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10. TAXES: (Cont)

AUSTIN LOCATION:	1929 VALUATION	1929 TAXES	1928 VALUATION	1928 TAXES
Part of Lot 5, Sec. 20-45-25	5,000	173.51	5,000	157.82
NW¼ of SE¼ " 20-45-25	10,000	347.00	10,000	315.61
NE¼ of SW¼ " 20-45-25	800	27.77	800	25.26
Part of SW¼ of SE¼ of Sec. 20-45-25	300	10.42	300	9.46
Total	16,100	558.70	16,100	508.15
Collection Fees		5.59		5.08
Total Taxes		564.29		513.28
Total C. C. I. Co., Forsyth, except mines and power companies	134,505	4,717.07	135,165	4,310.75
SUMMARY:				
Austin Mine	70,000	2,429.00	80,000	2,524.87
Stephenson Mine	335,160	11,630.07	530,000	16,727.27
Princeton Mine	281,260	9,759.78	281,260	8,876.89
Francis Mine	315,500	10,950.40	340,500	10,748.92
Gardner-Mackinaw Mine	96,200	3,338.15	47,200	1,489.73
Mineral Lands	2,870	99.67	2,920	92.26
Gwinn Townsite	107,235	3,723.34	106,955	3,377.55
Austin Location	16,100	564.29	16,100	508.15
Gardner-Mackinaw Location	6,500	225.57	7,500	236.72
Gwinn District Office and Crusher	1,800	63.09	1,690	53.38
Total C. C. I. Company	1,232,625	42,783.36	1,414,125	44,635.74
Collection Fees		427.83		446.34
Total Taxes, C. C. I. Company, Mines, etc.		43,211.19		45,082.08
Cliffs Power and Light Company	93,780	3,254.32	36,150	1,141.04
Cliffs Electric Company	5,000	173.51	10,000	315.62
Total	98,780	3,427.83	46,150	1,456.66
Collection Fees		34.28		14.57
Total Taxes		3,462.11		1,471.23
Grand Total	1,331,305	46,674.30	1,460,275	46,553.31

TAXES LEVIED - FORSYTH TOWNSHIP	1929	1928	1927	1926
State	8,837.14	6,770.27	8,670.96	7,322.08
County	15,619.99	13,341.05	13,232.64	15,365.44
County Road	6,697.18	6,742.11	6,101.27	7,459.59
Contingent	3,016.00	3,500.00	4,000.00	4,500.00
Highway Improvement	4,008.95	2,000.00	3,000.00	4,000.00
Highway Repair	4,009.25	4,000.00	4,000.00	2,000.00
Library	100.00	100.00	100.00	-
School and One Mill	38,239.35	40,350.80	34,469.00	40,948.00
Cemetery	-	500.00	500.00	-
Rejected	Included in roll	29.24	13.07	5.76
Total	80,527.86	77,333.47	74,086.94	81,600.87
Amount paid by C. C. I. Company	46,674.30	46,092.40	49,005.39	60,254.84
Percent paid by C. C. I. Company	57.96	59.60	66.14	73.84

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16. WATER SUPPLY:

The new water power plant on the Escanaba River went in operation in the summer on day shift; at night the plant was idle and the flow of the river was shut off. This effected the level of the water at the Pump Station, two miles down the river, and made it necessary to raise and repair the dam which controls the flow of water to the suction well.

The severe cold weather in the early part of last winter when there was no snow on the ground permitted the frost to penetrate to an unusual depth. The water mains froze in many places and thawing crews worked for weeks keeping the mains open. As a result of these conditions, numerous leaks developed in the mains and had to be repaired during the summer months. Due to the intermittent flow of the river, more contamination occurred and a much heavier charge of chlorine gas was required during the summer and fall months to purify the water. Samples are sent weekly to the State Laboratory at Houghton, Mich. The charge of chlorine gas was determined from the analysis.

The following table gives the cost of operating the pump station in 1929 and 1928:

		1929	1928	Increase	Decrease
General Expense		54.47	55.17		.70
Maintenance Labor	(1)	1,744.50	958.50	786.00	
Maintenance Supplies	(2)	476.69	6.25	470.44	
Operating Labor	(3)	1,909.78	1,653.83	255.95	
Operating Supplies	(4)	5,104.84	4,107.70	997.14	
Total		9,290.28	6,781.45	2,508.83	

(1 & 2) Maintenance expense high in 1929 account of thawing and repairing the water mains.

(3) An extra pumpman was employed part of February, March and April, to insure a continuous flow of water through mains that had been thawed but around which the ground was still frozen.

(4) Supplies increased due to more current used on account of more water pumped during year and also to more chlorine gas used to purify the water.

In November when some transformers were burned out the plant was operated with steam, and coal costing $70.20 was burned.

The 1929 and 1928 operating costs were charged off as follows:

	1929	1928	Increase	Decrease
C. C. I. Co. Mines	245.00	405.00		160.00
Gwinn Townsite Expense	5,445.32	2,823.38	2,621.94	
C. K. Quinn & Co.	1,206.00	1,200.50	5.50	
Water Service Accounts Receivable	2,393.96	2,352.57	41.39	
Total	9,290.28	6,781.45	2,508.83	

17. CONDITION OF PREMISES:

Gwinn Townsite:

The streets, alleys, and numerous parks in Gwinn Townsite were cleaned at regular intervals by township employees. The general appearance of neatness was maintained at the high standard of previous years and was favorably commented on by many of the tourists. There continues to be a small loss of the Jack Pine trees in the various parks and lots due to disease. These trees are removed and burnt by company employees in an effort to check further spread.

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17. CONDITION OF PREMISES: (Cont)

Austin Location:

The township kept the main street through the location in good condition, the alleys were cleaned at regular intervals by company employees. There are only half of the houses occupied in this location. It is doubtful if all the houses in this location will ever be occupied again as people now prefer to live in Gwinn Townsite.

Princeton Location:

This location was cleaned at township expense. There are numerous vacant houses, both company and privately owned, in marked contrast to the conditions prevailing a few years ago when the Stephenson and Austin Mines were operating.

Gardner-Mackinaw Location:

More employees have moved to the Gardner-Mackinaw location, twelve houses now being occupied as compared with five a year ago. The streets and alleys here are cleaned by the company. The children are transported by bus to the school at Gwinn. The roofs of the houses are in bad condition and a number must be replaced in 1930.

19. GWINN ASSOCIATION, GWINN HOTEL, GWINN COUNTY PARK:

a. Gwinn Association:

The Gwinn Association completed another very successful year with funds in the treasury. The report of the activities of the association is included in the yearly report of Mr. W. H. Moulton so is omitted from this report. The Gwinn Association, under the capable management of Mr. E. L. Miller, Secretary, provides a real community center. It is responsible for the strong attachment of residents to the community and aids materially in the moral and physical development of the young people.

b. Gwinn Hotel:

The hotel continues to operate under the same management as in the two previous years. The equipment of the hotel has been maintained by the Manager and the company has donated the rent and electric light. The tourist trade was not as good as in the previous year; this was offset by State engineers surveying location of U. S. 41, by telephone construction crews, etc. The total receipts averaged about the same as in 1928. The hotel is necessary in the community and it is hoped that the company will continue its generous policy of donating the rent and electric light service.

c. Gwinn County Park:

The equipment of the park was increased in 1929 by the erection of an attractive bath house. The park is growing in favor with Marquette County residents and is extensively patronized by tourists. It adds to the attractiveness of Gwinn Townsite and to the pleasure of the local residents who make extensive use of its facilities for picnics, swimming, etc.

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19. GWINN ASSOCIATION,
GWINN HOTEL, ETC.

e. Company Houses:

The following table shows the number of houses in each location vacant and occupied during 1929 and 1928.

	1929			1928		
	Vacant	Occupied	Total	Vacant	Occupied	Total
Princeton Location	6	9	15	8	7	15
Austin Location	30	36	66*	33	34	67
Gardner-Mackinaw Location	39	12	51	46	5	51
Gwinn Townsite	9	111	120	20	100	120
Total	84	168	252	107	146	253

Gain in occupied houses in 1929 - 23
*One boarding house sold in 1929.

f. Gwinn District Crusher:

Summary of crusher operations for 1929 and 1928:

	1929		1928		INCREASE		DECREASE	
	Amount To Dec. 1	Per Ton	Amount For Year	Per Ton	Amount	Per Ton	Amount	Per Ton
General Expense	357.83	.002	822.34	.003			464.51	.001
Maintenance	2,085.37	.012	5,164.74	.019			3,079.37	.007
Operating	5,022.64	.028	5,764.59	.021		.007	741.95	
Total Optg Cost	7,465.84	.042	11,751.67	.043			4,285.83	.001
Switching	820.00	.005	838.50	.003		.002	18.50	
Grand Total	8,285.84	.047	12,590.17	.046		.001	4,304.33	

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

Grade	1929 Tons Full Year	1928 Tons Full Year	INCREASE	DECREASE
Stephenson	10,626	14,250		3,624
Austin	525	275	250	
Gardner-Mackinaw	95,285	70,787	24,498	
Total C. C. I. Co.	106,436	85,312	21,124	
Archibald	44,967	69,636		24,669
Junior	5,523	7,865		2,342
Foundry	3,139	72,280		69,141
Roberts	17,886	39,728		21,842
Total Others	71,515	189,509		119,994
Grand Total	177,951	274,821		96,870

	1929 To Dec. 1	1928 Full Year
Average tons crushed per day	1,678.78	1,889
No. days operated	106	147
Shifts and hours	1-9 hour	1-9 hour
Rated capacity per ten hour shift	1,000	1,000

The cost of operation for 1929 is slightly higher than in 1928 due to less ore crushed for the Archibald Mine of the C. K. Quinn Company. With tonnages often running less than the actual capacity of the crusher there are idle periods during the shift and this condition accounts for the increase in operating cost.

REPUBLIC MINE

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1. GENERAL:

The Republic Mine was abandoned in 1928. The principal operation during 1929 was loading out the ore remaining in stock and picking over the old rock dumps, and salvaging the ore found in them. Some equipment was transferred to other operating mines of the Company and a large tonnage of scrap sold to the Michigan Scrap Iron Company of Ironwood, Michigan.

Mr. Chenhall, the Mine Clerk, was transferred to the Gardner-Mackinaw Mine on January 16th. He did not move his family until after school closed in June.

Mr. Thompson, Mechanic, was transferred to the Tilden Mine on November 16th, moving his family to Ishpeming. Up until the time Mr. Thompson was brought to the Tilden Mine, he was carried on the Cliffs Power & Light Company's pay roll as operator of the Republic Plant. He was in charge of the new electrical installation at the Water Power Plant and during the summer looked after the ore loading.

Captain Pascoe, who is acting as watchman, is the only man now employed at the Republic Mine.

2. PRODUCTION SHIPMENTS & INVENTORIES:

b. Shipments.

Grade of Ore.	Stockpile Tons.	Total Tons.	Total Last Year Tons.
Bessemer lump,	43	43	547
Basic lump,	18,674	18,674	20,693
Basic crushed,	134	134	25,267
Pascoe crushed,	1,017	1,017	659
Total,	19,868	19,868	47,166
Total last year,		47,166	
Decrease,		27,298	

The small tonnage shipped during 1929 was the ore remaining in stockpile and that salvaged from the old rock dumps, while the previous year we produced ore up until May 21st, inclusive, when the mine was closed down and carried over a large stockpile tonnage from the previous year.

Shipments of Bessemer and Basic Lump ore were made for all rail shipment from January to August, the loading being done by hand from stockpile. A total of 25 cars were loaded for six different companies as follows:

6 cars Basic Lump for The American Steel & Foundry Company, Indiana Harbor, Ind.
9 cars Basic Lump for The American Steel & Foundry Company, Granite City, Ill.
4 cars Basic Lump for The American Steel & Foundry Company, East St. Louis, Ill.

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PRODUCTION, SHIPMENTS & INVENTORIES:

b. Shipments (Continued).

1 car Basic Lump for W. K. Henderson Iron Works & Supply Company, Shreveport, La.
1 car Basic Lump for Michigan Steel Casting Company, Detroit, Mich.
1 car Basic Lump for Sterling Steel Casting Company, East St. Louis, Ill.
1 car Bessemer Lump for Swedish Crucible Steel Company, Detroit, Mich.
2 cars Basic Lump for Twin City Forge & Foundry Company, Stillwater, Minn.

The steam shovel loaded from the Basic Lump pile for five days in April, four days in May and ten days in June when this pile was cleaned up. The shovel was then moved into the Pascoe-Run-of-Mine pile. As this grade averaged 55.10% iron and 18.63% silica, it could not be disposed of except by mixing. It was loaded and shipped to the Maas crusher and after crushing was used, in small amounts, in a mixture with Cliffs Shaft crushed. There was an overrun of 4662 tons in the Basic Lump pile and 371 tons in the Pascoe-Run-of-Mine pile.

During the last half of June we employed two men and a team picking up lump ore from the old stockpile grounds and waste piles. After the steam shovel operations had been completed, we used the entire crew of six men picking out the ore from the rock piles scattered over the property. The piles around the Pascoe shaft were made many years ago when the miners were not so careful about sorting as in lateryears and considerable clean ore is found among the waste. In these piles and the ones near No.9 shaft, which were accumulated since the installation of the picking belt, there is a large tonnage of banded material, ore and jasper. These chunks are being broken with a sledge and the clean ore salvaged.

This operation proved profitable and the number of men was increased from time to time to a total of 36 in order to load one car a day. We continued this operation of hand sorting until November 15th, when the last cargo was shipped. We salvaged 4316 tons of Basic Lump ore and 134 tons of Basic Crushed, a total of 4450 tons in this manner. The average cost on cars at the mine for the 4450 tons was $3.91 per ton. The cost gradually increased as we worked further into the piles, as there was more fine material and rock to be handled per ton of ore recovered. We feel, that if the 1929 price is maintained during 1930, that we will be able to secure at a profit a small additional tonnage.

3. ANALYSIS:

b. Average Analysis on Straight Cargoes.

Grade.	MINE.			Lake Erie.		
	Iron.	Phos.	Sil.	Iron.	Moist.	Iron Nat.
Basic Lump,	63.20	.071	7.60	63.02	.29	62.84

REPUBLIC MINE
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6. SURFACE:

a. Buildings.

2. Location Houses:

House No.17 was sold to Captain P. W. Pascoe, Sr., in 1928, but when it came to signing the lease for the lot, he was dissatisfied with the terms and refused to do so and asked to have the money paid thus far refunded, which was done.

Three more of the location houses were disposed of during 1929 as follows:

House No.	Purchaser.	Sale Price.	
24	Martin Suneson,	$350.00	
25	Emanuel Isaacson,	300.00	
36	Finnish Church,	75.00	(Donated).

Practically no repairs were made to the houses during the year. The Company still owns 23 houses, 17 single and 6 double ones, of which 8 single and one side of 4 double houses were occupied on December 31, 1929.

d. Farm.

The Company Farm, located near the Water Power Plant, part of which is now owned by the Cliffs Power & Light Company, was leased to the Republic School District to be used in connection with their agricultural course taught in the High School. The Republic School is being operated under an Agricultural Act which gives them a certain amount of State aid. This is a great help to them in maintaining their High School.

e. Scrap.

The Michigan Scrap Iron Company, of Ironwood, Michigan, started several men during March, dismantling and cutting up material preparatory to loading out the Republic Mine scrap. They continued this work intermittently for the balance of the year, shipping the last car the end of November. They were handicapped by our loading ore from the same dock and were granted an extension of time on their contract. The equipment scrapped was as follows:

Water power compressors,
Old electric light machine and boilers at No.5 engine house,
Picking belt and screen at No.9 shaft,
Screen and hoist at crushing plant,
All underground and surface cars, skips and cages,
All steam equipment, hoist, compressor and boilers, at the Central Power Plant,
Miscellaneous scrap scattered about the property.

The contract price was $6.50 per gross ton, as is. A total of 513 tons 690 pounds was loaded with a net return of $3336.50.

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SURFACE:

f. Sale of Equipment.

The following equipment was sold to various Company properties and others:

The Cliffs Power & Light Company, Ishpeming, Mich.

1 Small drill press,
1 Electric soldering iron,
1 Grindstone and trough,
9 Transformers, various sizes,
6 Motors.

Canisteo-Cliffs Mining Company, Coleraine, Minn.

80 pieces 16" riveted pipe 52' lengths,
3 Expansion joints,
6 pieces of angle pipe.

Gardner-Mackinaw Mine, Gwinn, Mich.

1 Sullivan oil tempering furnace.

Harold Gjiers, Republic, Mich.

1 Coal dock (Central Plant).

Maas Mine, Negaunee, Mich.

1 Ingersoll-Rand oil tempering furnace.

Morris-Lloyd Mine, Ishpeming, Mich.

1 Wood boreing machine.
1 35' 18" leather belt.

Negaunee Mine, Negaunee, Mich.

1 Large drill press.

Republic Township.

18 lengths 12" pipe for culverts,
Scrap copper wire.

Spies-Virgil Mine, Iron River, Mich.

1 car used trestle timber and miscellaneous scrap iron and steel,
1 car lumber from Water Power compressor building.

Tilden Mine, Ishpeming, Mich.

1 Laboratory sample crusher and motor,
1 Power hack saw,
Miscellaneous shop tools.

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10. TAXES:

a. Republic Mine.

Description.	1929. Valuation.	1929. Taxes.	1928. Valuation.	1928. Taxes.
Republic Township.				
Realty as described on Tax Receipt,	$10,000	$571.20	$25,000	$1324.01
Personal property, - - - -	55,000	3141.50	160,000	8473.50
Lots 71,72,86,108 and 125, - -	95	5.56	95	5.07
Total,	$65,095	$3718.36	$185,095	$9802.58
Collection fees,		37.18		
Total opt. Republic Mine,	$65,095	$3755.54	$185,095	$9802.58
Various persons - accts. rec.,				154.40
Republic Mine Dwellings, inc.fees,	8,875	512.40	20,750	904.51
Dr. H. H. Loveland, Hospital,				40.00
Total Republic Township(Inc.fees),	$73,970	$4267.94	$205,845	$10901.49
Rate per $100.00,		5.712		5.243

b. The Cliffs Power & Light Company.

Description.	1929. Valuation.	1929. Taxes.	1928. Valuation.	1928. Taxes.
Lots 1,2,7 & 8 122.56 ac.	$15,000	$856.80		
Power lines, - - -	1,500	85.68	$1,500	$78.66
Lots 4 and 6 Sec.9, 47-30,	100	5.71	100	5.24
Total,	$16,600	$948.19	$1,600	$83.90
Collection fees,		9.48		.84
Total,	$16,600	$957.67	$1,600	$84.74
Rate per $100.00,		5.712		5.293

Up until 1929, Lots 1, 2, 7 and 8 of Section 18, 46-30 were included in the Republic Mine description. This year we had the assessment roll changed so as to list the lands owned by The Cliffs Power & Light Company separately. You will note that the total valuation on the Mine Company and Power Company lands is the same for 1929 as it was in 1928 on the Republic Mine descriptions only.

The decreased valuation on personal property between 1929 and 1928 is the smaller tonnage of ore in stock. A substantial reduction in valuation was secured on the mine dwellings due to the low sale price we have placed on them.

ACCIDENTS & PERSONAL INJURY:

We had only one accident during 1929, which was of a serious nature, as a result of an infection. George Thompson, Mine Mechanic, was in charge of the ore sorting from the rock piles during the summer. On July 16th, he was watching the men work at the bottom of the No.9 rock pile, which is West of the shaft in the river. As he stood there, he saw a piece of clean ore in the pile and stepped over to pick it

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ACCIDENTS & PERSONAL INJURY (CONTINUED).

out. He had taken the lump of ore, weighing about ten pounds, in his left hand and was walking away to throw it on to the pile of ore, when he heard the pile moving. He started to run but a chunk from the pile struck, the hand in which he was holding the piece of ore, he had just picked out, splitting both sides of the middle finger, left hand, from the knuckle to the first joint. Thompson was brought to the Ishpeming Hospital immediately where the wound was dressed. An infection set in and it took a very long time to clear up and the wound to heal. He was under the doctor's care until October 9th, A total of $171.00 was paid in compensation.

SPIES-VIRGIL MINE
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1. GENERAL:

The operations at the Spies-Virgil Mine were very satisfactory and steady up until September, when there was a decided decrease in production. This condition was foreseen, as the lens at the East end of the 6th level stope is very narrow and there is not the chance to break the tonnage. Every effort was made to ward off this situation. We started in March to develop the ore above the 8th level and arrange to mine the ore East of No.604 raise above the 6th level. On account of the large amount of development work no new places were opened up by the end of the year. Further, a crack developed across the bench on the 245' sub-level East stope and we were forced to suspend operations here for over a month, reducing the product to about half of a normal tonnage.

The shipments for the year were more than our production and were the largest made from the mine since the Virgil property was opened. We hope we have established a market for the Virgil grade of ore and will continue to ship each year at least the current production.

2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production by Grades.

Virgil crushed, - -	165,071 tons
Virgil high sulphur, -	92 tons
Total ore, - - -	165,163 tons
Rock, - - - -	3,750 tons

The production of 165,163 tons for 1929 compares with 180,403 tons in 1928, a decrease of 15,240 tons. This makes the total production from the Virgil Mine to January 1, 1930, 584,565 tons.

