, etc.			.0094	.0090
" " " - all explosives			.0548	.0536
<u>Sinking, Rock Development, etc.</u>				
Total Powder - 1931	1,950	13.30	259.37	
Total powder - 1930	100	13.99		13.99
Total Fuse, etc. - 1931			46.70	
Total Fuse, etc. - 1930				6.60
Total All Explosives - 1931			306.07	
Total All Explosives - 1930				20.59
Total Explosives used in mine			14,093.21	20,693.91
Average price per lb. for powder			.1322	.1370

58% of all powder used in 1931 was 60%
71% " " " " " 1930 " 60%

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7. UNDERGROUND:

f. Explosives, Drilling and Blasting: (Cont)

Statement of Explosives Used: (Cont)

The following statement shows the cost per ton for explosives exclusive of rock development for the period 1927-1931 inclusive:

	<u>Cost per ton</u>	<u>Product</u>
1931	.0548	251,580
1930	.0536	385,461
1929	.0588	343,147
1928	.0666	241,590
1927	.0636	232,748

There was a slight increase in the amount of powder used to break a ton of ore, with an increase in cost per ton of \$.0008. More 50% powder was used in 1931, and less 60%, which would indicate that there was no saving by the use of lower strength explosive.

g. Mining and Loading:

For the last two years all the ore mined in development and stoping has been handled by scrapers. There has been an increase in the number of places where 9 ft. legs and 9 ft. caps are used and this, together with some additional larger electrical scraper units, has increased the tons per man stoping. Various schemes have been tried during the year to keep the product up on account of so many idle days due to curtailment of operations. The days worked have been switched from every other day to the first three days of the week, etc. The last practice which was partially put into effect late in December of this year is to have half the men work one week of four days straight and then the other crew work four days the next week thus cutting down on the cost and delay due to repairing and timbering to keep the places open.

i. Ventilation:

There was considerable extra expense attached to maintaining airways during 1931 on account of the crushing of the main air raises between the 9th and 4th levels. It was necessary to keep one repair gang constantly on this work and in the first half of November repair gangs were working on #610 raise from the 6th to the 4th level on 8-hour continuous shifts during the idle days as this is the only air raise between these levels. In repairing this raise it was necessary to put in smaller cribbing inside the old rotten cribbing and, therefore, the capacity of the raise has been reduced about 20%. A new raise has been started about 200' nearer the shaft in the 6th level footwall drift to provide an additional airway between the 6th and 4th levels. Drifting has been practically continuous on the -550' sub level or new ventilation sub level above the 6th level, and the subs North and South of the dike, as well as the new area being opened over #620 crosscut, have now been connected to the ventilation raise.

Mining above the 8th level reached the ventilation sub with consequent crushing and cutting off of the airways and now the ventilation has to be controlled by booster fans placed near the raises on the 8th level. There are eight of these fans in the mine, most of which are located on the 8th level.

There was also some rearrangement of the main fan installation on the 10th level. Some of the pillar near the outlet of the fan was removed to give a freer passage to the air and a concrete wall and a new door were put in alongside the fan and across to the pillar on the intake end to make a better seal as well as to make the installation more fire proof.

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7. UNDERGROUND:

j. Pumping:

The number of gallons pumped per minute during 1931, 1930, and 1929, are shown below:

<u>Month</u>	<u>1931</u>	<u>1930</u>	<u>1929</u>
January	243	230	219
February	244	230	218
March	250	233	211
April	253	231	216
May	255	228	221
June	282	228	223
July	262	222	222
August	263	234	226
September	262	239	225
October	263	233	228
November	268	239	231
December	274	242	232
Total Average	260	232	223

There was an increase of 28 gallons per minute in the water pumped in 1931. This is the largest amount pumped since 1926. Evidently more ground water was encountered early in the summer, as a result of development and mining.

The average number of gallons pumped per minute over the last six years is as follows:

<u>Year</u>	<u>Gallons per minute</u>
1931	260
1930	232
1929	223
1928	228
1927	242
1926	268

k. Shaft:

Several additional steel skip road dividers were installed in 1931 in the circular part of the shaft where the steel sets are spaced too far apart. There has now been over 75 of these installed and the work will be continued as the present sets show damage. A trial is being made of using hardwood filling pieces on the sides of worn skip guides; thus far the results have proven quite satisfactory and the number of new guides installed has been greatly reduced.

i. Underground in General:

Conditions in the mine were not as good as in the previous year due to the shortened working schedule. More repairing was necessary, which interfered with production. Water interfered seriously with mining operations in a few areas, while in other areas stringers of dike and horses of jasper made mining more difficult and costly. It is expected that part of these unfavorable conditions will be overcome by concentration of contracts in one area which will permit of working on double shift 4 days per week in each working place. This will reduce the cost of repairs but will result in loss of some raises in the areas temporarily abandoned.

Less repairing was necessary on the 10th level, but more was required on the 6th and 8th levels, so that the expense for maintenance of the main level drifts was higher in 1931.

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7. UNDERGROUND:i. Underground in General: (Cont)

The use of wire netting decreased in the last half of the year due to demonstration that it was of little value in areas where there was a good timber mat. It is still used in areas under new hanging and in the vicinity of dikes and horses of jasper.

The use of 9 ft. legs and caps has become quite general and 8 ft. timber is used only in a few areas where crushing has decreased the sub level interval.

8. COST OF OPERATING:a. Comparative Mining Costs:

	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
PRODUCT	251,580	385,461		133,881
Underground Costs	1.183	1.107	.076	
Surface Costs	.209	.182	.027	
General Mine Expenses	.180	.121	.059	
Cost of Production	1.572	1.410	.162	
Depletion - Original Cost	.101	.100	.001	
Increment	.205	.205		
Depreciation - Plant & Equipt.	.096	.070	.026	
Development	.089	.089		
Taxes	.393	.243	.150	
Loading and Shipping	.018	.023		.005
Total Cost at Mine	2,474	2,140	.334	
Administrative & General Expense	.076	.087		.011
Miscellaneous Income	-.023	-.013		.010
Total Cost	2,527	2,214	.313	
No. of Days Operated	182	282		100
No. Shifts & Hours	1-8-hr	1-8-hr		
Average Daily Product	1,382	1,367	15	

<u>COST OF PRODUCTION:</u>	<u>1931</u>	<u>%</u>	<u>1930</u>	<u>%</u>	<u>Increase</u>	<u>Decrease</u>
Labor	.842	53.6	.780	55.3	.062	1.7%
Supplies	.730	46.4	.630	44.7	.100	1.7%
Total	1.572	100.0	1.410	100.0	.162	

b. Detailed Cost Comparison:

(1) <u>Days and Shifts:</u>		<u>Shifts &</u>		<u>Total</u>
<u>Year</u>	<u>Days Worked</u>	<u>Hours</u>	<u>Men Employed</u>	<u>Days Worked</u>
1931	182	1-8-hr	211	42,070
1930	282	1-8-hr	205	59,454
Increase			6	
Decrease	100			17,384

(2) Wages:

The mine operated on the same wage scale as in 1930 until October 1st when a 10% reduction in wages became effective. On June 16th there was a curtailment of one day per week in the working schedule of the salaried employees with a corresponding cut in salary.

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8. COST OF
OPERATING:

b. Detailed Cost Comparison: (Cont)

(3) Comparison of Production:

Production - 1931	251,580 tons
Production - 1930	<u>385,461</u> "
Decrease	133,881 "

(4) Comparison of Number of Men and Wages:

	<u>No. Men</u>	<u>No. Days</u>	<u>Amount</u>	<u>Rate per day</u>
1931	211	42,070	205,731.90	4.89
1930	<u>205</u>	<u>59,454</u>	<u>295,234.46</u>	<u>4.97</u>
Increase	6			
Decrease		17,384	89,502.56	.08

(5) Tons per man per day:

The tons of ore mined per man per day were as follows:

	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
Surface	25.87	28.94		3.07
Underground	<u>7.78</u>	<u>8.36</u>		.58
Total	5.98	6.48		.50

(6) Cost of Production:

1931	395,513.40	Cost per ton	1.572
1930	<u>543,355.01</u>	" " "	<u>1.410</u>
Decr.	147,841.61	Increase	.162

	<u>Total Cost</u>		<u>Cost per ton</u>		
	<u>Labor</u>	<u>%</u>	<u>Supplies</u>	<u>%</u>	<u>Total</u>
1931 -	211,767.15	53.6	183,746.25	46.4	1.572
1930 -	<u>300,528.62</u>	<u>55.3</u>	<u>242,826.39</u>	<u>44.7</u>	<u>1.410</u>
Incr.				1.7	.162
Decr.	88,761.47	1.7	59,080.14	.062	.100

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8. COST OF OPERATING:b. Detailed Cost Comparison:(7) Detail of Accounts:

	<u>1931</u>		<u>1930</u>		<u>Increase</u>		<u>Decrease</u>	
Days per week	4-3-2		6-5-4					
Shifts and Hours	1-8-hr		1-8-hr					
Production, Tons	251,580		385,461				133,881	
Avg. Daily Prod. - Tons	1,382		1,367		15			
Number of Days Worked	182		282				100	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
<u>Underground Costs</u>								
1. Exploring in Mine	175.37	.001	1164.92	.003			989.55	.002
3. Development in Rock	1663.27	.007	472.75	.001	1190.52	.006		
4. Development in Ore	5645.19	.022	6864.83	.018			1219.64	.004
5. Stoping	95725.33	.381	147881.01	.384		.003	52155.68	
6. Timbering	85875.19	.341	121154.25	.314		.027	35279.06	
7. Trammig	26942.07	.107	42577.13	.111			15635.06	.004
8. Ventilation	3324.37	.013	4259.32	.011		.002	934.95	
9. Pumping	21847.29	.087	20367.89	.053	1479.40	.034		
10. Compr. & Air Pipes	31625.36	.126	46826.25	.122		.004	15200.89	
12. U. G. Superintendence	10043.33	.040	12764.68	.033		.007	2721.35	
14. Maint: Compr & Pwr Drls	539.39	.002	2371.22	.006			1831.83	.004
Elec Tram Equip	12797.78	.051	17472.40	.045		.006	4674.62	
Pumping Machy.	1382.71	.005	2439.55	.006			1056.84	.001
Total U. G. Costs	297586.65	1.183	426616.40	1.107		.076	129029.75	
<u>Surface Costs:</u>								
18. Hoisting	22195.50	.088	33097.50	.086		.002	10902.00	
19. Stocking Ore	4382.12	.018	7835.35	.020			3453.23	.002
21. Dry House	4438.40	.018	6273.71	.016		.002	1835.31	
22. Gen. Surface Expense	5540.54	.022	6579.22	.017		.005	1038.68	
23. Maint: Hoisting Equip	7830.84	.031	9851.56	.026		.005	2020.72	
24. Shaft	1482.66	.006	2836.75	.002		.004	1354.09	
25. Top Tram Equip	1504.36	.006	1951.35	.005		.001	446.99	
26. Docks, Tres & Pkts	4574.94	.018	1050.10	.003	3524.84	.015		
27. Mine Buildings	529.80	.002	768.81	.002			239.01	
Total Surface Costs	52479.16	.209	70244.35	.182		.027	17765.19	
<u>General Mine Expenses:</u>								
28. Insurance	47.13		26.81		20.32			
29. Mining Engineering	2086.87	.008	2291.36	.006		.002	204.49	
30. Mech & Elec. Engrg	1957.46	.008	1639.39	.004	318.07	.004		
31. Analysis & Grading	5894.40	.023	7293.06	.019		.004	1398.66	
32. Personal Injury	11333.13	.045	13261.23	.035		.010	1928.10	
33. Safety Department	1299.29	.005	1256.68	.003	42.61	.002		
34. Tel. & Safety Devices	1050.68	.004	715.40	.002	335.28	.002		
36. Spec. Exp., Pens. & Allow	3837.94	.015	1372.31	.004	1465.63	.011		
37. Ishpeming Office	8660.34	.034	8139.78	.021	520.56	.013		
39. Mine Office	9281.84	.037	10498.24	.027		.010	1216.40	
Total Gen. Mine Exp.	45447.59	.180	46494.26	.121		.059	1046.67	
COST OF PRODUCTION	395513.40	1.572	543355.01	1.410		.162	147841.61	
40. Taxes	99041.51	.393	95122.50	.243	3919.01	.150		
Total Cost	494554.91	1.965	638477.51	1.653		.312	143922.60	

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8. COST OF OPERATING:

b. Detailed Cost Comparison: (Cont)
(7) Detail of Accounts: (Cont)

1. Decrease due to no diamond drilling underground in 1931. In 1930 Hole No. 11 was drilled on the -480 ft. sub level.

3.	<u>Drifting</u>	<u>Raising</u>	<u>Total Feet</u>	<u>Cost per ft.</u>
1931	142'	78'	220'	7.56
1930	91'	-	91'	5.20
Increase	51'	78'	129'	2.36

Increased expenditures on account of more rock drifting and raising and increase in cost per foot due to harder ground.

4.	<u>Drifting</u>	<u>Raising</u>	<u>Total Feet</u>	<u>Cost per ft.</u>
1931	99'	1065'	1164'	4.85
1930	527'	833'	1360'	5.05
Increase		232		
Decrease	428'		196'	.20

There was less ore drifting and more ore raising in 1931.

5.	<u>Labor</u>			<u>Supplies</u>		
	<u>Amount</u>	<u>Cost Per Ton</u>	<u>%</u>	<u>Amount</u>	<u>Cost Per Ton</u>	<u>%</u>
1931	70,148.66	.279	73.3	25,576.67	.102	26.7
1930	107,773.62	.280	72.9	40,107.39	.104	27.1
Incr.			.4			
Decr.	37,624.96	.001		14,530.72	.002	.4

Scraper hoists purchased in the two years compare as follows:

1931 - 4 electric cost	3,953.00
1930 - 4 " & one air cost	5,255.00
Decrease	1,302.00

6.	<u>Labor</u>			<u>Supplies</u>		
	<u>Amount</u>	<u>Cost Per Ton</u>	<u>%</u>	<u>Amount</u>	<u>Cost Per Ton</u>	<u>%</u>
1931	51,974.71	.206	60.5	33,900.48	.135	39.5
1930	73,653.53	.191	60.8	47,500.72	.123	39.2
Incr.		.015			.012	.3
Decr.	21,678.82		.3	13,600.24		

Cost per ton for timbering increased in 1931 due to more repairing on account of shortened working schedule.

7. Decrease due to mine operating 100 less days in 1931. Decrease in cost per ton due to division of electric haulage current charge in 1931 into lighting levels, etc., thereby decreasing the supply charge to tramping. Labor cost .102 in both years. Supply cost 1931 .005 per ton, in 1930 .009 per ton.

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8. COST OF OPERATING:

b. Detailed Cost Comparison: (Cont)
(7) Detail of Accounts: (Cont)

8. Decrease due to shortened working schedule which decreased charge for current \$767.22, also less ventube used.

9.	<u>Gallons Water Pumped</u>	<u>Gallons per minute</u>
1931	136,215,501	259
1930	121,785,145	232
Increase	14,430,356	27

	<u>Cost for Power</u>	<u>Amount</u>	<u>Cost per Ton</u>
1931		16,520.25	.066
1930		15,201.06	.039
Increase		1,319.19	.027

Increase due to more water pumped.

10.	<u>Compressors</u>	<u>Air Pipes</u>
1931	28,497.49	3,127.87
1930	41,327.92	5,498.33
Decrease	12,830.43	2,370.46

Total cu. ft. air used in 1931	686,750,000
" " " " " " 1930	1,060,650,000
Decrease	373,900,000

Cu. ft. per ton of ore - 1931	2,730
" " " " " " 1930	2,752

Decrease due to mine operating 100 less days in 1931.

12. Decrease due to mine operating 100 less days and 10% reduction in wages effective Oct. 1st. There was more overtime by bosses working on idle days in charge of repair crews.

14.	<u>Compressors</u>	<u>Power Drills</u>
1931	539.39	-
1930	1,861.22	510.00
Decrease	1,321.83	510.00

In 1930 the Nordberg compressor was equipped with feather valves to replace the complicated Corliss valves.

In 1930 there were three new auger drills charged out as compared with none in 1931.

16.	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
Generator & Motor	3,395.43	108.95	3,286.48	
Locomotives	1,012.24	2,068.04		1,055.80
Wiring	441.23	1,574.14		1,132.91
Main Line Tracks	1,808.43	3,907.69		2,099.26
Main Line Cars	6,140.45	9,813.58		3,673.13
	12,797.78	17,472.40		4,674.62

Second hand generator bought from Francis Mine equipment and installed in 1931. 8 new cars charged in 1931 as compared with 16 charged in 1930. 4-0 trolley wire installed in 1930 to replace 2-0 wire.

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YEAR 1931

8. COST OF
OPERATING:

b. Detailed Cost Comparison: (Cont)
(7) Detail of Accounts: (Cont)

17. In 1930 a new pump body was installed costing \$300.00. New subway boxes for terminals of pump cables were provided at a cost of \$721.00, and there were charges of \$878.00 from the General Shops for labor and material on pump repairs. The 1931 charges cover general maintenance.

<u>18. Electric Power</u>	<u>Amount</u>	<u>Cost per ton</u>
1931	17,895.70	.071
1930	<u>26,719.65</u>	<u>.069</u>
Increase		.002
Decrease	8,823.95	

There was a saving in electric power in 1931 due to shortening the skip ropes so that the skips did not go below the 8th level pocket where they rested on chairs when loaded. This decreased the distance traveled by the skips and speeded up hoisting.

<u>19.</u>	<u>Tons Stocked</u>	<u>Cost per ton for stocking</u>
1931	166,110	.026
1930	<u>295,793</u>	<u>.026</u>
Decrease	129,683	

Less ore stocked in 1931 due to decreased output and larger percent of ore shipped from pocket.

<u>21. Coal to Boiler House</u>	<u>Tons</u>	<u>Cost</u>
1931	621	3,174.59
1930	<u>659</u>	<u>3,425.56</u>
Decrease	38	250.97

In 1930 the interior of dry house was painted and charged in error to this account. No repairs were made in 1931.

22. Decrease due to mine operating 100 less days.

	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
23. Wire Rope	2,384.93	3,037.37		652.44
Skips & Skip Roads	2,373.69	3,453.10		1,079.41
Electric Hoists	<u>3,072.22</u>	<u>3,061.09</u>	<u>11.13</u>	
	7,830.84	9,551.56		<u>1,720.72</u>

Two 1 3/8" ropes charged in 1931 and two in 1930. Decrease due to difference in cost of ropes.

New rope slides installed in 1931 and one new 8' steel lined head frame sheave charged out.

<u>24.</u>	<u>Steel Sets</u>	<u>Underground Pockets</u>
1931	469.13	1,013.53
1930	<u>1,313.64</u>	<u>1,523.11</u>
Decrease	844.51	509.58

Decrease due to less repairs.

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ANNUAL REPORT
YEAR 1931

8. COST OF OPERATING:

b. Detailed Cost Comparison: (Cont)
(7) Detail of Accounts: (Cont)

25.	<u>Engines & Motors</u>	<u>Tracks & Cars</u>	<u>Wire Rope</u>	<u>Sheaves & Rollers</u>
1931	226.82	439.15	387.83	450.56
1930	<u>209.67</u>	<u>497.05</u>	<u>670.69</u>	<u>573.94</u>
Increase	17.15			
Decrease		57.90	282.86	123.38

Increase to Engines & Motors due to more repairs
 Decrease to Tracks & Cars due to less repairs
 " " Wire Rope due to less rope used
 " " Sheaves & Rollers due to less sheaves and rollers replaced.

26. Due to small shipments in 1931, 396 ft. of new double track wood trestle was erected

27.

	<u>1931</u>	<u>1930</u>
Warehouse	70.40	10.02
Shops	10.52	.86
Shaft House	4.37	57.73
Engine House	111.54	173.37
Boiler House	1.16	2.86
Dry House	5.12	10.79
Timber Tunnel	3.38	-
Iron House	218.46	360.41
Scraper House	-	152.77
Hose House	13.17	-
Storage Building	<u>91.68</u>	<u>-</u>
Total	<u>529.80</u>	<u>768.81</u>

General repair expense was lower in 1931. One building was erected, a storage shed for steel plate, pipe, and heavy equipment for underground haulage locomotives. This building is located directly opposite and 16 ft. from the side door of shop so that material can be moved to and from the shop very easily and cheaply.

28. Increase due to two new storage buildings insured in 1931.

29. Expense decreased due to 16 2/3% reduction in salaries effective June 16th. Cost per ton increased due to smaller product.

30. Expense increased due to more time at mine by mechanical and electrical department men.

31.

	<u>No. of Determinations</u>	<u>Cost per Determination</u>
1931	12,840	.20135
1930	<u>24,244</u>	<u>.15350</u>
Increase		.04785
Decrease	11,404	

ATHENS MINE
ANNUAL REPORT
YEAR 1931

8. COST OF OPERATING:

b. Detailed Cost Comparison: (Cont)
(7) Detail of Accounts: (Cont)

<u>32. Detail of Expense:</u>	<u>2% of Payroll</u>	<u>Catastrophe Insurance</u>	<u>Ishpeming Office Chge</u>
1931	4,284.33	241.85	6,806.45
1930	<u>6,158.56</u>	<u>217.10 *</u>	<u>6,885.57</u>
Increase		24.75	
Decrease	1,874.23		79.12

* 8 Months only.

Decrease in expense due to mine operating 100 less days in 1931.

<u>33. Detail of Expense:</u>	<u>Foremen's Meetings & First Aid Practice</u>	<u>First Aid Supplies</u>	<u>Check In & Out Bds</u>	<u>Ishpeming Off. Chge</u>
1931	220.86	119.46	68.69	890.28
1930	<u>119.63</u>	<u>90.05</u>	-	<u>1,047.00</u>
Increase	101.23	29.41	68.69	
Decrease				156.72

Increase due to more safety meetings for foremen and to making up equipment for check in and out system.

<u>34. Detail of Expense:</u>	<u>Lighting</u>	<u>Mine Telephone</u>	<u>Safety Gates, Sign Bds, etc.</u>	<u>Fire Equipment</u>
1931	884.86	61.26	54.18	50.38
1930	<u>509.37</u>	<u>66.21</u>	<u>87.15</u>	<u>52.67</u>
Increase	375.49			
Decrease		4.95	32.97	2.29

Increase due to careful division of electric haulage charges into tramping, lighting, etc. Charge for lights on plats and levels had been too low in previous years.

<u>39. Division of Charges:</u>	<u>Mine Office Supply Charge</u>	<u>Ishpeming Office Charges</u>
1931	830.29	8,451.55
1930	<u>1,072.58</u>	<u>9,425.66</u>
Decrease	242.29	974.11

Decrease due to mine working less days and office force on 5 day schedule from June 16th.

