

SPIES-VIRGIL MINE
ANNUAL REPORT
YEAR 1931.

10. TAXES:

(Continued)

<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>Village of Mineral Hills:</u>				
<u>Spies Mine:</u>				
SE $\frac{1}{4}$ of NW $\frac{1}{4}$ Sec. 24-43-35	See Note (a)		See Note (a)	
NE $\frac{1}{4}$ of NW $\frac{1}{4}$ Sec. 24-43-35	" " "		" " "	
Dwellings	5,000	2.85	5,000	9.82
<u>Virgil Mine Lease:</u>				
(b) SW $\frac{1}{4}$ of NW $\frac{1}{4}$ Sec. 24-43-35	215,000	122.56	205,000	402.46
Stockpile, Supplies & Equipment	370,000	210.91	365,000	716.57
Total Opt. Spies-Virgil	585,000	333.47	570,000	1,119.03
Total Mineral Hills	590,000	336.32	575,000	1,128.85
Rate		5.7003		1.9632

(a) The Mineral valuation is not divided between the Spies and Virgil, and the surface of the Spies is included in the mineral assessment of the Virgil.

Fees not required in Iron River Township accordance with a ruling of the Auditor General, Dec. 21st, 1931, and advice by Iron County Taxpayers' Association, Dec. 23rd, 1931.

(b) The Village of Mineral Hills is in Iron River Township. The valuation as shown here are the valuations (either all or in part) as the valuations of the respective townships.
Above taxes paid in August 1931.

(b) The valuation of \$ 585,000 includes both the Spies and Virgil descriptions noted above for the year 1931. Not divided by Tax Appraiser and any division would be arbitrary.

<u>Bates Township:</u>				
Erickson Lease SW $\frac{1}{4}$ Sec. 21-43-34	226,000	9,681.85	226,000	8,869.23
Collection Fees		96.82		88.69
Total Bates Township		9,778.67		8,957.92
Rate		4.283		3.921

<u>Village of Alpha:</u>				
NE $\frac{1}{4}$ of NE $\frac{1}{4}$ Sec. 12-42-33	See Note		137,000	2,127.61
Collection Fees				21.28
Total Village of Alpha				2,148.89
Rate				1.553

NOTE: Neely Lease which is situated in Village of Alpha was sold to Oliver Iron Mining Co. in 1930.

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11. ACCIDENTS
AND
PERSONAL
INJURY:

a. Accidents:

There were two lost time accidents at the Spies-Virgil Mine during 1931 compared with three in 1930 and four in 1929, and six slight accidents causing no lost time compared with nine the previous year.

The first accident occurred on January 26th and is as follows:-

"A miner had just finished putting in several sets of cribbing in a raise and was getting ready to drill when a piece of ore fell from the back of the raise and struck him in the small of the back."

The accident was not serious and the man was only home for five days and did not receive compensation.

The mine then went from January 26th until September 19th when the second lost time accident occurred. This was a period of seven and a half months, giving the employees at the Spies-Virgil Mine the safety knives for a perfect record of six months.

The second accident which occurred on September 19th is as follows:-

"A miner from the Sherwood drift was helping Shift Boss Dawe to dump a car of rock in the pocket at the sixth level, so as to have the car available for loading during the noon hour in this drift. The miner put his left hand on the rear frame of the (rocker dump) car and the box caught his hand as it dumped over, mashing his left little finger. After two weeks time it was necessary to amputate the finger between the first and second joints, giving him compensation for the loss of the finger, amounting to \$ 270.00. The miner did not actually lose any time due to the working schedule of the miners working one week and being home one week at that time. On account of compensation payment it is classed as a lost time accident."

b. Safety Work:

Regular training was given throughout the year in first aid and helmet work.

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12. NEW CONSTRUCTION
AND PROPOSED
NEW CONSTRUCTION:

An area 200 feet by 500 feet north of the coal dock approach track and east of the Virgil north stockpile was cleared and graded during September and October for a stockpile ground for the Sherwood ore. A trestle branching off the south end of the north pile was built, so as to be ready to stock any ore encountered in the course of development. Six of these bents were erected during October with timber belonging to the Virgil Mine, as the Sherwood material had not yet arrived. These were on the ore pile and had to be erected before bad weather. The timber was replaced when the Sherwood order was received. Ten additional bents were added and collar plank laid. This trestle is long enough to handle both High and Low Sulphur grades, leaving a space between the two piles.

14. MAINTENANCE
AND REPAIRS:

a. Shafts:

1. Spies Shaft:

A thorough examination was made of all pipes and cables in the shaft at frequent intervals on account of the action of the acid water and it has been necessary to replace some of the pipe hangers from time to time. All of the air and discharge pipes were covered with rubberoid roofing paper several years ago. This is rotting and portions have been renewed after each inspection.

An inspection made in November 1930 found the armor on the haulage cable between the fourth and sixth levels broken and eaten away in a number of places, grounding to the rock. A new length was ordered and installed during April 1931.

2. Virgil Shaft:

A monthly inspection is made of the Old Virgil Shaft, the second outlet, and connecting drifts and raises to the workings of the New Mine. The underground men were taken into the mine through this opening twice during the year to keep them familiar with the traveling ways. During 1930 the water in the stopes of the old mine raised to a point where we installed a syphon pipe to drain it upon reaching a higher level. Toward the end of 1930 for some unknown reason the water began to lower and dropped a total of about 12 feet during 1931.

b. Hoisting Equipment:

Two steel rope slides were installed in the engine house. Both the skip and cage ropes are giving excellent service due to regular greasing and the use of steel-lined head sheaves and hardwood idler sheaves. The skip rope has been in use for twenty-six months and the cage rope twenty-four months compared to a former life of eleven to thirteen months respectively. The cage rope was turned end for end on March 21st after being on for nearly fifteen months.

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14. MAINTENANCE
AND REPAIRS:
(Continued)

b. Hoisting Equipment: (Continued)

An inspection made by the Mechanical Department about the middle of November disclosed the fact that the main gear on the hoist was loose on the shaft, causing considerable lost motion and strain when starting to pick up a loaded skip. Arrangements were made to make the necessary repairs and the work started on Saturday, November 28th. It took four days to complete the job, so the mine did not work again until Wednesday, December 2nd. As we are operating four days per week, we worked the last four instead of the first four and had no lost time as a result. The key was driven out and the keyway trued up and a larger key driven in. Although there is not as much lost motion, still the gear is not tight. It may be necessary to put in a new main shaft to correct this trouble altogether at some future time.

c. Pumps:

An electric Bilge Pump was installed during January at the bottom of the shaft to handle the shaft water. An air pump had previously been used and with the number of idle days on the curtailed operating schedule, the compressor would have had to be run just for this pump. It has more than paid for itself during 1931 in current saved for operating the compressor.

The Prescott pumps gave very little trouble during the past year. One set of pump poles were turned down and cased with "Rezistal" metal tubing and installed in Pump No. 208 on February 11th and a second set in Pump No. 207 during June. The poles taken out in June were only in service fourteen months and were worn badly although they were steel poles. The "Rezistal" metal is acid resisting and takes a high polish, reducing the friction loss and wear on packing. The cost of making these new poles, per set, is about two-thirds the cost of new steel ones. We are awaiting with interest to see the service we get out of them.

When the Prescott pumps were first installed we had a great deal of trouble from vibration on the motor end. This vibration wore the gears and they became very noisy. During November the gears were chipped and filed so as to mesh better. The pumps are operating satisfactorily now.

d. Compressor:

Early in January we had some trouble with the compressor. A new gasket was put on the high pressure cylinder and new discharge and intake valves, and regulator valve chest complete were installed, overcoming the trouble. During November a new exciter armature was installed and the old one sent to Ishpeming for repairs.

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14. MAINTENANCE
AND REPAIRS:
(Continued)

e. Steam Shovel:

The No. 4 shovel used at the Spies-Virgil Mine is one of the oldest shovels still in service. It has needed continual repairs and adjustments and has been especially bad during the past season. After the shipping season was over it was sent to the General Shops at Ishpeming for a complete overhauling. This work will be done before spring and the 1932 season opens.

17. CONDITION
OF
PREMISES:

The mine and location premises were cleaned up during April and were kept in a neat and clean condition until cold weather set in. At the mine all material was kept neatly piled and grass plots around the buildings kept trimmed. The mine truck cleaned up the alley behind the location houses at regular intervals during the summer.

The men living in the location all had very fine vegetable gardens. We plowed up part of the old pasture and gave lots to a number of employees living outside the location for raising of potatoes.

18. NATIONALITY
OF
EMPLOYEES:

<u>Parentage</u>	<u>American</u> <u>Born</u>	<u>Foreign</u> <u>Born</u>	<u>Total</u>
American -----	5		5
English -----	8	13	21
Croatian -----		1	1
Swedish -----	5	2	7
German -----	2	3	5
Finnish -----	4	10	14
Polish -----	2	3	5
Italian -----		2	2
Irish -----	3		3
Danish -----	2		2
French-Canadian -----	5		5
Total -----	36	34	70
Percentage -----	51.43%	48.57%	100.00%

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1. GENERAL:

Operations at the Wade Mine during the year 1931 were confined exclusively to underground activities. A small tonnage was secured from the development work in the East Deposit, but all stoping operations were confined to the West Deposit.

Mining activities were conducted on a four day per week, double shift basis, until April 30th, when the property was closed down for an indefinite period.

Pumping conditions were normal throughout the year. The increase of about 75 gallons of water per minute, which resulted from development work in the East Deposit during the latter part of 1930, was about maintained as the result of further opening of the East Deposit.

2. PRODUCTION,
SHIPMENTS &
INVENTORIES:

a. Production by Grades:
Wade Pocket to Stockpile, ----- 50,484 tons.

b. Shipments:
No shipments were made from the Wade Mine during 1931.

c. Stockpile Inventories:
On Hand January 1st, 1932, ----- 111,930 tons.

e. Production by Months:

January, -----	12,357 tons
February, -----	11,364 "
March, -----	13,481 "
April, -----	13,282 "
Total, -----	50,484 "

f. Ore Statement:

	<u>1931</u>	<u>1930</u>
On Hand January 1st, -----	61,446	-
Output for year, -----	50,484	160,854
Total, -----	111,930	160,854
Shipments, -----	-	99,408
Balance January 1st, 1932, -----	111,930	61,446

g. Delays:
There were no delays at the Wade Mine during the season of 1931.

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3. ANALYSIS:a. Average Analyses on Shipments:

No shipments during the season of 1931.

a.a. Average Analyses of Production:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>
Wade Pocket to Stkpile,	50,484	55.47	.070	7.83	1.48	1.76
Total, -----	50,484	55.47	.070	7.83	1.48	1.76

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

13 Cubic Feet equals one ton.
10% Deduction for rock.
10% Deduction for Mining Loss.

West Deposit, ----- 462,803 tons.

b. Undeveloped Ore:

East Deposit, ----- 1,118,790 "

Total, ----- 1,581,593 "

Deacon Bessemer, ----- 80,000 "

Deacon Non-Bessemer, ----- 95,000 "

Grand Total, ----- 1,756,593 "

The reduction in tonnage from the figures of a year ago is arrived at by deducting the output secured during the four months that the mine was operated. The work done during the four months of 1931 did not demonstrate any necessary changes in our previous assumptions. The development of the East Deposit indicates, however, that there may be a decided increase in the tonnage here when the deposit is entirely proven up.

The Deacon ore, which is segregated above, is not included in our estimate of reserve tonnage. From all available information this ore is not subject to profitable extraction under existing conditions, as there would be heavy pumping and development costs.

c. Estimated Analysis:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Moist.</u>	<u>Fe.Nat.</u>
West Deposit,	462,803	57.51	.071	6.78	1.28	1.14	13.50	49.34
East Deposit,	1,118,790	57.76	.077	6.89	1.81	.78	13.50	49.96
Average,	1,581,593	57.68	.075	6.86	1.64	.89	13.50	49.90
Deacon Bess.	80,000	56.65	.045	8.04	1.16			
" Non-Bess.	95,000	55.77	.053	8.43	.42			

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5. LABOR & WAGES:a. Comments:

Ample labor of a satisfactory class was available during the four months that the Wade Mine operated.

Wages paid were in line with other operations on the Range and were at the same rate as prevailed during the year 1930. Common surface labor was paid \$4.20 per day.

b. Comparative Statement of Wages & Product:

<u>PRODUCT</u>	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
	50,484	160,854		110,370
No. Shifts & Hours,	2-8 hr.	2-8 hr.		
<u>AVG. NO. MEN WORKING:</u>				
Surface, -----	23	22	1	
Underground, -----	84	96		12
Total, -----	107	118		11
<u>AVG. WAGES PER DAY:</u>				
Surface, -----	4.92	4.86	.06	
Underground, -----	5.50	5.49	.10	
Total, -----	5.37	5.35	.02	
<u>WAGES PER MONTH OF 25 DAYS:</u>				
Surface, -----	2327.16	2702.85		375.69
Underground, -----	8588.71	10452.12		1863.41
Total, -----	10915.87	13154.97		2239.10
<u>PRODUCT PER MAN PER DAY:</u>				
Surface, -----	26.70	24.04	2.66	
Underground, -----	8.09	7.04	1.05	
Total, -----	6.21	5.44	.77	
<u>LABOR COST PER TON:</u>				
Surface, -----	.184	.202		.018
Underground, -----	.681	.779		.098
Total, -----	.865	.981		.116
<u>AVG. PRODUCT BRKG. & TRMG:</u>	12.74	10.67	2.07	
<u>AVG. WAGES CONTRACT MINERS:</u>	5.88	5.85	.03	
<u>TOTAL NO. OF DAYS:</u>				
Surface, -----	1891	6668 $\frac{1}{2}$	(Not comparable)	
Underground, -----	6235 $\frac{1}{2}$	22859 $\frac{1}{2}$	" "	
Total, -----	8126 $\frac{1}{2}$	29528		
<u>AMOUNT FOR LABOR:</u>				
Surface, -----	9308.63	32434.21		
Underground, -----	34354.83	125425.47	" "	
Total, -----	43663.46	157859.68		

Mining operations closed April 30, 1931 and the 1931 totals are for the four month period only.

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6. SURFACE:

a. Buildings, Repairs:

No repairs were made to the Wade Mine buildings or the location houses during the year 1931.

A small amount of clean-up work was undertaken during the month of April.

b. Stockpiles:

The output from the mine was stocked during the four months that the property operated. A total of 50,484 tons were placed in stock during 1931 and this added to the 61,446 tons on hand January 1st, brought the ore in stock as of January 1st, 1932, to 111,930 tons.

Of the ore stocked, 47,912 tons came from the West Deposit and 2,572 tons from development work in the East Deposit.

7. UNDERGROUND:

d. Development:

The development work undertaken during 1931 consisted in extending the East Deposit, main level haulage drift a distance of 520 feet; the putting up of three raises and development drifting in ore of 500 feet from these raises on the 1430-ft. sub.

The main level haulage drift was extended through broken taconite and ore for the most part. Some very hard rock was encountered and when operations were discontinued the headings were in ore material. It will be necessary to extend two drifts, one directly North, and the second to the Northeast, in order to develop the ore body to advantage. The second drift had been started to the Northeast from near the breast of the main heading when operations were suspended.

The ore encountered in the development on the 1430-ft. sub-level was of a good grade and rather indicates that the average grade of the ore to be blocked out in the East Deposit may be of somewhat higher grade than the drilling indicates.

c. Stoping:

1420 - 1410 ft. Sub-Levels:

The narrow lens of ore, extending above the 1400-ft. level, in the Northwest corner of the mine, extended along the edge of the open pit for a distance of about 150 feet. One gang completed the pillars on the 1420-ft. sub during the month of January, while two contracts were employed on the 1410-ft. sub during the months of January, February and half of March. The pillars on the 1410-ft. sub were extracted, the workings all blasted down and the two contracts spent the remainder of the month of March and the month of April in slicing on the 1400-ft. sub below. This deposit only extends down to the 1388-ft. sub and it would be entirely mined out by a force of from two to three gangs within four to five months.

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7. UNDERGROUND:
(Continued)

c. Stoping: (Continued)

1388-ft. Sub-Level:

Three contracts were employed in slicing and caving back the pillars remaining at this elevation during the month of January. The force was reduced to two gangs in February and one gang in March, when the work was completed.

1376-ft. Sub-Level:

A force of nine contracts was employed at this elevation during the four months that the mine was operated. These men were engaged in slicing, caving back and blasting down. While the ground became very heavy in places, due to riding pillars, operations were carried forward quite satisfactorily and no accidents occurred.

In the Southeasterly extension of the deposit a heavy flow of water was encountered and this interfered to some extent with mining operations. A new development drift was driven in from the North to attack this ore during the latter part of 1930, in an endeavor to minimize the bad water condition.

1365-ft. Sub-Level:

One contract was employed at this elevation in slicing back from the open pit over the center motor drift area. The removal of this ore was necessary in order to take the weight from the areas to the North and South.

General:

The underground operations conducted during 1931 were penalized to a considerable extent on account of the restricted area available. Considerable timbering was necessitated on account of the close proximity to heavy ground, which was caused by the weight thrown upon the small pillars. As the East Deposit is developed, the mining conditions will improve very decidedly and contracts would be taken from the West Deposit and added to the East Deposit as working places are made available. The East Deposit is comparatively dry and due to the thinness of the ore layer, mining operations here should compare very favorable with those at the Alexandria Mine. The timber cost in the East Deposit will be comparatively light and very satisfactory mining costs should be realized. It was the intention to have transferred at least half of the contracts working in the West Deposit to the East Deposit within a few months time.

7. OPEN PIT:

No operations of any nature were conducted in the open pit workings during 1931.

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7. OPEN PIT:
(Continued)

d. Timbering:

Statement of Timber Used:

	LINEAL <u>FEET</u>	AVG. PRICE <u>PER FOOT</u>	AMOUNT <u>1931</u>	AMOUNT <u>1930</u>
7" Top Timber,	49180	.079	3885.91	7862.90
8" " "	1952	.106	206.94	-
10" " "	13369	.150	2091.76	7826.14
<hr/>				
Total Timber, 1931 -	65001	.095	6184.61	
Total Timber, 1930 -	165178	.095		15689.04
<hr/>				
		<u>PER 100'</u>		
6 ft. Lagging,	112229	.816	916.50	5430.28
3" Top Poles,	60488	1.26	763.02	4251.05
4" " "	49462	1.47	728.64	-
Cribbing,	-			860.28
1" Covering Boards, Bd. Ft.	62000	13.20 M	819.00	2290.80
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Product,			50,484	160,854
Ft. Timber per ton of Ore,			1.287	1.026
Ft. Lagging per ton of Ore,			2.223	4.341
Ft. Lagging per foot of Timber,			1.726	4.227
Cost per ton for Timber,			.123	.097
Cost per ton for Covering Boards,			.016	.014
Cost per ton for Lagging,			.018	.034
Cost per ton for Poles,			.030	.026
Cost per ton for All Timber, etc.,			.187	.171
Cost of Timber, Lagging, Poles, etc., 1931 -				9411.77
Cost of Timber, Lagging, Poles, etc., 1930 -				28521.45

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7. OPEN PIT:
(Continued)

f. Explosives, Drilling and Blasting:

Statement of Explosives Used:

<u>KIND:</u>	<u>QUANTITY</u>	<u>AVERAGE PRICE</u>	<u>AMOUNT 1931</u>	<u>AMOUNT 1930</u>
40% Extra Powder, (Lbs.)	26150	11.27 C.	2946.17	12456.53
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Total Powder, 1931 -	26150	11.27 C.	2946.17	
Total Powder, 1930 -	108200	11.51 C.		12456.53
Fuse, (Ft.)	75500	.576 C.	434.88	1793.38
Caps,	15900	11.60 M.	184.44	825.30
Etc., etc.,			12.47	17.47
<hr/>				
Total Fuse, etc., 1931 -			631.79	2636.15
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Total all explosives,			3577.96	15092.68
<hr/>				
Product,			50,484	160,854
Pounds of Powder per ton of Ore,			.517	.672
Cost per ton for Powder,			.058	.0774
Cost per ton for Fuse, Caps, etc.,			.013	.0163
Cost per ton for All Explosives,			.071	.0937
Average Price per pound for Powder, etc., etc.,			.1131	.1151

g. Mining & Loading:

With the exception of the work in the East Deposit, all ore mined was transferred from slices to the chutes by tuggers and scrapers.

i. Ventilation:

The natural circulation of air was sufficient to furnish satisfactory ventilation in the West Deposit workings. In a few cases artificial circulation was obtained by the installation of small electrically-driven 1/2 H.P. Vano blowers.