Conditions in the stope above the 6th level did not allow the breaking of as large a tonnage due to the narrowing down of the lens as we worked Eastward. Further, the crack that developed in the stope was responsible for at least half of the decrease, which all occurred in December month.

The small tonnage of high sulphur ore was secured from development above the 8th level. We are not mining any of this grade of ore when it can be left in place.

The rock work during the past year was limited to the extending of the 8th level drift and raises above. About 25% of the rock hoisted in 1929 was taken from the stope above the 6th level during the month of December.

SPIES-VIRGIL MINE
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PRODUCTION, SHIPMENTS & INVENTORIES:

b. Shipments.

Grade of Ore.	Pocket Tons.	Stockpile Tons.	Total. Tons.	Last Year Total Tons.
Virgil crushed,	79,570	95,508	175,078	22,334
Virgil high sulphur,				
Total,	79,570	95,508	175,078	22,334
Total last year,	7,397	14,937	22,334	
Increase,	72,173	80,571	152,744	

The shipments of Virgil ore for 1929 were the largest made since the property was opened up, exceeding the year's production by 10,000 tons. The total shipments from the Virgil to January 1, 1930 are 275,107 tons.

Orders were received to start loading from pocket into railroad cars on April 4th and continued intermittently the rest of the month. From May 1st we shipped our entire production until September 15th, when we were compelled to start stocking on account of the phosphorus content of the ore running considerably below guarantee, namely, .407%. The orders remaining to be filled were for high phosphorus ore.

The first loading from stockpile for the season was started on April 10th and was intermittent throughout the season. The final tonnage was loaded about the middle of November. The steam shovel was operated in the main pile Northeast of the shaft at the beginning of the season. As the ore loaded during April ran high in phosphorus, the shovel was temporarily tied up. Arrangements were made at once with the Chicago and Northwestern Railway Company to build a track to serve the new stockpile North of the coal dock approach. This work was completed in July but no loading was done from this pile until November when 7,625 tons was shipped.

The Virgil ore was used in the Ranson grade, which is made up of Virgil, Morris-Lloyd and Athens ore. A number of cargoes of straight Virgil ore were also shipped. These went to furnaces desiring a high phosphorus ore.

c. Stockpile Inventories.

Grade.	Tons in Stock.
Virgil crushed,	306,442
Virgil crushed (high sulphur)	3,015
Total,	309,457

On December 31, 1929, the ore in stock amounted to 309,457ntons, a decrease of 9,915 tons over December 31, 1928. In other words, we shipped our 1929 production and reduced the stockpile by 9,915 tons. An engineer's estimate of the tonnage in stock on November 15th shows an overrun of 28,184 tons. This figure is less than the tonnage reported last year. A new factor of 16.65 cubic feet per ton of ore in stockpile was secured this year by the shipment of 57,158 tons,

SPIES-VIRGIL MINE
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PRODUCTION, SHIPMENTS & INVENTORIES:

c. Stockpile inventories (Continued).

which compares with the factor of 15 cubic feet per ton used in making the 1928 estimate. The overrun from the pocket shipments for the season averaged better than 15%.

d. Division of Produce by Levels.

The ore hoisted from the various levels was as follows:

Level.	Tons.	% of Product.
6th,	164,608	99.66
8th,	555	.34
Total,	165,163	100.00

The entire production was secured from the stope above the 6th level except for a small tonnage from development drifting and raising on the -131' sub-level. The 92 tons of high sulphur ore came from the raise and sub-level drift above the 8th level, from which deep holes Nos.102 and 103 were drilled.

e. Production by Months.

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

	Tons.					Average	Tons
Month.	Tons Rock.	Hi-Sulphur Ore.	Virgil Ore.	Tons Total.	No.Days Operated.	Daily Product.	Per Man Per Day.
January,	258		15,194	15,194	26	584	7.06
February,	184		13,390	13,390	24	558	6.70
March,	168		12,320	12,320	25	493	5.82
April,	140		16,238	16,238	26	625	7.28
May,	534	92	17,259	17,351	26	664	7.88
June,	716		16,242	16,242	25	650	7.72
July,	420		14,976	14,976	26	576	6.69
August,	52		15,458	15,458	25	618	7.05
September,	170		12,001	12,001	24	500	5.97
October,			13,620	13,620	27	504	6.05
November,	158		11,027	11,027	25	441	5.37
December,	950		7,346	7,346	22½	326	3.83
Total,	3750	92	165,071	165,163	301½	548	6.35
Stockpile Overrun,							
Grand Total,	3750	92	165,071	165,163	301½	548	6.35

We maintained a steady monthly production, realizing our estimate of 15,000 tons per month, up until September when the hoist dropped off. The exceedingly small output for December was due to the crack which developed in the stope on the 245' sub-level and prevented the breaking of any ore for over a month.

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PRODUCTION, SHIPMENTS & INVENTORIES:

f. Ore Statement.

	Virgil Low Sulphur.	Virgil Hi-Sulphur.	Total.	Total Last Year.
On hand January 1, 1921,	316,449	2,923	319,372	161,303
Output for year,	165,071	92	165,163	180,403
Stockpile overrun,				
Total,	481,520	3,015	484,535	341,706
Shipments,	175,078		175,078	22,334
Balance on hand,	306,442	3,015	309,457	319,372
Increase in output,	15,332	92	15,240	27,324
Increase in ore on hand,	10,007	92	9,915	158,069

1927, 2 - 8 hour shifts, 6 days per week, Jan.1 to Dec.31, 1927.
1928, 2 - 8 hour shifts, 6 days per week, Jan.1 to Dec.31, 1928.
1929, 2 - 8 hour shifts, 6 days per week, Jan.1 to Dec.31, 1929.

g. Delays.

Production was interrupted several times during the year as follows:

Delays.

Date.	Duration.	Cause.	Tonnage Lost.
Feb.13th,	5	(Air compressor exciter burned out.	75
Feb.14th,	8	(	100
Mar. 7th,	2	Coil burnt out on Larry car motor.	50
Apr.22nd,	1	Larry car off track.	25
Aug.14th,	16	(Burnt out motor generator set which oper-	575
Aug.15th,	8	(ates underground haulage.	275
Aug.19th,	8	Broken skip head sheave.	275
Dec.12th,	3	Larry car off track.	100

Of the accidents to equipment, there were only three that were of a serious nature and caused a delay of more than several hours. The armature on the exciter of the air compressor burned out on the night shift of February 13th. As it could not be repaired at the mine, a new armature was sent down from Ishpeming the next morning and the compressor was ready to operate by 2:00 P. M. It was not a complete shut down as we had sufficient broken ore in the stope to continue hoisting. We were only able to hoist one car at a time in the skip as we could not operate the pocket door. The miners were sent home at midnight on February 13th and did not work again until the night of the 14th.

The motor generatot set was giving some trouble on the night shift of August 13th. The electricians tried to repair it but found the insulation had given away in so many places that it had to be completely overhauled. The rotary converter from the Barnes-Hecker Mine was shipped to Iron River by truck and was installed and ready to operate for the night shift of August 15th. The motor generator set had been located underground for about five years and the insulation kept damp and after it was installed in the engine house dried out and cracked, causing short circuits between the coils.

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PRODUCTION, SHIPMENTS & INVENTORIES:

g. Delays (Continued).

On the morning of the 19th, the man that oils the head sheave in the shaft house noticed a piece broken from the rim of the skip sheave. We were affaid the rope might jump off and cause more trouble, the cage and skip operating in balance, so the men were sent home and a patch put in the wheel. We were ready to operate again that night. A new 8' sheave was sent from the Negaunee Mine by truck as we had no spare on hand as the ones in the shaft house had only recently been changed.

The sheave was broken by over-winding of the skip. The skip was hoisted to within a short distance of the dump when it was stopped. The hoisting engineer left the hoist and went over to work on the compressor. A signal for hoisting the skip was rung and the engineer forgot that the skip was so near the dump and gave it full current before he realized he was in the dump. The Crosby clips at the end of the skip rope were pulled in to the sheave, causing it to crack and breaking a piece from the rim.

h. Delays from Lack of Current.

There were only two delays during 1929 due to lack of current, neither of which were serious, as follows:

Delays.

Date.	Duration.	Cause.	Tonnage Lost.
Oct.22nd,	4	Snow storm.	150
Dec. 2nd,,	2	Main power line broke.	75

The first delay of the year, on account of lack of current, occurred on the day shift of October 22nd when during a severe snow storm the electrical power was off for four hours. On December 2nd, one of the circuits on the main transmission line serving the mine, broke and it took about two hours befpre it was repaired.

3. ANALYSIS:

a. Average Mine Analysis on Output.

Grade.	Iron.	Phos.	Sil.	Alum.	Mang.	Lime.	Mag.	Sul.	Loss.	Moist.
Virgil crushed,	57.20	.344	8.35	1.48	.18	.50	.28	.040	6.50	8.00

b. Average Analysis on Straight Cargoes.

		Mine.			Lake Erie.	
Grade.	Tons.	Iron.	Phos.	Sil.	Iron.	Moist.
Virgil crushed,	136,285	57.93	.382	7.47	57.49	6.99

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ANALYSIS:

c. High Sulphur Ore.

The only high sulphur ore mined during the year was that encountered in the course of the development drifting on the 355' and 380' sub-levels and the -131' sub-level above the 8th level.

As the ore mined on the 355' and 380' sub-levels had to be dumped into the stope, it was hoisted as Virgil grade. The tonnage was so small as to be negligible.

The 92 tons of high sulphur ore produced came from the raise and drift driven above the 8th level from which deep holes Nos.102 and 103 were drilled. Some high sulphur seams were cut in the development drifting on the -131' sub-level. As the sulphur was very spotty and varied from day to day, it was all hoisted as Virgil grade. The tonnage only amounted to 463 tons,so had little effect on the analysis of the total product.

d. Average Analysis on Total Shipments.

Grade.	Tons.	Iron.	Phos.	Sil.	Alum.	Mang.	Lime.	Mag.	Sul.	Loss.	Moist.
Virgil,	175,078	57.50	.374	7.45	1.57	.16	.55	.28	.078	6.70	

e. Average Analysis of Ore in Stockpile.

Virgil,	306,442	57.50	.374	7.45	1.57	.160	.55	.28	.078	6.70	8.00
Virgil Hi-Sul.,	3,015	58.32	.334	5.00	1.71	.20	.47	.21	.342	8.45	8.00
	309,457										

4. ESTIMATE OF ORE RESERVES:

a. Developed Ore.

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

	Available Tons.	Unavailable Tons.	Total Tons.
6th level and above,	418,135	261,681	679,816

b. Prospective Ore.

Below 6th level,,	653,857	44,954	698,811
Total all ore Dec.31, 1929,	1,071,992	306,635	1,378,627

Estimated reserves December 31, 1928, 1,584,682 tons.
Estimated reserves December 31, 1929, 1,378,627 tons.
Decrease over 1928, 206,055 tons
Production, 1929, 165,163 tons
Tons mined during 1929 in excess of tons of ore developed, 40,892 tons.

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ESTIMATE OF ORE RESERVES:

b. Prospective Ore (Continued).

The development of the subs above the 280' sub-level proved up 38,173 tons more than we expected. In 1928 the development appeared to prove that ore body had contracted to a small area above this elevation, but instead the ore body had fallen back to the Southeast connecting with the ore coming up from the Southwest stope. There are areas of high sulphur ore between the 330' sub-level and 4th level not included in the estimate as it is not merchantable.

The estimate of prospective ore below the 6th level is made from cross-sections. One section was reduced due to geological information on adjoining sections. As a result the tonnage of prospective ore was reduced 79,065 tons. This was partly offset by the additional 38,173 tons developed above the 6th level, making a total decrease in total tonnage after deducting the production of 40,892 tons.

The unavailable ore was increased by approximately 155,000 tons over that shown in 1928. This is explained by more supporting pillars being left in the Northwest stope and also the establishing a limit of mining on the North side of the Southwest stope. All ore South of this limit, which is tied up on account of this area being bulkheaded off, is considered unavailable in this year's estimate.

c. Estimated Analysis.

	Iron.	Phos.	Sil.	Alum.	Mang.	Lime.	Mag.	Sul.	Loss.	Moist.
Dried 212°,	57.50	.425	7.00	1.64	.16	.60	.30	.119	7.35	
Natural,	51.75	.382	6.30	1.48	.15	.55	.26	.107	6.60	10.00

d. Estimate of Production.

The following is the estimated tonnage and expected analysis of the 1930 production from the Spies-Virgil Mine:

Grade.	Tons.	Iron.	Phos.	Sil.	Sul.	Moist.	Iron Nat.
Virgil,	159,000	57.50	.350	8.00	.060	8.00	52.90

5. LABOR & WAGES:

a. Comments.

1. Labor.

The labor conditions at the mine were most satisfactory; at no time was there a shortage of men. The Davidson Mine, of the Davidson Ore Company, put two of their three shafts on double shift beginning January 21st. During the months of May and June a number of the mines in the Iron River District increased their crews by a small number. All of the Pickands, Mather & Company's mines were put on a six day week, except the James Mine, which continued to operate five days.

In March, three Republic Mine men were given employment.

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LABOR & WAGES:

a. Comments (Continued).

2. New Construction.

The only new construction undertaken was the starting of the Community Garage building at the Location. This is being put up by the mine carpenters.

b. Comparative Statement of Wages and Product.

	1929.	1928.	Increase.	Decrease.
Product, - - - - - -	165,163	180,403		15,240
No. shifts and hours, - -	2-8	2-8		
Average No. Men Working.				
Surface, - - - - - -	23	25		2
Underground, - - - - -	63	66		3
Total, - - - - - -	86	91		5
Average Wages Per Day.				
Surface, - - - - - -	$4.41	$4.28	$ .13	
Underground, - - - - -	5.14	5.20		.06
Total, - - - - - -	$4.94	$4.93	.01	
Wages Per Mo. of 25 Days.				
Surface, - - - - - -	$110.25	$107.00	$3.25	
Underground, - - - - -	128.50	130.00		1.50
Total, - - - - - -	$123.50	$123.25	.25	
Product Per Man Per Day.				
Surface, - - - - - -	23.06	22.89	.17	
Underground, - - - - -	8.75	9.19		.44
Total, - - - - - -	6.35	6.56		.21
Labor Cost Per Ton.				
Surface, - - - - - -	.1913	.1868	.0045	
Underground, - - - - -	.5872	.5651	.0221	
Total, - - - - - -	.7785	.7519	.0266	
Aver. Product Br'k & Trm'g.	29.74	22.21	7.53	
Aver. Wages Contract Miners,	5.42	5.84		.42
Total No. Days.				
Surface, - - - - - -	7160½	7880 3/4		720¼
Underground, - - - - -	18864¼	19623½		759¼
Total, - - - - - -	26024 3/4	27504¼		1479½
Amount For Labor.				
Surface, - - - - - -	$31596.37	$33702.69		$2106.32
Underground, - - - - -	96976.73	101950.87		4974.14
Total, - - - - - -	$128573.10	135653.56		7080.46

Proportion Surface To Underground Men.

1929	1 to 2.74
1928	1 to 2.64
1927	1 to 3.08
1926	1 to 3
1925	1 to 2.3
1924	1 to 1.82
1923	1 to 3
1922	1 to 2.8
1921	
1920	1 to 3.1
1919	1 to 2.91
1918	1 to 2.86

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6. SURFACE:

a. Buildings, Repairs.

1. Buildings, Mine.

The circular saw and wood planer purchased from the Republic Mine were set up in the North end of the carpenter shop. The walls were fireproofed by covering them with Toncan metal sheets which were salvaged from the top tram snow shed at the Republic Mine. The wood frame work of all the mine buildings were given a coat of paint during May and June.

The grizzlies and grizzly supports just under the skip dump were renewed early in the year. The chute from the crusher to the landing car and also the hopper to the loading pocket were completely worn out and when repairs were made the deflector was taken out as it gave considerable trouble when we were loading into the railroad pocket and handling rock on the landing. To take the place of the deflector, a movable chute was built in the shops. This chute is mounted on wheels and is placed under the shaft house chute when loading into the pocket and pushed out of the way when dumping into the stockpile car.

2. Buildings Location.

Only minor repairs were made to the location houses during the past season. The usual amount of kalsomining and painting was done by the tenants, the material being furnished by the Company.

We had a crew of five men at Republic dismantling the compressor building at the Water Power Plant. The Cliffs Power & Light Company gave the building to the Spies-Virgil Mine for tearing it down. It was a fire hazard for the other part of the plant. The lumber salvaged from this building will be used for the construction of a community garage of 14 stalls at the Spies location. The houses are not provided with garages and the tenants have erected unsightly sheds to house their cars. These will be removed as soon as the garage building is completed. Work on this building was started in November and the frame work partly finished and enclosed. The building will be gunited both outside and inside.

b. Stockpile.

The trestle on the East side of the North pile was filled early in February and we started side dumping. When side dumping an additional man is employed on each shift to keep the track and ties clean of ore; otherwise one man, the engineer, can take care of the top tram. The available room was almost filled by the first of April, when we started to clear and grade more ground. As we received orders to ship from pocket early in April, this work was stopped immediately.

We loaded out about 88,000 tons of ore from the main pile Northeast of the shaft this summer, making sufficient room for our winter's stocking. Sixteen ~~six~~ bents were erected in November, which when filled, we will start side dumping, filling the entire area.

Early in the season, on account of the grade of ore in the main pile running very high in phosphorus, we thought we would have to load most of our tonnage from the North pile. The Chicago & Northwestern Railway

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SURFACE:

b. Stockpile(Continued).

Company built a spur to this pile and had it ready by the end of June. Only a small tonnage was loaded from this North pile in November. When loading here, operations were slow due to the saturated condition of the ground. When the Railway Company constructed their spur, they ditched the East side of the stockpile ground well, so we blasted a ditch along the West side to help the drainage and dry up the ground.

Repairs were started in July on the permanent trestle to the rock and ore dumps. Four 10" "I" beams were put in to span between the shaft and first bent to the North. When rebuilding the permanent trestle, it was raised to a level grade, as the Larry car system has sufficient power to travel even up a slight grade. This work was completed in August and ready to stock ore September 15th.

c. Tracks, Roads, Teansmission Lines.
Roads.

The road from the location to the mine was widened to permit cars and trucks to pass each other on the hill. The road over the pocket tracks was changed to eliminate the dangerous crossing back of the electrical and carpenter shop and now crosses the tracks between the shaft and shop building, which gives one driving down the hill a clear view of the cars when being dropped down from the loading pocket.

The Village of Mineral Hills improved the road in front of the Spies location during the summer. The road was surfaced with a tar macadam.

7. UNDERGROUND:

a. Shaft Sinking.

There has been no shaft sinking during the past year.

b. Development.
Fourth Level.

There was no new development on the 4th level. A raise was put up from the 380' sub-level to this elevation and a drift driven West from the raise to hole to the main South crosscut. This raise was put up as a second outlet from the stope.

Sixth Level.

The development on this level during the past year was very small. One drift was driven South through the pillar between the first crosscut North ~~of~~ of the main drift South. Two raises were put up from this crosscut for mining the ore East of this pillar around No.604 raise. As the lens at the East end of the stope is very narrow, this area East of No.604 raise will have to furnish the larger part of our output during 1930 until an additional stope above the 8th level is developed.

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UNDERGROUND.

b. Development.

Subs Above Sixth Level.

Last year the development at the East end of the North finger of ore on the 165' sub showed a roll in the footwall below this elevation, which necessitated the driving of a crosscut on the main level under this area. Raises were put up from the main level and development drifting done on the 90', 120' and 145' sub-levels.

The development on the 280', 305' and 330' sub-levels was most encouraging as we were apprehensive that the ore had pinched out above the 280' elevation. We found, however, the ore had rolled back to the South instead of to the North as the general trend had been up to this point. The work done on these three sub-levels was blocking out the ore into pillars in the area to be mined from the new raises put up from the drift on the 6th level between No.1 crosscut and the main tramway.

The development on the 355' and 380' sub-levels showed a very small area of low sulphur ore, enclosed by a shell of high sulphur material similar to the condition on the 4th level. We were not at all surprised at this condition as the raise connecting the 330' sub to the 4th level passed through this high sulphur ore.

At the same time that development of the ore East of No.604 raise was started, two single compartment raises, one a traveling way and the other for handling the dirt, were put up from the first crosscut to the Southwest. These raises were carried up to the 4th level, and had to be completed before any mining around 604 raise could be attempted. No.604 raise was the main traveling road into the stope from the West end.

Eighth Level.

An estimate of ore above the 6th level made early in the year, disclosed the fact that we had only approximately 400,000 tons available, a large tonnage being tied up in supporting pillars. This made it necessary to take immediate steps to develop the ore below the 6th level from the 8th level the next one, 250' below. This level had been abandoned in 1925 as the onlyore cut in the driving of the main drift was very high in sulphur. The track and trolley installation had been taken out and had to be replaced. The timber had to be renewed as it was in very poor condition. Actual drifting was started in April and the main drift pushed ahead 150' when it was temporarily stopped until we could put up a raise and test the ground to the North about 50' above in the vicinity of No.52 diamond drill hole. Two raises were put up a short distance back of the breast, to an elevation of 50' above the level,-130' sub. A drift was driven Northwest from the Easterly raise, striking ore at No.52 D.D.H., which was just at the contact. This drift was pushed ahead about 65' in low sulphur ore to a breast of high sulphur material. We felt this ore was a continuation of the ore lens at the East end of the 6th level and had opened up at this depth. Development drifting was stopped and exploration work started with the deep hole machine as we wanted the information as quickly as possible to guide us in the main level development. The drilling was most discouraging as the samples were not constant as far as the sulphur content, and further, the ground was too hard to finish the holes. A diamond drill is con-

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UNDERGROUND:

b. Development (Continued).
Eighth Level (Continued).

tinuing this exploratory work. We feel that there is some low sulphur ore in this area but whether it can be mined at a profit cannot be decided until we know the tonnage available. We are now unable to tell from the explorations thus far if this ore is a continuation of the body above the 6th level. The sections of the ore body developed above the 6th level, do not show ore at an elevation as low as the -130' sub-level, so any ore proven up at this point will represent an additional tonnage.

c. Stoping.
Sixth Level.

