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8. COST OF OPERATING:

a. Comparative Mining Costs:

	1928	1927	INCREASE	DECREASE
PRODUCT	261,454	270,006		8,552
Underground Costs	1.427	1.354	.073	
Surface Costs	.146	.153		.007
General Mine Accounts	.116	.127		.011
Cost of Production	1.689	1.634	.055	
Loading and Shipping	.039	.047		.008
Total Cost on Cars	1.728	1.681	.047	
Depreciation - Original Cost	.073	.073		
Plant Account	.046	.046		
Development	.039	.039		
Movable Equipment	.010	.000	.010	
Taxes	.287	.286	.001	
Central Office	.105	.093	.012	
Welfare, Safety, Hosp.	.046	.027	.019	
Cost Adjustment	.000	.032		.032
Total Cost at Mine	2.334	2.277	.057	
No. of Days Operated	261½	263		1½
No. Shifts & Hours	1-8 hr.	1-8 hr.		
Average Daily Product	1,000	1,027		27
COST OF PRODUCTION:				
Labor	.982	.999		.017
Supplies	.707	.635	.072	
Total	1.689	1.634	.055	

b. Detailed Cost Comparison:

(1) Days and Shifts:

During 1928, the mine worked one eight hour shift for 261½ days, and the average number of men employed during the year was 189, for a total of 51,074¼ days. During 1927 the mine worked one eight hour shift for 263 days, and the average number of men employed during the year was 197, for a total of 53,626 3/4 days.

(2) Wages:

The mine operated on the same wage schedule in both 1928 and 1927.

(3) Comparison of Production:

Production, 1928 -	261,454 tons
Production, 1927 -	270,006 "
Decrease -	8,552 "

(4) Comparison of Number of Men and Wages:

	No. Men	No. Days	Amount	Rate per day
1928	189	51,074 1/4	$250,157.16	$ 4.90
1927	197	53,626 3/4	264,990.17	4.94
Decrease	8	2,552 ½	14,833.01	.04

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8. COST OF OPERATING:

b. Detailed Cost Comparison: (Cont.)

(5) Tons per man per day:

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

	1928	1927	INCREASE	DECREASE
Surface	25.51	25.21	.30	-
Underground	6.40	6.29	.11	-
Total	5.12	5.03	.09	

(6) Cost of Production:

1928 - $441,671.58 Cost per ton, $1.689
1927 - 441,221.38 " " " 1.634
Incr.- 450.20 .055

	Total Cost				Cost per ton		
	Labor	%	Supplies	%	Labor	Supplies	Total
1928 -	$256,847.96	58.2%	$184,823.62	41.8%	$.982	$.707	$1.689
1927 -	269,849.49	61.2%	171,371.89	38.8%	.999	.635	1.634
Incr.-			13,451.73			.072	.055
Decr.-	13,001.53				.017		

Labor cost decreased slightly in 1928, but supply cost increased, and accounts for the net increase of $.055.

(7) Detail of Accounts:

UNDERGROUND COSTS:

Development in Rock

1928 Amount $10,503.47 Cost per ton, $.040
1927 Amount 5,543.78 " " " .021
Increase 4,959.69 .019

	Sub Division.			
	Drifting	Raising	Total	Cost per foot
1928 -	1,101'	209'	1,310'	$8.02
1927 -	405'	581'	986'	5.62
Increase	696'		324'	2.40
Decrease		372		

The large increase in cost per foot was due to rock drifting on main levels in 1928, while in 1927 nearly all drifting was on sub levels.

Development in Ore

1928 Amount $11,488.38 Cost per ton, $.044
1927 Amount 6,883.37 " " " .025
Increase 4,605.01 .019

	No. of feet	Cost per foot
1928 -	1,898'	$6.05
1927 -	1,249'	5.51
Increase	649'	.54

The increase in cost per ton was due to more ore drifting and raising during the year. The cost per foot increasedon account of main level ore drifting as well as raising in 1928, while in 1927 there was no ore drifting, all raising.

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8. COST OF OPERATING:

Stoping

1928 Amount	$122,982.97	Cost per ton,	$.471
1927 Amount	141,320.14	" " "	.523
Decrease	18,337.17		.052

Detail.

	Labor		Supplies	
1928 -	$ 92,282.87	75 %	$30,700.10	25. %
1927 -	112,305.37	79.5%	29,014.77	20.5%
Decrease	20,022.50	4.5%	Incr. 1,685.33	4.5%

Cost per ton:

	Labor	Supplies	Total
1928 -	$.353	$.118	$.471
1927 -	.416	.107	.523
Decrease	.063		.052
Increase		.011	

Labor cost per ton decreased due to the use of more scraper hoists. Supply cost increased on account of purchasing more scraper hoists and other scraper equipment.

The following scraper hoists were charged in 1928: Six Sullivan and one Denver 6½ H.P. double drum hoists, second-hand, costing $2832.02; two Waugh model #300 air hoists, costing $671.15; one Sullivan air hoist, second-hand, costing $312.50; two Ingersoll Rand 6H.C. air hoists, new, costing $1290.00. This is compared with the following in 1927: Four I.R. 6HC air double drum hoists, costing $2668.00 and one Sullivan 15 H.P. electric hoist, costing $1160.00.

Explosives.

	1928	1927
Production	261,454	270,006
Total pounds of powder	94,450	106,300
Average price per pound	.14074	.14324
Total amount for powder	$13,293.27	$15,227.09
Fuse, caps, etc.	2,566.80	2,742.73
Cost of all explosives	15,860.07	17,969.82
Pounds of powder per ton of ore	.3612	.3937
Cost per ton for powder	.0509	.0564
Cost per ton for all explosives	.0607	.0666

There was 8.2% decrease in pounds of powder per ton of ore and 8.8% decrease in cost per ton for all explosives. The cost per pound for powder decreased .4% in 1928. There was less mining in areas where ore was tight and hard to break, so that the pounds of powder per ton of ore decreased.

Timbering

1928 Amount	$84,970.72	Cost per ton,	$.325
1927 Amount	84,292.97	" " "	.312
Increase	677.75		.013

Detailed cost of timber.

	1928	1927
Timber cost	$13,978.89	$11,695.14
Lagging, poles, etc.	14,104.73	11,402.17
Total	28,083.62	23,097.31
Feet of timber per ton of ore	.7962	.7277
Cost per ton for all timber	.1074	.0855
Average price per foot	.0671	.0595

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Timbering (Cont.)

The cost per foot for timber used in 1928 increased 12% due to more large sizes used on account of more main level drifting. More poles were used for covering down and for scraper slides in the floor of drifts.

Tramming

1928 Amount	$31,530.97	Cost per ton,	$.121
1927 Amount	30,350.99	" " "	.112
Increase	1,179.98		.009

There were 261½ working days in 1928 as compared with 263 working days in 1927. Tramming cost increased due to the extra expense on account of handling material from new main level drifts on the third and fourth levels. An extra motor was used on the third level part of the year and then moved to the fourth level. The cost per ton increased also on account of lower product.

Ventilation

1928 Amount	$3,520.19	Cost per ton,	$.013
1927 Amount	2,519.05	" " "	.009
Increase	1,001.14		.004

The expense in both years represents the Maas Mine proportion of the expense of operating a joint ventilation system at the Negaunee Mine. Also one #2½ Anaconda fan was charged in 1928, costing $344.00, and used as a booster fan to increase the air supply on sub levels.

Pumping

1928 Amount	$47,059.41	Cost per ton,	$.180
1927 Amount	43,581.98	" " "	.162
Increase	3,477.43		.018

	1928	1927
Total gallons of water pumped	553,419,346	534,129,791
Gallons pumped per minute	1,052	1,013
Cost for power	$38,196.15	$35,049.30
Increase	3,146.85	

The increase in expenditures was due to pumping more water in 1928. The cost per ton was also increased on account of a lower product.

Compressors & Air Pipes

1928 Amount	$31,155.95	Cost per ton,	$.119
1927 Amount	25,639.40		.095
Increase	5,516.55		.024

Cubic feet of air used in 1928 -	679,005,000	cubic feet
" " " " " 1927 -	521,730,000	" "
Increase, 1928 -	157,275,000	" "

More air was used on account of more air scraper hoists in operation. (During short periods of the year, one compressor was run at night to supply air for underground work.)

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Compressors & Air Pipes (Cont.)

The detail of this account for the two years is as follows:

	1928	1927
Compressors	$25,457.14	$20,577.87
Air Pipes	5,698.81	5,061.53
	31,155.95	25,639.40

Cost for power, 1928 - $22,633.50
Cost for power, 1927 - 17,394.00
Increase, 1928 - 5,239.50

Increase in Air Pipes was due to more extensions of air lines on account of new main level drifts on third and fourth levels, and to installation of larger air lines in raises for air scraper hoists.

Back Filling

1928 Amount $126.48 Cost per ton, $.000
1927 Amount 66.00 " " " .000
Increase 60.48

Increase due to more filling broken in 1928.

Underground Superintendence

1928 Amount $11,754.42 Cost per ton, $.045
1927 Amount 11,511.79 " " " .043
Increase 242.63 .002

Increase due to more days worked by shiftbosses in 1928 on account of more repairing and track cleaning on days that the mine was idle.

MAINTENANCE ACCOUNTS:

Compressors & Power Drills

1928 Amount $2,384.83 Cost per ton, $.009
1927 Amount 104.25 " " " .001
Increase 2,280.58 .008

The detail of this account for the two years is as follows:

	1928	1927
Compressors	91.41	104.25
Air Lines	491.63	-
Power drills	1,801.79	-
Total	2,384.83	104.25

The charge for air lines in 1928 was for connecting an old boiler to be used as an air receiver.

The following power drills were charged in 1928:

Three N-72 I.R. Drifters, costing,	$1,056.79
One 91-A Cleveland Auger drill,	170.00
One Sull. Class 8 " "	155.00
Six second-hand I.R. Auger drills,	420.00
	1,801.79

Hand Tramming Equipment

1928 Amount $ 92.11 Cost per ton, $.000
1927 Amount 839.14 " " " .003
Decrease 747.03 .003

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Hand Tramming Equipment (Cont.)

There was only a small expense for repairs to sub level cars in 1928, due to an increase in the number of scraper units used.

Electric Tram Equipment

1928 Amount	$11,902.86	Cost per ton,	$.046
1927 Amount	8,959.53	" " "	.033
Increase	2,943.33		.013

Sub Division.

	1928	1927	INCREASE	DECREASE
Generator and Motor	$ 33.46	$ 57.94		24.48
Locomotives	2,955.95	1,398.14	1,557.81	
Wiring	1,632.27	1,062.38	569.89	
Main Line Tracks	3,219.78	2,224.57	995.21	
Main Line Cars	4,061.40	4,216.50		155.10
Total	11,902.86	8,959.53	2,943.33	

Increase in locomotives due to overhauling locomotive #5691 from Gwinn District.
There was more expense for wiring in 1928. One electric welder was added to equipment, costing $185.00.
There was more extensions and renewals to main line tracks in 1928.
Three second-hand rocker dump cars were purchased from the Gwinn District in 1928 at a cost of $510.00, as compared with four saddle back cars purchased in 1927 at a cost of $576.00.

Pumping Machinery

1928 Amount	$3,584.27	Cost per ton,	$.014
1927 Amount	3,968.59	" " "	.015
Decrease	384.32		.001

Decrease due to 1927 cost including four porcelain plungers costing $456.00, and to extension of the discharge line on surface.

Total Underground Costs

1928 Amount	$373,057.03	Cost per ton,	$1.427
1927 Amount	365,580.98	" " "	1.354
Increase	7,476.05		.073

Cost per ton increased due to more development work in ore and rock, and to less product.

SURFACE COSTS:

Hoisting

1928 Amount	$16,322.90	Cost per ton,	$.063
1927 Amount	17,181.43	" " "	.064
Decrease	858.53		.001

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Hoisting (Cont.)

Cost of electric power, 1928 - $10,922.55
Cost of electric power, 1927- 11,268.15
Decrease - 345.60

Decrease due to the mine operating 1½ less days in 1928, and a smaller product.

Stocking Ore

1928 Amount	$4,913.22	Cost per ton,	$.019
1927 Amount	6,250.02	" " "	.023
Decrease	1,336.80		.004

There were 21 double ore bents and 8 single rock bents erected in the fall of 1928 on the stocking trestle, as compared with 26 double bents erected in 1927.
Tons stocked in 1928 - 134,176 tons.
Tons stocked in 1927 - 139,920 tons.
There was less expense for stocking trestles in 1928 and less tons stocked.

Dry House

1928 Amount	$6,364.22	Cost per ton,	$.024
1927 Amount	6,956.72	" " "	.026
Decrease	592.50		.002

The dry house proportion of heating plant expense in 1928 was $4,703.57, as compared with $5,303.24 in 1927.

Tons and cost of coal used in heating plant.

1928 - 657 tons	$3,645.96	$5.54 per ton
1927 - 767 tons	4,265.11	5.56 " "
Decr. 110 tons	619.15	

Decrease due to less tons of coal used in heating plant.

General Surface Expense

1928 Amount	$4,515.46	Cost per ton,	$.017
1927 Amount	5,987.83	" " "	.022
Decrease	1,472.37		.005

Decrease due to 1927 costs including expense of building new road into the Maas Mine.

MAINTENANCE ACCOUNTS:

Hoisting Equipment

1928 Amount	$3,146.56	Cost per ton,	$.012
1927 Amount	3,457.48	" " "	.013
Decrease	310.92		.001

Sub Division.

	1928	1927
Electric Hoists	$ 876.38	$ 607.67
Wire rope	810.91	845.18
Skips, cages, & skip roads	1,459.27	2,004.63
	3,146.56	3,457.48

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Hoisting Equipment (Cont.)

Increase in repairs to electric hoists due to repairing coupling on cage hoist motor.

Decrease in skips, cages, and skip roads due to 1927 charge including expense of purchasing and remodeling a cage from the Gwinn District to fit the Maas shaft.

Shaft

1928 Amount	$ 605.20	Cost per ton,	$.002
1927 Amount	315.06	" " "	.001
Increase	290.14		.001

The main cost in both years was for repairs to shaft pockets. The 1928 charge included the cost of casing the skip road in the shaft between the third and fourth levels.

Top Tram Equipment

1928 Amount	$672.75	Cost per ton,	$.003
1927 Amount	697.70	" " "	.003
Decrease	24.95		.000

Sub Division.

	Engine & Motors	Tracks & Cars	Wire Rope	Sheaves, etc
1928 -	$ 18.26	$ 383.86	$208.55	$ 62.08
1927 -	186.09	325.98	102.88	82.75
Increase		57.88	105.67	
Decrease	167.83			20.67

Decrease in Engine and Motors due to less expense for maintaining machinery in 1928.
Small increase in Tracks and Cars due to general maintenance of cars during the year being greater.
More new rope was required in 1928.
Less replacements of sheaves and rollers were necessary.

Docks, Trestles & Pockets

1928 Amount	$40.26	Cost per ton,	$.000
1927 Amount	50.75	" " "	.000
Decrease	10.49		.000

There were small repairs to ore pockets in shaft house required in both years.

Mine Buildings

1928 Amount	$1,684.87	Cost per ton,	$.006
1927 Amount	320.84	" " "	.001
Increase	1,364.03		.005

Sub Division.

	1928	1927
Office	$ 54.10	-
Warehouse	148.82	102.12
Shops	3.31	.20
Barn	6.44	23.99
Shaft House	6.55	.73
Engine House	119.71	21.15
Dry House	630.01	55.75
Coal Dock	289.58	-
Miscellaneous	426.35	-
Total	1,684.87	320.84

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Mine Buildings (Cont.)

Doors were built on the pipe rack after it had been enclosed.
The engine house roof was asphalted in 1928.
The dry house roof was repaired and asphalted in 1928.
A concrete abutment was built at the end of the sand fill of the coal dock, the old wooden abutment having rotted.
Retaining walls of concrete replaced the old wooden walls of the open timber tunnel.
A fuse capping room and a carbide distributing room was built adjoining the timber tunnel.
A room was built at the rear of the warehouse to house the gasoline pump.
Roofs were repaired on two storage sheds.

Total Surface Costs

1928 Amount	$38,265.44	Cost per ton,	$.146
1927 Amount	41,217.83	" " "	.153
Decrease	2,952.39		.007

GENERAL MINE ACCOUNTS:

Insurance

1928 Amount	$ 113.94	Cost per ton,	$.000
1927 Amount	2,681.98	" " "	.010
Decrease	2,568.04		.010

Decrease due to 1927 cost charged with $2,562.78, which should have been charged off previous to December, 1926, adjusting fire and boiler insurance premiums.

Engineering

1928 Amount	$2,525.26	Cost per ton,	$.010
1927 Amount	2,427.82	" " "	.009
Increase	97.44		.001

Increase due to more time by engineer on Maas Mine surveys, and time on erection of steel stocking trestle.

Analysis

1928 Amount	$7,689.30	Cost per ton,	$.029
1927 Amount	8,235.70	" " "	.030
Decrease	546.40		.001

This account includes the operating laboratory charge.

	No. of dets.	Cost per det.	Amount
1928 -	33,188	$.148543	$4,947.01
1927 -	33,012	.1429	4,757.94
Increase	176	.005643	189.07

Decrease due to shiftbosses taking the stope samples since February 1st, 1928. Previous to this date a sampler was employed half a shift each day doing this work.

Personal Injury Expense

1928 Amount	$ 5,262.94	Cost per ton,	$.020
1927 Amount	10,215.66	" " "	.038
Decrease	4,952.72		.018

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Personal Injury Expense (Cont.)

Decrease due to 1927 costs including $5,558.00 on account of the total disability of Isaac Salmi, report #371.

Effective April 1st, 1928, the charge to this account was on the basis of 2% of labor expense as per cost sheet set up as a reserve.

Fatal accident to Harry Spencer, January 25th, 1928, report #423.

Safety Department Expense

1928 Amount	$306.46	Cost per ton, $.001
1927 Amount	79.89	" " " .000
Increase	226.57	.001

Increase due to bosses attending safety meetings, also captain attending safety council in Duluth, $38.72.

Telephones & Safety Devices

1928 Amount	$401.85	Cost per ton, $.002
1927 Amount	312.37	" " " .001
Increase	89.48	.001

More expense for safety devices in 1928, and more expense for lighting at shafts and on main levels.

Local General Welfare

1928 Amount	$1,075.06	Cost per ton, $.004
1927 Amount	1,038.80	" " " .004
Increase	36.26	.000

More expense in 1928 for local general welfare.

Mine Office

1928 Amount	$12,974.30	Cost per ton, $.050
1927 Amount	9,430.35	" " " .035
Increase	3,543.95	.015

Central Office charges, 1928 - $11,127.62
Central Office charges, 1927 - 7,471.55
Increase, 1928 - 3,656.07

Increase due to Maas proportion of General Storehouse Overhead amounting to $1,150.39 charged to this account in 1928. Also expense of moving assistant superintendent from Hibbing to Negaunee, and additional salary expense on account of assistant superintendent.

Total General Mine Accounts

1928 Amount	$30,349.11	Cost per ton, $.116
1927 Amount	34,422.57	" " " .127
Decrease	4,073.46	.011

Decrease in General Mine Accounts due to less personal injury expense in 1928.

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9. **EXPLORATIONS AND FUTURE EXPLORATIONS:**

No exploring was done during the past year. Some interesting information was obtained from the development of the Race Course ore body on the foot wall side. Additional information will become available as the development work advances.

It is planned to drill a hole in 1929 near the southwest corner of the Race Course to gain information concerning the depth of this ore body below the fourth level. This information is needed to locate the one or two levels needed to mine all of this ore. Shaft sinking should be started in 1930.

10. **TAXES:**

DESCRIPTION	1928		1927	
CITY OF NEGAUNEE	VALUATION	TAXES	VALUATION	TAXES
MAAS MINE - (Lease and Und. ½ fee) 257.18 acres of minerals covered by State Tax Comm.	1,285,000	43,424.01	1,160,000	37,952.88
Stockpile, Supplies and Equipment,	890,000	30,075.77	1,150,000	37,625.70
TOTAL VALUE PLACED BY TAX COMMISSION -	2,175,000	73,499.78	2,310,000	75,578.58
Miscellaneous Parcels: Harris Addition, Anthony Property, Lobb Addition, and Kirkwood and Kellan's Addition -	21,350	721.49	23,650	773.74
Collection Fees		742.21		763.54
TOTAL MAAS MINE -	2,196,350	74,963.48	2,333,630	77,115.86
Tax Rate		3.3793		3.272
Total City of Negaunee Tax		571,083.87		589,686.71
Maas Mine % of City Tax		13%		13%

11. **ACCIDENTS AND PERSONAL INJURY:**

There was one fatal accident at the Maas Mine in 1928, the first one in several years. Harry Spencer was injured on January 25th at 9:45 A.M., and died two days later. The accident occurred on the fourth level about 225' from the shaft, and was caused by Spencer being hit by a motor car. Two motors had taken a broken car to the shaft a few minutes before, and one motor had passed Spencer on its way back to the mine. He was standing just inside a concrete frame in the drift, that obscures the motorman's view, and stepped on the track when the train was only two feet away. Spencer was an elderly man, 67 years of age, and was working as a track cleaner at the time of the accident.

The accident was classified as 3-A-3, Violation of Rules by Injured Workman. To avoid a recurrence of an accident of this character, a rule was adopted by the Central Safety Committee that no main line tracks were to be cleaned when the mine was operating, unless otherwise impossible, in which case two red lanterns were to be hung, one on each side of the workman, to warn the motorman.

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11. ACCIDENTS AND PERSONAL INJURY:

There were 17 minor accidents in 1928, as compared with 11 in 1927; the increase in 1928 was six minor accidents and one fatal.

The 17 accidents were classified as follows:

Eleven were slight injuries, the men returning to work in less than a month.