The ventilation in the development drift to the East was secured by the installation of a 10 H.P. direct connected blower, located near the timber shaft. Vent-tubing was carried to the breast of the East Deposit development drift.

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8. COST OF OPERATION:

a. Comparative Mining Costs:

	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
<u>PRODUCT:</u>	50,484	160,854		110,370
Average Daily Product,	711	559	152	
Tons Per Man Per Day,	6.21	5.44	.077	
Days Operating,	71	288		217
Budget, Estimated Production,	49,440	181,500		
<u>COST</u>				
<u>Total Cost at Mine:</u>				
Underground Costs,	1.213	1.325		.112
Surface Costs,	.112	.117		.005
General Mine Expense,	.182	.171	.011	
Cost of Production,	1.507	1.613		.106
<u>Loading and Shipping,</u>				
Steam Shovel,	-	.008		.008
Pocket,	-	.015		.015
Total Loading & Shipping,	-	.023		.023
Re-opening Mine,	.092	.092		-
Depreciation, Plant &				
Equipment,	-	.018		.018
" Development,	-	.012		.012
" Movable				
Equipment,	.006	.006		.012
Taxes - Ad. Valorem,	.237	.240		.003
" - Occupational,	.014	.015		.001
" - Royalty,	.030	.018	.012	
	.367	.401		.034
<u>Total Cost at Mine,</u>	1.874	2.037		.163
Misc. Debits & Credits,	-	-		-
<u>TOTAL COST,</u>	1.874	2.037		.163

(Mine closed down May 1st, 1931 - operated 71 days only, as compared with 288 days in 1930).

b. Detailed Cost Comparison:

(1) Production:

The average daily product for the four months of 1931 shows an increase of 152 tons per day, as compared with the previous year.

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8. COST OF OPERATION:
(Continued)

b. Detailed Cost Comparison: (Continued)

(2) Underground Costs:

There was a decrease of \$.112 per ton in the underground costs realized in 1931, as compared with the previous year. This was the result of improved mining conditions and the fact that all gangs were supplied with tuggers and scrapers.

(3) Surface:

There was a slight decrease in the surface costs for 1931, due to the increased product realized per day.

(4) General Mine Expense:

The increase of \$.011 in General Mine Expense for 1931 was occasioned by the fact that all ore produced in 1931 was stocked. During 1930, the product mined during the season of navigation was shipped, cutting down the necessary surface force.

(5) Loading & Shipping:

No ore was shipped from the Wade Mine during the year 1931.

(6) Re-opening Mine:

The fixed charge of \$.092 per ton was made against the ore produced each year.

(7) Depreciation:

No charge was made to Plant & Equipment, Development or Movable Equipment during the year 1931.

10. TAXES:

Tax Statement:

	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
Wade Mine,	\$ 24,883.98	31,784.60		6,900.62
Personal Property,	<u>17,472.65</u>	<u>6,776.37</u>	<u>10,696.28</u>	
Total,	\$ 42,356.63	38,560.97	3,795.66	

Tax Rates:

Village of Kinney,	.1259	.1394
Town of Great Scott,	.1319	.1499

11. ACCIDENTS AND PERSONAL INJURY

There was but one lost-time accident during the four months that the Wade Mine operated in 1931, as compared with five lost-time accidents during the year 1930.

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17. CONDITION
OF
PREMISES:

Some clean-up work was undertaken during the month of April and the winters accumulation of debris was removed and burned.

18. NATIONALITY
OF
EMPLOYEES:

<u>NATIONALITY:</u>	<u>NO. OF MEN</u>
American, -----	8
English, -----	6
Finnish, -----	35
Austrian, -----	25
Italian, -----	10
Serbian, -----	12
Montenegrins, -----	3
Polish, -----	8
Total, -----	107

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1. GENERAL:

Ore operations were started June 1st and conducted on a five-day shift per week basis until August 17th, when a four-day shift per week schedule was put into effect. The Hill-Trumbull Mine continued operating on the four day shift per week basis until September 29th. The operations during the previous year began May 1st and were finished September 29th, the work being carried on, however, on a six day per week basis during 1930.

Winter repair work was started upon the completion of ore operations and continued to December 24th on the five day per week basis. The regular shop men were employed steadily on the above basis, the balance of the repair men being engaged in half time.

Due to the reduced schedule of operations and the necessity of producing as much Hill ore as possible (a considerable part of the Hill operation being in rocky wash material), the 1931 costs were decidedly higher than those of the previous year. It was advisable to secure the maximum quantity of Hill ore during 1931 on account of the minimum royalty situation. The Hill ore available in 1931 was comparatively costly to produce, due to the rocky condition in the Hill pit bottom and to the difficulties encountered in mining at the East end of the Hill pit, in the so-called direct ore area. It was necessary to handle cretaceous, some direct shipping and wash ore at the East end of the Hill Mine, in order to make available upwards of 200,000 tons of Hill direct ore for 1932 operations.

The operations in the Trumbull pit were confined to the South side and the bench here was carried to the Oliver Iron Mining Company's line, leaving a small corner of waste material, which will have to be removed before the next mining cut is worked out.

2. PRODUCTION,
SHIPMENTS &
INVENTORIES:

a. Production by Grades:

Hill Crude Ore, -----	157,630	tons
Trumbull Crude Ore, -----	117,274	"
Total Crude Ore, -----	274,904	"
Hill Bessemer Direct Shipping Ore, -----	3,551	"
Hill Non-Bess. Direct Shipping Ore, -----	11,732	"
Hill Bessemer Concentrates, -----	37,609	"
Hill Non-Bessemer Concentrates, -----	66,742	"
Trumbull Non-Bessemer Direct Shipping Ore, -----	5,851	"
Trumbull Bessemer Concentrates, -----	28,390	"
Trumbull Non-Bessemer Concentrates, -----	48,604	"
TOTAL SHIPPING GRADE, -----	202,479	"

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2. PRODUCTION,
SHIPMENTS &
INVENTORIES:
(Continued)

b. Shipments:

The shipments from the Hill-Trumbull Mine during 1931 was the tonnage shown under the production statement, as all ore mined was forwarded to Lake Erie ports.

c. Stockpile Inventories:

No merchantable ore, either concentrates or direct, was stockpiled at the Hill-Trumbull property during 1931, but the following lean non-wash material was placed in stock:-

Concentrating Material Above 25%:

	<u>Tons</u>	<u>Fe.</u>	<u>Phos.</u>	<u>Silica</u>
Trumbull,	660	24.40	.027	61.24
Hill,	<u>14,145</u>	<u>31.82</u>	<u>.044</u>	<u>50.97</u>
	14,805	31.49	.043	51.43

Non-Concentrating Material Above 35%:

Hill,	21,000	48.27	.082	21.68
-------	--------	-------	------	-------

e. Production by Months:

(1) Crude Ore:

<u>MONTH:</u>	<u>HILL</u>	<u>TRUMBULL</u>	<u>TOTAL</u>
June, -----	22,109	42,248	64,357
July, -----	45,989	36,945	82,934
August, -----	46,515	17,861	64,376
September, -----	<u>43,017</u>	<u>20,220</u>	<u>63,237</u>
Total - 1931 -----	157,630	117,274	274,904
Total - 1930 -----	140,973	361,315	502,288

(2) Concentrates & Direct Ore:

<u>MONTH</u>	<u>HILL</u> <u>DIRECT</u>	<u>TRUMBULL</u> <u>DIRECT</u>	<u>HILL</u> <u>CONCTS.</u>	<u>TRUMBULL</u> <u>CONCTS.</u>	<u>GRAND</u> <u>TOTAL</u>
June, -----	14,441	-	14,874	27,762	57,077
July, -----	196	5,830	30,076	24,515	60,225
August, -----	1,038	21	31,364	11,922	44,345
September, ----	-	-	27,567	12,637	40,204
Oct. (Adj.) ---	-	-	470	158	628
Total - 1931-	15,283	5,851	104,351	76,994	202,479
Total - 1930-	55,272	12,319	87,945	247,062	402,598

HILL-TRUMBULL MINE
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2. PRODUCTION,
SHIPMENTS &
INVENTORIES:

f. Ore Statement:

All material considered as ore that was mined during 1931, was shipped from the property.

g. Delays:

The following delays were reported during the year 1931:-

<u>Date</u>	<u>Time Lost</u>	<u>Cause</u>
June 12th,	- 25 Min.	Logs plugged.
June 29th,	- 30 "	" "
June 30th,	- 30 "	Rock Crusher plugged.
July 3rd,	1 Hr.- 45 "	High tension fuse at plant blown out.
July 6th,	- 30 "	Classifier plugged.
July 9th,	1 Hr.- 35 "	" "
July 13th,	- 20 "	" "
July 14th,	- 20 "	" "
July 24th,	1 Hr.- 30 "	Short circuit - no power.
July 27th,	- 50 "	Repair sample chute.
Aug. 4th,	- 55 "	Rock crusher plugged.
Aug. 7th,	- 35 "	Haulage motor off track.
Sept. 7th,	- 55 "	Classifier plugged.
Sept. 14th,	1 Hr.- 30 "	Main transformer to mill out of order, wire burned out.
Sept. 17th,	- 35 "	Switch for classifier burned out.
Sept. 29th,	2 Hrs. 40 "	No electric power.

Delays Account No Cars:

There was a total delay of 11 hours and 30 minutes on account of no cars.

3. ANALYSIS:

a. Mine Analysis of Production & Shipments:

<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Moist.</u>	<u>Fe. Nat.</u>
Hill Non-Bess. Concts.	66,742	58.76	.052	8.90	.12	.40	8.99	
Hill Bess. Concts.	37,609	60.33	.039	8.85	.11	.46	7.85	
Hill N.B. Direct,	11,732	54.74	.068	14.61	.14	1.96	8.84	
Hill Bess. Direct,	3,551	60.64	.033	10.28	.12	1.00	5.90	
Trumbull N.B. Concts.	48,604	59.89	.049	6.08	.17	.46	8.94	
Trumbull Bess. Concts.	28,390	59.96	.041	6.24	.20	.46	9.65	
Trumbull N.B. Direct,	5,851	56.54	.057	11.83	.10	.59	6.30	
Total - 1931,	202,479	59.23	.048	8.28	.14	.54	8.72	54.07

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3. ANALYSIS:
(Continued)

b. Average Analysis on Straight Cargoes:

<u>Grade</u>	<u>Mine Analysis</u>			
	<u>Iron</u>	<u>Phos.</u>	<u>Moist.</u>	<u>Fe.Nat.</u>
McCook, (C.C.I.CO)	57.79	.058	8.70	52.76
McCook, (Inland)	57.95	.054	9.25	52.59
Hill Bess. (C.C.I.)	59.51	.037	8.50	54.45
Hill Bess. (Butler Bros.)	59.42	.0403	8.043	54.641

	<u>Lake Erie Analysis</u>			
	<u>Iron</u>	<u>Phos.</u>	<u>Moist.</u>	<u>Fe.Nat.</u>
McCook,	57.34	-	8.02	52.74
Hill Bessemer,	58.80	.034	8.39	53.87

d. Average Analysis of Crude Ore Production:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>
Hill Crude,	157,630	46.27	.043	29.32
Trumbull Crude,	117,274	45.17	.039	30.80
Total - 1931,	274,904	45.80	.041	29.95
Total - 1930,	502,288	42.75	.037	32.99

e. Composite Analysis of Season's Shipments:

<u>Grade</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mn.</u>	<u>Alu.</u>	<u>Lime</u>	<u>Meg.</u>	<u>Sul.</u>	<u>Loss</u>
Hill Bess. Direct	60.45	.033	10.32	.10	.94	.31	.15	.010	1.96
" N.B. Direct,	54.85	.066	14.45	.16	1.92	.33	.15	.110	4.08
" Bess. Concts. (C.C.I.)	61.00	.037	8.30	.12	.40	.31	.16	.011	3.54
" Bess. Concts. (Butler)	59.65	.042	9.39	.10	.44	.27	.17	.011	4.45
" N.B. Concts.	58.60	.050	9.12	.10	.40	.29	.14	.012	6.13
Trumbull N.B. Direct,	56.50	.055	11.88	.12	.54	.29	.15	.014	6.30
" Bess. Concts. (C.C.I.)	60.00	.041	6.22	.17	.46	.31	.15	.009	6.90
" Bess. Concts. (Butler)	59.70	.041	6.25	.20	.44	.31	.16	.009	7.20
" N.B. Concts.	59.80	.048	6.23	.15	.44	.25	.17	.009	7.34

The average analysis of all the ore shipped from the Hill-Trumbull Mine during 1931 was 59.23 Iron - with an 8.28 Silica, and compares with 58.94 Iron - 8.66 Silica for the 1930 output.

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4. ESTIMATE OF
ORE RESERVES:

a. Developed Ore:

Assumption: 13 cu. ft. per ton for Direct Ore.
17 cu. ft. per ton for Wash Ore.

A Rock deduction of 10 per cent was made in the case of the Direct Shipping and Wash Ore and 35 per cent for the Rocky Wash. Concentrates are figured on 65 per cent gross recovery.

Hill Bessemer Direct Shipping, -----	632,449	tons.	110
Hill Non-Bessemer Direct Shipping, -----	1,132,200	"	"
Hill Bessemer Concentrates, -----	291,226	"	40
Hill Non-Bessemer Concentrates, -----	389,323	"	"
TOTAL HILL ORE, -----	<u>2,445,198</u>	"	"
Trumbull Bessemer Direct Shipping, -----	85,000	"	"
Trumbull Non-Bessemer Direct Shipping, -----	200,560	"	"
Trumbull Bessemer Concentrates, -----	2,255,539	"	"
Trumbull Non-Bessemer Concentrates, -----	645,992	"	"
TOTAL TRUMBULL ORE, -----	<u>3,187,091</u>	"	"
GRAND TOTAL HILL AND TRUMBULL ORE, -----	5,632,289	"	"

The ore estimate of January 1st, 1932 is based on deducting the 1931 shipments for the various grades from the estimate of January 1st, 1931.

No drilling or test-pitting was done in either the Hill or Trumbull pits during 1931 and, therefore, no changes are made in the reserve tonnage, or in the grade of the ore assumed a year ago.

Operations in the Trumbull pit were in line with our expectations and did not indicate that we should make any changes in our factors. In the case of the Hill pit mining, the rock deductions assumed were too low in certain cases and too high in others, one off-setting the other and for this reason no change in the estimate is justified at this time.

b. Prospective Ore:

The drilling of the land to the North of the Hill pit in the vicinity of the taconite island, will no doubt show up an additional tonnage of concentrating ore. Test-pits put down along the ore limits of the pit in 1925 indicated that the ore makes back beyond the stripping banks and a few old scattered drill holes confirm this. From the standpoint of taxes, it has not been advisable to conduct any drilling in this locality, but the time is approaching when we should ascertain the possible extension of our open pit limits and the character of the ore, so that plans can be made to work in this ore so as to obtain a satisfactory mixture in our grades from year to year. It will be necessary to make a joint estimate of the tonnage reserve with the Great Northern engineers during 1932 in order to establish a new basis for fixing the minimum royalty requirements

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4. ESTIMATE OF
ORE RESERVES:
(Continued)

b. Prospective Ore: (Continued)

during the last 15 years of the Hill-Trumbull lease. The Great Northern engineers are preparing plans for additional drilling and the question of what amount of drilling will be done at the Hill-Trumbull Mine will be determined during the spring of 1932.

c. Estimated Analysis:

<u>Hill Mine:</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Fe.Nat.</u>
Bessemer Direct Shipping,	632,449	58.00	.045	13.00	53.36
Non-Bess. Direct Shipping,	1,132,200	58.00	.055	13.00	53.36
Bessemer Concentrates,	291,226	59.50	.045	8.50	55.04
Non-Bessemer Concentrates,	389,323	60.00	.059	7.50	55.50
TOTAL HILL ORE, -----	2,445,198	58.57	.052	11.38	54.87
 <u>Trumbull Mine:</u>					
Bessemer Direct Shipping,	85,000	56.40	.040	12.79	51.32
Non-Bess. Direct Shipping,	200,560	58.04	.060	9.85	52.82
Bessemer Concentrates,	2,255,539	59.00	.043	9.00	54.57
Non-Bessemer Concentrates,	645,992	59.00	.080	9.00	54.57
TOTAL TRUMBULL ORE, -----	3,187,091	58.88	.054	9.14	54.38
GRAND TOTAL HILL-TRUMBULL,	5,632,289	58.74	.053	10.11	54.59

5. LABOR & WAGES:

a. Comments:

(1) Labor:

Skilled and common labor was very plentiful during 1931. The wage schedule, which had been in effect for several years was reduced, approximately 10%, on October 1st, 1931. Effective June 15th, the salaried employees at the Hill-Trumbull Mine were put on a five-day per week basis and their salaries were reduced proportionately, or by 16%.

(2) New Construction:

The old wooden bridge, spanning the State highway and carrying the tracks from the mine to the dumps and washing plant, was torn down and replaced by a steel bridge. This work was done between May 11th and 20th. The new bridge has no center pier and thus a hazard is removed for highway traffic.

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5. LABOR & WAGES:
(Continued)

b. Comparative Statement of Wages & Product:

	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
PRODUCT, -----	202,479	402,598		200,119
No. Shifts & Hours, ---	1, 10-Hr.	1, 10-Hr.		
Avg. No. of Men Working,	94	130		36
Avg. Wages Per Day,	\$5.19	\$5.18	.01	
Product Per Man Per Day,	20.78	24.04		3.26
Labor Cost Per Ton,	.2500	.2154	.0346	
Total No. of Days,	9745	16745½		7000½
Amount Paid for Labor,	\$50622.28	\$86718.85		36096.57

- In 1923 - Production from May 5th to October 3rd.
- 1924 - " " April 26th to September 13th.
- 1925 - " " April 25th to October 6th.
- 1926 - " " May 7th to October 9th.
- 1927 - " " April 25th to October 12th.
- 1928 - " " May 7th to September 26th.
- 1929 e " " April 22nd to September 28th.
- 1930 - " " May 1st to September 29th.
- 1931 - " " June 1st to September 29th.

6. SURFACE:

a. Buildings, Repairs:

One of the roof trusses in the blacksmith shop was reinforced and a column removed. This was done to afford better and safer working conditions around the steam hammer.

A new roof was placed on House No. 6; a back shed built for House No. 3; some interior decorating done in House No. 8 and a bath room installed in House No. 4.

c. Tracks, Roads, Transmission Lines:

The track crew started work in preparation for the ore season on April 6th. The track on either side of the receiving bin was raised 2 feet in order to allow more head room in dumping the large 30-yard cars. During the 1930 operations, when these new cars were put in service, it was impossible to load them to the ends, as the dumping arrangement was such that there was considerable spill. During the latter part of April and throughout May, the work of placing new ties in the main line from the yards to the washing plant was continued, the track on either side of the new bridge was raised as the result of the new bridge having more depth of girder. The clearance from the highway was fixed and in taking out the center pier the depth of the steel girder required to carry the load was increased so as to bring the tracks over a foot above their former elevation in crossing the bridge.

The loading tracks in the pit were put in shape for the ore season, during the latter part of May.