The ore hoisted the past year has practically all been secured from stoping operations and amounted to 146,594 tons, or 88.75%; the balance of 18,571 tons, or 11.25%, coming from development drifts and raises. Three gangs were engaged in stoping the entire year above the 6th level. At times when there was a large accumulation of ore in the stope, a gang was put on drifting or raising in connection with their stoping operations.

The larger part of the tonnage was secured from the stoping in the East lens. Only a small tonnage was available from the main Northwest stope below the 185' sub-level. These two stopes come together on the 165' elevation. As we worked to the East above the 165' sub-level on account of the dip of the rock a great deal of the ore broken hung up until the East stope workings reached this height when the ore broken ran both ways. By the end of the year we had reached the extreme limit of the ore in this stope and had started to mine Southward above the 230' elevation. The operations for the next year will be confined to the ore East of 604 raise.

On the 27th of November, a crack developed across the bench on the 245' sub-level. There are seams of black slate in the ore and the crack occurred along one of these seams of slate. It is only a local condition but we had to take the men out of the stope for abour four weeks. The foot is very flat and it is taking quite a long time to break away. During the time the miners were out of the stope the production fell off materially. We hoisted about half of our normal production, pulling the ore accumulated in the stope. A large quantity of rock was mixed with the ore and this had to be hoisted and dumped on the rock pile. We expect to secure a normal production early in January.

d. Timbering.

The main level drifting where timber is used was limited in 1929. The largest part of the timber consumed was for repair work along the main levels. When the 8th level develppment was started, it was necessary to retimber the entire portion of the drift timbered. A total of 88 sets were renewed. In this work very little lagging and poles were used as wherever possible the old sets were left in place and lining sets put in. On the 6th level and 4th level, the main drifts were repaired during the year.

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UNDERGROUND:

d. Timbering (Continued).

While we used more stull timber in 1929 than 1928, it was smaller size and the price was less. The decrease in feet of lagging and poles used explains the large decrease in cost of timber used between the two years. We did not purchase any stull timber during the winter of 1928-1929.

Statement of Timber Used.

Kind.	Lineal Ft.	Aver. Price Per Ft.	Amount 1929.	Amount 1928.
6" to 8" timber,	2,859	$ .045	$128.65	$79.74
8 to 10 "	3,613	.095	343.23	156.56
10 to 12 "				71.52
12 to 14 "				147.81
14 to 16 "	488	.149	72.71	
Total timber 1929,	6,960	$ .0783	$544.59	
Total timber 1928,	4,892	.0931		$455.63
		Per 100 Ft.		
6' lagging,				693.50
7' "				65.00
Total lagging,				758.50
Poles,	24,000	$1.36	$326.40	485.43
Total lagging and poles 1929,	24,000	1.36	326.40	
Total lagging and poles 1928,	138,000	.901		1243.93
Product,			165,163	180,403
Feet of timber per ton of ore,			.0421	.0271
Feet of lagging per ton of ore,				.5820
Feet of lagging per foot of timber,				.2146
Cost per ton for timber,			.00329	.00252
Cost per ton for lagging,				.00421
Cost per ton for poles,			.00198	.00269
Cost per ton for timber, lagging and poles,			.00527	.00942
Equivalent of stull timber to board measure,			12,122	5,936
Feet of board measure per ton of ore,			.0734	.0329

Cost of timber, lagging and poles 1929 - $ 870.99

Cost of timber, lagging and poles 1928 - 1,699.56

e. Drifting and Raising.

The following is a comparison of drifting and raising done in the years 1928 and 1929:

	Drifting.		Raising.	
Year.	Ore.	Rock.	Ore.	Rock.
1928	6,758	604	2,720	699
1929	6,515	839	1,440	406

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UNDERGROUND:

e. Drifting and Raising (Continued).

Except for approximately 100' done on the 6th level, the entire footage of ore drifting was in development of the upper sub-levels above the 6th level and the -130' sub above the 8th level. We have maintained the same number of contracts on development work throughout the year and there is very little difference in the footage of progress between months. The rock drifting shows an increase over 1928 due to the work done on the 8th level and -130' sub-level. The rock drifting done in the course of the development of the stope above the 6th level has been about the same for both years.

There was a decrease in both ore and rock raising during the past year as the mining had reached a height where the ore broken still reached certain raises in the Northwest stope. The larger portion of the rock raising was in the development of the upper sub-levels in the vicinity of the 4th level.

f. Explosives, Drilling and Blasting.

The powder costs were less for 1929 due to a smaller production and a decrease in cost of explosives. Although we were working in the narrow lens at the East end of the stope our powder costs were not increased. The development drifting for the two years was about the same but the ground during 1929 was generally softer and more easily broken, requiring less powder.

During the latter part of the year we used some gelamite powder, which weighs less per stick than the gelatin powders. This effected a saving as we could use the same number of sticks of gelamite per hole at a lower cost. It worked satisfactorily in the stope and places where the ventilation was good but in the small dog drifts and raises the fumes were too strong. It was not used in the sub-level drifts and raises for this reason.

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UNDERGROUND:

f. Explosives, Drilling and Blasting (Continued).

Statement of Explosives Used.

Ore Development and Stoping.	Quantity.	Average Price.	Amount 1929.	Amount 1928.
40% powder,	127,759	$ .1200	$15331.08	$20474.40
50% powder,				263.13
60% powder,	7,150	.1425	1018.89	1162.50
Gelamite,	2,750	.1325	364.37	
Total powder, lbs.,	137,659	.12142	16714.34	21900.03
Fuse,	348,950	5.599	1953.80	2256.68
Caps,	49,560	11.620	575.88	656.05
Cap crimpers,				14.00
Cap seal,	1 pt.		.60	
Powder bags,	21	1.25	26.25	12.50
Tamping bags,	22,000	2.489	54.77	70.37
Total fuse, caps, etc,			2611.30	3009.60
Total all explosives,			19325.64	24909.63
Production,			165,163	180,403
Pounds powder per ton of ore,			.8335	.9335
Cost per ton for powder,			.1012	.1214
Cost per ton for all explosives,			.1170	.1381

Sinking, Rock Development, Etc.

40% powder,	7,707	.1200	924.84	1124.25
Total powder, lbs.,	7,707	.1200	924.84	1124.25
Fuse,	23,950	5.774	138.29	171.36
Caps,	3,200	11.600	37.12	49.68
Cap crimpers,				1.00
Powder bags,				
Tamping bags,				1.18
Total fuse, etc,			175.41	223.22
Total all explosives,			1100.25	1347.47
Total explosives used in mine,			20425.89	26257.10
Average price per pound for powder,			.1213	.1299

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9. EXPLORATIONS & FUTURE EXPLORATIONS:

b. Underground Explorations.

Early in the year it was realized that the available tonnage above the 6th level was getting so small as to restrict the tonnage that could be broken in the stope. Arrangements were made to open up the 8th level and to start development of the ore below the 6th level. The ore cut in driving the 8th level was all high in sulphur for a distance of 140'. As it ran high in iron, we thought that we had followed close to the footwall, explaining the high sulphur, and that the ore at some distance away would show a lower sulphur content.

A raise was put up from the 8th level, about 25' Southwest of where the high sulphur ore was encountered, to a height of 20' above the level and a drill station cut. The deep hole machine started on May 22nd drilling hole No.102 Southeast. The hole reached a depth of 80' when it encountered gray slate. The entire distance was in high sulphur ore averaging over .300%. Hole No.103 was then drilled in the opposite direction to the Northwest, to a depth of 164'. On account of the hardness of the ground and the fact it was in high sulphur ore, it was stopped. This hole showed 80' of ore averaging 59.09% iron, .266% phosphorus and .125% sulphur. The balance ran around .200% sulphur.

The ore cut by the main drift in an East-West direction was about 140' and that by drill holes Nos.102 and 103 in a North-South direction, including the sub-level drift 266', showing quite a sizeable ore body but all high in sulphur. The upper portion of our main Virgil body in the vicinity of the 4th level is high in sulphur. Using this as the basis of our assumptiom that the top of the ore bodies are high in sulphur, drilling done below this elevation may prove up a low sulphur deposit of substantial size. We expect to put down several diamond drill holes to test out this ground as soon as we finish the exploration work above.

In August after the -130' sub-level had been opened up, drilling to outline the ore at this elevation was undertaken. Five holes, Nos.105 to 109, inclusive, were drilled and a fair size area of low sulphur merchantable ore was developed. Hole No.108 reached a depth of 105'; the analysis averaged 63.16% iron, .282% phosphorus and .034% sulphur. There was difficulty in turning the rods so it was decided to stop the hole and get a diamond drill to finish it.

We felt that the exploration on the -130' sub was encouraging enough to go ahead with development drifting on the level and that this ore reached to the 8th level so the drift would be in ore. The diamond drill was started on October 3rd. Hole No.110 was drilled North from a point 400' East of the Virgil-Sherwood line. This hole was drilled to a depth of 246' to iron carbonate. From 80' to 150' material running over 2% in sulphur was

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EXPLORATIONS & FUTURE EXPLORATIONS:

b. Underground Explorations (Continued).

encountered. Diamond drill hole No.111 was drilled N. 30° W. from a point 10' back of the breast of the drift, to the iron carbonate, at a depth of 406'. It cut seams of ore and ferruginous slate but nothing of merchantable grade.

Diamond drill hole No.108-A was drilled on the -130' sub-level under No.108, which had been stopped in ore. Hole No.108-A was most discouraging as No.108, drilled with the deep hole machine, showed low sulphur ore for a distance of 105', while No.108-A was mixed seams of high sulphurore, the average, however, being about .125%. The drill was then moved to the 6th level and diamond drill hole No.10, which had been put down from the 2nd level of the old Virgil, workings, reamed out. This hole No.10 was struck by one of the crosscuts and drained the water from the old workings. During the winter the water in the old Virgil stope began to rise as this hole became blocked. We hope the opening of this hole will again lower the water level in the old mine.

Additional drilling will be done from the 6th level to test out the ore below this level and outline the footwall for development work above the 8th.

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10. TAXES:

The following tabulation is a comparative statement of taxes paid in Iron County for theyears 1929 and 1928:

Description Iron County.	1929. Valuation.	1929. Taxes.	1928. Valuation.	1928. Taxes.
Iron River Township.				
NE¼ of NW¼ Sec.24,43-35,40 acres,	See note (a)		See note (a)	
SE¼ of NW¼ " 24,43-35,40 "	" " "		" " "	
Spies dwellings,	5,000	153.42	5,000	133.48
Collection fees,		1.53		1.35
Total dwellings,		154.95		135.83
Spies-Virgil (a).				
E½ of NW¼ Sec.24,43-35, Spies)				
SW¼ of NW¼ " 24,43-35, Virgil)	187,000	5737.80	250,000	6724.57
Stockpile,supplies & equipment,	383,000	11751.77	320,000	8606.72
Total,	570,000	17489.57	570,000	15331.29
Collection fees,		174.90		153.31
Total Spies-Virgil Mine,		17664.47		15484.60
(a) Total Iron River Township,	575,000	17819.42	575,000	15620.43
Rate,		3.068		2.6896
Village of Mineral Hills.				
Spies Mine.				
SE¼ of NW¼ Sec.24,43-35,)				
NE¼ of NW¼ " 24,43-35,)	See note (a)		See note (a)	
Dwellings,	5,000	12.30	5,000	15.75
Virgil Mine.				
(a) SW¼ of NW¼ Sec.24,43-35,	187,000	459.94	250,000	787.35
Stockpile supplies - equipment,	383,000	942.06	320,000	1007.81
Total opt. Spies-Virgil,	570,000	1402.00	570,000	1795.16
Total Mineral Hills,	575,000	1414.30	575,000	1810.91
Rate,		2.46		.3150
Total Township and Village,		19233.72		17431.34

(a). The valuation of $570,000 includes both the Spies and Virgil descriptions noted above for the years 1929 and 1928. Not divided by tax appraiser and any division would be arbitrary.

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

Bates Township.				
Erickson Lease SW¼ Sec.21,43-34,	226,000	8346.86	226,000	7697.56
Collection fees,		82.47		76.98
Total Bates Township,		8430.33		7774.54
Rate,		3.694		3.406
Mastodon Township.				
Neely Lease.				
NW¼ of NE¼ Sec.12,43-33,40 acres,)				
NE¼ of NE¼ " 12,42-33,40 ")	137,000	5381.36	137,000	4870.35
NE¼ of NW¼ " 12,42-33,40 "	1,400	62.58	1,400	57.17
Total,	138,400	5443.94	138,400	4927.52
Collection fees,		54.44		49.27
Total Mastodon Township,		5498.38		4976.79
Rate,		3.928		3.555

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TAXES(CONTINUED):

Description Iron County.	1929. Valuation.	1929. Taxes.	1930. Valuation.	1930. Taxes.
Village of Alpha.				
NE¼ of NE¼ Sec.12,42-33,	137,000	2639.99	137,000	2642.04
Collection fees,		26.40		26.42
Total Village of Alpha,		2666.39		2668.46
Rate,		1.947		1.928
Total Township and Village,		8164.77		7645.25

NOTES: The Village of Alpha is situated in Mastodon Township, Mineral Hills is in Iron River Township. The valuations as shown here are the same valuations (either all or in part) as the valuations of the respective townships.

Above taxes paid in August 1929.

11. ACCIDENTS & PERSONAL INJURY:

a. Accidents.

There were four accidents at the Spies-Virgil Mine during 1929 compared with four in 1928, twelve in 1927 and sixteen in 1926. The accidents were more serious than last year, requiring compensation payments in two cases, amounting to $153.20 compared with $14.50 the year previous. A short description follows:

Report No.133.

Name: Erick Huitsala Date: March 5, 1929, 10:45 A. M.
Cause: Was starting to drill a hole and a piece of rock lodged in right eye.
Nature of Injury: Speck deeply imbedded on comea of right eye - ulcer formed on cornea directly below pupil.
Time lost: 6 days. Compensation paid: None.

Report No.134.

Name: Walter White Date: March 12, 1929, 3:45 P. M.
Cause: White was breaking chunks on the grizzly over pocket with chunk breaker. A large piece of ore broke off and rolled over on his foot.
Nature of Injury: Contusion and deep abrasion of little toe right foot.
Time lost: 4 days Compensation paid: None.

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ACCIDENTS & PERSONAL INJURY:

a. Accidents (Continued).

Report No.135.

Name: Ernest Orchard Date: July 30, 1929, 3:30 A. M.
Cause: Orchard and his partner had loaded a car at the chute, a large piece of ore was on top of the loaded car. This piece had to be moved in order for the car to pass the lip of the chute. Orchard and his partner got on top of the car and moved this piece of ore. It was resting on another chunk and moved quicker than they expected and caught Orchard on the foot before he could get out of the way.

Nature of Injury: Severe contusion of great toe, left foot with laceration over, under surface of great toe.

Time Lost: 4 2/3 weeks. Compensation paid, $81.20.

Report No.136.

Name: Wm. White Date: Octover 19, 1929, 11:15 A. M.
Cause: White and partner had bulldozed a piece of ore in the mouth of the chute. They returned a few minutes after blasting and found a piece of ore about 6" in diameter balanced on the edge of the stoppers. White stood on the end of the car, which was in front of the chute and reached up to take the piece of ore down. Just as he reached up another piece fell and caught the tip of his finger.

Nature of Injury: Compound fracture of first joint of index finger on right hand.
Time lost: 4 weeks. Compensation paid, $72.00.

b. Safety Work.

Regular training was given once a month throughout the year to First Aid and Helmet crews. The second helmet crew started training in the fall.

12. NEW CONSTRUCTION & PROPOSED NEW CONSTRUCTION:

A new community garage is being built at the location. The houses are not provided with garages and the tenants have erected unsightly sheds to house their cars. It is being built out of the lumber salvaged from the compressor building at the Republic Water Power Plant. The garage will have 14 stalls, one for each of the twelve tenants, one for the mine truck and one for a visiting car. The building will be gunited both inside and outside to make it as fireproof as possible.

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13. EQUIPMENT & PROPOSED EQUIPIENT:

There was no new equipment installed during the year.

14. MAINTENANCE & REPAIRS:

a. Shafts.

1. Spies Shaft.

The iron rungs of the ladders, in the old part of the shaft from ledge to the 3rd level, were eaten away by the acid water and had to be replaced with wood rung ladders. The casing plank between the skip and cage road from the 1st level to the 3rd level was renailed with Monel nails. Ordinary nails are eaten away in a short time, while the Monel metal nails and lag screws are acid resisting. We tested out a zinc covered nail and they were eaten away in three weeks, while the Monel ones showed no change.

The small drain pipes in the shaft were renewed from 1st level down to the 8th level. The pipes were examined several times during the year and the pipe hangers renewed where eaten away. An examination of the electric cable was also made and 36 new clamps put on.

Early in January we had trouble with ice accumulating in the skip compartment just below ledge. Doors were built so this compartment of the shaft could be covered between shifts, which changed the circulation and allowed the ice to melt.

b. Hoisting Equipment.

A new skip sheave was installed in April. This is a steel lined sheave and should give longer service than the cast iron one replaced. The rim of this sheave was broken by over-hoisting on August 18th. A patch was put on and it is giving satisfactory service again.

The cage rope was changed end for end on May 19th, after being in service eleven months. It began to show signs of breaking down toward the end of the year and we expect to put on a new rope early in January.

The skip was changed on April 19th and again on August 27th and a new rope put on October 31st, after eleven months of service. The rope taken off was plow steel but did not give any better wear than the crucible cast steel rope previously used, so we are again using the crucible cast steel ropes.

c. Pumps.

The crank shaft on Prescott pump No.209 broke on January 8th. Last year when the crank shaft broke on the other pump, the Prescott Company furnished us with two forged crank shafts made of special steel. We, therefore, had an extra one on hand, which was installed immediately, causing us no inconvenience or delay. During last year the crank shaft on the Dean pump, which is located in the 3rd level pump house, broke

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MAINTENANCE & REPAIRS:

c. Pumps(Continued).

and while a new one was received as we had a spare pump in this pump house, it was not installed until we could completely overhaul it. This was done in February.

The motor generator set was moved from the 8th level pump house to the power house in January. During the time it was underground, it was necessary to keep the pumpman on duty in the 8th level pump house during the operating hours of the mine in case the circuit breaker went out so there would be no delay to the tramming system. For this reason the water from the 3rd level was siphoned to the 8th level sump. After this change the pump man could move from one pump house to the other, and we showed a saving in electric power by operating the 3rd level pump of approximately $50 per month.

The centrifugal pump from the 8th level pump house was dismantled and stored on surface. This work was done by our shovel crew when not loading. This pumpx was installed during 1927 when we were continually breaking crank shafts on the Prescott pumps. It was never connected up or used.

The Aldrich triplex pump that was in the 3rd level pump house was dismantled and sent to the Morris-Lloyd Mine. This pump was loaned to the Spies-Virgil Mine when the shaft was being sunk below the 3rd level Spies.

17. CONDITION OF PREMISES:

The mine and location premises were cleaned up of the winter's accumulation of rubbish early in April. At the mine, all,material was kept neatly piled, and the grass plots around the buildings kept trimmed up. These plots were protected by large stones painted white which gave a neat appearance to the place. The mine team cleaned up the alley behind the location houses several times during the summer.

18. NATIONALITY OF EMPLOYES:

	1929.		1928.	
	No. Men.	%.	No. Men.	%.
American,	6	.070	7	.077
English,	25	.291	26.	.286
Croation,	1	.012	1	.011
Dane,	2	.023	1	.011
French,	7	.081	8	.088
Swede,	7	.081	7	.077
German,	3	.035	4	.044
Finn,	17	.198	22	.241
Polish,	10	.116	8	.088
Italian,	6	.070	4	.044
Irish,	.2	.023	3	.033
Total,	86	100%	91	100%

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8. COST OF OPERATING:

a. Comparative Mining Costs.

	1929.	1928.	Increase.	Decrease.
Production.				
Ore produced, - - - - -	165,163	180,403		15,240
Average daily product, - -	547	594		47
Tons per man per day, - -	6.35	6.56		.21
No. days operating, - - -	302	303½		1½
No. shifts and hours, - -	2 - 8	2 - 8		
Budget-estimated production,	180,000	180,000		
Budget-estimated cost at mine,	1.709	1.819		.11
Costs.				
Underground costs, - - -	.969	.966	.003	
Surface costs, - - - - -	.186	.225		.039
General mine accounts, - -	.103	.088	.015	
Cost of production, - - -	1.258	1.279		.021
Cost of loading & shipping, -	.037	.004	.033	
Cost at mine per cost sheet,	1.295	1.283	.012	
Depreciation:				
Plant and equipment, - -	.038	.219		.181
Development, - - - -	.219		.219	
Movable equipment, - - -	.006	.007		.001
Taxes, - - - - - - -	.115	.096	.019	
Central office, - - - -	.075	.083		.008
Welfare, safety, hospital, etc,	.015	.013	.002	
Supply inventory, - - -	.000	.001		.001
Total cost at mine, - - -	1.763	1.702	.061	
Expenses Beyond Mine.				
Royalty, - - - - - -	.407	.407		
Rail freight, - - - -	.820	.820		
Lake freight, - - - -	.655	.655		
Cargo, insurance & analysis,	.010	.010		
Shrinkage, - - - - -	.030	.029	.001	
Total cost lower lake ports,	3.685	3.623	.062	

b. Detailed Cost Comparison.