Three were injuries that kept the men home from one to two months.

Three were injuries that kept the men home more than two months. Of these, one was the loss of three fingers, one a fractured finger, and one severe bruises of the thigh.

One man received compensation during the entire year for injuries received in previous years, and one received compensation to October 15th for an injury received in November, 1927. Two men were paid the difference in wages during 1928.

No accident has occurred at the mine involving the loss of more than one day since August 6th.

12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION:

a. E. & A. #504 - Moving Race Course Houses: (Not Completed.)

Total estimate,	$135,951.00
Total expended in 1927,	83,577.89
Total expended in 1928, estimated,	17,330.95
Unexpended balance Jan. 1, 1929,	35,042.16

(1) New Road from Cherry Street:

This road was practically completed in 1927, and no work was done in 1928. The pavement on a small section about 250' in length has to be widened in front of the five lots at the east end of Cherry Street, on which Negaunee Mine houses were moved in 1928.

(2) Streets in the New Plat:

Lake Street:

This street was finished and the tar penetration surface put on by the City of Negaunee during 1928, for its entire length from the Baldwin Kiln Road to Prince Street. A portion of the alley south of Lake Street was surfaced with mine rock.

Elm Street:

Some additional grading was done, and mine rock filling was necessary to even off the street after the curbing was put in. A considerable amount of material excavated from the basements of houses was moved across the street for filling lots; this excess had to be removed and the street grade restored. At the street intersections 30' radius curves were used for curbing, and the additional areas thrown into the streets were sub-graded with mine rock. Part of the alley between Lake and Elm Streets was surfaced with mine rock. This street could not be surfaced on account of grading lots, moving houses, etc.

Prince Street:

Similar work was done on Prince Street after the lot grading was completed. There was more grading required for side walks here than on the other streets.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION:

a. E. & A. #504 - Moving Race Course Houses: (Cont.)

(2) Streets in the New Plat:

Baldwin Kiln Road:

This street will be graded and surfaced by the City. It is immediately west of the C. C. I. Co. First Addition to the City of Negaunee.

(3) Sidewalks:

Lake Street.

Completed the entire length on the south side and in front of the houses on the north side. Some walks from the street to the houses are yet to be laid on the north side of the street.

Elm Street.

Completed, except for 100', on the south side. No sidewalks were built on the north side, or concrete walks to the houses on either side.

Prince Street.

Completed on south side. Nothing done during the year to extend walks on the north side, as houses were moved on these lots late in the fall.

Baldwin Kiln Road.

No sidewalks will be built on this street unless the City refuses to build in front of the company houses facing west on this street.

(4) Curbing:

Lake Street. Completed on both sides of this street.

Elm Street. Completed on both sides of this street.

Prince Street. Completed on the south side of the street.

Baldwin Kiln Road. It is expected that the City will install curbing on both sides of this street.

(5) Sewer System:

a. Storm Sewers.

No main storm sewer mains were laid in 1928, as this was completed in 1927. Several laterals to curbing and catch-basins were constructed during the latter part of the summer as the curbing was being put in. A few catch basins [redacted] will be installed in 1929.

b. Sanitary Sewers.

House connections for the additional 44 houses (E. & A. #513) constituted the chief expense in 1928. An extension of the sewer to the east was made in the alley between Cherry and Lake Streets for the five Negaunee houses (E. & A. #531) moved to the six lots to the east of the former end of Cherry Street.

(6) Water System:

The cost of water connections to the additional 44 houses moved in 1928 was included in this account.

(7) Transferring 22 Houses to New Location:

Moving completed in 1927.

Repairing:

Repairs to the 22 houses moved in 1927 were not completed in 1928. Porches and covered rear entrances were erected at some of the houses, the former to improve the general appearance of the location, and the latter to provide shelter. Front porches have to be built on several houses in 1929 to complete this work. Garages and sheds were provided for all the houses, some being those originally with the house at its former site, and the rest being extra structures from the Race Course plat.

Wiring:

All completed in 1928.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION: (Cont.)

a. E. & A. #504 - Moving Race Course Houses: (Cont.)

(7) Transferring 22 Houses to New Location:

Preparing Grounds:

All grading around the houses was finished in 1928. All the material from the basement excavations of the 44 additional houses was used for this purpose, and extra filling was secured from the Maas Mine surface adjacent to the location.

Digging Trees:

Shade trees were set out on all streets during 1928 where they would not interfere with house moving operations. Maple trees were placed on Lake Street, elm trees on Elm Street, and oak trees on Prince Street. The trees were placed in the parkway between sidewalks and the curbs, on the lot lines.

Fencing:

Some fences were built in 1927, and those put in during 1928 were placed where the lot grading was completed early in the season. The balance of fencing will be completed in 1929.

(8) Superintendence and Engineering:

A surface foreman and engineer were employed during the year to superintend all of the work incidental to the new location.

b. E. & A. #513 - Moving 44 Additional Race Course Houses:

Total estimate,	$109,815.47
Total expenditures in 1928,	83,532.58
Unexpended balance Jan. 1, 1929,	26,282.89

Moving, and Foundations.

Early in May the Pfeffer Construction Company commenced work on the foundations at the New Location. A. J. Lindsley, of Hibbing, Minnesota, commenced house moving late in May, and houses were moved as fast as the concrete basements were ready. The following table shows the progress of the work:

	Foundations finished	Houses moved
May	9	3
June	11	11
July	15	15
August	4	10
Total	39	39

Repairing.

Repairing was commenced as soon as the houses were moved, but there was so much to do, however, that this work will not be finished until next summer.

Garages and Sheds.

All houses were supplied with sheds or garages. Some were new, some were brought from the Race Course, and some from the Negaunee Location. A considerable amount of work remains to be done in siding and painting these buildings.

Wiring.

All electrical work for these houses was finished in 1928.

Fencing.

Ten lots were fenced on the south side of Lake Street, completing this block. It was impossible to do any fencing on the other streets, as the grading was not finished until late in the season. Fence posts were placed along the north side of Lake Street just before the ground froze. All fencing will be completed in 1929.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION: (Cont.)

b. E. & A. #513 - Moving 44 Additional Race Course Houses:

Grading and Seeding:

There was more grading necessary than was anticipated. All the preliminary grading has been completed, except the top soil and the seeding. Shrubbery has been planted around approximately 20 houses. This work will be completed in 1929 after fences are erected.

Seven Additional Lots:

These lots are on the north side of Prince Street, east of the Maas Mine Road, and were needed to provide lots for seven Negaunee Mine houses. The houses have been moved to the lots, sewer and water lines installed, and grading completed except surface soil and seeding. No curbs or sidewalks have as yet been constructed in front of these lots.

Compensation Insurance:

There was a small expense in this account in 1928. Starting in April, 2% of the payroll was set up as a reserve.

Superintendence and Engineering:

A regular location foreman and engineer supervised the work under these E. & A's.

c. E & A. #527 - New Pockets, Stocking Trestle, and Pumphouse:

Total estimate,	$39,985.00
Estimated expenditures, 1928,	35,906.62
Unexpended balance, Jan. 1, 1929,	4,078.38

a. Installing Lake Mine Ore Pockets at Maas:

(1) Dismantling and Moving:

Estimate,	$700.00
Expenditures, 1928,	625.02
Unexpended balance,	74.98

The steel shaft house at the Lake Mine was pulled over on its side, and the shipping pockets were dismantled and moved to the Maas Mine. The work was commenced late in June and was completed in July.

(2) Piers:

Estimate,	$150.00
Expenditures, 1928,	73.90
Unexpended balance,	76.10

The four piers of the south pocket were placed in August. The forms for the north pocket were built late in the year, but the concrete was not poured due to freezing weather.

(3) Erecting Pockets:

Estimate,	$1,800.00
Expenditures, 1928,	990.22
Unexpended balance,	809.78

The erection of the south pocket was commenced in August and it went into service the middle of September. The erection of the north pocket was postponed until next spring owing to the pressure of other work.

(4) Planking and Plates:

Estimate,	$500.00
Expenditures, 1928,	664.34
Balance,	164.34 (red)

Enough good planking and plates were salvaged from the Lake Mine Shaft house pockets to line the south pocket. New plate and plank will be required for lining the north pocket when it is built next spring.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION: (Cont.)

c. E. & A. #527 - New Pockets, Stocking Trestle, and Pumphouse:

(5) Chute Closers:

Estimate,	$150.00
Expenditures, 1928,	12.02
Unexpended balance,	137.98

Chute closers were obtained from the Francis Mine head frame, as the ones used at the Lake Mine were not suitable.

General:

Total estimate,	$3,300.00
Expenditures, 1928,	2,365.50
Unexpended balance,	934.50

These two shipping pockets are to handle Race Course ore, which according to the lease must be kept separate from Maas ore. They are located immediately west of the present shaft house, and ore will be transferred in top tram cars from the skip dump, a distance of about 25'.

b. Installing Plunger Pump on Fourth Level:

(1) Aldrich Pump from Boeing Mine:

Estimate,	$3,500.00
Expenditures, 1928,	3,460.87
Unexpended balance,	39.13

An 850 gallons per minute, 350'head, Aldrich plunger pump was received from the Boeing Mine, Hibbing, Minnesota, in July. It has been taken underground but has not yet been installed as the new pumphouse was not finished until the end of the year.

(2) Addition to Pumphouse and Sump:

Estimate,	$1,800.00
Expenditures, 1928,	1,356.28
Unexpended balance,	443.72

A new pumphouse, 20' x 30' in size, just south of the present fourth level pumphouse, was started in August. It was completed at the end of the year. Early in October work was stopped, owing to lack of facilities to handle rock on surface while the steel trestle was being erected. Work was resumed late in November.

(3) Foundations:

Estimate,	$100.00
Expenditures, 1928,	-
Unexpended balance,	100.00

There were no expenditures in this account in 1928. The foundations will be installed in January.

(4) Pipes:

Estimate,	$150.00
Expenditures, 1928,	-
Unexpended balance,	150.00

There were no expenditures for piping in 1928.

(5) Freight and Erecting:

Estimate,	$500.00
Expenditures, 1928,	469.28
Unexpended balance,	30.72

The expenditures in this account cover freight on the pump from Hibbing, Minnesota. There were no erecting charges in 1928.

This pump should be installed and in operation in February, 1929.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION: (Cont.)

c. E. & A. #527 - New Pockets, Stocking Trestle, and Pumphouse:

c. Steel Trestle:

(1) Cost of Trestle, 1026 Ft.

Estimate,	$20,000.00
Expenditures, 1928,	20,755.78
Balance,	755.78 (red)

The contract with the Worden-Allen Company covered the entire cost of trestle, including freight and erection charges.

(2) Excavating Nine Piers:

Estimate,	$450.00
Expenditures, 1928,	465.53
Balance,	15.53 (red)

Excavating for the nine piers commenced in July and was completed in September. The work was done by teams and scrapers, and the material was used for leveling the stocking ground.

(3) Concreting Nine Piers:

Estimate,	$5,900.00
Expenditures, 1928,	4,451.60
Unexpended balance,	1,448.40

The pouring of concrete bases was begun as soon as the forms and re-inforcing bars were in place. Two shifts were required to fill one pier. The bases were completed in October, and were finished in advance of the arrival of the steel erectors. The steel columns were filled with concrete as soon as the steel erectors had completed their work. The last of the concrete was poured early in November. There was approximately 35 cubic yards of concrete required for each base, and 40 cubic yards per column.

(4) Bolts, Washers, Forms:

Estimate,	$400.00
Expenditures, 1928,	627.51
Balance,	227.51 (red)

The expense overran the estimate in this account. The piers under the columns were excavated in loose gravel, and much bracing was required to line up the bases.

(5) Reinforcing Steel:

Estimate,	$1,600.00
Expenditures, 1928,	1,913.66
Balance,	313.66 (red)

Expense overran the estimate in this account due to the use of more steel reinforcing bars in each pier than were used at the Athens. (The estimated cost was based on the cost at the Athens.)

(6) Decking Ties, Walks, Railings, Fastenings:

Estimate,	$2,400.00
Expenditures, 1928,	2,541.07
Balance,	141.07 (red)

Fir ties, 5"x6" x 42" long, spaced 18" apart, creosoted on the job, were used on the steel trestles with a 2" plank runway. Cross walk with railings were placed at each pier. All this work was completed in 1928.

(7) Grading:

Estimate,	$800.00
Expenditures,	661.59
Balance,	138.41

Prior to spreading the rock sollar, the ground surface was leveled off, and a portion of the abandoned county road was cut down about two feet. The high ground was broken with a plow, and the excess material moved with scraper and tractor to the low areas.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION: (Cont.)

c. E. & A. #527 - New Pockets, Stocking Trestle, and Pumphouse:

C. Steel Trestle:

(8) Rock Sollar:

Estimate,	$ 2,500.00
Expenditures, 1928,	2,575.00
Balance,	75.00 (red)

An 8' rock sollar was spread over the entire stocking area, and rolled with the City of Negaunee steam roller. The rock was secured from the mine rock pile lying east of the mine entrance road. A small revolving shovel from Ishpeming was used at first to load, but proved too slow and a Model #60 shovel was later substituted. The rock was hauled by dump trucks and a tractor pulling two wagons, and was spread by hand. Almost the entire pile was moved; the balance must be moved in 1929 as it is on the new stocking grounds. In addition, 1225 truck loads of rock were taken by the City of Negaunee for street sub-grading, for which they paid 50¢ per load. The work on the rock sollar was started in September and was completed late in November.

(9) Sheaves, Rollers, and Rope:

Estimate,	$2,000.00
Expenditures, 1928,	1,269.72
Balance,	730.28

All sheaves, rollers and rope required for equipping the trestle were installed in November.

(10) Laying Rail:

Estimate,	$300.00
Expenditures, 1928,	645.16
Balance,	345.16 (red)

About equal amounts of new and second-hand 40-pound rail was used on the new steel trestle. The estimate did not contemplate the purchase of any new rail.

General:

Total estimate,	$50,270.00
Expenditures, 1928,	43,192.14
Unexpended balance,	7,077.86

There will be additional expenditures in 1929 to complete the shipping pockets and pump installation on the fourth level. The steel stocking trestle was completed in 1928.

d. E. & A. #533 - Painting 30 Houses, Maas Location:

(1) Painting Houses and Sheds:

Estimate,	$4,713.00
Expenditures, 1928,	1,455.94
Unexpended balance,	3,257.06

During 1928, eighteen houses were painted. Rainy weather and uncompleted exterior repairs prevented the rest of the work from being done. This E. & A. will provide for painting the houses that are badly in need of paint.

e. Proposed New Construction:

(1) New Shop Building:

When the present shop building was erected many years ago, the use of tunnels to convey material to and from the shaft was not considered. This was a later development, and as a result the Maas Mine shops are not located so as to use the tunnel. All material has to be hauled to and from the shaft.

12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION: (Cont.)

b. Proposed New Construction:

(1) New Shop Building: (Cont.)

The shops are also smaller than the ones built today for mines with less life than the Maas Mine. When the mine is in condition to produce ore at a lower cost, comparable with the cost at the Negaunee Mine, consideration should be given to the erection of a new modern shop building southwest of the office and near the tunnel to the shaft.

(2) Steel Stocking Trestle West of the Shaft:

It is expected that the accumulation of ore in stockpiles west of the shaft will be removed prior to 1931, when it is planned to increase production to 400,000 tons per year. A steel stocking trestle should be built west of the shaft not later than next year, so as to have it installed prior to the time the mine increases production. If the stocking situation warrants, an E. & A. may be prepared and submitted next fall, and the trestle built.

(3) Development of Fifth Level:

Preparations must be completed in 1929 for sinking the shaft and opening the fifth level. The tonnage of Race Course ore above the fourth level will not last more than two years, so that a new level must be opened and developed in 1930.

13. EQUIPMENT AND PROPOSED EQUIPMENT:

a. Stockpile Trestles:

Twenty wooden bents were erected west of the shaft from the end of the permanent steel trestle for stocking Maas ore. Eight bents were put up at the east end of the south track of the new steel trestle for permanent rock trestle.

An additional rock trestle will be erected beyong the north tram at the east end of the new steel trestle, to give additional stocking capacity for rock.

b. Scraper Hoists:

The mine is now equipped with the following scraper hoists:

	On Hand 1/1/1928	Received 1928	On Hand 1/1/1929
Ingersoll-Rand air,	20	2	22
Denver air,	1	1	2
Sullivan air,	1	0	1
Sullivan 6½ H.P. electric,	7	0	7
Sullivan 15 H.P. electric,	1	0	1
Denver 7½ H.P. electric,	0	1	1
Total	30	4	34

Two new Ingersoll-Rand air hoists were purchased and charged out in 1928. Ten second hand hoists were charged out during the year as follows: 2 from the Boeing Mine and 8 from Gwinn. These second-hand hoists from Gwinn were received at the mine late in 1927.

New hoists purchased in 1929 will be 15 H.P. electrics, which have been proven to be best suited for this work.

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14. MAINTENANCE AND REPAIRS:

There were no extraordinary repairs made during the year. Some expense was incurred in repairing the dry roof where the lumber had rotted due to heat and sweating.

15. POWER:

Electric power was supplied during the year by the Cliffs Power and Light Company, a subsidiary of the Cleveland-Cliffs Iron Company. There were no serious delays due to lack of current. The minor delays from this cause are listed under 2-h.

The rate charged for current was 1½¢ per k.w. hour, the same as last year.

The steam turbine was operated once during the year, September 10th, on account of an accident to a hydroelectric plant.

17. CONDITION OF PREMISES:

The premises at the Maas Mine were kept in good condition during the past year. Some additional planting was done in the spring, completing work started in the fall of 1927.

In the fall barberry bushes were planted near the fence on the west line of the lawn. Additional bushes are needed to complete this planting.

18. NATIONALITY OF EMPLOYEES:

This has been prepared under two statements. The first statement gives the report as has been ordinarily submitted to the Company, that is, it shows the nationality of employees according to parentage. The second statement divides the employees according to country of birth.

Nationality of Employees:		Country of Birth		Percent
Americans	38	United States	72	39
English	44	England	38	20
Finnish	51	Finland	42	22
Italians	18	Italy	17	9
Swedish	15	Sweden	13	7
French	8	Canada	4	2
Danish	2	Denmark	1	½
Irish	5			
Germans	5			
Scotch	2	Scotland	1	½
	188		188	100%

19. MAAS CRUSHER:

	1928	1927	Decrease, 1928
PRODUCT	137,194	221,866	84,672
Composed of:			
Hard Ores	118,197	177,880	59,683
Hematite	18,997	43,986	24,989

The crusher operated 136 single 9 hour shifts in 1928, as compared with 201 shifts in 1927 as follows:

129	1 - 9 hour shifts
8	2 - 9 " "
28	1 - 11 hour "
14	2 - 11 " "

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19. MAAS CRUSHER:

Average tons crushed per shift, 1928 - 1,009 tons
Average tons crushed per shift, 1927 - 1,104 "

Cost at Crusher for 1928 and 1927:

	1928	Cost per ton	1927	Cost per ton
PRODUCT	137,194		221,866	
General Expense	$ 1,046.81	$.008	$ 6,542.31	$.029
Maintenance	7,465.06	.055	20,208.06	.091
Operating	9,120.02	.068	13,385.57	.061
Depreciation	6,739.30	.050	11,093.30	.050
Switching	1,743.06	.013	2,858.40	.013
Total	26,114.19	.194	54,087.60	.244

The 1928 figures are for ten months only, on account of not having the November or December crusher statements. The 1927 figures are for twelve months.

The main items for maintenance for each year were as follows:

1928.		1927.	
Repair pan conveyor,	$1,918.24	New conveyor belt,	$1,823.52
One pitman,	714.00	Two new toggles,	229.50
Five idlers,	164.35	New main shaft for reduction crusher,	1,687.24
Jaw Plates,	1,517.60	Jaw plates,	567.93
Wearing plates renewed,	160.42	Wearing plates renewed,	238.52
Repair 100 H.P. motor and sprocket for pan conveyor,	1,044.70	Concaves for reduction crusher,	394.44
Total,	5,519.31		4,941.15

General repairs, involving the re-assembly of the pan conveyor, were commenced in March and were completed when the first Ogden ore reached the crusher April 27th. The premises were also cleaned up, and all the ore spilled under belts was loaded into railway cars and shipped. The last ore was crushed early in November.

During October and November the second unit, consisting of screens, Superior fines crusher, conveying belt, steel building housing crusher and screens, and frame work supporting the conveying belt, were dismantled and shipped to the new Tilden Pit.

The jaw crusher will be removed next spring and shipped to the Holman Cliffs Pit on the Mesaba Range, and the old #7½ McCulley gyratory crusher will be installed again to crush hematite ores. Some changes of chutes, etc., will have to be made at this time. All expense in connection with this work should be charged to the jaw crusher. The small amount of hematite ore now being crusher at the Maas plant will not permit a low cost for crushing these soft ores in 1929.

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1. GENERAL:

The mine operated throughout the year on one eight hour shift, five days per week, the same as in 1927. All time lost on account of holidays was made up by working Saturdays.

Stoping continued in 1928 in the same territories that were being mined in 1927, namely, above the fourth level on the south foot wall, just above and below the sixth level on both the north and south sides of the fault dike, and north of the fault dike just below the fourth level. The last of the year, mining started south of the fault dike just below the fourth level. The only development work done in 1928 consisted of raising on the north and south side of the fault dike from the sixth level, nearly to the fourth level, and driving a new ore drift on the eighth level.

The grade of ore was slightly above the guarantee except on the Mitchell Lease, where the product averaged 59.50 iron. The ore on the hanging side on this lease is now high grade, but on the foot side it is low grade.

Labor conditions were quite satisfactory during 1928. As in previous years, the labor turnover was negligible.

The mine is in good condition, and a much larger product can be obtained on short notice by adding a night shift to tram and hoist.