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8. COST OF
OPERATING:

b. Detailed Cost Comparison: (Cont)
(7) Detail of Accounts: (Cont)

Statement of Supplies Used:

	First 5 Mos. 1931	Amount Per Day	Last 7 Mos. 1931	Amount Per Day
General	9,602.48	102.15	5,447.63	61.90
Iron & Steel	1,837.76	19.55	1,544.46	17.55
Oil & Grease	648.76	6.90	569.52	6.47
Machinery	6,443.17	68.54	3,197.23	36.33
Explosives	7,438.64	79.13	6,654.57	75.62
Lumber & Timber	16,236.66	172.73	16,580.38	188.41
Fuel	1,802.86	19.18	1,371.73	15.59
Electric Power	30,091.32	320.13	32,512.11	369.46
Sundries	2,494.83	26.54	2,103.33	23.90
E & A Charges	4,850.00	51.60	1,845.00	20.97
Total	81,446.48	866.45	71,825.96	816.20

	First 5 Mos. 1931	Last 7 Mos. 1931	Increase	Decrease
Mine Operated - days	94	88		6
General	102.15	61.90		40.25
Iron & Steel	19.55	17.55		2.00
Oil & Grease	6.90	6.47		.43
Machinery	68.54	36.33		32.21
Explosives	79.13	75.62		3.51
Lumber & Timber	172.73	188.41	15.68	
Fuel	19.18	15.59		3.59
Electric Power	320.13	369.46	49.33	
Sundries	26.54	23.90		2.64
E & A Charges	51.60	20.97		30.63
Total	866.45	816.20		50.25

Decreases in all accounts except lumber and timber and electric power. More timber used on account of more repairing underground and more raising. More electric power used on account of more water pumped last 7 months of the year.

9. EXPLORATIONS
AND
FUTURE
EXPLORATIONS:

There was no exploring done by diamond drilling in 1931.

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ANNUAL REPORT
YEAR 1931

10. TAXES:

The comparison of assessed valuation and taxes for 1931 and 1930 are as follows:

<u>Description</u>	<u>1 9 3 1</u>		<u>1 9 3 0</u>	
	<u>Valuation</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Taxes</u>
Realty (Tax Commission Figures)	2,085,000	81,590.22	1,950,000	75,375.30
Ore in Stock, Equipmt. & Supplies	415,000	16,239.78	450,000	17,394.30
<u>Sterling Addition</u>				
Lots 31 to 38 (C. C. I. Co. Purchase, 1927)	4,600	180.01	4,600	177.81
<u>Harvey Plat</u>				
Lots 1, 2, 3, Portion of	1,300	50.89	1,300	50.27
Total	2,505,900	98,060.90	2,405,900	92,997.28
Collection Fee		980.61		929.98
Total Operating Athens Mine		99,041.51		93,927.66
Rented Buildings (Harvey Plat)				
Lots 5, 6 & 7	7,900	309.18	7,900	305.40
<u>Sterling Addition</u>				
Lots Nos. 1, 2, 3, 7, 8, 9, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22, 23, 24, 25, 26, 27, 28, 29, 30, 72, 73, 74 & 75	22,700	888.40	22,700	877.61
Collection Fee		11.97		11.83
Total Rented Buildings		1,209.55		1,194.84
Total Athens Iron Mining Co.	2,536,500	100,251.06	2,436,500	95,122.50
Tax Rate		3.9132		3.8654
Total City of Negaunee tax		621,285.41		611,259.85
Athens Mine % of City tax		16.13%		15.56%

Taxes increased due to increase in value of mine as determined by the Tax Commission and to slight increase in the tax rate

11. ACCIDENTS
AND
PERSONAL
INJURY

The following table shows the classification of accidents for the years 1931, 1930, and 1929:

	<u>1931</u>	<u>1930</u>	<u>1929</u>
Fatal	-	1	-
Time Lost - Over 4 months	1	1	2
" " - 1 to 4 "	1	2	2
" " - Less than 1 month	-	2	-
Total Accidents	2	6	4

Number of cases paid compensation for accidents prior to January 1, 1931

Number of cases being paid difference in wages

The nature of the injury causing the loss of from 1 to 4 months time was a fracture of the right leg due to a fall of ground from the side, and the lesser injury was a torn Achilles tendon.

The surface men have made a very good record, having worked 961 days without an accident on Dec. 31st, 1931.

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12. NEW
CONSTRUCTION
AND
PROPOSED NEW
CONSTRUCTION:

E. & A. #575 - Rocker Dump Haulage Cars:

Total Estimate	14,550.00
" Expenditures	<u>14,550.00</u>
" Unexpended balance Jan. 1, 1932	-

This E. & A. was completed in 1930 but 8 of the cars were charged out on the regular cost sheet during 1931 as compared with 16 in 1930.

E. & A. #609 - Electric Scraper Hoists:

Total Estimate	7,650.00
" Expenditures in 1931	<u>3,953.00</u>
" Unexpended balance Jan. 1, 1932	<u>3,697.00</u>

This E. & A. was for the purchase of 6 electric scraper hoists; 4 were purchased in 1931, leaving 2 to purchase in 1932. The type of hoists purchased was as follows:

- 2 20-h.p. Sullivan Electric Hoists
- 2 10-h.p. Ingersoll-Rand Electric Hoists

13. EQUIPMENT
AND
PROPOSED
EQUIPMENT:

a. Steam Shovels:

The Athens steam shovel is rented from The Cleveland-Cliffs Iron Co. It was repaired last winter at the Negaunee Mine.

b. Stockpile Trestles:

A new wooden stocking trestle of 18 bents was erected in August and September of 1931 between the steel trestles to take care of the winter's product. The North trestle is completely filled and that part of the Southeast trestle used for the Athens grade has less than one-half of its total capacity available. There is sufficient room for the Mitchell Ore that will be hoisted during 1932.

c. Timber Treating Plant:

The timber was treated in open steel tanks the same as last year. Approximately twice as much timber was treated in 1931 as in 1930 and there was about the same amount of treated timber on hand at the end of both years. There was more zinc chloride solution used this year and better absorption was obtained due to allowing the timber to remain in the solution a longer time

d. Scraper Hoists:

The mine is now equipped with the following scraper equipment:

	<u>On Hand</u> <u>1/1/1931</u>	<u>Purchased</u> <u>1931</u>	<u>On Hand</u> <u>1/1/1932</u>	<u>Repair Cost</u> <u>per Machine</u> <u>per Year</u>
Ingersoll-Rand Air	28	-	28	19.53
Sullivan 6½ h.p. Electric	2	-	2	10.80
" 15 " "	10	-	10	17.76
" 20 " "	-	2	2	-
Ingersoll-Rand 10 h.p. Electric	-	<u>2</u>	<u>2</u>	-
Total	<u>40</u>	<u>4</u>	<u>44</u>	

ATHENS MINE
ANNUAL REPORT
YEAR 1931

13. EQUIPMENT
AND
PROPOSED
EQUIPMENT:

e. Hoisting Equipment:

There was no new hoisting equipment or major repairs to hoisting equipment in 1931.

f. Electric Haulage:

A second hand convertor, purchased from the Francis Mine, was installed in the 10th level pumphouse to provide more current for electric haulage and also to provide a second generator in case the present one broke down.

14. MAINTENANCE
AND REPAIRS:

The only large item of maintenance expense was the replacement of a number of the braces on the East steel stocking trestle. A crew of men worked over a month replacing those which had failed with additional larger and heavier channels.

15. POWER:

Electric power was purchased from the Cliffs Power & Light Company, a subsidiary of The Cleveland-Cliffs Iron Co. The charge for power was $1\frac{1}{2}$ ¢ per k. w. hour, the same as last year. The total power consumed in 1931 was less on account of curtailed operations.

The following statement shows a comparison of the power cost for the years 1931 and 1930 in detail:

Account	1931			1930		
	K. W.	Cost	Per Ton	K. W.	Cost	Per Ton
Stopping	44,336	665.05	.0026	20,000	300.00	.0008
Ventilation	140,242	2,103.63	.0084	191,390	2,870.85	.0075
*Pumping	1,101,350	16,520.25	.0657	1,013,404	15,201.06	.0394
*Compressors	1,551,016	23,265.23	.0925	2,384,350	35,765.25	.0928
*Hoisting	1,193,046	17,895.70	.0711	1,781,310	26,719.65	.0693
*Stocking Ore	32,784	491.76	.0020	59,406	891.09	.0023
Dry House	1,620	24.30	.0001	3,928	58.92	.0002
Lights at Shaft & Levels	32,103	481.54	.0019	34,736	521.04	.0014
*Mine Office	778	11.67	.0000	906	13.59	.0000
Electric Haulage	70,469	1,057.03	.0042	145,664	2,184.96	.0057
Heating Plant	700	10.50	.0000	800	12.00	.0000
*Shops	5,118	76.77	.0003	8,792	131.88	.0003
Total	4,173,562	62,603.43	.2488	5,644,686	84,670.29	.2197
Product	251,580			385,461		
K. W. per ton	16.589			14.644		
Cost per K. W.	.015			.015		

* Indicates Accounts that are metered

ATHENS MINE
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17. CONDITION
OF
PREMISES:

The grounds around the buildings were maintained in their usual good condition during the year.

Across the main highway opposite the office a parking ground for automobiles was made by removing fences and leveling the ground.

18. NATIONALITY
OF
EMPLOYEES:

This has been prepared under two statements. The first gives the report as ordinarily submitted to the Company. It shows the nationality of the employees as to parentage. The second separates the nationalities into foreign-born and American-born, the latter being shown as Americans.

<u>As to parentage</u>	<u>1931</u>	<u>%</u>	<u>1930</u>	<u>%</u>
English	48	23	47	23
Finnish	87	41	83	40
Italian	24	11	23	11
Swedish	16	8	18	9
French Canadians	17	8	18	9
Scotch	3	1	2	1
Germans	5	3	4	2
Austrians	2	1	2	1
Norwegians	6	3	5	3
Irish	2	1	2	1
Danish	1	-	1	-
Total	211	100	205	100

<u>As to birth</u>	<u>Total</u>		<u>American born</u>		<u>Foreign born</u>	
	<u>1931</u>	<u>1930</u>	<u>1931</u>	<u>1930</u>	<u>1931</u>	<u>1930</u>
English	48	47	31	31	17	16
Finnish	87	83	39	34	48	49
Italian	24	23	7	6	17	17
Swedish	16	18	12	13	4	5
French Canadians	17	18	17	18	-	-
Germans	5	4	5	4	-	-
Austrians	2	2	2	2	-	-
Norwegians	6	5	5	5	1	-
Irish	2	2	2	2	-	-
Danish	1	1	1	1	-	-
Scotch	3	1	3	1	-	-
Total	211	205	124	118	87	87
Percentage			59%	57%	41%	43%

NORTH JACKSON MINE
ANNUAL REPORT
YEAR 1931

1. GENERAL:

No work has been done at this mine since 1908.

6. SURFACE:

(1) The headframe erected many years ago at the South side of the open pit was dismantled last summer as it was becoming dangerous due to rotting of timbers. The expense of this work was charged to the Negaunee Mine, which salvaged the usable timber for repairing No. 2 Shaft.

(2) The loading pocket near the L. S. & I. switch track in Cornishtown was also dismantled by a crew of men from the Negaunee Mine and the usable timber salvaged. The timber in this structure was badly rotted.

(3) The former mine office, later used as barracks for the State Constabulary, had been vacant for several years. It was being seriously damaged by boys and to protect the building it was decided to make the necessary alterations to change it into a 3-flat apartment house. Tenants were waiting and as soon as a flat was ready they moved in. Toilets and sinks were installed in two of the flats, a few changes made in partitions to adapt the rooms to moderate sized families, the furnace and radiators removed, lighting and water system changed to three meters, roof repaired, etc. The cost of this work was about \$350.00. The full rental income is \$28.00 per month; on the half rent basis now temporarily effective the income is only \$14.00 per month. It makes a very good 3-apartment flat building and will always be in demand on account of its location near the downtown section.

(4) The old North Jackson dry house, a dilapidated structure near the D. S. S. & A. tracks was sold and dismantled.

(5) Fences around the pits were repaired, new posts and wire were installed where needed.

10. TAXES:

	1 9 3 1		1 9 3 0	
	Valuation	Taxes	Valuation	Taxes
<u>Realty</u>				
47% of Jackson Taxes, Section 1-47-27	235,000	9,196.02	235,000	9,083.69
Collection Fee		91.96		90.83
Total		9,287.98		9,173.52
<u>Rented Buildings</u>				
Jackson Office	500	19.57	500	19.33
Collection Fee		.20		.19
Total		19.77		19.52
Total Taxes North Jackson		9,307.75		9,193.04
Tax Rate per \$100 Valuation		3.9132		3.8654

SOUTH JACKSON MINE
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1. GENERAL:

This mine did not operate in 1931.

4. ESTIMATE OF ORE RESERVES:a. Available Ore:

Above present pit available by present system of mining:

On Southwest side	35,000 tons
North of Lucy Pit	5,000 "
South and Southwest of Lucy Pit	<u>3,000 "</u>
Total	43,000 "

Below present pit and above drainage tunnel available by milling:

West of Crusher	186,000 tons
Area below bottom of present pit shown by churn drilling	<u>105,226 "</u>
Total	291,226 "
Grand Total	334,226 "

c. Estimated Analysis:

	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Alum</u>	<u>Mang</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Igni</u>	<u>Moist</u>
Natural	34.55	.066	36.00	1.42	2.00	.435	.175	.010	2.00	7.00

6. SURFACE:

The part time watchman employed at this mine since operations ceased was laid off in January 1931.

The small pile of coal lying here for years (about 30 tons) was sold and trucked to the Maas Mine. It had shrunk about 7 tons due to loss by thieving.

The electric equipment in the crusher house was removed and stored in the Maas barn. It was being damaged by boys who broke into the buildings after the watchman was laid off.

10. TAXES:

<u>Description</u>	1 9 3 1		1 9 3 0	
	<u>Valuation</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Taxes</u>
53% of Sec. 1-47-27	265,000	10,369.98	265,000	10,243.32
Collection Fee		<u>103.70</u>		<u>102.43</u>
Total Taxes South Jackson		10,473.68		10,345.75
 Tax Rate per \$100 Valuation		 3.9132		 3.8654

LUCY MINE
ANNUAL REPORT
YEAR 1931

1. GENERAL:

There were no changes at this property in 1931.

10. TAXES:

<u>Description</u>	<u>1931</u>		<u>1930</u>	
	<u>Valuation</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Taxes</u>
Part of SW $\frac{1}{4}$ of SW $\frac{1}{4}$ Sec. 6, S. of L.S.& I. R.R.	10,000	391.32	10,000	386.54
Part of SW $\frac{1}{4}$ of SW $\frac{1}{4}$, North of State Road	2,000	78.26	2,000	77.31
Part of SW $\frac{1}{4}$ of SW $\frac{1}{4}$, Com. at W. line of Gold St.	400	15.65	400	15.47
Part of SW $\frac{1}{4}$ of SW $\frac{1}{4}$, W. of W. line Silver St.-41 A.	2,600	101.74	2,600	100.51
Part of SW $\frac{1}{4}$ of SW $\frac{1}{4}$, South of State Road - 5.64 A.	4,600	180.01	4,600	177.82
NW $\frac{1}{4}$ of NW $\frac{1}{4}$, Sec. 7-47-26	10,000	391.32	10,000	386.54
Iron Plat - Lots 89 to 198 as per Tax List, except those paid by Land Dept. and other parties	20,500	802.32	20,500	792.66
Total	50,100	1,960.62	50,100	1,936.85
Collection Fee		19.61		19.37
Total Taxes Lucy Mine		1,980.23		1,956.22
Tax Rate per \$100 Valuation		3.9132		3.8654

GWINN DISTRICT MINES
ANNUAL REPORT
YEAR 1931

1. GENERAL:

Conditions in the Gwinn District in 1931 as regards employment were much less favorable than in 1930 due to the Archibald Mine of the C. K. Quinn Company only operating with a reduced force for about three months of the year. In 1930 it operated nearly the full year, six days per week, double shift, with a crew of 180 men. This year it was idle from Christmas 1930 until May 25, 1931, a period of five months. It then reopened and was operated with a reduced force (about 120 men) on a part time basis, until September 5th. For several weeks it was hoped that work would be resumed but the owners were unable to arrange a loan and the last of the month the work of dismantling was started. Only a small crew was employed on this work which was completed the last of November.

A few men left the district but the majority concluded they were just as well off in Gwinn as there was no chance for work elsewhere. A few old employees with large families were taken on at the Gardner-Mackinaw, others have obtained work from the Marquette County Road Commission, but there are a number who have not worked since September. 180 men were registered as unemployed in Forsyth Township, about 40% of whom were former company employees. There is practically no work in the woods this winter and the outlook for work either locally or elsewhere is decidedly poor at this time. Many families will move away as soon as employment elsewhere is assured; until that time a number will have to be supported by County funds.

The savings deposits at the Gwinn Bank have only decreased a few thousand dollars as most of the unemployed were not depositors.

The feeling in the district is one of hope that employment conditions in general will improve in 1932, but there is universal regret by the people that must move away at leaving Gwinn as they like the town and the community life.

A local organization has been perfected to investigate applications for relief and prevent actual suffering. It is planned to keep in touch with this committee so that if necessary some relief for former employees can be given by the Company.

The number of pupils enrolled in the public schools increased in 1931 in spite of a number of families leaving the district. All children above the 3rd grade are brought by busses to the high school building in Gwinn. Expense of operating the schools is showing a gratifying decrease due to concentration of pupils and closing of four grade school houses in the township.

a. STATEMENT SHOWING TOTAL ORE PRODUCED FROM 1903 TO 1931 INCLUSIVE:

<u>YEAR</u>	<u>AUSTIN</u>	<u>PRINCETON</u>	<u>STEPHENSON</u>	<u>GWINN</u>	<u>FRANCIS</u>	<u>GARDNER- MACKINAW</u>	<u>TOTAL</u>
Total							
to							
1/1/31	1,582,616	1,584,333	3,792,429	988,665	522,602	534,407	9,005,052
1931	0	0	6,461	0	0	79,439	85,900
Total	1,582,616	1,584,333	3,798,890	988,665	522,602	613,846	9,090,952

b. STATEMENT SHOWING TOTAL ORE SHIPMENTS FROM 1905 TO 1931 INCLUSIVE:

<u>YEAR</u>	<u>AUSTIN</u>	<u>PRINCETON</u>	<u>STEPHENSON</u>	<u>GWINN</u>	<u>FRANCIS</u>	<u>GARDNER- MACKINAW</u>	<u>TOTAL</u>
Total							
to							
1/1/31	1,589,018	1,445,555	3,653,463	988,325	315,693	427,617	8,419,671
1931	0	7,891	24,623	0	9,233	18,871	60,618
Total	1,589,018	1,453,446	3,678,086	988,325	324,926	446,488	8,480,289

GWINN DISTRICT MINES
ANNUAL REPORT
YEAR 1931

1. GENERAL: (Cont)c. STATEMENT SHOWING ORE IN STOCK AT CLOSE OF 1930 AND 1931:

YEAR	AUSTIN	PRINCETON	STEPHENSON	GWINN	FRANCIS	GARDNER-	TOTAL
						MACKINAW	
Jan.1,1931	0	138,778	155,656	0	206,909	106,790	608,133
Jan.1,1932	0	130,887	137,494	0	197,676	167,358	633,415

5. LABOR AND WAGES:

The number of men employed in the district by The Cleveland-Cliffs Iron Co. increased due to staggering employment in the latter half of the year. In December there were 130 names on the payroll, a few work one day per week, the balance two days.

Wages were reduced 10% on October 1st; this was the first change in wage schedules since May 1st, 1923, when there was a 10% increase.

10. TAXES:

The following statement shows taxes in detail for the two years for all property in the district except mines, where the totals only are shown in the summary, as the detail of taxes for each mine is shown in the report on the mine. The total tax, Cliffs Power & Light Company, is also included in the summary in order to show total tax paid by The Cleveland-Cliffs Iron Company in Forsyth Township.

