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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

(7) Detail of Accounts: (Cont'd)

GENERAL MINE EXPENSES: (Cont'd)

29. Mechanical and Electrical Engineering:

The expense to this account increased $ 257.53 and the cost per ton $ .004. The charge to this account covers a proportion of time and expense of Mechanical and Electrical Department based on actual time spent on mechanical and electrical work at the mine.

30. Analysis and Grading:

	1938	1937	Increase	Decrease
Sampling at Mine	1637.88	3091.95		1454.07
Central Lab. Exp.	3283.36	5730.90		2447.54
Shipping Dept. Exp.	2086.29	2105.00		18.71
Trucking Samples, Etc.	261.08	299.07		37.99

Determinations - 1938	11,230	Cost per determ.	$ .292373
Determinations - 1937	21,218	Cost per determ.	.270096
Decrease	9,988		.022277

There was less ore shipped and smaller product.

31. Safety Department:

	1938	1937	Increase	Decrease
First Aid Supplies	131.92	64.53	67.39	
First Aid & Helmet Practice	56.80	92.51		35.71
Ishpeming Office Chge	930.09	824.00	106.09	
Cash Safety Awards	612.00	485.00	127.00	
Lunch Kits and Calenders		310.77		310.77

There was a decrease in expenditures of $ 40.54 and an increase in cost per ton of $ .003.

32. Telephones and Safety Devices:

	1938	1937	Increase	Decrease
Main Level Lights	1974.99	2804.58		829.59
Telephones	127.27	37.84	89.43	
Safety Devices	153.92	55.79	98.13	
Signals, etc.	191.58	117.78	73.80	
Fire Equipment	53.14	12.72	40.42	

The expenditures decreased $ 527.81 and the cost per ton increased $ .002. The increase in expense for mine telephones covered a new mine telephone for the 7th level. The increase in expense for safety gates incurred in making safety doors for raises. The increase in expenditures for fire equipment was incurred in overhauling underground fire truck and tank.

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

(7) Detail of Accounts: (Cont'd)

GENERAL MINE EXPENSES: (Cont'd)

34. Special Expense, Pensions and Allowances:

	1938	1937	Increase	Decrease
Legal	396.32	403.00		6.68
Saranac Invest.	1572.95	1163.17	409.78	
Curtailment	2846.67		2846.67	
Other	2208.45	1440.97	767.48	

There was an increase in expenditures of $3933.69 end in the cost per ton of $ .019.

35. Ishpeming Office:

Proportion of Ishpeming office expense prorated to various mines on basis of labor. The decrease in expense to this account was $ 67.21 and the cost per ton increased $ .013.

36. Mine Office:

	1938	1937	Increase	Decrease
Salaries	9142.02	9259.50		117.48
Cent. Warehouse Exp.	2820.86	2415.78	405.08	
Miscellaneous	731.28	957.96		226.68

The increase in expenditures was $ 60.92 and the cost per ton increased $ .019.

37. Insurance:

The expenditures decreased $ 3215.64 and the cost per ton $ .007.

	1938	1937	Increase	Decrease
Property	514.06	422.74	91.32	
Group	283.40	2662.57		2945.97
Catastrophe	585.27	697.84		112.57

There was a credit to Employees Group Insurance of $ 1576.57 in December.

38. Personal Injury:

	1938	1937	Increase	Decrease
Compensation & Drs.	6644.09	10894.44		4250.35
Compensation Dept.	783.14	774.00	9.14	
Hospital Loss	3847.50	2089.38	1758.12	

There was a decrease in expense to this account of $ 2483.09 and the cost per ton increased $ .011.

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

(7) Detail of Accounts: (Cont'd)

GENERAL MINE EXPENSES: (Cont'd)

39. Social Security Taxes:

	1938	1937	Increase	Decrease
Unemployment Insurance Tax	12225.01	9867.33	2357.68	
Old Age Benefit Tax	3387.83	4888.84		1501.01

The charges to this account are based on the amount of the payrolls. In 1938 the Unemployment Insurance tax was 3% while in 1937 it was only 2%. The Old Age Benefit tax was 1% in both 1938 and 1937. The increase in expense was $ 856.67 and the cost per ton $ .025.

40. Employees Vacation Pay:
The expenditures decreased $ 1858.95 due to employees entitled to vacations receiving vacation pay for twenty-four hours while in 1937 they were given forty hours vacation with pay.

41. Taxes:
There was an increase in taxes levied of $ 15,680.07 which increased the cost per ton $ .176.

9. EXPLORATIONS AND FUTURE EXPLORATIONS:

There was no diamond drilling on the Athens property in 1938 and no explorations are under consideration at this time.

10. TAXES:

A comparison of assessed valuation and taxes for 1938 and 1937 follows:

	1938		1937	
	Valuation	Taxes	Valuation	Taxes
Realty (Tax Commission)	2,025,000	76,071.96	1,810,000	64,212.83
Ore in Stock, Equipt. & Supp.	475,000	17,844.04	400,000	14,190.68
Total by Tax Commission	2,500,000	93,916.00	2,210,000	78,403.51
Sterling Addition	4,600	172.80	4,600	163.19
Harvey Plat	1,300	48.84	1,300	46.13
Total	2,505,900	94,137.64	2,215,900	78,612.83
Collection Fees		941.38		786.12
Total Optg. Athens Mine	2,505,900	95,079.02	2,215,900	79,398.95
Rented Buildings:				
Harvey Plat	4,200	157.78	4,200	149.00
Sterling Addition	22,800	856.53	22,800	808.91
Total	27,000	1014.31	27,000	957.91
Collection Fees		10.14		9.58
Total Athens Rented Buildings	27,000	1,024.45	27,000	967.49
TotalAthens Iron Mining Company	2,532,900	96,103.47	2,242,900	80,366.44

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10. TAXES: (Cont'd)

	1938	1937
Total Taxes City of Negaunee	556,066.25	491,453.00
Tax Rate per $100 Valuation	3.7566	3.54767
Athens Iron Mining Co. % of City Taxes	17.1%	16.34%

The tax rate for the City of Negaunee increased $ 2.0893 per $1000.00 valuation and the total tax for the City $ 64,613.25. These increases, with the increase of $ 290,000.00 in valuation of the mine by the Tax Commission, accounts for the increase of $ 15,737.03 in taxes paid by the Athens Iron Mining Company in 1938.

11. ACCIDENTS AND PERSONAL INJURY:

The following table gives the number and classification of the accidents causing personal injury for the past six years:

	1938	1937	1936	1935	1934	1933
Fatal	1	0	0	0	0	0
Time lost - Over 4 Months	1	1	3	1	1	0
" " - 1 to 4 "	3	5	3	2	0	1
" " - Less than 1 Month	1	1	1	0	0	0
Total Accidents	6	7	7	3	1	1
Number of cases paid conpensation for accidents prior to Jan. 1st of each year	7	7	6	7	7	14
Number of cases paid difference in wages (included in above total)	3	3	3	4	4	4

Nature and Classification of Compensable Accidents:

Date		Days Lost
3/11/38	Contusion of both legs and ankles. Fracture of both bones of left leg.	Still at home
4/14/38	Fracture 2nd and 3rd lateral processes left lumbar vertebrae.	51
5/16/38	Lacerated foot.	24
7/5/38	Fracture both transverse processes 1st lumbar vertebrae.	54
12/6/38	Fracture bone of foot.	Still at home
11/21/38	Electrocuted	Fatal

There was one less lost time accident in 1937 and aside from the fatality, less time lost than in 1937. More men were employed but less days were worked. One accident occurred on surface in 1938 and one in 1937 after an eight year record of no compensable accidents on surface.