2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production by Grades:

There is only one grade of ore at this mine, namely, Athens ore. Most of the ore produced in 1928 came from the parcels owned in fee, the balance from the Mitchell Lease. The distribution of the product is as follows:

Grade	1928	1927	INCREASE	DECREASE
Athens Ore	184,205	187,457		3,252
Mitchell Lease	57,385	45,291	12,094	
Total Ore	241,590	232,748	8,842	
Rock	387	473		86

During the year twelve tons of ore were transferred from Corbit Lease to Athens fee.

b. Shipments:

Grade of Ore	Pocket Tons	Stockpile Tons	Total Tons	Total Last Year
Athens Ore	1,912	255,422	257,334	200,746
Mitchell Lease	0	62,866	62,866	46,602
Lucky Star	0	40	40	0
Total	1,912	318,328	320,240	247,078
Total Last Year	4,199	242,879	247,078	
Decrease	2,287			
Increase		75,449	73,162	

Shipments increased in 1928, and exceeded production by 88,650 tons.

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2. PRODUCTION, SHIPMENTS & INVENTORIES:

c. Stockpile Inventories:

The ore by grades in stock December 31, 1928, is shown below:

Athens Fee	78,204 tons
Mitchell Lease	9,258 "
Total	87,462 "

On December 31st, 1927, there was in stock 166,112 tons. The decrease in 1928 was 78,650 tons. There was an increase in overrun in 1928, so that stockpile capacity is not much greater than in the previous year.

d. Division of Product by Levels:

The ore hoisted from the various levels was as follows:

Fourth Level	60,314 tons
Eighth Level	181,276 "
Total	241,590 "

3. ANALYSIS:

e. Production by Months:

The production by months is as follows:

Month	Athens	Mitchell Lease	Total	Rock
January	15,384	4,681	20,065	
February	15,971	3,998	19,969	
March	14,360	5,520	19,880	
April	15,250	5,036	20,286	131
May	16,464	4,353	20,817	
June	14,993	3,810	18,803	
July	16,017	5,078	21,095	
August	16,171	5,348	21,519	
September	14,205	3,985	18,190	
October	16,319	5,117	21,436	109
November	14,205	5,203	19,408	147
December	14,866	5,256	20,122	
Total	184,205	57,385	241,590	387
Total, 1927	187,457	45,291	232,748	473
Increase		12,094	8,842	
Decrease	3,252			86

4. ESTIMATE OF ORE RESERVES:

f. Ore Statement:

	Athens	Mitchell Lease	Corbit Lease	Lucky Star	Total	Total Last Year
On Hand Jan. 1, 1928	151,281	14,739	12	40	166,072	180,442
Output for Year	184,205	57,385	0	0	241,590	232,748
Transferred	12		12(red)			
Total	335,498	72,124	0	40	407,662	413,190
Shipments	257,294	62,866	0	40	320,200	247,078
Balance on Hand	78,204	9,258	0	0	87,462	
Increase in Output					8,842	
Decrease					78,650	

1928 - 1-8 hour shift 5 days per week, January 1st to December 31st, 1928.

1927 - 1-8 hour shift 5 days per week, January 1st to December 31st, 1927.

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2. PRODUCTION, SHIPMENTS & INVENTORIES:

g. **Delays:**

The non-electrical delays were as follows:

December 14th. Eight hours delay due to broken strand in hoisting rope, on south skip. This delay was made up by working on Saturday, December 29th.

h. **Delays from Lack of Current:**

The delays from lack of current during the year were as follows:

March 14th, 1 hour delay due to no power.
March 15th, ½ hour delay due to no power.
August 8th, 2 hours " " " " "
September 7th, 4 " " " " " "
September 17th, 1 hour " " " " "
October 8th, 3 hours delay due to burning out of cage hoist oil switch during an electrical storm.

3. ANALYSIS:

a. **Average Mine Analysis on Output:**

Grade	IRON	PHOS.	SILICA
Athens	61.12	.126	5.42
Mitchell Lease	59.50	.126	5.86

b. **Average Analysis on Straight Cargoes:**

	Mine			Lake Erie	
Grade	Iron	Phos.	Moist.	Iron	Moist.
Athens	61.32	.118	-	(All mixed)	
Mitchell Lease	(All mixed)				
Corbit Lease	(All mixed)				
Lucky Star	(All mixed)				

c. **High Sulphur Ore:**

No high sulphur ore was encountered during the year in mining or development work.

4. ESTIMATE OF ORE RESERVES:

a. **Developed Ore:**

Assumption: 12.75 cubic feet equals one ton.
10% deduction for rock.
10% deduction for loss in mining.
Percentage of Bessemer equals 0.

Fourth Level and above,	1,079,489 tons
Fourth level to sixth, north side of dike,	357,162 "
Sixth level to 660' sub, north side of dike,	198,863 "
Sixth level to 660' sub, south side of dike,	352,326 "
660' sub level to eighth level,	1,146,674 "
Eighth level to ninth level,	464,050 "
Ninth level to tenth level,	380,938 "
Below tenth level,	57,534 "
Total developed ore	4,037,036 "

Developed ore decreased 294,239 tons. The product was 241,590 tons, so that the ore reserves decreased 52,649 tons in excess of the product. This was due to the ore being cut off by jasper, which decreased the ore area in a few localities.

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4. ESTIMATE OF ORE RESERVES:

b. Prospective Ore:

Fourth level to sixth level, south side of dike,	1,864,066 tons
Total all ore,	5,901,102 tons
Decrease from 1927 estimate,	304,489 tons

Prospective ore shows a decrease of 10,250 tons, due to ore removed by raises in the undeveloped area south of the fault dike.

c. Estimated Analysis:

Ore Reserves; Approximate Expected Natural Analysis.

	Iron	Phos.	Silica	Alum.	Mang.	Lime	Mag.	Sul.	Igni.	Moist.
Athens Ore	52.50	.120	5.00	2.50	.430	.870	.851	.011	1.44	13.25

Ore in Stock: Average Natural Analysis.

	Iron	Phos.	Silica	Alum.	Mang.	Lime	Mag.	Sul.	Igni.	Moist.
Athens Ore	53.16	.110	4.49	2.51	.436	.870	.851	.011	1.44	13.00

5. LABOR AND WAGES:

a. Comments:

(1) Labor:

There was no labor shortage during the year.

(2) New Construction:

None.

b. Comparative Statement of Wages and Product:

	1928	1927	INCREASE	DECREASE
PRODUCT	241,590	232,748	8,842	
No. Shifts and Hours	1-8	1-8		
AVERAGE NO. MEN WORKING:				
Surface	35	35		
Underground	124	123	1	
Total	159	158	1	
AVERAGE WAGES PER DAY:				
Surface	4.46	4.48		.02
Underground	5.01	5.08		.07
Total	4.88	4.94		.06
WAGES PER MONTH OF 22 DAYS:				
Surface	108.48	107.53	.95	
Underground	112.58	114.20		1.62
Total	111.65	112.72		1.05
PRODUCT PER MAN PER DAY:				
Surface	23.66	23.09	.57	
Underground	7.23	7.02	.21	
Total	5.54	5.38	.16	
LABOR COST PER TON:				
Surface	.189	.194		.005
Underground	.693	.724		.031
Total	.882	.918		.036

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5. LABOR AND WAGES:

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

	1928	1927	Increase	Decrease
TONS PER MAN PER DAY:				
Stoping	18.52	17.04	1.48	
Ore Development	10.33	8.85	1.48	
Total	17.96	16.70	1.26	
AVG. WAGES CONTRACT MINERS	5.57	5.66		.09
TOTAL NUMBER OF DAYS:				
Surface	10,211½	10,080	131½	
Underground	33,431	33,154 3/4	276 1/4	
Total	43,642½	43,234 3/4	407 3/4	
AMOUNT FOR LABOR:				
Surface	45,559.78	45,162.40	397.38	
Underground	167,475.94	168,557.42		1,081.48
Total	213,035.72	213,719.82		684.10

Proportion of Surface to Underground Men:

1928 - 1 to 3.54 One 8 hour shift five days per week.
1927 - 1 to 3.51 One 8 hour shift five days per week.
1926 - 1 to 3.68 One 8 hour shift five days per week.
1925 - 1 to 3.80 One 8 hour shift five days per week.
1924 - 1 to 3.99 One 8 hour shift five days per week.

6. SURFACE:

a. Buildings, Repairs:

There were only a few minor building repairs during 1928.

b. Stockpiles:

Two bents were erected on the east end of the south trestle for stocking ore from the Mitchell Lease. Six other bents have been framed and will be erected early in the new year. This wooden trestle will give another stocking area for Mitchell Lease ore, so that this ore can remain in stock for three or four months before being shipped. It also increases the stockpile capacity approximately 50,000 tons.

7. UNDERGROUND:

a.

b.

c. Timber Treating Plant:

The comparative cost of treating timber for 1928 and 1927 is as follows:

	Cost of treating, per foot	
	1928	1927
Peeling	.0312	.0312
Framing	.0128	-
Treating	.0416	.0279
Decking	.0126	.0083
Unloading	.0074	-
Zinc Chloride	.1021	.0325
Heat, Water, etc.	.0098	.0093
Total	.2175	.1092
Increase, 1928 -	.1083	

Number of pieces treated, 1928 - 2,098 Number of feet, 18,018
Number of pieces treated, 1927 - 2,661 Number of feet, 23,135

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6. SURFACE:

c. Timber Treating Plant: (Cont.)

	1928	1927
Number of pieces used at the Athens Mine -	1,210	524
" " shipped to Maas Mine -	106	425
" " shipped to Negaunee Mine -	483	286
" " shipped to Holmes Mine -	225	617
" " shipped to Morris-Lloyd Mine -	-	964
Total pieces used and shipped -	2,024	2,816
Decrease in 1928 -	792	

	Treated Timber on hand 12/31/28	Peeled untreated timber on hand 12/31/28
9' pieces	1,173	589
8' pieces	226	458
7' pieces	19	-
Total	1,418	1,047
Total, 1927	1,758	2,435

The new two compartment concrete treating tank that was built in the summer of 1927 was put in service last summer. Additional heating pipes were installed and the steam line from the heating plant was covered to decrease the loss by radiation. It was not possible to get sufficient heat until these improvements were made. The treating solution, however, cooled very rapidly, and covers were then made for the hot tank, after which treatment was conducted under proper temperatures to give good penetration. It soon developed that the concrete tanks would not stand the higher temperature and cracked, permitting the treating solution to escape. Treating of timber was then abandoned, as there was a fairly large stock on hand. A study is now being made of treatment tanks, and definite recommendations will shortly be made.

7. UNDERGROUND:

a. Shaft Sinking:

There was no shaft sinking at the Athens Mine during the year.

b. Development:

Early in the year raising was completed in the last of the five raises put up to develop the ore below the fourth level in the territory on the north side of the fault dike, at the northeast end of the sixth level. When this territory had been mined down to the third sub below the fourth level, a drift was driven through the fault dike, which encountered a greater width of ore on the south side of the dike than was expected at this elevation. Raising was then started from the sixth level crosscut running parallel to and south of the dike. Six raises were needed between the old workings on the south side of the dike and the new mining limit set in 1927 to protect #610 ventilation raise. At the end of the year two of these raises had been put up to the jasper hanging wall, just below the fourth level, and the remaining four were up more than 120', or high enough to be connected on the -480' sub, the intermediate sub level between the fourth and sixth levels.

Below the sixth level on the south side of the dike and to the west, the slate foot wall was found coming in from the south on the third sub below the sixth level. This is the point where the jasper hanging wall makes contact with the footwall, and is the elevation where the greatest width of ore may be expected south of the dike.

Early in May a drift was started to the west from the old diamond drill hole crosscut on the eighth level. This drift was driven to the northwest corner of the ore area being mined above the eighth level in order that two raises might be put up to mine the ore that is too far away from the other raises for economical mining. The drift was finished in November and the

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7. UNDERGROUND:

b. Development: (Cont.)
first raise was started at the end of the year.

c. Stoping:
At the beginning of the year mining operations were being carried on in three separate territories: (1) On the south foot wall along the east edge of the property above the fourth level; (2) On the south side of the fault dike west of #610 ventilation raise just below the fourth level; (3) To the west of the second territory on both the north and south sides of the fault dike below the sixth level.

Mining was continued in these three territories throughout the year without any decided changes, except as mentioned under "Development." The territory on the south side of the dike, #2 in the preceding paragraph, was opened and mining was started under the jasper hanging wall in September. This area will take the place of the territory above the fourth level which is diminishing in size on each sub level.

The detail of mining on the various levels and sub levels is as follows:

Subs above the fourth level:

Most of the ore mined above the fourth level during the year came from Mitchell Lease lot #11, with a small proportion from Athens lots #10 and #12.

-300' Sub Level:

Mining was completed on this sub level in February. On this sub level the jasper mixed with dike stringers, which forms the east boundary of the ore body, started pitching rather flatly to the west to decrease successively the areas mined below.

-315' Sub Level:

Work was started on this sub level late in 1927, and was completed in June, 1928, the outline of the ore being only slightly smaller than on the sub level above. The mining of the ore body north of the jasper split was discontinued below this sub level, as it can be more easily reached from the east when the next step in this territory reaches this elevation.

-330' Sub Level:

This sub level, again showing a decrease in ore area from the one above, was opened in May and completed in October.

-340' Sub Level:

Work was started at this elevation in October, and the ore limits have been outlined and show that the ore area is again smaller than on the sub above, due to farther encroachment of the jasper and dike on the east side. Six contracts were working here in December.

Subs above the sixth level:

-415' Sub Level:

This sub level is immediately below the fourth level, and was opened on the north side of the fault dike in 1927 and mining completed in April, 1928. A greater width of ore was found than had been expected between the jasper hanging wall and the fault dike at the east end of the sub level. Two of the raises put up from the sixth level on the south side of the dike proved the jasper hanging wall to be approximately the same elevation as on the north side of the dike. Mining was started on the south side in September. The ore area was small, due to the downward curvature of the jasper hanging wall on all sides, and mining was completed in December.

-430' Sub Level:

Mining was started on the north side of the dike early in the year, and was completed in October. As was expected, the ore area was larger than on the sub above, due to the northward dip of the jasper hanging wall. Mining was started south of the dike by one contract, which worked there during the latter part of December.

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7. UNDERGROUND:

c. Stoping: (Cont.)

-445' Sub Level:

On the north side of the dike mining started at the west end of the ore area in March and was continued until June. Operations were then stopped because the development drift to the south of the dike encountered a greater width of ore than was expected. Mining was resumed in October, after mining had started two subs above on the south side of the dike. There were four contracts working on this sub level in December.

-480' Sub Level:

A double compartment branch raise was put up from the east raise on the north side of the dike from the -480' sub level to the -430' sub level to speed up the mining of ore at the east end of the -415' sub level. A drift was driven through the dike to connect with the new raises on the south side of the dike.

One contract was advancing this drift in December.

-575' Sub Level:

A short drift from #630 to #631 raise was completed at this elevation in October. It was driven to enable #631 raise, which was caving, to be carried through this caving area.

Sixth Level:

#642, the west raise of the five in #4 crosscut on the north side of the dike, was extended 68' in January to the -430' sub level.

Six double compartment raises, #629 to #634 inclusive, were started from #3 crosscut on the south side of the dike during the last half of the year. Two of these raises on the east end were put up in ore to the jasper hanging immediately below the fourth level, and the remaining four are all [redacted] 110', up to the elevation of the 480' sub level.

One contract was raising in the west, or #634, raise in December.

Subs above the eighth level:

-600' Sub Level:

Mining on the south side of the fault dike on this sub level was started in 1926, and was completed in March, 1928.

-615' Sub Level:

Mining on the south side of the fault dike on this sub level was started in 1926 and completed in November. The available areas and geological conditions were practically the same as on the sub level above.

-635' Sub Level:

This sub level was opened in 1927 on the north side of the fault dike, and mining is now 80% completed. The west part of the ore area on this sub level was mined during the year, and the slate foot wall was encountered for the first time coming in from the south. The width of the ore south of the dike will decrease as mining is carried to lower elevations, because of the northerly dip of the slate foot wall toward the dike. Mining of the east area on this sub level was started in November. Three contracts were working here in December.

-645' Sub Level:

Mining was started on this sub level on the north side of the dike late in 1927, and was completed in October, 1928. The outline of the ore was practically the same as on the sub level above.

Mining was started on the south side of the dike in October, 1928, and two contracts were working here in December.

-660' Sub Level:

Mining was started on this sub level in March, 1928. The area on the north side of the fault dike is being mined. The jasper hanging wall in the northeast corner of this area has descended farther to the west along the south side of the dike than was anticipated. This has reduced the ore area on this sub level. There were six contracts working here in December.

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7. UNDERGROUND:

c. Stoping: (Cont.)

-675' Sub Level:

Mining was started in October on this sub level, on the north side of the dike. There were five contracts working here in December.

-720' Sub Level:

This sub level, which is half way between the -625' sub level and the eighth level, was opened in 1927 and drifting continued until July, 1928. About 850' of ore drifting was done to connect all the raises from the eighth level, including the two ventilation raises to the sixth level. The development work on this sub level aids ventilation and provides a traveling road and facilities for handling and storage of timber.

Eighth Level:

In May a drift was started to the west towards the old workings from the old diamond drill crosscut. It was completed early in December. The other haulage drifts on the eighth level were not located in the right position for raises to be put up to mine an ore area on the -675' sub level.

One of the two raises to be put up from this new drift was started in December. When mining is started from this new raise, the large area now mined from the three present raises will be reduced to economical haulage limits for scraper hoists. One contract was raising from the eighth level in December.

d. Timbering:

e. Statement of Timber Used:

	LINEAR FEET	AVG. PRICE PER FOOT	AMOUNT 1928	AMOUNT 1927
6" to 8" Timber	93,290	.0411	3,838.68	3,961.67
8" to 10" "	69,840	.0620	4,329.76	4,631.85
10" to 12" "	39,714	.0878	3,488.82	2,419.12
12" to 14" "	26,100	.1627	4,245.40	2,020.71
Total Timber - 1928	228,944	.0695	15,902.66	
Total Timber - 1927	207,431	.0628		13,033.35
		Per 100'		
7' Lagging	806,315	.7298	5,884.23	5,423.86
Poles, 9½'	369,048	1.5712	5,798.42	3,762.28
Total, 1928 -	1,175,363	.9940	11,682.65	
Total, 1927 -	1,015,411	.9047		9,186.14
Covering Boards, 1"	84,800	18.5782 M	1,575.43	1,068.88

f.

Product for year	241,590	232,748
Feet of Timber per ton of ore	.948	.891
Feet of Lagging per ton of ore	3.338	3.303
Feet of Lagging per foot of timber	3.522	3.706
Cost per ton for timber	.0658	.0560
" " " lagging	.0244	.0233
" " " covering boards	.0065	.0046
" " " poles	.0240	.0162
" " timber, lagging, poles & boards,	.1207	.1001
Equivalent of stull timber to board measure	428,408	333,603
Feet of board measure per ton of ore	1.773	1.433

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7. UNDERGROUND:

d. Timbering: (Cont.)

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

YEAR	AMOUNT	COST PER TON
1928	$29,160.74	$.1207
1927	23,288.37	.1001
1926	21,637.70	.0956
1925	27,082.05	.1288
1924	24,403.00	.0984
1923	23,356.15	.0951
1922	16,566.21	.0857
1921	23,169.19	.1316
1920	22,622.15	.1146

The feet of timber per ton of ore increased again in 1928, due to more development drift in ore and to more repairing of drifts. The cost per ton for timber increased due to the use of more large sizes of timber on account of more ore development. The cost for poles increased 50%, or .8 of a cent per ton, on account of more poles used for covering down on sub levels.

The cost for timber, lagging, etc., increased 20% in 1928, due to the reasons enumerated above.

e. Drifting and Raising:

The following statement gives comparative figures of drifting and raising for the years 1928 and 1927.

YEAR	ORE DRIFTING	ORE RAISING	ROCK DRIFTING	ROCK RAISING	TOTAL
1928	951'	1,097'	30'	0'	2,078'
1927	38'	922'	121'	0'	1,081'
Decrease			91'		
Increase	913'	175'			997'

Increase in drifting and raising - 92%.

This large increase was due to opening the -720' sub level as an intermediate level, for ventilation and access to the sub levels being mined above. The total feet of raising was slightly greater than in the previous year. The immediate program of raising has not been completed, but should be finished early in 1929.

f. Explosives, Drilling and Blasting:

Statement of Explosives Used:

	Quantity	Average Price	1928 Amount	1927 Amount
50% Am. Gel.	65,100	13.89 C	9,040.04	8,599.92
60% Am. Gel.	30,450	15.14 C	4,609.50	3,867.25
Total Powder - 1928	95,550	14.29	13,649.54	
Total Powder - 1927	85,300	14.62		12,467.17
Fuse	315,100'	5.91 M	1,861.24	1,811.39
Caps	51,500	10.91 M	562.09	506.99
Cap Crimpers	14	8.00 Dz	9.32	10.67
Connecting Wire	10	.383	3.83	
Tamping Bags	5,000	2.15 M	10.75	
Total Fuse, etc. 1928			2,447.23	
Total Fuse, etc. 1927				2,329.05
Total All Explosives - 1928			16,096.77	
Total All Explosives - 1927				14,796.22

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7. UNDERGROUND:

f. Explosives, Drilling and Blasting: (Cont.)

	1928 Amount	1927 Amount
Product	241,590	232,748
Pounds of powder per ton of ore	.3955	.3665
Cost per ton for powder	.0565	.0536
" " fuse, caps, etc.	.0101	.0100
" " all explosives	.0666	.0636

Sinking, Rock Development, etc.