(1). Days and Shifts.

The mine operated on the same schedule: 2 - 8 hour shifts, six days per week, both in 1929 and 1928. We operated one and half less days in 1929 on account of accidents to equipment requiring shut downs.

(2). Production.

We show a decrease in production of 15,240 tons for 1929. Half of this tonnage decrease occurred in December when we were forced to take the miners out of the stope on account of the crack developing on the bench on the 245' sub-level. Further, there was a falling off from the normal 15,000 tons per month from September due to unfavorable conditions in the stope.

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COST OF OPERATING:

b. Detailed Cost Comparison (Continued).

(3). Cost of Production.

Even with a smaller production we showed a decrease of $.021 in cost, which is in the Surface items, Stocking ore and Docks, Trestles and Pockets. These were partly offset by General account, Analysis. On account of large tonnage loaded from stockpile in 1929 compared with 1928, the loading and shipping expense increased $.033, making the total cost at the mine, $1.293 compared with $1.283, an increase of $.010.

(4). Underground Costs.

Exploring in Mine.		Amount.	Per Ton.
Year 1928,	-	$1801.65	$ .010
1929,	-	3282.54	.020
Increase for 1929,		$1480.89	$ .010

During 1928 we only operated the deep hole machine for 3½ months compared with 7½ months 1929. The footage drilled in 1929 was 665' with the deep hole machine at $2.15 per foot and 935' with the diamond drill at $2.00 per foot, a total of 1600' at an average cost per foot of $2.052, compared with 1928 of 638' at $2.82.

Development in Rock.		Amount.	Per Ton.
Year 1928,	-	$7363.14	$.041
1929,	-	6572.56	.040
Decrease for 1929,		$ 790.58	$.001

The total footage of rock drifting and raising was 1245' for both 1929 and 1928. The decrease in cost in explained by the softer character of the material.

Development in Ore.		Amount.	Per Ton.
Year 1928,	-	$21440.86	$.119
1929,	-	39604.69	.240
Increase for 1929,		$18163.83	$.121

While there was less development drifting and raising in ore for 1929, the costs show a decided increase. This is due to an error in charging considerable ore development during 1928 to stoping.

Stoping.		Amount.	Per Ton.
Year 1928,	-	$67550.98	$.374
1929,	-	39016.47	.236
Decrease for 1929,		$28534.51	$.138

There was a decrease in both labor and supplies charged to this account in 1929, due to lessgangs employed stoping and decrease in tonnage broken. The large decrease in total money for 1929 is explained by charging a considerable proportion of the ore development expense for 1928 to stoping in error. The 1929 charges show the true cost of stoping.

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COST OF OPERATING:

b. Detailed Cost Comparison (Continued).

(4). Underground Costs (Continued).

Timbering.

		Amount.	Per Ton.
Year 1928,	-	$12047.72	$.067
1929,	-	8401.54	.051
Decrease for 1929,		$ 3646.18	$.016

Due to a decrease in main level development only a few chutes were built during 1929 compared to the previousyear. The timber used was only about half that consumed in 1928.

Tramming.

		Amount.	Per Ton.
Year 1928,	-	$18699.30	$.104
1929,	-	18360.70	.111
Increase for 1929,			.007
Decrease for 1929,		$ 338.60	

The decrease is due to less current used in tramming the smaller tonnage. The decrease in cost was not proportional to the tonnage trammed as the labor was practically the same, showing a slight increase in cost per ton.

Pumping.

		Amount.	Per Ton.
Year 1928,	-	$9256.18	$.051
1929,	-	8635.04	.052
Increase for 1929,			.001
Decrease for 1929,		$ 621.14	

The decrease in cost of pumping for 1929 is entirely in the current charge as an adjustment in rate was made with the Power Company based on the maximum demand meter being near enough to take the next lower rate per K.W.H.

Compressors and Air Pipes.

		Amount.	Per Ton.
Year 1928,	-	$21214.08	$.118
1929,	-	19226.62	.116
Decrease for 1929,		$1987.46	.002

The decrease in cost of operating the compressor for 1929 is entirely in the current charge as exaplained under Pumping.

Underground Superintendence.

		Amount.	Per Ton.
Year 1928,	-	$6284.34	$.035
1929,	-	6486.70	.039
Increase for 1929,		$ 201.36	.004

This small increase is due to more overtime by the bosses.

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COST OF OPERATING:

b. Detailed Cost Comparison (Continued).

(4). Underground Costs(Continued).

Maintenance Accounts.

Compressors & Power Drills.

		Amount.	Per Ton.
Year 1928,	-	$ 20.73	$.000
1929,	-	1594.13	.010
Increase for 1929,		$1573.40	.010

This large increase against this account is for six new S.49 drills and three J. C. mountings purchased during the year at a cost of $1336.00 and for repairs to compressor exciter which burnt out.

Electric Tram Equipment.

		Amount.	Per Ton.
Year 1928,	-	$7227.45	$.040
1929,	-	7452.37	.045
Increase for 1929,		$ 229.92	.005
		to	

The largest part of this charge is for repairs underground cars. During the year tie plates were installed along the main 6th level track explaining the increase cost for 1929 over 1928.

Pumping Machinery.

		Amount.	Per Ton.
Year 1928,	-	$1313.19	$.007
1929,	-	1463.91	.009
Increase for 1929,		$ 150.72	.002

A crank shaft was broken each year on one of the Prescott pumps. During 1928 the discharge line was covered with rubberoid roofing to protect it from the action of the acid water, while in 1929, repairs were made to the Dean pump on the 3rd level and No.10 D. D. hole reamed out to drain the water from the old Virgil workings.

(5). Surface Costs.

Hoisting.

		Amount.	Per Ton.
Year 1928,	-	$8837.25	$.049
1929,	-	8198.10	.050
Increase for 1929,			.001
Decrease for 1929,		$ 639.15	

The smaller tonnage handled explains the decrease for 1929 which is mostly in the current charge.

Stocking Ore.

		Amount.	Per Ton.
Year 1928,	-	$7776.54	$.043
1929,	-	4319.26	.026
Decrease for 1929,		$3457.28	.017

A largertonnage was placed on stockpile during 1928 than 1929 and under more unfavorable conditions explaining this large decrease against this. account.

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COST OF OPERATING:

b. Detailed Cost Comparison (Continued).

(5). Surface Costs (Continued).

Crushing & Screening at Mine.

		Amount.	Per Ton.
Year 1928,	-	$2945.68	$.016
1929,	-	2929.64	.018
Increase for 1929,			.002
Decrease for 1929,		$ 16.04	

The small decrease is explained by the 1½ days less operation in 1929 compared with 1928. The labor and supplies vary little with production.

Dry House.

		Amount.	Per Ton.
Year 1928,	-	$2998.79	$.017
1929,	-	3101.06	.019
Increase for 1929,		$ 102.27	.002

More repairs made to Heating Boiler during 1929 than previous year.

General Surface.

		Amount.	Per Ton.
Year 1928,	-	$2503.77	$.014
1929,	-	2897.35	.018
Increase for 1929,		$ 393.58	.004

Additional labor was employed for a short time improving the road from the location to the mine which explains this increasein 1929.

Maintenance Accounts.
Hoisting Equipment.

		Amount.	Per Ton.
Year 1928,	-	$3799.93	$.021
1929,	-	3030.18	.018
Increase for 1929,			.003
Decrease for 1929,		$ 769.75	

A new hoisting rope was put on both the skip and cage during 1929 compared with only one on the skip in 1928. Further, a new 8' head sheave was installed during the year explaining this increase.

Shaft.

		Amount.	Per Ton.
Year 1928,	-	$1371.82	$.008
1929,	-	879.69	.005
Decrease for1929,		$ 492.13	.003

Only minor repairs were made during the year, such as renailing the casing plank between cage and skip ways with monel nails.

Top Tram Equipment.

		Amount.	Per Ton.
Year 1928,	-	$2577.13	$.014
1929,	-	1585.64	.010
Decrease for 1929,		$ 991.49	.004

There was a decrease in repairs to the Larry cars during 1929 on account of better stocking conditions and also the smaller tonnage stockpiled. During 1928 when the Larry cars were first installed adjustments were made, the original wheels replaced with crome-nickel and one motor burnt out.

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COST OF OPERATING:

b. Detailed Cost Comparison (Continued).

(5). Surface Costs (Continued).

Docks, Trestles and Pockets.

	Amount.	Per Ton.
Year 1928, -	$6629.97	$.037
1929, -	2471.07	.015
Decrease for1929,	$4158.90	.022

This large decrease is explained by the heavy expenditure made in 1928 preparing the new stocking ground north of the Coal Dock approach, laying sollar plank and original cost of portable trestles. In 1929 the permanent trestle leading off the shaft house was rebuilt.

Mine Buildings.

	Amount.	Per Ton.
Year 1928, -	$1096.98	$.006
1929, -	1210.75	.007
Increase for 1929,	$ 113.77	.001

The general repairs on the mine buildings were slightly less for 1929 than 1928. The increase is due to the labor expense of tearing down the water power compressor building at Republic amounting to $272.20.

(6). General Mine Accounts.

Insurance.

	Amount.	Per Ton.
Year 1928, -	$153.91	$.001
1929, -	232.02	.001
Increase for 1929,	$ 78.11	.000

The insurance charge was increased about $6.50 per month in 1929.

Engineering.

	Amount.	Per Ton.
Year 1928, -	$2298.35	$.013
1929, -	1711.99	.010
Decrease for 1929,	$ 586.36	.003

Due to less main level development, less time was required of the engineers giving lines and making surveys.

Analyses.

	Amount.	Per Ton.
Year 1928, -	$ 897.54	$.005
1929, *	2266.39	.014
Increase for 1929,	$1368.85	.009

The increase in cost of analysis is due to the large tonnage shipped in 1929 compared to 1928. Further, there was an increase in Laboratory charge during the winter months to a minimum of $75 per month.

Personal Injury Expense.

	Amount.	Per Ton.
Year 1928, -	$2845.23	$.016
1929, -	2733.24	.017
Increase for 1929,		.001
Decrease for 1929,	$ 111.99	

Although we only paid $153.20 compensation during 1929, the charge to this account is on a pay roll basis of 2% of the total labor.

SPIES-VIRGIL MINE
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COST OF OPERATING:

b. Detailed Cost Comparison (Continued).

(6). General Mine Accounts (Continued).

Safety Department Expense.

		Amount.	Per Ton.
Year 1928,	-	$158.04	$.001
1929,	-	973.89	.006
Increase for 1929,		$815.85	.005

While more first aid and helmet practices were held in 1929, the large increase is due to the charge of $699.64, the Spies-Virgil's proportion of the cost of The Labor Day Picnic.

Telephone & Safety Devices.

		Amount.	Per Ton.
Year 1928,	-	$1095.80	$.006
1929,	-	1208.20	.007
Increase for 1929,		$ 112.40	.001

Small increase.

Local General Welfare.

		Amount.	Per Ton.
Year 1928,	-	$273.97	$.001
1929,	-	206.08	.001
Decrease for 1929,		$ 67.89	.000

This charge is for the Spies-Virgil proportion of Visiting Nurse and Iron River District ambulance, which is made on a pay roll basis of the different mines interested.

Special Expenses.

		Amount.	Per Ton.
Year 1928,	-	$585.40	$.003
1929,	-	1086.43	.007
Increase for 1929,		$ 501.03	.004

In addition to the usual charges to this account, which includes The Cleveland-Cliffs Iron Company's proportion of the Iron County Tax Payers Association and the monthly charge of $32.50 for fire protection by the Village of Mineral Hills, it also covers the cost of fighting a fire in the rock pile during 1929.

Mine Office.

		Amount.	Per Ton.
Year 1928,	-	$7597.90	$.042
1929,	-	1658.31	.040
Decrease for 1929,		$ 939.59	.002

Due to the Superintendent assuming additional duties in August 1929, a small proportion of his time was charged to the Spies-Virgil Mine after that date, explaining the decrease against Mine Office expense.

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1. GENERAL:

Aside from the open pit operations, conducted by A. Guthrie Company, no mining activities were undertaken until early in October, when it was decided to clean out and repair the underground workings, preparatory to resuming mining in the underground West deposit. With the exception of some minor repair work and a small amount of clean-up to keep the drainage drifts and sump in shape, no underground work had been undertaken at the Wade Mine since the property was closed on May 28, 1921.

The A. Guthrie Company removed all of the open pit ore, under their contract, with the exception of some very low grade material in the Southeast corner of the pit and a shell of ore from ten to fifteen feet in thickness along a portion of the East side of the pit, which was left as a support and will be scrammed in connection with the underground operations.

Some cleaning was done about the mine premises and several of the buildings put in shape for service during the fall of 1929.

Pumping conditions were normal throughout the year and only the customary shut-downs were made for cleaning and minor repairs. It was possible to pump out most of the mud which had accumulated in the main level drifts. The sand and clay was agitated by a stream of water under pressure and by keeping the ditches open the soupy material was handled to advantage by the centrifugal pumps.

2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production by Grades:

Wade Open Pit, ----------	160,066	tons.
Wade-Oliver Trespass (To satisfy Oliver Trespass)----	385	"
Wade-Helmer Trespass (To satisfy Helmer Trespass)----	2,144	"
Total, ----------	162,595	"

b. Shipments:

All ore produced during the year was shipped.

c. Stockpile Inventories:

There was no ore in stockpile at the Wade Mine at the end of the year.

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2. PRODUCTION, SHIPMENTS & INVENTORIES:

e. Production by Months:

MONTH	CLEVELAND-CLIFFS IRON COMPANY	WADE-OLIVER TRESPASS	WADE-HELMER TRESPASS	TOTAL
May, ---------	27,907	-	-	27,907
June, --------	44,206	-	-	44,206
July, --------	44,524	-	2,144	46,668
August, ------	14,573	-	-	14,573
September, ---	18,364	-	-	18,364
October, -----	10,492	385	-	10,877
Total, ------	160,066	385	2,144	162,595

f. Ore Statement:

	1929	1928
On hand Jan. 1, 1929, -----	-	219
Output for Year, ----------	162,595	307,011
Total, ------------------	162,595	307,230
Shipments, ----------------	162,595	307,230
Balance on hand, --------	-	-

g. Delays:

There were no serious delays account of car service during the year. The A. Guthrie Company turned in the following delays:

Hours	Min.	Cause
7	-	Skip off track.
16	-	Wet weather - trucks not operating.
10	-	Broken sheave, steam shovel.
1	30	Broken hoisting cable
-	30	Broken valve.

3. ANALYSIS:

a. Average Analysis on Output:

Open Pit Ore:

	Tons	Iron	Phos.	Sil.	Mang.	Alum.	Moist.	Fe.Nat.
C.C.I.Co. -----	160,066	55.20	.065	11.32	.94	2.00	13.34	47.84
OIMCo.Trespass-	385	54.98	.059	13.50	.81	2.07	12.51	48.10
Helmer Trespass	2,144	56.26	.079	9.15	.96	2.08	14.19	48.28
Helmer, -------	16,472	58.53	.071	8.28	.88	1.83	12.12	51.44

b. Average Analysis on Cargoes:

	----Mine Analysis----			--Lake Erie Analysis--		
Grade	Iron	Moist.	Fe.Nat.	Iron	Moist.	Fe.Nat.
Wadena, D.M.&.N.	57.66	14.58	49.25	57.46	13.79	49.54
Clarke, G.N.	56.18	15.16	47.66	55.93	14.26	47.95
Clarke, D.M.&.N.	57.35	14.30	49.15	57.25	14.52	48.94
Clarke Special DM&N	57.98	14.67	49.47	57.25	14.80	48.78

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3. ANALYSIS:
(Continued)

The following table shows the tonnage of outside ores going into mixtures with Wade ore during the season of 1929:

	Tons	Iron	Phos.	Sil.	Mang.	Alum.	Moist.	Fe.Nat.
Helmer Open Pit Dohm Bldg.Co.	18,616	58.25	.072	8.40	.89	1.87	12.36	51.05
Wacootah O.P. Pitt I.M.Co.	201,870	57.86	.055	6.28	.65	4.35	16.46	48.33
Wilpen - Shenango F.Co.	7,580	57.71	.064	7.41	1.28	2.55	12.88	50.27
Group Three - O.I.M.Co.	77,691	59.31	.077	5.40	1.13	2.94	13.62	51.23

The following table shows the tonnage of Wade and other ores going into mixed cargoes during the past season:

	CLARKE	CLARKE SPECIAL	WADENA
Wade Pit ----------	84,382	8,889	66,794
Wacootah ----------	103,381	24,303	74,187
Wilpen ----------	1,170	6,410	-
Helmer ----------	15,684	564	2,368
Group Three --------	23,033	20,905	33,753
Total ----------	227,650	61,071	177,102

d. Composite Analysis by Lerch Bros. of Season's Shipments:

	Iron	Phos.	Mang.	Silica	Alum.	Lime	Mag.	Sul.	Loss.
Wade, ---	55.85	.065	.91	10.76	1.95	.54	.36	.014	5.20
Helmer, -	58.13	.071	.89	8.17	1.90	.47	.38	.016	4.63

A test cargo of Dean ore was shipped during the season from the Dean Mine. The ore being dried in the Lamberton drier and shipped from the Great Northern dock mixed with O.I.M.Co. Group Three ore as shown herewith:

	-----Mine Analysis-----			--Lake Erie Analysis--		
Grade	Iron	Moist.	Fe.Nat.	Iron	Moist.	Fe.Nat.
Dean Special,	57.05	11.07	50.73	55.26	11.26	49.93

The following are the tonnages comprising the Dean Special Ore:

Dean,	578	tons.
Group Three,	2,198	"
Total ----	2,776	"

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4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:

Assumption: 13 cu. ft. equals one ton
10% deduction for cock
10% deduction for loss in underground mining:

Open Pit Ore, ----------	---	
Underground Ore, West Deposit, ----------	804,000	tons
Total Developed Ore, ----------	804,000	"

b. Undeveloped Ore:

East Deposit, Underground Ore, ----------	1,515,000	"
Deacon Bessemer, Underground Ore, ----------	80,000	"
Deacon Non-Bessemer, Underground Ore, ----------	95,000	"
Total Undeveloped Ore, ----------	1,690,000	"
GRAND TOTAL, AIL ORE, ----------	2,494,000	"

In the report for 1928 the estimated open pit tonnage was given as 178,000. The shipments of 162,595 tons was realized - the difference in the tonnages was the result of our not being able to remove all of the shell of ore at the East end of the pit and some second-grade ore in the Southeast corner of the pit. This unmined tonnage of open pit ore will be scrammed in connection with the underground operations, but it is not included in our estimated figures of January 1, 1930, as it is a question as to how much of this ore can be mined safely.

No exploratory work will be undertaken during 1930, but further development of the underground workings in the West deposit during the year may disclose some additional ore.

c. Estimated Analysis:

Dried 212°	Tons	Iron	Phos.	Mn.	Sil.	Moist.
Underground - West Deposit,	804,000	57.50	.074	1.45	7.49	12.50
" - East Deposit,	1,515,000	56.91	.075	1.83	7.44	13.50
" - Deacon Bess.	80,000	56.65	.045	1.16	8.04	12.50
" - " Non-Bess.	95,000	55.77	.053	.42	8.43	12.50
Total, ----------	2,494,000	56.92	.072	1.60	7.73	13.11

5. LABOR & WAGES:

a. Comments:

The A. Guthrie Company had no difficulty in securing ample labor for their 1929 operations. The contractor's scale of wages was based on 35¢ per hour for common labor. This wage schedule compares with 42¢ per hour for common labor paid by the several mining companies operating on the Mesaba Range.

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5. LABOR & WAGES:
(Continued)

b. Comparative Statement of Wages & Product:

	1929	1928	Increase	Decrease
PRODUCT, ----------	160,066 (Loaded by Contract)	298,137		138,071
AVG. NO. MEN WORKING:				
Surface, ----------	21	4	17	
Underground, ----------	24	4	20	
Total, ----------	45	8	37	-
AVG. WAGES PER DAY:				
Surface, ----------	5.01	5,49		.48
Underground, ----------	5.26	5.13	.13	
Total, ----------	5.15	5.29	-	.14
WAGES PER MONTH OF 25 DAYS:				
Surface,----------	125.25	137.25	-	12.00
Underground, ----------	131.50	128.25	3.25	
Total, ----------	128.75	132.25		3.50
TOTAL NO.OF DAYS WORKED:				
Surface, ----------	1981	770¼	1210¾	
Underground, ----------	2618½	921¼	1697	
Total, ----------	4599½	1691½	2907¾	
AMOUNT FOR LABOR:				
Surface, ----------	9,927.42	4,233.38	5,694.04	
Underground, ----------	13,776.96	4,729.04	9,047.92	
Total, ----------	23,704.38	8,962.42	14,741.96	

6. SURFACE:

a. Buildings; Repairs:

Very little repair work was done on the location and mine buildings during the year 1929. Some clapboarding was nailed down, several of the chimneys repaired and when it was decided to re-open the underground workings, the office, power house, shops and dry were thoroughly cleaned and the interior of the office was kalsomined.

b. Stockpiles:

A stockpile trestle for handling the ore to be hoisted from underground to the opening of navigation in 1930, was erected during the latter part of October and the fore part of November. The stocking equipment was put in shape for service and as soon as the development work for scraper operations is completed, stocking will be started. This will be about the middle of January, when the mine goes on an operating basis.

c. Tracks, Roads, Transmission Lines, etc:

The A. Guthrie Company did some work during the summer on the tracks and roads in connection with their operations. The Cleveland-Cliffs Iron Company were put to no expense during the year in connection with these items.