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11. ACCIDENTS AND PERSONAL INJURY: (Cont'd)

Fatal Accident:

I regret to report that a fatal accident occurred about 2:30 P.M. November 21st, Vaino Etelamaki, a miner in No. 17 contract, being instantly killed by electrocution. The manner in which he came in contact with the trolley wire will never be known as there were no witnesses. His body was found by another miner within two minutes after he received the electric shock. Based on the post mortem examination there was no assignable cause of death but the microscopic examination of his brain at the University Hospital at Ann Arbor indicated electrocution as the cause of death. A brief statement of the know facts is given herewith:

Vaino Etelamaki and his father, Wm. Etelamaki, work in No. 17 contract. For several weeks they had been repairing No. 732 raise above the 7th level, taking out the crushed and broken cribbing and putting in new cribbing after sufficient room had been made. They took turns in working in the raise and on the day of the accident, after Vaino had worked for some time, his father told him to go to the level and empty the raise in which there was some ore and several pieces of short cribbing. Vaino climbed down the raise, opened the chute and ran the material in the raise into one of the regular steel haulage cars. He had arranged with his father to rap twice on the air line pipe in the raise to signal that it was empty and his father would then throw down some broken pieces of cribbing. On receiving the prearranged signal his father threw in several short pieces of cribbing. About this time, Arvid Saari, a miner repairing the next raise about 60 ft. distant, came by the car where Vaino was working and after getting two plank, passed them over the car with Vaino's help. When Saari picked up the plank again, he talked to Vaino who was seated on the corner of the car holding the chute bar in his left hand and with one foot resting on the edge of the loading platform. Saari carried the plant into his raise, then returned for other supplies and when he rounded a turn in the drift saw Vaino lying by the side of the track. He died a moment later. His feet were 6 ft. beyond the car and his head about even with the end of the car. There were no burns on the body which might have come from contact with the trolley wire. A car was set under the chute and tests made to determine if the chute bar could have come in contact with the trolley wire. It was found that it would touch at one point which might have caused the accident. It is also possible that Vaino may have lost his balance and in falling accidently touched the trolley wire with his hand. His clothing was quite wet from working the raise and if in contact with the steel car, a perfect ground would have been established and he would have received the full force of the 250 volt current. Vaino had formerly worked as a motorman and had no doubt been previously shocked from accidental contact with the trolley wire as has nearly all the men in the mine. The conditions, however, were not right for the full current to pass through their bodies due to dry clothing and absence of a good ground contact.

Vaino was a young man, 24 years of age, married and in good health. He had been employed at the mine for nearly two years. He was a good careful workman. His untimely death was a shock to everyone. As a result of the accident the trolley wire at the chutes has been more fully guarded so that it is now impossible to touch it with a chute bar while barring the raises.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION:

E. & A. No. 725 dated 1/12/37 - Development of 7th Level

	Estimated Expenditure	Expended 1938	Expended 1937	Expended Balance	Unexpended Balance
1265' Rock Drift	18,975.00	2,033.62	21866.06	23899.68	4,924.68
Air Lock Doors	500.00		295.78	295.78	204.22
Powder House	200.00		204.50	204.50	4.50
Air Lines	600.00		394.09	394.09	205.91
Water Lines	100.00		9.41	9.41	90.59
Trolley	600.00		2384.00	2384.00	1,784.00
Total	20,975.00	2,033.62	25153.84	27187.46	6,212.46
Contingencies	2,097.50				2,097.50
Grand Total	23,072.50	2,033.62	25153.84	27187.46	4,114.96

E. &A. completed in May 1938. The expenditures overran the estimate on account of more rock drifting than was estimated.

E. & A. No. 782 dated 11/3/37 - Four (4) Rocker Dump Cars

4 - 65 cu.ft. cars	2,154.00	1,062.00	1,069.50	2,131.50	22.50

The cars were delivered in 1937 - two were paid for in 1937 and two in January 1938. E. & A. completed in January 1938.

E. & A. No. 791 dated 12/4/37 - Drill Sharpener No. 40

Drill Sharpener	1,535.00	1,535.00		1,535.00

The frame on the old drill sharpener broke and could not be repaired. E. & A. completed March 1938.

E. & A. No. 799 dated 2/25/38 - One (1) 20 H.P. I-R Scraper Hoist

Scraper Hoist	1,473.50	1,473.50		1,473.50

Additional equipment required. E. & A. completed March 1938.

E. & A. No. 798 dated 2/18/38 - Storage Battery Locomotive

Locomotive	2,550.00	2,550.00		2,550.00

This locomotive purchased to replace gasoline timber tunnel locomotive that was worn out. E. & A. completed August 1938.

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13. EQUIPMENT AND PROPOSED EQUIPMENT:

a. Steam Shovels:

The 33,935 tons of ore shipped from stockpile in 1938 was loaded by No. 42 shovel owned by the C. C. I. Co. and rented to the Athens Mine.

b. Scraper Hoists:

Following is a list of scraper hoist equipment at the mine:

	On Hand 1-1-1938	Purchased 1938	Total on Hand 12/31/38		Repair Cost Per Machine 1938	1937
Sull. 15 H.P. Elec.	17		17		67.86	67.69
" 20 H.P. "	2		2		46.80	10.60
" 25 H.P. "	1		1		18.78	18.78
I-R 10 H.P. "	2		2		145.01	70.68
" 15 H.P. "	4		4		23.42	6.74
" 20 H.P. "	2	1	3		40.30	11.36
Total	28	1	29	Avg.	61.06	48.68

One 20 H.P. Ingersoll-Rand electric scraper hoist was purchased early in 1938 on E. & A. No. 799 at a cost of $ 1473.50. The scraper equipment on hand is sufficient for the present product on the two shift basis but if additional product is wanted more scraper hoists must be purchased. The costs for repairs were higher, not on account of more use in 1938 but because of the hard and continual service during 1937.

c. Drill Machines:

No drill machines were purchased in 1938 while in 1937 six RB12 Ingersoll-Rand drill machines were purchased at a cost of $ 1150.20.

d. Motor Haulage:Cars:

Four 65 cu. ft. rocker dump cars were purchased on E. & A. No. 782. This E. & A. authorized the purchase of four cars, two of which were paid for in 1937 and two in 1938. The four cars were delivered late in 1937.

e. Spherical Bottom Skips:

The spherical bottom skips built in 1937 went into service in the summer of 1938 after the skip dumps were rebuilt. The new skips clean themselves much better when dumped than the square bottom skips formerly in use. They are of more rigid construction and as far as possible welding has replaced riveting. The cost for repairs to the new skips, aside from replacement of wearing shoes, should be low. In rebuilding the skip dumps there was an expenditure of $ 2612.00

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14. MAINTENANCE AND REPAIRS:

a. Steel Trestles:

Early in February two of the channels broke which support the girders on which the track is laid on the steel stocking trestle after which the girders sheered the bolts at a nearby joint and swung out of line. Two wood bents were erected under the girder for support and for a stage from which repairs were made. Reinforcing heavier channels were installed and 2" bolts to hold the girder more rigidly. An examination of all the piers found several other channels cracked and it was decided to reinforce the supporting channels on all of the piers on both of the steel trestles. The work was started in February and completed in April. Larger and heavier gusset plates were also bolted in place and after all of them were installed they were welded to the old gusset plates. There should be no future repairs of this kind necessary during the life of the mine. The total cost was $ 1878.00 - it was charged direct to operating costs.