	Quantity	Average Price	1928 Amount	1927 Amount
50% Am. Gel.	300	13.75 C	41.25	21.37
60% Am. Gel.	850	15.00 C	127.50	124.00
Total Powder - 1928	1,150	14.67	168.75	
Total Powder - 1927	950	15.30		145.37
Fuse	1,900'	5.86 M	11.13	13.71
Caps	200	10.65 M	2.13	7.40
Cap Crimpers	4	8.00 Dz.	2.67	.67
Total Fuse, etc. 1928			15.93	
Total Fuse, etc. 1927				21.78
Total All Explosives - 1928			184.68	
Total All Explosives - 1927				167.15
Total Explosives Used in Mine, 1928 -			16,281.45	
Total Explosives Used in Mine, 1927 -				14,963.37
Average price per pound for powder			.1429	.1462

This statement shows an increase of 12% in the amount of powder used in 1928, while production increased only 3.8%. The increase in amount of powder used was due to more mining in areas where the ore was tough and hard to break, to more raising, and more drifting. The price of powder decreased 2.2% in 1928.

The total cost per ton for all explosives increased 4% in 1928.

g. Mining and Loading:

There was no change in the mining methods during the past year. Sub levels have been opened at intervals of about 12', the same as in previous years.

The mine is now fully equipped with scraper hoists, but the horsepower of the machines in two areas is not large enough to give good results. This condition will be remedied by the purchase of 15 H.P. electric hoists to replace the present 6½ H.P. electrics. Three new double drum air hoists were purchased in 1928, making a total of thirty. Several second-hand hoists from the Gwinn District were received in November, 1927, and paid for in 1928.

The following statement shows the product handled by mechanical loaders and by hand shoveling in 1928:

	1928 Tons	1927 Tons	1928 % of Product	1927 % of Product	Incr. tons per man over hand shoveling
Hand Shoveling	20,348	59,363	8.4%	25.5%	
Scrapers	221,242	173,385	91.6%	74.5%	67%
Total	241,590	232,748	100 %	100 %	

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7. UNDERGROUND:

g. Mining and Loading: (Cont.)

	Scrapers		Hand Shoveling	
	1928	1927	1928	1927
Average tons per man	18.97	20.23	11.38	11.05

i. Ventilation:

Ventilation, on the whole, was good during the past year. The main fan worked satisfactorily. Three booster fans were installed to force air into the subs above the eighth level, where the air conditions were not good, due to heat and low oxygen content of the air. This condition was due to rotting of the timber mat over the sub levels. Considerable expense was incurred in 1928, in re-opening to full size the airways on and between levels, that had crushed. This work was not entirely completed at the end of the year.

j. Pumping:

The number of gallons pumped per minute in 1928 as compared with 1927 and 1926 is shown by the following report:

Month	1928	1927	1926
January	233	261	262
February	231	257	243
March	228	251	274
April	227	239	285
May	227	232	274
June	227	233	280
July	227	239	274
August	228	238	274
September	230	236	277
October	230	236	277
November	227	235	254
December	224	234	256
Total average	228	242	268

The average gallons pumped per minute for the past seven years is as follows:

Year	Gals. per minute
1928	228
1927	242
1926	268
1925	251
1924	218
1923	195
1922	164

The average number of gallons pumped per minute decreased both in 1928 and 1927, and are now down near the average in 1924.

k. Shaft:

There is no evidence of disintegration of the concrete in the section of shaft from 200' to 400' below the collar that was gunited in 1926.

Starting in 1927 and continuing through 1928, it was found that the steel skip road dividers in the shaft from surface to 700' below the collar were getting loose and in some cases were cracked. This apparently followed excessive wear of rivets, and was due to lack of brace supports back of the skip runners. 90 new steel dividers were purchased in the fall, of a changed design, to overcome structural weakness in the old dividers. The work of installing these new dividers was started several months ago. This work is being done gradually over the week-ends, the old dividers in the worst condition being replaced first. It will be continued until all the old dividers are replaced.

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7. UNDERGROUND:

1. Underground in General:

Conditions in the mine have been good throughout the year. The success of the method of mining by separate steps ascending from west to east along the fault dike is now well established. Since the middle of the year the ore has been handled entirely by scrapers. Conditions in nearly all working places are ideal for scrapers; in a few places water interferes and ditching is necessary.

No changes were necessary in primary ventilation, but three blowers were installed on the -720' sub level, the new intermediate sub level between the sixth and eighth levels, to improve ventilation on the sub levels being mined above.

Considerable repairing was done during the year on the main levels, due to crushing of timber. This was due to rotting of treated timber that had been in service for several years, and also to comparatively new treated timber that broke down, due to excessive pressures. A systematic repair program has also been under way for the past six months to open up all ventilation drifts and raises, many of which were partially crushed.

8. COST OF OPERATING:

a. Comparative Mining Costs:

	1928	1927	INCREASE	DECREASE
PRODUCT	241,590	232,748	8,842	
Underground Costs	1.248	1.245	.003	
Surface Costs	.225	.235		.010
General Mine Accounts	.082	.075	.007	
Cost of Production	1.555	1.555		
Loading and Shipping	.035	.031	.004	
Total Cost on Cars	1.590	1.586	.004	
Depreciation - Plant and Equipment	.138	.155		.017
Depletion	.082	.086		.004
Movable Equipment	.002	-	.002	
Development	.089	.089		
Taxes	.396	.434		.038
Increment Depletion	.200	.200		
Central Office	.066	.058	.008	
Welfare, Safety, Hosp.	.032	.015	.017	
Cost Adjustment	-	.009		.009
Misc. Debits & Credits	.003(red)	.013(red)	.010(red)	
Administrative Expense	.050	.050		
Total Cost at Mine	2.642	2.669		.027
No. of Days Operated	261½	260	1½	
No. Shifts & Hours	1-8 hr.	1-8 hr.		
Average Daily Product	921	895	26	
COST OF PRODUCTION:				
Labor	.898	.938		.040
Supplies	.657	.617	.040	
Total	1.555	1.555		

The cost of production for the two years is exactly the same, a very unusual occurrence. The interesting feature is the decrease in labor cost being offset by a corresponding increase in supply cost. Labor costs decreased due to the use of more scrapers(the mine has operated 100% scrapers for the past several months). Supply costs increased due to expenditures of $3,109.33 more in 1928 for scraper hoists,(.013 per ton), to more supplies

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8. COST OF OPERATING:

a. Comparative Mining Costs: (Cont.)
on account of using more scraper hoists, to more timber and explosives used, to more expense for personal injury on account of setting up a 2% reserve, and to more expense for loading and shipping on account of a larger tonnage shipped in 1928.

The decrease in total cost in 1928 of .027 per ton was in "Depreciation Account (Plant and Equipment)", and in "Taxes".

b. Detailed Cost Comparison:

(1) Days and Shifts:

During 1928, the mine worked one eight hour shift, five days per week, the same as in 1927. There were 261½ days worked in 1928, and the average number of men employed during the year was 159, for a total of 43,642½ days. During 1927 the mine worked 260 days, and the average number of men employed during the year was 158, for a total of 43,234 3/4 days.

(2) Wages:

The mine operated on the same wage schedule in 1928 and 1927.

(3) Comparison of Production:

Production, 1928 -	241,590	tons
Production, 1927 -	232,748	"
Increase -	8,842	"

(4) Comparison of Number of Men and Wages:

	No. Men	No. Days	Amount	Rate per day
1928 -	159	43,642½	$213,035.72	$ 4.88
1927 -	158	43,234 3/4	213,719.82	4.94
Increase	1	407 3/4		
Decrease			674.10	.06

(5) Tons per man per day:

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

	1928	1927	Increase	Inc. in 1927 over 1926
Surface	23.66	23.09	.57	.09
Underground	7.23	7.02	.21	.28
Total	5.54	5.38	.16	.17

(6) Cost of Production:

1928 -	$375,952.87	Cost per ton,	$1.555
1927 -	361,978.43	" " "	1.555
Incr.-	13,974.44		.000

	Total Cost				Cost per ton		
	Labor	%	Supplies	%	Labor	Supplies	Total
1928 -	$217,040.17	57.75	$158,912.70	42.25	$.898	$.657	$1.555
1927 -	218,297.00	60.25	143,681.43	39.75	.938	.617	1.555
Increase			15,231.27		.040		
Decrease	1,256.83				.040		

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8. COST OF OPERATING:

b. Detailed Cost Comparison: (Cont.)

(7) Detail of Accounts:

UNDERGROUND COSTS:

Development in Rock

1928 Amount	$ 111.93	Cost per ton,	$.000
1927 Amount	575.46	" " "	.002
Decrease	464.53		.002

Sub Division.

	Drifting	Per Foot	Raising	Per foot
1928 -	30'	$3.70	None	-
1927 -	121'	4.36	None	-

The decrease in expenditures and in cost per ton was due to less rock drifting in 1928.

Development in Ore

1928 Amount	$7,329.86	Cost per ton,	$.030
1927 Amount	4,990.76	" " "	.021
Increase	2,339.10		.009

Sub Division.

	Drifting	Raising	Total	Cost per Ft.
1928 -	951'	1,097'	2,048'	$ 3.58
1927 -	111'	922'	1,033'	4.83
Increase	840'	175'	1,015'	1.25 Decr.

Increase due to more drifting and raising in 1928. In 1928, there were 9,401 tons of ore mined in development work, at an average of 10.33 tons per man per day, while in 1927 there were 5,222 tons of ore mined at an average of 8.85 tons per man per day, or an increase in 1928 of 4,179 tons and 1.48 tons per man per day.

Stoping

1928 Amount	$101,707.14	Cost per ton,	$.421
1927 Amount	102,455.27	" " "	.440
Decrease	748.13		.019

Detail.

	Labor		Supplies	
1928 -	$73,129.03	71.9%	$28,578.11	28.1%
1927 -	79,559.01	77.7%	22,896.26	21.1%
Decrease	6,429.98		Incr. 5,681.85	

In 1928, there were 232,189 tons mined in stoping operations, averaging 18.52 tons per man per day, while in 1927, 227,526 tons were mined, averaging 17.04 tons per man per day. The increase in 1928 was 4,663 tons and 1.48 tons per man per day.

In 1928, there were three new Ingersoll-Rand air scraper hoists, costing $1,981.00, five second-hand Ingersoll-Rand air scraper hoists, costing $1,694.50, and two second-hand Sullivan 6½ H.P. electric scraper hoists, costing $780.00, charged out, a total of $4,455.50. In 1927 two Ingersoll-Rand air scraper hoists were charged, costing $1,346.17. There was also more expense in 1928 for explosives, for wire rope, for repairs to scraper hoists, and an increase in other supplies due to a larger product.

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Stoping (Cont.)

Explosives:

	1928	1927
Total pounds of powder	95,550	85,300
Average price per pound	.1429	.1462
Total amount for powder	$13,649.54	$12,467.17
Cost of fuse, caps, etc.	2,447.23	2,329.05
Cost of all explosives	16,096.77	14,796.22
Lbs. of powder per ton of ore	.3955	.3665
Cost per ton for powder	.0565	.0536
Cost per ton for all explosives	.0666	.0636

Increase in 1928 was $.003 per ton. Due to a lower cost per pound for powder, the increase in cost per ton was not as much as was indicated by the increase in pounds of powder used. More 60% powder was used in 1928, on account of more development drifting and raising, and more mining in tough ground.

Timbering

1928 Amount	$89,431.49	Cost per ton,	$.370
1927 Amount	78,122.88	" " "	.336
Increase	11,308.61		.034

Detailed Cost of Timber.

	1928	1927
Cost of stull timber	$15,902.66	$13,033.35
Cost of lagging and poles	13,258.08	10,255.02
Total cost	29,160.74	23,288.37
Feet of timber per ton of ore	.948	.891
Cost per ton for timber, lagging, and poles	.1207	.1001
Increase, 1928	.0206	

In 1928, three second-hand single drum tugger hoists were bought from the Stephenson Mine equipment at a cost of $469.00, while in 1927 two were bought at a cost of $325. More timber was used in 1928, and in larger sizes, on account of more repairing of main level drifts, and more new development drifts. Repairs on the intermediate sub level, the -660', used for a traveling road, ventilation, and for handling timber, were especially heavy in 1928 as mining approached this elevation.

Tramming

1928 Amount	$25,921.00	Cost per ton,	$.107
1927 Amount	25,517.00	" " "	.110
Increase	404.00	Decrease	.003

Sub Division.

	1928	1927
Tramming	$20,683.43	$20,768.02
Skips Tenders & Bellmen	3,416.89	3,157.41
Cleaning skip pit	1,820.68	1,591.65

There was a small decrease in tramming expense and an increase in the two other accounts. The cost per ton decreased on account of a larger product.

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Ventilation

1928 Amount	$3,938.84	Cost per ton, $.016
1927 Amount	2,944.71	" " " .013
Increase	994.13	.003

The increase in expense was due to purchasing one new #2½ Anaconda type fan costing $311.00 and putting two of the idle fans in service. There was also an increase in the amount of ventube charged out in 1928.

Pumping

1928 Amount	$20,872.94	Cost per ton, $.087
1927 Amount	21,713.16	" " " .093
Decrease	840.22	.006

	1928	1927
Total gallons of water pumped	120,178,303	127,086,869
Gallons pumped per minute	228	242

There was a decrease in 1928 of 6,908,566 gallons of water pumped, or 14 gallons per minute. Labor cost remained the same; the decrease was in supply cost for current.

Compressors & Air Pipes

1928 Amount	$34,005.62	Cost per ton, $.141
1927 Amount	32,735.38	" " " .141
Increase	1,270.24	.000

Sub Division.	1928	1927
Compressors	$29,388.96	$28,425.68
Air Pipes	4,616.66	4,309.70

Cubic feet of air compressed in 1928 - 710,640,000
Cubic feet of air compressed in 1927 - 679,815,000
Cost per thousand cubic feet in 1928 - $.0419
Cost per thousand cubic feet in 1927 - .0418

The increase in 1928 was 30,825,000 cubic feet, at an increase in cost of $.0001 per thousand cubic feet. In 1928 there were six more air scraper hoists put in service during the year, and three which operated a few months in 1927 were in service all of 1928.

The increase in air pipes was due to extra piping for air scraper hoists put in service in 1928. Larger air lines were installed in the raises.

Underground Superintendence

1928 Amount	$10,008.80	Cost per ton, $.042
1927 Amount	11,930.83	" " " .051
Decrease	1,922.03	.009

The decrease in 1928 was due to not having an underground foreman. There were four shiftbosses in 1928, the same as in 1927.

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MAINTENANCE ACCOUNTS:

Compressors & Power Drills

1928 Amount	$ 364.87	Cost per ton, $.002
1927 Amount	1,471.22	" " " .006
Decrease	1,106.35	.004

	Repairs to compressors	To power drills
1928 -	$ 364.87	None
1927 -	1,471.22	None
Decrease	1,106.35	

The decrease in repairs to compressors was due to replacing piston rings in the Ingersoll-Rand compressor twice during 1927.

Hand Tramming Equipment

1928 Amount	$ 9.95	Cost per ton, $.000
1927 Amount	423.20	" " " .002
Decrease	413.25	.002

Ore scrapers have replaced tramming by sub level cars, and therefore there was very little expense in 1928.

Electric Tram Equipment

1928 Amount	$6,131.34	Cost per ton, $.025
1927 Amount	5,827.03	" " " .025
Increase	304.31	.000

Sub Division.	1928	1927	INCREASE	DECREASE
Generator and Motor	$ 21.50	$ 109.90		$ 88.40
Locomotives	1,145.48	1,956.84		811.36
Wiring	758.27	736.41	21.86	
Main Line Tracks	1,905.57	556.58	1,348.99	
Main Line Cars	2,300.52	2,467.30		166.78

Decrease in Generator and Motor due to less repairs to generator.
Decrease in Locomotives due to less repairs to motors in 1928. In 1927 two armatures were rewound and two sets of locomotive wheels were replaced.
Increase in Wiring due to extending and repairing trolley lines.
Increase in Main Line Tracks due to more repairs and extensions to tracks in 1928.
Decrease in Main Line Cars due to less repairs to cars in 1928.

Pumping Machinery

1928 Amount	$1,691.07	Cost per ton, $.007
1927 Amount	1,202.62	" " " .005
Increase	488.45	.002

In 1928 there were eight pump plungers and bushings replaced, while in 1927 there were only four replaced. There was also a charge on account of replacing a section of pump cable in 1928, which was burnt through.

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Total Underground Costs

1928 Amount	$301,523.85	Cost per ton,	$1.248
1927 Amount	289,909.60	" " "	1.245
Increase	11,614.25		.003

SURFACE COSTS:

Hoisting

1928 Amount	$22,745.03	Cost per ton,	$.094
1927 Amount	21,921.80	" " "	.094
Increase	823.23		.000

In 1928, there were 241,977 tons of ore and rock hoisted from an average depth of 2100 feet. In 1927, there were 233,221 tons hoisted from an average depth of 2109 feet. The increase in 1928 was 8,756 tons, and a decrease in depth of nine feet.

Stocking Ore

1928 Amount	$5,602.01	Cost per ton,	$.023
1927 Amount	5,139.13	" " "	.022
Increase	462.88		.001

In 1928, there were 239,678 tons placed on stockpile, while in 1927, there were 228,549 tons stocked; an increase of 11,129 tons in 1928.

Dry House

1928 Amount	$5,432.17	Cost per ton,	$.023
1927 Amount	5,386.89	" " "	.023
Increase	45.28		.000

The heating charge to dry house in 1928 was $3,885.83; in 1927 it was $3,898.42; a decrease in 1928 of $12.59.

General Surface Expense

1928 Amount	$6,068.30	Cost per ton,	$.025
1927 Amount	6,119.16	" " "	.026
Decrease	50.86		.001

The charges to improvement and care of grounds in 1928 were $646.08, while in 1927 they were $636.42; an increase in 1928 of $9.66. The decrease in surface expense in 1928 was due to more repairs to roads and fences in 1927.

MAINTENANCE ACCOUNTS:

Hoisting Equipment

1928 Amount	$ 8,840.34	Cost per ton,	$.037
1927 Amount	11,063.97	" " "	.048
Decrease	2,223.63		.011

Sub Division.

	Mach. Parts	Skips & Skip Roads	Wire Rope
1928 -	$3,251.55	$2,543.76	$3,045.03
1927 -	1,885.07	4,443.71	4,735.19
Increase -	1,366.48		
Decrease -		1,899.95	1,690.16

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Hoisting Equipment (Cont.)

Increase in Machinery parts for 1928 due to new shaft and turnbuckle from Lake Shore Engine Works for cage hoist, costing $616.50. There was also an increase in Hard Ore Shop charges of $200, and repairs to hoist motors and bell signals.
Decrease in charges to skips and skip roads due to less repairs to skips and skip roads on account of accident of May 13th, 1927.
In 1928, two new 1 3/8" hoisting ropes, one costing $1,773, and the other costing $1,172, were charged out, while in 1927 two 1 3/8" ropes costing $2,437.70 and one 1 3/8" special Leschen rope costing $2,206.31 were charged. One of the new ropes charged out in 1927 replaced the rope that was broken in the accident of May 13th.

Shaft

1928 Amount	$2,229.67	Cost per ton,	$.009
1927 Amount	1,749.92	" " "	.008
Increase	479.75		.001

The increase in 1928 was due to repairing and replacing the steel dividers in the skip compartment of the circular shaft.

Top Tram Equipment

1928 Amount	$1,923.31	Cost per ton,	$.008
1927 Amount	1,418.21	" " "	.006
Increase	505.10		.002

Sub Division.

	1928	1927	INCREASE	DECREASE
Engine and Motors	$ 62.98	$ 102.40		$ 39.42
Tracks and Cars	808.17	904.36		96.19
Wire Rope	695.52	202.25	$493.27	
Sheaves, Rollers, etc.	356.64	209.20	147.44	

Decrease in Engines and Motors in 1928 due to less repairs.
Decrease in Tracks and Cars in 1928 due to less repairs to cars.
In 1928, there were 8,070 feet of 5/8" wire rope charged to top tram, while in 1927 only 2200 feet were charged.
Increase in Sheaves, Rollers, etc. in 1928 was due to more rollers replaced during the year.

Docks, Trestles & Pockets

1928 Amount	$1,271.04	Cost per ton,	$.005
1927 Amount	1,231.19	" " "	.005
Increase	39.95		.000

In 1928 two bents of wood stocking trestle were erected at the end of the southeast steel trestle, and legs and timbers were framed for six more bents.
The 1927 charges cover the cost of replacing the decking timbers on the north permanent steel trestle, painting part of the steel trestle, and repairing the skip dump.

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Mine Buildings

1928 Amount	$396.54	Cost per ton,	$.002
1927 Amount	596.88	" " "	.003
Decrease	200.34		.001

Detail of Mine Buildings.

	1928	1927
Office	$ 54.75	$ 64.43
Shops	9.24	68.53
Stables	-	18.97
Shaft House	-	6.11
Engine House	30.98	94.01
Boiler House	2.27	8.42
Dry House	209.35	229.90
Coal Dock	76.31	-
Storage Building	-	49.10
Laboratory	-	46.90
Transfer House	-	2.49
Tunnel	13.64	8.02

In 1928 the charge to office was for interior decorating. The charges to shops, engine house, and boiler house were for repairing windows and doors, and replacing broken window lights. The charges to dry house were for repairs to hot water pipe and to the dry house benches. Charges to coal dock were for repairs to dock. The charges to tunnel were for repairing the sheet iron covering and replacing broken window lights.

Total Surface Costs

1928 Amount	$54,508.41	Cost per ton,	$.226
1927 Amount	54,627.15	" " "	.235
Decrease	118.74		.009

GENERAL MINE ACCOUNTS:

Insurance

1928 Amount	$ 19.92	Cost per ton,	$.000
1927 Amount	10.98red	" " "	.000
Increase	30.90		.000

Engineering

1928 Amount	$1,850.71	Cost per ton,	$.008
1927 Amount	2,315.46	" " "	.010
Decrease	464.75		.002

Decrease due to less time spent by engineer on underground work at the mine. A younger engineer was employed at a lower salary for the full year, as compared with nine months in 1927.