Description	1931		1930	
	Valuation	Taxes	Valuation	Taxes
<u>Mineral Lands Gwinn Fee:</u>				
Lots 1, 2 & 3, Sec. 36-45-25 - 52 Acres	100	3.75	100	3.90
" 7, 8 & 9, " - 98.92 "	200	7.54	200	7.73
" 11, " - 13.2 "	20	.75	20	.80
NW $\frac{1}{4}$ of Sec. 35-45-25 -160 "	320	12.02	320	12.37
N $\frac{1}{2}$ of NE $\frac{1}{2}$ Sec. 34-45-25 - 80 "	160	6.01	160	6.18
SE $\frac{1}{2}$ of NE $\frac{1}{2}$ " - 40 "	80	3.02	80	3.09
NE $\frac{1}{4}$ of NW $\frac{1}{4}$ " - 40 "	80	3.02	80	3.09
NE $\frac{1}{4}$ of SE $\frac{1}{4}$ " - 40 "	80	3.02	80	3.09
S $\frac{1}{2}$ of NE $\frac{1}{2}$ Sec. 28-45-25 - 80 "	130	4.88	130	5.03
NE $\frac{1}{4}$ of SE $\frac{1}{4}$ " - 40 "	600	22.55	600	23.17
NW $\frac{1}{4}$ of SE $\frac{1}{4}$ Sec. 27-45-25 - 40 "	80	3.02	80	3.09
S $\frac{1}{2}$ of SE $\frac{1}{2}$ " - 80 "	160	6.01	160	6.18
SW $\frac{1}{4}$ of SW $\frac{1}{4}$ Sec. 26-45-25 - 40 "	80	3.02	80	3.09
S $\frac{1}{2}$ of N $\frac{1}{2}$ Sec. 22-45-25 -160 "	500	18.80	500	19.34
N $\frac{1}{2}$ of NW $\frac{1}{4}$ Sec. 22-45-26 - 87.08 "	90	3.38	90	3.49
NE $\frac{1}{4}$ Sec. 2-45-26 -165.61 "	190	7.14	190	7.35
Total	2,870	107.93	2,870	110.99
Collection Fees		1.08		1.11
Total Taxes		109.01		112.10
Adjustment with C. & N. W.		-		44.45
Total		109.01		156.55
<u>Gwinn Townsite - Surface Only:</u>				
NE $\frac{1}{4}$ of NW $\frac{1}{4}$, Sec. 21-45-25, 27.40 Acres	150	5.64	150	5.77
Part of S $\frac{1}{2}$ of NW $\frac{1}{4}$ Sec. 21-45-25 not included in Gwinn Plat, 25.01 acres	200	7.51	200	7.74
E $\frac{1}{2}$ of SE $\frac{1}{4}$ Sec. 21-45-25, 65.84 Acres	400	15.05	400	15.46
Part of W $\frac{1}{2}$ of SE $\frac{1}{4}$ Sec. 21-45-25 not included in Gwinn Plat, 36.80 acres	300	11.30	300	11.60

GWINN DISTRICT MINES
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10. TAXES: (Cont)

	<u>1 9 3 1</u>		<u>1 9 3 0</u>	
<u>Gwinn Townsite - Surface Only (Cont)</u>	<u>Valuation</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Taxes</u>
Gwinn Townsite Plat	96,185	3,617.56	102,185	3,949.75
Part of $W\frac{1}{2}$ of $SE\frac{1}{4}$ Sec. 21-45-25, Superintendent's residence, 1.2 Acres	3,500	131.61	3,500	135.23
$NW\frac{1}{4}$ of $NE\frac{1}{4}$ Sec. 21-45-25, except 5 Acres in Cemetery, 35 Acres	100	3.76	100	3.86
Part of $S\frac{1}{2}$ of $NE\frac{1}{4}$ Sec. 21-45-25, 69.69 Acres	400	15.05	400	15.46
Total	101,235	3,807.48	107,235	4,144.87
Collection Fees		38.08		41.45
Total Current Payment		3,845.56		4,186.32
Lot 4, Block 4, 1927-28-29 for 1930 Amounts				17.03
Lot 16, " 5, Bank, J. Entry	6,000	227.87		
Total	107,235	4,073.43		4,203.35
<u>Gardner-Mackinaw Location</u>				
$N\frac{1}{2}$ of $NE\frac{1}{4}$ Sec. 35-45-25	6,500	244.43	6,500	251.12
Collection Fees		2.44		2.51
Total Taxes		246.87		253.63
<u>District Office and Crusher</u>				
Personal	500	18.99	800	31.21
$N\frac{1}{2}$ of $NW\frac{1}{4}$ Sec. 27-45-25, District Crusher	1,000	37.97	1,000	39.02
Total	1,500	56.96	1,800	70.23
Collection Fees		.57		.70
Total Taxes		57.53		70.93
<u>Austin Location</u>				
Part of Lot 5, Sec. 20-45-25	5,000	188.02	5,000	193.15
$NW\frac{1}{4}$ of $SE\frac{1}{4}$ " "	10,000	376.04	10,000	386.30
$NE\frac{1}{4}$ of $SW\frac{1}{4}$ " "	320	12.02	320	12.37
Part of $SW\frac{1}{4}$ of $SE\frac{1}{4}$ Sec. 20-45-25	30	1.12	300	11.60
Total	15,350	577.20	15,620	603.42
Collection Fees		5.77		6.03
Total Taxes		582.97		609.45
<u>Summary:</u>				
Stephenson Mine	178,660	6,718.34	230,660	8,910.40
Princeton Mine	281,260	10,576.52	281,260	10,865.18
Francis Mine	186,000	6,997.47	271,000	10,471.55
Gardner-Mackinaw Mine	175,200	6,588.21	125,200	4,836.49
Mineral Lands	2,870	107.93	2,870	155.44
Gwinn Townsite	107,235	4,032.49	107,235	4,161.90
Austin Location	15,350	577.20	15,620	603.42
Gardner-Mackinaw Location	6,500	244.43	6,500	251.12
Gwinn District Office and Crusher	1,500	56.96	1,800	70.23
Total C. C. I. Co.	954,575	35,899.55	1,042,145	40,325.73
Collection Fees		359.00		401.91
Total C. C. I. Co.		36,258.55		40,727.64
Less Adjustments	6,000	230.99		64.29
Total Taxes, C. C. I. Co. Mines, etc.	948,575	36,027.56		40,663.35
Cliffs Power & Light Company	103,795	3,903.23	101,280	3,912.39
Cliffs Electric Co.	5,000	188.02	5,000	195.08
Total	108,795	4,091.25	106,280	4,107.47
Collection Fees		40.91		41.07
Total Taxes		4,132.16		4,148.54
Grand Total	1,057,370	40,159.72	1,148,425	44,811.89
Rate		3.7604		3.863

GWINN DISTRICT MINES
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10. TAXES: (Cont)

	<u>Taxes Levied - Forsyth Township</u>			
	<u>1931</u>	<u>1930</u>	<u>1929</u>	<u>1928</u>
State	6,883.97	7,742.15	8,837.14	6,770.27
County	14,112.00	16,180.47	15,619.99	13,341.05
County Road	4,330.45	5,679.86	6,697.18	6,742.11
Contingent (Township)	4,504.14	4,007.74	3,016.00	3,500.00
Highway Improvement	4,327.50	5,009.91	4,008.95	2,000.00
Highway Repair	4,008.76	5,011.13	4,009.25	4,000.00
Library	-	-	100.00	100.00
School and One Mill	31,904.50	36,101.82	38,239.35	40,350.80
Cemetery	-	-	-	500.00
Rejected	<u>Inc in roll</u>			<u>29.24</u>
Total	<u>70,071.32</u>	<u>79,733.08</u>	<u>80,527.86</u>	<u>77,333.47</u>
Amount paid by C. C. I. Company	40,159.72	44,811.89	46,664.44	46,092.40
Percent paid by C. C. I. Company	57.30	56.20	57.96	59.60

The percentage of the total township tax paid by The C. C. I. Co. increased in 1931 but the amount of money paid decreased. The total taxes levied by the township decreased 12% in 1931; the main decreases were in State, County, County Road, and School taxes. The valuation of personal property in the township is decreasing each year due to shipment of ore in stock from the idle mines.

16. WATER SUPPLY:

During the summer months heavy charges of chlorine gas were necessary to make the water safe for use. The chlorinator was out of commission for a few days and it was necessary to get a maintenance engineer from the factory to overhaul it. Analysis of water samples are made weekly at the State Laboratory at Houghton and monthly reports have been sent each month to the Department of Health at Lansing. By regulation of the amount of chlorine gas it has been possible to keep the water supply safe for use at all times.

Considerable expense was incurred during the year in repairing the wood water mains. Many sections of the wood pipe have rotted; steel clamps are used where possible but in quite a few places the wood pipe was cut out and replaced with steel pipe. It is hoped that the water mains will last for the life of the town but undoubtedly many sections will have to be replaced. The cost for repairs was lower than in the previous year but there were more small repair jobs and less replacement of extensive sections of pipe.

The following table gives the cost of operating the pump station in 1931 and 1930:

	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
General Expense	56.55	52.62	3.93	
Maintenance Labor	651.13	1,018.77		367.64
Maintenance Supplies	90.64	648.52		557.88
Operating Labor	1,773.29	1,727.48	45.81	
Operating Supplies	3,885.79	4,325.34		439.55
Total	<u>6,457.40</u>	<u>7,772.73</u>		<u>1,315.33</u>
Cost per 1000 gallons	.027	.029		.002
Gallons of water pumped	240,460,000	262,080,000		21,620,000

GWINN DISTRICT MINES
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16. WATER SUPPLY: (Cont)

The 1931 and 1930 operating costs were charged off as follows:

	<u>1931</u>	<u>1930</u>	<u>Decrease</u>
C. C. I. Co. Mines	33.00	147.00	114.00
Gwinn Townsite Expense	3,867.33	4,081.16	213.83
Water Service Accts. Recv.	<u>2,557.07</u>	<u>3,544.57</u>	<u>987.50</u>
Total	6,457.40	7,772.73	1,315.33

Water Service Accounts Receivable decreased due to the Archibald Mine only operating three months in 1931.

17. CONDITION OF
PREMISES:

Gwinn Townsite:

The town was kept clean and in good condition at township expense. Prizes for the best kept premises and vegetable gardens were awarded by the Company and many tenants competed. It was a favorable year due to frequent rains and in 15 years as Superintendent I have never seen as many attractive yards and good vegetable gardens.

Expense for repair of rented houses was kept down to a minimum, only absolutely necessary repairs being made. A few new roofs, new sills and posts under several houses, new porches and steps, covered the main repairs. The cost of repairs and rents collected are shown for the years 1931 and 1930:

	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
Cost of repairs	2,925.51	7,587.12		4,661.61
Rent Income	<u>13,150.05</u>	<u>14,560.12</u>		<u>1,410.07</u>
Excess rents over repair cost	10,224.54	6,973.00	3,251.54	

Austin Location:

The alleys in this location were cleaned several times during the summer at Company expense. There were less houses occupied in 1931 and more will be vacated each year. It is doubtful if this location will be used again to any extent even after the Princeton Mine reopens so very few repairs are being made.

	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
Cost of repairs	348.94	535.59		186.65
Rent Income	<u>2,654.00</u>	<u>3,545.50</u>		<u>891.50</u>
Excess rents over repair cost	2,305.06	3,009.91		704.85

Princeton Location:

This location is cleaned at Township expense. Only four houses out of fourteen owned by the Company were vacant in 1931. The old Princeton boarding house, unoccupied for over 12 years, was sold and dismantled last Fall. Repairs were kept down to a low figure.

	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
Cost of Repairs	209.67	260.04		50.37
Rent Income	<u>694.75</u>	<u>781.00</u>		<u>86.25</u>
Excess rents over repair cost	485.08	520.96		35.88

GWINN DISTRICT MINES
ANNUAL REPORT
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17. CONDITION OF PREMISES:

Gardner-Mackinaw Location:

This location was kept clean at Company expense. Only 11 houses were occupied in 1931 and 40 were vacant. The vacant houses should be sold as soon as conditions warrant as they are deteriorating rapidly due to being unoccupied for many years.

	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
Cost of Repairs	170.50*	716.46*		545.96
Rent Income	885.55	1,300.00		414.45
Excess rents over repair cost	715.05	583.54	131.51	

* Includes sewer repairs and fire protection expense.

19. GWINN ASSOCIATION:

GWINN HOTEL:

GWINN COUNTY PARK:

a. Gwinn Association:

The Gwinn Association finished a trying year with a small amount of funds in the treasury. Income was reduced due to curtailed operation of the Archibald Mine, also after the 10% reduction in wages on October 1st, and the two days per week operating schedule effective November 16th, the dues of Company employees were reduced from 50¢ to 25¢ per month. Total income from all sources has been reduced about \$100.00 per month; this has been partly offset by reducing the operating expense and a donation of 25¢ per month from the Company for each employee in the district. It is hoped to maintain practically all the activities during 1932 for they are needed now more than ever to provide recreation for the idle men. "Keep the club house operating for we depend on it for all our social and recreational life" is the request of every person in the district. The payment of \$2500 per year by the school for use of the club house and its Secretary, E. L. Miller, as instructor in athletics is the main source of income. The Company should, and I hope will, provide any additional amount needed to maintain the Club. Under ordinary conditions a donation of less than \$1000 per year will be sufficient to support all the activities and maintain the buildings.

b. Gwinn Hotel

The hotel operated during 1931 under the same management as in the previous year. It is not a profitable operating unit under present conditions but the Manager is breaking even and will keep it open as long as he does not incur a loss. The building and equipment has been maintained in good condition.

c. Gwinn County Park:

The warm summer made the park very popular and it was used by more people than in any previous year. No additions were made to the facilities in the park as they are adequate until the patronage increases materially. It is a decided asset to the town.

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19. GWINN ASSOCIATION,
GWINN HOTEL, ETC.: (Cont)

e. Company Houses:

The following table shows the number of houses in each location vacant and occupied during 1931 and 1930:

	<u>1931</u>			<u>1930</u>		
	<u>Vacant</u>	<u>Occupied</u>	<u>Total</u>	<u>Vacant</u>	<u>Occupied</u>	<u>Total</u>
Princeton Location	4	10	14 *	5	10	15
Austin Location	34	31	65	31	34	65
Gardner-Mackinaw Location	40	11	51	37	14	51
Gwinn Townsite	22	101	123	11	112	123
Total	100	153	253	84	170	254

* One boarding house in the Princeton Location was sold and dismantled in 1931.

The number of vacant houses increased by 16 due to families leaving the district on account of the closing of the Archibald Mine.

f. Gwinn District Crusher:

Summary of crusher operations for 1931 and 1930:

	<u>1931</u>		<u>1930</u>		<u>Increase</u>		<u>Decrease</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
General Expense	157.81	.007	244.14	.001		.006	86.33	
Maintenance	50.00	.002	310.98	.001		.001	260.98	
Operating	910.51	.039	6,151.93	.029		.010	5,241.42	
Total Optg. Cost	1,118.32	.048	6,707.05	.031		.017	5,588.73	
Switching	214.00	.009	657.50	.003		.006	443.50	
Grand Total	1,332.32	.057	7,364.85	.034		.023	6,032.23	
Tons Crushed	23,123		214,887				191,764	

Operating expense increased \$.017 in 1931 due to small tonnage crushed and intermittent operating. The decrease in tons crushed was 191,764 tons or approximately 90%. The maintenance cost for both years was low.

The following table shows the grade and tons of ore crushed:

<u>Grade</u>	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
	<u>Tons</u>	<u>Tons</u>		
Stephenson	3,229	3,704		475
Gardner-Mackinaw	18,871	60,385		41,514
Francis	-	3,838		3,838
Total C. C. I. Co.	22,100	67,927		45,827
Archibald	1,023	93,782		92,759
Junior	-	9,905		9,905
Foundry	-	42,002		42,002
Roberts	-	1,271		1,271
Total Others	1,023	146,960		145,937
Grand Total	23,123	214,887		191,764

	<u>1931</u>	<u>1930</u>
Average tons crushed per day	1,445.19	1,557.15
No. Days Operated	16	138
Shifts and Hours	1 8-hr	1 9-hr
Rated capacity per 10-hour shift	1,000	1,000

STEPHENSON MINE
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1. GENERAL:

This mine was abandoned in 1927. The only structures remaining on the property at the end of the year were the engine and boiler house and the shaft house.

2. PRODUCTION,
SHIPMENTS &
INVENTORIES:b. Shipments:

<u>Grade of Ore</u>	<u>1931</u> <u>Stockpile</u> <u>Tons</u>	<u>1930</u> <u>Stockpile</u> <u>Tons</u>
Stephenson Lease - Sec. 20		
1. Stephenson	6,461 (1)	14,348 (1)
2. Stephenwood	<u>18,162</u>	<u>28,753</u>
Total Stephenson Lease	24,623	43,101
 C. & N. W. Ry. Co. Lease - Sec. 29		
1. Northdale	-	9,405 (2)
2. Northwood	<u>-</u>	<u>15,847</u>
Total C. & N. W. Ry. Co. Lease	-	25,252
 Grand Total	24,623	68,353
Decrease in Shipments - 1931	43,730	
(1) Stockpile overrun both years		
(2) 3,523 tons stockpile overrun		

c. Stockpile Inventories:

	<u>1931</u>	<u>1930</u>	<u>Decrease</u>
Stephenson Lease - Sec. 20			
1. Stephenson Ore	-	-	-
2. Stephenwood Ore	<u>114,344</u>	<u>132,506</u>	<u>18,162</u>
Total Stephenson Lease	114,344	132,506	18,162
 C. & N. W. Ry. Co. Lease			
1. Northdale Ore	-	-	-
2. Northwood Ore	<u>23,150</u>	<u>23,150</u>	-
Total C. & N. W. Ry. Co. Lease	23,150	23,150	-
 Grand Total	137,494	155,656	18,162

f. Ore Statement:

	<u>Stephenson Lease</u>		<u>C. & N.W.Ry.Co.</u> <u>Lease, Sec. 29</u>		<u>Total</u>	<u>Total</u> <u>Last</u> <u>Year</u>
	<u>Stephen-</u> <u>son</u>	<u>Stephen-</u> <u>wood</u>	<u>North-</u> <u>dale</u>	<u>North-</u> <u>wood</u>	<u>Total</u>	<u>Total</u> <u>Last</u> <u>Year</u>
On Hand Jan. 1, 1931	-	132,506	-	23,150	155,656	206,138
Output for Year	-	-	-	-	-	-
Total	-	132,506	-	23,150	155,656	206,138
Shipments	6,461	18,162	-	-	24,623	68,353
Overrun	6,461	-	-	-	6,461	17,871
Balance on Hand	-	114,344	-	23,150	137,494	155,656
Decrease in ore on hand					18,162	

The 6,461 tons of Stephenson grade shipped in 1931 was overrun. A total of 26,262 tons of Stephenson and 3,523 tons of Northdale overrun have been shipped since the mine was abandoned July 29, 1927.

STEPHENSON MINE
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3. ANALYSIS:b. Average Analysis on Straight Cargoes:

<u>Grade</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>
Stephenson		All mixed		
Stephenwood		"		
Northdale		"		
Northwood		"		

6. SURFACE:

In 1931 the dry house was dismantled and most of the brick sold, the permanent trestles torn down and the usable material trucked to the Gardner-Mackinaw Mine. The cage hoist is still in the engine house but all the electrical equipment has been moved away and stored. There are a few old pumps stored near the shaft house (worth scrap price only). The top tram shanties must be dismantled next year as the timbers supporting them are rotten. Everything of value will be removed from the property by the time all the ore is shipped.

8. COST OF OPERATING:a. Comparative Mining Costs:

<u>PRODUCT</u>	<u>1931</u>	<u>1930</u>	<u>Decrease</u>
Underground Costs	-	-	-
Surface Costs	1,176.52	1,512.00	335.48
General Mine Accounts	207.45	593.22	385.77
Cost of Production	1,383.97	2,105.22	721.25
Loading & Shipping	1,838.40	5,774.57	3,936.17
Taxes	6,785.52	8,999.50	2,213.98
Track Agreement with E. L. S. Ry.	615.58	1,077.53	461.95
Total Cost at Mine	10,623.47	17,956.82	7,333.35
Estimated Budget Cost at Mine	14,667.00	(Based on shipment 66,000 tons)	

Surface costs were lower due to less expense for watchman.

General Mine Accounts were lower due to less ore shipped, hence less expense for analysis.

Loading & Shipping Expense was much less due to shipping only 24,623 tons this year as compared with 68,353 tons in 1930.

Taxes decreased in 1931 due to less ore in stock when taxes were levied and a slightly lower tax rate.

Royalty to E. L. S. Ry. as per track agreement was less due to decreased shipments in 1931.

10. TAXES:

<u>Description</u>	<u>1931</u>		<u>1930</u>	
	<u>Valuation</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Taxes</u>
$\frac{1}{2}$ of SW $\frac{1}{4}$ Sec. 20-45-25, 80 Acres	3,000	112.83	5,000	193.15
$\frac{1}{2}$ of NW $\frac{1}{4}$ Sec. 29-45-25, 80 Acres	160	6.01	160	6.18
Personal Property	175,500	6,599.50	225,500	8,711.07
Total	178,660	6,718.34	230,660	8,910.40
Collection Fee		67.18		89.10
Total Taxes		6,785.52		8,999.50
Tax Rate per \$100		3.7604		3.863

Taxes lower in 1931 due to less ore in stock and lower tax rate.

PRINCETON MINE
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1. GENERAL:

The stocking trestles at this mine, which were erected 12 years or more ago, were dismantled in the summer. The legs, caps, and stringers were rotted and there was danger that the trestles might fall. Part of the permanent trestles were dismantled and in 1932 this work must be completed. The top tram shanty must be removed next year. The shaft house is also in bad condition and will soon have to be torn down. It is planned to replace it with a steel shaft house when the mine reopens.

2. PRODUCTION,
SHIPMENTS &
INVENTORIES:

b. Shipments:

<u>Grade of Ore</u>	<u>Pocket</u> <u>Tons</u>	<u>Stockpile</u> <u>Tons</u>	<u>Total</u> <u>Tons</u>	<u>Total</u> <u>Last Year</u>
Cambridge	-	7,891	7,891	3,230
Princeport	-	-	-	-
Total	-	7,891	7,891	3,230
Total Last Year			3,230	
Increase 1931			4,661	

This mine has been idle since August 27, 1921.

c. Stockpile Inventories:

The ore by grades in stock December 31, 1931, was as follows:

	<u>1931</u> <u>Tons</u>	<u>1930</u> <u>Tons</u>	<u>Increase</u>	<u>Decrease</u>
Cambridge Ore	106,573	113,557		6,984
Princeport Ore	9,160	9,160		
Sec. 19 Cambridge	13,841	14,748		907 *
Sec. 19 Princeport	1,313	1,313		
Total	130,887	138,778		7,891

* This tonnage was transferred from Sec. 19 Cambridge to Cambridge when shipped in 1931.

f. Ore Statement:

	<u>Prince</u> <u>port</u>	<u>Sec.19</u> <u>Prince</u> <u>port</u>	<u>Cambridge</u>	<u>Sec. 19</u> <u>Cambridge</u>	<u>Total</u>	<u>Total</u> <u>Last Year</u>
On Hand Jan. 1, 1931	9,160	1,313	113,557	14,748	138,778	142,008
Output for Year	-	-	-	-	-	-
Transferred			907	907		
Total	9,160	1,313	114,464	13,841	138,778	142,008
Shipments	-	-	7,891	-	7,891	3,230
Balance on Hand	9,160	1,313	106,573	13,841	130,887	138,778
Decrease in ore on hand					7,891	

3. ANALYSIS:

b. Average Analysis on Straight Cargoes:

<u>Grade</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>
Cambridge		All mixed		

PRINCETON MINE
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4. ESTIMATE OF
ORE RESERVES:

a. Developed Ore

Assumption: 12 cu. ft. equals one ton
10% deduction for rock
10% deduction for loss in mining
Percentage of Bessemer equals 0.

	<u>Prince- port</u>	<u>Cambridge</u>	<u>Sec. 19 Prince- port</u>	<u>Sec. 19 Cambridge</u>	<u>Total</u>
Ore above 2nd level	2,552				2,552
" " 4th "		78,325			78,325
" " 5th "	20,000	58,778			78,778
" " 6th "	60,318	445,694	9,000	57,128	572,140
Total	82,870	582,797	9,000	57,128	731,795

b. Prospective Ore

Ore below 6th level	20,000	418,815	5,000	46,921	490,736
Total Ore - - - - -					1,222,531

c. Estimated Analysis

<u>Grade</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Igni.</u>	<u>Moist</u>
<u>Princeport</u>										
Dried 212°	59.50	.300	7.73	.505	1.214	1.605	1.037	.023	2.235	
Natural	50.60	.256	6.57	.429	1.032	1.365	.882	.020	1.900	15.00
<u>Cambridge</u>										
Dried 212°	59.75	.853	4.42	1.193	.937	3.676	.840	.023	1.447	
Natural	50.80	.725	3.76	1.014	.797	3.125	.714	.020	1.230	15.00

d. Estimated Tonnage as required by State Tax Commission:

Non-Bessemer Ore:

Developed,	1. Princeport	91,870 Tons	
	2. Cambridge	639,925 "	
	Total Developed		731,795 tons
Prospective,	1. Princeport	25,000 "	
	2. Cambridge	465,736 "	
	Total Prospective		490,736 "
Grand Total			1,222,531 "

The above estimates of ore in the mine were made in December 1921.

6. SURFACE:

a. General:

All the stocking trestle and part of the permanent trestle was dismantled. The usable material from the trestles, consisting of parts of a few stringers, was taken to the Gardner-Mackinaw Mine; the balance was burned as it was too badly rotted to even be used for fire wood.

Shipments from stockpile increased in 1931, two small cargoes being loaded by steam shovel for lake shipment. No ore was loaded for shipment all rail to paint manufacturers.