b. Coal Dock:

A new coal dock was built to replace the old dock which had rotted beyond repair. A full description is given under "Surface - Repair of Buildings" elsewhere in this report. The total cost of the new dock was $ 2636.78.

c. Comparison of costs - 1938 with 1937:

Maintenance and repairs listed under underground costs:

	Amount	Cost Per Ton
1938	21,320.48	.080
1937	37,281.50	.085
Decrease	15,961.02	.005

Maintenance and repairs listed by the four accounts as shown on the Cost Sheet:

	1938	1937	Increase	Decrease
Comp. & Power Drills	963.48	1654.00		690.52
Scraper Equipment	8527.22	21332.73		12687.39
Elec. Tram Equipt.	9676.88	12687.39		3010.51
Pumping Machinery	2152.90	1607.38	545.52	

The expense for compressors and power drills in 1938 was entirely for repairs to compressor while in 1937, six (6) RB12 drill machines were purchased at a cost of $ 1150.20.

In 1938 under account "SCRAPERS", there was no charge for new scraper hoists while in 1937, six new scraper hoists, costing $ 8923.53, were charged. There was also fourteen Holcomb Westico scrapers costing $ 2209.91 charged in 1937, - none in 1938. The total cost for new equipment charged to this account in 1937 was $11,133.44 as compared with no charges in 1938. The balance of the decrease amounting to $ 1662.07 mainly represents less wire rope used in 1938 account of the mine operating less days.

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14. MAINTENANCE AND REPAIRS: (Cont'd)

c. Comparison of Costs - 1938 with 1937: (Cont'd)

The expense for electric tram equipment decreased in 1938 due to less expense for repair of locomotives for maintenance and extensions of underground tracks and no rocker dump haulage cars purchased. In 1937 three new rocker dump cars were charged to this account - the cars purchased since have been charged to E. & A.'s.

The detail of charges in 1938 under the account "Pumping Machinery" covers air pumps that had been borrowed from other mines a number of years ago and not sold to the Athens until this year. The cost of these pumps was $270.00. There was expense incurred in 1938 for digging a ditch on surface to divert water from the cave, replacing syphon pipes in the mine and also wood launders that had rotted. In addition there were the ordinary repairs to the mine pumps. In 1937, a new pump and motor costing $ 452.92 was bought for the Breitung Shaft - the balance of the expense was for ordinary repairs to the pumps.

From the above detail of the four accounts it is evident that the decrease in 1938 was due to the purchase of less new equipment. One scraper hoist and two haulage cars bought in 1938 were charged to E. & A.'s and were not included in the above accounts while in 1937 over $ 14,000.00 spent for new equipment was charged to these accounts.

Maintenance and repairs listed under Surface Costs:

	Amount	Cost Per Ton
1938	20,112.76	.075
1937	34,823.34	.079
Decrease	14,710.58	.004

Listed by the five (5) accounts as shown on the Cost Sheet:

	1938	1937	Increase	Decrease
Hoisting Equipt.	5960.79	24509.25		18548.46
Shaft	1802.51	4569.20		2766.69
Top Tram Equipt.	2439.36	3520.07		1080.71
D. T. & P.	6486.87	1218.34	5268.53	
Mine Buildings	3423.23	1006.48	2416.75	

In the account "Hoisting Equipment", the main items of expense in each year are listed below:

	1938	1937
Skip Rope	1528.66	
Four Skip Ropes		5637.60
Cage Rope		1219.59
Double Deck Aluminum Cage		2154.78
Three Spherical Bottom Skips		2012.08
Replacing Skip Runners in Circular Shaft		4066.38
Total	1528.66	15090.43

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14. MAINTENANCE AND REPAIRS: (Cont'd)

c. Comparison of Costs - 1938 with 1937: (Cont'd)

In 1938 there were also less repairs to electric hoists and signal systems and less expense for sheaves due to replacement of idler sheaves on pulley stands with rubber lined sheaves in 1937.

In the account "Shaft" the detail of expenditures is given below:

	Steel Sets	Undg. Pockets
1938	558.56	1243.95
1937	2948.59	1620.61
Decrease	2390.03	376.66

The large decrease in expense for steel sets was due to reinforcing, repairing and rebolting the steel sets in the circular concrete shaft in 1937 prior to installation of new skip runners.

In 1937 a transfer pocket on the 7th level was built for dumping ore in the transfer raises to 8th level shaft pocket while in 1938 the 10th level shaft loading pocket was repaired.

In the account "Top Tram Equipment" expenditures decreased $ 1080.71 due to the mine operating less days which reduced repair and maintenance costs in three sub accounts. In one sub account, "Sheaves, Rollers, etc." there was a small increase due to replacement of a number of the return rope guide sheaves under the tracks on the trestles.

In the account "Docks, Trestles and Pockets" expenditures increased $ 5268.53 or over 400% in 1938. The detail of increases follows:

Repairing and reinforcing the braces from the piers that support the girders on which the tracks are laid	$ 1878.00
Rebuilding skip dumps before installing spherical bottom skips	2612.00
Replacing decking timbers on East permanent steel trestle	780.00
Total extraordinary expenses - 1938	$ 5270.00

The balance of expense in 1938 as also the expense in 1937 covers ordinary repairs to pockets and trestles.

In the account "Mine Buildings" expenditures increased $ 2416.75 or 240% in 1938. The large increase was due to building a new coal dock at a cost of $ 2636.78.

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.5. POWER:

Detail of electric current purchased compared with 1937:

	1938 - 12 Mos. Optg.		1937 - 12 Mos. Optg.	
	Cost	Per Ton	Cost	Per Ton
Stoping	1,094.40	.004	1,483.15	.003
Ventilation	3,080.33	.011	2,969.37	.007
Pumping	21,928.96	.082	15,880.42	.036
Hoisting	17,951.58	.067	27,669.23	.063
Stocking Ore	731.02	.003	762.79	.002
Dry House	99.71		90.43	
Lights at Levels	1,256.34	.005	1,667.60	.004
Compressor	21,975.66	.082	27,598.91	.062
Electric Haulage	1,789.07	.006	2,369.79	.005
Shops	260.26	.001	294.18	.001
Heating Plant	18.46		16.75	
Office	18.76		16.54	
Storage Battery Loco.	8.46			
Total	70,213.01	.261	80,819.16	.183

Main Line Meter - K.W.	4,627,154	5,837,186
Separate Meter Readings	4,592,820	5,813,096
Line Loss	34,334	24,090
Product	268,050	443,098
K.W. Per Ton (Inc.Line Loss)	17.26	13.17
Cost Per K.W. (Avg.)	.015174	.013846
15 Min. Demand (Avg.)	1300	1217
Load Factor (Avg.)	39.9%	54.0%

The increase in cost due to the higher charge per kilowatt hour amounted to $ 6099.27 in 1938. The increase in cost per kilowatt hour was due to unfavorable load factor caused by the reduced operating schedule - two shifts per twenty-four hours instead of three, and more idle days.

.7. CONDITION OF PREMISES:

a. Grounds:

The grounds around the mine were kept in good condition during the year. The lawn and shrubbery need an application of fertilizer next spring.