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6. SURFACE:

c. Tracks, Roads, Transmission Lines: (Continued)

Some maintenance work was done on the main line and yard tracks during the summer.

Owing to the uncertainty of our 1932 operations at the Hill-Trumbull Mine, the customary fall track work was not attempted.

7. OPEN PIT:

a. Stripping:

No stripping or clean-up work was done in 1931, other than the removal of some lean cretaceous ore in connection with the operations in the Hill "A" Area.

d. Timbering:

Statement of Railroad Ties Used:

<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
3,658	5,674		2,016

Fewer ties were used in 1931, as less replacements were necessary on the main line and approach tracks.

f. Explosives, Drilling & Blasting:

Statement of Explosives Used:

<u>KIND</u>	<u>QUANTITY</u>	<u>AVERAGE PRICE</u>	<u>AMOUNT 1931</u>	<u>AMOUNT 1930</u>
40% Hercules, -----	1,150	.1125	129.38	63.63
25% Gelatine, -----	19,500	.1050	2,047.50	-
40% Gelatine, -----	400	.1150	46.00	-
60% Gelatine, -----	-	-	-	108.38
Hereomite #2 & #4 (Sticks)	3,550	.1225	434.86	1,189.73
Hereomite Bag, -----	30,700	.1225	3,760.75	13,599.38
Total Powder, -----	55,300	.1161	6,418.49	14,961.12
Fuse, -----	900	.0062	5.61	20.58
Caps, -----	1,000	.0116	11.59	23.31
Electric Exploders, -----	1,250	.1030	128.77	330.69
Connecting Wire, -----	8	.3888	3.11	17.74
Crimpers, -----	3	.5567	1.67	-
Total Caps, etc., -----			150.75	392.32
TOTAL ALL EXPLOSIVES,--			6,569.24	15,353.44

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7. OPEN PIT:
(Continued)

f. Explosives, Drilling & Blasting: (Continued)

Statement of Explosives Used: (Continued)

	1931 CRUDE & DIRECT	1931 CONCTS. & DIRECT	1930 CRUDE & DIRECT	1930 CONCTS. & DIRECT
Product, -----	296,038	202,479	569,879	402,598
Lbs. Powder Per Ton of Ore,-	.1868	.2731	.2082	.2947
Cost per ton for Powder, ---	.0217	.0317	.0263	.0372
Cost per ton for Caps, etc.-	.0005	.0007	.0007	.0010
Cost per ton all Explosives,	.0222	.0324	.0269	.0381
Avg. Cost per lb. for Powder	.1161	.1161	.1261	.1261

Commenced operations June 1st, 1931; suspended operations
September 29th, 1931.

g. Open Pit Mining & Loading:

Wash Ore:

The Armstrong drill was put in service in Hill Area "B" and the Cyclone machine in Trumbull Area "F" on May 25th. These drills continued working until September 7th, putting down blast holes for ore operations.

The electric shovel, #34, was operated intermittently in Trumbull Area "F" throughout the season. The end of a cut remaining from 1930 was finished and a second cut taken along the length of Area "F". Thereafter, the shovel was cut in at several places in an effort to obtain Bessemer ore and secure high grade material for sweetening purposes. The electric shovel was worked as grading conditions required and at times when the Hill shovels encountered such unfavorable rock conditions that they were not able to supply the mill with crude ore. A small tonnage of direct ore was handled in connection with the electric shovel wash ore operations.

Shovel #26 spent the fore part of the season in Hill Area "C". The machine completed a 1930 cut and was then moved back and took a second cut here, finishing the work on June 25th. The ore encountered in Area "C" was of better grade than had been anticipated and the rock factor applied here was found to be too conservative. The shovel was turned around and moved to Hill Area "B", where a sinking cut was started. At the beginning of this cut the ore was badly mixed with rock, but as the machine progressed Westward, a number of pockets of clean ore were encountered and at the West end of the area, loading conditions were quite satisfactory. This cut was finished on August 3rd and a second cut started immediately. When the shovel had progressed about half way through the second cut, an almost solid bank of rock was encountered. After loading in this material for a

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7. OPEN PIT:
(Continued)

g. Open Pit Mining & Loading: (Continued)

Wash Ore: (Continued)

few shifts, it was decided to shut down the operation here for the season. The amount of rock to be encountered in the balance of this cut is so extensive that the work can only be done when we are working in clean high grade ore elsewhere in the pit.

Shovel #27 started operating in Hill Area "A" on June 26th, having previously cleaned back some waste cretaceous material. A short cut was completed here June 30th and the machine was then moved to Area "B" extension, in the vicinity of the main approach. Old drilling indicated that there was a high grade deposit of Bessemer ore in Area "B" extension and it was anticipated that operations here would assist us materially in securing a sweetening Bessemer grade. In the first cut in this area, rock was encountered, which slowed up the operation considerably. Further than this the grade of the ore was disappointing, in that it was almost entirely non-Bessemer and the Silica was higher than the drilling indicated. The first cut in this area was completed July 24th and a second cut started immediately, where some high grade material was secured for a few shifts. On account of grading conditions it was necessary to move the shovel to Hill Area "A", where this machine was engaged during the balance of the season. Preparations were made in Area "A" for a direct ore operation in 1932. To do this, several cuts were taken in wash, waste and lean ore material.

Shovel #22 was moved into the Hill pit at the end of July and was placed in the second cut in Area "B" extension. This machine is a Marion Model 60 type and could not be used to advantage in Area "A" but was of ample capacity to furnish the required ore from Area "B" extension. The machine took several short cuts in Area "B" extension, working here intermittently during the balance of the ore season, as grading conditions required.

Direct Ore:

Shovel #34 loaded Trumbull direct ore from Area "F" in connection with the wash ore operations during several shifts.

Shovel #26 secured a small tonnage of direct ore from the East end of the cuts in Hill Area "C".

Shovel #27 secured a small tonnage of direct ore in connection with the operations in Hill Area "A".

Lean & Waste Ore:

Shovel #27 loaded cretaceous lean ore from Hill Area "A" and also some lean wash and waste material while engaged in the wash ore layer.

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7. OPEN PIT:
(Continued)

g. Open Pit Mining & Loading: (Continued)

Lean & Waste Ore: (Continued)

Shovels Nos. 27 and 22 loaded a small quantity of lean ore and some rock from Area "B" extension.

Shovel #26 handled considerable waste rock in connection with the work in Area "B".

k. Water Level in the Pit:

The Layne & Bowler pump was shut down for repairs during February and resumed operations the fore part of April. The water level in the Trumbull pit had been reduced to such an extent that it was only necessary to operate the Layne & Bowler pump on a day shift basis during the ore season. On September 1st it was decided to shut this pump down indefinitely, as the water level had been lowered to such an extent that the pumping operations at the Hill-Annex Mine will hold the water, except in very heavy flood conditions, below the bottom of our pits.

It was not necessary to operate our raft pump, located in the bottom of the Hill pit, during the year 1931. In fact, this pump was removed from the pit and sent to the Holman-Cliffs Mine.

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8. COST OF OPERATION:

a. Comparative Mining Costs:

	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
<u>PRODUCT:</u>				
Direct Shipping, -----	21,134	67,591		46,457
Concentrates, -----	181,345	335,007		153,662
Total Production, -----	202,479	402,598		200,019
Avg. Daily Product, -----	3,610	3,121	489	
Tons Per Man Per Day, -----	26.9	22.20	47.0	
Days Operated, -----	82	129		47
Budget, Estimated Production,	200,000	480,000		280,000
" " Cost at Mine,	2.005	1.474	.531	
<u>COST</u>				
<u>Total Cost at Mine:</u>				
Open Pit Direct Shipping Ore,	.117	.133		.016
Open Pit Wash Ore, -----	.516	.409	.107	
Concentrating, -----	.325	.203	.122	
General Expense, -----	.193	.164	.029	
Cost of Production, -----	.959	.696	.263	
Depreciation, Plant & Equipt.	.200	.200	-	-
Depreciation, Movable Equipt.	.003	.001	.002	-
Taxes - Ad. Valorem, -----	.451	.240	.211	
" - Occupational, -----	.035	.045	-	.010
" - Royalty, -----	.055	.056	-	.001
Amortization, Stripping, ---	.250	.350	-	.100
Total Cost at Mine, -----	1.953	1.588	.365	
Administrative & Genl. Exp.--	.108	.131		.023
Miscellaneous Income,	.012	.031		.019
Total Cost at Mine, -----	2.049	1.688	.361	

d. Detailed Cost Comparison:

(1) Product:

There was a decrease of 46,457 tons in the direct ore produced in 1931, as compared with 1930 and a decrease of 153,662 tons in the concentrates for 1931 as against those in 1930. This makes a total decrease in the shipments from the property during 1931 of 200,019 tons. This very large decrease in production effects to a considerable extent all the fixed charges at the Hill-Trumbull Mine.

The average daily output was 489 tons per day higher in 1931 than in 1930.

The budget estimated cost for 1931 was \$2.005 per ton on a 200,000 ton basis and the cost realized was \$2.049, an increase over the budget figure of \$.044. The two factors entering into this increase over the budget figures were: first - the higher AdValorem taxes as the

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8. COST OF
OPERATION:
(Continued)

d. Detailed Cost Comparison:

(1) Product: (Continued)

result of an increased rate and - second, more extensive operations in rocky wash ore areas, than was anticipated, this being necessary on account of the demand for a larger proportion of Bessemer ore.

(2) Direct Ore Costs:

There was a decrease of \$.016 per ton in the direct ore produced during 1931, as compared with the previous year. This was due to the fact that tracks had been laid into the direct ore area in 1930 and it was not necessary to spend as much money in this account in 1931. Further than this the direct ore operations in 1931 were incidental to the wash ore production.

(3) Wash Ore Costs:

The increase of \$.107 in the wash ore costs in 1931 was due to the fact that the proportion of rocky wash operations was much greater in 1931. The reduced tonnage in 1931, as affecting certain fixed charges under this caption, was also a factor.

(4) Concentrating:

The 1931 increase of \$.122 for concentrating was the result of handling such a large proportion of rocky wash material that year and the absorption of the winter expense by a much smaller tonnage.

(5) General Expense:

The large reduction in the output of 1931 explains the increase of \$.029 per ton in this account.

(6) Miscellaneous Group:

The absorption of the Ad Valorem taxes by the smaller 1931 output resulted in increasing this item by \$.211. This was partly off-set by a reduction of \$.01 per ton in the Occupational Tax and an arbitrary reduction of \$.10 per ton in the Stripping Amortization.

The Amortization of Stripping was arbitrarily reduced from \$.35 in 1930 to \$.25 for 1931. This was the result of revised estimate made, which showed that the stripping account at the Hill-Trumbull Mine would be amortized by the charging of 25¢ per ton.

9. EXPLORATIONS
AND
FUTURE
EXPLORATIONS:

The exploratory work undertaken during 1931 was confined to the test-pitting of Hill Area "A". This work was started early in October and thirteen pits had been completed by November 6th. This work was done for determining the character and grade of the direct ore available for mining during 1932.

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9. EXPLORATIONS
AND
FUTURE
EXPLORATIONS:
(Continued)

The question of drilling in connection with the revised estimate for January 1st, 1933, will be decided during the spring of 1932. Some exploratory work will be necessary, unless some agreement can be reached with the Great Northern interests, as to the minimum royalty requirements during the last fifteen years of the Hill-Trumbull lease. According to the Hill-Trumbull lease, we are required to do sufficient exploratory work to determine the reserve tonnage of ore in the Hill-Trumbull Mine, as of January 1st, 1933. The joint estimate then agreed upon between the Great Northern and our engineers, will determine the minimum royalty requirements during the remaining fifteen years of the lease. In other words, the minimum royalty requirements would be based on one-fifteenth of the ore remaining in the properties on January 1st, 1933.

10. TAXES:

The following statement shows the taxes and average rate at the Hill-Trumbull Mine for the years 1931 and 1930:

	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
Hill Mine, -----	40,548.02	42,270.65		1,722.63
Trumbull Mine, -----	46,525.04	49,590.90		3,065.86
Hill-Trumbull Shops, ----	1,006.44	994.60	11.84	
Hill-Trumbull W.P.Lands, -	<u>3,301.97</u>	<u>3,493.75</u>		<u>191.78</u>
TOTAL, -----	\$ 91,381.47	96,349.90		4,968.43
Village Lots, -----	<u>571.46</u>	<u>564.02</u>	<u>7.44</u>	
GRAND TOTAL, -----	\$ 91,952.93	96,913.92		4,960.99
Average Rate, -----	.771	.763	.008	

There was a decrease of \$4,960.99 in the Hill-Trumbull taxes, charged to the 1931 ore, as compared with the previous year, due to the tonnage shipped from the property during the year 1930. This amount of taxes would have shown a further reduction if it had not been for an increase in the tax rate for 1931 of \$.008.

11. ACCIDENTS
AND
PERSONAL
INJURY

There were no lost-time accidents at the Hill-Trumbull Mine during 1931. This record compares with five lost-time accidents during 1930 and shows what may be accomplished by whole-hearted cooperation on the part of the men with the management of the property. The last lost-time accident at the Hill-Trumbull Mine occurred September 2nd, 1930.

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11. ACCIDENTS
AND
PERSONAL
INJURY:

The employees at the Hill-Trumbull Mine received safety knives on March 2nd for having completed a six months period without a lost-time accident and they were awarded gold safety buttons upon the completion of a year's record, September 2nd, 1931.

12. NEW CONSTRUCTION
AND PROPOSED
NEW CONSTRUCTION:

The work of removing the old bridge over Highway No. 35 was begun on the 3rd of April and finished April 5th. The concrete piers were put in by April 18th, and the steel, which was received May 9th, was all erected and the bridge in shape for service by May 20th.

13. EQUIPMENT AND
PROPOSED
EQUIPMENT:

No new equipment was purchased during 1931.

Considering proposed new equipment, there are three items at present before us; first - the purchase of an electric shovel for pit operations; second - a fine ore treatment plant to be added to our washer lay-out, and - third - a gasoline dragline to replace the old second-hand machine, which we purchased some four years ago. An electric shovel will not be necessary until we get into a normal operation and the purchase and installation of the fine treating plant and gasoline dragline can be postponed until such time as a capacity operation is resumed at this property.

14. MAINTENANCE
& REPAIRS:

Repair work in the shops was resumed on January 5th, after a two weeks lay-off.

The over-hauling of the Holman-Cliffs locomotive No. 104 was finished January 10th.

Locomotive No. 101 was taken into the shop January 12th and the over-hauling of this machine was finished during the latter part of February. The following work was done on the engine: The drivers were removed and the crown brasses, shoes and wedges were repaired. The front truck and tank were repaired. The air pump was over-hauled. New pins and bushings were made for the side rods. The spring hangers and equalizers were checked up. The pistons and valves fitted with new rings and the cross-heads were lined up. The engine had been taken into the shops on December 11th, and was

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14. MAINTENANCE
& REPAIRS:
(Continued)

then furnished with a new set of tires and cross-head shoes.

Locomotive #102 was taken into the shop during the last week in February and the repairs were finished March 28th, the following work having been done: The drivers were removed and new crown brasses were put in and the shoes and wedges repaired. The tire flanges were built up by welding; the tank and trucks were overhauled; the side and main rods were fitted with new brasses and the valves were equipped with new rings. It was necessary to put two new flues in the boilers. Repair work on the tires of this machine was undertaken at the same time as locomotive #101.

Locomotive #103 was taken into the shop at the end of March and the repairs finished by the end of April, the following repair work being accomplished: The drivers were removed and new crown brasses and hub liners installed. The tender was completely repaired; the boiler was caulked; new rings were placed on the valves and pistons; the side rod bushings were reduced and the main rods were fitted with new brasses.

During the winter, wearing plates were made for the Holman-Cliffs washing plant 8-ft. pan conveyor and the pans and hinges of this equipment were straightened.

The repairs on the 20-yard cars were completed during the fore part of April. This work, which was started in the fall of 1930, consisted in cleaning and repairing the air equipment; cleaning and greasing the journal boxes; re-babbitting the brasses and straightening and repairing all bent parts. At the end of the 1931 ore season, the job of overhauling the cars was again started and eight of them had been put through the shop by the end of the year. The spring work on the 20-yard cars was finished May 9th and the three flat cars were put in shape for service by the first of May.

A new foundation was placed under the steam hammer during February.

A new paddle shaft was made up for one of the washing plant logs during February.

Some new flues were placed in the shop heating boiler during February.

Two new driver axles for one of the Canisteo locomotives were made up in the shops during March.

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14. MAINTENANCE
& REPAIRS:
(Continued)

Minor repairs were made on the gasoline dragline during the spring of 1931.

The pans of the 5-ft. conveyor from the washing plant were repaired.

The tires of Holman locomotives Nos. 104, 105 and 106 were turned down at the Hill-Trumbull shops.

The locomotive crane was repaired, the work being started on April 27th and completed May 9th. A new crank-shaft was installed; the drum repaired; the valve motion re-bushed and fitted with new pins and some repairs were made to the boom.

A new cylinder was installed in the shop air compressor during May.

A new lower section was made for the dragline boom in May, the old one having collapsed under the strain of a heavy load.

The steam shovel repairs during 1931 were relatively light. Shovel #27 received some minor repairs and the boom of shovel #26 was overhauled.

Locomotive #19 was given a thorough overhauling. This engine was jacked up and the drivers removed; new crown brasses were put in place and the shoes and wedges, and also the hub liners were machined. The links and blocks of the valve motion were ground; the eccentric straps were built up in the machine; the air pump overhauled; the boiler jacket repaired; the rod pins on the drivers turned down and the cylinder heads, valve seats and covers were ground. This engine was still in the shops at the end of the year.

The toggle bearing on the Holman-Cliffs washing plant jaw crusher was being re-babbitted at the end of the year.

Washing Plant Repairs:

Repair work was started on the receiving bin in January and completed in May. The carpenter crew did not work steadily on this job as there was other work coming up from time to time. The old planking and part of the timber frame were removed and new material put in. The ends of the pocket were raised two feet and the railway tracks were raised a corresponding amount, to afford capacity for the dumping of a fully-loaded 30-yard car in the pocket.

The regular washing plant crew were engaged at the Canisteco mill during the months of January and February and did not resume work at

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14. MAINTENANCE
& REPAIRS:
(Continued)

the Hill-Trumbull until the 3rd of March. The following repair work was undertaken:-

The pans were removed from the 5-ft. pan conveyor and sent to the shops for overhauling.

A new paddle shaft was installed in one of the logs and the two machines were completely overhauled.

The lugs on the head sprockets of the 5-ft. and 8-ft. pan conveyors were built up.

The bearings of the revolving screen were cleaned and new perforated plates installed.

The bowl classifiers were repaired; the bearings of the 8-ft. pan conveyor cleaned and greased; the grizzly and chutes were overhauled and new liners were placed in the chutes where needed.

New cushion boxes, lined with concrete, were provided under the revolving screen.

The rollers of the 36" belt conveyor were cleaned and greased.

The pumps were re-assembled and made ready for use.

The vibrating screens were given some repairs and new cushion boxes were provided for the logs.

The dragline started work on the dikes at the end of April and was kept on this job until September 26th. The dikes have now been built up so as to accommodate at least a full year's operation.

During July, the chutes handling the concentrates from the picking belt, logs and classifiers, were re-arranged so that the product from all of these machines was discharged into the bin at one point. This was done so that an accurate sample might be obtained of the concentrates. In the past the product from the several machines was sampled and the average analyses was obtained by calculating the proportion of product from the several machines. As there was no way of accurately determining this proportion, the samples computed to secure the average analyses was based on estimating. In the future, the sampling at the Hill-Trumbull washing plant should give accurate results.

A new line of sprinklers was installed in the tailings basin during the past summer. This line was run across the center of

HILL-TRUMBULL MINE
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14. MAINTENANCE
& REPAIRS:
(Continued)

the large Northerly basin. At times of heavy wind storms, the material from the South side of the tailings basin would rise to such a height that the sprinkler system, located across the North side of the basin, could not dampen and settle all of the dust. The later sprinkler installation has added materially in controlling the dust from being carried to the Village of Calumet.