PRINCETON MINE
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YEAR 1931

8. COST OF OPERATING:

a. Comparative Mining Costs:

PRODUCT	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
Underground Costs	6.32	5.05	1.27	
Surface Costs	1,274.34	2,260.92		986.58
General Mine Expense	403.10	151.58	251.52	
Total	1,683.76	2,417.55		733.79
Loading and Shipping	507.34	282.79	224.55	
Taxes	10,682.29	10,974.05		291.76
Obsolete Supplies	-	323.66		323.66
Total Cost at Mine	12,873.39	13,998.05		1,124.66
Budget Cost	17,397.00			

Surface costs were lower due to less expense for policeman and less expense for repairing dry and office buildings.

General Mine expense was higher due to special expense dismantling trestles.

Loading & Shipping was higher due to shipping more ore.

Taxes were slightly lower due to lower tax rate.

10. TAXES:

Description	<u>1 9 3 1</u>		<u>1 9 3 0</u>	
	Valuation	Taxes	Valuation	Taxes
NE $\frac{1}{4}$ of NE $\frac{1}{4}$ Sec. 19-45-25 (C & N W)	10,000	376.04	10,000	386.30
158.27 Acres in Sec. 18-45-25	5,000	188.02	5,000	193.15
160.00 " " NW $\frac{1}{4}$ of Sec. 20-45-25	120,000	4,512.48	120,000	4,635.60
NW $\frac{1}{4}$ of NE $\frac{1}{4}$ Sec. 19-45-25 Location	420	15.80	420	16.26
S $\frac{1}{2}$ of NE $\frac{1}{4}$ " " "	840	31.60	840	32.52
Personal Property	145,000	5,452.58	145,000	5,601.35
Total	281,260	10,576.52	281,260	10,865.18
Collection Fee		105.77		108.87
Total Taxes		10,682.29		10,974.05
Tax Rate per \$100		3.7604		3.863

GARDNER-MACKINAW MINE
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1. GENERAL:

No ore was mined on the Gardner property during the year. Filling of a stope between the 1st and 2nd levels with waste rock from surface was completed in February. No ground movement occurred during the year. Frequent inspections were made of the stopes, main levels, and travelling roads.

The Mackinaw shaft was being sunk at the end of 1930 from the 6th to 7th level. Sinking was completed and the 7th level nearly developed at the end of 1931. Sinking of a winze on the 7th level 200 ft. Northwest of the auxiliary incline shaft was started in August and at the end of the year it was down 160 ft. on an inclination of 45°. It is planned to open the 8th level 150 ft. vertically below the 7th, or 210 ft. on the incline. The ore in the winze is of excellent grade, averaging over 63% iron, about .040 phosphorus, and .450 sulphur. The 7th level has not shown up as much ore as the 6th level and there was no noticeable improvement in the sulphur content. The ore body Southeast of the shaft is narrow, running from 7 ft. to 10 ft. in width for most of its length. Northwest of the shaft the ore is irregular in width, running high in sulphur near the footwall and much lower near the hanging. There is a possibility that the sulphur will decrease with depth to a point that would permit of mixing the ore with other low sulphur ores and thus take full advantage of its good structure, high iron and low phosphorus and silica. As soon as the 8th level is opened it is planned to resume sinking and continue the winze to the bottom of the deposit.

A method of plugging diamond drill holes underground with concrete against water pressures as high as 500 lbs. per square inch was worked out by Wilfred Tousignant, Chief Mechanic in the Gwinn District. During the year every hole that could be located underground was successfully plugged and the incoming water reduced materially. Every deep hole from surface has now been encountered on the lower levels so there will be no further trouble from this source. During the year the water pumped to surface was reduced from a maximum of 454 gallons per minute in March to 251 gallons per minute in December. Some expense was incurred in searching for drill holes at points where there was considerable water; in all but one place this work was successful.

The mine is in good condition for ore production during 1932 as some broken ore remains in the 6th level stopes and quite a large amount has accumulated in the new 7th level stopes.

The safety record that was started in 1928 at this mine was extended in 1931, as no lost time accident occurred during the year. The mine operated 546 days without an accident to May 19th, 1930, since which time it has operated 586 days without an accident. One lost time accident in 1132 days, or in over three years, is an outstanding record in Lake Superior underground mines. This record has only been possible through the efforts of the Captain and shift bosses and whole hearted cooperation of the men.

2. PRODUCTION,
SHIPMENTS &
INVENTORIES:

a. Production by Grades:

	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
Gardner Ore	0	8,028		8,028
Mackinaw Ore	79,439	117,129		37,690
Total Ore	79,439	125,157		45,718
Rock	1,328	4,044		2,716
Total Hoist	80,767	129,201		118,434

Production decreased in 1931 due to mine operating less days.

GARDNER-MACKINAW MINE
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2. PRODUCTION,
SHIPMENTS &
INVENTORIES:

b. Shipments

<u>Grade of Ore</u>	<u>Pocket</u> <u>Tons</u>	<u>Stockpile</u> <u>Tons</u>	<u>Total</u> <u>Tons</u>	<u>Total</u> <u>Last Year</u>
Gardner Ore	0	8,365	8,365	51
Mackinaw Ore	8,998	1,508	10,506	60,334
Total	8,998	9,873	18,871	60,385
Total Last Year	<u>26,531</u>	<u>33,854</u>	<u>60,385</u>	
Decrease 1931	17,533	23,981	41,514	

Shipments continued to decrease, the amount being 41,514 tons decrease in 1931 as compared with 35,013 tons decrease in 1930.

c. Stockpile Inventories:

<u>Grade of Ore</u>	<u>Dec.31,1931</u>	<u>Dec.31,1930</u>	<u>Increase</u>	<u>Decrease</u>
Gardner Ore	24,808	33,173		8,365
Mackinaw Ore	142,550	73,617	60,568	
Total	<u>167,358</u>	<u>106,790</u>	52,203	

Ore in stock at Mackinaw increased due to 49,828 tons less ore shipped in 1931.

d. Division of Product by Levels:

	<u>1931</u>		<u>1930</u>	
	<u>Gardner</u>	<u>Mackinaw</u>	<u>Gardner</u>	<u>Mackinaw</u>
1st Level	0	0	7,006	0
2nd "	0	0	0	439
3rd "	0	0	1,022	2,820
4th "	0	0	0	408
5th "	0	220	0	84,435
6th "	0	52,432	0	29,027
7th "	0	25,613	0	0
Winze	<u>0</u>	<u>1,174</u>	<u>0</u>	<u>0</u>
Total	0	79,439	8,028	117,129
Decrease - 1931	8,028	37,690		

The ore from the 6th and 7th levels is hoisted in the auxiliary shaft and transferred on the 5th level to the main shaft. Production from the 5th level was approximately 85,000 tons in 1930 and 1931. The 6th level product to date is approximately 82,000 tons with probably 8,000 tons of broken ore remaining in the stopes.

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2. PRODUCTION,
SHIPMENTS &
INVENTORIES:

e. Production by Months:

The production by months is as follows:

<u>Month</u>	<u>Gardner</u>	<u>Mackinaw</u>	<u>Total</u>	<u>Rock</u>
January	0	7,681	7,681	867
February	0	7,522	7,522	177
March	0	7,397	7,397	280
April	0	8,832	8,832	0
May	0	7,378	7,378	0
June	0	5,947	5,947	0
July	0	5,963	5,963	0
August	0	6,988	6,988	0
September	0	6,077	6,077	0
October	0	6,346	6,346	4
November	0	4,616	4,616	0
December	0	4,692	4,692	0
Total	0	79,439	79,439	1,328
Transferred from	0	0	0	
Stockpile Overrun	0	0	0	
Total	0	79,439	79,439	1,328
Total 1930	8,028	117,129	125,157	4,044
Decrease	8,028	37,690	45,718	2,716

The product was distributed as follows:

	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
Gardner Ore	-	8,028		8,028
Mackinaw Ore	79,439	117,129		37,690
Total	79,439	125,157		45,718

f. Ore Statement

	<u>Gardner</u>	<u>Mackinaw</u>	<u>Total</u>	<u>Total Last Year</u>
On Hand Jan. 1, 1931	33,173	73,617	106,790	42,018
Product for Year	-	79,439	79,439	125,157
Overrun	-	-	-	-
Transferred from	-	-	-	-
Total	33,173	153,056	186,229	167,175
Shipments	8,365	10,506	18,871	60,385
Balance on Hand	24,808	142,550	167,358	106,790
Decrease in Output	8,028	37,690	45,718	
Increase in ore on hand			60,568	

1931 - One 8-hour shift, 5 days per week, January 1st to May 1st.
 4 " " " May 1st to June 8th
 3 " " " June 8th to November 16th
 2 " " " November 16th to December 31st.
 1930 - One 8-hour shift, 6 days per week, January 1st to July 16th
 5 " " " July 16th to December 31st.

GARDNER-MACKINAW MINE
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2. PRODUCTION, SHIPMENTS & INVENTORIES:

g. Delays:

Week from March 3rd to March 10th no ore hoisted on account of water in auxiliary shaft, loss 1,675 tons.
 April 4th - 2½ hours delay on account of coil burned out on 6th level motor
 " 11th - 2 " " " " " repairing hoists U. G. and Surface
 " 21st - 3½ " " " " " skip in auxiliary shaft off track
 May 18-19 - 16 " " " " " water in auxiliary shaft
 June 15th - 4 " " " " " transformer burned out
 Nov. 12th - 4 " " " " " repairing broken skip runner

The loss in tonnage from all non-electrical delays was 2,475 tons.

h. Delays from Lack of Current:

July 16th - 2 hours delay on account of no current - loss 50 tons
 Sept. 9th - 1½ " " " " " " " - line trouble, loss 50 tons.

3. ANALYSIS:

a. Average Mine Analysis on Output:

<u>Grade</u>	<u>1931</u>			<u>1930</u>		
	<u>Iron</u>	<u>Phos.</u>	<u>Sul.</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sul.</u>
Mackinaw	60.73	.141	.903	60.79	.152	.724

There was not much change in the analysis of output except in percent of sulphur which increased in 1931. The sulphur in stockpile will be decreased by side dumping of low sulphur ore on the pile during the coming year.

b. Average Analysis on Straight Cargoes:

<u>Grade</u>	<u>Mine</u>						<u>Lake Erie</u>		
	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Sul.</u>	<u>Moist</u>	<u>Iron</u>	<u>Phos.</u>	<u>Moist</u>
				None					None

c. High Sulphur Ore:

High sulphur ore was found in large quantities on the 6th and 7th levels Northwest of the auxiliary incline shaft. The ore near the hanging on the 7th level runs lower in sulphur than in corresponding areas on the 6th level, but there was no decrease in the sulphur content of the ore near the footwall. Some high sulphur ore has been hoisted; it, however, came largely from development work on the 7th level. The ore in the winze being sunk below the 7th level runs low in sulphur but only development drifts and crosscuts will reveal the general sulphur content of the ore body at increased depth.

4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:

Assumption: 12 cu. ft. equals one ton
 10% deducted for rock
 10% deducted for loss in mining
 Estimate is of available ore only.

<u>Non-Bessemer:</u>	<u>Gardner</u>	<u>Mackinaw</u>	<u>Total</u>
5th level to 6th level	-	18,115	18,115
6th " " 7th "	-	68,036	68,036
Below 7th level	-	54,540	54,540
Total developed ore Nov. 30, 1931	-	140,691	140,691
Mined December 1931	-	4,692	4,692
Total developed ore Dec. 31, 1931	-	135,999	135,999

GARDNER-MACKINAW MINE
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4. ESTIMATE OF
ORE RESERVES:

a. Developed Ore: (Cont)

This estimate shows an increase over last year's estimate of 76,082 tons, considering the product mined in 1931 due to the development of the 7th level and the ore proved up by sinking the winze below the 7th level. The estimate of available developed ore is 3,357 tons less than a year ago, it does not include the ore left in pillars to support the hanging.

Statement showing ore reserves and new ore development for the following years:

	<u>1927</u>	<u>1928</u>	<u>1929</u>	<u>1930</u>	<u>1931</u>
Ore in mine January 1st	625,425	625,425	439,725	282,785	139,349
Production	-	90,866	117,224	125,157	79,439
Balance	625,425	534,559	322,501	157,628	59,910
Ore in mine December 31st	625,425	439,725	282,785	139,349	135,992
New ore developed	-	- 94,834*	- 39,716**	-18,279#	76,082##

* This decrease in estimate is due to ore pillars that have to be left in mine

** Estimate decreased on account of unavailable ore pillars not reported this year.

Reported 50% of ore unavailable instead of 40%

Increase due to ore proved up on 7th level and below

b. Prospective Ore:

There is no prospective ore estimated.

c. Estimated Analysis:

Ore Reserves: Approximate Expected Natural Analysis:

Developed Ore:

	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Igni.</u>	<u>Moist</u>
Mackinaw	52.90	.126	3.10	.220	1.64	1.88	1.20	.700	2.45	12.50

Ore in Stock: Average Natural Analysis:

	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Igni.</u>	<u>Moist</u>
Gardner	50.94	.096	2.10	.258	1.65	3.06	2.21	.597	4.20	12.50
Mackinaw	53.14	.126	2.80	.206	1.64	1.88	1.08	.722	2.45	12.50

The only change in analysis this year was on account of sulphur which was .075 higher in developed ore and .097 higher in ore in stock.

5. LABOR AND WAGES:

a. Comments:

(1) Labor:

There has been an excess of labor available all year due to the general unemployment situation and locally to the closing of the Archibald Mine which was the only other mine working in the Gwinn District.

(2) New Construction:

Work was done in 1931 on E & A #566 - Sinking Mackinaw Shaft & Developing 6th Level.

This will be taken up in detail under Item 12 - New Construction and Proposed New Construction.

GARDNER-MACKINAW MINE
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5. LABOR AND WAGES:b. Comparative Statement of Wages and Product:

	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
<u>PRODUCT</u>	79,439	125,157		45,716
No. Shifts and Hours	1-8-hr	1-8-hr		
<u>AVERAGE NO. MEN WORKING:</u>				
Surface	20	26		6
Underground	<u>75</u>	<u>68</u>	<u>7</u>	
Total	95	94	1	
<u>AVERAGE WAGES PER DAY:</u>				
Surface	4.47	4.47		
Underground	<u>4.88</u>	<u>5.09</u>		<u>.21</u>
Total	4.78	4.92		.14
<u>AVERAGE WAGES PER MONTH:</u>				
	16 days	23.5 days		7.5
Surface	71.52	105.04		33.52
Underground	<u>78.08</u>	<u>119.61</u>		<u>41.53</u>
Total	76.48	115.62		39.14
<u>PRODUCT PER MAN PER DAY:</u>				
Surface	16.73	19.12		2.39
Underground	<u>5.41</u>	<u>7.03</u>		<u>1.62</u>
Total	4.09	5.14		1.05
<u>LABOR COST PER TON:</u>				
Surface	.267	.234	.033	
Underground	<u>.902</u>	<u>.723</u>	<u>.179</u>	
Total	1.169	.957	.212	
<u>AVERAGE PRODUCT MINING:</u>				
Stopping	10.74	11.65		.91
Ore Development	<u>8.71</u>	<u>9.51</u>		<u>.80</u>
Total	9.88	11.12		1.24
AVERAGE WAGES CONTRACT LABOR	5.08	5.54		.46
<u>TOTAL NUMBER OF DAYS:</u>				
Surface	4,749 $\frac{1}{4}$	6,546		1,796 $\frac{3}{4}$
Underground	<u>14,679$\frac{3}{4}$</u>	<u>17,799</u>		<u>3,119$\frac{1}{4}$</u>
Total	19,429	24,345		4,916
<u>AMOUNT FOR LABOR:</u>				
Surface	21,236.45	29,239.95		8,003.50
Underground	<u>71,604.17</u>	<u>90,512.31</u>		<u>18,908.14</u>
Total	92,840.62	119,752.26		26,911.64
<u>AVERAGE WAGES PER MONTH BASED ON MEN CARRIED ON MINE PAYROLL:</u>				
	<u>18 days per Mo.</u>	<u>13 days per Mo.</u>	<u>9 days per Mo.*</u>	
Surface	80.28	57.85	36.54	
Underground	<u>86.04</u>	<u>65.39</u>	<u>39.24</u>	
Total	84.24	62.66	38.34	

* 10% Reduction in Wages

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5. LABOR AND WAGES:

b. Comparative Statement of Wages and Product: (Cont)

Proportion of Surface to Underground Men:

1931 - 1 to 3.09 - One 8-hour shift,	5 days per week,	Jan. 1st to May 1st
4 " " "	" " "	May 1st to June 8th
3 " " "	" " "	June 8th to Nov. 16th
2 " " "	" " "	Nov. 16th to Dec. 31st
1930 - 1 to 2.61 - One 8-hour shift,	6 days per week,	Jan. 1st to July 16th
5 " " "	" " "	July 16th to Dec. 31st
1929 - 1 to 2.83 - One 8-hour shift,	6 days per week	
1928 - 1 to 2.32 - One 8-hour shift,	6 days per week	
1927 - Mine idle.		

6. SURFACE:

a. Buildings, Repairs:

The sills and posts under the mine office building were repaired in December. Part of the office building was painted.

A new roof was put on the change room at one end of the Captain's office.

b. Stockpiles:

Additional stocking ground was made to the East at the end of the stocking trestle and several cars of sollar plank laid. The old stocking trestle was reerected in the Fall. The legs were standing in the ore pile but the caps, stringers, etc. had been taken down when shipments from the stockpile were underway. Sufficient stocking ground is available for 1932 on basis of present operating schedule. Part of the material for the trestles erected this Fall was obtained by dismantling the trestles at the Gardner Mine.

c. Tracks, Roads, etc.

The road to the mine across the swamp was brought up to grade by filling with rock hauled from the Gardner rock pile. This road settles every year as it is built across a bog hole where the mud is 50 ft. deep.

d. Grounds:

The ground to the East of the shop and office building was leveled and filled with rock and cinders to make a parking place for automobiles. All cars are now parked in this area.

No landscape work has ever been done at this mine.

e. Plugging Surface Diamond Drill Holes:

The work of sinking stand pipes on the line of surface diamond drill holes that intersected the ore body was started in December 1930 and was completed the last of February 1931. Three holes, Nos. 20, 38 & 27, were found and plugged with cement for distances of from 50 to 100 ft in the ledge. The work at holes Nos. 32, 34, 43, 39, 36, 9 and 11, a total of 7, was not successful but at each hole several bags of quick setting cement was pumped down on the ledge in the hope that it might flow to the hole and plug it. The mine water showed a decrease of 50 gallons per minute as a result of this work.

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7. UNDERGROUND:

a. Shaft Sinking (Auxiliary Incline Shaft)

Sinking of the auxiliary shaft in ore was stopped in June 1930, and the 6th level opened. Sinking was resumed in December and at the end of the year the shaft was down 145 ft. on the incline below the 6th level. The inclination at the 6th level was 52° ; 35 ft. below the 6th it was flattened to 45° for 85 ft., then to 42° , which inclination was continued as the shaft was sunk to the 7th level. In January 1931 the shaft was sunk 35 ft. and in February 25 ft. The 7th level was opened at a depth of 174 ft. on the incline or 125 ft. vertically below the 6th level. The shaft was extended 31 ft. below the 7th level for skip pocket and sump. It was sunk partly in the footwall; at the 7th level about two-thirds of the shaft area was in ore. The 7th level plat was then excavated and the shaft pocket installed early in April, there having been over a week's delay in March due to water from diamond drill hole No. 39. The elevation of the 7th level is -88 or 1195 ft. below surface.

b. Development:

General:

Early in the year development of the 6th level was completed and the auxiliary shaft sunk to the 7th level. During the balance of the year a heavy program of work was underway on the 7th level. The main haulage drift was driven to the end of the ore body Southeast of the shaft a distance of 545 ft., and a distance of 515 ft. Northwest of the shaft, making the total length of the ore body 1060 ft. at the end of the year. The Northwest drift is following the hanging; the Northwest extent of the ore body is unknown as drifting on the 6th level was abandoned with high sulphur ore in the breast. During the year there was 2,123 ft. of drifting in ore on main levels and the intermediate sub level, and 3,154 ft. of raising in ore, a total of 5,277 ft., as compared with a total of 4,375 ft. in 1930. The greater part of the raising has been in the area Southeast of the auxiliary shaft in the low sulphur territory.

Winze - 7th Level:

It was decided to sink a winze in ore below the 7th level to develop the ore body at depth and to raise the auxiliary shaft. This work was started in July at a point 200 ft. Northwest of the shaft and, after excavating for an engine house and pockets for handling the ore on the 7th level, sinking was started in August but on account of the reduced operating schedule during the balance of the year the winze was sunk only 160 ft. in ore on an inclination of 45° . It is planned to sink 60 ft. more or 220 ft. on the incline and open the 8th level at a depth of 210 ft. on the incline or 150 ft. vertically below the 7th level. The elevation of the 8th level will be -238 ft. or 1,345 ft. below surface. A drift will be driven to the site of the auxiliary shaft 200 ft. distant, a raise put up and the shaft then stripped and timbered. On the present operating schedule this work will require a full year or all of 1932 to complete. The cost per foot for sinking the winze has averaged about \$18.00, which is very reasonable; it is approximately 8 ft. by 11 ft. in size and contains a ladder and skip road.

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7. UNDERGROUND:

c. Stoping:
General:

There was no ore mined at the Gardner property in 1931; in the previous year the production was only 8,028 tons.

Practically all the ore mined at the Mackinaw came from the 6th and 7th levels. It was hoisted in the auxiliary shaft to the 5th level and transferred to the main shaft. About two-thirds of the year's product came from the stopes above the 6th level, the balance came mainly from the development of the 7th level.

The ore body Southeast of the auxiliary shaft thinned to a width of from 7 ft. to 9 ft. for a length of over 300 ft. on both the 6th and 7th levels. Northwest of the shaft, on both levels, the ore body is much wider but unfortunately runs high in sulphur in some sections.

The mine was in good condition for ore production at the end of the year as stoping had been started over quite an area on the 7th level.

Detail of Stoping:

The following is a detail of stoping operations during the year:

Gardner Mine:

There was no mining done on the Gardner property during the year. At the end of 1930 several stopes between the 1st and 3rd levels were being filled to block ground movements in the upper portion of the mine. After the settlement of the hanging wall and crushing of pillars in stopes Nos. 22, 23, and 25 above the 3rd level late in 1930, the pressure was relieved and all ground movement ceased. However, as an additional precaution, Stope No. 55 between the 1st and 2nd levels was filled with rock from the rock pile on surface at the Gardner shaft. This work was carried on through January and completed in February, after which all equipment used in filling was returned to surface or to use in the Mackinaw Mine.