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17. CONDITION OF PREMISES: (Cont'd)

b. Athens Mine Houses:

The following statement gives the total cost of repairs and the average cost per house for the past five years:

Year	No. Houses	Amount	Avg. Cost Per House
1938	31	7303.20	235.59
1937	31	19300.86	622.61
1936	30	6680.02	222.67
1935	30	2654.63	88.49
1934	30	2088.70	69.32

The cost of repairs to Athens Mine houses decreased in 1938. One house was repaired ready for painting and priming coat applied. The expense for repairs was heavy due to the sills and joist having rotted due to house partly resting on the ground. It was raised 18 inches and the foundation extended. Entirely new floors were required after new joists were installed. The old lime and sand plaster throughout the house had to be replaced as it was in bad condition.

Repairs were made to floors, some partitions removed and absolutely necessary other repairs made, also there was some interior decorating.

The income from rents was $ 4886.80. As stated in last years report extensive repairs were required to the entire group of houses to bring them up to the standard maintained by the Cleveland-Cliffs Iron Company. Due to the decreased working schedule in effect during the summer it was not possible to complete all of the work planned for 1938. The repair and painting program, (four (4) houses still to be painted) will be completed in 1939, after which expense for maintenance will be very low for a number of years.

18. NATIONALITY OF EMPLOYEES:

The following statements show: first, the nationality of employees as to parentage, and secondly, a separation of nationalities into American and foreign born:

As to Parentage	1938	%	1937	%
English	49	15.0	47	16.6
Finnish	144	44.0	125	44.2
Italian	60	18.4	50	17.7
Swedish	24	7.4	20	7.0
French (Canadian)	29	8.9	26	9.2
Scotch	2	.6	1	.4
German	6	1.8	4	1.4
Austrian	3	.9	2	.7
Norwegian	7	2.1	5	1.7
Irish	1	.3		
Greek	1	.3	1	.4
Danish	1	.3	2	.7
	327	100.0	283	100.0

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18. NATIONALITY OF EMPLOYEES: (Cont'd)

As to Birth	American Born		Foreign Born	
	1938	1937	1938	1937
English	33	33	16	14
Finnish	86	72	58	53
Italian	24	24	36	29
Swedish	19	17	5	3
French (Canadian)	28	26	1	
Scotch	2	1		
German	6	4		
Austrian	2	2	1	
Norwegian	6	5	1	
Irish	1			
Greek			1	1
Danish	1	2		
Total	208	183	119	100
	63.6%	64.7%	36.4%	35.3%

CAMBRIA MINE
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1. GENERAL

The average monthly production for the first five months of 1938, which was the duration of the time the mine operated, was 4,333 tons. This is a decrease of 1,828 tons per month as compared with last year and is due to mine curtailment. The mine was worked two 8 hour shifts, 5 days a week, practically all of last year whereas this year it was operated on a schedule of one 8 hour shift, six days a week, which is a reduction of 40% in working time.

During the mine shut-down, a considerable number of men were employed repairing the main hoisting shaft and timber shaft and keeping the main haulage drifts in repair. The two shafts are now in fairly good condition and considering the length of time the mine has been closed, the working places have stood up remarkably well.

The winze which was started last year on the Sixth Level just south of the shaft preparatory to opening a new level, was completed to the proposed depth of 280 feet, from which point a drift was driven underneath the shaft. A cut out in the winze was also made 100 feet below the Sixth Level and a like drift driven. From these drifts a small vertical raise was put up and holed to the ladder compartment of the hoisting shaft. The stripping of the raise to the full size of the shaft was started about 15 feet below the bottom of the shaft leaving this rock as a pentice. From this point steel shaft sets were installed as the stripping progressed until the elevation of the proposed Seventh Level was reached. From the Seventh Level down, the raise was enlarged to full size and the excavation for the pocket made, Main level drift East and West of the shaft was started and a small drift to the proposed pump room north of the shaft was driven before continuing the placing of the shaft sets. The shaft sets are now in to the bottom of the pocket and the steel framework for the pocket is now being erected.

A fatal accident occurred on the Jackson property on the 19th of January to Ernest Moyle who died from the injuries on the 21st. Mr. Moyle was working on a narrow bench about 25 feet above the 135' Sub-Level at a point 45' South and 3002' East. This bench was on the edge of a mill or enlarged raise which was filled with ore to within about 12 or 13 feet from the point where he was working. It is not positively known whether he slipped in or was pushed over by a fall of ground from the rib of the pillar which he was removing.

2. PRODUCTION SHIPMENTS & INVENTORIES

a. Production by Grades

Grade	Tons	% of Product
Cambria (Non-Bessemer) - - - - - -	21,663	100
Violet (Bessemer) - - - - - - - -	0	0
Total - - - - - - - - - - - - -	21,663	100

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2. PRODUCTION SHIPMENTS & INVENTORIES (CONT.)

a. Production by Grades (Continued)

The production from the property since the lease became operative is as follows:

Grade	1938 Tons	1937 Tons	1936 Tons	Total Tons.
Cambria	21,663	66,116	7,791	95,570

b. Shipments

There were no shipments from the Jackson property for the year 1938.

Shipments from the property since the lease became operative are as follows:

Grade	1938 Tons	1937 Tons	1936 Tons	Total Tons.
Cambria (Non-Bessemer)	0	61,008	2,324	63,332

c. Stockpile Inventory

On December 31, 1938 the stockpile balance was as follows:

Grade	Tons
Cambria (Non-Bessemer)	32,237

e. Production by Months

Month	Tons
January - - - - - -	4,980
February - - - - - -	4,236
March - - - - - - -	5,249
April - - - - - - -	3,262
May - - - - - - - -	3,936
Total - - - - - -	21,663

3. ANALYSIS

The following are the analyses of the Cambria ore produced from the Jackson Lease during 1938. These figures are compiled from the averages of the daily reports of production and analyses by underground cars of each contract for each day's operation:

Month	Grade	Cars	Dried Iron	Dried Phos.
January	Cambria	2,075	58.16	.085
February	"	1,765	58.61	.087
March	"	2,187	58.15	.081
April	"	1,359	58.82	.078
May	"	1,640	58.57	.085
	Total	9,026	58.42	.083

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6. SURFACE

During the shut-down of mine operations, many improvements were made to the surface layout including the installation of two electric hoists, erection of a new power house building and putting in a new heating plant and complete new system of air and steam pipe lines.

The two electric hoists, one for the timber shaft and one for the main hoisting shaft were erected adjacent to and west of the electric compressor installed last year. The temporary building over the compressor was taken down and a large new insulated steel building was put up to cover the two electric hoists as well as the compressor. The idlers in the idler stands were changed to accomodate the new positions of the hoisting ropes.

The new central heating plant was installed in the change house which was enlarged and overhauled last year.

All the pipe lines, air and steam, between the engine house, shaft and change house were renewed and placed in a $2\frac{1}{2}$ ft. square concrete trench with 3" plank top covered with sheet metal to keep out water.

With these many alterations and improvements the surface layout will be in shape to operate more efficiently and economically that formerly.

7. UNDERGROUND

a. General

There is not very much to report on the Jackson Lease for the year 1938 as the mine was operated only the first five months of the year. I have been informed by the management that all drifts and working places are open and in good condition so that when the mine resumes operations, it will go into production immediately.