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7. OPEN PIT:

It was necessary to operate the Aldrich Triplex pump from 16 to 18 hours out of each 24, during the past season in order to take care of the Wade Mine drainage. Until underground work was started in October, the pumping was on account of open pit mining. The open pit operations were conducted very largely in the pit bottom during the past year and the water had to be kept drained. It was not possible to form dams in the pit to hold back the surface wash and as a result, quite a little surface material was carried into the underground drifts at times of heavy rains.

The A. Guthrie Company started ore loading in the pit on May 8th and had completed their contract and removed all of their equipment from the pit prior to November 1st.

The contractor handled 4,336 yards of stripping and 22,499 yards of taconite during the season of 1929.

In addition to the mining operations in the pit, the contractor loaded and placed in stockpile 300 tons of taconite, running 38.13% Iron and 36.11% Silica. This makes the total tonnage of taconite in stock January 1, 1930, as follows:

Tons	Iron	Silica
17,630	38.12	24.79

The first ore mined was from the deep channel and while we had considered this as No. 1 grade, the water and frost conditions were so bad that we were unable to separate out the better ore, with the result that it was shipped as No. 2 grade. When the channel ore had been removed, operations were conducted along the South side of the pit with the loading track squeezed up against the Oliver boundary. In finishing the operation at the South side of the pit, the track grade along the Oliver line was dug out, the contractor's 300 shovel digging the bench and loading cars ahead. This was all No. 2 ore and it was necessary to cast some taconite into the cleaned out channel during the progress of this operation.

The ore along the South side of the pit had all been loaded out by the middle of June and the contractor's 300 shovel then started loading out the lower track bench. By the end of June the shovel had progressed to a point opposite the underground drainage ditch. Approximately 11,000 cubic yards of taconite was handled by the contractor in mining out the No. 2 ore at the South side of the pit and the lower track bench to the drainage ditch.

The shovel continued digging Northward and had removed all of the lower track bench by July 20th. The shovel then started on the upper bench at the Northeast corner of the pit, taking all ore to the underground caves. The Helmer Mine operations had been completed by the middle of July and the upper track bench could be attacked, which destroyed the connection to the pit bottom and the Helmer Mine.

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7. OPEN PIT:

In attempting to dig the shallow pillar of ore along the underground caves, quite a quantity of sand and gravel material ran out into the pit and it was necessary to cast this behind the shovel upon the bottom rock where the ore had all been removed. As the shovel progressed Southward it was necessary to build up a footing in the bottom of the pit for the shovel to operate on and loading ore into the railway cars, 45 feet above. The track grade was approximately 4% and it was necessary to carry the shovel footing on this same grade. The narrow shell of ore did not afford sufficient material for this footing and it was not possible to mine out the Southeast corner of ore and load it directly into railway cars with the 300 shovel. It was finally decided to cast the shell of ore and the material in the Southeast corner back into the pit; to then dismantle the shovel, and handle this ore on the incline hoist. A small revolving shovel was used to load the ore into trucks which transported it to the incline pocket where it was hoisted and dumped into railway cars. The contractor handled this job, but an extra allowance was made per ton as the contract called for the removal of the ore by open pit methods. The ore had been cast by the end of August and the big shovel was dismantled and taken from the pit in September.

The A. Guthrie Company repaired the incline and pocket and loaded out the cast ore during the months of September and October, using a small gasoline shovel and three trucks on this work. The A. Guthrie Company completed their contract and removed all equipment from the pit prior to November 1st.

Two trespasses were settled before the season ended, one with the Oliver Company and the other with the Helmer.

The pit was left in good shape by the contractor and such ore as remains in the Southeast corner and along the East rim will be scrammed in connection with underground operations so far as it is safe to conduct this operation.

The fee owners were entirely satisfied with the open pit mining clean up.

7. UNDERGROUND:

Cleaning operations on the main level, which were started early in October, were continued throughout November and December. All of the mud that had been washed in was removed and considerable progress had been made in repairing the main haulage-ways and the crosscuts by the end of the year. A number of caves had occurred on the main level, mostly at the raises and the surface material had run out into the drifts. All of the crosscuts were repaired, as well as the main haulage-way to the open pit and a crib raise was put up for handling the drainage water from the pit.

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7. UNDERGROUND:

It is the intention to mine the Wade ore with scrapers and development work was carried well along by the first of the year with this end in view. Instead of putting up additional raises in the crosscuts and tramming the ore through these crosscuts, it was decided advisable to drive two drifts, one to the North and one to the South of the main haulage-way; to put up raises in these drifts at intervals of 35 foot centers and to operate approximately eighteen contracts with scrapers. It is anticipated that we will be able to produce approximately 1,000 tons per gang, operating day shifts only, which would mean 18,000 tons per month. It will be several months before we are able to obtain this result.

Props will be placed in the crosscuts and especial care taken to hold the ground at the switches leading in to the crosscuts. On account of the weight which will probably develop in the center of the ore body, on account of the horse of taconite which runs in an East-Westerly direction, the ore will be mined down over the main haulage-way somewhat ahead of the sides. It will be necessary to maintain the main haulage-way as a drainage drift and the question of keeping this drift open will be given very careful attention.

The system of mining has been gone over very carefully with the Great Northern engineers and the program adopted meets with their approval.

A considerable quantity of timber supplies were received during the latter part of the year and a new timber shaft will be put in commission for the handling of material to the working places without the necessity of handling it through the main shaft and on the tramming level. This timber shaft will be placed South of the underground workings and will not be effected by caving operations. A very satisfactory timber yard is afforded along the present Great Northern tracks.

Statement of Timber used:

	LINEAR FEET FEET	AVG. PRICE PER FOOT.	AMOUNT
7" to 9" Timber, ----------	810	.07	56.70
8" to 10" " ----------	2,216	.09	199.44
9" to 12" " ----------	1,280	.115	147.20
10" to 12" " ----------	18,339	.142	2,608.62
Poles, ----------	17,200	.02	344.00
Lagging, ----------	10 Cds.	8.50	85.00

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8. COST OF OPERATION:

a. Comparative Mining Costs:

	1929	1928	Increase	Decrease
PRODUCT:.	160,066	298,137		138,071
Budget, Estimated Production	178,000	350,000		172,000
Budget, " Cost at Mine	1.564	1.283	.281	
COST:				
Cost at Mine as per Cost Sheet	.829	.625	.204	
Depreciation - Plant & Equipt.	.127	.357		.230
Development,	.132	-	.132	
Taxes,	.215	.126	.089	
Central Office,	.037	.004	.033	
Welfare, Safety, Hospital, etc.	.008	.001	.007	
Stripping,	.653	.313	.340	
Winter Expense,	.053	.051	.002	
Total Cost at Mine,	2.054	1.477	.577	

The production for 1929 was 138,071 tons less than for the previous year, which effected the fixed charges very decidedly.

The ore mined each year was handled by the A. Guthrie Company under contract, the increase of $.204 per ton in 1929 being due to the adjustment with the contractor for handling the clean-up ore operation in the pit on the incline and to the fact that the amount of taconite removed in connection with the ore operations was considerably greater than in 1928.

The items - "Pumping & Drainage" increase of $.018 - "General Pit Expense" increase of $.003; "Open Pit Superintendence" increase of $.004 and "Mine Office" increase of $.004 are all the result of the large decrease in the 1929 production as compared with that for 1928.

Under "Depreciation" a charge of $.357 per ton was made under Plant and Equipment for 1928, whereas the charge was $.127 for Plant & Equipment and $.132 for "Development" in 1929. These depreciation accounts were handled in Cleveland with the idea of charging off as much of the old accounts as seemed feasible.

Under "Taxes", there was an increase of $.089 per ton in 1929, as compared with the previous year. This was due to the greatly reduced output in 1929. There was a reduction in the taxes paid but the production was so much less that it more than offset this. The increase of $.033 to "Central Office" was due to a decision to charge off a definite amount against Central Office and spread it proportionately to the Mesaba Range operations. Only a very nominal charge was made against the Wade Mine in 1928 for Central Office.

The 1929 increase of $.007 - "Welfare, Safety, Etc.", as compared with 1928 - is the result of charges from the Ishpeming office made by the Pension Department. The charges in 1929 were quite a little higher and the output of the Wade Mine much smaller.

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8. COST OF OPERATION
(Continued)

Under "Stripping" there was an increase in the 1929 cost per ton of $.340. This large increase was the result of charging off the unamortized stripping account against the output for 1929. The amount used in amortizing the stripping account during 1927 and 1928 was not sufficient to cover all old charges to the stripping and this had to be adjusted in 1929, as all of the open pit ore was mined and the balance remaining in the stripping account had to be entirely charged off.

10. TAXES:

Tax Statement:

	1929	1928	Increase	Decrease
Wade Mine, ---------	$ 33,546.70	$ 36,741.44		$3,194.74
Personal Property, -	871.96	936.56		64.60
Total, ----------	$ 34,418.66	$ 37,678.00		$3,259.34

13. EQUIPMENT & PROPOSED EQUIPMENT:

The only new surface equipment purchased in 1929 was a one-ton Dodge truck. This truck handles the timber and lagging, as well as general supplies at the mine.

Twelve "Tugger" hoists were purchased in connection with the underground scraping operations and scrapers are being built at the mine. It will be necessary to purchase at least six additional "Tuggers", as we contemplate carrying on underground operations with a force of eighteen gangs, working on day shifts.

18. NATIONALITY OF EMPLOYEES:

NATIONALITY	NO.OF MEN 1929	NO.OF MEN 1928
American, ...	11	3
Austrian, ...	10	3
English, ...	3	
Finnish, ...	22	
Italian, ...	10	
Montenegrin, ...	5	
Polish, ...	3	
Serbian, ...	6	
Total, ...	70	6

HILL-TRUMBULL MINE
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1. GENERAL:

Ore operations were started April 22nd and completed on September 28th. This work was begun fifteen days earlier than in 1928 and closed two days later.

Generally speaking, the season's operations were quite satisfactory, mining and weather conditions being fairly good. The Great Northern car service was comparatively satisfactory, the only delays for cars being the result of our crowded dock conditions and in a few instances, poor general boat service. The frost during the early pit operations gave very little trouble, there being reported a slowing down at the washing plant due to frost on only the first two days of the season.

While open pit mining was scattered over both the Hill and Trumbull pits the method of operation in the bottom of the Hill pit was somewhat better than during the previous year. This was due to the utilization of one of the larger shovels and a better track arrangement. On the other hand, the amount of rocky material handled was considerable in excess of that for the previous year. This tended to slow down the pit operations as well as those at the washing plant and were reflected in the costs.

2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production by Grades:

Hill Crude Ore	293,405	tons.
Trumbull Crude Ore	358,501	"
Total Crude Ore	651,906	"
Hill Non-Bessemer Direct Shipping Ore	77,411	"
Hill Bessemer Concentrates	85,686	"
Hill Non-Bessemer Concentrates	85,319	"
Trumbull Non-Bessemer Direct Shipping Ore	33,270	"
Trumbull Bessemer Concentrates	36,127	"
Trumbull Non-Bessemer Concentrates	204,032	"
TOTAL SHIPPING GRADE	521,845	"

The total output for the year 1929 was 32,948 tons greater than that in 1928. The increase was largely due to the demand for Bessemer ore in addition to the 500,000-ton schedule. The direct ore shipped in 1929 was 110,681 tons, as compared with 39,551 tons in 1928. The concentrates shipped in 1929 was 411,164 tons, against 449,346 tons in 1928. The estimate for 1930 is 400,000 tons of concentrates and 100,000 tons of direct ore.

b. Shipments:

The shipments from the Hill-Trumbull Mine during 1929 was the same tonnage as 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 stocked at the Hill-Trumbull property during 1929, but the following lean non-wash material was placed in stock:-

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

c. Stockpile Inventories (Continued)

Concentrating Material Above 25%:

	Tons	Fe.	Phos.	Silica
Trumbull--------	87,490	27.43	.035	54.14
Hill----------	10,088	27.18	.035	50.48

Non-Concentrating Material Between 30% and 40%:

	Tons	Fe.	Phos.	Silica
Hill----------	282	41.81	.033	35.63
Hill----------	7,245	32.90	.028	42.65

The lean material has been placed in stockpile in accordance with the terms of our lease with the Great Northern Ore Company. It is not at all probable that any of this ore can be treated and shipped to advantage during the life of our lease.

e. Production by Months:

(1) Crude Ore:

MONTH	HILL	TRUMBULL	TOTAL
April, ----------	3,449	32,866	36,315
May, ----------	32,529	105,481	138,010
June, ----------	28,418	114,730	143,148
July, ----------	69,541	56,900	126,441
August, ----------	88,572	29,015	117,587
September, ----------	70,896	19,509	90,405
TOTAL - 1929, ----------	293,405	358,501	651,906
TOTAL - 1928, ----------	94,158	583,361	677,519

(2) Concentrates and Direct Ore:

MONTH	HILL DIRECT	TRUMBULL DIRECT	HILL CONCTS.	TRUMBULL CONCTS.	GRAND TOTAL
April, --------	-	1,456	2,081	21,327	24,864
May, ----------	-	14,001	17,789	70,105	101,895
June, ---------	14,196	8,998	18,134	78,858	120,186
July, ---------	15,168	8,172	44,326	37,763	105,429
August, -------	34,327	643	49,663	19,936	104,569
September, ----	13,630	---	39,303	12,170	65,103
Oct.(Adjustment)	90		291		201
TOTAL - 1929, -	77,411	33,270	171,005	240,159	521,845
TOTAL - 1928, -	11,857	27,694	60,438	388,908	488,897

f. Ore Statement:

All material considered as ore that was mined during 1929, was shipped from the property.

g. Delays:

The following delays were reported during the year 1929:-

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2. PRODUCTION, SHIPMENTS & INVENTORIES:

g. Delays (Continued)

Pit Delays:

DATE	HOURS LOST	CAUSE
May 28th,	5 - Hrs. 40 Min.	"A" Frame of Steam Shovel #27 broken.

Washing Plant Delays:

May 18th,	1 - Hr. -	Rock stuck in pocket
June 7th,	2 - Hrs. 45 Min.	Rock stuck in pocket
July 12th,	- 30 Min.	Repairs of Screen Motor.
Sept. 4th,	1 - Hr. 20 Min.	Repairs of Screen Motor.

Delays Account No Cars:

The total delays on account of not being furnished with Great Northern cars was reported as twenty-five hours - twenty minutes. A wreck on the Great Northern Railway was responsible for over fourteen hours of this delay. During 1928, the time lost on account of not being furnished with Great Northern cars amounted to seven hours - thirty minutes.

Delays to Stripping:

DATE	HOURS LOST	CAUSE
October 7th,	1 - Hr.	Fog and smoke.
October 7th,	1 - Hr. 5 Min.	Repairs to Swinging engine on #28 steam shovel.
October 10th,	3 - Hrs. -	Locomotive tender off track near shovel.
October 13th,	1 - Hr. -	Account of fog.
October 24th,	- 45 Min.	Repairs to track at shovel.
October 24th,	- 40 Min.	Repairs to hoisting cable.
October 25th,	3 - Hrs. 15 Min.	Putting on new hoisting cable
October 28th,	1 - Hr. -	Repairs to latch plate
October 28th,	11 - Hrs. -	Repairs broken shipper shaft pinion.
October 29th,	4 - Hrs. -	Putting on new hoisting cable
October 30th,	- 40 Min.	Plugged dump.
October 31st,	10 - Hrs. -	Soft dump
November 5th,	- 20 Min.	Car off track.
November 5th,	- 30 Min.	Repairs - Hoisting Engine
November 6th,	1 - Hr. -	Repairs - Latch Plate
November 6th,	1 - Hr. -	Digging out pontoons - caved bank
November 7th,	1 - Hr. -	Repairs dipper cable
November 12th,	1 - Hr. -	Village of Marble repairing water line
November 14th,	1 - Hr. -	Repairs broken friction band belt
November 18th,	2 - Hrs. 30 Min.	Frozen pipe line
November 26th,	3 - Hrs. -	No water supply - frozen water line.
November 27th,	1 - Hr. -	Repairs to friction band
DBcember 3rd,	- 35 Min.	Broken water line
December 9th,	1 - Hr. -	Repairs Pipe Line
December 10th,	- 45 Min.	Car off track
December 11th,	1 - Hr. -	No electric lights
December 15th,	15 - Hrs. -	Repairs equalizing jack
December 16th,	4 - Hrs. 30 Min.	Frozen pipe line.

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3. ANALYSIS:

a. Mine Analysis of Production and Shipments:

Grade	Tons	Iron	Phos.	Sil.	Moist.	Fe.Nat.
Hill Non-Bessemer Direct,	77,411	57.53	.058	9.70	9.05	52.32
Hill Bess. Concentrates,	85,686	60.63	.034	9.48	7.71	55.95
Hill Non-Bess. Concts.,	85,319	59.34	.052	7.80	8.45	54.32
Trumbull Non-Bess.Direct,	33,270	57.28	.055	11.03	6.76	53.41
Trumbull Bess. Concts.,	36,127	58.44	.044	8.14	6.33	54.74
Trumbull Non-Bess.Ctes.	204,032	58.57	.051	8.53	6.64	54.68
TOTAL - 1929, ----------	521,845	58.79	.049	8.87	7.45	54.41
TOTAL - 1928, ----------	488,897	59.48	.051	7.76	7.66	54.92

b. Average Analysis on Straight Cargoes:

----------Mine Analysis----------					---------Lake Erie Analysis---------				
Grade	Iron	Moist.	Phos.	Fe.Nat.	Grade	Iron	Moist	Phos.	Fe.Nat.
McCook	58.45	7.48		54.08	McCook,	58.18	7.35		53.91
Hill Bess.	60.03	7.30	.037	55.65	Hill Bess.	59.75	6.79	.038	55.69

d. Average Analysis of Crude Ore Production:

	Tons	Iron	Phos.	Sil.
Hill Crude, ----------	293,405	43.39	.033	32.05
Trumbull Crude, ----------	358,501	40.74	.037	33.93
TOTAL - 1929, ----------	651,906	41.93	.035	33.08
TOTAL - 1928, ----------	677,519	45.08	.040	29.35

e. Composite Analysis by Lerch Bros. of Season's Shipments:

Grade	Iron	Phos.	Sil.	Mn.	Alu.	Lime	Mag.	Sul.	Loss
Hill N.B.Concts.	57.38	.057	9.62	.14	.83	.19	.18	.010	6.60
Hill Bess.Concts.	60.62	.031	9.30	.13	.91	.24	.18	.012	2.88
Hill N.B.Concts.	59.29	.049	7.72	.13	.75	.22	.17	.014	6.42
Trumbull Direct N.B.	57.27	.051	10.96	.12	.79	.20	.16	.012	5.91
" Bess.Concts.	58.42	.043	8.08	.12	.52	.18	.16	.014	7.58
" N.B.Concts.	58.58	.048	8.49	.11	.61	.21	.15	.013	6.84

ee. Average Analysis of McCook for Pickands Mather & Co:

Tons	Iron	Silica	Moist.	Iron Nat.
15,153	57.12	10.54	8.39	52.33

The analysis of the ore shipped during 1929 was quite close to the anticipations, especially as regards the concentrates. The Bessemer concentrates ran above expectations and the McCook grade was slightly under.

The analysis of the Lower Lake chemists checked fairly well with the mine results, the McCook grade being .27% below and the Bessemer .28% below the results at the mine.

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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 Ore----------	636,000	tons.
Hill Non-Bessemer Direct Shipping Ore----------	1,199,204	"
Hill Bessemer Concentrates----------	409.064	"
Hill Non-Bessemer Concentrates----------	463,781	"
TOTAL HILL ORE, ----------	2,708,049	"
Trumbull Bessemer Direct Shipping Ore----------	85,000	"
Trumbull Non-Bessemer Direct Shipping Ore----------	218,730	"
Trumbull Bessemer Concentrates----------	2,306,873	"
Trumbull Non-Bessemer Concentrates----------	918,714	"
TOTAL TRUMBULL ORE----------	3,529,317	"
GRAND TOTAL HILL AND TRUMBULL ORE----------	6,237,366	" 1-1-30

The ore estimate of January 1st, 1930 shows a net increase of 164,915 tons of Hill ore over that for the previous year, after deducting the 1929 shipments. This increase in the Hill tonnage is the result of the drilling which was done at the Southeast corner of the Hill property in the spring of 1929. The test-pitting and mining activities in the bottom of the Hill pit, where mining was undertaken during 1929, bore out our anticipations very closely.