At the close of the 1931 ore season, the washing plant was thoroughly cleaned and all water lines drained; the sprinkling system was repaired; the lugs on the head sprocket of the 8-ft. pan conveyor built up; the South log overhauled; the air compressor repaired and the bowl classifiers were taken apart for overhauling and some light repairs were made on the revolving screen.

The ditch, leading away from the concrete culvert, which handle the drainage from the mine and Mud Lake, was cleared of an accumulation of debris. Beavers had built a dam in the ditch and had backed up the water in Mud Lake. The dragline was utilized in this operation.

The washing plant crew spent considerable time during the months of November and December in placing brush along the dikes. Further than this, snow fences were constructed across the tailings basin. It is hoped that this work will help to control the dust from the tailings basin. Last winter there was very little snow and as our water was turned off we could not do any sprinkling, with the result that there were numerous complaints from people living in the Village of Calumet.

18. NATIONALITY
OF
EMPLOYEES:

<u>NATIONALITY:</u>	<u>NO. OF MEN</u> <u>1931</u>	<u>NO. OF MEN</u> <u>1930</u>
Finnish, -----	7	23
English, -----	5	12
Swedish, -----	5	12
French, -----	2	3
German, -----	5	14
Jugo-Slav, -----	11	17
Scotch, -----	2	4
Italian, -----	2	3
Irish, -----	7	13
Bulgarian, -----	3	3
Norwegian, -----	3	5
Austrian, -----	3	3
Dane, -----	1	1
Croatian, -----	3	2
Welch, -----	2	1
Polish, -----	1	1
Serbian, -----	0	2
<u>TOTAL, -----</u>	<u>62</u>	<u>119</u>

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19. WASHING PLANT
OPERATIONS:

The washing plant was started June 1st and finished operations for the season on September 29th. The crew worked on a ten-hour five day per week basis until August 17th and from then to the end of the season on a four-day basis.

The late start at the washing plant eliminated the usual trouble that is experienced with frost chunks. The operation of the plant was, however, slowed down to a considerable extent during the entire season, due to the exceptionally rocky condition of the wash ores treated.

In order to secure as much Bessemer ore as possible, forced the tonnage from the Hill pit on account of minimum royalty conditions and to produce a sweetening material for the Hill Bessemer and McCook mixtures, it was necessary to conduct our washing operations very carefully and to sort out quantities of rock in the plant.

During the year 1931 - 274,904 tons of wash ore was treated, as compared with 502,288 tons during 1930. The concentrates produced in 1931 amounted to 181,345 tons as against 335,007 tons in 1930.

Some trouble was experienced with the dust from the tailings basin, but we feel that we now have this matter pretty well in hand and we should very largely avoid difficulty in the future so far as the Village of Calumet is concerned.

The rejects from the mill during 1931 amounted to 9,783 tons, averaging 24.07% Iron. This compares with 25,125 tons of rock, running 25.78% Iron for the 1930 season.

The gross recovery for 1931 was 65.97% as against 66.70% for the year 1930.

The iron unit recovery for 1931 was 85.80% as compared with 92.91% for 1930.

The lower gross and iron unit recoveries realized in the treatment of ores in 1931 was due to the very rocky material handled. The clean wash ore treated during 1931 was proportionately less than for any year since we have operated the Hill-Trumbull Mine.

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19. WASHING PLANT
OPERATIONS:

The analyses of the product from the several machines for the years 1931 and 1930, were as follows:

	-----1931-----			-----1930-----		
	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>
Screens,	58.98	.044	8.49	55.91	.048	13.28
Logs,	60.52	.047	6.17	59.23	.050	8.18
Classifiers,	53.46	.041	16.67	54.23	.041	18.11
Tailings,	18.75			14.37		

The analyses of the plant rejects for the year 1931 were as follows:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Hill, -----	9,654	24.25	.039	62.63
Trumbull, -----	129	10.70	.014	80.15
Total, 1931 -----	9,783	24.07	.039	62.86

The rock removed from the pit and placed on the dumps during 1931, together with the iron analyses, follows:

	<u>Tons</u>	<u>Iron</u>
Hill, -----	10,272	32.65
Trumbull, -----	-	-
Total, 1931 -----	10,272	32.65
Total, 1930 -----	48,690	28.83

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1. GENERAL:

During the winter months the open pit equipment and washing plant machinery was given an overhauling and the pit drainage system was prepared for handling the flow of water.

The A. Guthrie Company continued the stripping of the taconite island during the months of April and May, completing the work in the latter month. These contractors then started stripping work in the Mt. Griffen area, a new shovel being supplied for this job. Stripping work on the North Star-Mt. Griffen land was carried forward in- to the month of November.

During the months of January and February, test-pitting was carried forward in the North Star and Brown #1 areas to provide data for 1931 ore operations.

Structure drilling was started on the Bingham land during the spring and was continued to the end of the year.

Ore operations began June 1st and were completed October 16th. During the first three weeks in June, the mine was operated on a six-day per week basis, but during the remainder of the season work was carried forward on a five-day per week basis.

Generally speaking, the pit was in much better shape for ore operations in 1931 than it was the previous year. The new approach in- to the Holman pit bottom eliminated several switch-backs; the tracks were in much better shape than the previous year and the water conditions were much less troublesome. If it had not been for the very decided reduction in the ore schedule, the costs realized would have been much more favorable than in 1930. Due to the large reduction in the output, the cost of production showed an increase.

Rather extensive experimentation was carried forward at the wash- ing plant during the operating season of 1931. This work was largely confined to betterments in treatment of the fine ores.

2. PRODUCTION,
SHIPMENTS &
INVENTORIES:

a. Production by Grades:

Holman Crude Ore, -----	261,731 tons.
Brown Crude Ore, -----	59,860 "
North Star Crude Ore, -----	68,940 "
Total Crude Ore, -----	390,531 "

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2. PRODUCTION,
SHIPMENTS &
INVENTORIES:
(Continued)

a. Production by Grades: (Continued)

Holman Bessemer Concentrates, -----	5,420	tons
Holman Non-Bessemer Concentrates, -----	189,964	"
Brown Bessemer Concentrates, -----	8,301	"
Brown Non-Bessemer Concentrates, -----	36,313	"
North Star Non-Bessemer Direct Shipping, -----	248	"
North Star Bessemer Concentrates, -----	20,859	"
North Star Non-Bessemer Concentrates, -----	<u>35,309</u>	"
TOTAL HOLMAN-CLIFFS MINE, -----	296,414	"

b. Shipments:

The shipments from the Holman-Cliffs Mine during 1931 were the same tonnages as shown under the production statement, as all ore mined was forwarded to Lower Lake ports.

c. Stockpile Inventories:

No merchantable ore, either concentrates or direct shipping, was stocked at the Holman-Cliffs property during 1931, but the following lean non-wash material was placed in stock:

Non-Concentrating Material Above 40%:

	<u>Tons</u>	<u>Fe.</u>	<u>Phos.</u>	<u>Silica</u>
North Star,	585	48.89	.044	24.50

e. Production by Months:

(1) Crude Ore:

	<u>HOLMAN</u>	<u>BROWN</u>	<u>NORTH STAR</u>	<u>TOTAL</u>
June, -----	84,917	13,208	230	98,355
July, -----	69,465	3,761	10,880	84,106
August, -----	41,760	20,901	14,284	76,945
September, -----	42,296	9,538	37,159	88,993
October, -----	<u>23,293</u>	<u>12,452</u>	<u>6,387</u>	<u>42,132</u>
Total, 1931 -----	261,731	59,860	68,940	390,531

(2) Concentrates & Direct Ore:

<u>MONTH</u>	<u>HOLMAN CONCTS.</u>	<u>BROWN CONCTS.</u>	<u>NORTH STAR DIRECT</u>	<u>NORTH STAR CONCTS.</u>	<u>TOTAL</u>
June, -----	61,349	9,310	-	126	70,785
July, -----	54,527	2,975	230	9,177	66,909
August, -----	31,356	16,057	18	11,545	58,976
September, ----	31,009	7,018	-	30,202	68,229
October, -----	<u>17,143</u>	<u>9,254</u>	-	<u>5,118</u>	<u>31,515</u>
Total, 1931 --	195,384	44,614	248	56,168	296,414

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2. PRODUCTION,
SHIPMENTS &
INVENTORIES:
(Continued)

f. Ore Statement:

All material considered as ore that was mined during 1931, was shipped from the property.

g. Delays:

The following delays were reported during the year 1931:

<u>Date</u>	<u>Time Lost</u>	<u>Cause:</u>
June 1st,	2 - Hr.	Classifiers plugged.
" 3rd,	1 - " 15 Min.	Motor panel burned out.
" 9th,	1 - " 55 "	Car off at pocket.
" 24th,	1 - "	Classifiers plugged.
" 30th,	1 - "	Classifiers plugged.
July 27th,	1 - "	Classifiers plugged.
" 31st,	1 - "	Classifiers plugged.
" 31st,	2 - "	Pumps broke down
Sept. 29th,	3 - "	No power.

Delays Account No Cars:

There was a total delay of twelve hours and ten minutes on account of no cars.

3. ANALYSIS:

a. Mine Analysis of Production & Shipments:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Moist.</u>
Holman Non-Bess. Concts.,	189,964	57.23	.062	10.57	.36	.70	8.68
Holman Bess. Concts.,	5,420	57.61	.038	11.29	.23	.48	7.13
Brown Bess. Concts.,	8,301	57.03	.034	12.15	.19	.44	7.64
Brown Non-Bess. Concts.,	36,313	56.30	.050	12.53	.24	.48	8.66
North Star Bess. Concts.,	20,859	58.52	.035	10.40	.27	.47	8.36
North Star Non-Bess. Concts.,	35,309	57.65	.058	10.60	.28	.46	8.93
North Star Non-Bess. Direct,	248	58.50	.050	10.67	.28	1.13	10.30
Total, 1931 -----	296,414	57.26	.057	10.86	.32	.62	8.63

d. Average Analysis of Crude Ore Produced:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Holman Crude, -----	261,731	49.77	.057	22.74
Brown Crude, -----	59,860	46.02	.043	28.30
North Star Crude, -----	68,940	52.11	.044	19.77
Total Crude Ore, -----	390,531	49.61	.051	23.07

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3. ANALYSIS:
(Continued)

e. Composite Analysis of Season's Shipments:

	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mn.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>
Holman Bess.Concts. (C.C.I.)	57.90	.039	10.31	.22	.42	.25	.14	.040	5.56
Holman Bess.Concts. (Butler Bros.)	57.40	.037	11.52	.22	.42	.28	.18	.038	5.13
Holman N.B.Concts.	57.35	.061	10.54	.35	.66	.33	.18	.035	5.54
Brown Bess. Concts. (C.C.I.)	56.40	.032	12.72	.19	.40	.33	.14	.038	5.52
Brown Bess. Concts. (Butler Bros.)	58.40	.036	11.15	.17	.44	.29	.16	.040	4.34
Brown N.B.Concts.	56.20	.050	12.60	.22	.45	.28	.15	.040	5.58
N.Star Bess.Concts. (C.C.I.)	58.00	.032	10.88	.27	.52	.33	.14	.038	4.94
N.Star Bess.Concts. (Butler Bros.)	59.00	.035	9.70	.20	.48	.31	.16	.038	4.75
N.Star N.B.Concts.	57.70	.055	10.82	.30	.50	.23	.17	.038	5.27
N.Star N.B.Direct,	58.40	.048	10.75	.30	1.10	.25	.17	.042	3.84

4. ESTIMATE OF
ORE RESERVES:

a. Developed Ore:

Assumption: 16 cubic feet per ton for Wash Ore.

A rock deduction of 10% was made generally and in estimating a part of the deposit the deduction was increased to 20%, due to the exceptionally rocky condition of this ore.

The tonnage listed below is on a concentrated basis and is figured on a 60% gross recovery:

Brown No. 1:

Non-Bess. Concentrates, ----- 1,126,196 tons

Holman:

Non-Bess. Concentrates, ----- 2,798,873 "

Brown #2:

Non-Bess. Concentrates, ----- 1,891,533 "

TOTAL HOLMAN-BROWN, ----- 5,816,602 "

North Star:

Non-Bess. Direct, ----- 80,103 "

Bess. Concentrates, ----- 538,083 "

Non-Bess. Concentrates, ----- 101,891 "

TOTAL NORTH STAR, ----- 720,077 "

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4. ESTIMATE OF
ORE RESERVES:

a. Developed Ore: (Continued)

Bingham:

Bessemer Direct, -----	269,664 tons
Non-Bess. Direct, -----	329,590 "
Bessemer Concentrates, -----	1,198,361 "
Non-Bess. Concentrates, -----	590,238 "
 TOTAL BINGHAM, -----	 2,387,853 "
 TOTAL BINGHAM-NORTH STAR, -----	 3,107,930 "
 GRAND TOTAL HOLMAN-CLIFFS MINE, -----	 8,924,532 "

No exploratory work was undertaken at the Holman-Brown property during 1931, other than some shallow test pits to determine the grade of ore to be shipped during that season. There was no additional information obtained at this property, which would result in changing the factors or areas making up the ore estimate. The tonnages and analyses used in the estimate of January 1, 1932 are obtained by subtracting the ore mined and shipped from the several descriptions.

At the North Star Mine, exploratory work undertaken during the year and results obtained from mining operations, indicated that a change should be made in the ore estimate as of January 1, 1932. Deducting the 1931 shipments from the reserves set up a year ago, shows an increase in the tonnage of this property, as of January 1st, 1932, of 49,593 tons. The present estimate is still conservative and unquestionably there will be some further increases when mining operations are carried forward.

The Bingham Mine was thoroughly drilled during 1931 with the result that the tonnage of reserve ore in this property was increased from 1,400,000 to 2,387,853 tons, or approximately 1,000,000 tons.

b. Prospective Ore:

It is very probable that drilling at depth on the Holman and Brown #2 properties will show additional ore of washable grade. Further than this the improved methods of treating the so-called jig ores, will undoubtedly show a substantial tonnage in the future that is not now considered.

There is small likelihood of adding any substantial tonnage of wash ore in the case of the Brown #1 Mine, but undoubtedly some jigging material will be included in future estimates as commercial jigging methods are developed.

At the North Star property the West forty has now been pretty thoroughly explored and it is not likely that any additional tonnage will be developed here. There is a good chance of additional ore being proven up, however, in the East forty. Some drilling will be required to outline the Northern extension of the East North Star forty deposit.

HOLMAN-CLIFFS MINE
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4. ESTIMATE OF
ORE RESERVES:
(Continued)

b. Prospective Ore: (Continued)

The Bingham Mine has now been thoroughly drilled and the ore estimate is comprehensive. There has been considerable jig material encountered in the drilling and this will be added to the ore reserves as the jiggling processes are developed.

c. Estimated Analyses:

<u>Brown No. 1:</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Moist.</u>	<u>Fe.Net.</u>
Non-Bess. Concts.	1,126,196	56.30	.038	12.97	9.35	51.03
<u>Holman:</u>						
Non-Bess. Concts.	2,798,873	57.17	.063	10.44	9.33	51.84
<u>Brown #2:</u>						
Non-Bess. Concts.	1,891,533	56.93	.063	11.12	9.35	51.61
Total Holman-Brown,	5,816,602	56.93	.058	11.14	9.34	51.61
<u>North Star:</u>						
Non-Bess. Direct,	80,103	57.95	.064	10.00		
Bess. Concts.	538,083	57.80	.033	11.00		
Non-Bess. Concts.	101,891	56.82	.052	10.98		
Total North Star,	720,077	57.68	.039	10.88	8.90	52.60
<u>Bingham:</u>						
Bess. Direct,	269,664	58.12	.031	8.91		
Non-Bess. Direct,	329,590	59.11	.056	9.55		
Bess. Concts.	1,198,361	59.92	.033	10.24		
Non-Bess. Concts.	590,238	59.40	.058	8.51		
Total Bingham,	2,387,853	59.48	.043	9.57	9.40	53.89
TOTAL BINGHAM- NORTH STAR,	3,107,930	59.06	.042	9.87	9.28	53.58
GRAND TOTAL - HOLMAN-CLIFFS MINE,	8,924,532	57.67	.052	10.70	9.32	52.30

HOLMAN-CLIFFS MINE
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5. LABOR & WAGES:

a. Comments:

(1) Labor:

Labor conditions generally in the Taconite district were very satisfactory during the year 1931. Ample skilled and common labor was available at all times. So far as possible, old employees were engaged. All labor was paid on the basis, which has been in effect for a number of years, until October 1st, when a 10% reduction was put into effect. Salaried employees were put on a five-day per week basis, as of June 15th, the reduction in salaries being about 15%.

(2) New Construction:

This information is shown under No. 12 - "New Construction and proposed New Construction".

b. Statement of Labor & Wages:

	<u>HOLMAN-CLIFFS</u>	<u>HOLMAN-BROWN</u>	<u>BINGHAM-NORTH STAR</u>
<u>PRODUCT</u> -----	296,414	239,998	56,416
No. of Shifts & Hours, --	1, 10-Hr.	1, 10-Hr.	1, 10-Hr.
Avg. No. of Men Working, -	98	81½	16½
Avg. Wages per Day, -----	\$4.99	\$4.98	\$5.04
Product per man Per Day, -	20.97	20.33	24.20
Labor Cost Per Ton, -----	.238	.245	.208
Total No. of Days, -----	14,136¼	11,804¾	2,331½
Amount paid for Labor, --	\$ 70,518.30	\$ 58,770.64	\$11,747.66

HOLMAN-CLIFFS MINE
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YEAR 1931

5. LABOR & WAGES:
(Continued)

b. Statement of Wages & Product:

<u>PRODUCT:</u>		
Holman-Brown, -----	239,998 tons.	
Bingham-North Star, -----	56,416 "	
<u>NO. SHIFTS & HOURS:</u>		
Holman-Brown, -----	1, 10-hr.	
Bingham-North Star, -----	1, 10-hr.	
<u>AVG. NO. OF MEN WORKING:</u>		
Holman-Brown, -----	81 $\frac{1}{2}$	
Bingham-North Star, -----	16 $\frac{1}{2}$	
<u>AVG. WAGES PER DAY:</u>		
Holman-Brown, -----	\$ 4.98	
Bingham-North Star, -----	5.04	
<u>PRODUCT PER MAN PER DAY:</u>		
Holman-Brown, -----	20.33 tons.	
Bingham-North Star, -----	24.20 "	
<u>LABOR COST PER TON:</u>		
Holman-Brown, -----	.245	
Bingham-North Star, -----	.208	
<u>TOTAL NO. OF DAYS:</u>		
Holman-Brown, -----	11,804 $\frac{3}{4}$	
Bingham-North Star, -----	2,331 $\frac{1}{2}$	
<u>AMOUNT PAID FOR LABOR:</u>		
Holman-Brown, -----	\$ 58,770.64	
Bingham-North Star, -----	11,747.66	

In 1930 - Production from May 12th to October 21st.

In 1931 - Production from June 1st to October 16th.