In January 18.1 contract miners were employed on the Jackson Lease diminishing to 14.5 miners in May which was the last month worked. It is probable that this number will be further reduced until such time as the proposed Seventh Level reaches this territory. During the time the mine was operated, it was on a one 8 hour shift, 6 days a week, schedule, with the exception of the first week in January when it worked two 8 hour shifts, 3 days a week. The change in schedule was made to avoid such long periods of idleness. With the old system it was found that after a four day shutdown, it took almost a whole shift to clean up and get going again. This change in schedule considerably increased the production per miner.

b. Development

Developments for the operation of the sub-level stope in the west wing of the west deposit consisted of the putting up of five mills from the 135' Sub-Level, 220' of dog-drifting at an elevation of +162' and 50 feet of dog-drifting at the +183' elevation. Some development work was done on the 135' Sub-Level. Drifts were driven southeast from each of the raises in the center deposit to points underneath two stringers of lean ore that were discovered by explorations at an elevation of +158. These drifts being in ore would indicate that the ore is continuous from the 135' Sub.

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7. UNDERGROUND (Cont.)

b. Development (Cont.)

Other developments consisted of putting up three raises on the Cambria side of the line to the elevation of the 135' Sub-Level, two being in the center deposit and one in the east deposit and drifting southerly across the property line into the respective deposits.

c. Stoping

East Deposit

Very little stoping was done on the Jackson Lease in the east deposit, practically all work being confined to the Cambria side of the line. The mining in the deposit consisted of 20 feet of slicing on the 135' Sub and 20 feet of slicing on the 150' Sub, taking the back as they retreated.

Center Deposit

All developed ore in this deposit above the 160' elevation has been mined and slicing is now in progress on the 135' Sub-Level. Some exploration work was done at elevations of +158' and +177' and consisted of 40 feet of drifting to the north in mixed ore and jasper and breasting in footwall jasper, drifting westerly 55 feet in mixed ore, 18 feet of which was good enough to be classified as merchantable, and drifting 105 feet southwesterly cutting through two stringers of ore, one 25 feet wide and the other 35 feet wide. This ore is not of very good quality but in conjunction with the rest of the deposit will be merchantable. These finds are southeast of the known center deposit but as previously mentioned under developments, connects on the 135' Sub-Level. The explorations on the 177' elevation were not enough to prove or disprove the continuation of this ore to a greater height as no drifting was done immediately above same.

West Deposit

The east wing of the west deposit has been mined down to an elevation of +135 feet and is now being stoped underneath the hanging at the south limits of the ore body.

The West wing is being sub-level stoped from the 135' Sub on elevations of +162 feet and +183 feet. This mining was started in the southwest corner of the deposit while the north end is being mined on the Cambria side of the property line. The Cambria portion will be mined out by the time the Jackson Lease operations reach their northern limits.

John Trowig
Engineer

JT:DWC
1-17-39
-3-

LUCY MINE
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1. GENERAL:

The fences around the open pits and the old shafts were inspected several times during the summer and necessary repairs made.

10. TAXES:

	1938		1937	
	Valuation	Taxes	Valuation	Taxes
Various Parcels	$ 29,600	$ 1111.96	$ 29,600	$ 1050.12
Collection Fees		11.12		10.50
Total Taxes		$ 1123.08		$ 1060.62
City of Negaunee Tax Rate Per $100.00		$ 3.7566		$ 3.54767

Taxes increased due to higher rate per $100.00 valuation.

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1. GENERAL

The Maas Mine operated continuously during 1938, although the working schedule was very much curtailed as compared with that in 1937. From the first of the year to April 16th the schedule was four days per week with three crews on a staggered basis requiring the mine to be operated two eight-hour shifts six days per week; three days per week with three crews on a staggered basis, the mine operating four double shifts and one single shift per week from April 16th to June 1st. At this time it was decided to further curtail operations by dispensing with the third shift and therefore 60 of the men hired in the last two years were laid off, 39 of whom was for the purpose of reducing the force and the other 21 to make room for an equal number of men from the Gardner-Mackinaw Mine which was being shut down, and these latter men had a much longer service with the Company. The Mine was then put on a two day per week schedule with alternate crews working the first four days in each week and this continued until November 1st when the time was increased to three days per week with the mine operating five day shifts and one afternoon shift, which schedule continued throughout the rest of the year.

The seniority rule was used as a basis in laying off the men and this considerably effected the efficiency of operations as they were all young active men who were, to a large extent, working as partners with their fathers, making an ideal set-up, the father having the experience and the son the strength and alertness to keep things moving. The men from Gwinn were between 45 and 55 years of age and in most cases were not familiar with the present system of the top slicing method of mining soft ore bodies.

Mining was carried on in the same four general areas as in the preceding year; namely, the East and West footwall pillars above the Third Level, the section lying just East of the Race Course Lease and above the Fourth Level, and in that part of the ore body lying in and South of the Race Course Lease between the Fourth and Fifth Levels. Toward the last of 1937 development started in an area lying between 280 and 460 feet East of the Race Course Lease and 100 feet above the Fourth Level and this work continued during 1938 with mining being started toward the latter part of 1938. Development was continued on the Fifth Level and consisted of extending No. 7 Cross-cut to the Northeast along the Southwest boundary of the Race Course Lease, drifting to the Southwest in No. 3 Cross-cut in the footwall, and putting up several raises.

The water continued to be considerable of a problem as there was a further increase during the year of approximately 125 gallons per minute and over one-third of the contracts were delayed in their scraping operations, besides the additional delay at the shaft and on the landing. The surface well only operated intermittently and when in use did not deliver over 150 gallons per minute. The fine

sand works into the pump, cutting the impellors and bearings, and it had to be disassembled and repaired three times during the year, these idle periods being quite lengthy. It is encouraging to note, however, that since it was reassembled near the last of November it has delivered approximately 300 gallons per minute and this should soon decrease the amount of underground water. Work has been started by the Layne Northwest Company on a new well about 1100 feet Northwest of No. 1 well and, from the character of the formation found in No. 11 test hole at this point, it should be possible to develop a much larger flow of water and therefore underground conditions in 1939 ought to show a considerable improvement.

On account of the small amount of ore shipments during 1938 and the consequent accumulation of ore on the existing stockpiles, it was necessary to develop a new stocking ground and this was done by removing the Southeast rock pile at the East end of the steel trestle and filling the West part of a deep gulley lying to the South of the trestle, as well as making and grading a rock sollar on the entire area between the trestle and the highway which runs along the South side of the area involved. Single track trestles were erected here and also on the Southwest side of the stocking area and a new rock trestle was also put up Northeast of the shaft which will shorten the rock tram from 1400 feet to 400 feet.

A larry car system for the stocking of ore and rock was installed during the year and while all the difficulties encountered in any new system have not as yet been entirely overcome, the cars, which are powered by alternating current motors remotely controlled from the shafthouse and obtaining their current from a third rail, are fairly satisfactory and when operating properly will be a great improvement over the old endless rope system.

There was one very serious accident during the year when one of the miners was struck by a fall of ground which, in all probability, will disable him permanently and this, together with a slightly increased number of minor injuries, makes a poorer safety record than is desired and it is hoped that 1939 will show considerable improvement.