Mackinaw Mine - 3rd Level:

In May a raise was started in the hanging wall directly over the traveling raise to the 4th level. The purpose of the new raise was to find and then endeavor to plug a diamond drill hole from surface which had been delivering an increasing quantity of surface water into the mine since the ground movement started in this territory. The raise was advanced on a 45° angle 25 ft. from the 3rd level floor normal to the dip of the black slate hanging wall. At this point it was reversed and advanced 65 ft. upward on the dip of the black slate. Then, following the main stream of the water issuing from the side, a drift 25 ft. long was driven to the Northwest at an elevation of +408. The water then came up through the floor of the drift so a second drift was driven to the North and West a distance of 30 ft. at elevation +392 (35' vertically above 3rd level floor). These two drifts were then connected by a short raise that followed the main stream of water. This small raise was then extended some 20 ft. until the water disappeared. Instead of coming in at one place the water spread over the drifts and raises so the attempt was given up in September after driving 90 ft. of rock raise and 55 ft. of small rock drift. The rock that came from the raises and drifts was scraped about 40 ft. to the East into a 4th level stope.

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7. UNDERGROUND:

- c. Stoping: (Cont)
Detail of Stoping: (Cont)

Mackinaw Mine - 5th Level:

In May a diamond drill hole from surface which had been encountered on the Northwest side of No. 10 stope was plugged. The water from this hole ran into the storage raises at the top of the incline shaft and interfered with the loading of cars at the chutes. To reach the hole in safety it was necessary to drive a small connecting drift from the Southeast side of No. 11 stope 25 ft. through the pillar to No. 10 stope at a point about 40 ft. below the 4th level. A staging was then erected to reach the back and the drill hole was successfully plugged.

Stoping operations were completed above this level in 1930, and until the final stage in the life of the mine all future production will be hoisted in the auxiliary shaft and transferred to the Mackinaw shaft on this level.

Mackinaw Mine - 6th Level:

The ore mined between this level and the 5th accounted for two-thirds of the total product for the year. At the beginning of 1931 a total of 940 ft. of drift had been driven in both directions from the incline shaft; Nos. 6, 7, 13, 17 and 18 raises had been started; mining was under way in Nos. 8, 9, 11, 12, 14, 15 and 16 stopes; and the sub level drift 50 ft. on the incline above the 6th level had been driven from Nos. 7 to 19 raises. In September 1931 when operations were discontinued above the level, 185 ft. of additional drift had been driven in the high sulphur ore to the Northwest; Nos. 1-A, 3, 13 and 21 raises had been completed; the stopes up to and including No. 16 were mined through to the 5th level. Stoping in the high sulphur stopes Nos. 17, 18, 19, 20 and 22 in the wide ore body at the Northwest end of the level was temporarily discontinued as only a small quantity of this ore could be mined with the low sulphur ore from other areas. The sub level drift had also been extended the full length of the ore body.

Except for the grade of ore, the results Southeast of the incline shaft continued disappointing. The pinch in the ore body 50 ft. Southeast of the shaft resulted in a stoping thickness of only 7 to 9 ft. in stopes Nos. 4 to 7. A bulge in the hanging wall produced a 25 ft. thickness in Stope No. 2 which was the most productive stope on this side of the shaft. A diamond drill hole was intercepted in this stope 15 ft. below the 5th level. The small flow of water from the hole indicated that it was one of those that had been sealed on surface late in 1930. The extension of the ore body to the Southeast beyond the limits on the 5th level extended only 50 ft. above the 6th level where it pinched out.

The sulphur content of the ore from a point about 250 ft. Northwest of the auxiliary shaft averages above 1%. In the hope of avoiding the high sulphur ore the Northwest drift was extended in 1931 on a line nearer the hanging wall a distance of 185 ft. The physical character of the ore at this end of the mine changed from the usual blue semi-hard hematite to a red ore which is much softer but at the same time stands very well. The sulphur content did not decrease so both the sub level drift and the main drift were stopped with high sulphur ore in the breast. At this point the 6th level drift shows an additional 200 ft. of ore to the Northwest beyond the limit on the 5th level. The thickness of Stopes Nos. 17 to 20 showed a remarkable increase over that on the 5th level, Stope No. 18 disclosing a maximum ore thickness of 65 ft. Because of this great thickness and the softer character of the ore it was decided to mine only every other stope above the sub level drift. There is, therefore, a large reserve of high sulphur ore

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7. UNDERGROUND:

c. Stoping: (Cont)
Detail of Stoping: (Cont)

in Stopes Nos. 17 and 19 which can be mined very cheaply in the future. There is also a tonnage of broken and unbroken high sulphur ore in Stopes Nos. 18 and 20 which will be mined with the lower sulphur ore now being mined South-east of the shaft on the 7th level and the lower sulphur ore it is hoped to find on lower levels.

Sinking of the auxiliary shaft was discontinued in June 1930 to allow production to get well under way from the 6th level. Sinking was resumed in December 1930 and the shaft had reached a depth of 145 ft. on the incline below the 6th level at the end of the year. At this point the shaft was in the footwall jasper even though the shaft had been flattened from 52° at the 5th level to an angle of 42° . In January a drift on the hanging wall side of the shaft was driven into the ore a distance of 25 ft. The drift showed the ore to be dipping at about a 50° angle so sinking was resumed on the 42° angle and the shaft entered ore at a distance of 160 ft. below the 6th level. In February sinking ceased at a depth on the incline of 205 ft. below the 6th level. The advance for the year was 45 ft. in ore and 15 ft. in rock. In the same month the 7th level plat was cut, the floor of this level being 165 ft. on the incline and about 120 ft. vertically below the floor of the 6th level.

Early in March the shaft below the 6th level was flooded by a large flow of water which entered the Southeast side of the shaft at a distance of 100 ft. below the 6th level. Using the skips for bailers lowered the water sufficiently to restore pumping facilities and the search for the diamond drill hole causing this flow started immediately. The first drift to the Southwest from the side of the shaft was driven a distance of 25 ft. at elevation -43.5 at which point the water issued from the floor. A second drift was started at elevation -54 under the same circumstances and the third drift located the drill hole in the jasper hanging wall at elevation -72 at a point 68 ft. Southwest of the side of the shaft. The hole which dipped 25° North 10° East (and which is thought to be No. 47 having a horizontal declination of over 650 ft. at this depth) was sealed off and a concrete dam built in the small drift. About 10 or 15 gallons a minute still issues from this hole through cracks surrounding the dam and another effort will be made in 1932 to seal it completely.

Mackinaw Mine - 7th Level:

This level was cut out at an elevation of 89.5 ft. below sea level (about 120 ft. vertically and 165 ft. on the incline below 6th level) late in the month of February. The Southeast drift was completed early in December with an advance of 545 ft. in ore. The last 90 ft. was an extension or lengthening of the ore over that found on the 6th level but a seam of rock near the hanging wall increased the sulphur content in this section of the drift. The Northwest drift at the end of the year had advanced 515 ft. from the auxiliary shaft. In addition a small test crosscut had been driven 75 ft. to the hanging wall 180 ft. Northwest of the shaft, a 95 ft. drift had been driven parallel with the main drift near the site of the winze, and a 55 ft. drift seeking lower sulphur ore to the hanging wall.

Two surface diamond drill holes were intersected, one 140 ft. Northwest of the shaft, and the other 450 ft. Northwest of the shaft. These holes were sealed with concrete and are the deepest surface holes in ore; there are no more to be encountered as mining proceeds downward in the ore body.

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7. UNDERGROUND:

c. Stoping: (Cont)
Detail of Stoping: (Cont)

Mackinaw Mine - 7th Level (Cont)

In the Southeast drift 6th level conditions repeated themselves on this level. The pinch in the ore body 50 ft. Southeast of the shaft resulted in a stoping thickness of from 7 to 10 ft. along at least a 300 ft. length of the drift. The ore is narrow and hard and runs low in sulphur the same as on the 6th level. At the end of the year Nos. 3, 4, and 5 raises had been started; Nos. 5, 6 and 7 stopes were opened, Nos. 5 and 6 to be carried through as stopes in the narrow thickness of ore without holing a raise to 6th level. Nos. 8 and 9 stopes were nearing completion, the former averaging 15 ft. in thickness and the latter over 20 ft. On this side of the shaft stopes were started on either 50 or 60 ft. centers, allowing a 25 or 30 ft. width stope and the same width pillar. The sub drift was started from a traveling raise 50 ft. on the incline above the level midway between Nos. 8 and 9 stopes and had been advanced 275 ft. at the end of the year with the breast beyond the line of No. 4 stope.

High sulphur ore was found in the Northwest drift within 150 ft. of the auxiliary shaft. A 75 ft. crosscut showed lower sulphur ore nearer the hanging wall so in July the main drift was turned into this ore at a distance 150 ft. Northwest of the shaft. About this time it was decided that instead of interfering with production from the 7th level by sinking the auxiliary shaft it would be advisable to put down a winze in ore for exploration purposes which could then be used to handle the ore coming from the drift to the site of the auxiliary shaft and from raising the shaft from lower levels. Accordingly, the crosscut and hanging wall drift were utilized in starting a winze 11 ft. by 8 ft. in section in the floor of the hanging wall drift at a distance about 200 ft. Northwest of the auxiliary shaft. The end of the crosscut was widened to provide an engine room, and a raise 11 ft. by 8 ft. put up on the line of the winze to provide head room for a skip dump and hoisting sheaves. Meanwhile, the footwall drift was advanced to the Northwest and a raise was extended from this drift to the skip dump to provide a storage pocket. Sinking of the winze was underway in August and at the end of the year it had reached a depth of 160 ft. on the incline below the floor of the 7th level. The raise and first 50 ft. of the winze are on a 50° incline, but below 50 ft. the winze was flattened to 45° to parallel the dip of the ore body. The grade of ore in the winze is excellent, the iron averaging 63%, the phos. below .050%, and the sulphur under .450%. It is planned to cut out the 8th level 150 ft. vertically or about 210 ft. on the incline below the floor of the 7th level.

Fifty feet Northwest of the winze a roll in the footwall turned the Northwest drift so that it encountered the hanging wall within a short distance. This indicated that the winze had fortunately been started in a local widening of the ore body about 100 ft. in length. The Northwest drift was then driven through the bulge in the footwall. The footwall and also a 10 ft. seam of soft red high phosphorus ore again turned the drift towards the hanging wall about 150 ft. farther to the Northwest and at the end of the year, after rounding the corner of the turn, the drift was being advanced in a narrow width of ore under the jasper hanging wall with about 160 ft. to go to reach the same point as the breast of the 6th level drift which had been stopped in high sulphur ore.

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7. UNDERGROUND:

c. Stoping: (Cont)
Detail of Stoping: (Cont)

Mackinaw Mine - 7th Level (Cont)

No. 11 stope, averaging about 25 ft. in thickness, was nearing completion at the end of the year. No. 12 stope had reached the sub drift and averaged about 30 ft. thick. These stopes are on 50 ft. centers, leaving 25 ft. pillars between. The diamond drill hole intersected by the level drift caused the center line of No. 13 stope to be placed 75 ft. Northwest of the line of No. 12 stope. To protect the winze the lines of Nos. 14 and 15 stopes are on 55 ft. centers, and beyond, the lines of Nos. 16, 17 and 18 stopes are on 50 ft. centers. Of these only Nos. 13 and 14 raises had been started at the end of the year (No. 14 raise was inclined toward the hanging wall seeking lower sulphur ore) and the sub level drift to connect these raises was being driven at the end of the year.

At the end of the year mining was underway in seven stopes and work preliminary to stoping had been started in five others. The extent of stoping operations Northwest of the shaft will depend on the sulphur content of the ore, determined by raising. It is hoped that some of the ore will run low enough in sulphur to permit of opening stopes near the hanging in the area Northwest of the winze.

d. Timbering:

The cost per ton for all timber is low at this mine as it is only used on the main levels. It was higher in 1930 due to building bulkheads on the upper levels in the area under pressure. All timbering work in 1931 was confined to the 7th level.

Statement of Timber Used:

	<u>LINEAR</u> <u>FEET</u>	<u>AVG. PRICE</u> <u>PER FT.</u>	<u>AMOUNT</u> <u>1931</u>	<u>AMOUNT</u> <u>1930</u>
8 to 10" Stull Timber	3,205	.030	94.93	126.98
10 " 12" " "	1,473	.047	68.91	745.98
12 " 14" " "	476	.070	33.32	104.65
14 " 16" " "	1,866	.093	173.35	87.73
Total - 1931	7,020	.053	370.51	
Total - 1930				1,065.34
Lagging - 5 ft.	43,138	5.934	256.00	376.42
Poles - 9½ ft.	38,731	6.460	250.16	858.90
Total			506.16	1,235.32
Grand Total			876.67	2,300.66
Product			79,439	125,157
Feet of timber per ton of ore			.00884	.00992
" " lagging " " " "			.05430	.04278
" " " " foot of timber			6.1450	4.3126
" " poles " ton of ore			.04875	.04351
Cost per ton for timber			.0047	.0085
" " " " lagging			.0032	.0030
" " " " poles			.0032	.0069
Total Cost per ton - all timber			.0111	.0184
Equivalent of stull timber to board measure			25.2672	44.6927
Feet of board measure per ton of ore			.00318	.00357

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7. UNDERGROUND:

d. Timbering: (Cont)
Statement of Timber Used: (Cont)

Total Cost for timber, lagging, and poles, and cost per ton:

Year	Amount	Cost per ton
1931	876.67	.0110
1930	2,300.66	.0184
1929	1,722.04	.0147
1928	737.82	.0081

e. Drifting and Raising:

There was an increase in the amount of development work done in 1931, due to completing work on the 6th level at the Northwest end of the ore body and to opening the 7th level.

Year	Drifting		Raising		Total
	Ore	Rock	Ore	Rock	
1931	2,123'	33'	3,154'	-	5,310'
1930	1,775'	16'	2,600'	-	4,391'
Increase	348'	17'	554'	-	919'

f. Explosives, Drilling and Blasting:

The cost per ton for explosives was .053 higher than in 1930, due mainly to more development work in ore, also to more stoping in the narrow section of the ore body where the ore averages from 7 to 9 ft. in thickness. Unfortunately, the wide section of the ore body runs high in sulphur and only a small amount of this ore can be mined; the cost per ton for powder averages much lower in this area. The cost per ton for explosives is much higher during the period a level is being opened by drifts and raises preparatory to stoping operations. On the present working schedule a new level will not be opened in 1932 and costs should average lower.

Statement of Explosives Used: (Ore Development and Stopping)

	Quantity	Average Price	1931 Amount	1930 Amount
Dupont, Extra A, Powder				554.63
40% Gelatin Special	2,500	.1150	287.50	-
50% " "	109,090	.1250	13,630.92	14,158.44
60% " "				1,461.14
Total Powder - 1931	111,590		13,918.42	
Total Powder - 1930	126,010			16,174.21
Fuse	211,565	.6030	1,275.75	1,319.12
Caps - #6	29,600	1.1407	337.67	397.84
Fuse Lighters	1,750	.8153	14.27	-
Tamping Bags	8,000	.2150	17.20	-
Total Fuse, etc.			1,644.89	1,716.96
Total All Explosives			15,563.31	17,891.17
Product			79,439	125,157
Pounds of powder per ton of ore			1.4047	1.006
Tons of ore per pound of powder			.712	.994
Cost per ton - powder			.1752	.1296
" " " - fuse, caps, etc.			.0207	.0137
" " " - all explosives			.1959	.1429

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7. UNDERGROUND:f. Explosives, Drilling and Blasting:Statement of Explosives Used: (Cont)Sinking, Rock Development, etc.

	1931	1930
	<u>Amount</u>	<u>Amount</u>
Total Powder	6.40	37.00
Total Fuse, etc.	1.00	3.00
Total All Explosives	7.40	40.00
Total Explosives used in mine	15,570.71	17,931.17
Average price per lb. for powder	.1247	.1283
97.8% of all powder used in 1931 was 50%		
87.9% " " " " " 1930 " 50%		
8.7 % " " " " " " " 60%		

The following statement shows the cost per ton for explosives, exclusive of rock development, for the years 1930 and 1931 inclusive:

	<u>Cost per ton</u>	<u>Product</u>
1931	.1959	79,439
1930	.1429	125,157

g. Mining & Loading:

Larger pillars are being left in the lower levels of the mine as they provide better protection and also can be removed to better advantage when robbing is started after regular mining operations are completed.

The general dip of the ore body has not flattened as much as was anticipated so that the greater part of the ore still runs to the chutes without scraping.

Scrapers are used to clean out the fine ore on the foot of the stopes, also to load ore over slides into cars on the main levels.

h. Ventilation:

The air has been good in the mine and it was not necessary to use fans. The temperature is somewhat higher on the 6th and 7th levels but not enough to lower efficiency. The system of mining provides for many openings between the levels and there is a constant circulation of the air.

i. Pumping:

The number of gallons pumped per minute during 1931, 1930, and 1929, are shown below:

<u>Month</u>	<u>1931</u>	<u>1930</u>	<u>1929</u>
January	465	100	116
February	419	101	113
March	470	100	111
April	377	126	115
May	332	102	101
June	314	114	104
July	302	104	109
August	273	111	106
September	192	128	109
October	263	180	99
November	260	236	99
December	253	350	99
Total Average	327	142	107

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7. UNDERGROUND:

1. Pumping: (Cont)

Late in 1930 when the ground was settling under heavy pressure in an area above a few stopes on the 2nd and 3rd levels, the mine water increased from slightly above 100 gallons per minute to over 400 gallons. This was due to the settlement of ground opening several diamond drill holes that had been plugged when encountered in mining operations. In addition several holes were encountered on the lower levels of the mine which could not be plugged tightly due to the heavy pressure. The mine mechanic, Wilfred Tousignant, then perfected a device for plugging the drill holes underground against pressures as high as 700 lbs. per square inch. A hole near the 7th level that flowed 100 gallons per minute was plugged in March and from this time on a gradual decrease was made in the water by plugging every hole that could be located in the mine. The device forces concrete into the drill hole against the water pressure and in every case has been successful in entirely sealing off the water. All drill holes in ore in the lower part of the mine have been found and plugged so that no further increase in the mine water is anticipated.

The average number of gallons pumped per minute over the last four years is as follows:

<u>Year</u>	<u>Gals. per minute</u>
1931	327
1930	142
1929	107
1928	150

j. Underground in General:

Ore for another year has been developed on the 7th level and sinking is underway to the 8th level. The lower levels have proven disappointing due to increase in sulphur content in the wide, low cost, stoping areas. There is good reason, based on the results in other districts, to hope that the high sulphur will be confined to a definite horizon, below which the ore will not carry enough sulphur to penalize it. The iron content is increasing with depth and as the physical character remains good the ore would be quite valuable if the sulphur dropped to .100 or lower. As yet there is not any evidence of flattening of the deposit that would indicate the bottom of the trough was being reached. It seems reasonable therefore to assume a life of several years for the property and even longer on a reduced operating schedule.

Conditions at the end of the year were good. The reduced operating schedule does not affect costs at this mine to the extent that it does at all the other soft ore mines where repair expense is a big factor. Expense for overhead, pumping and taxes, are the main items affected by the two day per week schedule at this mine.

The mine is kept clean and neat and the mining standards are observed. The safety record is outstanding due to splendid cooperation of all the employees.

GARDNER-MACKINAW MINE
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8. COST OF OPERATING:

a. Comparative Mining Costs:

	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
PRODUCT	79,439	125,157		45,718
Underground Costs	1.646	1.242	.404	
Surface Costs	.265	.270		.005
General Mine Expenses	.324	.198	.126	
Cost of Production	2.235	1.710	.525	
Depreciation - Plant & Equipt	.447	.448		.001
Development	.626	.626		
Movable Equipt	.006	.003	.003	
Taxes	.084	.039	.045	
Loading and Shipping	.025	.037		.012
Total Cost at Mine	3.423	2.863	.560	
No. of Days Operated	193	282		89
No. Shifts & Hours	1-8-hr	1-8-hr		
Average Daily Product	412	444		32
 <u>COST OF PRODUCTION:</u>				
	<u>1931</u>	<u>%</u>	<u>1930</u>	<u>%</u>
Labor	1.214	54.3	.987	57.8
Supplies	1.021	45.7	.723	42.2
Total	2.235	100.0	1.710	100.0
				<u>Increase</u>
				.227
				.298
				.525

b. Detailed Cost Comparison:

(1) Days and Shifts:

<u>Year</u>	<u>Days Worked</u>	<u>Shifts & Hours</u>	<u>Men Employed</u>	<u>Total Days Worked</u>
1931	193	1-8-hr	95	19,429
1930	282	1-8-hr	94	24,345
Increase			1	
Decrease	89			4,916

(2) Wages:

The mine operated on the same wage scale in 1931 as in 1930 until October 1st when a 10% reduction in wages became effective. The salaried employees received a curtailment of one working day a week with a corresponding decrease in wages on June 16th.