There is no change in the estimate of Trumbull ore in sight on January 1st, 1930. The 1929 shipments are deducted from the estimate of January 1st, 1929. Test-pitting and mining activities in the Trumbull pit have been such that no change is warranted in the estimate 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. This matter will be given special attention and a report made thereon during the present year.

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4. ESTIMATE OF ORE RESERVES: (Continued)

c. Estimated Analysis:

Hill Mine:	Tons	Iron	Phos.	Sil.	Fe.Nat.
Bessemer Direct Shipping,	636,000	58.00	.045	13.00	53.36
Non-Bess.Direct Shipping,	1,199,204	58.00	.035	13.00	55.36
Bessemer Concentrates,	409,064	59.50	.045	8.50	55.04
Non-Bess. Concentrates,	463,781	60.00	.059	7.50	55.50
TOTAL HILL ORE, ---------	2,708,049	58.57	.052	11.38	54.87
Trumbull Mine:					
Bessemer Direct Shipping,	85,000	56.40	.040	12.79	51.32
Non-Bess. Direct Shipping,	218,730	58.04	.060	9.85	52.82
Bessemer Concentrates,	2,306,873	59.00	.043	9.00	54.57
Non-Bess. Concentrates,	918,714	59.00	.080	9.00	54.57
TOTAL TRUMBULL ORE, -----	3,529,317	58.88	.054	9.14	54.38
GRAND TOTAL HILL-TRUMBULL,	6,237,366	58.74	.053	10.11	54.59

5. LABOR & WAGES:

a. Comments:

(1) Labor:

Labor conditions were very satisfactory during 1929. No change was made in the wage schedule during the year.

(2) New Construction:

The only new construction undertaken at the Hill-Trumbull property during 1929 was the erection of a residence for Superintendent Bolthouse. An explanation of this work is taken up under the heading of No. 12 - "New Construction".

b. Comparative Statement of Wages and Product:

	1929	1928	Increase	Decrease
PRODUCT, ----------	521,845	488,897	32,948	
No.Shifts & Hours, -------	1 - 10	1 - 10	-	-
Avg. No. of Men Working---	130	117	13	
Avg. Wages per Day, ------	$5.20	$5.27		.07
Product Per Man Per Day---	25.68	31.97		6.29
Labor Cost Per Ton--------	.2024	.1647	.377	
Total No. of Days---------	20322½	15292¼	5030¼	
Amount Paid for Labor-----$	105,614.13	$80,540.67	$ 25,073.46	

In 1923 - Production from May 5th to October 3rd.
1924 - " " Apr. 26th to Sept. 13th.
1925 - " " Apr. 25th to Oct. 6th.
1926 - " " May 7th to Oct. 9th.
1927 - " " Apr. 25th to Oct. 12th.
1928 - " " May 7th to September 26th.
1929 - " " April 22nd to September 28th.

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5. LABOR & WAGES:
(continued)

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

In order to furnish cargoes for boats it was necessary to operate overtime during the season of 1929 in the amount of 225 hours in the pit and 152 hours at the washing plant. This overtime is figured on the basis of the regular operation - one, ten-hour shift in each 24 hours. Less overtime was worked at the Hill-Trumbull during 1929 than in the two previous years.

6. SURFACE:

a. Buildings, Repairs:

The interior of the office was repaired and decorated.

The old barn was converted into a sample house, where all the hand-wash tests are made for the pit test-pitting and drill holes are classified.

c. Tracks, Roads, Transmission Lines:

A track crew of thirty-two men started work on March 15th. New rails were put in the main line where necessary and considerable repair work and replacements were made on the approach track. The old rails, taken from the main line and approach tracks, were used for pit tracks.

During the latter part of March, a track was laid from the Trumbull approach along the North side of that pit. The small revolving shovel dug a track grade to the top of the ore and the track was carried up this grade and extended to the West end of the Trumbull put during the fore part of April. This track was used to clean up slough from the surface stripping bank, so that the ore could be mined back to the toe of stripping.

During the latter part of March, the small revolving shovel was used to clean up some dirt along the Trumbull approach track.

The track crew devoted the latter part of April to the loading tracks, spending a few shifts altogether on the main lines.

In May, a new track was laid on to the second bench in the Trumbull pit and the track to the Hill direct ore area was put in.

On June 9th the small revolving shovel started cutting the track grade to the top of the Hill direct ore area at the Southeast corner of the Hill pit. Work here was continued throughout the balance of the season, the material for the most part being questionable wash and progress was quite slow, due to the fact that the shovel loaded behind itself and only one car spots could be made. The shovel had about reached the surface of the ore at the end of the season. During 1930 the track will be extended on to the top of the ore and cuts taken across the area stripped by A. Guthrie Company during the summer of 1929.

During the months of July and August the track gang were engaged at times in replacing ties in the approach, yard and main line tracks.

Upon the completion of ore loading, tracks for the stripping operations

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6. SURFACE:
(Continued)

c. Tracks, Roads, Transmission Lines: (Continued)
were put in.

The track crew were engaged during October, November and a part of December on the dump tracks in connection with the stripping operation and also in replacing ties in the coal dock track.

7. OPEN PIT:

a. Stripping:

Some coyote-hole work was continued into January, 1929, in connection with stripping operations and a number of holes were blasted on January 8th.

During the latter part of February, the A. Guthrie Company started blasting operations in the stripping bank at the Southeast corner of the Hill pit. The contractor put the tracks in shape and started stripping operations April 9th. The first stripping for the season was finished with the large electric revolving shovel on May 4th and clean-up operations on the direct ore area to be mined in 1929 was completed by May 12th. This consisted in taking out the old track benches. The contractor's shovel was then moved to the stripping bank and the second cut started. This cut was completed June 22nd and a third cut by June 29th, and the contractor then started cleaning up the track benches. The large shovel finished this work July 24th and was moved into the Hill-Annex pit. The small remaining clean-up yardage was handled by a 100-ton shovel. Operations were rather intermittent here, the job being finally finished on November 9th.

The yardage handled by the A. Guthrie Company at the Southeast corner of the Hill pit was as follows:

	Yards Stripping	Yards Paint Rock	Total Yards
Year 1929,	577,406	16,571	593,977
Year 1928,	438,811	---	438,811
TOTALS,	1,016,217	16,571	1,032,788

According to the original estimate, it was anticipated that a somewhat larger yardage would be moved from the Southeast corner of the Hill pit and placed on the Hill-Annex stripping lands by the A. Guthrie Company. It was found, however, that the handling of the paint-rock and lean non-washable ores could be handled to better advantage by the Mesaba-Cliffs Company in connection with ore operations. No further waste material will be placed upon the Hill-Annex dumps, as such clean-up work as will be necessary in the future from this area will be disposed of on the Hill-Trumbull dumps to the South of that property.

Our small revolving shovel started clean-up work on the North side of the Trumbull pit on April 1st and completed this job April 18th.

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7. OPEN PIT:
(Continued)

a. Stripping: (Continued)

A gasoline shovel was rented to clean up along the South toe of the Hill ore bank, so that the material sloughed out in digging the approach to the top of the direct ore would not become mixed with the surface wash, which was deposited here before the stripping bank was dug back by the Guthrie Company. The work of the gasoline shovel was started August 10th and completed by the end of that month. The dirt was cast back from the bank and will be picked up later when we put in an ore track.

The 350-ton shovel was put in shape for service the fore part of October and stripping operations were started October 3rd. The machine started in an unfinished cut of the previous season and had completed this cut by October 18th. The new loading track was laid and the second cut started October 19th. This second cut, extending to the stripping limits, was completed by November 15th. The shovel then cut through the track benches and moved into position to load out the outside bench. The opening through the second bench was back-filled and the track replaced. The removal of the first bench was completed on December 4th and the shovel was then cut through to the inside bench and started work here December 6th. This bench was cleaned up by the 13th of December. It was then necessary to lay a new track on top of ore and the work of loading out this last bench was started December 15th, but due to the very severe weather it was decided to suspend operations and the work was discontinued December 23rd. There remains some 10,000 yards to be handled in the spring before ore operations are started.

The yardage handled and the cost secured while digging in the high bank was most satisfactory. The taking out of the track benches was somewhat slower, due, in part, to the amount of moving necessary for the yardage secured and to the fact that frost conditions were bad.

The surface material removed here by The Mesaba-Cliffs Company during 1929 amounted to 318,462 cubic yards.

d. Timbering:

Statement of Railroad Ties Used:

1929	1928	Increase	Decrease
8,504	6,563	1,941	-

The reason for the increase in ties used during 1929 was the result of operating on several benches in the Trumbull pit, the laying of a new line in to the Hill direct area and the large number of replacements on the approach, yards and main line.

f. Explosives, Drilling and Blasting:

Statement of Explosives Used:

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7. OPEN PIT:
(Continued)

KIND	QUANTITY	AVERAGE PRICE	AMOUNT 1929	AMOUNT 1928
25% Hercules----------	100	.1165	11.65	221.35
35% Hercules----------	-	-	-	19.12
40% Hercules----------	400	.1175	47.01	1,451.93
40% Gelatine----------	6,450	.1200	774.00	--
60% Gelatine----------	1,750	.1375	240.62	623.75
Hercules Special #1, ------	-	-	-	1,012.50
Hercules Pluto, ----------	-	-	-	350.30
Mesabi Bag, ----------	-	-	-	7,841.25
Hercomite #2----------	500	.1275	63.75	2,133.00
Hercomite #4----------	111,050	.1275	14,158.86	337.50
Total Powder----------	120,250	.1272	15,295.89	13,990.70
Fuse----------	2,300	.0062	14.37	15.48
Caps----------	1,500	.0116	17.38	17.05
Electric Exploders---------	3,258	.0983	320.53	232.44
Connecting Wire----------	38	.4216	16.02	7.82
Crimpers----------	1	.5000	.50	--
Total Caps, etc.-------			368.80	272.79
TOTAL EXPLOSIVES-------			15,664.69	14,263.49

	1929 CRUDE & DIRECT	1929 CONCTS. & DIRECT	1928 CRUDE & DIRECT	1928 CONCTS. & DIRECT
Product----------	762,587	521,845	717,070	488,897
Lbs. Powder per ton of ore-	.1577	.2304	.1716	.2517
Cost per ton for powder----	.0201	.0293	.0195	.0291
Cost per ton for Caps,etc.-	.0005	.0007	.0004	.0006
Cost per ton All Explosives	.0205	.0300	.0199	.0297
Avg. Cost per Lb. for Powder	.1272	.1272	.1137	.1137

Commenced operations April 22nd, 1929; suspended operation September 28th, 1929.

g. Open Pit Mining & Loading:

Wash Ore:

The cyclone drill was taken into the pit the middle of March and was used to put down blast holes along the second bench in the Trumbull pit. Wash ore operations were started here on April 22nd.

Shovel No. 27 was taken into the Trumbull pit on April 20th and cut in, ready for loading. This machine took a thorough cut across the central part of the bottom of the pit, completing the work on May 6th.

The No. 27 shovel took four cuts across the bottom of the Trumbull pit during the season, work here being completed on July 20th. Some direct ore was loaded in about the center of the second, third and fourth cuts and rocky material was encountered at the West end of all four cuts, in fact, the last cut had to be stopped on account of the extremely lean character of the ore. The West end of the Trumbull pit

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7. OPEN PIT:
(Continued)

g. Open Pit Mining & Loading: (Continued)

Wash Ore: (Continued)

contains a great deal of semi-frozen material, which cannot be treated in the washing plant to advantage. This is the first ore of this character that we have encountered and the installation of secondary crushers before the ore season of 1930 opens, will allow us to handle this material to advantage.

Upon completion of the fourth cut in the Trumbull bottom, the No.27 shovel was moved into the Hill pit and spent the balance of the season taking four cuts in old Area "A", which is at the Southwest corner of the Hill pit. This ore produced a very satisfactory grade of concentrates, but the tonnage recovery was well below the average, due to the large proportion of sandy seams in the ore. Operations in this area cannot be pushed Southward any further until the lean ore is removed from the top of the deposit and the large shovel cuts down and loads out the upper part of the ore body. The test-pitting over the area, which was stripped by the 350-ton shovel during the past season, will determine the best method of attacking this part of the deposit. The bank is too high to be loaded with a 100-ton type shovel from the Hill bottom and as much of the ore as can be loaded out from the top with the large machine, will be of decided advantage from the cost standpoint.

Shovel No. 26 was taken into the Hill pit bottom and started working on the rocky wash ore, April 22nd. Plans were made to handle the rocky wash ore here in 1929 from two benches. Four cuts were taken with the No. 26 shovel by July 3rd and four cuts were taken on the lower bench, the work being completed at the end of the ore season.

Better progress was made in the Hill pit bottom during 1929 than was the case in 1928, although a very large quantity of rock was handled in connection with the ore work. In 1928, a smaller shovel was used here but it was found inadequate for the severe service.

While large quantities of rock were encountered, a number of pockets of clean ore were struck during the seasons work and the concentrates derived therefrom were highly satisfactory. The Iron content of the concentrates from all the rocky wash material was somewhat higher than anticipated, but the Silica was also high and the ore had to be mixed with some of the lower Silica concentrates from the Trumbull pit to make the grade. The bulk of the ore from the Hill bottom was shipped as Bessemer grade.

In order to facilitate the handling of this rocky wash material, the No. 26 shovel worked on night shifts most of the time. All of the cars and washing plant pocket would be filled with ore on the night shift and the rock taken to the dumps. The amount of rock encountered here was so excessive that the washing plant operations were slowed up in putting the ore through and it was found advisable to load up the equipment and start washing this ore the first thing in the morning rather than to work it in intermittently throughout the shift.

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7. OPEN PIT:
(Continued)

g. Open Pit Mining & Loading: (Continued)

Wash Ore: (Continued)

The test-pitting of the Hill pit bottom between the rocky area mined in 1929 and the South ore bank, has been undertaken. It is contemplated that most of the rocky wash ore operations will be conducted in that part of the pit now being test-pitted, but some pits will be put down over the area worked during the past year and it is quite likely that this will disclose some further ore.

Shovel No. 22 started loading from the upper Trumbull bench on April 25th. Frost conditions were somewhat bad here to start with. Two cuts were taken along this bench, which carried the ore bank back to the stripping limits along the Western part. It was necessary to take two additional cuts to remove the ore back to the stripping limits at the East end of the area.

The concentrates produced from this upper bench were of rather low grade and it was necessary to work the shovel intermittently so as to maintain a satisfactory grade. The shovel completed operations here and was moved on September 5th to the second bench. The machine operated at the West end of this bench in lean material until September 23rd.

Some direct ore was loaded by shovel No. 22 at the East end of the upper bench.

Shovel No. 23 was cut in on the second Trumbull bench July 1st. This shovel was in high grade ore and was worked intermittently, for sweetening purposes, until June 30th.

Shovel No. 23 was moved to the East side of the approach and was engaged here in taking two short cuts, which remained to clean up this part of the pit from the previous season's operations. The No. 23 machine was transferred back to the Hill bottom to load sweetening ore for a cargo and it was then taken to the Hill direct area at the East end of that pit, where it operated the balance of the season.

Shovel No. 19 loaded wash ore in connection with the cutting of the track grade into the Hill direct ore area.

Direct Ore:

Shovel No. 23 was moved to the Hill direct ore area on July 30th. The machine was worked night shifts and took several East and West cuts, working up against the Hill-Annex line. Operations were conducted here throughout August but only seven shifts were worked in September.

Shovels Nos. 22, 23 and 27 loaded some direct ore in connection with the wash ore cuts across the Trumbull pit.

Shovel No. 19 loaded some direct ore from the track grade in the Hill direct ore area.

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7. OPEN PIT:
(Continued)

g. Open Pit Mining & Loading: (Continued)

Lean and Waste Ore:

Some lean and waste ore was loaded by shovel No. 22 from the upper bench of the Trumbull pit. A small amount of this material was encountered at the West end of the Trumbull cuts by shovel No. 27.

k. Water Level in Pit:

The Layne & Bowler pump operated steadily throughout the year, but was only worked on a 12-hour basis after July 8th, due to an increase in the power rate and to the fact that the water had been lowered sufficiently and could be held by the pump operating on this basis.

A deep test-pit was put down in about the center of the Trumbull pit and the water level is shown by this pit at 1240.8 ft. This is 26 feet below the present bottom of the Trumbull pit.

The water level in the Hill pit was reduced during the year, both by the Hill-Annex and our Layne & Bowler pumping.

The water level in the Trumbull pit dropped 32⅓ feet during the year and in the Hill pit 14.7 feet.

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8. COST OF OPERATION:

a. Comparative Mining Costs:

	1929	1928	Increase	Decrease
PRODUCT:				
Direct Shipping, ----------	110,681	39,551	71,130	
Concentrates, ----------	411,164	449,346		38,182
Total Production, -------	521,845	488,897	32,948	
Avg. Daily Product, -------	3,781	3,943		162
Tons Per Man Per Day, -----	25.68	31.97		6.29
Days Operated, ----------	138	124	14	
Budget, Estimated Production	500,000	500,000	-	-
" " Cost at Mine,	1.474	1.703		.229
COST:				
Total Cost at Mine:				
Open Pit Direct Shipping Ore,	.160	.132	.028	
Open Pit Wash Ore, -------	.284	.212	.072	
Concentrates, ----------	.152	.150	.002	
Total, ----------	.378	.343	.035	
Depreciation - Plant & Equipment, --	.200	.200	-	-
Movable Equipment, -------	.001	.002	-	.001
Taxes, ----------	.059	.311	-	.252
Minnesota Royalty Taxes, -	.056	.055	.001	
Occupational Taxes, ------	.048	.020	.028	
Central Office, ----------	.021	.012	.009	
Stripping, ----------	.400	.519		.119
Winter Expense, ----------	.155	.173		.018
Misc. Credits & Debits, --	.003	.016		.013
Expense of Other Mines, --	.001	.015		.014
Administrative Expense, --	.100	.100	-	-
Cleveland Office Items, --	.029	.012	.017	
Total Cost at Mine, -----	1.451	1.778		.327

d. Detailed Cost Comparison:

(1) Product:

There was an increase of 71,130 tons in the production of direct shipping ore during 1929, as compared with the previous year. The bulk of the direct shipping ore secured during 1928 came from the Trumbull pit and was mined in conjunction with the wash ore, no extra track work being necessary in the operation. In 1929, a large part of the direct shipping ore came from the East end of the Hill pit and considerable track work was necessary in connection with the operation.

The amount of concentrates turned out from the Hill-Trumbull mill in 1929 was 38,182 tons less than that for 1928. The wash ore operation in 1929 was considerably more scattered than in the previous year, which entailed considerably more track work.

The average daily production was 162 tons lower in 1929 than in 1928.

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8. COST OF OPERATION:

d. Detailed Cost Comparison (Continued)

(2) Direct Ore Costs:

The cost per ton for producing the direct shipping ore showed an increase of $.028 per ton in 1929. This was due to the fact that in 1928 the bulk of the direct ore was produced in connection with wash ore operations and no extra track work was necessary, whereas in 1929 a large part of the direct ore was mined at the East end of the Hill pit, necessitating considerable track work and the operation of a shovel just for this ore.

(3) Wash Ore Costs: |Concentrated Basis|

The wash ore cost showed an increase of $.072 per ton in 1929, as compared with the previous year. The wash ore operation in 1929 was much more scattered than in 1928, with the result that a considerable more track work was necessary and the shovels were moved more frequently. Further than this one shovel operated the entire season of 1929 in the rocky wash ore in the bottom of the Hill pit. The cost for this operation was comparatively high and was a big factor in the increased cost. During 1928 one shovel operated intermittently in rocky wash material.

(4) Concentrating:

There was an increase of $.002 per ton in the cost of concentrating in 1929 over that for 1928. This was due to the comparatively large quantity of rocky material handled in the washer during 1929. The mill feed had to be cut down and the concentrates turned out per shift was less than for the previous year.

(5) Miscellaneous Group:

The 1928 Ad Valorem taxes were very high as the result of the Tax Commission having increased very decidedly the valuation of the Hill Mine. This was adjusted by the Tax Commission and a credit applied for 1929, with the result that there was a decrease in the cost per ton for Ad Valoren taxes of $.252.

The royalty tax in 1929 was $.001 per ton higher than for 1928. This was due to the fact that more direct ore was mined in 1929 at a higher rate of royalty. The royalty on the concentrates is 90¢ whereas on the direct ore it is $1.10.

The occupational taxes showed an increase in 1929 of $.028 per ton over those for 1928, as the result of there being a larger profit shown per ton upon which the taxes are computed.

The item "Central Office" showed an increase of $.009 per ton in 1929, as compared with the previous year. This was due to the fact that the production from other Mesaba mines in 1929 was reduced and to heavier charges being made for Central Office expense to the Hill-Trumbull Mine.

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8. COST OF OPERATION:

d. Detailed Cost Comparison (Continued)

(5) Miscellaneous Group:

The Amortization charge for "Stripping" was reduced from $.519 per ton in 1928 to $.400 per ton in 1929, or a decrease of $.119 per ton. This was the result of a conference in Cleveland, where it was shown that the Amortization charge per ton could be reduced and still charge off the balance in Stripping against the ore definitely in sight.

The decrease of $.018 per ton in "Winter Expense" in 1929, as compared with the previous year, was due to adjustments in the charges to this account.

The decrease of $.013 in the cost per ton under "Miscellaneous Credits & Debits" is due to the fact that in 1929 the expense of operating the rented buildings was considerably less than for the previous year.