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2. PRODUCTION, SHIPMENTS & INVENTORIES

a. Production by Grades

Production by Grades	1938	1937	Increase	Decrease
Maas Bessemer	44,753	78,915*		34,162
Race Course Bessemer	22,740	65,363*		42,623
Maas	273,050	444,378		171,328
Race Course	68,903	182,957*		114,054
Maas Special	715	1,984		1,269
Race Course Special	11,077	31,664		20,587
Race Course Bess. Special	2,332		2,332	
Total	423,570	805,261		381,691
Rock	14,789	17,797		3,008
Total Hoist	438,359	823,058		384,699

*Includes current and previous year's stockpile overrun of 39,445 tons.

67,493 tons or 16% of the actual production was Bessemer grade.

b. Shipments

Grade of Ore	Pocket Tons	Stockpile Tons	Total Tons	Total Last Year
Maas Bessemer	1,767	23,315	25,082	99,010
Race Course Bessemer	884	19,516	20,400	71,113
Maas	34,757	23,095	57,852	398,633
Race Course	4,810	19,162	23,972	181,178
Maas Special	60	378	438	2,643
Race Course Special	350	10,463	10,813	26,180
R. C. B. Special				
Total	42,628	95,929	138,557	778,757
Total Last Year	434,355	344,402	778,757	
Decrease	391,727	248,473	640,200	

Included in the above is 17,976 tons shipped all rail to Charcoal furnaces.

c. Stockpile Inventories

Grade of Ore	12-31-38	12-31-37	Increase
Maas Bessemer	25,787	6,116	19,671
Race Course Bessemer	11,669	9,329	2,340
Maas	304,202	89,004	215,198
Race Course	68,892	23,961	44,931
Maas Special	306	29	277
Race Course Special	5,911	5,647	264
R. C. Bess. Special	2,332		2,332
Total	419,099	134,086	285,013

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d. Division of Product by Levels

	1938	%	1937	%
Third Level	126,281	29.8	215,163	27.6
Fourth Level	99,604	23.5	135,495	17.4
Fifth Level	197,685	46.7	429,531	55.0
Total	423,570	100.0	780,189	100.0

e. Production by Months

Month	Maas Bess.	Maas	Maas Spcl.	R. C. Bess.	Race Course	R. C. Spcl.	R. C. Bess. Spcl.	Total	Rock
January	2,684	26,950		4,203	7,640	1,789		43,266	1,039
February	6,519	30,473		3,624	6,892	1,493		49,001	743
March	12,079	33,289		4,009	9,126	938		59,441	1,540
April	6,796	31,373		2,157	7,951	740		49,017	1,630
May	2,784	27,745	169	2,163	5,566	570		38,997	1,303
June	2,472	17,281	4	1,935	2,764	929		25,385	910
July	2,536	14,661		515	2,691	954		21,357	660
August	2,739	14,563	147	1,140	3,941	152	593	23,275	936
September	1,662	17,881	85	1,722	4,241	215	23	25,829	702
October	2,042	14,605		1,559	4,861	136	39	23,242	1,567
November	3,364	19,610	118	1,769	5,814	1,530	700	32,905	1,895
December	3,243	20,452	192	1,672	3,688	1,631	977	31,855	1,864
Total	48,920	268,883	715	26,468	65,175	11,077	2,332	423,570	14,789

There was no stockpile overrun in 1938.

The product was distributed as follows:

	1938	1937	Decrease
George Maas Lease	253,875	418,971	165,096
Catholic Cemetery	37,144	69,451	32,307
American Mining Co.	6,988	8,853	1,865
C.C.I.Co.(Right of Way)	11,306	14,208	2,902
Race Course	105,052	279,984	174,932
City of Negaunee	9,205	13,794	4,589
	423,570	805,261	381,691

f. Ore Statement

	Maas Bess.	Maas	R. C. Bess.	R. C. Bess. Spcl.	Race Course	Maas Spcl.	R. C. Spcl.	Total	Total Last Year
On Hand 1-1-38	6,116	89,004	9,329		23,961	29	5,647	134,086	107,582
Product for year	48,920	268,883	26,468	2,332	65,175	715	11,077	423,570	765,816
Trans. to & from	4,167	4,167	3,728		3,728				
Overrun									39,445
Total	50,869	362,054	32,069	2,332	92,864	744	16,724	557,656	912,843
Shipments	25,082	57,852	20,400		23,972	438	10,613	138,557	778,757
Balance on Hand	25,787	304,202	11,669	2,332	68,892	306	5,911	419,099	134,086
Decrease in Output								342,246	
Increase in ore on hand								311,517	

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f. Ore Statement (Cont.)

Estimated stockpile overrun end of 1938 season:

Maas Bessemer	0 tons
Maas	30,000 "
Race Course Bessemer	1,000 "
Race Course	0 "
Maas Special	0 "
Race Course Special	3,000 "
R. C. Bess. Special	0 "
Total Estimated Stockpile Overrun	34,000 tons

No stockpile overrun shipped in 1938.

1938 2 8-hrs. shifts, 6 days per week January 1st to April 16th with 3 crews alternating to average 4 days per week; April 16th to June 1st, 5 days per week with 3 crews alternating to average 3 days per week.

1 8-hr. shift, June 1st to November 1st, 4 days per week with 2 crews alternating each week to average 2 days per week. November 1st to December 31st 5 days per week with 2 crews staggered to average 3 days per week. In last two schedules there was also a small hoisting crew on a second 8-hour shift.

1937 2 8-hrs. shifts, 5 days per week January 1st to April 17th, with a third 8-hour shift composed of a tramming and hoisting crew and approximately 16 mining contracts. April 17th to October 3rd, the same schedule as above with one extra 8-hour shift on Saturdays. October 3rd to December 6th, 5 days per week as from January 1st to April 17th. December 6th to December 31st, 2 8-hour shifts 6 days per week with the men alternating to average 4 days per week.

1936 1 8-hr. shift, 6 days per week, 2 crews working alternate weeks, January 1st to February 1st; 6 days and 2 nights per week with 2 crews averaging 4 days per week, February 1st to May 1st. 2 8-hour shifts 5 days per week with 1 extra 8-hour hoisting shift from May 1st through the balance of the year. Starting November 15th, a few mining crews were gradually added to this third shift. About October 1st the straight 8-hour shift was put into operation. Under this schedule the men take their lunches underground with them and relieve their opposite partners in the

working places, thus having the entire 8 hours for work instead of loosing part of their time in going to and from their working places. They do not take time out for lunch, arranging to eat when it does not interfere with their operation.

1935 1-8-hr. shift, 4 days per week, 2 crews working alternate weeks, January 1st to February 11th. Six days per week, 2 crews working each 3 days from February 11th through balance of year.

1934 1 8-hr. shift, 6 days per week and 5 nights in six Bessemer places; 3 crews working 3 and 4 days per week January 1st to September 1st. Four days per week and 4 nights in six Bessemer places; 3 crews working 2 or 3 days per week September 1st to December 31st, 1934.

g. Delays
Electrical

Date	Shift	Duration	Loss In Product	Cause
Mar. 31st	Day	1 hour	100 tons	Lack of current.
June 2nd	Day	1 hour	100 tons	Skip bell out of order.
July 7th	Day	3/4 hour	75 tons	Large transformer burned out.
Oct. 27th	Day	8 days	1,500 tons	Several coils burnt out in the skip hoist motor due to a chunk of ore jamming skip in shaft.
Nov. 7th	Aft.	1 hour	100 tons	Lack of current.