(3) Comparison of Production:

Production - 1931	79,439 tons
Production - 1930	125,157 "
Decrease	45,718 "

(4) Comparison of Number of Men and Wages:

	<u>No. Men</u>	<u>No. Days</u>	<u>Amount</u>	<u>Rate per day</u>
1931	95	19,429	92,840.62	4.78
1930	94	24,345	119,752.26	4.92
Increase	1			
Decrease		4,916	26,911.64	.14

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8. COST OF
OPERATING:

b. Detailed Cost Comparison: (Cont)

(5) Tons per man per day:

The tons of ore mined per man per day were as follows:

	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
Surface	16.73	19.12		2.39
Underground	<u>5.41</u>	<u>7.03</u>		<u>1.62</u>
Total	4.09	5.14		1.05

(6) Cost of Production:

1931	177,494.76	Cost per ton	2.235
1930	<u>213,949.27</u>	" " "	<u>1.710</u>
Increase			.525
Decrease	36,454.51		

	<u>Total Cost</u>				<u>Cost per ton</u>		
	<u>Labor</u>	<u>%</u>	<u>Supplies</u>	<u>%</u>	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>
1931	96,404.32	54.3	81,090.44	45.7	1.214	1.021	2.235
1930	<u>123,506.65</u>	57.8	<u>90,442.61</u>	42.2	.987	.723	1.710
Incr.				3.5	.227	.298	.525
Decr.	27,102.33	3.5	9,352.17				

GARDNER-MACKINAW MINE
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8. COST OF OPERATING:b. Detailed Cost Comparison:(7) Detail of Accounts:

	<u>1931</u>		<u>1930</u>		<u>Increase</u>		<u>Decrease</u>	
Days per week	2-4-5-6		5-6				3-2	
Shifts and Hours	1-8-hr		1-8-hr					
Production, Tons	79,439		125,157				45,718	
Avg. Daily Prod. - Tons	418		444				26	
Number of Days Worked	190		282				92	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
<u>Underground Costs</u>								
1. Exploring in Mine	247.96	.003	523.22	.004			275.26	.001
3. Development in Rock	104.60	.001	144.00	.001			39.40	
4. Development in Ore	29051.44	.366	26535.43	.213	2516.01	.153		
5. Stoping	37656.76	.474	63579.26	.509			25922.50	.035
6. Timbering	6428.66	.081	10325.74	.080		.001	3897.08	
7. Trammig	15556.38	.197	15713.56	.126		.071	157.18	
9. Pumping	19010.86	.239	8843.57	.071	10167.29	.168		
10. Compressors & Air Pipes	10966.39	.138	12013.12	.096		.042	1046.73	
11. Back Filling	1804.64	.022	4977.02	.040			3172.38	.018
12. U. G. Superintendence	4952.21	.062	6384.96	.051		.011	1432.75	
14. Maint:Comp & Power Drls			1370.00	.011			1370.00	.011
16. Elec Tram Equipt	2791.36	.035	4364.86	.035			1573.50	
17. Pumping Machy	2205.05	.028	693.24	.005	1511.81	.023		
Total U. G. Costs	130776.31	1.646	155467.98	1.242		.404	24691.67	
<u>Surface Costs</u>								
18. Hoisting	9038.68	.115	10708.39	.085		.030	1669.71	
19. Stocking Ore	3124.73	.039	6374.02	.052			3249.29	.013
21. Dry House	2406.41	.031	3514.08	.028		.003	1107.67	
22. Gen. Surface Expense	2650.23	.033	3437.39	.027		.006	787.16	
23. Maint: Hoisting Equipt	1980.68	.025	3082.65	.025			1101.97	
24. Shaft	149.32	.002	309.11	.003			159.79	.001
25. Top Tram Equipt	349.76	.004	1411.66	.011			1061.90	.007
26. Docks, Tres. & Pkts	994.79	.012	2751.70	.022			1756.91	.010
27. Mine Buildings	352.17	.004	2179.17	.017			1827.00	.013
Total Surface Costs	21046.77	.265	33768.17	.270			12721.40	.005
<u>General Mine Expenses:</u>								
28. Insurance	396.99	.005	320.69	.002	76.30	.003		
29. Mining Engineering	1686.34	.021	1981.47	.016		.005	295.13	
30. Mech. & Elec. Engrg	565.62	.007	702.95	.005		.002	137.33	
31. Analysis & Grading	1980.12	.025	1566.06	.012	414.06	.013		
32. Personal Injury	2415.41	.030	2966.08	.024		.006	550.67	
33. Safety Department	809.11	.010	874.22	.007		.003	65.11	
34. Tel. & Safety Devices	497.37	.006	520.39	.004		.002	23.02	
35. Local & Gen. Welfare	1667.61	.021	1447.92	.012	119.67	.009		
36. Spec. Exp., Pens. & Allow	4634.53	.059	3825.23	.031	809.30	.028		
37. Ishpeming Office	6183.10	.079	5374.74	.043	808.36	.036		
39. Mine Office	4835.48	.061	5133.37	.042		.019	297.89	
Total Gen. Mine Exp.	25671.68	.324	24713.12	.198	958.56	.126		
COST OF PRODUCTION	177494.76	2.235	213949.27	1.710		.525	36454.51	
40. Taxes	6654.09	.084	4884.86	.039	1769.23	.045		
Total Cost	184148.85	2.319	218834.13	1.749		.570	34685.28	

GARDNER-MACKINAW MINE
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8. COST OF OPERATING:

b. Detailed Cost Comparison: (Cont)
(7) Detail of Accounts: (Cont)

1. Ishpeming Office Charge. (Less time by Geologists at mine)
3. Very little rock work in either 1930 or 1931
4. More development in ore due to completing work on the 6th level and opening the 7th level.

	1931	1930	Increase	Increase in Cost per Ton
Drifting	2123'	1775'	348'	
Raising	3154'	2600'	554'	
Total	5277'	4375'	902'	.153

5. Decrease in cash expenditures due to shortened working schedule. Decrease in cost per ton due to less labor expense - .051 per ton. Supplies increased .016 per ton, making net decrease .035 per ton. There was less ore produced from stoping in 1931 and more ore obtained from development work. One scraper hoist costing \$1,088.00 was purchased in 1931; none were bought in 1930.
6. Decrease in cash expenditures due to shortened working schedule and to less expense for timbering on upper levels. In 1930 considerable expense was incurred in timbering and building timber bulkheads on the 2nd and 3rd levels, Gardner, in the area under pressure.
7. Expense for the two years practically equal. Cost per ton higher in 1931 due to handling all ore produced twice and to less average daily production.
9. Large increase due to more mine water, to expense of trying to plug surface diamond drill holes at ledge and to expense of plugging diamond drill holes underground.

	1931	1930	Increase
Gallons per minute	327	142	185
Cost for power per ton	.127	.032	.095
Labor cost per ton	.070	.019	.051

10. Decrease in cash expenditures due to mine operating on a part time basis. Increase in cost per ton due to more air consumed per ton hoisted on account of less stoping and more development in ore.
11. Less expense for filling stopes in Gardner Mine in the area under pressure. In 1930 several stopes were filled, in 1931 only one.
12. Decrease due to purchase of four drill machines in 1930; none were bought in 1931.

	Sub Division				Cost per Ton	
	1931	1930	Incr.	Decr.	Incr.	Decr.
Locomotives	1543.54	1336.35	207.19		.009	
Wiring	380.62	572.52		191.90		
M. L. Tracks	340.13	1028.64		688.51		.004
M. L. Cars	527.07	1427.35		900.28		.005
Total	2791.36	4364.84		1573.48		

GARDNER-MACKINAW MINE
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8. COST OF OPERATING:

b. Detailed Cost Comparison: (Cont)

(7) Detail of Accounts: (Cont)

16. Two locomotives overhauled in 1931 for the 7th level. Expense in all other accounts decreased due to less trolley wire and rail purchased and fewer cars rebuilt in the shops.
17. Large increase due to installation of additional pumping equipment on account of the increase in mine water. A 1,000 gallon, 1,000 ft. head, centrifugal pump was installed in the main pumping plant on the 4th level; a small centrifugal with automatic equipment was purchased and installed on the 6th level and a No. 10 Cameron air pump on the 7th level.
18. Expense decreased somewhat due to operating on a part time schedule, but all ore was handled twice in 1931, first hoisted in the auxiliary underground shaft and again in the main shaft, whereas in 1930 only one-third of the product was handled twice. Two hoisting plants were in operation throughout 1931, one on surface and one underground.
- | | | | |
|----------------------|-----------|---------|--------|
| Labor Expense - 1931 | \$4262.13 | Per Ton | \$.054 |
| " " - 1930 | 4120.43 | " " | .033 |

19. Less ore stocked in 1931 due to less product. More expense in 1930 for erecting portable trestles.

21. Decrease due to mine operating less days in 1931

22. " " " " " " " " "

	<u>Sub Division</u>		<u>Decrease</u>
	<u>1931</u>	<u>1930</u>	
Electric Hoist	517.64	575.49	57.85
Wire Rope	627.70	839.83	212.13
Skips & Skip Roads	<u>835.34</u>	<u>1667.33</u>	<u>831.99</u>
Total	1980.68	3082.65	1101.97

Decrease due to less repairs to electric hoists, less wire rope charged out, and less repairs to skips and skip roads. One new hoisting rope was charged out in 1931; in 1930 two ropes were charged, also two skips were built for the auxiliary shaft.

24. Decrease due to less replacement of skip guides in Mackinaw shaft.

	<u>Sub Division</u>		<u>Decrease</u>
	<u>1931</u>	<u>1930</u>	
Engines & Motors	99.47	368.76	269.29
Tracks & Cars	236.78	451.88	215.10
Wire Rope	7.99	521.84	513.85
Sheaves & Rollers	<u>5.52</u>	<u>69.18</u>	<u>63.66</u>
Total	349.76	1411.66	1061.90

All maintenance costs lower in 1931 due to mine operating less days. A new top tram rope was purchased in 1930.

GARDNER-MACKINAW MINE
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YEAR 1931

8. COST OF OPERATING:

b. Detailed Cost Comparison: (Cont)
(7) Detail of Accounts: (Cont)

26.	<u>Sub Division</u>		<u>Increase</u>	<u>Decrease</u>
	<u>1931</u>	<u>1930</u>		
Grading & Planking	321.21	1396.88		1075.67
Permanent Trestles	319.39	140.32	179.07	
Portable Trestles	305.11	1180.29		875.18
Pockets, etc.	49.08	34.21	14.87	
Total	994.79	2751.70		1756.91

Less expense for preparing stocking grounds and laying solar plank and for erecting new stocking trestles in 1931.

27.	<u>Sub Division</u>		<u>Increase</u>	<u>Decrease</u>
	<u>1931</u>	<u>1930</u>		
Office	46.45	38.46	7.99	
Warehouse	6.48	20.03		13.55
Shops	101.60	38.63	62.97	
Stable	1.77	12.76		10.99
Shaft House	25.96	20.13	5.83	
Engine House	54.96	42.94	12.02	
Boiler House	31.55	-	31.55	
Dry House	27.56	1837.86		1810.30
Sampler's Shanty	38.60	142.07		105.27
Miscellaneous	19.04	26.29		7.25
Total	352.17	2179.17		1827.00

Expense was high in 1930 on account of remodeling the dry to bring it up to the Company standard, also the sampler's shanty was moved from the Gardner to the Mackinaw shaft and repaired. Expense was normal in 1931 and covered minor repairs to all mine buildings.

29. Expense lower partly on account of less time by engineer at mine due to shortened working schedule, also to salary reduction effective in June.

30. Same as 29.

31. Expense higher on account of more determinations and higher cost per determination. More samples taken underground on account of more development work opening the 7th level.

	<u>No. of Determinations</u>	<u>Cost per Determination</u>
1931	4,662	.20135
1930	3,976	.1535
Increase	686	.04785

32. Decrease due to lower payroll total for year which reduced the 2% reserve and casualty insurance.

33.	<u>Sub Division</u>	
	<u>1931</u>	<u>1930</u>
Salaries of Committees	144.47	51.71
Traveling Expense	.94	25.32
First Aid Supplies & Ish. Salaries	478.39	506.69
Award for Safety Record (flour)	185.31	290.50 (Gold Buttons)
Total	809.11	874.22

Committee expense increased in 1931 on account of more meetings of foremen. Safety awards cost less in 1931.

GARDNER-MACKINAW MINE
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8. COST OF
OPERATING:

b. Detailed Cost Comparison: (Cont)
(7) Detail of Accounts: (Cont)

34.	<u>Sub Division</u>	
	<u>1931</u>	<u>1930</u>
Lighting Shaft & Levels	382.54	413.05
Mine Telephones	<u>114.83</u>	<u>107.34</u>
Total	497.37	520.39

Based on cost per operating day there was more expense in 1931 for lighting levels on account of opening a new level. Mine telephone expense increased for same reason

39. Decrease due to salary adjustment to five day working schedule effective June 15th.
40. Taxes increased due to more ore in stock on April 13th, 1931, than on same day in the previous year.

The following statement shows a comparison of the supplies used per operating day in the first five months of 1931 as compared with the last seven months:

	<u>1st 5 Months</u>	<u>Last 7 Months</u>	<u>Increase</u>	<u>Decrease</u>
	<u>1931</u>	<u>1931</u>		
No. of Days Operated	105	88		
Gen. Supplies per day	25.89	23.19		2.70
Iron & Steel	4.50	3.78		.72
Oil & Grease	5.07	4.41		.66
Machinery Supplies	23.76	24.73	.97	
Explosives	89.10	71.76		17.34
Lumber & Timber	11.89	11.14		.74
Fuel	5.68	4.58		1.10
Electric Power	176.18	155.18		21.00
Sundries	18.48	9.65		8.83
Total	<u>337.70</u>	<u>294.42</u>		<u>43.28</u>

This mine reduced the supply cost per operating day in the last seven months of the year. In eight out of nine divisions the reduction was due to economies and elimination of waste. The mine is small, employing only about 95 men so that close supervision was possible.

9. EXPLORATIONS
AND
FUTURE
EXPLORATIONS:

There was no diamond drilling at the mine during the year.

GARDNER-MACKINAW MINE
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10. TAXES:

<u>Description</u>	<u>1 9 3 1</u>		<u>1 9 3 0</u>	
	<u>Valuation</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Taxes</u>
C. & N. W. Lease, Gardner:				
SE $\frac{1}{4}$ of SE $\frac{1}{4}$ Sec. 35-45-25	5,000	188.02	7,000	270.41
NW $\frac{1}{4}$ of NE $\frac{1}{4}$ Sec. 2-45-25	200	7.51	200	7.74
Personal Property	155,000	5,828.62	90,000	3,476.70
Total	160,200	6,024.15	97,200	3,754.85
Collection Fee		60.24		37.55
Total Taxes		6,084.39		3,792.40
D. M. & M. Lease, Mackinaw:				
N $\frac{1}{2}$ of SE $\frac{1}{4}$ & SW $\frac{1}{4}$ of SE $\frac{1}{4}$ Sec. 35-45-25	15,000	564.06	28,000	1,081.64
Collection Fee		5.64		10.82
Total Taxes		569.70		1,092.46
Gardner-Mackinaw Dwellings	6,500	244.43	6,500	251.12
Collection Fee		2.44		2.51
Total Taxes		246.87		253.63
Total Taxes - Gardner-Mackinaw Mine and Location	181,700	6,900.96	131,700	5,138.49
Increase - 1931		1,762.47		
Tax Rate per \$100		3.7604		3.863

Taxes increased in 1931 due to more ore in stock. The valuation of the ore in the two properties was decreased \$15,000. Valuation in both years was nominal.

11. ACCIDENTS
AND
PERSONAL
INJURY:

The following table shows the classification of accidents for the years 1931, 1930, and 1929:

	<u>1931</u>	<u>1930</u>	<u>1929</u>
Fatal	-	-	-
Time Lost - Over 4 months	-	1	-
" " - 1 to 4 months	-	-	-
" " - Less than 1 month	-	-	-
Total accidents	-	1	-
Number of cases paid compensation for accidents prior to January 1, 1931	-	1	-
Number of cases being paid difference in wages	-	-	-

No lost time accident in 1931. Record at end of year is 587 days. On surface the record lacked three days of 4 years with no lost time accident. Only one lost time accident in 1132 days or in 3 years 2 months. If no accident occurs, on May 20th, 1932, the mine will have a record of two full years.

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12. NEW
CONSTRUCTION
AND
PROPOSED NEW
CONSTRUCTION:

E. & A. #566 - Sinking Mackinaw Shaft & Developing 6th Level:

Total Estimate	\$82,280.00
Total unexpended balance Jan. 1, 1931	53,457.46
Total expenditures in 1931	18,935.07
Total unexpended balance Jan. 1, 1932	34,522.39

Detail:

Sinking Shaft:

Total Estimate	35,000.00
Total expended to Jan. 1, 1931	22,125.66
Total expenditures in 1931	3,856.34
Total unexpended balance Jan. 1, 1932	9,018.00

Covers cost of sinking auxiliary shaft to the 7th level.

Plat & Pocket:

Total Estimate	4,000.00
" expenditures to Jan. 1, 1931	1,982.55
" " in 1931	2,179.72
" unexpended balance Jan. 1, 1932	-162.37

Covers cost of cutting the plat and building pocket on the 7th level.

Pump House & Sump:

Total Estimate	5,000.00
No expenditures to Jan. 1, 1932.	

Pumping Equipment:

Total Estimate	8,000.00
" expenditures in 1931	455.19
" unexpended balance Jan. 1, 1932	7,544.81

Covers expense in connection with installation of an electric pump on 6th level and a No. 10 Cameron air pump on the 7th level.

Drifting 1100'

Total Estimate	19,800.00
" expenditures to Jan. 1, 1931	2,108.72
" " in 1931	4,920.11
" unexpended balance Jan. 1, 1932	12,771.17

Expenditures were for drifting on the 7th level, mainly in connection with sinking a winze to the 8th level.

Equipment:

Total Estimate	3,000.00
" expenditures to Jan. 1, 1931	2,605.61
" " in 1931	20.00
" unexpended balance Jan. 1, 1932	374.39

Small expense for equipment in 1931.

GARDNER-MACKINAW MINE
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12. NEW
CONSTRUCTION
AND
PROPOSED NEW
CONSTRUCTION:

E. & A. #566 - Sinking Mackinaw Shaft & Developing 6th Level: (Cont)

Contingencies:

Total at 10%	7,480.00
" expenditures in 1931	7,539.71
" unexpended balance Jan. 1, 1932	-59.71

Expenditures in this account cover cost of preparation and sinking of winze in ore below the 7th level. The winze is 200 ft. from the auxiliary shaft. The 8th level will be opened 150 ft. vertically below the 7th level, a drift driven to the line of the auxiliary shaft, and the shaft raised to connect with the present bottom 30 ft. below the 7th level. The winze was down 160 ft. on the incline at the end of the year, with 50 ft. to sink to reach the elevation of the 8th level.

13. EQUIPMENT
AND
PROPOSED
EQUIPMENT:

a. Steam Shovels:

Necessary repairs were made to No. 3 and No. 8 steam shovels during the winter at the Gardner-Mackinaw Mine. Owing to small tonnage loaded last summer, repairs will be light this winter.

b. Stockpile Trestles:

Wooden Trestle:

The trestle erected in 1931 was not quite filled at the end of the year. The partly dismantled trestle erected in 1929 and 1930 was reassembled last Fall, which on the reduced working schedule will provide stocking room for this winter's hoist. Trestle timber was framed for an extension of this trestle, which will be erected next summer if shipments continue below normal.

c. Scraper Hoists:

<u>Company</u>	<u>On Hand</u> <u>1/1/1931</u>	<u>Purchased</u> <u>1931</u>	<u>On Hand</u> <u>1/1/1932</u>
Ingersoll-Rand Air	6	-	6
Sullivan Air	3	-	3
" 10 H. P. Electric	1	-	1
" 20 " "	-	1	1
Total	<u>10</u>	<u>1</u>	<u>11</u>

There was only one scraper hoist purchased in 1931. It was a 20 h. p. Sullivan electric, to provide a more powerful and speedier machine which was needed for certain operations.

d. Pumping Equipment:

A 1,000 gallon, 1,000 cu. ft. head, centrifugal pump was installed in the 4th level pumphouse as a spare to use in case of an accident to the plunger pump.

A small centrifugal was installed on the 6th level to pump 125 ft. to the 5th level and a No. 10 Cameron on the 7th level to pump to the 6th.

There is only a small amount of water in the lower levels of the mine as most of it is caught on the 4th level. The water encountered for brief periods on the lower levels from diamond drill holes required considerable pumping equipment until the drill holes were plugged.

GARDNER-MACKINAW MINE
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YEAR 1931

13. EQUIPMENT
AND
PROPOSED
EQUIPMENT: (Cont)

e. Hoisting Equipment:

A small geared electric hoist was installed on the 7th level for sinking the winze. This hoist originally belonged to the Gwinn Mine.

14. MAINTENANCE
AND REPAIRS:

There was no extraordinary maintenance or repair expense in 1931.

15. POWER:

Electric power was furnished by the Cliffs Power & Light Company, a subsidiary of The Cleveland-Cliffs Iron Co. The charge for power was 1³⁴/₁₀₀ per k. w. hour, the same as last year.

The following statement shows a comparison of the detail of the power cost for the years 1931 and 1930:

	<u>K.W.H. Used</u>		<u>Increase</u>	<u>Decrease</u>	<u>Remarks</u>
	<u>1931</u>	<u>1930</u>			
Gardner Hoist	22,950	30,670		7,720	Acct. filling Gardner stopes
Mackinaw Hoist	215,340	298,790		83,450	Less tonnage hoisted in 1931
Compressors	1,087,200	1,381,000		293,800	Mine working part time basis
Compressors - Cooling					
Water Pump	2,440	5,620		3,180	" " " " "
Safety Department	12,918	-	12,918		This exp. for lighting levels, etc. was formerly included with Elec. Haulage.
Electric Haulage	74,046	95,100		21,054	Mine on part time basis
E & A #566 - Winze	14,334	-	14,334		7th Lev. winze started in 1931
Shops	2,954	4,274		1,320	Mine on part time basis
Top Tram - Gardner	-	104		104	Acct. filling Gardner stopes
" " - Mackinaw	1,258	1,310		52	Mine on part time basis
U. G. Hoist	27,760	10,970	16,790		Started hoisting July 16, 1930
Pumping - Quintuplex	568,200	247,400	320,800		More water in mine
" - Triplex	4,700	5,400		700	
" - Automatic	60,690	19,310	41,380		" " " "
" - 4th Lev. Centrif.	23,100	-	23,100		" " " "
" - 5th " "	2,700	-	2,700		" " " "
" - 6th " "	104	-	104		" " " "
4th Level Lights	2,875	-	2,875		
Analysis - Crusher	65	50		15	More samples prepared
" - Drier	13,282	12,000	1,282		" " "
Flood Light - Gardner	-	1,468		1,468	Exp. acct. filling Gardner stopes
" " - Mackinaw	1,214	2,344		1,130	Mine on part time basis
Barn	38	56		18	Team sold in July 1931
Heating Plant	2,234	3,710		1,476	Mine on part time basis
Dry	4,854	8,658		3,804	" " " " "
Office	739	1,234		495	" " " " "
Hoisting - Lights	4,224	7,010		2,786	" " " " "
Timbering	1,440	-	1,440		Formerly included with surface lighting, lights in tbr. tunnel

GARDNER-MACKINAW MINE
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17. CONDITION
OF
PREMISES:

The mine premises were improved by filling in the low swampy ground near the mine buildings to make a parking space for the automobiles used by employees. The grounds are kept clean and neat at all times.

18. NATIONALITY
OF
EMPLOYEES:

This report has been prepared under two statements. The first shows the nationality of the employees as to parentage. The second statement separates the nationalities into "Foreign born" and "American born".

<u>As to parentage</u>	<u>1931</u>	<u>%</u>	<u>1930</u>	<u>%</u>
English	10	7.9	10	7.8
Finnish	46	36.2	48	37.2
Italian	32	25.2	32	24.8
Swedish	17	13.4	16	12.4
French Canadians	16	12.5	14	10.8
Germans	2	1.6	2	1.5
Norwegians	2	1.6	5	3.9
Irish	1	.8	1	.8
Scotch	1	.8	1	.8
Total	127	100.0	129	100.0

<u>As to birth</u>	<u>Total</u>		<u>American born</u>		<u>Foreign born</u>	
	<u>1931</u>	<u>1930</u>	<u>1931</u>	<u>1930</u>	<u>1931</u>	<u>1930</u>
English	10	10	6	6	4	4
Finnish	46	48	17	17	29	31
Italian	32	32	7	7	25	25
Swedish	17	16	10	9	7	7
French Canadians	16	14	11	9	5	5
Germans	2	2	2	2	-	-
Austrians	-	-	-	-	-	-
Norwegians	2	5	1	4	1	1
Irish	1	1	1	1	-	-
Scotch	1	1	1	-	-	1
Total	127	129	56	55	71	74
Percentage			44%	42%	56%	58%

FRANCIS MINE
ANNUAL REPORT
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1. GENERAL:

Conditions at this abandoned mine did not change in 1931. A small amount of ore, only 10% as compared with the previous year, was shipped. Two bents of the permanent trestle, the only ones left standing, were dismantled as they were badly rotted and liable to fall on the C. & N. W. Ry. Co. tracks near the shaft.