HOLMAN-CLIFFS MINE
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YEAR 1931

6. SURFACE:a. Buildings, Repairs, etc:

The houses in the Village of Taconite, under lease from the Oliver Iron Mining Company, and occupied by our employees, were repaired as per the following statement:

<u>HO. NO.</u>	<u>OCCUPANT</u>	<u>WORK DONE</u>	<u>AMOUNT</u>
1	Andy Nelson,	Rep. Plumbing & Windows,	13.18
11	Peter Baril,	" Wiring, plaster & windows,	16.44
12	Malcolm Olson,	" Toilet, doors & windows,	6.23
13	George Trombly,	" Wiring and windows,	2.06
14	George Dunstan,	" Wiring, plumbing & windows,	17.83
15	W.E. Gustason,	" Windows, doors, wiring, screens, plumbing, plaster & painting,	730.66
16	Gerome Vanoverchelde,	" Toilet and windows,	1.90
17	C. Winkleblack,	" Windows,	3.75
18	Mike Shipka,	" Toilet, windows, wiring & porch,	18.71
37	George Sullivan,	" Foundation, plaster, interior painting and windows,	606.44
38	Ernest Lueck,	" Wiring, doors, floors, plumbing and windows,	22.39
39	T. J. O'Brien,	" Wiring,	.24
40	J. C. Downing,	" Windows, roof & wiring,	4.02
41	A. L. Sundquist,	" Plumbing, windows and foundation,	22.43
42	Arnold Lawson,	" Wiring, windows & plumbing,	4.76
43	Mrs.G. Belle Phillips,	" Windows, floors, wiring & plaster	81.53
44	H. J. Lynch,	" Windows and doors,	6.12
45	Ed. Gustason,	" Porch, windows, wiring & plumbing,	15.17
46	Phillip Loucks,	" Toilet,	2.12
48	William Hanson,	" Plumbing, windows and wiring,	11.74
49	Clarence Martin,	" Plumbing,	4.06
50	Dan McKinnon,	" Plaster and windows,	43.83
51	J. W. Griffith,	" Wiring, garage, plumbing and windows,	28.29
52	Ambrose Hoey,	" Wiring and windows,	6.51
53	Chester Fox,	" Wiring, plaster, plumbing, win- dows and garage,	141.31
54	Roy Elliott,	" Wiring, plumbing and toilet,	6.76
55	Mrs. Hugh McNulty,	" Foundation, floors, plumbing, windows, painting,	459.13
56	B. P. Axford,	" Windows and floors,	21.33
57	August Mergle,	" Plumbing, doors, windows,	10.05
58	Russell Barkla,	" Porch, wiring, windows,	14.58
59	A. J. Mayhew,	" Wiring and windows,	4.10
60	William LeClair,	" Windows, porch, wiring and plumbing,	12.61
61	Russell Wivell,	" Toilet, plumbing and windows,	27.40
62	Joseph Dolezel,	" Windows and wiring,	2.15
63	Pearl Nelson,	" Garbage stand, chimney, windows and wiring,	25.15
64	Herman Mork,	" Windows,	6.41
65	Adolph Lehman,	" Stairs and Chimney,	7.07

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1931

6. SURFACE:
(Continued)

a. Buildings, Repairs, etc: (Continued)

<u>HO. NO.</u>	<u>OCCUPANT</u>	<u>WORK DONE</u>	<u>AMOUNT</u>
66	Ray Perrier,	Moving, toilet, repair windows,	2.73
67	Ed. Doyas,	Rep. plumbing, chimney, plaster and windows,	60.52
68	George Lee,	Repair windows,	5.50
69	Milton Hansen,	Rep. plumbing, wiring, windows,	11.94
70	Henry Carno,	" Windows and doors,	4.21
71	Charles James,	" Windows,	8.02
72	Martin Fleisher,	Build shelves, rep. windows,	7.74
73	Ernest Boutin,	Rep. windows, chimney,	10.38
74	Jess Conway,	" Windows,	2.39
75	Mike Doyle,	" Foundation and windows,	218.94
76	Carl Eggebratten,	" Windows and shed,	8.97
77	Vacant,	" Toilet, plumbing, wiring, plaster and doors,	101.47
78	James McNe vins,	" Windows and shed,	10.69
79	Reynold Gustason,	" Wiring, windows, plumbing,	35.12
80	H. J. Stephens,	" Foundation, plaster & plumbing,	334.09
81	Lloyd Wetherell,	" Plumbing, foundation, plaster and windows,	422.21
97	William Saw,	" Windows,	2.05
98	Dan Fitzhenry,	" Windows,	8.99
99	Steve Dukich,	" Plumbing and windows,	11.77
100	John Winkleblack,	" Windows and shed,	12.55
101	Loy Kolar,	" Garbage stand, windows, plumb- ing and floors,	136.42
102	James Maney,	" Foundation, plaster, plumb- ing, painting, wiring and windows,	1466.65
103	George Beasley,	" Plumbing and windows,	20.60
105	Dan Chamberlain,	" Windows and shed,	10.48
106	Myron Youngberg,	" Windows and plumbing,	8.07
107	Albert Embury,	" Garbage stand, plumbing and windows,	35.40
108	Martin Johnson,	" Toilet and windows,	5.09
109	Albert Owens,	" Toilet, garage, windows,	26.07
110	Alfred Loucks,	" Windows,	2.87
111	Robert Nelson,	" Toilet, windows and porch,	31.26
112	Grant Hess,	" Windows,	2.63
113	Harry Hart,	" Wiring, windows and shed,	20.20
114	Lee Poore,	" Windows and shed,	9.79
115	Frank Wassberg,	" Wiring, plaster and windows,	15.77
116	G. L. Reid,	" Windows, plumbing, plaster, painting and wiring,	315.22
155	J. F. Carson,	" Garbage stand and painting,	109.58
156	Lee Farr,	" Garbage stand, plumbing,	17.87
157	J. W. Mattson,	" Plumbing, garbage stand, coal bin and windows,	25.71
158	W. S. McComber,	" Plumbing, garbage stand and windows,	19.83

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1931

6. SURFACE:
(Continued)

a. Buildings, Repairs, etc: (Continued)

<u>HO.NO.</u>	<u>OCCUPANT</u>	<u>WORK DONE</u>	<u>AMOUNT</u>
Camps:			
4	Charles Flynn,	Repair windows,	1.60
5	Sam Latkovitch,	" Plumbing and windows,	6.06
6	A. Guthrie,	" Plumbing,	6.16
7	Sam Kirkes,	" Porch, garbage stand and windows,	27.63
10	Helmer Point,	" Windows and plumbing,	2.98
Total Cost of Repairs - 1931 -			\$ 6,012.68

c. Tracks, Roads, Transmission Lines:

A track crew was put at work on May 13th and was engaged in making repairs to the main line between the dumps and the washing plant to the end of that month.

During June and July one of the electric shovels was engaged in digging a track grade leading to the bottom of the Holman pit. This grade was dug around the edge of the Holman pit and when completed eliminated three switch-backs which were formerly necessary. The grading job was not entirely finished, but sufficient work was done so that a connection could be made to the lower benches which were worked in 1931. The shovel engaged in this work had to be moved to the North Star ore operation.

During October, the track crew was engaged in raising and ballasting some of the low spots along the main line.

7. OPEN PIT:

a. Stripping:

The A. Guthrie Company started stripping operations at the taconite island on April 4th. The 300-ton shovel completed the cut which was left in the fall of 1930, loaded out some paint-rock at the North end of the island and removed some waste material adjacent to the North end of the track bench. The contractor's machine was then moved to the South end of the island and loaded out the taconite that had been cast for a track connection. This job was completed May 24th and the stripping contract with A. Guthrie Company was finished. The shovel used on this work was so badly racked that the contracting company decided to scrap it. The machine was cut to pieces and removed from the pit during July.

The A. Guthrie Company shipped a 350-ton shovel to the Holman-Cliffs Mine and had erected the machine for the Mt. Griffen stripping job by June 9th. The machine removed two cuts in the heavy stripping bank and had completed about one-half of a third cut, when it was decided to defer further operations until 1932. The contractor had

HOLMAN-CLIFFS MINE
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YEAR 1931

7. OPEN PIT:
(Continued)

a. Stripping: (Continued)

removed approximately 500,000 yards of material from the stripping bank, when the work was stopped. The machine was then used to remove the loading benches and clean all surface material down to the ore. This involved the handling of approximately 80,000 yards and made available for mining the Southerly half of the North Star-Mt. Griffen ore area. This clean-up work was started on September 4th and finished September 26th. The A. Guthrie Company was paid for approximately 500,000 yards of stripping, but arrangements were made to defer payment for the 80,000 yards of clean-up stripping until the spring of 1932. Deferred payments will be made on the basis of the engineers' estimate of yardage removed and no interest will be charged. The benefits accruing to the contractor by having done this work during favorable weather in the fall of 1931, at least off-set the loss of interest on the money expended. As it was necessary to do the work in April of 1932, the actual operating costs would have been considerably higher and would at least have made up for the difference in interest consideration.

Included in the clean-up work was the removing of sloughed material along the bottom of the Brown #1 bank. Some of this material was washed down by rains and some was kicked out while stripping operations along the edge of the pit were in progress.

A gasoline shovel was rented during the month of June to do some clean-up work on the Brown #1-Mt. Griffen area. This work was finished the latter part of June and the gasoline shovel was then used to clean up surface wash along the approach tracks.

d. Timbering:

Statement of Ties Used:

Holman-Brown - Pit Tracks, -----	2,891
Bingham-North Star - Pit Tracks, -----	70
Washing Plant Tracks - Joint, -----	55
Waste Pile Tracks - Joint, -----	297
Yard Tracks - Joint, -----	40
Washing Plant Dike - Joint, -----	30
North Star High Grade Stockpile, -----	90
E&A #615, Waste Pile Tracks, -----	<u>2,017</u>
 Total, -----	 5,490

HOLMAN-CLIFFS MINE
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7. OPEN PIT:
(Continued)

f. Explosives, Drilling & Blasting:

Statement of Explosives Used:

HOLMAN-BROWN MINE

<u>KIND:</u>	<u>QUANTITY</u>	<u>AVERAGE PRICE</u>	<u>AMOUNT 1931</u>	<u>AMOUNT 1930</u>
25% Gelatin, -----	86,450	.1050	9,077.25	21,428.00
40% Gelatin, -----	-	-	-	42.00
40% L.F. Extra, -----	300	.1125	33.75	47.00
60% L.F. Extra, -----	250	.1325	33.13	137.26
60% Gelatin, -----	20,900	.1375	2,873.75	3,335.63
60% Nitro Gliscerin, -	-	-	-	23.25
No.4 Hercomite, -----	200	.1225	24.50	12.75
Hercomite Bag, -----	-	-	-	122.50
<hr/>				
Total Powder, -----	108,100	.1114	12,042.38	25,148.39
Fuse, -----	500	.00624	3.12	16.23
Caps, -----	100	.0116	1.16	9.28
Electric Exploders, --	675	.0789	53.26	68.70
Connecting Wire, -----	56	.3550	19.88	18.89
Lead Wire, -----	-	-	-	5.00
Cordeau - Plain, -----	15,726	.0425	668.36	746.77
Cordeau, Double -----	15,607	.0488	761.62	1,000.89
<hr/>				
Total Caps, etc. ---			1,507.40	1,865.76
<hr/>				
Total Explosives, --			13,549.78	27,014.15
	<u>1931</u>	<u>1931</u>	<u>1930</u>	<u>1930</u>
	<u>CRUDE</u>	<u>CONCTS.</u>	<u>CRUDE</u>	<u>CONCTS.</u>
	&	&	&	&
	<u>DIRECT</u>	<u>DIRECT</u>	<u>DIRECT</u>	<u>DIRECT</u>
Product, -----	321,591	239,998	808,840	553,699
Lbs. Powder per ton Ore	.3361	.4504	.2783	.4065
Cost per ton for Powder	.0374	.0502	.0311	.0454
Cost per ton for Caps, etc.	.0047	.0063	.0023	.0034
Cost per ton All Explosives	.0421	.0565	.0334	.0488
Avg. Cost per Lb. for Powder,	.1114	.1114	.1117	.1117

Commenced operations June 1st, 1931; suspended operations
October 16th, 1931.

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1931

7. OPEN PIT:
(Continued)

f. Explosives, Drilling & Blasting: (Continued)

Statement of Explosives Used:

BINGHAM-NORTH STAR MINE

<u>KIND:</u>	<u>QUANTITY</u>	<u>AVERAGE PRICE</u>	<u>AMOUNT 1931</u>	<u>AMOUNT 1930</u>
25% Gelatin, -----	25,100	.1050	2,835.50	3,974.25
60% Gelatin, -----	100	.1375	13.75	510.25
60% L.F. Extra, -----	-	-	-	13.25
No. 4 Hercomite, -----	-	-	-	19.13
 Total Powder, -----	 25,200	 .1051	 2,649.25	 4,516.88
Fuse, -----	-	-	-	3.12
Caps, -----	-	-	-	5.48
Electric Exploders, ----	75	.07565	5.67	27.86
Connecting Wire, -----	18	.3550	6.39	8.69
Cordeau - Plain, -----	2,988	.0425	126.99	107.19
Cordeau - Double, -----	3,055	.0488	149.08	170.95
 Total Caps, etc., ----			 288.13	 323.29
 Total Explosives, ----			 2,937.38	 4,840.17
	1931	1931	1930	1930
	CRUDE	CONCTS.	CRUDE	CONCTS.
	&	&	&	&
	<u>DIRECT</u>	<u>DIRECT</u>	<u>DIRECT</u>	<u>DIRECT</u>
Product, -----	69,188	56,416	165,214	119,349
Lbs. Powder per ton Ore--	.3642	.4467	.2500	.3460
Cost per ton for Powder-	.0383	.0470	.0273	.0378
Cost per ton for Caps, etc.	.0042	.0051	.0020	.0027
Cost per ton All Explosives,	.0425	.0521	.0293	.0405
Avg. Cost per Lb. for Powder,	.1051	.1051	.1094	.1094

Commenced operations July 22nd, 1931; suspended operations
October 16th, 1931.

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1931

7. OPEN PIT:
(Continued)

g. Open Pit Mining & Loading:

Wash Ore:

Wash ore operations were started on June 1st and conducted on a six day per week basis during the succeeding three weeks and on a five day per week basis during the remainder of the shipping season.

Shovel #33 was engaged during the entire season in the Holman pit bottom. Four cuts were taken across the pit and a sinking drainage cut was made during August. This latter cut was for the purpose of improving the pit drainage system and in connection with this cut, the pump sump was cleaned out and deepened. Of the ore cuts taken in the Holman pit bottom, two were on the bench along the West side of the pit. In order to facilitate the handling of the ore, a track grade was cut from the East bench across the North side of the pit down on to the pit bottom. The grade of ore encountered in the Holman pit was on the whole quite satisfactory and came up fully to expectations. The amount of rock to be sorted from the ore was well within the factors considered in making the estimate.

From the opening of the ore season to July 20th, shovel #32 worked on the new approach grade, leading to the bottom of the Holman pit. Two cuts were taken in making a connection between the upper East bench and the lower North bench. When this work was completed the #32 shovel was moved to the North Star and operated in the Mt. Griffen-North Star and Brown #1 areas during the balance of the season. It will require one more cut in the approach tracks in order to reach the bottom of the pit without the necessity of a switch-back. This work will be done when the Holman-Cliffs Mine resumes ore operations.

Shovel #32 started loading North Star ore July 22nd and operated here and in the Brown #1-Mt. Griffen area during the remainder of the season. Four cuts were taken across the ore bank to the West of the approach tracks. A fifth cut was made to the lean Brown #1 ore material. The remainder of this cut was in material that had to be wasted. In order to straighten out the pit and make an easy curve into the Brown #1 pit bottom, this lean material was handled during the latter part of the season. The North Star-Mt. Griffen ore was quite rocky and some pit sorting was necessary, the concentrates secured from a treatment of this ore, however, was quite satisfactory. The Brown #1-Mt. Griffen ore required sorting, due to the intrusions of very lean ores. As stated before, the South end of the Brown #1-Mt. Griffen area was extremely lean and material had to be wasted.

Direct Ore:

Only 248 tons of direct ore was loaded from the Holman-Cliffs Mine during 1931, this coming from the North Star-Mt. Griffen deposit. More of the North Star ore could have been shipped as direct, if it were not for its very coarse structure, which required crushing. The fee owners allowed us to put this material through the washing plant. We used comparatively little water and a high recovery was secured in the treatment.

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1931

7. OPEN PIT:
(Continued)

g. Open Pit Mining & Loading: (Continued)

Lean & Waste Ore:

Some waste painty material was loaded out in connection with the approach grade to the bottom of the Holman pit.

The material in the South ends of the Brown #1-Mt. Griffen ore cuts was sent to the waste dump. During the operating season the lean material was loaded during week-ends so as to avoid a tie-up in our regular wash ore operations. Upon the conclusion of the ore season the corner of the Brown #1-Mt. Griffen ore was loaded out and sent to the waste dump. This lean ore job was completed October 31st.

k. Drainage:

It was necessary to take care of the drainage in the Holman pit bottom before starting ore operations in 1931. A gasoline excavator was rented for this purpose and a 10-ft. ditch was dug across the bottom of the Holman pit. This work was started in December, 1930 and completed January 9th, 1931.

The old pump-house and raft were enlarged to accommodate a second 800 G.P.M. pump. The enlarged installation was placed in the sump in February and took care of the mine water to very good advantage during the balance of the year. The discharge line was extended and connections made with this pumping plant. A new raft and pump-house were provided for emergencies and the 4,500 G.P.M. pump installed thereon. It was not necessary to use this equipment during 1931, but in case of a cloud burst we are now in shape to take care of a large increase in the flow of water without any danger of being drowned out.

The pumps have been supplied with automatic equipment and the mine watchmen are able to take care of the pumping problem by making one trip per shift into the pit.

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1931

8. COST OF OPERATION:

a. Comparative Mining Costs:

	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
<u>PRODUCT:</u>				
Direct Shipping, -----	248	15,410		15,162
Concentrates, -----	296,166	657,638		361,472
Total Production, -----	296,414	673,048		376,634
Avg. Daily Product, -----	3,428	4,579		1,151
Tons Per Man Per Day, -----	20.97	21.19		.22
Days Operated, -----	114	147		33
Budget, Estimated Production	300,000	667,000		367,000
" " Cost at Mine-	1.918	1.708	.210	
<u>COST:</u>				
<u>Total Cost at Mine:</u>				
Open Pit Direct Shipping Ore,	.044	.146		.102
" " Wash Ore, -----	.479	.297	.182	
Concentrates, -----	.236	.187	.049	
General Expense, -----	.219	.117	.102	
Cost of Production, -----	.938	.594	.344	
Depreciation, Plant & Equipment, -----	.150	.150		
Depreciation, Movable Equipt.	.002	.000	.002	
Taxes - Ad Valorem, -----	.285	.056	.229	
" - Occupational, -----	.035	.042		.007
" - Royalty, -----	.043	.036	.007	
Amortization, Stripping, --	.519	.518	.001	
Total Cost at Mine, -----	1.972	1.396	.576	
Administrative & General Expense, -----	.170	.119	.051	
Miscellaneous Income,	.050	.007	.043	
TOTAL COST,	2.093	1.508	.585	

Cost of Production:

The production from the Holman-Cliffs Mine in 1931 showed a decrease of 376,634 tons from the previous year, this being made up of 15,162 tons less direct ore and 361,472 tons less of concentrates. This reduced tonnage had a decided effect in increasing the fixed charges, including all items of winter expense, in the 1931 cost figures.

The average daily product realized in 1931 was 3,428 tons, as compared with 4,579 tons in 1930, a decrease of 1,151 tons.

The cost of producing direct shipping ore in 1931 only amounted to \$.044 per ton, as compared with \$.146 during the previous year. The very small tonnage of 1931 direct ore was produced in connection with wash ore operations and the charges, such as track work, blasting, etc., were extremely low.

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8. COST OF
OPERATION:
(Continued)

Cost of Production: (Continued)

The increase of \$.182 per ton in the cost of producing the open pit wash ore (concentrated basis) was due largely to the heavy charges for winter expense against a comparatively small tonnage. Such fixed charges as pumping and superintendence also effected this 1931 cost adversely.

There was an increase of \$.049 per ton in concentrating. This increase was also the result of washing plant winter repair work being applied against a much smaller tonnage in 1931. A proportion of the experimental work was also charged into the 1931 costs here.

The General Expense increase of \$.102 for 1931, as compared with 1930, was the result of fixed charges, office expense and winter expense being charged against a comparatively small tonnage.