Analysis

1928 Amount	$4,158.71	Cost per ton,	$.017
1927 Amount	3,959.26	" " "	.017
Increase	199.45		.000

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Analysis (Cont.)

The Athens Mine samples are worked at the Negaunee Mine laboratory. The number of determinations worked in 1928 was 17,342, at a cost per determination of $.148543, while in 1927 there were 16,622 determinations worked, at a cost of $.1430 per determination; an increase in 1928 of 720 determinations and $.005543 per determination.

Personal Injury Expense

1928 Amount,	$4,463.71	Cost per ton,	$.018
1927 Amount,	2,521.81	" " "	.011
Increase	1,941.90		.007

In 1928 this account was charged with 2% of the labor cost at the mine to be used as a reserve fund for personal injury expense.

Safety Department Expense

1928 Amount	$364.20	Cost per ton,	$.001
1927 Amount	278.65	" " "	.001
Increase	85.55		.000

9. EXPLORATIONS AND FUTURE EXPLORATIONS:

There was an increase in labor of $32.26 and supplies of $53.29. The increase in supplies was due to buying a pair of new blankets for the first aid room, an increase in first aid supplies, and the cost of cigars for all employees for working three months without an accident.

10. TAXES:

Telephones & Safety Devices

1928 Amount	$911.50	Cost per ton,	$.004
1927 Amount	838.09	" " "	.004
Increase	73.41		.000

Sub Division.

	1928	1927
Lighting shaft and levels	$739.69	$606.66
Mine Telephones	112.39	178.58
Safety Gates and U.G. Improvement	15.79	27.93
Sign boards, signals, etc.	17.66	4.35
Fire equipment	25.97	20.57

The increase is due to the installation of more lights on levels and in raises used for traveling roads between levels and air ways. Better lighting is a safety measure.

Special Expenses

1928 Amount	$152.06	Cost per ton,	$.001
1927 Amount	95.65	" " "	.000
Increase	56.41		.001

In 1928 this account was charged with an assessment of $65.58 for the Lake Superior Iron Ore Association, and another item of $86.48 by the Cleveland Office.

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Mine Office

1928 Amount	$7,999.80	Cost per ton,	$.033
1927 Amount	7,443.74	" " "	.032
Increase	556.06		.001

Sub Division.	Direct Charges	Central Office
1928 -	$855.19	$7,144.61
1927 -	837.29	6,606.45
Increase -	17.90	538.16

The increase in Central Office expense was due to a charge for a proportion of central warehouse overhead in 1928.

Total General Mine Accounts

1928 Amount	$19,920.61	Cost per ton,	$.082
1927 Amount	17,441.68	" " "	.075
Increase	2,478.93		.007

9. EXPLORATIONS AND FUTURE EXPLORATIONS:

There were no explorations at the mine in 1928.

10. TAXES:

The comparison of the total taxes for the Athens Iron Mining Company for the years 1928 and 1927 are as follows:

	1928 VALUATION	1928 TAXES	1927 VALUATION	1927 TAXES
Realty (Tax Commission)	2,259,000	76,338.00	2,333,000	76,331.09
Ore in Stock, Equipment, and Supplies,	541,000	18,282.01	715,000	23,395.37
STERLING ADDITION				
Lots 31 to 38 (C.C.I. Co. purchase, 1927)	4,600	155.44	4,600	150.46
HARVEY PLAT				
Lots 1, 2, 3, Portion of	1,300	43.93	1,300	42.53
Total	2,805,900	94,819.78	3,053,900	99,917.47
Collection Fees		948.19		999.17
TOTAL OPERATING ATHENS MINE		95,767.97		100,916.64
Rented Buildings (Harvey Plat) Lots #5, 6, & 7.	7,900	266.92	7,900	258.47
STERLING ADDITION				
Lots Nos. 1, 2, 3, 7, 8, 9, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22, 23, 24, 25, 26, 27, 28, 29, 30, 72, 73, 74 & 75.	22,700	767.07	22,700	742.68
Collection Fees		10.34		10.01
TOTAL RENTED BUILDINGS	30,600	1,044.33	30,600	1,011.16
TOTAL ATHENS IRON MINING CO.	2,836,500	96,812.30	3,084,500	101,927.80
Tax Rate		3.379		3.272
Total City of Negaunee Tax		571,121.55		589,686.71
Athens Mine % of City Tax		17%		17¼%

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11. ACCIDENTS AND PERSONAL INJURY:

There were no fatal accidents at the Athens Mine in 1928 or 1927. There were 12 accidents as compared with 15 in 1927, a decrease of three for the year. The twelve accidents were classified as follows:
Three were slight injuries, the men returning to work in one week.
Three were injuries that kept the men home for two weeks.
Five were injuries that kept the men home for two months.
One was an injury which kept the man at home for the past six months, and he is still unable to work.

One man who was totally disabled in July, 1926, received compensation throughout 1928, and one man who received injuries in 1926 was paid the difference in wages during 1927 and 1928.

12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION:

a. New Construction:

There was no new construction in 1928.

13. EQUIPMENT AND PROPOSED EQUIPMENT:

a. Steam Shovels:

The Athens Mine rented a shovel during the year, as none has been bought for the mine.

b. Stockpile Trestles:

The southeast steel trestle was extended two bents (wood extension) in 1928, and early in January will be extended six bents further. The wooden extension will provide a second stocking ground for Mitchell ore, and permit this grade to dry out in stockpile for at least three months before being shipped.

c. Timber Treating Plant:

The present concrete vat for heating timber, built in 1927, did not prove a success, due to cracking which caused a loss of treating solution. During the coming year, either steel vats will have to be installed inside the concrete vats, or a pressure treatment plant installed. The pressure treatment doubles the life of the timber as compared with hot and cold treatment in the open air. A careful investigation is being made to determine costs, and some plan will be adopted early enough to permit starting up the treating plant in the summer.

g. Hoisting Ropes:

The special Leschen hoisting rope was turned end for end on January 8, 1928, and taken off December 14th. It was in service about 19 months, and hoisted 186,865 tons. It gave more service that the other types of rope, but not enough extra service to justify its cost, which is nearly double that of other ropes. The other skip rope wore out in May and was replaced. It went in service in February, 1927, was reversed July 17th, and taken off in May, 1928. It was in service about 16 months, and hoisted 139,129 tons. Two new ropes were put on in 1928. Further experiments are being made with different ropes, in the hopes that the rope best suited to conditions at this mine will be found.

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14. MAINTENANCE AND REPAIRS:

There were no unusual repairs during the year, only minor repairs to buildings and equipment.

15. POWER:

Power was supplied by the Cliffs Power and Light Company, a subsidiary of the Cleveland-Cliffs Iron Company. The rate per kilowatt hour was 1½ cents, the same as in the previous year.

17. CONDITION OF PREMISES:

The grounds around the buildings were kept in good condition during the year.

18. NATIONALITY OF EMPLOYEES:

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

As to Parentage	1928	PERCENT	1927	PERCENT
English	34	21	38	24
Finnish	60	38	58	37
Italian	21	13	20	13
Swedish	15	9	13	8
Irish	3	2	2	
Scotch	1		1	2
French	17	11	18	11
German	4	3	4	3
Norwegian	4	3	4	2
Total	159	100%	158	100%

As to Birth	Total	American born	Foreign born
English	34	21	13
Finnish	60	20	40
Italian	21	4	17
Swedish	15	10	5
Irish	3	3	
Scotch	1	1	
French	17	17	
German	4	4	
Norwegian	4	4	
Total	159	84	75
Percentage	100%	53%	47%

NORTH JACKSON MINE
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1. GENERAL:

The North Jackson Mine has not operated since 1908.

6. SURFACE:

a. Buildings:

During 1928 the old Jackson barn was torn down and the material salvaged for use in the new location. The building had been unused for many years.

The top tram shanty on the landing of the headframe at #5 Open Pit was torn down, as it was being used as a hang-out by boys living in the neighborhood.

c. Roads:

The City of Negaunee widened and paved with tar penetration surface the road between the end of Iron Street and the Jackson Monument. Concrete walls were built along the edge of the open pits.

10. TAXES:

DESCRIPTION	1928 VALUATION	1928 TAXES	1927 VALUATION	1927 TAXES
47% of Sec. 1-47-27, except certain small parcels and right of way,	235,000	7,941.36	235,235	7,696.42
Collection Fees,		79.41		76.96
Total,		8,020.77		7,773.38
Rented Buildings:				
Old Jackson Office,	500	16.89	(Included in above	
Collection Fees,		.17	and in So. Jackson.)	
Total,		17.06		
Total Taxes North Jackson,		8,037.83		7,773.38

Increase due to higher tax rate in 1928.

SOUTH JACKSON MINE
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1. GENERAL:

There have not been any operations conducted at the South Jackson Mine for the past four years. The crusher plant has not operated since 1926. The fences around the pits were repaired during the summer of 1928.

4. ESTIMATE OF ORE RESERVES:

a. Available Ore:

Above present pit available by present system of mining:

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

Below present pit and above drainage tunnel available by milling:

West of Crusher,	186,000 tons
Area below bottom of present pit shown by churn drilling,	105,226 "
Total,	291,226 "
GRAND TOTAL,	334,226 tons.

c. Estimated Analysis:

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

8. COST OF OPERATING:

a. Comparative Mining Costs:

	1928	1927	Increase	Decrease
PRODUCT	0	0		
Underground Costs,	0	0		
Surface Costs,	158.13	123.28	34.85	
General Mine Accounts,	0	0		
Total as per Cost Sheet,	158.13	123.28	34.85	
Taxes,	9,044.69	8,765.73	278.96	
Welfare, Safety, Hosp.	196.83	206.29		9.46
Total Cost at Mine,	9,399.65	9,095.30	304.35	

10. TAXES:

DESCRIPTION	1928 Valuation	1928 Taxes	1927 Valuation	1927 Taxes
53% of Sec. 1-47-27, except certain small parcels and right of way,	265,000	8,955.14	265,265	8,678.94
Collection Fees,		89.55		86.79
Total Taxes, South Jackson,		9,044.69		8,765.73

LUCY MINE
ANNUAL REPORT
YEAR 1928

1. GENERAL:

The Lucy Mine has not been operated since 1911.

6. SURFACE:

a. Buildings:

Two dwellings belonging to the Lucy Mine, situated on the north side of the County Road, were sold during 1928, and the ground rentals transferred to the Land Department.

10. TAXES:

DESCRIPTION	1928 VALUATION	1928 TAXES	1927 VALUATION	1927 TAXES
SW¼ of SW¼ of Sec.6-47-26, except Right of way and roads,	50,500	1,706.25	50,500	1,652.12
Collection Fees,		17.06		16.52
Total Taxes, Lucy Mine,		1,723.31		1,688.64

The tax rate was higher in 1928.

AUSTIN MINE
ANNUAL REPORT
YEAR 1928

1. GENERAL:

This mine was abandoned on September 12th, 1927, when all the ore was mined. All underground and surface equipment was removed from the property and the lease surrendered on November 26th, 1927. Provision was made for reserving the land on which the ore is stocked for two years, or until November 26th, 1929. There is a clause in this agreement which permits a one year renewal, or until November 26th, 1930. Provision must therefore be made to remove all ore by the end of the shipping season in 1930.

2. PRODUCTION, SHIPMENTS & INVENTORIES:

b. Shipments:

Grade of Ore	Pocket Tons	Stockpile Tons	Total Tons	Total Last Year
Austin Bessemer,	0	0	0	20,693
Austinport,	0	9,483	9,483	44,654
Total	0	9,483	9,483	65,347
Total Last Year,	51,926	13,421	65,347	
Decrease, 1928,	51,926	3,938	55,864	

Shipments decreased greatly in 1928, as other grades of ore were used in place of Austinport. The ore shipped in 1928 came from the old pile stocked in 1923, and did not average as high in iron as had been expected. This was due in part to cleaning the stockpile grounds and dumping the ore against the stockpile, where it would be loaded by the shovel. There is only a few thousand tons of Austinport left in this pile, together with 2,600 tons of high phosphorus, or Austinwood, ore. The balance of ore in this old stockpile should be cleaned up before loading starts in the new stockpile made in 1926 and 1927.

c. Stockpile Inventories:

Grade of Ore	1928	1927	Increase	Decrease
Austinport,	68,352	77,835		9,483
Austinwood,	2,672	2,672		0
Total,	71,024	80,507		9,483

Including the overrun, there is in excess of 80,000 tons of ore in stock.

f. Ore Statement:

	Austin Bessemer	Austin-port	Austin-wood	Total	Total Last Year
On Hand Jan. 1, 1928,	0	77,835	2,672	80,507	66,787
Output for Year	0	0	0	0	79,067
Total	0	77,835	2,672	80,507	145,854
Shipments	0	9,483	0	9,483	65,347
Balance on Hand,	0	68,352	2,672	71,024	80,507
Decrease in Output,				79,067	
Decrease in Ore on Hand,				9,483	

1928 - Mine idle during year.
1927 - Mine idle after being closed September 12, 1927.

AUSTIN MINE
ANNUAL REPORT
YEAR 1928

3. ANALYSIS:

b. Average Analysis on Straight Cargoes:

Grade	Iron	Phos.	Silica	Mang.
Austinport		(All mixed)		

The analysis of ore shipped in 1928 was nearly 3% under the average analysis of ore in stock. The remainder of the old stockpile will probably not average any higher than the ore shipped in 1928, but as there are only a few thousand tons here, loading from the new pile will bring the grade of shipments back near to the average of the ore in stock.

6. SURFACE:

There was some expense for building fences around caves on the Austin property, required by state law.

8. COST OF OPERATING:

a. Comparative Mining Costs:

	1928	1927	Increase	Decrease
PRODUCT	0	79,067		79,067
Underground Costs	97.08	72,653.56		72,556.48
Surface Costs	1,009.00	7,848.69		6,839.69
General Mine Accounts	3,980.56	12,099.86		8,119.30
Cost of Production,	5,086.64	92,602.11		87,515.47
Loading & Shipping	445.98	4,181.40		3,735.42
Total Cost on Cars,	5,532.62	96,783.51		91,250.89
Taxes	2,550.12	3,270.51		720.39
Central Office	173.07	6,091.18		5,918.11
Welfare, Safety, Hosp.	21.89	1,422.43		1,400.54
Cost Adjustment,		2,994.22		2,994.22
Total Cost at Mine	8,277.70	110,415.01		102,137.31

The high cost in 1928 was due to setting up an amount sufficient to pay the balance of compensation due former employees for injuries for which they are still receiving compensation. The amount this set up was approximately $3,385.00, or 40% of the total expenditures for the year.

10. TAXES:

	1928		1927	
DESCRIPTION	VALUATION	TAXES	VALUATION	TAXES
346.37 Acres in Sec. 20-45-25,	-	-	20,000	576.84
39.05 " " Sec. 28-45-25,	-	-	280	8.09
Personal Property,	80,000	2,524.87	92,000	2,653.20
Total,	80,000	2,524.87	112,280	3,238.13
Collection fees,		25.25		32.38
Total Taxes,		2,550.12		3,270.51
Tax Rate per $100,		3.1561		2.885

Taxes decreased due to a lower valuation in 1928.

STEPHENSON MINE
ANNUAL REPORT
YEAR 1928

1. GENERAL:

The Stephenson Mine was abandoned on July 29th, 1927. All underground equipment was salvaged and part of the surface equipment, trestles, etc., dismantled. Some further dismantling work was done in 1928, as it is necessary to have all material removed from the property by the time the ore is shipped, when the leases will be surrendered. Shipments from stockpile increased in 1928, and the Stephenson ore in stock will soon be all shipped. This leaves a large tonnage of Stephenwood or high phosphorus ore, which moves slowly. It is hoped sales of this grade will increase in 1929, otherwise it will require many years to clean up this grade.

2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production by Grades:

None. Mine abandoned July 29, 1927.

b. Shipments:

Grade of Ore	Pocket Tons	Stockpile Tons	Total Tons
Stephenson Lease, Sec. 20:			
1. Stephenson,	0	192,792	192,792
2. Stephenwood,	0	12,676	12,676
Total Stephenson Lease,	0	205,468	205,468
C. & N.W. Ry. Co. Lease, Sec. 29:			
1. Northdale,	0	3,267	3,267
2. Northwood,	0	0	0
Total C. & N.W. Railway Co. Lease,	0	3,267	3,267
Grand Total,	0	208,735	208,735

c. Stockpile Inventories:

	1928	1927	Increase	Decrease
Stephenson Lease, Section 20:				
1. Stephenson Ore,	63,799	256,591		192,792
2. Stephenwood Ore,	161,259	173,935		12,676
Total Stephenson Lease,	225,058	430,526		205,468
C. & N.W. Ry. Co. Lease, Section 29:				
1. Northdale,	30,937	34,204		3,267
2. Northwood,	44,008	44,008		
Total C. & N.W. Ry. Co. Lease,	74,945	78,221		3,267
Grand Total,	300,003	508,738		208,735

With the overrun there is now in excess of 260,000 tons of ore in stock. The Stephenson and Northdale ore will soon be exhausted, leaving a considerable amount of high phosphorus grades. Heavier shipments of the high phosphorus grades are necessary to clean up piles that interfere with loading of Stephenson and Northdale ore.

STEPHENSON MINE
ANNUAL REPORT
YEAR 1928

2. PRODUCTION, SHIPMENTS & INVENTORIES:

f. Ore Statement:

	Stephenson Lease		C.& N.W.Ry.Co. Lease, Sec. 29			Total Last
	Stephenson	Stephenwood	Northdale	Northwood	Total	Year
On Hand Jan. 1, 1928	256,591	173,935	34,204	44,008	508,738	526,991
Output for Year	0	0	0	0	0	109,318
Total,	256,591	173,935	34,204	44,008	508,738	636,309
Shipments	192,792	12,676	3,267	0	208,735	127,571
Balance on Hand	63,799	161,259	30,937	44,008	300,003	508,738
Decrease in Output					109,318	
Decrease in Ore on Hand					208,735	

1928 - Mine idle during year.
1927 - Mine closed July 29th, 1927.

3. ANALYSIS:

b. Average Analysis on Straight Cargoes:

Grade	Iron	Phos.	Silica	Mang.
Stephenson,		(All mixed)		
Stephenwood,		"		
Northdale,		"		
Northwood,		"		

The analyses of ore shipped held up to those of previous years.

6. SURFACE:

All of the remaining stocking trestles and part of the permanent trestles were dismantled and the usable material shipped to the Gardner-Mackinaw Mine. All the dismantling expense was charged to the Gardner-Mackinaw in lieu of billing the material. The rail from the trestles was loaded and shipped to various mines, the basis of payment being 50% of the cost of new rail.

One top tram unit was dismantled and shipped to the Gardner-Mackinaw Mine the last of the year. Two of the former Stephenson plants are now at the Gardner-Mackinaw, the other two are still in place at the Stephenson.

The cage hoist was dismantled in November and early December and shipped to the Gardner-Mackinaw Mine, where it is being installed at the Gardner.

The old dry building, used in recent years as an auxiliary warehouse, was dismantled in sections in December and taken to the Gardner, where it will be used as an engine house. There was no sale for this building, so that it is not planned to charge the Gardner-Mackinaw for it. The Gardner-Mackinaw paid all dismantling and shipping charges.

The south change room at the dry was dismantled. The trusses, windows, doors and frames, usable roof lumber, toilets, etc., were shipped to the Spies-Virgil Mine.

The Layne and Bowler pump, with the exception of the pipe, was shipped to the Holman-Cliffs Mine on the Mesaba Range.

The last of the year all material in the warehouse was removed, some being taken to the Gardner-Mackinaw Mine, and the balance to the General Storehouse. All these supplies were taken off the inventory.

STEPHENSON MINE
ANNUAL REPORT
YEAR 1928

6. SURFACE: (Cont.)

At the end of the year the following buildings remained on the property:
Steel Shaft House, in bad condition, due to rusting.
Wood Pulley Stands. Will be dismantled to recover the good 10" x 10" fir timber.
Top Tram Shanties. No value. Still housing some electrical equipment and the rock tram.
Engine and Boiler House. Contains skip hoist and boiler plant.
Dry House. One-third dismantled. Nearly all equipment removed.
Office and Warehouse. All supplies removed, building for sale.
Captain's Office. For sale.
Oil House. Equipment still in building. No salvage value, brick building.
Old Top Tram Engine House. Used as storage building. No value.

Considerable equipment remains on the mine property, including underground motor cars, heavy pipe, part of Layne and Bowler equipment, and a large steam pump. This will be removed as orders are received for this material. Some of it will be sold for scrap.

If opportunity develops to use any building or equipment left on the property, it will be removed.

8. COST OF OPERATING:

a. Comparative Mining Costs:

	1928	7 months 1927	Increase	Decrease
PRODUCT	0	109,318		109,318
Underground Costs	39.06	157,900.97		157,860.91
Surface Costs	1,034.95	23,484.21		22,429.26
General Mine Accounts	11,420.48	35,218.52		23,798.04
Cost of Production	12,494.49	216,603.70		204,108.21
Abandonment Expense	-	4,091.86		4,091.86
Loading and Shipping	12,283.86	12,301.29		17.43
Total Cost on Cars	24,778.35	232,996.85		208,218.50
Depreciation - Plant and Equipment	-	1,336.95		1,336.95
Taxes	16,894.54	19,281.78		2,387.24
Central Office	1,002.57	12,878.97		11,876.40
Welfare, Safety, etc.	127.67	2,700.84		2,573.17
Cost Adjustment	-	16,997.81		16,997.81
Track Agreement with E.L.S. Ry.	5,136.72	-	5,136.72	
Total Cost at Mine	47,939.85	286,193.20		238,253.35
No. of Days Operated	0	153		153
No. Shifts & Hours	0	1-8 hr.		
Average Daily Product	0	714		714

Underground costs in 1928 cover repairs to fences around surface caves.