In 1928 - $7,500.00 was set up to take care of Boeing Mine Personal Injury Expense, whereas in 1929 there was a comparatively small expenditure under this caption, explaining the decrease of $.014 per ton.

The "Cleveland Office Items" show an increase in 1929 of $.017 per ton as the result of larger charges made against the Hill-Trumbull Mine by the Cleveland office.

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9. EXPLORATIONS AND FUTURE EXPLORATIONS

One gang of miners was engaged in extending two drifts Northward at the Northeast corner of the Hill pit to determine whether or not a minable ore body existed. These drifts were known as No. 6 and No. 7, No. 6 being pushed ahead for 109 feet to solid rock and No.7 for 62 feet to the taconite. They were in rather narrow seams of ore and they did not disclose a workable deposit.

Two crews of test-pitters were engaged in putting down a row of pits across the Trumbull area, which was being stripped. The ore had not been uncovered to any great extent and the men were transferred to the Hill direct ore area, where they were engaged in sinking pits until the middle of February. The test-pit crews worked from the middle of February until the 20th of March in the Trumbull pit bottom. They were stopped here on account of the seepage of water into the pits from the melting snows. Test-pitting in the Trumbull pit bottom could not be undertaken until last spring on account of the water not being lowered sufficiently by the Layne & Bowler pump until that time.

Test-pitting to determine the quality and operating plans for the 1930 ore was started in the Hill direct area the latter part of September and was still being pushed forward by the end of the year. A force of two gangs was employed on this work.

Four crews of test-pitters worked throughout October in the Trumbull pit bottom. In November, two of the crews were transferred to the newly stripped Trumbull area to the East of the approach.

During the latter part of December, two gangs of test-pitters were engaged in the Hill rocky wash ore. At the end of the year two crews were working in the Trumbull pit bottom, two in the Trumbull Area "A", two crews in the Hill rocky wash and one crew in the Hill direct area. These gangs will be employed for at least an additional month to six weeks.

A drilling contractor moved his equipment on to the ground at the Southeast corner of the Hill pit. It was decided to drill from three to four holes here to determine the Southerly limits of the area to be stripped by the A. Guthrie Company.

Hole No. 1 was started March 6th and finished at a depth of 188 feet, March 21st. Hole No. 2 was started March 26th and bottomed at a depth of 193'8" on April 6th. Hole No. 3 was started on April 9th and finished at a depth of 198 feet on April 23rd. These three holes demonstrated that the open pit limits at the Southeast corner of the Hill pit should be extended to the Oliver Iron Mining Company's boundary. It was not necessary to put down the fourth hole.

Outside of the usual test-pitting, no exploratory work is contemplated for 1930, at this time.

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10. TAXES:

The following statement shows the taxes and average rate for 1929 and 1928, covering the Hill-Trumbull, Bingham and North Star Mines, the Hill-Trumbull washing plant, the Bingham-North Star washing plant site and the Hill-Trumbull shops. The reason for including the Bingham and North Star Mines and washing plant site is that the Hill-Trumbull operations carried the taxes on these properties through 1929 and as the Bingham and North Star are not operating, the taxes on these mines would not be shown otherwise in the annual report of the Mesaba District.

	1929	1928	Increase	Decrease
Hill Mine----------				
As assessed----$	45,508.44	99,537.86		
Less adjustment	--	51,421.84		
Hill Mine, corrected------	45,508.44	48,116.02		2,607.58
Trumbull Mine----------	26,118.94	33,265.92		7,146.98
Hill-Trumbull Shops-------	1,078.69	1,109.84		31.15
Bingham Mine----------	7,250.43	7,376.06		125.63
North Star Mine----------	5,538.60	5,634.57		95.97
Hill-Trumbull W.P. Lands--	3,233.88	3,798.95		565.07
Bingham-N.Star " " --	84.81	81.90	2.91	
TOTAL----------$	88,813.79	99,383.26	2.91	10,572.38
Village Lots----------	604.42	621.87		17.45
GRAND TOTAL----------$	89,418.21 ✓	100,005.13		10,586.92
Average Rate----------	7.74	8.54		.80

The adjustment of $51,421.84 in the Ad Valorem tax of the Hill Mine was the result of a re-estimate made by the Tax Commission's engineers. Their previous estimate had been based on incorrect data.

The decrease of $10,586.92 in the total 1929 taxes paid, as compared with those paid in 1928, was due to the tonnage of ore mined from May 1, 1927 to May 1, 1928. There were no increases in the tonnages reported by the Tax Commission's engineers, as of May 1, 1929 and the Ad Valorem taxes to be paid in 1930, should show a substantial decrease as compared with those paid in 1929.

11. ACCIDENTS AND PERSONAL INJURY:

There were nine lost time accidents at the Hill-Trumbull Mine during 1929, as compared with eleven for the previous year. The total number of days lost in 1929 was 161, against 251 in 1928.

There was only one accident of a semi-serious nature during 1929, that to Frank Hill. A brief description of the nine accidents follows:

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11. ACCIDENTS AND PERSONAL INJURY:

NAME: Ed. Iverson DATE: Mar. 17, 1929.
CAUSE: Rail was being carried and piled and in setting one rail down it toppled over and caught Iverson's left hand, crushing two of the finger tips.
NATURE: Second finger, left hand, crushed approximately half way from tip to chistal joint. Top of third finger cut and hanging by shreds.
TIME LOST: Worked two shifts after accident. Laid off March 20th to April 15th.

NAME: Leonard Halmi. DATE: May 9th, 1929.
CAUSE: Halmi was employed taking down storm windows at the District Office; in moving a heavy extension ladder he strained himself and developed a hernia.
NATURE: Strangulated right femoral hernia.
TIME LOST: May 9th to June 18th.

NAME: Ralph Simpson. DATE: May 22nd, 1929.
CAUSE: Simpson was oiling the hoisting engine while the machine was running. His right hand was caught between the cross-head and frame and was crushed. This man was given a ten-day lay-off.
NATURE: Crushing injury to back of right hand; no bones broken.
TIME LOST: May 22nd to May 28th.

NAME: John Snarich. DATE: June 7, 1929.
CAUSE: In riveting the frame of the McMyler crane, the operator laid aside the air hammer. A fellow workman, moving the hammer out of the way, struck the trigger, which allowed the snap to fly out. This fellow workman, in replacing the snap, struck the trigger against his thigh, setting off the air hammer and the snap struck Snarich, who was standing close by, in the face.
NATURE: Laceration 1½" long extending from medial margin of eye laterally over cheek, right side.
TIME LOST: June 7th to June 12th.

NAME: Clarence Warner. DATE: July 3rd, 1929.
CAUSE: Warner had started a hole in hard ground, when the vibration and side-sway caused the drill stem guide to become loosened and drop on his left hand, breaking the thumb..
NATURE: Broken metacarpal thumb, left hand (compound fracture).
TIME LOST: July 3rd to July 9th; then worked until Sept. 18th, when an operation was performed. Returned to work October 7th.

NAME: Walter Steckman. DATE: Aug. 8th, 1929.
CAUSE: Steckman was engaged on the pit tracks when a rock rolled down from the bank and bruised a toe on his left foot.
NATURE: Big toe bruised.
TIME LOST: Laid off until August 15th.

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11. ACCIDENTS AND PERSONAL INJURY:

NAME: Joe Latkovich. DATE: Sept.29, 1929.
CAUSE: Latkovich sprained his ankle while helping to carry a tie in the pit.
NATURE: Sprain of left ankle.
TIME LOST: Sept. 29th to Oct. 14th.

NAME: Mike Rozankovich. DATE Oct. 3rd, 1929.
CAUSE: Rozankovich was assisting in cribbing up track, when a tie fell on his left foot, bruising the instep.
NATURE: Bruise of left instep.
TIME LOST: Oct. 3rd to Oct. 12th.

NAME: Frank Hill. DATE: Dec. 3rd, 1929.
CAUSE: Hill was working in the bottom of a test-pit and had loaded a bucket. This bucket was being hoisted by his partner by means of a windlass. When the bucket was at a height of about 15 feet, it slipped off the hook and fell upon Hill, injuring his back and head. The hook provided for hoisting buckets was not properly fastened by Hill, or the bale could not have slipped out. A new form of hook is now being used, which is absolutely fool-proof and it would be impossible to have an accident of this description occur.
NATURE: Three and one-half inch laceration, left occiput, exposing skull. Contusion of back mid-thoracic region.
TIME LOST: 22-1/2 Days in 1929.

12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION:

A new residence was constructed for Superintendent Bolthouse during 1929. The house in which Mr. Bolthouse was living was sold and removed and the new residence erected on the same lot. The estimated cost was $12,000.00, and the actual expenditures, including all excavating, foundations and grading, amounted to $ 11,475.98.

We had anticipated re-building our railway bridge over the state highway, but it was found that by renewing the stringers and doing some other repair work that the bridge could be made serviceable for some time.

It will be necessary to make extensive alterations and improvements at the washing plant during the spring of 1930. An estimate of $85,000.00 has been made to cover the cost of this work, which will consist in the installation of two 4-ft. Symons secondary crushers, the necessary conveyor belting to handle this product to the crushers and from the crushers to the logs and the replacing of the turbos and tables with two Dorr bowl classifiers. This work will be completed before the ore season opens and will allow us to treat some frozen ore which we are now unable to concentrate to advantage.

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13. EQUIPMENT AND PROPOSED EQUIPMENT:

A Dodge one-ton truck was received and placed in service during the summer.

In order to handle the samples from the pit and the washing plant to the chemical laboratory and for the use of the engineers, a Ford station wagon was purchased and placed in service during the summer.

An electric welding outfit was purchased for the shops during the spring.

A new Armstrong churn drill was purchased in connection with the work of ore blasting in the pit. This machine was delivered in October.

It was found that our air-dump car capacity was inadequate to take care of our ore operations. The old 12-yard cars were beyond economical repair. As the result, five new 30-yard all-steel air dump cars were purchased from the Western Wheeled Scraper Company and put in service the fore part of May.

The question of purchasing an electric or Diesel shovel, to augment our present equipment, has been discussed. The two Marion "60" shovels and the Model "36" revolving shovel are in a very bad state of repair and are not suitable in any event for the service required at the Hill-Trumbull Mine. A portable two-yard Diesel shove, or a four-yard electric shovel would allow us to scrap at least two of the old shovels and the results would show a decided saving.

14. MAINTENANCE & REPAIRS:

Following a holiday lay-off of ten days, repair work was resumed in the shops on January 3rd

The overhauling of shovel No. 19, which was started in December, 1928, was completed during the second week in January. This machine was tipped over while digging a grade for the stripping track and it was found necessary to straighten and repair the housing, remove and clean the rollers, repair some broken pipes, straighten the jack-arm braces and overhaul the engines.

Locomotive No. 101 was taken into the shops on January 3rd and the repair work was finished during the third week in January.

Locomotive No. 103 was in the shops for overhauling from the third week in January until February 2nd. The repairs on these two engines was about the same; the front draw bars were built up and refitted; the cross-heads were fitted with new liners; a section of the boiler jacket was replaced; the flues were cleaned and repaired and some new stay-bolts were put in. Several broken grates were replaced; the air pump valves removed for cleaning and the rear driver equalizers were repaired.

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14. MAINTENANCE & REPAIRS: (Continued)

Locomotive No. 102 was taken into the shop during the third week in February and the repair work on this machine was completed February 23rd. The drivers were removed and the driving boxes and hub liners were repaired. New brass driving box shoes and wedges were installed. A small amount of repair work was done on the boiler. The cylinders, pistons and the pins and bushings of the side rods were given the necessary repairs.

Some light repair work was made on Locomotive No. 2 early in March and the engine was sent to Taconite for service at that property.

Boeing Locomotive No. 105 was taken into the shop during the first week in March and was turned out by the end of the month. The flues were removed to have new tips lap-welded. The drivers were removed and the driving boxes, hub liners, shoes and wedges were repaired. All pins and bushings of the side rods, the air pump and the cylinders were repaired.

Locomotives Nos. 17 and 19 were sent to the shops, where some boiler work and light repairs were made during the latter part of March and the fore part of April.

The sixteen 20-yard cars were put through the shops during the period from January 3rd to March 16th. Bent parts were straightened; the draw bars were repaired; the journal boxes cleaned and greased; new springs were put in where needed and the dump cylinders and air equipment repaired. A small amount of work was done on some of the 12-yard cars.

The Keystone drill was overhauled. This machine being in the shops about a month.

The Cyclone drill was taken to the shops during the first week of February and the repair work on it finished by February 23rd.

Repairs on the dragline were started during the third week in January. The machine was completely dismantled and given a thorough overhauling. It was found that the shafts were out of line, which was causing an uneven wear on the gears and pinions. These shafts were lined and new gears and pinions put in. The work on this machine was finished March 25th.

The tires on Locomotives Nos. 101, 102 and 103 were turned down during April. Cutting tools were fitted on the brake rigging and the work was done by drawing the engines along the yard tracks.

The boom of shovel No. 26 was repaired in April.

Steam Shovel No. 22 was given some light repairs during April.

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14. MAINTENANCE & REPAIRS: (Continued)

New table grates were placed in the fire box of shovel No. 27 and some light repairs were made.

Repair work was started on the McMyler crane upon its receipt June 1st. This machine was given a complete overhauling, the work being completed early in October. It was necessary to get a number of new parts for the crane, which was responsible for its being in the shop for such a length of time. The repairs and replacements on the McMyler crane were as follows:

The lower or truck deck was stripped. Two new outside "I" beams were put in. Some new angle iron bracing; jack-arm bracket plates and new gussets were installed.

A new truck column was installed and some new plates were placed on the decking.

The boiler received a new set of flues; a piece of boiler patch plate was placed on the bottom and a new set of grates installed. A new asbestos jacket lining and new sheet jacket were installed.

It was found necessary to place a new intermediate rotating pinion and crankshaft on the machine.

New bushings were put in both the hoist and brake drums and a new drum shaft was installed.

It was necessary to furnish the crane with new rotating rollers and some new gearing.

The boom was fitted with new heel plates and braces were installed.

It was necessary to practically rebuild the housing for the crane.

Fall repair work on the equipment was started in October. Locomotives Nos. 104 and 106 from the Boeing Mine were put through the shops, the job being completed the latter part of November. These machines, with No. 105 are being repaired for the Boeing Mine account and will be sold by that property to the Holman-Cliffs Company. The repairs on these Locomotives consisted in the welding of new tips on the flues; removing and placing new hub liners on the drivers; repairing the pins, bushings and brasses of the side-rods and overhauling the throttles and air pumps.

Locomotive No. 105 was repaired during December. The drivers were removed and the driving boxes were furnished with new hub liners. Some boiler work was done on this machine.

A new set of paddle shafts were made for one of the Holman washing plant logs during November.

Locomotive No. 152, purchased from the Oliver Iron Mining Company, was taken into the shop during the second week in November. It was necessary to take out the fire box and put ina new one. The fules were fitted with new tips. The work on the boiler was finished during the last week in December and the machine was being re-assembled, since the repair work on this engine is for the Holman-Cliffs Company.

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14. MAINTENANCE & REPAIRS: (Continued)

Locomotive No. 180, purchased from the Oliver Iron Mining Company, was taken into the shops during the third week in December. This engine is having a new fire box put in and will be given a thorough overhauling. This engine will go to the Canisteo-Cliffs Company and the work is being done for the account of that concern.

Shovel No. 27 was taken into the shops at the end of December. This machine will require comparatively light repairs.

Winter repair work on the 20-yard cars, to put them in shape for service in 1930, was started the latter part of December.

Washing Plant Repairs:

The washing plant crew started on general repair work January 28th and worked at the concentrator until April 20th. This force was used from time to time on the installation work of the Holman-Cliffs pumps.

The following repairs were made at the Hill-Trumbull washing plant: The chute under the grizzly was relined; the paddle shafts of the logs were straightened and these machines were thoroughly overhauled; the turbos were repaired; the lining of the receiving bin replaced; the hopper under the revolving screen repaired; the chutes extending from the picking belts and logs to the concentrating bin relined; the head shaft bearing on the 36" belt conveyor was cleaned and lined up; the pan conveyor motor was cleaned and repaired; the rollers of the 36" belt conveyor cleaned and greased; pipe launders were put in on the turbo floor, replacing the old wooden ones and the pumps were reassembled and repaired for spring operations.

No repair work was undertaken at the Hill-Trumbull washing plant during the fall of 1929, as the crew were used on installation work at the Holman-Cliffs washer. Such repairs as are necessary at the Hill-Trumbull plant, including the changes to be made, can be carried forward satisfactorily during the spring, so as to have the concentrator in shape for operation by the opening of the ore season.

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18. NATIONALITY OF EMPLOYEES:

NATIONALITY	NO. OF MEN 1929	NO. OF MEN 1928
Jugo-Slav,	22	17
English,	15	11
Irish,	15	14
Finnish,	13	8
Swedish,	13	14
Scotch,	6	6
Croatian,	5	3
French,	4	3
Norwegian,	4	5
Austrian,	4	3
Serbian,	3	4
Bulgarian,	3	2
Italian,	2	3
Welch,	2	1
Polish,	2	1
Dutch,	1	0
Dane,	1	1
German,	0	10
Slovanian,	0	1
Bohemian,	0	1
TOTAL,	115	108

19. WASHING PLANT OPERATIONS:

Washing plant operations were started April 22nd and Completed the 28th of September.

Conditions throughout the season were generally good and there were no serious delays. Some small trouble was experienced with frost in the ore during the first few days of the operation.

Operations were started on one 12-hour shift, but due to the fact that we were up to, or a little ahead of our schedule, the plant was operated on one 10-hour shift after July 6th, except in instances where it was necessary to crowd production for a boat.

Considerable lean ore was put through the mill during 1929. The tonnage of rocky wash material handled at the mill was considerably larger than during any past season. This resulted in slowing down the mill feed, as compared with the average of previous years.

The dragline was sent to the washing plant basin on May 23rd and worked there until the middle of July. This machine raised the dyke along the North and East sides of the North basin and raised the cross dyke between the North and South basins. While repair

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19. WASHING PLANT OPERATIONS: (Continued)

work was going forward on the North basin, the tailings were diverted to the South area in June, but the heavy winds carried the dust from the dry North basin toward the Village of Calumet and it was necessary to change over the plan and flood the North basin. In order to take care of dust conditions, which will result when either of the basins are dry, planting will be started next spring in an endeavor to correct the situation.

In 1929 - 651,906 tons of Wash ore were treated and in 1928 - 677,519 tons were put through the mill.

The production of concentrates in 1929 amounted to 411,164 tons, which compares with 449,346 tons for the previous year.

The rejects from the mill during 1929 amounted to 28,296 tons, running 24.05 Iron - as against 11,408 tons in 1928, averaging 28.35 Iron.

The gross recovery during the year 1929 was 63.06 and compares with 66.32 for the year 1928. The reason for this decrease in recovery in 1929 was due to our handling a lower grade material and to the larger quantity of rocky wash ore handled.

The iron unit recovery in 1929 was 88.97 as against 87.77 for the year 1928. Considering the lower grade material handled in 1929, this increase in iron unit recovery was most satisfactory and indicates some improvement in the plant's operation.

The analysis of the product from the several machines for the years 1929 and 1928 were as follows:

	1929				1928		
	Iron	Phos.	Sil.		Iron	Phos.	Sil.
Screens,-----	56.53	.045	12.30	Screens-----	58.79	.052	7.93
Logs---------	59.63	.045	8.42	Logs--------	59.63	.050	7.28
Turbos-------	54.61	.039	17.15	Turbos------	55.63	.044	14.48
Tailings-----	11.49						

The analysis of the plant rejects for the year 1929 were as follows:

	Tons	Iron	Phos.	Silica.
Hill----------	17,807	30.90	.019	50.08
Trumbull------	10,489	12.43	.017	75.07
Total 1929----	28,296	24.05	.018	59.34

The rock removed from the pit and placed on the dumps during 1929, together with the iron analyses, follows:-

	Tons	Iron
Hill----------	62,587	31.88
Trumbull------	1,198	11.06
Total 1929, --	63,785	31.49
Total 1928, --	36,773	31.26

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1. GENERAL:

Drainage:

The raft, carrying the open pit centrifugal pump, capacity 5,000 G.P.M., was floated into position on January 5th. The discharge line and electrical connections were made and the pump was started operating January 22nd. Some trouble was experienced with the discharge line, and it was necessary to shut the pump down upon several occasions to make adjustments and extend the line as the pump lowered the water in the pit. When this pump was shut down, the Layne & Bowler pump was operated in the Oliver shaft.

The raft pump operated on dump power until July, when, due to low water conditions of the power company, we were forced to go on second-class power, the power rate increasing from $.005 to $.0085 per K. W.

Some trouble was experienced with the raft pump over-heating when the weather became milder in the spring and it was necessary to install a ventilating fan. When this was done the pump operated without any further trouble.

Approximately one billion gallons of water was pumped from the Holman-Cliffs pit, aside from the incoming water, the total fall amounting to 85 ft. 11 in.

A gasoline shovel was rented in April and a temporary sump dug. This sump was put down about 12 feet and the shovel was then used to dig a channel across the pit, so as to drain the water. This work was completed on September 26th.