The large increase of \$.229 per ton for Ad Valorem Taxes was entirely due to the reduced output secured in 1931, as compared with the previous year.

9. EXPLORATIONS
AND
FUTURE
EXPLORATIONS:

The following exploratory work was undertaken during 1931:

BINGHAM STRUCTURE DRILLING:

NW $\frac{1}{4}$ -SE $\frac{1}{4}$ Sec. 21, 56-24. Bingham. Between April 10th, 1931 and December 29th, 1931, twenty-four (24) structure drill holes were completed. A total of 5,220'-11" of drilling. Two drill rigs operated continuously. Hole #25 was being drilled, is 40 feet deep in surface and will be bottomed at about 130 feet. This hole is the last to be put down on this program.

NORTH STAR TESTPITTING:

NW $\frac{1}{4}$ -NE $\frac{1}{4}$ Sec. 21, 56-24. North Star. Between Sept. 18th and October 12th, 1931; eight pits were sunk, totaling 98 feet of testpitting, of which 2 feet was through rock. Two crews performed this work. Mt. Griffen area.

HOLMAN TESTPITTING:

SE $\frac{1}{4}$ -NE $\frac{1}{4}$ Sec. 21, 56-24. Holman. Between Oct. 2nd, and Oct. 12th, 1931. Eighteen pits were sunk, totaling 213 feet of testpitting, of which 9 feet was through rock. Part of the time, three crews worked and part of the time - two crews worked on these pits. The majority of these pits were shallow and had to be abandoned on account of water.

BROWN #1 TESTPITTING:

SW $\frac{1}{4}$ -NE $\frac{1}{4}$ Sec. 21, 56-24. Brown #1. Between Sept. 18th and Oct. 9th, 1931, fourteen pits were sunk in the Mt. Griffen area, totaling 228 feet, of which 32 feet was rock - and two pits in the Holman bottom area, totaling 35 feet, of which 2 feet was through rock. Two and three crews were working. Between Jan. 1st and Feb. 3rd, 1931, six pits were

HOLMAN-CLIFFS MINE
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9. EXPLORATIONS
AND
FUTURE
EXPLORATIONS:
(Continued)

BROWN #1 TESTPITTING:

sunk in the Mt. Griffen area, totaling 152 feet, of which 54 feet was through rock. Two crews performed the work.

Summary, Dec. 31st, 1931

Bingham Structure Drilling,	24 complete holes	5220'-11"
	1 incomplete "	40'
Total,	25 holes.	5260'-11"
North Star Testpitting,	8 pits	98 feet 2' rock incl.
Holman Testpitting,	18 pits	213 " 9' " "
Brown #1 Testpitting,	22 "	415 " 89' " "
Total Testpitting,	48 "	726 feet 100' rock incl.

If it is decided to operate the Holman-Brown property during 1932, it will be necessary to put down about ten structure holes in the Brown #1-Mt. Griffen deposit. No other exploratory work will be necessary, so far as the Holman-Brown lands are concerned, during 1932.

The Bingham drilling is practically completed, so far as the open pit limits of this property are concerned. The Great Northern have asked us to do additional drilling in the Bingham in order to demonstrate the tonnage remaining in the property, for the purpose of fixing the minimum royalties, as of January 1st, 1933. It is questionable whether we will have to do this additional drilling or not. The Great Northern engineers are also working up a program of required drilling on the North Star property, which will be submitted shortly. It is quite likely that some agreement can be reached with the Great Northern people, both as regards the North Star and the Bingham, relative to this drilling. The purpose of the drilling is to establish a new tonnage basis for fixing minimum royalty requirements. It is quite likely that some compromise arrangement may be affected with the Great Northern.

10. TAXES:

The following statement shows the taxes and average rate for the Holman-Brown, Bingham, North Star and Holman-Cliffs Mines and auxiliary lands; Bingham-North Star washing plant lands; Holman-Brown lands; Holman-Cliffs shops and Holman-Cliffs Personal Property for the years 1931 and 1930.

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10. TAXES:
(Continued)

Statement of Taxes:

	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
Holman-Brown Mine,	57,160.45	16,787.96	40,372.49	
Bingham Mine,	7,061.99	7,429.90		367.91
North Star Mine,	12,828.10	5,642.58	7,185.52	
Holman-Cliffs Aux.Lands	2,867.13	2,815.04	52.09	
Bingham-North Star W.P. Lends,	44.64	44.64	-	-
Holman-Brown Lends,	20.80	20.80	-	-
Holman-Cliffs Shops,	301.76	317.85		16.09
Holman-Cliffs Personal Property,	<u>4,193.06</u>	<u>4,935.00</u>		<u>741.94</u>
TOTAL,	\$ 84,477.93	37,993.77	46,484.16	
Rented Buildings,	<u>1,504.94</u>	<u>1,255.05</u>	<u>249.89</u>	
GRAND TOTAL,	\$ 85,982.87	39,248.82	46,734.05	
Average Rate,	.786	.825		.039

The large net increase of \$46,734.05 at the Holman-Cliffs property for the year 1931 was the result of increasing the tonnage, on the part of the Tax Commission, on the Holman-Brown and North Star properties. The Holman-Brown tonnage was increased very materially as the result of re-estimates made by the Tax Commission engineers. This increase was anticipated, whenever the Commission's engineers might make a re-estimate, as our exploratory maps indicated a larger tonnage than had previously been carried on the books of the Commission.

The increase at the North Star Mine was the result of the Tax Commission's engineers including a tonnage of underground direct shipping ore. It is very questionable whether this ore can be shipped direct and a protest was filed with the Commission, with the result that the rate of valuation, contemplated by the Commission was reduced, but their tonnage stood. It is hoped that a further reduction may be secured, as of May 1st, 1932.

11. ACCIDENTS
AND
PERSONAL
INJURY:

There were no lost-time accidents at the Holman-Cliffs Mine during the year 1931; in fact, the last lost-time accident occurring at this property was in March, 1930. The Holman-Cliffs Mine continue to fly the banner flag of The Cleveland-Cliffs operations on the Mesaba Range. The employees received their safety gold

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11. ACCIDENTS
AND
PERSONAL
INJURY:
(Continued)

buttons, in recognition of having gone a year without a lost-time accident, on March 29th, 1931. A Safety Club was formed some time ago at the Holman-Cliffs Mine. All of the employees of the mine belong to this Club and they have manifested great interest in the welfare movement. It is hoped that this property may continue the very enviable record throughout the coming year.

There were five lost-time accidents at the Holman-Cliffs property during the year 1930.

12. NEW CONSTRUCTION:
AND PROPOSED
NEW CONSTRUCTION:

Work was started on the Hydrotator building in April. This job was completed and the machinery installed, ready for operations, by the latter part of July. There was some delay in receiving some of the equipment.

The only new construction contemplated is the erection of a fine ore treating plant. This work will not be undertaken, however, until normal conditions are restored, as there is sufficient ore of a good wash character available to carry on for a time.

The question of a jigging plant will also be considered when ore market conditions justify an expenditure of this nature.

13. EQUIPMENT AND
PROPOSED
EQUIPMENT:

No new equipment was purchased during the year 1931.

It will be necessary to replace the trommel screen at the washing plant with a vibrating screen, prior to the resumption of wash ore operations at this property.

The installation of equipment in connection with the fine ore treating plant and the jigging plant will be brought up when conditions warrant, as stated above under "Proposed New Construction".

14. MAINTENANCE
& REPAIRS:

General repair work in the shops was resumed on June 5th, 1931, following a two weeks lay-off.

Locomotive #148 was taken into the shops January 12th and the following work undertaken: The piston rods were turned down; the

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14. MAINTENANCE
& REPAIRS:

link motion overhauled; the valves ground; the tank repaired; some new stay bolts placed in the boiler; the flues caulked; new crown brasses installed and the shoes and wedges repaired. The brake rigging was overhauled; the side and main rod brasses refitted, and a new cab floor provided. Work on this engine was finished in March.

Locomotive #106 was turned out of the shop the fore part of May. The repairing of this machine was started in 1930. The following work was undertaken: The side and main rods were fitted with new brasses; the driving boxes repaired; the air pump overhauled; new crown brasses provided; the valves adjusted and the brake rigging overhauled. Included in the repairs on this engine was the turning down of the drivers, which work was done at the Hill-Trumbull shops.

Locomotives Nos. 104 and 105 were moved into the shops in April, the repair work consisting of the following: The valve motions and air pumps were overhauled; the tires built up; the brake rigging repaired; new main rod brasses put in; valves adjusted and the cab fittings repaired. The engines were ready for service by the end of May.

Locomotive #180 was given the following repairs during the month of May: The tender truck was overhauled; the throttle valve ground; the driving boxes, shoes and wedges repaired; new crown brasses installed; the air pump overhauled and a new smoke stack put on.

During the winter, wearing plates were put on the pans of the 8-ft. conveyor.

Steel tender frames were made for locomotives Nos. 148 and 180.

General repairs were made on the pit pumps.

The work of overhauling the 30-yard cars, which had been started in 1930, was completed in January, 1931.

The two flat cars were repaired and were furnished with new decks.

The two electric shovels were checked over and given such minor repairs as were necessary.

A new swinging pinion was installed on the locomotive crane; the clutch and draw-bars overhauled and the propelling gear repaired during the month of April.

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14. MAINTENANCE
& REPAIRS:

Washing Plant Repairs:

Repairs on the washing plant machinery was resumed January 5th, the following work being undertaken: The revolving screen was thoroughly overhauled and new chutes were built under this machine; the jaw crusher was repaired; the bearings of the 8-ft. pan conveyor were cleaned and greased. The pumps were overhauled; new rock chutes were put in at the picking belt; the 36" belt conveyor rollers were cleaned and greased; a new lining was placed in the receiving bin and the chute under the grizzly repaired. The pans were removed from the 8-ft. conveyor and sent to the shops for wearing plates; the vibrating screens were overhauled; a by-pass chute was put in from the revolving screen to the concentrating bin; the grizzly bars were built up; the logs were repaired and the center log was assembled and made ready for a capacity operation.

During the month of April, a dike, running North from the washing plant, was provided by the dragline operation. This work was done to divert the tailings away from the intake of the pumps and thus settle it as far as possible, of particles held in suspension.

Repair work at the washing plant was resumed upon the completion of the ore season and an overhauling of the equipment was undertaken. The repairs will not be nearly as extensive as a year ago, as the tonnage treated in the mill during 1931 was less than half of that for the previous year and a number of the kinks had been straightened out in the previous year's operation.

18. NATIONALITY
OF EMPLOYEES:

<u>NATIONALITY:</u>	<u>NO. MEN 1931</u>	<u>NO. MEN 1930</u>
German, -----	12	17
English, -----	12	19
Irish, -----	12	11
French, -----	11	15
Swede, -----	13	17
Italian, -----	6	10
Scotch, -----	6	7
Slovanian, -----	4	6
Norwegian, -----	4	11
Dutch, -----	4	5
Austrian, -----	3	9
Canadian, -----	3	5
Danish, -----	2	3
Belgian, -----	2	2
Bohemian, -----	1	1
Polish, -----	1	3
Serbien, -----	1	2
Finnish, -----	1	12
TOTAL, -----	98	155

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19. WASHING PLANT
OPERATIONS:

Washing plant operations were begun on June 1st. The plant was worked on a six day per week basis during the first three weeks in June and a five-day per week basis during the remainder of the season, which ended October 16th.

Washing plant operations were generally quite satisfactory throughout the season, a good average production being maintained. During 1931 - 390,531 tons of wash ore was treated, as compared with 958,644 tons in 1930.

The production of concentrates in 1931 was 296,166 tons, as against 657,638 tons for 1930. The 1931 tonnage was divided as follows: 195,384 tons of Holman; 44,614 tons of Brown and 56,160 tons of North Star ore.

The plant rejects from the mill during 1931 amounted to 44,019 tons, averaging 27.24% Iron. This compares with 85,282 tons, averaging 32.84% Iron for the season of 1930. This shows an improvement in the ore extraction during 1931.

Experimental work was carried on with a Fahrenwald classifier and a Deister-Overstrom table, during the months of July and August. The results obtained indicated that an additional recovery of ore could be satisfactorily recovered by the installation of a fine treating plant at the Holman-Cliffs washer.

The Hydrotator equipment was put in operation on July 31st and experiments were conducted with this machine until the end of the season. The Hydrotator also demonstrated the fact that a further and increased economic recovery could be made in the treatment of the fine ores, but from the cost standpoint it was not demonstrated that this machine was as economical, everything considered, as the Fahrenwald, Deister-Overstrom table treatment. The installation of Hydrotator equipment would be more expensive than the Fahrenwald-Deister-Overstrom table combination.

The results of the experimentation showed not only that a further recovery of fines could be advantageously made, but that our present bowl classifier product is not being sufficiently cleaned. The installation of a fine treating plant would also require the addition of some bowl classifier equipment to more thoroughly give the fine ores a preliminary treatment and to later clean up this product with the Fahrenwald classifiers and Deister-Overstrom tables, or with the Hydrotator equipment. A complete detailed report was made on this experimentation during the year 1931.

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19. WASHING PLANT
OPERATIONS:
(Continued)

The analysis of the plant rejects for the year 1931 were as follows:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>
Holman, -----	26,028	27.14	.053	54.52
Brown, -----	8,246	24.41	.074	59.19
North Star, -----	<u>9,745</u>	<u>29.91</u>	<u>.054</u>	<u>50.60</u>
Total 1931, ----	44,019	27.24	.057	54.53

The rock removed from the pit and placed on the dumps during 1931, together with the Iron analysis, follows:-

	<u>Tons</u>	<u>Iron</u>
Holman, -----	10,665	24.50
Brown, -----	22,995	17.16
North Star, -----	<u>5,490</u>	<u>29.44</u>
Total 1931, ----	39,150	20.88

The gross recovery obtained in treating the Holman-Cliffs ores in 1931, as compared with 1930, was as follows:

	<u>Year 1931</u>	<u>Year 1930</u>
Holman, -----	74.65%	68.41%
Brown, -----	74.53%	65.00%
North Star, -----	81.47%	69.95%

The iron unit recovery obtained in treating the Holman-Cliffs ores in 1931, as compared with 1930, is as follows:

	<u>Year 1931</u>	<u>Year 1930</u>
Holman, -----	85.86%	83.34%
Brown, -----	91.39%	85.91%
North Star, -----	90.64%	83.92%

The increase in the gross recovery, as well as the higher iron unit recovery realized in 1931, as compared with the previous year, was the result of our having had more experience in the handling of the Holman-Cliffs ores and making necessary adjustments in our washing equipment. It is true, however, that the grade of material handled at the Holman-Cliffs washer during 1931 was of somewhat better grade than that treated in 1930. During 1930, we handled a considerable tonnage of painty material from the Holman pit bottom. Some of this material could not be washed to the best advantage and caused considerable mechanical difficulties on account of its extremely sticky characteristics.

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19. WASHING PLANT
OPERATIONS:
(Continued)

The analysis of the product from the several machines for the year 1931, as compared with the year 1930, follows:

HOLMAN MILL MACHINES:

	-----1931-----			-----1930-----		
	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>
Screens,	-	-	-	53.23	.100	12.37
Logs,	55.90	.069	12.96	55.54	.085	10.01
Hydrotator,	57.61	.038	13.80	-	-	-
Classifiers,	58.89	.045	10.86	53.98	.064	14.39
Tailings,	29.36			28.78		

BROWN MILL MACHINES:

Screens,	-	-	-	-	-	-
Logs,	55.25	.052	13.56	52.20	.080	14.35
Hydrotator,	57.94	.036	13.22	-	-	-
Classifiers,	55.52	.038	15.29	51.45	.067	19.83
Tailings,	26.37			20.38		

NORTH STAR MILL MACHINES:

Screens,	-	-	-	51.47	.101	15.75
Logs,	56.50	.055	11.73	55.49	.060	11.83
Hydrotator,	57.90	.034	13.06	-	-	-
Classifiers,	60.28	.034	9.58	54.63	.049	15.13
Tailings,	32.08			26.94		

CANISTEO-CLIFFS MINE
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1. GENERAL:

The installation of washing plant machinery was carried forward to the 14th of February, when, owing to the uncertainty as to the operation of the Canisteco-Cliffs Mine, it was decided not to put the finishing touches on the Canisteco plant. This work was being done by the Hill-Trumbull washing plant crew. It was later decided not to produce any ore from the Canisteco-Cliffs Mine during 1931 and no further work was done on the washing plant machinery during the year. Some grading and clean-up work was done around the plant grounds, however, during the summer of 1931. It is estimated that the Canisteco washer could be put in shape for service within a month to six weeks.

Pumping operations were conducted throughout 1931 in such a manner as to confine the water to the bottom of the pit. The capacity of the pump (7000 G.P.M.) is approximately three times the amount of inflow and the lower portion of the pit acted as a sump and pumping operations only had to be carried on approximately one-third of the time in order to hold the water at a given elevation.

During the spring and early summer months the main line tracks, including the approach into the pit, were established on a permanent grade and the necessary ballasting was done. The permanent approach tracks were established around the North Bovey bay. Operations in the rest of the pit have not been carried forward sufficiently so that a permanent grade could be provided beyond the North Bovey area.

Stripping operations were carried on in the North Bovey forty until April 8th, when thawing conditions softened the tracks to such an extent that operations were impeded. The stripping job here was shut down until June 1st, and when work was resumed it was on a five-day shift per week basis. Stripping operations on the North Bovey property were completed September 19th and work on the Hemmens started September 21st. A night shift was added on October 26th and the stripping job was continued on a five-day per week, double shift basis, until November 30th, when the operation was suspended for the winter.

Some drilling and test-pitting was done on the North Bovey forty during the month of January.

Two structure drill outfits were employed during the fall months in putting down structure holes through islands, which had been left by the former operator on the Snyder and Hemmens lands. These holes were put down to the level of the pit bottom and were for the purpose of demonstrating the character of the material under the paint-rock capping of these so-called islands. The results of this work were quite satisfactory so far as the Snyder land was concerned, but rather negative as regards the Hemmens. The reason for doing the work during 1931 was to provide data in setting up a capacity operation of 800,000 tons production for the year 1932 from the Canisteco-Cliffs Mine.

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1. GENERAL:
(Continued)

A few test-pits were put down in the North Bovey forty during the fall of 1931.

2. PRODUCTION,
SHIPMENTS &
INVENTORIES:

No ore was produced from the Canisteco-Cliffs Mine during the year 1931.

g. Delays:

The following list of delays were reported in connection with the Canisteco-Cliffs operations during 1931:

<u>Date:</u>	<u>Time Lost:</u>	<u>Cause:</u>
Jan. 9th,	1-1/2 Hrs.	Broken hoisting cable.
" 11th,	1 "	Locomotive off track.
" 15th,	3 "	Blasting account of overhanging bank.
" 19th,	5 "	Broken dipper bale.
" 20th,	8 "	Waiting for and repairing broken dipper bale.
" 21st,	3 "	Broken boom brace.
Feb. 11th,	5 "	Broken dipper bale.
" 16th,	1 "	Overhanging frost chunk dropped, striking and damaging shovel.
" 18th,	1 "	Hoisting cable broken.
Mar. 4th,	1 "	Repairing exciter set.
" 19th,	1 "	Repairing power cable.
" 17th,	1 "	Broken hoisting cable.
" 18th,	6 "	Burned out compensator.
" 30th,	-1/2 "	Broken trip cable.
" 31st,	3- "	Broken trip motor.
June 10th,	10- "	No work, soft track beds account of excessive rains.
July 2nd,	2 "	Waiting for blasters.
Aug. 11th,	4 "	Drilling and blasting ahead of shovel.
Sept. 23rd,	1 "	Broken hoisting cable.
Oct. 21st,	1 "	Broken power cable.
Nov. 16th,	2 "	Trip motor cable burned out.
" 17th,	2-1/2 "	Locomotive off track.
" 20th,	10- "	No operating night shift account of poor dump tracks - caused by unusually heavy rains.
Total,	73-1/2 "	

3. ANALYSIS:

No ore was produced during 1931.