Delays
Non-electrical

Jan. 3rd	Both	2½ hours	300 tons	Car frozen on landing in morning. Car over trestle in afternoon leaving only 1 car in operation.
Jan. 4th	Both	3 hours	300 tons	Only one car for tramming.
Jan. 5th	Both	2 hours	200 tons	" " " " "
Jan. 6th	Both	2 hours	200 tons	" " " " "
Jan. 11th	Day	2 hours	200 tons	Installing new car.
Jan. 18th	Day	1 hour	100 tons	Cutting off stretch in skip rope.
Jan. 25th	Both	All Day	2,000 tons	Severe snow storm, roads im-
Jan. 26th	Both	All Day	2,000 tons	passable.
Feb. 5th	Day	3 hours	300 tons	Broken butterfly in dump.
July 18th	Both	16 hours	1,400 tons	Broken "Y" section in pump discharge line. Time and tonnage made up on 22nd.
Oct. 27th	Day	1½ hours	200 tons	Chunk of ore stuck between skip and skip road.
Nov. 9th	Day	2 hours	200 tons	Replacing broken skip roller.

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3. ANALYSIS

a. Average Mine Analysis on Output

Grade	1938 Iron	Phos	Sil.	Sul.	1937 Iron	Phos	Sil.	Sul.
Maas Bessemer	62.05	.046	6.73	.016	62.68	.043	6.00	.014
Maas	60.61	.075	7.85	.015	60.66	.069	8.26	.015
Race Course Bess.	62.59	.044	6.34	.018	62.55	.044	6.63	.013
Race Course	60.45	.072	8.10	.016	60.78	.066	7.90	.015
Maas Special	59.65	.077	6.86	.075	61.28	.074	6.92	.173
Race Course Spcl.	61.58	.054	5.63	.102	60.76	.055	8.06	.142
R. C. Bess. Spcl.	62.84	.047	5.43	.118				

b. Average Mine Analysis on Ore Shipped

Grade	Iron	Phos.	Sil.	Alum.	Mang.	Lime	Mag.	Sul.	Loss	Moist.
Maas & R. C. Bess.	62.55	.041	6.28	2.35	.21	.40	.15	.012	1.00	11.37
Maas & Race Course	60.65	.068	8.20	2.40	.21	.50	.16	.014	1.30	11.83
Maas & R. C. Special	60.30	.052	8.50	2.35	.22	.55	.18	.120	1.26	11.26

c. Average Analysis on Straight Cargoes

	Mine Iron	Phos.	Silica	Lake Erie Iron	Phos.	Moist.
Lake Bessemer (Maas & Race Course Bessemer)	62.56	.041	6.10	62.54	.042	11.15
Maas (Maas & Race Course Non-Bessemer)	62.57	.042	6.27	62.42	.042	10.40

e. Average Analysis of Ore in Stockpiles

Average Natural Analysis

Grade	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist
Maas Bessemer	54.79	.041	5.99	.19	1.99	.39	.17	.011	1.00	11.75
Race Course Bess.	55.46	.039	6.57	.19	2.08	.75	.22	.011	1.00	10.85
Maas	53.93	.070	6.85	.19	2.12	.75	.19	.013	1.76	11.10
Race Course	53.57	.064	7.36	.18	2.34	.77	.24	.013	2.00	11.10
Maas Special	51.37	.080	6.95	.19	2.12	.75	.19	.069	1.76	10.90
Race Course Spcl.	54.27	.051	6.90	.19	2.34	.77	.24	.079	2.00	11.25
R. C. Bess. Specl.	56.02	.042	4.84	.18	2.08	.75	.22	.105	1.00	10.85

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4. ESTIMATE OF ORE RESERVES

a. Developed Ore

Assumption: 12 Cu. Ft. equals one ton.
10% deduction for rock.
10% deduction for loss in mining.

Location	Race Course Lease	Maas Lease	R.C.Cem. Lease	B.K. Road City of Neg. Lease	C.C.I.Co. Strip	Total Tons
Above 3rd Level	54,861	562,987	152,942	5,779	37,689	814,258
3rd to 4th Levels	203,246	2,620,824	4,526	31,220	97,500	2,957,316
4th to 5th Levels	1,071,011	1,462,675		47,168	23,871	2,604,725
Total above 5th Level	1,329,118	4,646,486	157,468	84,167	159,060	6,376,299
Below 5th Level	626,991	256,077				883,068
Grand Total	1,956,109	4,902,563	157,468	84,167	159,060	7,259,367

6.7% of total tonnage of Maas and Race Course is estimated to be Bessemer grade - 486,378

There was an increase in the estimate of ore reserves of 221,166 tons over the 1938 production and this is explained in detail as follows:

INCREASE IN ORE RESERVES

	Maas	Race Course	Total
Above 3rd Level	4,377	3,287	7,664
3rd to 4th Levels	62,862	2,652	65,514
4th to 5th Levels	168,513	27,569	196,082
Below 4th Level	**32,779**	**15,315**	**48,094**
Total	202,973	18,193	221,166

The increase in the Maas Lease from the Third to the Fourth Levels was due to the development in the new mining block East of the Race Course Lease, where the ore areas were found to be larger than was originally estimated. This also accounts for part of the increase from the Fourth to the Fifth Levels. There was also a considerable flattening of the hanging on the 90' Sub Level to the Southwest of the Race Course Lease and this, together with the ore proved up in the diamond drill holes South of the dike on the 50' and 90' elevations, caused the rest of the increase. The increase in the Race Course Lease between the Fourth and Fifth Levels was due to a Northerly extension of the jasper hanging found on the 90' Sub Level. The decrease below the Fifth Level in both the Maas and Race Course Leases is due to a change in the estimated Western limit of ore based on information found on the 25' and 40' Sub Levels above where the jasper hanging did not continue to the West as had been expected.

The percentage of Bessemer grade decreased from 8% to 6.7% because 16% of the product was mined in 1938 and there was only a very small increase in the Bessemer areas.

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c. Estimated Reserve Analysis

Natural Grade	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist
Maas & Race Course Bessemer	54.00	.040	5.60	.180	2.00	.700	.200	.012	1.00	11.50
Maas & Race Course Non-Bessemer	53.00	.070	7.20	.190	2.20	.800	.240	.012	1.70	12.00

d. Estimated Production

The following is the estimated tonnage and expected analysis, by grades, of the 1939 production from the Maas Mine on an operating schedule of 4 days per week, 2 straight 8-hour shifts and one small 8-hour hoisting shift.

Grade	Estimated Production 4 Day per Week Basis
Maas & Race Course Bessemer	82,000 tons
Maas & Race Course Non-Bessemer	430,000 "
Maas & Race Course Special	24,000 "
Maas & Race Course Bessemer Special	16,000 "
Total	552,000 tons

Expected Analysis of Above Tonnages

Grade	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist	Iron Natl.
Maas & Race Course Bessemer	62.50	.043	6.50	.22	2.30	.60	.20	.015	1.00	11.25	55.47
Maas & Race Course Non-Bessemer	60.50	.080	8.00	.22	2.40	.85	.25	.015	1.80	11.75	53.69
Maas & Race Course Special	61.00	.070	7.70	.22	2.40	.85	.25	.150	1.80	11.75	54.13
Maas & Race Course Bessemer Special	62.50	.043	6.30	.22	2.30	.85	.20	.150	1.00	11.25	55.47

5. LABOR & WAGES

a. Comments

1. Labor

There was very little change in the personnel of the employees during the first five months in the year but on the first of June it was decided to curtail operations and dispense with the third shift, necessitating the laying off of not only the 39 men required for this reduction, but also an additional 21 to make places for a like number transferred from the Gardner-Mackinaw Mine, which was being closed, and who had a much longer service with the Company. A combination of seniority and the number of dependants was used as a basis for deciding who should

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5. LABOR & WAGES

1. Labor (Cont.)

be laid off and in most cases they were all men hired within the last two years. This naturally decreased the efficiency of the operations as these men were all comparatively young and 50% of them had been working in contracts with their fathers, making an ideal combination, while the men from Gwinn averaged over 45 years of age and in most cases were not familiar with the present style of soft ore mining.