2. PRODUCTION,
SHIPMENTS &
INVENTORIES:

b. Shipments:

<u>Grade of Ore</u>	<u>Stockpile</u>	<u>Total</u>	<u>Total Last Year</u>
Franport	9,233	9,233	92,828
Total Last Year		92,828	
Decrease in 1931		83,595	

1931 - Mine abandoned
1930 - " "

c. Stockpile Inventories:

<u>Grade of Ore</u>	<u>1931</u>	<u>1930</u>	<u>Decrease</u>
Franport	197,676	206,909	9,233

f. Ore Statement:

	<u>Franport Tons</u>	<u>Total Tons</u>	<u>Total Last Year</u>
On Hand Jan. 1, 1931	206,909	206,909	299,737
Output for Year	-	-	-
Total	206,909	206,909	299,737
Shipments	9,233	9,233	92,828
Balance on Hand	197,676	197,676	206,909
Decrease in Ore on Hand	9,233	9,233	

3. ANALYSIS:

b. Average Analysis on Straight Cargoes:

<u>Grade</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>
Franport		(All mixed)		

8. COST OF OPERATING:

a. Comparative Mining Costs:

	<u>1931</u>	<u>1930</u>	<u>Decrease</u>
PRODUCT	-	-	-
Underground Costs	-	-	-
Surface Costs	-	-	-
General Mine Expense	53.39	438.91	385.52
Total	53.39	438.91	385.52
Loading & Shipping	412.67	5,549.33	5,136.66
Taxes	7,067.41	10,576.02	3,508.61
Total Cost at Mine	7,533.47	16,564.26	9,030.79
Budget Cost	14,945.00	(Based on shipments of 100,000 tons)	

General Mine Expense was lower in 1931 due to less expense for analysis on account of less ore shipped.

Loading & Shipping Expense was greatly reduced due to shipments of only 9,233 tons as compared with 92,828 tons last year.

FRANCIS MINE
ANNUAL REPORT
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10. TAXES:

<u>Description</u>	<u>1 9 3 1</u>		<u>1 9 3 0</u>	
	<u>Valuation</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Taxes</u>
SW $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 27-45-25, 40 Acres	C & N W	3.12	C & N W	2.81
SW $\frac{1}{4}$ (Ex. R. of W.) " 153.56 "	500	18.81	500	19.34
Personal Property	185,500	6,975.54	270,500	10,449.40
Total	186,000	6,997.47	271,000	10,471.55
Collection Fee		69.97		104.47
Total Taxes		7,067.44		10,576.02
Tax Rate per \$100		3.7604		3.863

Taxes decreased in 1931 due to less ore in stock and slightly lower tax rate.

REPUBLIC MINE
ANNUAL REPORT
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1. GENERAL

Very little transpired at this property during 1931. Captain P. W. Pascoe, Jr. who has been acting as watchman at the Republic property since the mine was closed down in May 1928, was laid off on January 31st, 1931. He has since been given employment at the Morris-Lloyd Mine in Ishpeming.

In August an inspection of the property was made, and it was found that the buildings where the mine equipment was stored, had been broken into and the brass and bronze parts of different machines robbed and some even destroyed.. Arrangements were made immediately to transfer all of the motors and electrical equipment, as well as any supplies of value, to Ishpeming, and store them at the General Storehouse. The other heavy equipment was concentrated in the drill sharpening shop near No. 9 shaft.

Two men were employed during part of September and October in boarding up the windows and doors of the drill sharpening shop and No. 9 Power House more securely. The switchboard in connection with the Republic Water Power Plant is located in the latter building. Two-inch plank, salvaged from one of the mine buildings, was spiked to the windows, and then several pieces of strap iron bolted through to straps on the inside, making it very hard to pry loose these boards and open the windows.

6. SURFACE

a. Buildings

1. Mine Buildings.

The old mine office building has been leased to the American Legion for a club house. This building being occupied, will probably keep people away and protect what little property we have left at Republic.

2. Location Houses.

House No. 47 was sold to John Raher and wife on a monthly contract basis. The sale price was \$400.00

Very few repairs were made to the houses during the year. The Company still owns twenty houses, 13 single and 7 double ones, of which 11 single houses and 4 halves of the double houses were occupied on December 31st, 1931.

10. TAXES

Description	1931		1930	
	VALUATION	TAXES	VALUATION	TAXES
Republic Township				
Realty as Described on Tax Receipt	\$10,000	592.90	10,000	604.70
Personal Property.....	10,000	592.90	10,000	604.70
Lots 71, 72, 86, 108 and 126.....	95	5.75	95	5.77
Total.....	20,095	1,191.55	20,095	1,215.17
Collection Fees.....		11.92		12.15
Total Operating Republic Mine.		1,203.47		1,227.32
Republic Mine Dwellings Incl. Fees	6,950	416.53	8,500	519.75
Total Republic Township.....	27,045	1,620.00	28,595	1,747.07
Rate.....		5.929		6.047

REPUBLIC MINEANNUAL REPORT
YEAR 193110. TAXES (Continued)

There were no changes in the valuation of the Mine Realty and Personal Property. The valuation on the dwellings was reduced by the amount of the houses that were sold. It will be noted that there was a slight decrease in the rate.

SPIES-VIRGIL MINEANNUAL REPORTYEAR 1931.1. GENERAL:

The Spies-Virgil Mine was operated at a normal basis on a five day week, double shift, schedule until May 1st, when due to the general depression in the iron ore industry, the working schedule was reduced to four days a week. On May 25th the mine was placed on half time, working six single shifts instead of three double shifts until November 16th, when the time was further reduced to four single shifts. We have been able to maintain our entire crew, giving each man at least two days per week. The employees appreciate The Cleveland-Cliffs Iron Co.'s continuing to operate at least on a part time schedule when so many mines in the district closed down. They have worked hard and shown an increased efficiency.

On July 29th we started to extend the sixth level Virgil drift onto the Sherwood property. Although only one contract was employed on this work, it helped our operations somewhat and should give the Republic Steel Corporation valuable information at a very much less cost, than if the same work had been done from a shaft on the Sherwood.

We continued with the development of the eighth level and sub-levels above. This work proved up an additional tonnage of merchantable ore. The high sulphur ore does not extend as high above the eighth level at the west end of the fold and the low sulphur ore has been developed to a greater height toward the Virgil-Sherwood line. Stoping was started in this orebody during the year and a larger percentage of the product secured from the eighth level. No connection has been developed between this orebody and the main body below the sixth.

Considering the general condition of the ore market during 1931, the tonnage shipped from the Spies-Virgil was very satisfactory.

SPIES-VIRGIL MINE
ANNUAL REPORT
YEAR 1931.

2. PRODUCTION,
SHIPMENTS &
INVENTORIES:

a. Production by Grades:

<u>Grade</u>	<u>Tons</u>
Virgil Crushed	91,454
Virgil High Sulphur	<u>2,126</u>
Total Virgil	93,580
Rock	721
Sherwood	1,027

The production of 93,580 tons for 1931 compares with 142,827 tons in 1930, a decrease of 49,247 tons, the reduction being due to curtailment. The total production from the Virgil Mine to Jan. 1st, 1932 is 814,219 tons.

b. Shipments:

<u>Grade of Ore</u>	<u>Pocket</u> <u>Tons</u>	<u>Stockpile</u> <u>Tons</u>	<u>Total</u> <u>Tons</u>	<u>Last Year</u> <u>Tons</u>
Virgil Crushed	30,221	49,276	79,497	137,854
Sherwood	<u>1,027</u>	<u> </u>	<u>1,027</u>	<u> </u>
Total	31,248	49,276	80,524	137,854
Total Last Year	<u>71,635</u>	<u>66,219</u>	<u>137,854</u>	<u> </u>
Decrease	40,387	16,943	57,330	<u> </u>

The shipment of Virgil ore for 1931 was 14,083 tons less than the production including the small tonnage from the Sherwood. In comparison to other properties this was very good. The total shipments from the Virgil Mine to January 1st, 1932 were 492,457 tons.

The loading of ore was started as early as April 14th from pocket and the 15th from stockpile and was intermittent throughout the rest of the season. During June the ore loaded from stockpile ran low in iron and high in silica content. Although the daily product was running above the average, we were not hoisting a large enough tonnage to sweeten that from the stockpile. As the shipments from the Iron River District were light, the Chicago and Northwestern Railway Company allowed us to load into cars from pocket, holding the ore at the mine until a boat was named. This allowed us to accumulate a larger tonnage of high grade pocket ore to mix with that from stockpile. It also reduced our loading cost as we did not have to load as large a tonnage from stockpile, which in turn cut the cost of the Railroad Company as there were fewer days requiring a switching crew for stockpile loading.

The small tonnage of Sherwood ore was shipped as Virgil. Except for one cargo all Virgil ore was shipped straight. 6449 tons of Virgil ore was used in a Cambridge mixture.

SPIES-VIRGIL MINE
ANNUAL REPORT
YEAR 1931.

2. PRODUCTION,
SHIPMENTS &
INVENTORIES:
(Continued)

c. Stockpile Inventories:

<u>Grade</u>	<u>Tons in Stock</u>
Virgil Crushed	319,634
Virgil Crushed (High Sulphur)	8,879
Total	328,513

d. Division of Product by Levels:

<u>Level</u>	<u>Tons</u>	<u>Per Cent of Product</u>
Sixth	51,378	54.31
Eighth	43,229	45.69
Total	94,607	100.00

The tonnage hoisted from the sixth level includes the 1027 tons of Sherwood and that from the eighth level includes the 2126 tons of high sulphur ore secured in the raises and development drifts above the eighth level.

It will be noted that the division of product is more evenly distributed than during 1930, when only a little more than 10% was hoisted from the eighth level.

e. Production by Months:

The production by months, days operated, average daily product and tons per man per day are shown in the table below.

<u>Month</u>	<u>Rock Tons</u>	<u>Hi-Sulphur Ore Tons</u>	<u>Virgil Ore Tons</u>	<u>No. Days Opt.</u>	<u>Average Daily Product</u>	<u>Tons Per Man Per Day</u>
January		142	9974	21	482	6.08
February	342		9376	20	469	5.87
March	178	325	10423	22	489	6.12
April	6	737	10561	21	538	6.90
May		744	7190	15	529	6.35
June	39	82	8832	26	343	7.90
July	126		7964	27	295	6.70
August	14	60	6353	26	247	6.36
September	16	36	4887	26	189	5.16
October			6919	27	256	7.11
November			5266	20	263	6.44
December			3709	20	185	4.63
Year	721	2126	91454	271	345	6.33

The Sherwood production of 1027 tons is not included in the above totals.

The product for the first four months until May 1st was about normal and we realized good tons per man. On May 1st the mine was reduced to four days per week, double shift, and then on May 25th to half time, which explains the sudden drop in the tonnage hoisted. On November 16th the working time was further reduced to four single shifts per week, each man working eight or nine days per month.

SPIES-VIRGIL MINE
ANNUAL REPORT
YEAR 1931.

2. PRODUCTION,
SHIPMENTS &
INVENTORIES:
(Continued)

f. Ore Statement:

	Virgil Low Sul.	Virgil Hi-Sul.	Total	Total Last Year
On Hand Jan. 1st, 1931.	307,677	6,753	314,430	309,457
Output for Year	91,454	2,126	93,580	142,827
Total	399,131	8,879	408,010	452,284
Shipments	79,497		79,497	137,854
Balance on Hand, 12-31-31	319,634	8,879	328,513	314,430
Increase in Output	47,635	1,612	49,247	22,336
Increase in Ore on Hand	11,957	2,126	14,083	4,973
1930 - 2-8 Hr. Shifts 6 Days per Week Jan. 1st to July 19th.				
1930 - 2-8 Hr. Shifts 5 Days per Week July 19th to Dec. 31st.				
1931 - 2-8 Hr. Shifts 5 Days per Week to May 1st.				
1931 - 2-8 Hr. Shifts 4 Days per Week May 1st to May 25th.				
1931 - 1-8 Hr. Shift 6 Days per Week May 25th to Nov. 16th.				
1931 - 1-8 Hr. Shift 4 Days per Week Nov. 16th to Dec. 31st.				

g. Delays:

Date	Duration	Tonnage Lost	Cause
Jan. 8	4 Hrs.	150	Coil on larry car burnt out.
Jan. 17	2 "	100	When testing the cage, the safety catches jammed into the runners so tight they could not be replaced until the runners was chopped out. Then a new runner had to be installed.
Feb. 25	3 "	125	Trolley poles breaking on larry car.
Mar. 13	3 "	125	Larry car off track.
Mar. 26	2 "	80	Larry car off track.
Mar. 27	2½ "	100	Slow stocking on account of tracks settling.
Total	16½ "	680	

None of the above delays were of a serious nature. The delays on the top landing during February and March were due to our side dumping from stockpile and the track settling as the frost went out.

h. Delays from Lack of Current:

There were no delays during the entire year due to lack of current.

SPIES-VIRGIL MINE
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YEAR 1931.

3. ANALYSIS:a. Average Mine Analysis on Output:

<u>Grade</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Sul.</u>
Virgil Crushed	58.18	.450	5.75	.091
Virgil Hi-Sulphur	57.86	.405	3.73	.360
Sherwood Crushed	57.47	.646	5.04	.062

b. Average Analysis on Straight Cargoes:

<u>Grade</u>	<u>Tons</u>	<u>Mine</u>			<u>Lake Erie</u>	
		<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Iron</u>	<u>Moist.</u>
Virgil Crushed	74,075	56.97	.397	7.86	57.32	7.23

c. High Sulphur Ore:

All the high sulphur ore mined during 1931 came from the raises and development drifts on the eighth level and -150' and -130' sub-levels above. As the orebody above the eighth level was developed, it was found that the division line between the high and low sulphur areas pitched to the west. At the extreme east end of the orebody the high sulphur ore extended to a point about 15 feet above the -130 foot sub-level, while to the west of the 200 coordinate the -150 foot elevation was the division between the high and low sulphur ore. The -150 foot elevation is laid out for the grizzly sub for the ore to the west of No. 816 Raise. The high sulphur is stockpiled separately and only that encountered in development work and must be mined is hoisted.

d. Average Analysis on Total Shipments:

<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Alum.</u>	<u>Mang.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>
Virgil	79497	57.40	.416	7.15	1.84	.19	.60	.21	.092	6.50
Sherwood	1027	57.80	.660	4.45	2.09	.24	.75	.54	.077	7.35

e. Average Analysis of Ore in Stockpile:

<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Sul.</u>
Virgil	319634	57.58	.401	7.25	.078
Virgil High Sulphur	8879	57.41	.424	4.09	.369

4. ESTIMATE
OF ORE
RESERVES:a. Developed Ore:

Assumption:- 12 cu. ft. equals one ton.
10% deduction for rock.
10% deduction for loss in mining.

	<u>Available</u>	<u>Unavailable</u>	<u>Total</u>
	<u>Tons</u>	<u>Tons</u>	<u>Tons</u>
6th Level and Above	104,520	457,472	561,992
Between 6th & 8th Levels	<u>170,498</u>	<u>95,712</u>	<u>266,210</u>
Total Developed Ore	275,018	553,184	828,202

SPIES-VIRGIL MINE
ANNUAL REPORT
YEAR 1931.

4. ESTIMATE
OF ORE
RESERVES:
(Continued)

b. Prospective Ore:

	<u>Available</u> <u>Tons</u>	<u>Unavailable</u> <u>Tons</u>	<u>Total</u> <u>Tons</u>
Between 6th & 8th Levels	409,151	278,755	687,906
Total All Ore Dec. 31st, 1931.	684,169	831,939	1,516,108
Estimated Reserves Nov. 30th, 1931.			1,516,108
Estimated Reserves, Dec. 31st, 1930.			<u>1,465,629</u>
Increase Over 1930			50,479
Production 1930 to Nov. 30th, 1931.			87,745
Tons Developed During 1931			138,224
Tons Developed Above the 6th Level			24,565
Tons Developed Above the 8th Level			113,659

It will be noted that we have reduced materially the available ore above both the sixth and eighth levels and increased the unavailable tonnage proportionally. This is due to our experience in the course of mining of finding the necessity of leaving a layer of ore of from 10 to 15 feet thick on top of the soft black slates, also larger supporting pillars. In previous estimates of the prospective ore below the sixth level we have taken the entire tonnage as available, while in the 1931 estimate we have figured on leaving several pillars and taken this deduction. We feel our figures are very conservative, but rather be on the safe side until the orebody is developed and the method of mining is definitely decided. We also feel that we will recover a fair percentage of the unavailable ore above the sixth level.

c. Estimated Analysis:

	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Alum.</u>	<u>Mang.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moist.</u>
Dried	57.50	.425	7.00	1.64	.16	.60	.30	.119	7.35	
Natural	51.75	.382	6.30	1.48	.15	.55	.26	.107	6.60	10.00

d. Estimate of Production:

The following is the estimated tonnage and expected analysis of the 1932 production from the Virgil Mine:

<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Sul.</u>	<u>Moist.</u>	<u>Iron Natural</u>
Virgil Cr.	50,000	57.50	.425	7.50	.080	8.00	52.90

SPIES-VIRGIL MINE
ANNUAL REPORT
YEAR 1931.

5. LABOR
AND
WAGES:

a. Comments:

We maintained a steady crew with practically no changes except that two men were forced to quit on account of sickness and one man left to go farming. These men were not replaced, as we wished to curtail production as much as possible. Our men realize fully and appreciate the effort the Company has made to keep the mine operating.

The unemployed situation in Iron County, especially in the Iron River-Stambaugh District, was very critical from April 1st until about October 1st, as so many properties were closed. Several mines resumed operations on a two day week basis October 1st, which has relieved conditions materially.

b. Comparative Statement of Wages and Product:

	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
PRODUCT	93,580	142,827		49,247
NO. SHIFTS & HRS. 5 Mos. 2-8	7 Mos. 1-8	2-8		

AVG. NO. MEN WORKING:

Surface	19	21		2
Underground	51	57		6
Total	70	78		8

AVG. WAGES PER DAY:

Surface	4.40	4.41		.01
Underground	5.30	5.36		.06
Total	5.03	5.08		.05

WAGES PER MO. OF 25 DAYS:

Surface	110.00	110.25		.25
Underground	132.50	134.00		1.50
Total	125.75	127.00		1.25

WAGES PER MO. OF 20 DAYS:

Surface	88.00			
Underground	106.00			
Total	100.60			

WAGES PER MO. OF 16 DAYS:

Surface	70.40			
Underground	84.80			
Total	80.48			

WAGES PER MO. OF 12 DAYS:

Surface	52.80			
Underground	63.60			
Total	60.36			

WAGES PER MO. OF 8 DAYS:

Surface	35.20			
Underground	42.40			
Total	40.24			

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5. LABOR
AND
WAGES:
(Continued)

b. Comparative Statement of Wages and Product: (Continued)

	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
<u>PRODUCTION PER MAN PER DAY:</u>				
Surface	20.80	21.85		1.05
Underground	9.11	8.98	.13	
Total	6.33	6.37		.04
<u>LABOR COST PER TON:</u>				
Surface	.2116	.2018	.0098	
Underground	.5820	.5968		.0148
Total	.7936	.7986		.0050
AVG. PRODUCT BR'K & TRAM.	36.48	35.37	1.11	
AVG. WAGES CONT. MINERS	5.78	6.00		.22
<u>TOTAL NO. OF DAYS:</u>				
Surface	4,499 $\frac{3}{4}$	6,536		2,036 $\frac{1}{4}$
Underground	10,274 $\frac{3}{4}$	15,902		5,627 $\frac{1}{4}$
Total	14,774 $\frac{1}{2}$	22,438		7,663 $\frac{1}{2}$
<u>AMOUNT FOR LABOR:</u>				
Surface	19,803.07	28,827.75		9,024.68
Underground	54,459.15	85,237.05		30,777.90
Total	74,262.22	114,064.80		39,802.58
<u>PROPORTION SURFACE TO UNDERGROUND MEN:</u>				
1931	-	1 to 2.28		
1930	-	1 to 2.43		
1929	-	1 to 2.74		
1928	-	1 to 2.64		
1927	-	1 to 3.08		

6. SURFACE:

a. Building Repairs:

1. Buildings, Mine:

The loading pocket in the shaft house was divided into two compartments during August, so as to handle both Virgil and Sherwood ore. The larger compartment is used to accumulate the Sherwood ore and the Virgil ore is run through the smaller one directly into the railroad car. No difficulty was experienced handling the ore in this manner.

Only minor and most necessary repairs were made to the other mine buildings during the year.

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6. SURFACE:
(Continued)

a. Building Repairs: (Continued)

2. Buildings, Location:

Only minor repairs were made to the location houses the past year. The usual kalsomining and painting which is done by the tenants, with material furnished by the mine, was reduced to a minimum.

The boarding house was completed early in the spring and all the apartments have been occupied. Due to the high rents charged in Iron River, our location houses are always rented.

Larger transformers were installed at the location to handle the load and some changes made in the house and street lighting lines. Some of these were too small for the load they were carrying.

b. Stockpiles:

The ore stockpiled during the winter of 1930-1931 and up to November 1931 was all placed on the pile north of the shaft. The trestle was filled early in March and we started side dumping, fanning the track to the east. When side dumping, an additional man is employed on each shift, besides the time of the entire shop and surface crew for shifting tracks.

We loaded out 49,276 tons from stockpile during 1931, all but a small tonnage coming from the main pile northeast of the shaft. One complete cut was taken and several short ones. The first five bents off the permanent trestle were left standing and were reconditioned and four more added. This will give us sufficient room until early spring at which time more trestle can be erected, if necessary.

7. UNDERGROUND:

b. Development:

Fourth Level:

There was no new development on the fourth level during 1931.

Sixth Level:

The sixth level development was confined entirely to extending the most northerly crosscut to the southwest onto the Sherwood property of the Republic Steel Corporation. One of the stoping gangs, No. 6 contract, was transferred from the stope above the sixth level to this drift on July 27th and started to clean up and get things ready for actual work on August 1st. This drift was extended 38 feet on the Virgil side to the Sherwood line and 19 feet on the Sherwood during August, a total of 57 feet. Progress was slow in starting. The drift was only advanced 15 feet when it struck an old tramway paralleling the boundary, with two chutes in line of the new drift, that had to be blocked and timber caught up. Further the dirt was all loaded by hand. The scraper slide from the eighth level drift was dismantled and set up in the Sherwood drift and ready for operation by the first of September. A 15 horse-power, Ingersoll-Rand hoist is used on this slide.

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7. UNDERGROUND:
(Continued)

b. Development:

Sixth Level: (Continued)

Our blower was moved to a point where the Sherwood drift cut across the drift along the boundary and connected with several feet of Ventube, which improved the ventilation and reduced the time of the miners returning to the breast after blasting. A blower fan was received from the Cambria Mine during September and set up in place of ours. It was only operated 2½ hours when the armature burnt out and it was necessary to re-install the Virgil fan. We understand that the fan from the Cambria had been underground for sometime without being operated and no doubt the armature was damp and the insulation in poor condition.