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4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:

Assumption:

14 cu. ft. per ton for Direct Ore.

16 cu. ft. per ton for Wash Ore.

A rock deduction of 10% was applied in this estimate.

The ratio of concentration was figured at 60%.

	<u>WASH</u>	<u>LOW GRADE</u> <u>WASH</u>	<u>LEAN</u> <u>WASH</u>	<u>MERCH.</u>
Snyder, SE $\frac{1}{4}$ -SE $\frac{1}{4}$ Sec. 30, --	2,091,075	187,000	285,000	
" SW $\frac{1}{4}$ -SE $\frac{1}{4}$ " --	1,000,000	129,000	78,000	
" SE $\frac{1}{4}$ -SW $\frac{1}{4}$ " --	485,000	-	-	
Total, -----	3,576,075	316,000	363,000	
No. Bovey NW $\frac{1}{4}$ -SE $\frac{1}{4}$ Sec. 30, --	302,800	35,900	13,500	
" NE $\frac{1}{4}$ -SE $\frac{1}{4}$ " --	597,500	-	-	229,400
Total, -----	900,300	35,900	13,500	229,400
So. Bovey NE $\frac{1}{4}$ -NE $\frac{1}{4}$ Sec. 31, --	742,700	78,400	60,900	-
Hammens SW $\frac{1}{4}$ -SW $\frac{1}{4}$ Sec. 29, ---	1,356,500	178,800	148,000	-
Total Wash Concentrates, -	6,575,575	609,100	585,400	229,400
Total Low Grade Wash " -	609,100			
Total Lean Wash,	585,400			
Total Merch.	229,400			
GRAND TOTAL ORE, -----	7,999,475			

There was an increase of 377,075 tons in the Canisteco ore estimate of January 1st, 1932, as compared to that of the previous year. This increase was the result of the structure drilling on the Snyder island, which lies in the central part of the pit and is located in the SE $\frac{1}{4}$ of the SE $\frac{1}{4}$ of Section 30.

From hand-wash tests it is indicated that the tonnage added to the Snyder land is of wash grade and it has, therefore, been added to the reserve under this caption. While there was some test-pitting done during the year, it did not in any way change the ore estimates and was merely for the purpose of demonstrating the character of ore to be mined during the first year's operation of this property.

As no ore was mined or treated from the Canisteco during 1931, there is no reason to change any of the factors used in preparing the ore estimate.

c. Estimated Analyses:

	<u>Fe.</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Moist.</u>	<u>Fe. Nat.</u>
Bessemer, -----	58.00	.045	10.00	9.00	52.78
Non-Bessemer, -----	58.00	.095	10.00	9.00	52.78

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5. LABOR & WAGES:a. Comments:(1) Labor:

There was an abundance of skilled and common labor available at the Canisteco-Cliffs Mine during the year 1931. A very satisfactory organization was built up and this was reflected in gratifying stripping results. The scale of wages, which had been in effect for a number of years, was continued to October 1st, when a 10% reduction was made. Salaried employees at the Canisteco-Cliffs Mine were put on a five-day per week basis, with a reduction of approximately 16%, effective June 15th.

b. Statement of Wages & Product:

<u>PRODUCTION</u> (Stripping)	Soft Rock,	193,777	cu.yds.	
	Surface,	741,525	"	
	Total,	935,302	"	

Number of Shifts Operated,	
Single 10 Hr. Shifts,	88
Double 10 Hr. Shifts,	111

Cubic yards per shift operated,	3,017
---------------------------------	-------

Average number of men working,	119
--------------------------------	-----

Average wage per day,	4.82
-----------------------	------

Amount paid for labor,	\$ 145,877.63
------------------------	---------------

6. SURFACE:a. Buildings, Repairs:

There were no repairs made to the buildings at the Canisteco-Cliffs Mine during the year 1931.

c. Tracks, Roads, Transmission Lines:(1) Tracks:

The work of taking up and moving the temporary track was completed during the month of February. This temporary track was provided for the handling of supplies and the moving in of equipment to start our stripping and construction work in the spring of 1930.

The track grade for the stripping on the lower bench of the North Bovey forty was completed during the fore part of January. A rented gasoline shovel was utilized on this job.

The filling of the washing plant trestle was finished by the end of January, and the fill was widened for a double track lay-out and brought up to final grade by the end of March.

The switch track in to the coal dock was laid during the month of February.

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6. SURFACE:
(Continued)

c. Tracks, Roads, Transmission Lines:

(1) Tracks: (Continued)

The gasoline shovel was used to clean out the ditches on either side of the approach tracks, in order to provide satisfactory drainage for the road bed, during the month of April.

The work of ballasting the main line and approach tracks was started May 14th. The gasoline shovel was cut into a gravel pit near the washing plant and a very satisfactory ballast material was secured here. The tracks were brought to final grade and alignment by the end of July and it was only necessary to do a small amount of maintenance work here during the balance of the year.

During the months of August and September the permanent approach grade was cut along the East bench on the North Bovey forty, in connection with the regular stripping operations. During September and October the tracks were laid along the permanent approach and were ballasted.

The approach track was extended across the Hemmens property to the South boundary in preparation for the Hemmens stripping job.

When stripping operations were suspended November 30th, the dump and loading tracks were jacked up to prevent their freezing, in anticipation of resuming stripping operations in the spring of 1932.

It was not necessary to do any work on the roads or transmission lines during the year.

7. OPEN PIT:

a. Stripping:

The fifth and last cut on the upper bench of the stripping, along the East side of the Bovey forty, was finished January 13th. The electric shovel was moved back to the approach on the West side, where several shifts were worked in preparing a grade for a connection to a lower bench. A portion of the material encountered in this work was cretaceous ore, sufficiently high to be stocked as a direct shipping ore.

The first cut on the lower bench was begun January 17th. A total of six cuts were taken here by April 8th, when the job had to be shut down on account of unsatisfactory track conditions.

During the first two weeks in May, the gasoline shovel was used to load out a small track bench along the West side of the Bovey property. This job was in connection with the permanent approach.

Stripping operations were resumed June 1st, on a five-day per week basis. The electric shovel was employed until the 9th of June in cutting the approach down to the final grade on the West side of the Bovey forty. The fill for the approach across the North end of the

CANISTEO-CLIFFS MINE
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7. OPEN PIT:
(Continued)

a. Stripping: (Continued)

Bovey bay, was accomplished during the balance of June.

The shovel was moved back to the East side of the Bovey ? on June 10th and stripping operations were started in the soft rock capping, which overlay the ore. Six full-length cuts were taken in this rocky material and several small clean-up cuts. All material was removed and the East Bovey bay ore deposit made ready for mining operations by September 19th.

During the course of operations in the ore formation, a quantity of wash ore was loaded and dumped along the crest of the ore bank into the bottom of the Bovey pit, to be picked up later when ore operations are inaugurated. The surface of the ore was very irregular and in order to operate to advantage and gouge out the waste rocky material, it was necessary to push the cuts through and remove the ridges of wash ore. The permanent approach grade along the East side was dug and a connection made to the old approach on the Walker property. It was necessary to remove some ore from the Walker land in connection with providing the permanent approach across that property. Permission was obtained from the Oliver Iron Mining Company and such Walker ore as had to be removed, was transferred and dumped into the Walker pit.

Stripping operations were started on the Hemmens land September 21st. The first cut was finished October 23rd and the shovel was then moved across the old Oliver approach, where a short cut was taken to provide room for a tail track and switching facilities. The second cut on the Hemmens was started October 27th and finished November 14th. A third cut had been practically completed when operations were suspended on November 30th.

Owing to the height of the Hemmens stripping bank, the surface material was blasted by the coyote hole method. Some blasting was also necessary in connection with the North Bovey stripping.

The record stripping was made during the month of March, when 165,155 cubic yards of surface material was removed. This was accomplished with the four-yard electric shovel.

During the fore part of August the gasoline shovel was used on clean-up work along the old approach, which lead to the bottom of the pit. This work was done to prepare a place for dumping the wash ore encountered in connection with the Bovey stripping operations. During the last two weeks in August the gasoline machine was used to clean up broken rock, in the bottom of the Bovey stripping cuts. This work could not be done to advantage with the larger electric machine. From the first of September until the last week in October, the gasoline shovel was employed in cleaning up the sloughed material along the

GANISTEO-CLIFFS MINE
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7. OPEN PIT:
(Continued)

a. Stripping: (Continued)

old track grade, leading to the bottom of the pit. This machine was taken out of the pit and used on a ditching job during the remainder of the year.

There was stripped from the Bovey property during 1931 (under E. & A. #570) 194,570 cubic yards of rock material and 484,414 cubic yards of surface. The Bovey stripping job was completed in September and the total rock stripping handled amounted to 194,570 cubic yards and surface material - 1,275,125 cubic yards.

There was removed on the Hemmens stripping job (E. & A. #626) - 256,318 cubic yards of surface material, during 1931.

d. Timbering:

Statement of Ties Used:

<u>Amount</u>	<u>Kind</u>	<u>Price</u>	<u>Cost</u>
2,509	Standard Ties,	.88 Ea.	\$ 2,207.92

f. Explosives, Drilling & Blasting:

Statement of Explosives Used:

<u>KIND</u>	<u>AMOUNT</u>	<u>PRICE</u>	<u>TOTAL</u>
1-1/4 x 8 - 60% L.F. Extra, -----	900 Lb.	13.75	\$ 123.75
1-1/4 x 8 - 40% L.F. Extra, -----	11650	11.25	1,310.62
7/8 x 8 - 40% L.F. Extra, -----	1250	11.25	140.63
1-1/8 x 8 - 35% L.F. Am. Gel. -----	5050	11.15	563.08
5 x 16- 25% Gl. Am. Gel. -----	35600	10.50	3,738.00
Hercomite Bag, -----	52350	12.25	6,412.87
 Crescent Fuse, -----	 9300 Ft.	 7.80 - 20%	 58.03
#6 E. B. Caps, -----	5000	15.45 - 25%	57.94
 8' #6 Electric Blasting Caps, -----	 750	 8.95 - 25%	 50.34
12' #6 " " -----	500	10.55 - 25%	39.56
24' #6 " " -----	1500	15.35 - 25%	172.69
30' #6 " " -----	625	17.75 - 25%	83.21
40' #6 " " -----	200	23.00 - 25%	34.50
 2 Lb. Spools Connecting Wire, -----	 70 Lb.	 .5226	 22.58
Lead Wire, -----	250 Ft.		2.16
Grand Total, -----			\$12,809.96

g. Open Pit Mining & Loading:

No mining operations were conducted at this property during 1931.

CANISTEO-CLIFFS MINE
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7. OPEN PIT:
(Continued)

k. Drainage:

From the first of the year until April 8th, while stripping operations were underway, the 7000 G.P.M. pump was operated only at such times as the electric shovel was not in service. The pumping operations were conducted in this manner so as to avoid excessive peak loads and to secure the best cost for current. As the result of this part-time operation, the water rose slightly in the pit. From the 8th of April to the end of that month the pump was operated steadily and the water was reduced to a minimum permissible amount, considering the bottom of the pit as a sump. No pumping was done during the month of May and the water in the pit rose 12 feet. Pumping operations were conducted on night shifts and holidays during the months of June, July, August, September and October. The water level was reduced 13 feet during the months of June and July and was maintained at about this level until the end of November. This water level will be about maintained until ore operations make it necessary to drain the present pit bottom. This will be a number of years in the future.

8. COST OF
OPERATION:

No ore was mined and shipped from the Canisteco property during the year 1931.

The Bovey stripping under E. & A. #570 was completed during the year. The estimated cost per yard (averaged between surface and rocky material) was \$.3060, whereas the actual operating cost, exclusive of depreciation, amounted to \$.2137.

Under the Hemmens stripping job, E. & A. No. 626 - 256, 318 cubic yards of surface overburden was removed during the months of September, October and November. The estimated cost for handling the surface stripping here was \$.25 per yard, whereas the cost secured to November 30th, amounted to \$.1906 per yard. This cost does not include certain repairs to equipment, which will be made subsequent to the completion of the stripping and which will be charged to this account. We estimate that not over \$.05 per yard should be charged to repairs against this E. & A., as the equipment was only engaged on this work about 2-1/2 months. Such additional repairs as are necessary to put the open pit equipment in first-class shape, should be charged to E. & A. No. 570.

The estimated cost for handling soft rock and cretaceous material under E. & A. #626, is \$.35 per yard and for paintrock - \$.45 per yard. In view of the results obtained on the stripping jobs at the Canisteco property, we should better these estimates somewhat.

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9. EXPLORATIONS
AND
FUTURE
EXPLORATIONS:

The structure drilling program, which was started along the East side of the North Bovey forty in the fall of 1930, was finished on January 24th.

One of the Armstrong drills started putting down structure drill holes in the Snyder island the latter part of August. This work was carried on until December 24th, the second drill being added and engaged here during the last five weeks. A total of fourteen holes were punched down on this island area and extended to the bottom of the pit. Considerable ore material, which had previously been classified as non-washable, was found to be of treatable character and resulted in increasing the tonnage of ore on the Snyder island by approximately 400,000 tons. The holes put down on the Easterly part of the island were especially good, those to the West disclosed an ore of lower grade and there were some runs encountered in the drill holes of non-washable material.

During September several structure holes were put down, adjacent to the Snyder island on the North. This work did not disclose any ore of treatable grade; the conditions here being extremely rocky. One of the drill rigs was moved to the Hemmens land the latter part of September, and six holes were put down through the island area at the East end of the pit. These holes did not disclose any first-class wash ore, the material encountered being of a mixed nature, grading from a low grade wash to a jig ore.

Test-pitting was started in the bottom of the North Bovey forty in November and continued to the 24th of December. The results of this work was rather disappointing, but a few pits went down in a high grade wash and direct shipping material. There is apparently one deep channel of good grade ore extending in a Northerly direction in the Westerly portion of the present Bovey pit bottom. During April and May about thirty shallow pits were put down in the newly stripped North Bovey area. These pits were put down to determine the amount of material that had to be removed in order to properly clean the top of the ore body.

10. TAXES:

The following statement shows the taxes and average rate for the years 1931 and 1930:

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10. TAXES:
(Continued)

	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
Canisteco-Cliffs Mine,	\$ 39,570.45	38,777.11	793.34	
Washing Plant Lands,	338.10	282.93	55.17	
Personal Property,	<u>3,475.71</u>	<u>1,580.75</u>	<u>1,894.96</u>	
Total,	43,384.26	40,640.79	2,743.47	
Village Lots,	<u>199.87</u>	<u>195.86</u>	<u>4.01</u>	
Grand Total,	\$ 43,584.13	40,836.65	2,747.48	
Average Rate,	.0795	.0780	.0015	

The increase in the taxes for 1931, as compared with the previous year, was largely the result of an increase in the rate of taxation from \$.0780 to \$.0795. There was also an increase in the Personal Property taxes, as the result of additional equipment being included on May 1st, 1931.

11. ACCIDENTS
AND
PERSONAL
INJURY:

There were two lost-time accidents at the Canisteco-Cliffs Mine during the year 1931. A description of these accidents follows:

NAME: Fred G. Hamm DATE: February 13, 1931.
CAUSE: The stripping bank was blasted at 11:30 A.M. A quantity of dirt was thrown across the loading track and Hamm, with others, was engaged in cleaning the track. The dirt was removed from the rails and to a distance of approximately two feet along side to allow clearance for the locomotive and cars. Several chunks of frozen dirt lay along side the track grade about a foot higher than the level of the rail. Hamm was in the act of taking another shovel full of dirt, with his right foot behind him and against the end of a tie, when one of the frost chunks settled against his foot. The chunk weighed in the neighborhood of 75 to 100 pounds.
NATURE: Fracture of lower third right tibia.
TIME LOST: 97 Days.

NAME: Oscar E. Engstrom DATE: March 18, 1931.
CAUSE: A starting compensator, weighing from 500 to 600 pounds, and rectangular in shape, burned out on the #35 electric shovel and the shovel crew, together with the electricians, were in the act of repairing the damage. The transformer, or compensator, was hung in place by means of four angle irons extending beyond the corners of the transformer about four inches. It was necessary to remove the burned out transformer and same was being lowered to the ground through the rear door of the shovel. At about the center of the door was a permanent crossbar made of angle iron and to which the transformer was suspended with a hemp rope. A crew was standing on the ground with

CANISTEO-CLIFFS MINE
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11. ACCIDENTS
AND
PERSONAL
INJURY:
(Continued)

another rope tied to the bottom of the transformer, the idea being to pull it free from the floor of the shovel while another party handled the lowering rope. Engstrom was standing on the floor of the shovel forcing the piece of equipment out with his right foot. The pulling action from the bottom by the ground crew caused the transformer to tilt inward and one of the extended angle bars caught Engstrom's left foot against the floor, causing the fracture of two toes.

NATURE: Laceration base of little toe. Fracture of fifth and fourth metatarsals.

TIME LOST: 37-1/2 days.

The employees of the Canisteco-Cliffs Mine were awarded safety knives September 18th, in recognition of their having gone six months without a lost-time accident.

12. NEW CONSTRUCTION
AND PROPOSED
NEW CONSTRUCTION:

The erection of the coal dock to serve the pit locomotives was completed during the month of February and put in service.

A 50000-gal. water tank was constructed near the shop site, the work being accomplished during the months of April and May.

An inverted syphon, made of two 18" pipe lines, was installed under and across the approach tracks during the month of January. In providing our approach in to the North side of the Canisteco pit, it was necessary to dig below the large drainage ditch, which handles the surface water around the North side of the mine. In order to take care of the flood waters, which are carried by this drainage ditch, during the spring break-up and at times of heavy rains, it was necessary to provide this syphon arrangement.

Dikes were constructed in connection with the tailings basin, in order to prevent any seepage from the basin on to lands not owned or controlled by us. This work was done during February.

A culvert was placed under the Great Northern tracks in the vicinity of the washing plant, to take care of the drainage.

During the latter part of the summer, a brick pump-house was constructed near the shops. There was an old wooden structure over the deep well pump; this was unsightly and it would have been necessary to rebuild it within a short time.

CANISTEO-CLIFFS MINE
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12. NEW CONSTRUCTION
AND PROPOSED
NEW CONSTRUCTION:

The gasoline shovel was converted into a dragline and utilized in excavating a ditch around the Northwest side of the pit. The old ditch was too close to the pit and was not sufficiently large to adequately handle flood waters.

During the month of January and the first half of February, the following construction work was done at the washing plant:

The installation of the Dorr washers was completed; the 8-ft. pan conveyor assembled; the Symons crushers put in place; the Dorr bowl classifiers installed; the jaw crusher placed and the air compressor installed. The tailings discharge pipes were laid; the pump-house was moved to the East side of the tailings basin lake; the intake pipe was installed and the water line put in from the pump to the mill. During September, some cleaning was done in the vicinity of the mill.

13. EQUIPMENT AND
PROPOSED
EQUIPMENT:

A Northwest 1-1/2-yard gas shovel was delivered to the Canisteco-Cliffs Mine in the spring.

A second-hand track shifter, purchased from the A. Guthrie Company, was delivered and utilized in our operations during 1931.

A 350-gallon Cameron centrifugal pump was installed in the shops and connected with the 50,000-gallon tank in connection with our fire protection system.

A second-hand boring mill was purchased and placed in the shops during the summer. A portable Ingersoll-Rand air compressor was delivered to the mine in the spring of 1931.

14. MAINTENANCE
& REPAIRS:

During the months of April and May, while the stripping was shut down, the locomotives were taken into the shops for repairs. New sheets were placed in the fire box of locomotive #176 and the machine was given a general overhauling. The air equipment was overhauled and the shoes, wedges and driving rods repaired on locomotive #152. The fire box grates of locomotive #2 were repaired. The shoes, wedges and valve motion of locomotive # 156 were overhauled and the driving rods repaired. Locomotive #146 was furnished with a new set of tires; the air pump was overhauled; the link motion and eccentrics checked up and the hub liners, shoes and wedges repaired.