Surface costs cover the salary of the policeman that guards the property.

General Mine Accounts cover the cost of measuring stockpile by engineers, analysis of shipments, 2% of payroll set up as a reserve for personal injuries and the calculated amount still payable for compensation due for former injuries, and a proportion of the district office expense.

There was no abandonment expense for 1928.

Loading and shipping expense was lower in 1928, although more ore was shipped. Less expense for moving the shovel in 1928, and less expense for blasting the stockpile.

Taxes decreased in 1928, in spite of a higher rate, due to lower valuation.

STEPHENSON MINE
ANNUAL REPORT
YEAR 1928

10. TAXES:

DESCRIPTION	1928 VALUATION	1928 TAXES	1927 VALUATION	1927 TAXES
S½ of SW¼ Sec. 20-45-25, 80 acres,	35,000	1,104.65	55,000	1,586.32
N½ of NW¼ Sec. 29-45-25, 80 acres,	5,000	157.82	5,000	144.22
Personal Property,	490,000	15,464.80	602,000	17,360.34
Total,	530,000	16,727.27	662,000	19,090.88
Collection Fees,		167.27		190.90
Total Taxes,		16,894.54		19,281.78
Tax Rate per $100,		3.1561		2.885

Grade of Ore	Pocket Tons	Stockpile Tons	Total Tons	Total Last Year
Cambridge	0	5,864	5,864	11,507
Princeport	0	0	0	0
Total	0	5,864	5,864	11,507
Total Last Year	0	11,507	11,507	
Decrease, 1928			7,643	

e. Stockpile Inventories:

The ore by grades in stock December 31st, 1928, were as follows:

	1928 Tons	1927 Tons	Increase	Decrease
Cambridge ore	122,755	126,175		3,420
Princeport ore	9,160	9,160		
Sec. 19 Cambridge	15,942	16,386		444*
Sec. 19 Princeport	1,313	1,313		
Total	149,170	153,034		3,864

* This tonnage was transferred from Sec. 19 Cambridge to Cambridge when shipped during 1928.

f. Ore Statement:

	Princeport	Sec.19 Princeport	Cambridge	Sec.19 Cambridge	Total	Total Last Year
On Hand Jan. 1, 1928	9,160	1,313	126,175	16,386	153,034	164,541
Output for Year	0	0	0	0	0	0
Transferred			444	444		
Total	9,160	1,313	126,619	15,942	153,034	164,541
Shipments	0	0	3,864	0	3,864	11,507
Balance on Hand	9,160	1,313	122,755	15,942	149,170	153,034
Decrease in Ore on Hand			3,864		3,864	

1928 - Mine idle during year.
1927 - Mine idle during year.

5. ANALYSIS:

b. Average Analysis on Straight Cargoes:

Grade	Iron	Phos.	Silica	Mang.
Cambridge		(All mixed)		

PRINCETON MINE
ANNUAL REPORT
YEAR 1928

1. GENERAL:

The Princeton Mine closed on August 27th, 1921. The pumps were kept in operation until June 18th, 1927, when they were removed and the mine flooded. The mine did not fill with water for several months. No changes in condition occurred in 1928.

2. PRODUCTION, SHIPMENTS & INVENTORIES:

b. Shipments:

Grade of Ore	Pocket Tons	Stockpile Tons	Total Tons	Total Last Year
Cambridge	0	3,864	3,864	11,507
Princeport	0	0	0	0
Total	0	3,864	3,864	11,507
Total Last Year	0	11,507	11,507	
Decrease, 1928			7,643	

c. Stockpile Inventories:

The ore by grades in stock December 31st, 1928, were as follows:

	1928 Tons	1927 Tons	Increase	Decrease
Cambridge ore	122,755	126,175		3,420
Princeport ore	9,160	9,160		
Sec. 19 Cambridge	15,942	16,386		444*
Sec. 19 Princeport	1,313	1,313		
Total	149,170	153,034		3,864

* This tonnage was transferred from Sec. 19 Cambridge to Cambridge when shipped during 1928.

f. Ore Statement:

	Princeport	Sec.19 Princeport	Cambridge	Sec.19 Cambridge	Total	Total Last Year
On Hand Jan. 1, 1928	9,160	1,313	126,175	16,386	153,034	164,541
Output for Year	0	0	0	0	0	0
Transferred	-		- 444	444		-
Total	9,160	1,313	126,619	15,942	153,034	164,541
Shipments	0	0	3,864	0	3,864	11,507
Balance on Hand	9,160	1,313	122,755	15,942	149,170	153,034
Decrease in Ore on Hand			3,864		3,864	

1928 - Mine idle during year.
1927 - Mine idle during year.

3. ANALYSIS:

b. Average Analysis on Straight Cargoes:

Grade	Iron	Phos.	Silica	Mang.
Cambridge		(All mixed)		

PRINCETON MINE
ANNUAL REPORT
YEAR 1928

4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:

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

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

b. Prospective Ore:

Ore below 6th Level	20,000	418,815	5,000	46,921	490,736

Total Ore, ... 1,222,531

c. Estimated Analysis:

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

d. Estimated Tonnage as Required by State Tax Commission:

Non-Bessemer Ore:

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

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

6. SURFACE:

a. General:

The only work done on surface at this mine in 1928 consisted of loading ore with scraper hoist for all-rail shipment to Illinois to paint manufacturers. The roofs of the mine buildings are in poor condition, and must be given attention in 1929.

PRINCETON MINE
ANNUAL REPORT
YEAR 1928

8. COST OF OPERATING:

a. Comparative Mining Costs:

	1928	1927	Increase	Decrease
PRODUCT	0	0		
Underground Costs	58.44	6,477.62		6,419.18
Surface Costs	1,030.08	2,065.25		1,035.17
General Mine Accounts	9,834.63	8,036.12	1,798.51	
Total	10,923.20	16,578.99		5,655.79
Loading & Shipping	519.94	931.56		411.62
Closing Expense	-	396.37		396.37
Total as per Cost Sheet	11,443.14	17,906.92		6,462.98
Central Office	142.49		142.49	
Taxes	8,965.66	8,775.80	189.86	
Welfare, Safety, etc.	16.93	2,371.39		2,354.46
Cost Adjustment	-	1,056.48		1,056.48
Supply Inventory	35.34	-	35.34	
Total Cost at Mine	20,603.56	30,110.59		9,507.03

In 1928 the underground expense covered the cost of repairing fences around caves on surface. In 1927, it covered the cost of timber repairs in the mine, props on levels, etc., before the mine was flooded in June.

The expenditures under surface costs in 1928 cover the expense for a policeman guarding this idle property. In 1927 there were some surface expenses, in addition to policeman, on account of repair work in the mine up to the time the pumps were pulled in June.

The expense in general mine accounts in 1928 was due to setting up of an amount calculated as necessary to pay out on old injury cases still getting compensation. This amounted to over $9,600.00. 2% of the pay roll, starting in April, was set aside as a reserve for personal injury expense. The balance of expense was for engineers measuring stockpiles, analysis of ore shipped, and a small proportion of District Office expense. The expense in 1927 was largely incurred in connection with keeping the mine pumped until in June, compensation payments for old injury cases, etc.

Loading and shipping expense in 1928 was lower due to less ore loaded by shovel. Only one small cargo was loaded in 1928, while several cargoes were loaded in 1927. About the same amount of ore was loaded by hand, using a scraper hoist, in both years, but there was some expense in 1927 for the scraper hoist.

Taxes were a little higher in 1928, due to a higher tax rate on account of a decrease in total valuation of the township property. The actual assessed value of the Princeton Mine decreased $20,000 in 1928, while taxes paid increased $190.00.

Welfare, safety, and hospital expense was nominal in 1928, while in 1927 the old proportion of this expense continued until the Gwinn District hospital closed in September.

There was no cost adjustment expense in 1928, while in 1927 considerable expense was incurred in this account.

The total cost at the mine in 1928 decreased only $9,507.03; due to the larger amount set up in "Personal Injury Expense", which is non-recurrent, there will be a further decrease in 1929.

PRINCETON MINE
ANNUAL REPORT
YEAR 1928

10. TAXES:

DESCRIPTION:	1928 VALUATION	1928 TAXES	1927 VALUATION	1927 TAXES
NE¼ of NE¼ of Sec. 19-45-25 (C.& N.W.)	10,000	315.61	10,000	288.42
158.27 Acres in Sec. 18-45-25,	5,000	157.82	10,000	288.42
NW¼ Sec. 20-45-25, 160 acres,	120,000	3,787.32	115,000	3,316.84
NW¼ of NE¼ Sec. 19-45-25 Location,	420	13.27	420	12.11
S½ of NE¼ of Sec. 19-45-25 "	840	26.54	840	24.22
Personal Property,	145,000	4,576.33	165,000	4,758.90
Total,	281,260	8,876.89	301,260	8,688.91
Collection fees,		88.77		86.89
Total Taxes,		8,965.66		8,775.80
Total Tax Rate per $100		3.1561		2.885

2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production By Grades:

Grade of Ore	Tons
Gardner	90,866
Total Ore	90,866
Rock	226
Grand Total	91,092

GARDNER-MACKINAW MINE
ANNUAL REPORT
YEAR 1928

1. GENERAL:

The mine closed on November 30th, 1920, and on November 30th, 1927, orders were received to re-open. This work was started on December 1st, 1927, and the water lowered to the fourth level plat on March 8th. Bailing was continued until March 21st, until the pumps on the fourth level had been installed and were operating satisfactorily. Repairing of levels was started, also other work preliminary to stoping. Actual mining started in April, and was gradually extended over the entire available area. A small product was obtained in April, which was gradually increased as more gangs started stoping.

By the end of the year stoping was nearly completed, and authority had been given for sinking the Mackinaw shaft and opening the fifth level. It was estimated that this would increase the available ore 120,000 tons and add one year to the life of the mine. The sequence of mining the ore in both properties calls for the removal of approximately 2/3 of the ore by stoping operations, followed by the removal of part of the ore remaining in pillars and floors on the levels. Work connected with equipping the Mackinaw shaft for sinking was started in December, and will be completed in the last week of January. Sinking and drifting to the ore body will start in February and be pushed on double shift, so that some Mackinaw ore will be available for shipping in 1929.

An unexpected development was the change in physical character of the ore above the first level. It was much softer than the ore previously mined, and contained more moisture. The average moisture in ore shipped in 1928 was 12.77%, as compared with 9% in Mackinaw ore mined in 1919, and 10.50% moisture in Gardner ore shipped from stockpile in 1927. Mining in this softer area has now been practically completed, and only a small amount of ore is left in the stopes in this area. It is safe to assume that the ore stocked this winter should not average over 11.50% in moisture when loaded from stockpile next summer, and that the ore hoisted next summer should also average lower in moisture than the ore produced in 1928.

Two-thirds of the ore area above the first level was smaller than had been anticipated, due to jasper. Two seams of ore were found in several stopes with 10' to 20' of lean ore and jasper between them. The ore was cut off by jasper considerably below the mining limit, so that the estimated tonnage in the Gardner Mine had to be reduced 80,000 tons. The reduction would have been larger if some additional ore had not been developed at the south-east end of the ore body on both the second and first levels.

Only one grade of ore was produced in 1928, averaging about .720 sulphur. The ore from the Mackinaw fifth level may average .600 in sulphur, but no lower sulphur can be expected in the balance of product from the Gardner Mine.

2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production By Grades:

Grade of Ore	Tons
Gardner	90,866
Total Ore	90,866
Rock	226
Grand Total	91,092

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

b. Shipments:

Grade	Pocket Tons	Stockpile Tons	Total Tons	Total Last Year
Gardner,	70,675	0	70,675	0
Gardner High Sulphur,	0	0	0	40,972
Mackinaw High Sulphur,	0	0	0	8,472
Total,	70,675	0	70,675	49,444
Total last year,			49,444	
Increase, 1928,			21,231	

c. Stockpile Inventories:

Grade	1928	1927	Increase	Decrease
Gardner ore,	20,191	50,562		30,371

d. Division of Product by Levels:

The ore hoisted from the various levels was as follows:

First Level,	45,574 tons
Second Level,	44,303 "
Third Level,	989 "
Total,	90,866 tons

3. ANALYSIS:

The second level ore was transferred and hoisted from the third level, as there is no connection to the Gardner shaft on the second level.

e. Production by Months:

Month	Gardner Ore	Rock
April	1,693	-
May	6,495	28
June	10,157	-
July	10,093	-
August	12,594	20
September	12,614	-
October	19,553	58
November	9,561	10
December	8,106	110
Total	90,886	226

4. ESTIMATE OF ORE RESERVES:

f. Ore Statement:

	Gardner Ore	Total	Last Year
On Hand Jan. 1, 1928,	0	0	50,562
Output for Year	90,866	90,866	0
Overrun and Shortage,	0	0	1,118 (red)
Total	90,866	90,866	49,444
b. Shipments	70,675	70,675	49,444
Balance on Hand	20,191	20,191	0
Increase in Ore on Hand		20,191	

1928 - One 8-hour shift six days per week, April 7th to December 31, 1928.
1927 - Mine idle during year.

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2. PRODUCTION, 4. SHIPMENTS & INVENTORIES:

g. Delays:

There were no serious delays during the year. The minor delays were as follows:

June 8th, 2 hours delay due to broken rod on compressor.
June 9th, 6 hours delay due to broken rod on compressor.
July 27th, 1½ hours delay due to burned out finger on first level motor.
October 8th, 1½ hours delay due to trouble with hoist motor.
November 26th, 1/2 hour delay due to trouble with motor generator set.

h. Delays from Lack of Current:

There were no serious electrical delays during the year. The minor delays were as follows:

May 21st, ½ hour delay due to no power.
June 14th, ½ " " " "
June 24th, 3½ " " " "
July 26th, 3/4 " " " "
August 8th, 1½ " " "
September 5th, 1½ " " "
September 14th, 3/4 " "
September 21st, 3 " "
October 10th, 1½ " "

3. ANALYSIS:

a. Average Mine Analysis on Output:

Grade	Iron	Phos.	Silica	Sul.
Gardner	58.18	.101	3.72	.759

b. Average Analysis on Straight Cargoes:

	Mine				Lake Erie		
Grade	Iron	Phos.	Silica	Sul.	Iron	Phos.	Moist.
Gardner	57.89	.101	3.74	.711	58.60	.663	12.25

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.
60% of ore in pillars left to support the surface is unavailable.
Percentage of Bessemer equals 0.

	Gardner	Mackinaw	Total
Non-Bessemer,	58,281	26,862	85,143

b. Prospective Ore:

	Gardner	Mackinaw	Total
Non-Bessemer,	0	354,582	354,582
Total all ore,			439,725

The estimates this year of available and probable ore are calculated in a different way from those submitted in previous years. Heretofore, it was assumed that eventually nearly all of the pillars left in the mine could be removed, starting at the bottom of the deposit and working upward. It is

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4. ESTIMATE OF ORE RESERVES:

b. Prospective Ore: (Cont.)

now assumed that only 40% of the ore left in pillars and floors will be recovered, and as a result the estimates of ore reserves are lower than in previous years. The estimate of prospective ore represents all ore below the fourth level down to the bottom of the deposit as shown by diamond drilling. The estimate is conservative, as comparatively little information is available of the ore body below the fourth level.

c. Estimated Analysis:

Ore Reserves: Approximate Expected Natural Analysis.

Developed Ore:

	Iron	Phos.	Silica	Mang.	Alum.	Lime	Mag.	Sul.	Igni.	Moist.
Gardner	51.24	.091	2.92	.295	1.75	2.96	1.70	.619	3.91	13.00
Mackinaw	53.16	.126	2.70	.317	1.64	2.85	1.29	.749	4.18	9.00

Prospective Ore:

	Iron	Phos.	Silica	Mang.	Alum.	Lime	Mag.	Sul.	Igni.	Moist.
Mackinaw	53.11	.130	2.73	.317	1.64	2.84	1.29	.717	4.47	9.00

Ore in Stock: Average Natural Analysis.

	Iron	Phos.	Silica	Mang.	Alum.	Lime	Mag.	Sul.	Igni.	Moist.
Gardner	51.24	.091	2.92	.295	1.75	2.96	1.70	.619	3.91	13.00

The previous annual reports show the analysis of two grades of ore from Mackinaw property, a high and a low sulphur ore. This year it is assumed that only one grade of ore will be produced from the Mackinaw, that will average about the same in sulphur as the ore from the Gardner property. This arrangement simplifies the stocking proposition, decreases the number of analyses, and thus reduces the cost of production.

Due to a lower moisture content, the natural iron is higher in the Mackinaw ore than in the Gardner. The ore is also harder and of better physical character.

5. LABOR AND WAGES:

a. Comments:

(1) Labor:

There was an excess of labor available throughout the year, representing former employees who were waiting for a chance to resume work with the Company.

(2) New Construction:

Reopening Mine - This is covered under other headings.

Development of fifth level, Mackinaw - This is fully covered under #12-a.

b. Comparative Statement of Wages and Product:

Re-opening started on December 1st, 1927.

	1928
PRODUCT	90,866
No. Shifts and Hours	1-8 hr.

AVERAGE NO. MEN WORKING:

Surface	15½
Underground	46
Total	61½

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5. LABOR AND WAGES:

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

	1928
AVERAGE WAGES PER DAY:	
Surface	4.24
Underground	4.97
Total	4.77
WAGES PER MONTH OF 25 DAYS:	
Surface	106.00
Underground	124.25
Total	119.25
PRODUCT PER MAN PER DAY:	
Surface	23.36
Underground	8.50
Total	6.16
LABOR COST PER TON:	
Surface	.2995
Underground	.7903
Total	1.0898

7. UNDERGROUND:

a.

TONS PER MAN PER DAY:	
Stoping	15.28
Ore Development	9.60
Total	14.03
AVERAGE WAGES CONTRACT MINER	5.12
TOTAL NUMBER OF DAYS:	
Surface	4,062 3/4
Underground	10,684 3/4
Total	14,747 1/2
AMOUNT FOR LABOR:	
Surface	17,247.25
Underground,	53,218.09
Total	70,465.34

Proportion of Surface to Underground Men:
1928 - 1 to 2.32 One 8-hour shift six days per week.
Mine idle previous years.

6. SURFACE:

a. Buildings, Repairs:
Considerable new piping was installed in the dry house and the building put in condition while the mine was unwatered.
A new roof was put on the office and warehouse building.
The steam and return water lines to the heating plant from all the mine buildings had to be replaced, and a new wooden conduit built. The steam lines were also covered.

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6. SURFACE:

b. Stockpiles:

The permanent stocking trestle at the Gardner shaft was repaired during January and February. A number of new legs were installed, also some new stringers and an entire new floor. Seven bents leading to the stocking ground were replaced, as the old ones had rotted. Several bents were erected on the stockpile grounds, and ore was stocked until shipping started in May. In the fall thirteen stocking bents were erected.

Old sollar planks were shipped from the Stephenson Mine and laid on the stockpile grounds at the Gardner. The rock sollar was rough, and some of the slate rock contained pyrite. Unless plank sollar was installed, careful hand work would be necessary to clean up the ore when mining was finished.

c. Tracks and Roads:

During April the grade and tracks were put in by the C. & N.W. Railway Company to the Gardner shaft, and were ready by the opening of the shipping season. When the mine operated in 1920, all the ore was stocked, as there were no tracks to the shaft.

The road to the mine was filled in and surfaced with mine rock across the swamp near the mine buildings, a distance of about 200 feet.

7. UNDERGROUND:

a. Shaft Sinking:

There was no shaft sinking at the Gardner-Mackinaw Mine during 1928.

b. Development:

There was comparatively little development work done during the year, as the limits of the ore body were well defined prior to the shut-down in 1920. Some additional tonnage was found at the northwest end of the ore body, between the first and second levels, where either faulting or an overturn in the foot occurs.

A raise had been put up in 1920, following a narrow ore body to a point 18' below the first level. A scraper hoist was installed here last spring to handle the ore, and work was resumed. The ore was followed to a point above the first level and a stope opened by widening the raise. The ore body apparently extends as a thin sheet, from 5' to 20' thick, to the north from the Gardner on to the Mackinaw property. This ore was developed on the first level in the fall, and stoping was nearly ready to be started at the end of the year. It is anticipated that several thousand tons will be available on the Gardner and possibly an equal quantity on the Mackinaw.

The southeast end of the ore body was developed in 1928. This area is high in sulphur, and had been opened by one or two raises, when the mine previously operated. As sulphur no longer prohibits the sale of the ore, this area was developed and stoping has been under way since last summer. The ore in this area is quite hard and resembles the ore mined on the Mackinaw property.

The northwest half of the ore body above the first level was split by jasper into two ore bodies, one near the foot and one near the hanging. The ore was also intirely cut off by jasper much below the mining limit of 140' above the first level. The ore in this area was quite soft, auger drill machines being used here, while water Leyners were required elsewhere. The ore was also high in moisture, averaging over 13%. Mining has been completed in this area.

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7. UNDERGROUND:

c. Stoping:

The ore hoisted the past year has practically all been secured from two levels, the first and the second. A small amount of ore was broken on the third level late in the year, but the transfer raise interferes with stoping operations at the southeast end of the ore body between the third and second levels. There was probably 10,000 tons of broken ore in the stopes at the end of the year.

Stoping operations above the first level were completed at the end of the year in all but three stopes at the southeast end of the ore body, and in the narrow trough of ore found at the northwest end of the ore body. Stoping at the southeast end will be completed in 60 days, while at the northwest end the life of the stopes will depend on the developments. The ore body here is thin, and if it extends upwards any distance will cross the boundary over on the Mackinaw property.