The area in the pit bottom, where the permanent sump was to be located, was drilled and blasted on October 19th. The McMyler crane started excavating on October 31st, but progress was very slow and it was also necessary to use this crane for other jobs around the pit and at the washing plant. The Hill-Trumbull crane is a faster acting and more suitable for this sort of a job and an exchange was made early in December, the Hill-Trumbull crane being placed on the sump job and the McMyler crane being sent to the Hill-Trumbull Mine. It was found that the ore was too compact to be dug with an orange-peel bucket and drill holes were put down under water and blasted, to loosen up the material. At the end of the year the sump was down 20 feet and it is the intention to lower it 10 feet further, so that the water may be drained below the bottom of the pit and test-pitting, to determine the orea area to be mined in 1930. The pump has now been moved to the site of the permanent sump and is keeping the head of water down 10 feet below the bottom of the pit.

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4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:

Assumption: 16 cu. ft. per ton for Wash Ore.

A rock deduction of 10% was made and the Concentrates are figured on a 60% gross recovery. This weight recovery compares with 65% at the Hill-Trumbull Mine, but it was made to be ultra-conservative, as the ore in the Holman-Brown-Bingham & North Star Mines is somewhat more rocky.

Brown No. 1,	1,514,205
Brown No. 2,	1,924,654
Holman,	3,171,441
TOTAL HOLMAN-BROWN ORE,	6,610,300
Bingham,	1,400,000
North Star,	1,180,000
TOTAL BINGHAM-NORTH STAR ORE,	2,580,000
GRAND TOTAL,	9,190,300

The test-pitting of these ore bodies during the next year will give us positive information, with the result that the ore estimates will undoubtedly be changed somewhat.

b. Prospective Ore:

The 1930 drilling on the North-Star property and the test-pitting on the North Star, Holman and Brown properties may result in showing up a larger tonnage than is indicated by the present estimate. The further drilling of the Bingham ore body will undoubtedly disclose a larger tonnage here than is shown by the estimates, at least a study of that property would indicate this.

c. Estimated Analysis:

Holman-Brown:	Tons	Iron	Phos.	Sil.	Moist.	Iron Nat.
Brown No. 1,	1,514,205	59.60	.060	10.10	9.40	54.00
Brown No. 2,	1,924,654	59.60	.060	10.10	9.40	54.00
Holman,	3,171,441	59.60	.060	10.10	9.40	54.00
Bingham-North Star:						
Bingham,	1,400,000	59.60	.060	10.10	9.40	54.00
North Star,	1,180,000	59.60	.060	10.10	9.40	54.00

From the information at hand it has been considered advisable to show the same expectations in the concentrates from the Holman-Brown, Bingham & North Star Mines. Exploration work and test-pitting during 1930, as well as the washing resultsa obtained will no doubt be responsible in changing the estimated figures somewhat and in the report a year hence the analysis of the Concentrates to be derived from ore in the several properties will show some variation.

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5. LABOR & WAGES:

a. Comments:

(1) Labor:

Labor conditions were quite satisfactory at the Holman-Cliffs Mine during the past year. The Oliver Company had operated quite extensively in the Taconite district until 1927 and a large number of their old employees were still living in the district and were available.

6. SURFACE:

a. Buildings, Repairs, etc:

The mine buildings and houses in Taconite were inspected jointly with officials of the Oliver Iron Mining Company during the latter part of April.

The interior of the office was redecorated and repaired in May and the roof of the locomotive round-house was renewed.

General repairs were started on the houses in May, but this was stopped in June, as the lease with the Oliver Company had not been executed. Further repairs on the houses during the balance of the year was in the nature of emergency work, as the lease had not been executed at the end of the year. The job of bracing and repairing the round-house and the shop building was being carried on to completion. This included the repairing of the cupola on the machine shop and renailing and replacing sheeting as necessary. This work was completed by the end of July and the mine buildings, except the office were painted during August.

Bridge:

Repair work was started on the railway bridge crossing the state highway, in April and completed by the middle of May. New ties and walk-ways were placed on the deck of the bridge and the space between the walk-ways was covered with sheet iron, to prevent sparks from falling on the highway. New railing was built on each side of the bridge.

Coal Dock:

Work was started on the coal dock in April and completed May 25th. Some ties were replaced and new planking was put on the deck. The railing was repaired, the lining of the pockets renewed, as well as chutes and some of the posts and sills. The work on this coal dock was more extensive than had been anticipated from the inspection made at the time of preparing the estimate.

Culverts:

Three new culverts were put in during April, one under the "Y" track near the shops; one under the branch connecting the main line with the shop tracks and one under the main line tracks near the mouth of the approach.

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6. SURFACE:
(Continued)

c. Tracks, Roads, Transmission Lines:

A crew of thirty-two men started track work on March 18th. The first job undertaken was the reconditioning of the load line from the pit to the dumps. The accumulation of cinders and dirt was cleared from the track and all of the steel and ties were taken up. While we had anticipated that some of the old ties could be used, we found that this was very inadvisable and the line was installed with new ties and steel. New 90-lb. rail was laid for 3,800 feet from a point well down the approach to a point just North of the switch leading to the shops. Eighty-pound steel was laid on out to the dumps. All work on the load line to the dumps was completed by April 27th.

The work on the empty line and coal dock tracks was started the end of April and was completed by the first of July, with the exception of some ballasting, which was done in August. There was some realignment made to eliminate unnecessary curves on this line.

The old yard tracks above the approach were taken up and two new set-out tracks were provided to take care of switching and for the storing of equipment.

The small revolving shovel was sent from the Hill-Trumbull Mine to cut a grade for the railway lines leading across the dump to the washing plant fill. This work was started on May 20th and completed June 1st.

The load line, equipped with 90-lb. steel, was laid as far as the shovel had graded by June 1st.

The tracks from the main line to the shops was reconditioned during July.

A gasoline-driven shovel was rented for the purpose of digging a track grade along the side of the old Oliver high dump in order to form a connection between our dump tracks and the grade to the washing plant. This work was started on July 24th and finished early in August.

During August, the empty line was extended as far as we had laid the 90-lb. rail across the dumps. Some of the 80-lb. rail, which we had purchased from the Oliver Iron Mining Company, was used here.

The track crew was laid off the first week in September on account of the shortage of ties. Work was resumed on September 9th and both load and empty lines were extended to the end of the dump by September 27th. Following this, the track crew was used to recondition the approach tracks and one line across the bottom of the Holman pit, to be used in connection with the pump sump operation. All of this work was completed October 12th and the track force was laid off.

The original estimated cost of reconditioning the tracks was found to be inadequate, due to the fact that practically none of the old ties could be utilized.

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6. SURFACE:
(Continued)

Road to Washing Plant:

This job was started May 22nd and completed July 20th. A contract was let to Peter Swanson for the construction of this road from the State Highway to the tailings basin dam and from the tailings basin dam to the washing plant site. The gravel material for the surfacing of the road was dumped by the A. Guthrie Company along the side of the tailings basin dam.

7. OPEN PIT:

a. Stripping:

The A. Guthrie Company shipped their 125-B Bucyrus shovel to Taconite early in March and the machine was erected and made ready for stripping operation by the middle of April.

The contractor put a crew of men to work on April 1st, laying a track from the Holman-Cliffs approach around the North side of the North Star property and extending it to the area to be stripped. The contractor also laid the track for the tailings basin dam job during the month of April.

The trestle material for the tailings dump was started in April and a ditch was blasted through the muskeg in order to insure a contact between the fill and the solid ground and eliminate any possibility of seepage. The trestle was completed May 18th and the filling of this dump started.

The contractor's shovel was moved up the bank of the approach and started operations during the second week in May. The progress was rather slow to begin with, as the shovel was working within narrow limits and had to do considerable casting in order to affect a grade for the loading track. Some of the stripping was used for track ballast but the greater part of it went into the washing plant basin dam. The first cut was taken at an elevation that about divided the high bank into two lifts. A small gasoline revolving shovel was used by the contractor in June to cast the loading track grade along the slope of the stripping bank.

The dam fill was completed in June and some gravel was dumped at the South end for surfacing the road and for concrete work. The caps and stringers on the dump trestle were salvaged.

The A. Guthrie Company extended their tracks and started dumping dirt along the shoulder of the track grade of the old Holman dump in order to build out so that the track could be hooked on to the trestle for the first 1fft of the big fill, which connected the dump with the washing plant. Some trouble was experienced with muskeg here, but it did not delay operations materially. A trough was blasted across the muskeg leading to the washing plant, so that a contact could be made between the fill material and the solid ground and eliminate seepage from the storage basin.

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7. OPEN PIT:
(Continued)

a. Stripping: (Continued)

A part of the lower trestle for the main fill to the washing plant was erected during June and the contractor started dumping from this structure.

The first lift of the fill, approximately 35 feet in height, was completed by August 1st. The dirt was then fanned Eastward to secure the required width at this elevation.

The erection of the second lift of the trestle was started in July and was completed October 19th. The contractor began dumping from this fill in September and completed the work the fore part of December.

The contractor graded down from the high fill and laid a track across a ravine extending North and South on the land to be utilized for stockpiling lean ore from the Holman-Brown pits. This work was completed during the month of December.

The A. Guthrie Company completed the first stripping cut during the first week of July. The second cut was finished August 15th; the third cut October 5th and the fourth cut October 30th. The third cut went back to the stripping limits while the fourth cut was taken on a lower bench and a fifth cut was well along when surface stripping operations for the season were discontinued on December 20th. Both the fourth and fifth cuts were close to the ore in places.

During July, a 24" concrete culvert was placed in solid ground, leading out from the Southeast corner of the storage basin. This pipe is 10 feet above the bottom of the storage basin and was provided, so that the water can be drained from the basin in the event that there was any likelihood of its over-flowing the dam to the west.

The A. Guthrie Company shipped a 300-ton revolving shovel to the Holman-Cliffs Mine early in October and the machine was erected during that month for work on the taconite island. The first job the shovel did was to cast a track fill connecting the island with the pit bank. A gasoline shovel had previously dug an approach along the Brown No. 2 bank, adjacent to this island.

The contractor placed three cyclone drills on the taconite island in October and the rock was blasted for the first cut on November 9th. The 300-ton shovel started loading that day and had completed the first cut by December 27th. The shovel was moved back and the second cut started on December 30th. The material handled was a mixture of taconite and paint rock. The material was sampled and found to be of such low grade that it could be wasted. This was done with the consent of the fee owners.

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7. OPEN PIT:
(Continued)

a. Stripping: (Continued)

The A. Guthrie Company moved 737,700 cubic yards of surface material and 116,366 yards of rock from the island during 1929. The contract surface stripping job has been completed, but there remains approximately 164,000 yards of rock to be handled. The contractor will continue moving rock during the winter.

There is a question about continuing the rock stripping after the present A. Guthrie Company's contract has been completed. The contractor had been asked to furnish figures for continuing this work on the basis of handling an additional 300,000 yards and also for the removing of the 600,000 yards of rock, which will remain when the present contract has been completed.

d. Timbering:

Statement of Railroad Ties Used:

1929	1928	Increase	Decrease
21,996	-	21,996	

9. EXPLORATIONS AND FUTURE EXPLORATIONS:

Four crews of test-pitters started work in the North Star pit during the first week of November. A number of pits have been finished, some showing a good character of wash ore, some approximately all rock and some a mixture of rock and ore.

During the latter part of November, one crew of test-pitters started work on the taconite island. The first cut taken by the contractor was sufficiently wide so that one row of standard test-pits would prove the ground. A second row of test-pits will be put down through ore, when the second cut is completed. The pits put down here have all shown a good grade of wash ore.

A number of drill holes will be put down on the North Star property next spring to ascertain the outline of the open pit. The present information is not sufficient to determine this accurately.

11. ACCIDENTS AND PERSONAL INJURY:

There were two accidents at the Holman-Cliffs Mine during 1929, the number of days lost being seventeen. A brief description of these two accidents follows:-

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10. TAXES:

The following statement shows the taxes for 1929 and 1928, covering the Holman-Brown, Bingham-North Star Mines and Holman-Cliffs and Bingham-North Star Washing Plant Lands:

	1929	1928	Increase	Decrease
Holman-Brown Mine, ---	$17,210.08	16,686.28	523.80	
Bingham Mine, --------	7,250.43	7,376.06		125.63
North Star Mine, -----	5,538.60	5,634.57		95.97
Holman-Cliffs W.P.Lands	278.05	269.55	8.50	
Bingham N.Star " "	84.81	81.90	2.91	
TOTAL, ----------	$30,361.97	30,048.36		313.61

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11. ACCIDENTS AND PERSONAL INJURY:

NAME: Edward Cartier DATE: Oct. 11, 1929.
CAUSE: Building pump raft in Canisteo Mine pit. Working on deck of raft and stepped backwards, falling over side, striking body on edge of floor and a beam protruding from underneath.
NATURE: Fracture of eight and ninth ribs on right side, also wrenched left knee.
TIME LOST: Seven days - Oct. 12th to Oct. 21st, 1929.

NAME: Charles Trescott. DATE: Dec. 3rd, 1929.
CAUSE: He had been cutting a line and started back toward transit when he stumbled on a leg and fell on a sharp pointed stub of sapling which had been previously cut while brushing.
NATURE: Two inch wound in fleshy part of left thigh near the crotch.
TIME LOST. Ten days - Dec. 4th to Dec. 16th, 1929.

12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

The pumphouse on Lawrence Lake; the water tank on the dump and the watchman's house at the washing plant will be constructed during 1930.

13. EQUIPMENT AND PROPOSED EQUIPMENT:

The contractor started delivering timber on January 14th and had practically finished by the end of May.

Two flat cars were purchased from the Duluth Iron & Metal Co., delivery being made March 4th.

The revolving screen from the Maas Mine was received the middle of March.

Locomotive No. 2 and a crane rented from the Oliver Iron Mining Co., were sent to Taconite early in March for track work.

The concrete culvert pipe was received March 4th.

The delivery of 300 tons of 90# steel was made in April.

The McMyler crane was received in April and overhauled in the Hill-Trumbull shops. This machine was delivered to the Holman-Cliffs Mine the first of October.

The three Boeing locomotives have been put through the Hill-Trumbull shops and are ready for delivery to the Holman-Cliffs.

The 2 - 120-B electric shovels and 16 - 30-yd. air-dump cars are to be delivered March 1, 1930.

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18. NATIONALITY OF EMPLOYEES:

NATIONALITY:	NO. OF MEN 1929.
English,	7
Irish,	5
French,	6
Finnish,	10
Italian,	7
Swedish,	4
German,	5
Canadian,	2
Danish,	2
Belgian,	2
Bohemian,	1
Jugo-Slav,	3
Norwegian,	1
Scotch,	1
Dutch,	1
Total,	57 - Average.

19. WASHING PLANT:

During June, the washing plant site was cleared and grubbed.

The E. W. Coons Company were given a contract for the concrete foundation work. This company started excavating for the receiving bin, crusher and conveyor pit on July 14th and finished the work July 23rd. This work was largely done with a small gasoline shovel.

Excavating for the piers of the washer building were begun the latter part of July and the concrete poured by August 1st.

The concrete work on the crusher foundation, the conveyor pit and foundation piers for the 8-ft. pan conveyor were completed by the first of September.

During the second week in August the forms for the receiving bin were started and the concrete work followed along. The forms were in place by the middle of September and the pouring of the concrete was completed October 4th.

Structural steel and machinery for the washing plant was delivered during the latter part of July and throughout August.

The pipe for the water supply line from Lawrence Lake to the tailings basin was received in July. This pipe and the transmission line were in place by the middle of September.

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19. WASHING PLANT:

The Worden-Allen Company's erecting crew started work the latter part of August. This crew completed erecting the steel by November 16th and assisted in landing the washing plant machinery on them several floors of the plant. The sheet iron workers and glaziers finished their work by the end of November.

The Hill-Trumbull washing plant crew started installing machinery during the second week in October and the job was practically completed by January 1st.

The pumphouse at the plant was erected during August and the gasoline dragline dug a ditch across the storage basin and a sump near the pumphouse. This is for the purpose of draining any water in the basin to the pumps.

The erection of the water pressure tank was started the middle of September and completed October 19th.

The transformer station at the plant was erected during October.

The Great Northern Railway spur leading into the washing plant was started during the spring and completed in July.

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1. GENERAL:

A crew of carpenters started building the pump rafts in connection with the unwatering of the Canisteo pit, on September 20th. This work was completed by October 19th.

The work of laying the discharge pipe lines from the pit to the drainage ditch was begun during the first week in October and finished by the end of that month. A force of from four to six men were employed on this job.

The sub-station and transmission line were installed during the months of October and November.

A gasoline dragline was sent to Coleraine during the latter part of September and cleaned out and widened the drainage ditches to handle the water to be pumped from the Canisteo-Cliffs pit. This work was completed by the 26th of October.

The two 7,000 G.P.M. capacity electric centrifugal pumps were received from the Allis-Chalmers Company on November 25th. They were moved down in to the pit and installed on the rafts at a point near the Northeast corner of the pit. The old approach came down to the water level at this point and it was a comparatively small task to unload the pumps and put them on to the rafts. The rafts were then moved across the pit and the connections made to the discharge pipe line. The power line was connected and one pump was started operating on December 14th. It was advisable to make sure that the several culverts would take care of the water. The second pump was started December 22nd.

These pumps are operated on night shifts only, except Sundays and holidays, so as to take advantage of the lower power rate.

The pumps have been operating satisfactorily since they were started and the ditches and culverts have taken care of the flow to good advantage. There have been no wash-outs or flooding in connection with the pumping operations.

The elevation of the water was 1255.6 feet when pumping was started. The water had been lowered to an elevation of 1251.3 feet by January 1, or a drop of 4.3 feet. There was approximately 2,500,000,000 gallons of water in the Canisteo-Cliffs pit when pumping operations were started. We figure that it will take us to about August 1st to pump out the water, provided our operations are conducted on the same basis as at present. The Oliver Iron Mining Company were handling less than 1,000 gallons of water per minute when they discontinued pumping in the Canisteo pit. The incoming water will undoubtedly be somewhat in excess of this for a time after we have pumped out the pit, as the ground will have been saturated for some distance back from the pit.

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9. EXPLORATIONS AND FUTURE EXPLORATIONS:

Drilling started on the Canisteo-Cliffs property May 17th, two outfits being operated by the Duluth Diamond Drill Company and two outfits by J. S. Schultze.

The Duluth Diamond Drill Company put down six standard churn drill holes, completing their work on July 12th. Schultze put down eighteen structure holes, finishing the last one on December 12th. The standard churn drilling is done with 2" casing, whereas with structure drilling - 3" casing is used. The character of the wash material, from the structure standpoint, can be much more readily determined when the larger casing is used.

A program of test-pitting will be carried forward next fall, when the water has been drained from the pit.

22. REPORT OF THE GEOLOGIST FOR THE YEAR ENDING DECEMBER 31, 1929.

A. STAFF.

The staff of the Geological Department for the year 1929 is shown in Table I below. The personnel has remained the same throughout the year:

TABLE I.

NAME.	OCCUPATION.	DURATION OF EMPLOYMENT IN 1929.	DAYS LOST. SICKNESS.	VACATION.	% OF WORKING DAYS WORKED.
E.L.Derby,Jr.,	Chief Geologist,	Entire year	0	0	104.5#
A.H.Tillson,	Assistant Geologist,	" "	6½	11	95.0
Gustav Afuhs,	Draftsman,	" "	2	7¼	96.6
E.A.Allen,	Assistant,	" "	1	8½	96.5

Includes 12¼ days overtime during the year.

The year was divided into the factors shown in Table II below:

TABLE II.

Total days of eight hours worked, - - -	274 days
Sundays, - - - - - - - - - -	52 "
Full days resulting from Saturday afternoons,	26 "
Holidays, - - - - - - - - - -	13 "
Total,	365 days

Table III, below, shows the average number of men regularly employed on the staff of the Geological Department during the past five years:

TABLE III.

YEAR.	AVERAGE NUMBER OF MEN.
1925	4.0
1926	4.0
1927	4.0
1928	4.0
1929	4.0

B. DIVISION OF WORK AMONG THE MEMBERS OF THE DEPARTMENT.

The division of the time actually consumed by the members of the Department is shown in Table IV below:

TABLE IV.

ITEMS.	DAYS WORKED. DERBY.	TILLSON.	AFUHS.	ALLEN.	TOTAL DAYS.
MINES:-					
Athens,		3	10½		13½
Bingham-North Star,	½				½
Canisteo,	79	1½	42		122½
Cliffs-Shaft,	11½	114¼	24 3/4	62¼	212 3/4
Dean-Itasca,	35¼	¼	3½		39
Gardner-Mackinaw,	½	12½			13
Hill-Trumbull,	1		1		2
Holman-Brown,	½				½
Holmes,	¼	34¼	1	20¼	55 3/4
Maas,	3¼	15½			18 3/4
Morris-Lloyd,		55	11 3/4		66 3/4
Megaunee,		12	6		18
Tilden,			2¼	4	6¼
Virgil,	6 3/4	4	22	21¼	54
MISCELLANEOUS ITEMS:-					
Annual report,	7¼		9½		16 3/4
Assisting engineers,		1½		17¼	18 3/4
Driving Eng'g. Dept. truck,				20	20
General Departmental	111	1	52½	119½	284
Investigating land offers,	12½				12½
Investigating outside explorations,		1 3/4	25½		27¼
Michigamme lands (for W.G.M.),			52½		52½
Valuation of C.C.I.Co. mineral estate,	17				17
Total days worked,	286¼	256½	264 3/4	264½	1072

GEOLOGICAL DEPARTMENT.