The Sherwood drift was extended 394 feet from the Virgil-Sherwood line beside advancing a crosscut to the south along the 200 West coordinate 25 feet. Of the 394 feet of drift, the first 111 feet was in merchantable ore and the balance in seams of cherty and black slate. The sulphur content was satisfactory, but the phosphorus was exceptionally high. The analysis of the tonnage mined from this drift, which was shipped as Virgil, was as follows:-

<u>Grade</u>	<u>Tonnage</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Alum.</u>	<u>Mang.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>
Sherwood	1027	57.80	.660	4.45	2.09	.24	.75	.54	.077	7.35

During December a crosscut was started to the south along the 200 West coordinate to reach the ore in the vicinity of Diamond-Drill Hole No. 9, which shows over 100 feet of ore above the sixth level elevation. In order to start this crosscut the main drift was temporarily stopped. As the crosscut is being driven from the Sherwood side, it will mean additional switching and will be slow until the main drift is advanced far enough to switch an entire train. It is estimated that this crosscut will have to be driven at least 200 feet in rock before striking the ore. As soon as it is in far enough a temporary slide will be constructed for handling the rock.

The main drift is being driven on a one half per cent down grade, so as to take care of the drainage toward the Sherwood Shaft. While driving this drift it has been necessary to operate a small air pump. After the operating days were reduced, it was necessary to run the compressor just for this pumping. During December a siphon was installed to drain the water from the Sherwood drift. It is working very well and will reduce the pumping expense.

The 419 feet of drifting done during 1931 cost a total of \$ 7537.28, or \$ 17.99, compared with our estimate of \$ 18.00 per foot. Our estimate, however, was based on the use of a mechanical loader, which we feel would show a saving of at least \$ 1.00 per foot and a full time operation. It must be remembered also that the cost at the start was above the average due to getting the equipment together and the crews organized.

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7. UNDERGROUND:
(Continued)

b. Development: (Continued)

Subs Above Sixth Level:

There was no actual development of any additional ore on the sub-levels above the sixth level.

Eighth Level:

The drift to the northwest was advanced 215 feet to within 8 feet of the Sherwood line. The course of the drift was changed a few degrees to the north, so that raises put up would hole about in the center of the orebody. This drift was in high sulphur ore and seams of slate for 155 feet. Where black slate seams occur between other formations a swelling always takes place, making the ground slabby and heavy. It was necessary from time to time to stop work in the breast and go back and put in lining sets and change legs broken from the side pressure of swelling ground.

The last 60 feet of the drift was in merchantable ore, averaging 62.45 Iron and .080 Sulphur. The dividing line between the high sulphur ore pitches from the east toward the west. At the east end of this orebody the high sulphur reaches a point 15 feet above the -130 foot elevation and at the west end crosses the eighth level about 68 feet east of the Virgil-Sherwood line.

Nine raises were put up from the main eighth level drift, those from No. 818 west being put up to the -150 foot elevation, which will be the grizzly sub-level.

Subs Above Eighth Level:

The development on the sub-levels above the eighth level has proved up approximately 73,000 tons additional ore. We found that the high sulphur area did not extend as high up at the west end as the east, changing the grizzly elevation to the -150 foot sub-level for the west 200 feet instead of the -130 foot sub-level. The orebody is about 450 feet long and varying in width from 50 to 100 feet. The top of the ore is higher at the west than at the east and has been developed to a point 25 feet above the 00 sub-level.

We felt that the ore pitched up to the east as well as the west and one gang was employed for several months on development drifting and raising at the east end of this orebody. On the -25 foot sub a drift was carried to the southeast past the 600 East coordinate in mixed seams of ore and black slate. The ground was very soft and considerable trouble was experienced with it caving, even in a small dog drift, and work was discontinued at the time on account of wishing to curtail all unnecessary development. Deep Holes Nos. 102 and 103 drilled to the southeast and northwest from a sub 20 feet above the eighth level, approximately 2000 South and 600 East, proved up high sulphur ore 290 feet in extent. With this information and the

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7. UNDERGROUND:
(Continued)

b. Development:

Subs Above Eighth Level: (Continued)

fact that the high sulphur ore extended higher at the east, we felt if we followed it upward as we drifted east we would run into some merchantable ore even above the sixth level elevation. This development will be resumed at some future date.

A pillar dividing this orebody in half is being left to maintain the traveling and supply raises and also as a support between the stopes. The upper portion of the pillar is in rock and the lower part in high sulphur ore, so the tonnage tied up is not large.

c. Stoping:

Sixth Level:

The ore hoisted the past year from the sixth level has practically all been secured from stoping operations, there being little or no development on the sixth level and subs above. Two gangs were engaged in stoping until the first of August when one gang was transferred to extend the Virgil drift onto the Sherwood property.

Stoping was conducted on the 90 foot sub and all elevations up to the 380 foot sub-level. As we were able to increase the tonnage broken in the stope above the eighth level, we cut down on the tonnage mined in this stope. During 1931 we mined all the merchantable ore above the 305 foot elevation. The ore remaining above the 305 foot elevation is high in sulphur. The bulk of the ore mined during the past year has come from the area east of the main pillar. Part of the Northeast pillar has caved. This is probably due to the black slate seams in the orebody, causing a sliding on the footwall. This cave has not caused any harm, only the ore became mixed with lean material and a large part of the tonnage will have to be left in the stope or wasted.

On December 31st, 1931 we only had left approximately 100,000 tons of available ore, 457,000 tons being tied up in pillars and in the Southwest Stope, which is still blocked off with bulkheads. We have used every precaution in mining the ore in this stope to prevent the caving of the black slate and have left a layer of 10 to 15 feet of ore wherever we have found the black slates exposed.

Eighth Level:

A large part of the 1931 tonnage was secured from the East Stope above the eighth level. This stope has been carried up from the -100 foot elevation to the -25 foot sub. A stope 175 feet long and 50 feet wide was opened up. We found the walls of this stope black slate which made it necessary to leave a layer of ore on top of the black slate hanging and footwall, as we did above the sixth level. One gang was employed in this stope up until November when they were transferred to the West Stope and started to open up around 814 Raise. The high sulphur area west of 814 Raise only reaches to the -150 foot sub-level, which is developed as the grizzly sub from this

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7. UNDERGROUND:
(Continued)

c. Stoping:

Eighth Level: (Continued)

raise west. The ore mined in this stope has been low in sulphur due to the dividing line between the low and high sulphur ore being below the point of stoping. The grizzly sub-levels have reduced the expense and difficulty of handling chunks in the raises. The chunks are held on top of the grizzly where they can be easily block-holed and blasted. This has reduced the cost of loading, as the motorman and one man can load the cars without any trouble as the dirt runs freely.

d. Timbering:

The main level drifting where timber is used was on the sixth and eighth levels. On the eighth level the drift was through seams of soft black slate and chert. After the drift was driven the ground began to swell due to the black slate seams causing a very heavy side pressure and it was necessary to do considerable re-timbering. The largest part of the timber consumed was 6" to 8" for cribbing the raises from the eighth level to the grizzly sub above. Due to less development work the amount of timber consumed the past year was considerable less than in 1930 when conducting a more normal operation. The timbering cost at the Virgil Mine is not very large, but shows a decrease over the previous year.

Statement of Timber Used:

<u>Kind</u>	<u>Lineal Feet</u>	<u>Average Price Per Foot</u>	<u>Amount 1931</u>	<u>Amount 1930</u>
6" to 8"	4,980	.0436	217.22	650.97
8" to 10"	872	.0658	57.38	95.00
10" to 12"	2,463	.0890	219.22	150.33
12" to 14"	653	.1131	73.88	92.37
14" to 16"				8.19
Total Timber 1931	8,968	.0633	567.70	
Total Timber 1930	17,919	.0556		996.86
		<u>Per 100 Ft.</u>		
6' Lagging	6,226	.650	40.47	43.94
7' Lagging	29,905	.678	202.70	212.40
Total Lagging	36,131	.673	243.17	256.34
Poles	32,678	1.460	477.14	269.79
Total Lagging & Poles 1931	68,809	1.047	720.31	
Total Lagging & Poles 1930	58,700	.896		526.13
Product			93,580	142,827
Feet of Timber per Ton of Ore			.0958	.1255
Feet of Lagging per Ton of Ore			.3861	.2826
Feet of Lagging per Foot of Timber			.4029	.2252
Cost per Ton for Timber			.00606	.00698
Cost per Ton for Lagging			.00260	.00179
Cost per Ton for Poles			.00510	.00189
Cost per Ton for Timber, Lagging & Poles			.01376	.01066
Equivalent of Stull Timber to Board Measure			16,004	27,922
Feet of Board Measure per Ton of Ore			.1710	.1955
Cost of Timber, Lagging & Poles			\$ 1288.01	\$ 1522.99

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7. UNDERGROUND:
(Continued)

e. Drifting and Raising:

The following is a comparison of the drifting and raising done in the years 1931 and 1930.

<u>Year</u>	<u>Drifting</u>		<u>Raising</u>	
	<u>Ore</u>	<u>Rock</u>	<u>Ore</u>	<u>Rock</u>
1931	4521'	578'	1132'	231'
1930	4539'	1111'	682'	988'

We employed less contracts on development work during 1931 than the previous year and worked fewer shifts, which explains the decrease in feet drifted and raised. Practically the entire footage of both drifting and raising was done on the eighth level and in the course of development on the subs above. The footage of rock work includes the high sulphur material, which is stocked separately, but considered waste.

f. Explosives, Drilling and Blasting:

The powder cost for 1931 shows a large decrease due to the smaller production and the fact that we used a larger amount of Gelamite No. 2, which has a larger stick count per 100 lbs. There is an increase in the pounds of powder per ton of ore broken and the cost per ton for powder. This is due to a larger proportion of the year's product being secured from the stope above the eighth level. The stope here is not wide and had not been carried up very high and the tonnage broken per pound of powder not as large as in the stope above the sixth level, from where a larger proportion of the 1930 product was secured.

We have conducted some experiments during 1931 in an effort to determine the best method of loading and blasting in drifting and stoping. We have experimented by placing higher grade powder in the bottom of the holes, where the burden is greater, and a lower percentage in the outer portion. We feel that we have secured better results with this method of loading the holes than by using the same grade of powder throughout the hole. We find that our powder costs are higher for the small dog drifts than for stoping.

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7. UNDERGROUND:
(Continued)

f. Explosives, Drilling and Blasting: (Continued)
Statement of Explosives Used:

<u>Ore Development</u> <u>and Stopping:</u>	<u>Quantity</u>	<u>Average</u> <u>Price</u>	<u>Amount</u> <u>1931</u>	<u>Amount</u> <u>1930</u>
40% Gelatine Powder	21,221	.1150	2440.61	8126.17
50% Gelatine Powder	250	.1250	31.25	
No. 1 Gelamite Powder				63.75
No. 2 Gelamite Powder	<u>42,449</u>	<u>.1275</u>	<u>5412.28</u>	<u>3489.38</u>
Total Powder	63,920	.1233	7884.14	11679.30
Fuse	227,620	5.8156	1323.76	1614.21
Caps	30,685	11.587	355.55	502.40
Fuse & Cap Seal	8 Pts.	.60	4.80	7.80
Cap Crimpers	1		.42	
Powder Bags	23	1.446	33.26	22.50
Tamping Bags	13,600	2.419	32.90	4.82
Safety Fuse Lighters	2,550	9.098	<u>23.20</u>	
Total Fuse, Caps, Etc.			1773.89	2151.73
TOTAL ALL EXPLOSIVES			9658.03	13831.03
Production			93,580	142,827
Pounds Powder per Ton of Ore			.68305	.6755
Cost per Ton for Powder			.08425	.0818
Cost per Ton for All Explosives			.10320	.0968
<u>Sinking, Rock</u> <u>Development, Etc.</u>				
40% Gelatine Powder	314	.1150	36.11	665.79
No. 2 Gelamite Powder	<u>216</u>	<u>.1275</u>	<u>27.54</u>	<u>59.62</u>
Total Powder	530	.1201	63.65	725.41
Fuse	1,680	5.845	9.82	117.50
Caps	500	11.58	5.79	35.13
Powder Bags				<u>1.25</u>
Total Fuse, Caps, Etc.			15.61	153.88
TOTAL ALL EXPLOSIVES			79.26	879.29
TOTAL EXPLOSIVES USED IN MINE			9737.29	14710.32
AVERAGE PRICE PER POUND FOR POWDER			.1233	.1210

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8. COST OF OPERATING:

a. Comparative Mining Costs:

	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
<u>PRODUCTION:</u>				
Ore Produced	93,580	142,827		49,247
Average Daily Product	345	517		172
Tons per Man per Day	6.33	6.37		.04
No. Days Operating	271	276 $\frac{1}{2}$		5 $\frac{1}{2}$
No. Shifts & Hours	5 Mos. 2-8 7 Mos. 1-8	2-8		
Budget Estimated Production	100,000	159,000		59,000
Budget Estimated Cost at Mine	1.916	1.897	.019	
<u>COSTS:</u>				
Underground Costs	1.003	1.007		.004
Surface Costs	.217	.201	.016	
General Mine Accounts	<u>.319</u>	<u>.204</u>	<u>.115</u>	
Cost of Production	1.539	1.412	.127	
Cost of Loading & Shipping	<u>.027</u>	<u>.033</u>		.006
Cost at Mine per Cost Sheet	1.566	1.445	.121	
<u>Depreciation</u>				
Plant and Equipment	.038	.038		
Development	.219	.219		
Movable Equipment	.001	.001		
Taxes	.227	.132	.095	
Supply Inventory		<u>.008</u>		.008
Total Cost at Mine	2.051	1.843	.208	

b. Detailed Cost Comparison:

	<u>1931</u>		<u>1930</u>		<u>Increase</u>		<u>Decrease</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
1. Exploring in Mine	658.12	.007	8407.54	.060			7749.42	.053
3. Development in Rock	873.08	.009	5254.59	.037			4381.51	.028
4. Development in Ore	23223.28	.248	31429.54	.220	.028		8206.26	
5. Stopping	19190.60	.205	29958.85	.210			10768.25	.005
6. Timbering	7028.58	.075	8555.09	.060	.015		1526.51	
7. Trimming	10677.44	.114	18201.75	.127			7524.31	.013
8. Ventilation	120.84	.001	106.92	.001	13.92	.000		

SPIES-VIRGIL MINE
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8. COST OF
OPERATING:
(Continued)

b. Detailed Cost Comparison: (Continued)

	<u>1931</u>		<u>1930</u>		<u>Increase</u>		<u>Decrease</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
9. Pumping	8593.43	.092	8650.91	.061		.031	57.48	
10. Compressors & Air Pipes	11145.19	.119	16078.55	.112		.007	4933.36	
12. Underground Superintendence	4915.52	.053	6583.68	.046		.007	1668.16	
14. Compressors & Power Drills	1052.24	.011	2106.02	.015			1053.78	.004
16. Electric Tram Equipt.	5093.64	.055	6831.54	.048		.007	1737.90	
17. Pumping Machinery	1276.98	.014	1586.52	.010		.004	309.54	
18. Hoisting	6298.15	.067	7748.84	.054		.013	1450.69	
19. Stocking Ore	2783.46	.030	3074.45	.022		.008	290.99	
20. Screening & Crushing	2055.91	.022	3202.64	.022			1146.73	
21. Dry House	2672.03	.028	3518.17	.025		.003	846.14	
22. General Surface Exp.	2694.63	.029	3820.24	.027		.002	1125.61	
23. Hoisting Equipment	1948.72	.021	2855.09	.020		.001	906.37	
24. Shaft	93.78	.001	253.30	.002			159.52	.001
25. Top Tram Equipment	1012.10	.011	2184.25	.015			1172.15	.004
26. Docks, Trestles & Pockets	683.89	.007	1326.84	.009			642.95	.002
27. Mine Buildings	96.42	.001	759.54	.005			663.12	.004
28. Insurance	191.46	.002	157.17	.001	34.29	.001		

SPIES-VIRGIL MINE
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8. COST OF
OPERATING:
(Continued)

b. Detailed Cost Comparison: (Continued)

	<u>1931</u>		<u>1930</u>		<u>Increase</u>		<u>Decrease</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
29. Mining Engineering	2274.11	.024	1646.25	.011	627.86	.013		
30. Mech. & Elect. Engineering	286.00	.003	248.24	.002	37.76	.001		
31. Analysis & Grading	2482.44	.026	3954.74	.028			1472.30	.002
32. Personal Injury	3030.38	.032	2881.42	.020	148.96	.012		
33. Safety Department	567.36	.006	533.15	.004	34.21	.002		
34. Telephones & Safety Devices	831.28	.009	887.66	.006		.003	56.38	
35. Local & General Welfare	1546.75	.017	1613.69	.011		.006	66.94	
36. Special Exp., Pens. & Allows.	4347.40	.046	4537.28	.032		.014	189.88	
37. Ishpeming Office	4942.58	.053	5119.59	.036		.017	177.01	
39. Mine Office	9450.64	.101	7561.79	.053	1888.85	.048		

1. EXPLORING IN MINE:

This large decrease in amount and cost per ton is due to all exploration work being discontinued the latter part of 1930. The 1931 charge is a proportion of the Geological Department expense charged to the Spies-Virgil Mine.

3. DEVELOPMENT IN ROCK:

There was very little development in rock during 1931.

<u>Year</u>	<u>Rock Drifting</u>	<u>Rock Raising</u>
1931	578'	231'
1930	1111'	988'

4. DEVELOPMENT IN ORE:

While there was practically the same amount of ore drifting and raising done in 1931 as in 1930, less contract shifts were worked, explaining the decrease in this account. The increased cost per ton is explained by the smaller production.

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8. COST OF
OPERATING:
(Continued)

b. Detailed Cost Comparison: (Continued)

5. STOPING:

The large decrease in stoping is explained by the decrease in number of shifts worked during 1931, reducing the labor cost. This in turn decreased the tonnage broken, affecting a material saving in cost of supplies. In August when development of the Sherwood was started one stoping gang was taken off and put on the Sherwood work.

6. TIMBERING:

There was a decrease in both labor and supplies in 1931 due to less operating shifts and less re-timbering of chutes on the sixth level. A larger proportion of the year's product was secured from the eighth level. Due to blasting on a grizzly sub repairs to chutes were reduced to a minimum.

7. TRAMMING:

The cost of tramming is usually proportional to the tonnage handled. Due to our charging a proportion to the Sherwood Development, the tramming cost shows a slight decrease rather than an increased cost per ton.

9. PUMPING:

The total cost for pumping in 1931 was only slightly less than for the previous year. It was necessary to employ additional pumpmen helpers on account of the increased number of idle days. This was offset, however, due to our reducing the number of shifts pumped over the idle period each week. The increased cost per ton for pumping is explained by the smaller production.

10. COMPRESSORS & AIR PIPES:

There was a decrease in both labor and supplies due to fewer shifts operated. From August on a proportional part of this expense was charged to Sherwood Development.

12. UNDERGROUND SUPERINTENDENCE:

The decrease is in number of shifts worked and reduction in Captain's salary and shift bosses' wages.

14. COMPRESSORS & POWER DRILLS:

This large decrease is explained by the re-erecting of the compressor in 1930.

16. ELECTRIC TRAM EQUIPMENT:

Due to the smaller tonnage handled there was a decided decrease in cost of repairs to underground cars. There was also less extensions to main line tracks during 1931. The increased cost per ton is due to the smaller output.

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8. COST OF
OPERATING:
(Continued)

b. Detailed Cost Comparison: (Continued)

17. PUMPING MACHINERY:

A new set of Rezialal cased pump poles was installed in both of the eighth level pumps during 1931. The cost of these poles was about the same as the ones installed in Pump No. 208 during 1930. The decrease is a saving in general supplies.

18. HOISTING:

The decrease against this account is due to the curtailment in operating days during 1931. A proportion of this expense was charged to Sherwood Development from August 1st.

19. STOCKING ORE:

A smaller tonnage was stockpiled during 1931 than the previous year, resulting in an increased cost per ton.

20. SCREENING-CRUSHING AT MINE:

The decrease against this account is in both labor and supplies and due to a decrease in the number of operating shifts.

21. DRY HOUSE:

The decrease is explained by the overhauling of the boiler feed pump, water tank and installation of additional radiators in the dry during 1930. There was also a further decrease in labor due to not employing a dryhouse man one shift each week after November 16th.

22. GENERAL SURFACE EXPENSE:

General surface work was reduced to a minimum during 1931 in line with curtailed operations.

23. HOISTING EQUIPMENT:

A new hoisting rope was put on the cage in 1930 and a new box made for one of the skips, explaining the decrease in 1931.

25. TOP TRAM EQUIPMENT:

Only minor repairs were made to Larry cars during 1931 and practically no new material charged out as in 1930. New trolley wire and track were installed when arranging to dump on the north stockpile ground.

26. DOCKS, TRESTLES & POCKETS:

This decrease is due to repairs to shaft-house loading pocket and grading for extensions to stockpile ground in 1930.

27. MINE BUILDINGS:

Only minor repairs were made to mine buildings during 1931.

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8. COST OF
OPERATING:
(Continued)

b. Detailed Cost Comparison: (Continued)

28-37. INSURANCE - ISHPEMING OFFICE:

Except for the caption Analysis and Grading which shows a decrease, due to fewer determinations on account of a smaller tonnage being shipped during 1931, the General Expense charges are a direct charge from the Ishpeming Office and are proportioned on a tonnage basis, which has been small at all of the company's properties.

39. MINE OFFICE:

This charge increased in spite of a reduction in salaries of the Superintendent and Mine Clerks and is due to a larger proportion of the Superintendent's time being charged to the Virgil Mine. During 1930 the Superintendent's time was divided between the Holmes, Tilden and Spies-Virgil Mines, while during 1931 between the Tilden and Spies-Virgil.

9. EXPLORATIONS
AND FUTURE
EXPLORATIONS:

No exploration work of any kind was done during the past year.

10. TAXES:

The following tabulation is a comparative statement of taxes paid in Iron County for the years 1931 and 1930.

<u>Description</u> <u>Iron County</u>	<u>1931</u>		<u>1930</u>	
	<u>Valuation</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Taxes</u>
<u>Iron River Township</u>				
NE $\frac{1}{4}$ of NW $\frac{1}{4}$ Sec. 24-43-35, 40 Acres	See Note (a)		See Note (a)	
SE $\frac{1}{4}$ of NW $\frac{1}{4}$ Sec. 24-43-35, 40 Acres	" " "		" " "	
Spies Dwellings	5,000	178.57	5,000	154.60
Collection Fees				1.55
Total Dwellings		178.57		156.15
<u>Spies-Virgil (a)</u>				
E $\frac{1}{2}$ of NW $\frac{1}{4}$ Sec. 24-43-35, Spies)	215,000	7,678.36	200,000	6,184.00
SW $\frac{1}{4}$ of NW $\frac{1}{4}$ Sec. 24-43-35, Virgil)				
Stockpile, Supplies & Equipment	370,000	13,213.92	370,000	11,440.40
Total	585,000	20,892.28	570,000	17,624.40
Collection Fees				176.24
Total Spies-Virgil Mine		20,892.28		17,800.64
(a) Total Iron River Township	590,000	21,070.85	575,000	17,956.79
Rate		3.57133		3.092