Stoping between the second and first levels was also nearly completed at the end of the year. Two stopes were in operation at the southeast end of the ore body and at least two stopes can be opened near the Mackinaw boundary at the northwest end.

Practically no ore was mined above the third level. One stope was started late in the year near the southeast end of the ore body. Some additional ore can be mined here after mining is completed above the second level, so that the transfer raise can be abandoned.

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

First Level:

When the mine closed down in 1920, raising was in progress above the first level, preliminary to stoping. Stoping had been started in two of the seven stopes that were being opened above the first level. When mining was resumed last April, work was started immediately in the first level stopes. Raises were pushed up to an elevation of 100' above the first level, where a connection was made to a traveling road that had been put up before the mine shut down. Another stope was opened at the southeast end of the mine where the flat foot wall made it necessary to use a scraper for handling the dirt to the chute. Later on, two additional stopes were opened in this territory, and the ore body was found to extend to the east on the flat foot wall far enough to permit opening at least one and possibly two additional stopes. Brief comment will be made on each stope, using the numbers by which the stope has been designated throughout the year in the monthly report.

#74 Stope:

Number 74 stope, located at the northeast end of the main level ore body, was opened and stoping started on the foot wall when the mine closed in 1920. The raise in the center of this stope had only been extended up about 40' above the first level, and a connection made through the pillar to an adjoining stope, which was used as a traveling road to the stope. Stoping was resumed when the mine re-opened, but the ore gradually pinched out until there was only a narrow seam left between the foot wall and what was assumed to be the jasper hanging. A second level stope almost directly below this stope showed the ore to be nearly 50' thick between foot and hanging, so that a small raise was put up in the stope through the jasper in the back and 20' of ore found near the hanging. Mining was then abandoned on the foot wall side of the stope, and the ore on the hanging side was mined. This ore was cut off by seams of jasper at an elevation of 45' above the first level. A description of the work done in #74 stope would not be complete without including the plugging of #9 drill hole, which was encountered on the side of the stope. Plugs had been put in this drill hole in 1920, but the ground cracked and considerable water entered the stope. A raise was put

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7. UNDERGROUND:

c. Stoping:(Cont.)

up on the line of the drill hole and an attempt made to plug it soon after work was resumed last spring. The water was temporarily cut off, but soon entered the stope at higher elevations. It was then decided to put up a raise parallel with the drill hole and about 10' distant from it, until hard jasper was encountered, then drift to the drill hole and make another effort to plug it. A raise was put up a distance of 50' before solid ground was encountered. After drifting to the drill hole, plugs were inserted and at least 95% of the water cut off. This had an immediate effect on pumping, as it decreased the mine water and cut down the hours that the pump was operated. There has been no further trouble with water from this drill hole.

#75 Stope:

Conditions in this stope, with respect to the jasper seam that separated the ore into two bodies, were practically the same as in #74 stope. The ore on the foot side extended about 40' above the level, but the hanging wall ore continued to a point about 75' above the first level.

#77 Stope:

This stope had been opened a distance of 40' above the level when the mine closed down, but the raise in the center stope had been extended to an elevation of 100' above the level, and a connection made to the traveling road. Stoping was started here as soon as the mine was in condition to operate, and continued until the stope was completed, jasper being encountered at an elevation of 123' above the first level.

#78 Stope:

A raise in the center of this stope had been put up about 80' above the level when the mine closed. It was extended 20' and a connection made to the traveling road, after which stoping was started. This stope reached an elevation of 118' above the first level, where it was cut off by jasper.

#79 Stope:

The raise in the center of this stope was continued from an elevation of 50' up to the traveling road, a distance of 50'. Stoping was then started and was continued till the stope reached an elevation of 115' above the first level, at which point jasper was encountered.

#80 Stope:

The raise in this stope was up about 20' when the mine re-opened. It was continued to an elevation of 100' and a connection made to the traveling road. This stope was extended to an elevation of 140' above the first level, which is the limit of mining.

#81 Stope:

This stope was opened on the flat foot wall near the southeast end of the ore body. It started at a point 30' above the first level, and was extended to a point 140' above, or to the limit of mining. While this stope was being put up, the ore was followed in an easterly direction and later on other stopes were opened further to the east. All ore mined in this stope, as also stopes #82 and #83, was handled by scraper hoists, which moved the ore on the flat foot wall and through a drift to a raise which connected with the haulage road on the first level.

#82 Stope:

This is a branch stope put up from #81 stope. It started at an elevation of 40' above the main level and was put up 54' by the end of the year, with 48' to go to reach the limit of mining.

#83 Stope:

This stope started as a branch stope from #82 stope, at an elevation of about 50' above the first level. It has been extended in an easterly direction on the flat foot wall, and at the end of the year had advanced 60' to an elevation of 112' above the main level, or within 30' of the limit of mining.

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7. UNDERGROUND:

c. Stoping: (Cont.)

Another stope, #84, will be opened as a branch stope from #83. It will advance about 70' to reach the limit of mining.

First Level General:

The ore in the stopes from #74 to #79, inclusive, was quite soft, particularly near the hanging, and auger drills were mainly used in drilling. The sulphur in this ore averaged around .500. The ore in stopes #81 to #83 inclusive, is hard and high in sulphur. The ore body averages only about 15' in thickness between the foot and hanging in these stopes. As shown by the above detailed report of work in the stopes, they have practically all been completed, except #82, #83, and another branch stope to be known as #84. Only a limited quantity of ore will be obtained from these stopes, due to the ore body not averaging over 15' in thickness.

Some development work was done during the year at the northwest end of the first level, where a narrow seam of ore was found near the Mackinaw boundary as a result of following this ore upward in a small stope from a point midway between the first and second levels. After this ore was proved to extend to the first level, the main level drift was extended and the ore followed at the elevation of the first level until it was cut off by rock. The ore was then followed up on the rock, which dipped from the north at a flat angle, for a distance of about 50', when the ore was cut off by jasper. The last of the year a drift was started through the rock on the main level to extend the motor haulage drift to this ore. All ore found from this development work was pulled by scraper to the incline raise from the second level, from which point it was transferred by another scraper to a second level stope which connected with the second level haulage road. The extension of the first level haulage drift will permit this ore to be loaded directly with scraper into motor cars. It is not anticipated that much ore will be found in this territory, but there is enough to warrant opening at least three small stopes. If the ore continues upward following the foot wall, it will extend across the boundary on the Mackinaw property, where mining will be continued and the ore hoisted through the Mackinaw shaft.

Second Level:

One contract worked practically the entire year at the northwest end of the ore body mining the ore in the narrow body discovered here prior to closing the mine in 1920. They first drove a drift through a pillar at a point 30' above the second level connecting #50 stope with this narrow ore body. A scraper hoist was set here and all the ore which they have mined has been transferred by scraper to #50 stope. They enlarged the raise, that had originally been put up to follow this ore, to stope size, and continued in the ore until they had reached the elevation of the first level. They also opened two small stopes to the north, one of which was extended to the Mackinaw boundary. There is still ore in the breast. Mining will be resumed here after the Mackinaw shaft is in condition for hoisting ore. In the latter part of the year they followed a seam of ore at an elevation of 30' above the second level that was found to extend back in under the foot of #53 and #54 stopes. When these stopes were put up it was thought that they were following the foot wall, but it was found this fall that there was considerable ore left in the foot, due to a roll which caused the ore to extend down some 25' deeper. All available ore was mined here at the end of the year. Only a limited amount of ore can be obtained from this territory until mining can be started on the Mackinaw and the ore followed upward on this property.

When the mine was closed down ore was being mined in stopes #55 and up to #59, inclusive. Mining had been completed in #54 stope and was nearly

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7. UNDERGROUND:

c. Stoping:

Second Level: (Cont.)
finished in #55 and #56. The raise in #57 stope was used as a traveling road from the second to the first levels. #58 and #59 stopes were about half finished when the mine closed down.

#55 Stope:

When work was resumed last spring, this stope was continued through to the first level, work being completed here early in the summer. The ore in the foot wall of this stope was cleaned out by scraper hoists.

#56 Stope:

This stope was also up about 75' above the second level, and it was continued through to the first level. The ore on the foot wall here was also cleaned down with a scraper hoist.

#57 Stope:

This stope had been set aside as a traveling road, and was used for a short time after the mine re-opened. It was then decided to put up a new traveling road in the pillar between #54 and #55 stopes, so that stoping operations could start in #57. The new traveling road was completed in the summer, and stoping started in #57 stope. At the end of the year stoping on the foot wall side had been completed to the first level, and there was still about 25' to complete on the hanging side. This stope was nearly full of ore at the end of the year.

#58 Stope:

This stope was up about 70' when the mine closed. Stoping was resumed here in May and it was found that the ore extended further into the hanging than had been thought when the stope was previously worked. The ore was cleaned out of the stope and stoping on the hanging side resumed at an elevation of 50' above the second level, and a considerable quantity of ore removed near the hanging. Stoping was continued here until all the ore was removed up to the first level.

#59 Stope:

This stope was up about 50' when the mine re-opened, and it was carried through to the elevation of the first level, stoping being completed in the fall.

#60 Stope:

The ore was known to extend further to the southeast beyond #59 stope, but it had not been developed when the mine closed down, as it was high in sulphur and it was not considered advisable at that time to mine it. Arrangements were made for handling ore by scraper hoist to the main transfer raise to the third level, and drifting was started to the east near the transfer raise on the sill floor. This drift advanced about 50' before encountering the foot wall. A raise was then put through to the second level, which for a time was used as a traveling road. Stoping was started here in the fall, and at the end of the year #60 stope was up about 50'. The ore body between foot and hanging from this point up to the first level is between 50' and 60' in thickness, so that quite a large tonnage of ore will be obtained from #60 stope.

#61 Stope:

At the point where the foot wall was encountered in the drift driven from the transfer raise, a drift was started in a southeasterly direction following the foot wall, and after advancing about 30' the ore was cut off on the line that is the limit of the southward extension of the ore body. In the fall a stope was started up over the foot from this point, which advanced in a due easterly direction, and at the end of the year was up about 50'.

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7. UNDERGROUND:

c. Stoping: (Cont.)

#61 Stope:

If this stope continues to the east it will be possible to open at least two branch stopes to take out the block of ground left between this stope and #60 stope. The ore here is hard, high in sulphur, but when mixed with ore from other stopes gives a produce that is close to the average of .730 sulphur.

Third Level:

All the ore mined in stopes above the second level was trammed to the transfer raise by motor haulage and in #60 and #61 stopes by scraper hoist, and taken to the shaft on the third level. The second level does not connect with the Gardner shaft. Considerable re-timbering was necessary on the third level, as the haulage drift here averaged 15' or more in width, extending in part of the area from the foot to the hanging wall. This timber rotted during the time the mine was idle, and new timber had to be installed before haulage started. Part of the third level territory was not repaired when the mine re-opened, but repair work was started here late in the fall and was still under way at the end of the year. The latter part of the year a raise was started in a large pillar at the southeast end of the ore body, which raise was put up to a distance of 50', where a connection was made to an old traveling road from the transfer raise to #16 stope. Access to the top of this raise is gained through the old stopes. The last of the year stoping started just above the third level.

The only other work done during the year in the stopes above the third level was in #19 stope, which had been stoppedat a point 20' below the second level. This stope was extended through to the second level. The ore in this stope is narrow between the foot and hanging, averaging only 15' in thickness.

As soon as mining is completed above the second level, so that the transfer raise can be abandoned, it will be possible to open a stope here and one or more branch stopes in the eastward extension of the ore body, the same as has been done on the first and second levels.

Fourth Level:

The fourth level ore body is almost entirely on the Mackinaw property. Since authority was received to open the fifth level, Mackinaw Mine, work of cleaning up the fourth level has been started. Tracks and ditches have been cleaned from the Mackinaw shaft to the ore body, and for some distance in the ore drift. This is anticipating work that would have to be done when the raises hole from the fifth level. The chutes in #1 and #2 stopes, fourth level, have been thoroughly blocked at the bottom, as it is planned to dump the rock that will come from sinking the Mackinaw shaft into these stopes on the third level. If they are filled, #3 stope will then be used for a rock dump.

d. Timbering:

Timber at this mine is used for timbering the main levels and building chutes. The ore body is mined by the open stope method, and due to the hard and compact hanging wall, no timber is required. When the mine re-opened, considerable timber on the main levels had to be replaced due to rotting.

The following is a statement of timber used:

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7. UNDERGROUND:

d. Timbering: (Cont.)

Statement of Timber Used:

KIND	LINEAR FEET	AVG. PRICE PER FT.	AMOUNT 1928
8" to 10" Timber,	332	.06913	22.26
10" to 12" "	2,800	.1101	308.41
12" to 14" "	1,220	.1072	230.80
14" to 16" "	108	.1079	11.66
Total timber,	4,460	.1060	473.13
		per 1000'	
5' Lagging,	2,250	7.835	19.98
Poles, 9'6",	17,174	14.20	244.71
Total Lagging and Poles,	19,724		264.69
Product,			90,866
Feet of timber per ton of ore,			.0049
Feet of Lagging per ton of ore,			.002806
Cost per ton for timber,			.0052
" " lagging,			.0002
" " poles,			.0027
" " timber, lagging, and poles,			.0081
Equivalent of stull timber to board measure,			16.0530
Feet of board measure per ton of ore,			.00176
Total cost for timber, lagging, and poles,			737.82

e. Drifting and Raising:

	ORE DRIFTING	ORE RAISING	ROCK DRIFTING	ROCK RAISING
1928 -	330'	667'	0	0

There was comparatively little drifting or raising necessary at this property, due to the ore being developed prior to the closing of the mine in 1920. Ore drifting was done on the main levels in connection with new traveling roads and transfer raises. Ore raising was done in putting up a new traveling road from the second to the first levels, and in extending raises in ore above the first level to the top of the ore body or to the mining limit.

f. Explosives, Drilling and Blasting:

The following is a statement of explosives used:

Statement of Explosives Used:

	QUANTITY	AVERAGE PRICE	AMOUNT 1928
Dupont, Extra A, Powder,	51,300	13.50	6,925.10
Gel. Spec., 50%, "	20,400	13.75	2,805.00
Red Cross, 50% "	500	13.50	67.50
Total Powder,	72,200	13.57	9,797.60
Fuse,	145,000	.624	904.78
Caps,	24,300	1.108	269.36
Cap Crimpers,	33	5.00 dz	13.75
Tamping Bags,	1,500	2.15	32.25
Connecting Wire,	4#		1.59
Total Fuse, etc.,			1,221.73
Total All Explosives,			11,019.33

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7. UNDERGROUND:

f. Explosives, Drilling and Blasting: (Cont.)

Statement of Explosives Used: (Cont.)

	Amount 1928
Product,	90,866
Pounds of powder per ton of ore,	.1258
Cost per ton for powder,	.107
Cost per ton for all explosives,	.121
Total explosives used in mine,	$11,019.33

Due to good natural ventilation, Dupont Extra A, a low density explosive, was used in the stopes and 50% Gelatin Special in the drifts and raises and where ventilation was not good. The cost per ton for explosives was lower than when the mine previously operated.

g. Mining and Loading:

There was no change in the mining methods in 1928. Careful computations show that 58% of the ore is recovered from stoping operations and 42% left in pillars and floors. It is now thought that 40% of the ore left in the pillars and floors can be recovered when robbing is started, after regular stoping operations are completed.

The ore from certain areas has been moved to chutes with scrapers. This method made it possible to mine the ore at a profit, whereas under the former system, with one or more transfers with tram cars, it could only have been mined at a loss.

Three ten H.P. Sullivan electric hoists were used in the transfer work. Several air hoists were used to scrape ore off the foot of the stopes, doing work that was formerly done by hand, with greater speed and safety.

h. Ventilation:

Ventilation at this mine is by natural means and is very satisfactory. Ventilation doors on the levels control the draft in cold weather. If ice forms in the downcast shaft the draft can be reversed.

i. Pumping:

Bailing was continued until March 17th, when the small pump which had been left on the fourth level was ready to operate. Installation of the 2,000 gallon plunger pump was completed on March 21st, but it did not operate satisfactorily until April 29th, since which time pumping has been done on day shift only.

The following table gives the gallons pumped per minute:

Month	Gals. per minute
May	127
June	135
July	134
August	138
September	193
October	231
November	132
December	110
Average	150

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7. UNDERGROUND:

i. Pumping: (Cont.)

The increase in September and October was due to water from #9 drill hole on the first level. The water in earlier months was also increased by leakage from this drill hole. When the mine operated before, the water averaged from 125 to 175 gallons per minute. It is not expected that it will now exceed 125 gallons per minute.

j. Underground in General:

The tonnage of ore in the Gardner Mine is not as great as was expected when the mine re-opened. This was due to jasper cutting off the ore in a number of the stopes some distance below the mining limit, and to the ore not being of average thickness in other stopes.

The mine is in good condition, the levels are clean, and the safety standards are being followed.

8. COST OF OPERATING:

a. Comparative Mining Costs:

	1928
PRODUCT	90,866
Underground Costs,	.985
Surface Costs,	.202
General Mine Accounts,	.088
Cost of Production,	1.275
Loading and Shipping,	.063
Total Cost at Mine,	1.338
Depreciation - Movable Equipment,	.002
Plant and Equipment,	.180
Development,	.199
Taxes,	.017
Central Office,	.097
Welfare, Safety, Hospital,	.012
Unwatering and Re-opening,	.150
Supply Inventory,	.000
Total Cost at Mine,	1.995
No. of Days Operated,	226
No. Shifts & Hours,	1-8 hr.
Average Daily Product,	402
COST OF PRODUCTION:	
Labor,	.776
Supplies,	.499
Total,	1.275

b. Detailed Cost Comparison:

(1) Days and Shifts:

During 1928 the mine worked one eight hour shift for 226 days, and the average number of men employed was 61½, for a total of 14,747½ days.

(2) Wages:

There was no change in the wage schedule during the year.

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8. COST OF OPERATING:

b. Detailed Cost Comparison: (Cont.)

(3) Comparison of Production:

Production, 1928 - 90,866 tons
Production, 1927 - - - -

(4) Comparison of Number of Men and Wages:

	No. Men	No. Days	Amount	Rate per day
1928 -	61½	14,747½	$70,465.34	$ 4.77

(5) Tons per man per day:

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

	1928
Surface,	23.36
Underground,	8.50
Total,	6.16

9. EXPLORATIONS AND FUTURE EXPLORATIONS:

(6) Cost of Production:

1928 - $115,865.15 Cost per ton, $1.275

	Total Cost				Cost per ton		
	Labor	%	Supplies	%	Labor	Supplies	Total
1928 -	$ 70.541.27	61%	$ 45,323.88	39%	.776	.499	1.275

10. TAXES:

On account of the mine not operating in 1927, no detailed cost comparison can be made. Comments are made to explain unusual expenditures in a few of the accounts.

Stoping cost was increased due to the purchase of seven scraper hoists, five new ones and two second-hand. Scrapers are of great benefit at this property, due to the flat foot wall.

Timbering cost was higher than normal for this mine, due to repair of timber and chutes on the main levels, that had rotted during the time the mine was idle.

Tramming costs were very reasonable considering the fact that nearly 50% of the product was transferred by motor train on the second level to a transfer raise from the third level, then loaded on third level and trammed to the shaft.

Maintenance cost "Compressors and Power Drills" was high due to changing valves. The complicated valve system on all Nordberg compressors was scrapped and a new simple valve system substituted. With the old valves delays were common, while with the new valves no delays have occurred. The balance of maintenance cost was due to the purchase of four drill machines.

Maintenance cost "Pumping Machinery" was high due to the purchase of 905' of #2 conductor cable, for electric line in the shaft. The old pump cable was used at the Gwinn Mine and was included with the equipment sold the Quinn Mining Company.

Maintenance cost "Hoisting Equipment" was above normal due to the purchase of a complete new set of grids. The grids belonging to the Mackinaw hoist were used on the cage hoist at the Stephenson mine, where several burned out. The load when bailing out the Mackinaw caused others to burn out, so that to avoid delays a new set was bought from the Barnes-Hecker hoist. The opening of the fifth level, Mackinaw, made it necessary to install a hoist at the Gardner Mine. There was considerable expense for dismantling the Stephenson Cage hoist, and moving and setting it up at the Gardner.

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8. COST OF OPERATING:

b. Detailed Cost Comparison: (Cont.)

Maintenance Cost "Shaft" was due to replacing casing plank, knocked off when the mine was bailed out.

Maintenance cost "Mine Buildings" was high due to repairs necessary on account of the long period the mine had been idle. In December, this account was charged with the cost of dismantling the old Stephenson dry house, moving and setting it up for an engine house at the Gardner Mine. (The old Gardner engine house was sold to the Cliffs Power and Light Company for use at the Cataract Water Power job, after the Gardner hoist was sold.)

Telephones and Safety Devices expense was high due to extending the lighting system underground to increase safety, also more than the usual expense for safety devices.

9. EXPLORATIONS AND FUTURE EXPLORATIONS:

There were no explorations at the mine during the year.

10. TAXES:

DESCRIPTION	1928 VALUATION	1928 TAXES	1927 VALUATION	1927 TAXES
C. & N.W. Lease, Gardner:				
SE¼ of SE¼ Sec. 35-45-25,	7,000	220.93	10,000	288.42
NW¼ of NE¼ Sec. 2-44-25,	200	6.31	200	5.77
Personal property,	15,000	473.45	20,000	576.80
Total,	22,000	700.69	30,200	870.99
CollectionFees,		7.00		8.71
Total Taxes,		707.69		879.70
D.M.& M. Lease, Mackinaw:				
N½ of SE¼ & SW¼ of SE¼, Sec. 35-45-25,	25,000	789.04	22,000	634.53
Collection Fees,		7.89		6.35
Total Taxes,		796.93		640.88
Gardner-Mackinaw Dwellings,	7,500	236.72	5,000	144.22
Collection Fees,		2.37		1.44
Total Taxes,		239.09		145.66
Total Taxes Gardner-Mackinaw Mine and Location,		1,743.71		1,666.24
Increase, 1928 -		77.47		

The assessed valuation of the Gardner Mine was reduced in 1928, due to ore in stock having been shipped, and to a further reduction in the valuation placed on ore reserves.