The 30-yard cars were checked over and some minor repairs made.

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14. MAINTENANCE
& REPAIRS:
(Continued)

Upon the completion of stripping operations November 30th, repair work was started on the open pit equipment. Locomotive #146 was taken into the shops for general overhauling.

Some repair work was done on the 30-yard cars during December.

18. NATIONALITY
OF
EMPLOYERS:

<u>NATIONALITY:</u>	<u>NO. OF MEN</u> <u>1931</u>	<u>NO. OF MEN</u> <u>1930</u>
American, -----	27	33
Swedish, -----	5	17
Norwegian, -----	4	14
Croatian, -----	2	-
Slavish, -----	2	38
Austrian, -----	2	2
Scotch, -----	1	-
Italian, -----	1	3
Canadian, -----	1	-
Dane, -----	1	1
Serbian, -----	1	10
Irish, -----	-	9
English, -----	-	26
Finnish, -----	-	22
French, -----	-	12
German, -----	-	1
Total, -----	47	188

THE CLEVELAND-CLIFFS IRON COMPANY-AGENTS
ALEXANDRIA MINE
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1. GENERAL:

Underground mining activities at the Alexandria property were carried forward into 1931 with the same operating force that was employed during the latter part of 1930. On November 10th, 1930, the Alexandria Mine was put on a single shift and operations were conducted four days per week. There were 21 contracts employed, 20 of them being composed of three men and one of two men. Activities were continued with this force until August 12th, when orders to close down the property were received. Preparations were immediately made to put the property in shape for an indefinite period of idleness and all operations were completed to this end by August 20th.

Mining operations during the active period of 1931 were carried forward on all three properties, the idea being to exhaust the ore on the several descriptions as near simultaneously as possible. In working to this end it is possible to provide adequate working space for each contract and to permit of single shift operation during the remainder of the mine's life. The shore lines are being drawn in so that the last ore to be mined will be that adjacent to the East boundary and in the immediate proximity of the operating shaft.

There are four forties included in the Alexandria lease; the SW $\frac{1}{4}$ of the SE $\frac{1}{4}$ of Section 29, referred to as the East forty; the SE $\frac{1}{4}$ of the SW $\frac{1}{4}$ of Section 29, as the West forty; the NE $\frac{1}{4}$ of the NW $\frac{1}{4}$ of Section 32 as the South forty and the SW $\frac{1}{4}$ of the SE $\frac{1}{4}$ of Section 32 as the St. Anthony No. 2 Reserve. These descriptions are all in Township 58 - Range 20. The St. Anthony No. 2 Reserve ground has never been developed, this being an isolated forty lying to the Southwest of the Alexandria Mine property,

2. PRODUCTION,
SHIPMENTS &
INVENTORIES:

a. <u>Production by Grades:</u>		
Pocket to Dock, -----	49,281	tons
Pocket to Stockpile, -----	91,445	"
Total, -----	140,726	"
b. <u>Shipments:</u>		
Alexandria Pocket to Dock, -----	49,281	"
Alexandria Stockpile to Dock, -----	97,341	"
Total, -----	146,622	"
c. <u>Stockpile Inventories:</u>		
January 1st, 1932, -----	128,052	"

ALEXANDRIA MINE
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2. PRODUCTION,
SHIPMENTS &
INVENTORIES:

e. Production by Months:

January, -----	17,819	tons
February, -----	16,652	"
March, -----	20,392	"
April, -----	19,480	"
May, -----	17,102	"
June, -----	19,538	"
July, -----	20,173	"
August, -----	9,570	"
Total, -----		140,726 tons.

f. Ore Statement:

	<u>1 9 3 1</u>	<u>1 9 3 0</u>
On Hand January 1st, 1931, -----	133,948	48,526
Output for Year, -----	140,726	320,210
Total, -----	274,674	368,736
Shipments, -----	146,622	234,788
Balance on Hand January 1st, 1932--	128,052	133,948

g. Delays:

The following delays were reported during the year 1931:

<u>Date</u>	<u>Time Lost</u>	<u>Cause</u>
March 9th -	1 - Hour	Broken piston rod on air cylinder in skip pit.

3. ANALYSIS:

a. Average Analyses on Shipments:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Moist.</u>	<u>Nat.</u>	<u>Fe.</u>
Alexandria Pocket to Dock	49,281	56.86	.091	5.59	1.56	1.54	13.03		
Alexandria Stockpile to Dock, -----	97,341	56.38	.095	5.87	1.62	1.50	12.16		
Total, -----	146,622	56.54	.094	5.77	1.60	1.51	12.45	49.50	

a.a. Analyses of Production:

Pocket to Dock, -----	49,281	56.86	.091	5.59	1.56	1.54
Pocket to Stockpile----	91,445	56.85	.090	5.64	1.45	1.61
Total, -----	140,726	56.85	.090	5.62	1.49	1.59

b. Average Analyses of Cargoes:

56.54 .094 5.77 1.60 1.51 12.45 49.50

d. Composite Analyses of Season's Shipments:

<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>Loss</u>
56.40	.092	5.99	1.62	1.46	.24	.16	.012	9.00

ALEXANDRIA MINE
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4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:

Displacement factor based on Oliver Curve.

15.72 Cubic Foot = 1 Ton.

No deduction for rock. (Included in factor used above).

East Forty, -----	242,124 tons.
West Forty, -----	148,271 "
South Forty, -----	<u>833,334</u> "
Total Alexandria, -----	1,223,729 "

b. Undeveloped Ore:

St. Anthony #2 Reserve, ----- 800,317 "

c. Estimated Analyses:

	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Moist.</u>	<u>Fe.Nat.</u>
Alexandria, -----	56.41	.106	5.74	1.44	1.41	13.00	49.08
St. Anthony #2 Reserve	55.43	.088	6.34	1.43	3.78	-	-

The estimated analyses of the ore remaining in the mine is based on exploration drill hole records and the sampling of drifts and raises. The analyses shown should be realized in the mining of the remainder of the ore body. There might be some slight decrease in the average iron content, with a corresponding increase in the Manganese content. This is especially true, as indicated by our operations to date in the South Forty ore body.

5. LABOR & WAGES:

a. Comments:

The labor conditions were entirely satisfactory during the time that the property was operated. General activities on the Mesaba Range were curtailed to some extent during 1930 and a large number of skilled underground workmen were out of work.

The rate of wages paid during the time the Alexandria Mine was operated was the same as for the previous year. The average wages earned by the underground miners was somewhat in excess of that for 1930, due to the increased production secured per miner.

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5. LABOR & WAGES:
(Continued)

b. Comparative Statement of Wages & Product:

	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
<u>PRODUCT</u> -----	140,726	320,210		179,484
No. Shifts, -----	13,736	31,663		17,927
 <u>AVG. NO. MEN WORKING:</u>				
Surface, -----	21	19	2	
Underground, -----	84	95		11
Total, -----	105	114		9
 <u>AVG. WAGES PER DAY:</u>				
Surface, -----	4.97	4.97	-	-
Underground, -----	5.78	5.77	.01	
Total, -----	5.61	5.64		.03
 <u>WAGES PER MO. OF 25 DAYS.</u>				
Surface, -----	124.25	124.25	-	-
Underground, -----	144.50	144.25	.25	
Total, -----	140.25	141.00		.75
 <u>PRODUCT PER MAN PER DAY</u>				
Surface, -----	50.49	59.96		9.47
Underground, -----	12.85	12.16	.69	
Total, -----	10.25	10.11	.14	
 <u>LABOR COST PER TON:</u>				
Surface, -----	.098	.083	.015	
Underground, -----	.450	.474		.024
Total, -----	.548	.557		.009
 <u>AVG. PRODUCT BRK'G. & TRM'G:</u>				
Surface, -----	15.99	15.82	.17	
Underground, -----	6.00	5.98	.02	
 <u>TOTAL NO. OF DAYS:</u>				
Surface, -----	2,787	5,340		2,553
Underground, -----	10,949	26,323		15,374
Total, -----	13,736	31,663		17,927
 <u>AMOUNT FOR LABOR:</u>				
Surface, -----	13846.78	26514.31		12667.53
Underground, -----	63259.10	151991.90		88732.80
Total, -----	77105.88	178506.21		101400.33

Since November 10th, 1930, the Alexandria Mine has operated single shift, four days per week.

The above figures for 1931, are for operating period only, i.e. August 20th, 1931.

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6. SURFACE:

a. Buildings, Repairs:

No repairs of any consequence were made to the buildings during the year 1931.

b. Stockpile:

Stockpile loading started during the month of June and was continued intermittently throughout the balance of the season. The ore was forwarded as cargoes were named. After the property was closed, the men living in the location were used in connection with the stockpile operations.

c. Tracks, Roads, etc:

The mine premises were cleared of debris during the months of May and June and the refuse from the handling of timber was burned.

Repair work on the stockpile shovel was undertaken during May. The front end of the frame was badly cracked and had been covered with patches. These patches, which had been loosened, had to be removed and new ones put in place.

The Bureau of Mines rescue car was stationed at the property during the week March 8th to March 15th. First aid training was given to all employees and a crew of five men were instructed in the use of oxygen helmets.

7. UNDERGROUND:

Orders were received on August 12th to close down the Alexandria Mine. Rooms were blasted in as they were completed, the gangs laid off and all ore hoisting was discontinued on the 19th. The working places were prepared for an indefinite shut-down to the satisfaction of the fee representatives, dams were placed to handle the drainage water to advantage and the mine premises were cleaned up. The mine was completely closed down by August 20th, a force of four men being retained to look after the necessary pumping and the policing of the property. Six men were carried on the pay-roll, two in the capacity of watchmen and four as pumpmen, these men working half time.

c. Stoping:

East Forty:

Four gangs of miners were employed in the East forty workings. They mined out the pillars to the North and Northwest of No. 11 timber shaft and gouged out the trough of ore in the immediate vicinity of this shaft. The ore remaining in this forty lies to the West of the 1931 workings and will be drawn back in a Westerly direction when operations are resumed.

West Forty:

The force employed here during the period of activity in 1931 consisted of five contracts, two gangs being engaged the fore part of the year in mining out the trough of ore to the West of No. 2 timber shaft,

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7. UNDERGROUND:
(Continued)

c. Stoping: (Continued)

and the balance of the mining being confined to the North and West of the old No. 1 hoisting shaft. The ground is being mined and caved back toward this shaft and when this objective is reached they will be continued to the South, toward the main hoisting shaft. There is sufficient ore remaining on this forty to furnish employment to at least five gangs of miners for better than an additional year.

South Forty:

Twelve contracts operated in this ground during 1931. Two of the gangs were employed in the chimney of ore to the South of the hoisting shaft and ten gangs in slicing and caving back from the shore line along the West side of the ore body. The bulk of mining operations in the future will be conducted on this forty, which contains approximately two-thirds of the reserve ore estimated in the Alexandria Mine.

d. Timber:

Statement of Timber Used:

	<u>LINEAL</u> <u>FEEET</u>	<u>AVG. PRICE</u> <u>PER FOOT</u>	<u>AMOUNT</u> <u>1931</u>	<u>AMOUNT</u> <u>1930</u>
7" to 9" Timber, -----	138,996	.0814	11317.62	24420.92
9" to 12" " -----	29,241	.1443	4220.63	7501.42
Total Timber - 1931 ----	168,237	.0923	15538.25	-
Total Timber - 1930 ----	396,358	.0805		31922.34
	<u>LINEAL</u> <u>FEEET</u>	<u>PER 100</u> <u>FEEET</u>	<u>AMOUNT</u> <u>1931</u>	<u>AMOUNT</u> <u>1930</u>
6-ft. Lagging, -----	246,240	.746	1835883	3521.56
3" Poles, -----	207,264	1.229	2546.89	5444.76
Cribbing Timber, -----	-	-	-	921.34
1" Covering Boards, -----	292,187	1.243	3632.44	8969.11
Product, -----			140726	320210
Ft. Timber Per Ton of Ore, -----			1.195	1.238
Ft. Lagging Per Ton of Ore, -----			1.750	1.475
Ft. Lagging Per Foot of Timber, -----			1.464	1.192
Cost per ton for Timber, -----			.1104	.0997
Cost Per Ton for Covering Boards, -----			.0258	.0280
Cost per ton for Lagging, -----			.0130	.0110
Cost per ton for Poles, -----			.0181	.0170
Cost per ton for Timber, etc. -----			.1674	.1586
Cost of Timber, lagging, poles, etc., 1931 -----			23553.41	
Cost of Timber, lagging, poles, etc., 1930 -----				50779.11

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7. UNDERGROUND:
(Continued)

f. Statement of Explosives Used:

<u>KIND:</u>	<u>QUANTITY</u>	<u>AVERAGE PRICE</u>	<u>AMOUNT 1931</u>	<u>AMOUNT 1930</u>
40% Dup. Spec. Gel. -----	90,720	11.50	10432.80	25013.09
<hr/>				
Total Powder, 1931 ----	90,720	11.50	10432.80	
Total Powder, 1930 ----	213,430	11.72		25013.09
Fuse, -----	217,740	5.76	1254.18	2839.21
Caps, -----	41,190	11.589	477.34	1143.60
Tamping Bags & Fuse Liters	33,000		100.80	60.25
<hr/>				
Total Fuse, etc., 1931-	291,930		1832.32	
Total Fuse, etc., 1930-	605,700			4043.06
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Total All Explosives,	382,650		12265.12	29031.15
<hr/>				
Product, -----			140726	320210
Pounds of Powder per ton of Ore, -----			.645	.666
Cost per ton for Powder, -----			.074	.078
Cost per ton for Fuse, Caps, etc., -----			.013	.013
Cost per ton for All Explosives, -----			.087	.091
Average price per pound for Powder, -----			11.50	11.72

g. Mining & Loading:

During the year 1930 the single drum Tugger hoists were discarded and the underground loading of ore was accomplished with double-drum machines. The improved operation here is reflected in the increased tonnage secured by the contract miners during 1931. All gangs were provided with electric tugger hoists and scrapers and the ore was loaded into two-ton hand-tram cars and transferred to the chutes.

i. Ventilation:

Ventilation in the Alexandria underground workings is provided by a 13,000 cubic foot per minute fan, located in the old hoisting shaft. The air is forced into the mine at this point. It is only necessary to resort to this forced ventilation during periods of high temperatures. During the winter months the natural ventilation is sufficient.

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8. COST OF OPERATION:

a. Comparative Mining Costs:

<u>PRODUCT</u>	1931 140,726	1930 320,210	<u>Increase</u>	<u>Decrease</u> 179,484
Average Daily Product,	1,083	1,152		69
Tons Per Man Per Day,	10.25	10.11	.14	
Days Operation,	130	278		148
Budget, Estimated Production,	144,000	340,000		
" " Cost at Mine,	1.400	1.188	.212	
<u>COST:</u>				
<u>Total Cost at Mine:</u>				
Underground Costs,	.827	.842		.015
Surface Costs,	.069	.054	.015	
General Mine Expense,	.145	.098	.047	
Cost of Production,	1.041	.994	.047	
<u>Loading & Shipping:</u>				
Steam Shovel,	.040	.047		.007
Pocket,	.008	.007	.001	
Total Loading & Shipping,	.030	.013	.017	
Depreciation, Plant & Equipmt.	.085	.056	.029	
" Development,	.012	.012	-	-
Taxes - Ad Valorem,	.103	.071	.032	
" - Occupational,	.048	.048	-	
" - Royalty,	.029	.020	.009	
	.277	.207	.070	
TOTAL COST AT MINE,	1.348	1.214	.134	
Administrative & Gen'l. Exp.	.053	.054		.001
Miscellaneous Income,	.003	.005		.002
TOTAL COST,	1.398	1.263	.135	

(Mine closed down August 20th, 1931 - operated 130 days only, as compared with 278 days in 1930).

Considering the retrenchment in the operations, the decrease of 69 tons per day in the average production was quite gratifying. The important point was the tons per man per day and this shows an increase of .14.

Naturally the cost per ton at the mine showed a decided increase in 1931, as compared with the previous year, due to the fact that the over-head, including taxes, had to be charged against a much smaller tonnage.

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8. COST OF
OPERATION;
(Continued)

The underground costs showed a decrease of \$.015 for the year 1931, as the result of improvements in the method of operation. The Surface and General Mine Expense costs, however, showed an increase totaling \$.062 per ton. The larger increase here was in General Mine Expense, which is due to the absorption of over-head by the greatly reduced tonnage.

There was a decrease in the Cost per Ton of \$.007 in the item "Steam Shovel" and a slight increase of \$.001 in the cost of "Loading at Pocket".

The increase of \$.029 in the Depreciation was caused by the reduced output with the same annual charge being applied.

The increase of \$.032 per ton for Ad Valorem taxes was due entirely to the decreased production.

Considering the restricted output, the total cost at the mine of \$1.398 per ton in 1931, as compared with \$1.263 for 1930, or an increase of \$.135, was quite satisfactory.

10. TAXES:

a. Tax Statement:

	<u>1931</u>	<u>1930</u>	<u>Increase</u>	<u>Decrease</u>
Alexandria Mine,	\$ 9,628.81	11,266.78		1,637.97
St. Anthony #2 Reserve,	1,952.96	2,020.07		67.11
Village Lot,	<u>161.21</u>	<u>166.75</u>		5.54
Total,	\$ 11,742.98	13,453.60		1,710.62
Personal Property,	<u>13,621.15</u>	<u>9,453.27</u>	4,167.88	
GRAND TOTAL,	\$ 25,364.13	22,906.87	2,457.26	
	<u>TAX RATE</u>	<u>TAX RATE</u>		
	<u>1931</u>	<u>1930</u>		
Town of Stuntz,	.527	.498		
Town of Balkan,	.488	.450		
Village of Hibbing,	.582	.602		

11. ACCIDENTS
AND
PERSONAL
INJURY:

There was only one lost-time accident at the Alexandria Mine during the year 1931, as compared with ten in 1930. A brief description of this accident follows:

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11. ACCIDENTS
AND
PERSONAL
INJURY
(Continued)

NAME: Jos. Gersich. DATE: Aug. 12, 1931.
Gersich and his partner were changing the position of their scraper slide and were carrying it to the new position on the opposite side of the tram tracks. While crossing the tracks, Gersich stepped on a rail and his foot slipped off. Gersich then complained of a pain in his right side.

NATURE: Indirect right inguinal hernia of medium size.

TIME LOST: Injured party did not return to work as mine closed down on August 20th, 1931. Gersich received compensation up to and including November 18th, 1931.

13. EQUIPMENT AND
PROPOSED
EQUIPMENT:

No new equipment was put in service during the operating period of 1931. The mine is now on an idle basis and there is sufficient equipment for requirements when the property is re-opened and no additions or replacements will be necessary for some time to come.

15. POWER:

The mine is completely equipped with electrically-driven machinery. The power is furnished by the Minnesota Power & Light Company.

16. WATER SUPPLY:

The water supply for the change house and location dwellings is furnished by the Oliver Iron Mining Company through a pipe line from the Godfrey Mine.

17. CONDITION OF
PREMISES:

An effort was made to keep the premises as neatly as possible. The location buildings are in a good state of preservation, having been painted during the year 1929. The mine buildings are in a good state of preservation and require no immediate repairs.

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18. NATIONALITY
OF
EMPLOYEES:

<u>NATIONALITY:</u>	<u>NO. OF MEN</u>
Finnish, -----	30
Austrian, -----	23
American, -----	18
Italian, -----	10
Slovanian, -----	9
Polish, -----	4
Manx, -----	3
German, -----	1
Norwegian, -----	1
English, -----	1
Swedish, -----	1
Total, -----	<u>101</u>