A slight increase was made in the valuation of the Mackinaw ore reserves, enough to offset the decrease at the Gardner.

The valuation of location houses was increased, due to some of the houses being occupied.

The total valuation of the mines and the location decreased $2500, but taxes increased due to a higher tax rate.

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11. ACCIDENTS AND PERSONAL INJURY:

There were three minor accidents for which compensation was paid during 1928, and resulted in a total loss of 94 days. The following table shows the nature of accident and loss of time.

No. of Accidents	Nature	Time Lost
1	Fracture of four ribs.	37 days
1	Infection of finger.	4 "
1	Severe laceration of thigh.	53 "
3		94 days.

12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION:

E. & A. #537 - Opening Fifth Level, Mackinaw Mine.

This E. & A. was approved in November and the work of preparing the Mackinaw shaft for hoisting and other work incidental thereto was started. The Mackinaw shaft is down 97' below the fourth level, and by sinking 40' it will be deep enough to open the fifth level. The E. & A. covers work of sinking, cutting plat and pocket, and drifting 850' to the ore body. All other expense will be absorbed directly into the operating cost. Actual sinking will be delayed due to the sale of the Gardner hoist and engine house, as they have to be replaced. This work was under way at the end of the year. It is planned to handle the rock from sinking on the third level, Mackinaw, and dump it into the old fourth level stopes. Sinking can be started just as soon as the Gardner hoist is in commission.

13. EQUIPMENT AND PROPOSED EQUIPMENT:

A McClure top tram plant, for the Mackinaw top tram, was obtained from the Stephenson and is now at the Mackinaw ready to be erected.

The cage hoist from the Stephenson Mine was taken to the Gardner and is now being set on foundations.

Two underground haulage motors will be needed for development of the fifth level. They will be obtained from surplus motors at the Stephenson Mine.

c. Scraper Hoists:

The following scraper hoists are used in the stopes and on the levels to pull down the ore on the foot, where the slope is too flat for the ore to run.

	On Hand 1/1/1928	Purchased 1928	On Hand 1/1/1929
Ingersoll-Rand air,	0	2	2
10 H.P. Sullivan electric,	0	3	3
Sullivan air,	0	2	2
Total	0	7	7

One 10 H.P. Sullivan electric hoist was received too late in December to be charged out. The two Sullivan air hoists were second-hand machines from the Republic Mine.

GARDNER-MACKINAW MINE
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14. MAINTENANCE AND REPAIRS:

There were no extraordinary repairs made after the mine started to operate. A large amount of work was necessary to assemble and put the equipment into proper operating condition, owing to the long shut-down and to the fact that some of the equipment had been sold and some borrowed by other mines.

15. POWER:

Electric power was supplied during the year by the Cliffs Power and Light Company, a subsidiary of the Cleveland-Cliffs Iron Company. There were no serious delays due to lack of power during the year. The delays from this cause are listed under 2 - h.

The rate charged for current was 1½¢ per kilowatt hour, the same as has been in effect for a number of years.

17. CONDITION OF PREMISES:

No landscaping was ever done at this mine. An unusual feature at this property was the eight large Norway and white pine trees near the mine buildings. During the idle period two of these trees blew down and two were struck by lightning. The surface around the mine buildings was kept in good condition at all times. The short life of the mine and small margin of profit does not warrant any expenditures for shrubbery or lawn. The water level is less than two feet below surface, and filling around the buildings and on roads is nedessary in wet weather to keep them out of the water.

18. NATIONALITY OF EMPLOYEES:

The nationality report for the Gardner-Mackinaw Mine based on time books for the December 31st, 1928, period, is as follows:

	No. of Men	Percentage
Italian,	24	24.5%
Finnish,	31	31.6
Swedish,	13	13.3
Norwegian,	1	1.0
French,	14	14.3
English,	14	14.3
Scotch,	1	1.0
Total,	98	100%

19. RE-OPENING MINE:

Authority to re-open the mine was received on November 30th, 1928, and the work was started December 1st. The mine started operating April 7th, 1928, although some re-opening expense was incurred in April and May. The original estimated cost of re-opening was $20,000, while the actual cost was in excess of $33,000. The main reason for the

GARDNER-MACKINAW MINE
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19. RE-OPENING MINE:

increase was delay in bailing after the mine was nearly unwatered due to various causes, replacement of air, water, and trolley lines throughout the mine due to action of acid mine water on the pipes and hangers, more repairs to timber and tracks, and more expense for assembling and overhauling equipment. Expense for repairing trestles at the Gardner was higher than expected. It is probable that costs were at least 15% to 20% higher on account of re-opening in the winter, with the severe cold weather and short days.

2. PRODUCTION, SHIPMENTS & INVENTORIES:

b.

Grade of Ore	Stockpile	Total	Total Last Year
Franport	23,603	23,603	21,686
Increase in 1928 -		1,917	

c. Stockpile Inventories:

Grade of Ore	1928	1927	Increase	Decrease
Franport	357,746	381,349		23,603

f. Ore Statement:

	Franport Tons	Total Tons	Total Last Year
On Hand Jan. 1, 1928	381,349	381,349	403,035
Output for Year	0	0	0
Total	381,349	381,349	403,035
Shipments	23,603	23,603	21,686
Balance on Hand	357,746	357,746	381,349
Decrease in Ore on Hand		23,603	21,686

1928 - Mine abandoned.
1927 - " "

3. ANALYSIS:

b. Average Analysis on Straight Cargoes:

The analysis of the ore shipped from stockpile was below the average analysis of the piles. The steam shovel cut on the north side was nearly completed, and a cut started on the south side of the pile. The lump ore contains the bands of slate that reduce the iron content, and the first cut gets the greater part of this lower grade ore. The analysis of ore loaded next year can be improved by loading out the second cut on the north side of the stockpile.

8. COST OF OPERATING:

a. Comparative Mining Costs:

	1928	1927	INCREASE	DECREASE
Underground Costs,	0	0		
Surface Costs,	1.90	0	1.90	
General Mine Accounts,	3,066.70	1,066.93	1,999.77	
Total	3,068.60	1,066.93	2,001.67	
Abandonment Expense	0	140.74		140.74
Loading and Shipping	1,054.87	1,676.16		621.29
Total as per Cost Sheet	4,123.47	2,883.83	1,239.64	
Taxes	10,856.39	11,550.23		693.84
Central Office	106.33	0	106.33	
Welfare, Safety, Hosp.	11.22	0	11.22	
Cost Adjustment	-	3,897.51		3,897.51
Grand Total	15,097.41	18,331.57		3,234.16

FRANCIS MINE
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1. GENERAL:

There was no change in the condition of this abandoned mine during 1928. A small shipment was made from the stockpile. The steel shaft house and steel pulley stands are the only structures left on the property.

2. PRODUCTION, SHIPMENTS & INVENTORIES:

b. Shipments:

Grade of Ore	Stockpile	Total	Total Last Year
Franport	23,603	23,603	21,686
Increase in 1928 -		1,917	

c. Stockpile Inventories:

Grade of Ore	1928	1927	Increase	Decrease
Franport	357,746	381,349		23,603

f. Ore Statement:

	Franport Tons	Total Tons	Total Last Year
On Hand Jan. 1, 1928	381,349	381,349	403,035
Output for Year	0	0	0
Total	381,349	381,349	403,035
Shipments	23,603	23,603	21,686
Balance on Hand	357,746	357,746	381,349
Decrease in Ore on Hand		23,603	21,686

1928 - Mine abandoned.
1927 - " "

3. ANALYSIS:

b. Average Analysis on Straight Cargoes:

The analysis of the ore shipped from stockpile was below the average analysis of the piles. The steam shovel cut on the north side was nearly completed, and a cut started on the south side of the pile. The lump ore contains the bands of slate that reduce the iron content, and the first cut gets the greater part of this lower grade ore. The analysis of ore loaded next year can be improved by loading out the second cut on the north side of the stockpile.

8. COST OF OPERATING:

a. Comparative Mining Costs:

	1928	1927	INCREASE	DECREASE
Underground Costs,	0	0		
Surface Costs,	1.90	0	1.90	
General Mine Accounts,	3,066.70	1,066.93	1,999.77	
Total	3,068.60	1,066.93	2,001.67	
Abandonment Expense	0	140.74		140.74
Loading and Shipping	1,054.87	1,676.16		621.29
Total as per Cost Sheet	4,123.47	2,883.83	1,239.64	
Taxes	10,856.39	11,550.23		693.84
Central Office	106.33	0	106.33	
Welfare, Safety, Hosp.	11.22	0	11.22	
Cost Adjustment	-	3,897.51		3,897.51
Grand Total	15,097.41	18,331.57		3,234.16

FRANCIS MINE
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8. COST OF OPERATING:

a. Comparative Mining Costs: (Cont.)

The large increase in General Mine Accounts is due to setting up a reserve to take care of compensation payments for personal injuries. It is 2% of the payroll for 1928, plus a calculated amount to cover payments to employees still receiving compensation for injuries incurred when the mine operated.

Cost Adjustment charges were high in 1927 due to closing up accounts connected with dismantling and storing equipment.

10. TAXES:

DESCRIPTION	1928 VALUATION	1928 TAXES	1927 VALUATION	1927 TAXES
SW¼ of NW¼ Sec. 27-45-25, 40 acres,	-	2.33	-	-
SW¼ (Ex. R. of W.) " 153.56 acres,	500	15.79	500	14.43
Personal Property,	340,000	10,730.80	396,000	11,421.44
Total,	340,500	10,748.92	396,500	11,435.87
Collection Fees		107.47		114.36
Total Taxes,		10,856.39		11,550.23
Total Tax Rate per $100		3.1561		2.885

Taxes decreased in 1928 due to lower valuation set by the Tax Commission on the ore in stock.

GWINN DISTRICT MINES
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YEAR 1928

1. GENERAL:

Conditions in the Gwinn District were good during 1928, in fact, it ranks as one of the best years since 1923. The Archibald Mine continued to operate on double shift, a construction crew worked at the new Water Power Plant on the Escanaba River, the Gardner-Mackinaw Mine operated all the year, and there was also other Company activities in the district during the shipping season, and extensive woods operations around Gwinn. A general feeling of optimism prevails, in marked contrast with the depression of the previous year.

It is hoped that some solution will develop which will permit Gwinn and surrounding villages to continue in existence.

a. STATEMENT SHOWING TOTAL ORE PRODUCED FROM 1903 to 1928 INCLUSIVE:

YEAR	AUSTIN	PRINCETON	STEPHENSON	GWINN	FRANCIS	GARDNER-MACKINAW	TOTAL
Total to 1/1/28	1,582,616	1,584,333	3,792,429	988,665	522,602	201,160	8,671,805
1928	0	0	0	0	0	90,866	90,866
Total	1,582,616	1,584,333	3,792,429	988,665	522,602	292,026	8,762,671

b. STATEMENT SHOWING TOTAL ORE SHIPMENTS FROM 1905 to 1928 INCLUSIVE:

YEAR	AUSTIN	PRINCETON	STEPHENSON	GWINN	FRANCIS	GARDNER-MACKINAW	TOTAL
Total to 1/1/28	1,502,109	1,431,299	3,277,057	988,325	141,253	201,160	7,541,203
1928	9,483	3,864	208,735	0	23,603	70,675	316,360
Total	1,511,592	1,435,163	3,485,792	988,325	164,856	271,835	7,857,563

c. STATEMENT SHOWING ORE IN STOCK AT CLOSE OF 1927 AND 1928:

YEAR	AUSTIN	PRINCETON	STEPHENSON	GWINN	FRANCIS	GARDNER-MACKINAW	TOTAL
Jan.1, 1928	80,507	153,034	508,738	0	381,349	0	1,123,628
Jan.1, 1929	71,024	149,170	300,003	0	357,746	20,191	898,134

5. LABOR AND WAGES:

The number of men employed in the district by the Cleveland-Cliffs Iron Company on December 31st, 1928, was 84; on December 30, 1927, there were 36 men; the increase for the year was 48. The Archibald Mine employees averaged 180, the Cliffs Power and Light Company, 39, and probably 50 others who live at Gwinn work in the woods and at the lumber mill at Little Lake.

The population of Gwinn Townsite is greater than at any time since 1923, but there are fewer people living in the Austin and Princeton Locations.

There are very few idle men in the district. Any vacancies at the Company operations are quickly filled by former employees who have been working at the Archibald Mine.

10. TAXES:

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

GWINN DISTRICT MINES
ANNUAL REPORT
YEAR 1928

10. TAXES:

DESCRIPTION	1928 VALUATION	1928 TAXES	1927 VALUATION	1927 TAXES
MINERAL LANDS GWINN FEE:				
Lots 1, 2 & 3, Sec. 36-45-25, 52 Acres,	100	3.18	100	2.92
" 7, 8 & 9, " 36 " 98.92 Acres,	200	6.33	200	5.77
" 11, " 36 " 13.2 "	20	.64	20	.58
SW¼ of SW¼ " 26-45-25, 40 "	80	2.53	80	2.30
NW¼ of SE¼ " 27 " 40 "	80	2.53	80	2.30
NW¼ of " 35 " 160 "	320	10.07	320	9.23
N½ of NE¼ " 34 " 80 "	160	5.04	160	4.61
SE¼ of NE¼ " 34 " 40 "	80	2.53	80	2.30
NE¼ of NW¼ " 34 " 40 "	80	2.53	80	2.30
S½ of SE¼ " 27 " 80 "	160	5.04	160	4.61
NE¼ of SE¼ " 28 " 40 "	600	18.94	600	17.31
S½ of NE¼ " 28 " 80 "	130	4.11	130	3.75
S½ of N½ " 22 " 160 "	500	15.80	500	14.43
N½ of NW¼ " 2-45-26, 87.08 "	90	2.86	90	2.60
NE¼ of " 2 " 165.61 "	190	6.02	190	5.48
NE¼ of SE¼ " 34 " 40 "	130	4.11	130	3.75
Total,	2,920	92.26	2,920	84.24
Collection Fees,		.92		.84
Total Taxes,		93.18		85.08
GWINN TOWNSITE - SURFACE ONLY:				
Lot, 17, Block 5, Nyquist Lot,	-	-		14.94
NE¼ of NW¼, Sec. 21-45-25, 27.40 Acres,	150	4.74	150	4.33
That part of S½ of NW¼ Sec. 21-45-25 not included in plat of Gwinn, 25.01 acres,	200	6.31	200	5.77
E½ of SE¼, Sec. 21-45-25, 65.84 acres,	400	12.63	400	11.53
That part of W½ of SE¼, Sec. 21-45-25 not included in plat of Gwinn, 38.80 acres,	300	9.46	300	8.66
Gwinn Townsite Plat,	101,905	3,218.15	101,935	2,942.85
Part of W½ of SE¼ Sec. 21-45-25, Superintendent's Residence, 1.2 acres,	3,500	110.48	3,500	100.95
NW¼ of NE¼ Sec. 21-45-25 except 5 acres in cemetery, 35 acres,	100	3.15	100	2.91
Part of S½ of NE¼ Sec. 21-45-25, 69.69 acres,	400	12.63	400	11.53
Total,	106,955	3,377.55	106,985	3,103.47
Collection Fees,		33.78		30.89
Total Taxes,		3,411.33		3,134.36
GARDNER-MACKINAW DWELLINGS:				
N½ of NE¼ of Sec. 35-45-25,	7,500	236.72	5,000	144.22
Collection Fees,		2.37		1.44
Total Taxes,		239.09		145.66
GWINN DISTRICT OFFICE AND CRUSHER:				
Personal,	690	21.80	1,832	55.71
N½ of NW¼ Sec. 27-45-25, Dist. Crusher,	1,000	31.58	1,000	25.85
Total,	1,690	53.38	2,832	84.56
Collection Fees,		.54		.84
Total Taxes,		53.92		85.40

GWINN DISTRICT MINES
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10. TAXES: (Cont.)

	1928 VALUATION	1928 TAXES	1927 VALUATION	1927 TAXES
AUSTIN LOCATION:				
Part of Lot 5, Sec. 20-45-25,	5,000	157.82	(Included in	
NW¼ of SE¼ of Sec. 20-45-25,	10,000	315.61	Mineral land	
NE¼ of SW¼ of Sec. 20-45-25,	800	25.26	valuation.)	
Part of SW¼ of SE¼ of Sec. 20-45-25,	300	9.46		
Total,	16,100	508.15	20,000	576.84
Collection Fees,		5.08		5.77
Total Taxes,		513.23		582.61
Total C. C. I. Co., Forsyth, except mines and power companies,	135,165	4,310.75	137,737	4,033.11
SUMMARY:				
Austin Mine,	80,000	2,524.87	112,280	3,238.13
Stephenson Mine,	530,000	16,727.27	662,000	19,090.88
Princeton Mine,	281,260	8,876.89	301,260	8,688.91
Francis Mine,	340,500	10,748.92	396,500	11,435.87
Gardner-Mackinaw Mine,	47,200	1,489.73	50,200	1,505.52
Mineral Lands,	2,920	92.26	2,920	84.24
Gwinn Townsite,	106,955	3,377.55	106,985	3,103.47
Austin Dwellings and Lands,	16,100	508.15	20,000	576.84
Gardner-Mackinaw Dwellings,	7,500	236.72	5,000	144.22
Gwinn District Office and Crusher,	1,690	53.38	2,832	84.56
Total C. C. I. Company,	1,414,125	44,635.74	1,659,977	47,952.64
Collection Fees,		446.34		479.37
Total Taxes, C. C. I. Company,		45,082.08		48,432.01
Cliffs Power and Light Company,	36,150	1,141.04	36,490	1,052.75
Cliffs Electric Company,	10,000	315.62	(not included)	
Total,	46,150	1,456.66	36,490	1,052.75
Collection Fees,		14.57		10.53
Total Taxes,		1,471.23		1,063.28
Grand Total,	1,460,275	46,553.31	1,696,467	49,495.29

TAXES LEVIED - FORSYTH TOWNSHIP	1928	1927	1926	1925
State,	6,770.27	8,670.96	7,322.08	7,739.33
County,	13,341.05	13,232.64	15,365.44	11,989.62
County Road,	6,742.11	6,101.27	7,459.59	7,272.94
Contingent,	3,500.00	4,000.00	4,500.00	4,500.00
Highway Improvement,	2,000.00	3,000.00	4,000.00	3,000.00
Highway Repair,	4,000.00	4,000.00	2,000.00	7,000.00
Library,	100.00	100.00		
School and One Mill,	40,350.80	34,469.00	40,948.00	42,892.65
Cemetery,	500.00	500.00		
Bridge,				1,000.00
Rejected,	29.24	13.07	5.76	351.76
Total,	77,333.47	74,086.94	81,600.87	82,745.30

Note: Previous to 1928 part of Austin location was included in Austin Mine valuation. Above 1928 valuations include 2 boarding houses and Austin location dwellings.

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10. TAXES: (Cont.)

TAXES LEVIED - FORSYTH TOWNSHIP	1928	1927	1926	1925
Amount paid by C. C. I. Company,	46,092.40	49,005.39	60,254.84	61,940.86
Percent paid by C. C. I. Company,	59.60	66.14	73.84	74.84

16. WATER SUPPLY:

The new system of operating the pumping plant on the Escanaba River, inaugurated in December, 1927, was in force during 1928 and proved successful. Only one pumpman is required and there have been no delays. A sample of water taken by a state employee of the Department of Health showed contamination of the water with some colon bacilli. A larger number of samples taken by the health officer from Negaunee failed to disclose the source of contamination, but did show that the water was unsafe for drinking. It was then decided to install a chlorinating apparatus to treat all the water pumped through the mains. This was purchased from the Wallace-Tiernan Company of Chicago, and installed by one of their representatives. A heavy charge of chlorine gas was used during September and October due to the heavy rainfall and also to destroy bacteria that were in the wooden pipe mains. The charge was then reduced, so that a tank of chlorine gas now lasts three weeks. Samples of water show no dangerous bacteria. This installation forestalled a possible typhoid epidemic or other intestinal infection. It places Gwinn among the progressive villages of the state that have provided certain protection for their water supply.

The following table gives the cost of operating the pump station in 1928 and 1927:

	1928	1927	INCREASE	DECREASE
General Expense	55.17	72.57		17.40
Maintenance Labor	713.97	741.27		27.30
Maintenance Supplies	6.25	834.22		827.97
Operating Labor	1,653.83	3,974.70		2,320.87
Operating Supplies	4,107.70	5,424.60		1,316.90
Total	6,536.92	11,047.36		4,010.44

The 1928 and 1927 operating costs were charged off as follows:

	1928	1927	INCREASE	DECREASE
C. C. I. Co. Mines	405.00	7,092.19		6,687.19
Gwinn Townsite Expense,	2,823.38	866.81	1,956.57	
C. K. Quinn & Co.	1,200.50	725.00	475.50	
Water Service Accounts Receivable,	2,352.57	2,363.47		10.90
Total	6,781.45	11,047.47		4,266.02

17. CONDITION OF PREMISES:

Gwinn Townsite:

The streets and alleys in Gwinn Townsite were cleaned by the Township and kept in good condition. Some expense was incurred by the Company in removing dead trees in the parks, and vacant lots. The Norway pines in the parkway on Pine Street made a good growth during 1928 and are now well established. A few were destroyed by automobiles.

Austin Location:

The alleys in this location were cleaned several times during the year by the Company. Less expense was incurred in this work due to more vacant houses.