The average age for the entire personnel was increased from 37 to 41, of whom 16 were between 65 and 72 years of age. Some of the men who were laid off received temporary employment on Cliffs Power & Light projects while the remainder have been on unemployment insurance and W.P.A. Only six voluntarily quit during the year and these together with two deaths and one permanent disability through an accident underground, made it possible to rehire some of those laid off in June.

There was a very limited amount of temporary employment in 1938 as the work in the Second Addition was nearly completed and while only a small crew of painters and carpenters were working here and on other rented houses during the summer, this crew was further curtailed to only five men at the end of the year. Some of these men were also used when there was any steam shovel loading or work at the crusher.

There was no change in the wage schedule during 1938 and the only overtime put in was on account of emergency repairs.

The men who had worked for the Company for five years were given a three day vacation with pay in August, the Mine being idle one week during the vacation period and the men who were not eligible for vacations received their two days per week previous to the vacation.

The plan used this year in the Safety campaign required the Mine to work for a two week period without a compensable lost time accident, as it was considered that a month was too long a period for the larger mines. The Maas Mine had fifteen drawings, making a 60% record for the year, with 210 men or 50% of the total employed receiving cash awards.

2. New Construction

The following is a list of the E & A's on which work was done during 1938:

No. 689 Moving 30 Maas Mine Location houses.
" 715 250 K.W. Motor Generator Set in Engine House.
" 716 Maas Mine Drainage; sinking of a large bore well and installing a Layne-Bowler pump.

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5. LABOR & WAGES

2. New Construction (Cont.)

No. 727 Moving 28 Maas Mine Location houses.
" 775 Installing crusher in shafthouse.
" 783 Larry car installation for stocking ore.
" 792 Crankshaft for Aldrich pump (Replacement)
" 801 Repairs to Centrifugal pump on Third Level pump station.
" 803 Sinking churn drill test hole No. 10.
" 806 Sinking churn drill test holes Nos. 11 and 12.
" 808 Sinking churn drill test hole No. 13 and sinking a large bore well and installing a Layne-Bowler pump at No. 11 test hole.

All E & A's will be taken up in detail under No. 12, "New Construction and Proposed New Construction".

b. Comparative Statement of Wages & Product

	1938	1937	Increase	Decrease
Product	423,570	780,189		356,619
Number of Shifts & Hours				
2 8-hour	237	285		48
AVERAGE NO. MEN WORKING				
Surface	77	67	10	
Underground	339	346		7
Total	416	413	3	
AVERAGE WAGES PER DAY				
Surface	5.61	5.54	.07	
Underground	6.31	6.22	.09	
Total	6.16	6.11	.05	
AVERAGE WAGES PER MONTH				
5.5 Days per Week 1937				
2.9 Days per Week 1938				
Surface	88.82	126.97		38.15
Underground	85.56	143.28		57.72
Total	86.17	140.63		54.56
PRODUCT PER MAN PER DAY				
Surface	28.95	42.36		13.41
Underground	7.68	8.15		.47
Total	6.07	6.84		.77
LABOR COST PER TON				
Surface	.194	.131	.063	
Underground	.822	.762	.060	
Total	1.016	.893	.123	

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5. LABOR & WAGES

b. Comparative Statement of Wages & Product (Cont.)

AVERAGE PRODUCT MINING	1938	1937	Increase	Decrease
Stoping	19.12	17.77	1.35	
Ore Development	10.57	8.92	1.65	
Total	18.66	17.25	1.41	
AVERAGE WAGES CONTRACT LABOR	6.764	6.528	.236	
TOTAL NUMBER OF DAYS				
Surface	14,628 3/4	18,417 1/2		3,788 3/4
Underground	55,157 3/4	95,724 1/2		40,566 3/4
Total	69,786 1/2	114,142		44,355 1/2
AMOUNT FOR LABOR				
Surface	82,070.23	102,083.64		20,013.41
Underground	348,081.43	594,885.59		246,804.16
Total	430,151.66	696,969.23		266,817.57
AVERAGE WAGES PER MONTH BASED ON MEN CARRIED ON MINE PAYROLL				
Surface	86.06	125.82		39.76
Underground	84.99	142.86		57.87
Total	85.18	140.21		55.03

Proportion of Surface to Underground Men

1938 - 1 to 4.4 2 8-hour shifts, 4 days per week, from January 1st to April 16th, with a third 8-hour shift composed of a tramming and hoisting crew and approximately 16 mining contracts. April 16th to June 1st, the time was decreased to two days per week with the same crews. On June 1st the third shift mining crew was laid off and until November 1st operated 1 8-hour shift 4 days per week with a very small haulage crew on the second shift, the two crews alternating each week so that the men received only 2 days per week average. November 1st to December 31st, 1 8-hour shift 4 days per week and 2 8-hour shifts 1 day per week with staggered crews receiving 3 days per week.

1937 - 1 to 5.2 2 8-hour shifts, 5 days per week, from January 1st to April 17th with a third 8-hour shift composed of a tramming and hoisting crew and approximately 16 mining contracts. April 17th to October 3rd, the same schedule as above with one extra 8-hour shift on Saturdays. October 3rd to December 6th, 5 days per week as from January 1st to April 17th. December 6th to December 31st, 2 8-hour shifts, 6 days per week with the men alternating to average 4 days per week.

1936 - 1 to 5.9 1 8-hour shift 6 days per week, 2 crews working alternate weeks, January 1st to February 1st. Six days and 2 nights per week with 2 crews averaging

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5. LABOR & WAGES

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

Proportion of Surface to Underground Men (Cont.)

	4 days per week, February 1st to May 1st. Two 8-hour shifts, 5 days per week with 1 extra 8-hour hoisting shift from May 1st through the balance of the year. Starting November 15th, a few mining crews were gradually added to this third shift.
1935 - 1 to 4.9	4 days per week, 2 crews working alternate weeks, January 1st to February 11th. Six days per week, 2 crews working each 3 days, from February 11th through balance of year.
1934 - 1 to 4.7	1 8-hour shift, 6 days and 5 nights per week, 3 crews working 3 and 4 days per week, January 1st to August 31st. One 8-hour shift, 4 days per week, 3 crews working 2 and 3 days per week, September 1st to December 31st.

6. SURFACE

a. Buildings, Repairs

There was very little erecting, dismantling or repairing of the mine buildings during 1938 with the exception of the shafthouse where two operations were in progress. The installation of the crusher authorized under E & A No. 775 last year was continued and placed in operation in November. This crusher is mounted on a concrete pier South of the shaft and connected to the skip pocket by means of a long grizzly whereby the fines are separated out before the ore enters the crusher. There are about ten cars of ore per week shipped all rail to charcoal furnaces and where formerly the larger chunks of ore had to be crushed by hand, the installation of the crusher will greatly improve the efficiency of operations when loading furnace ore.

Toward the latter part of the year it was found that the steel members in the main North loading pocket were in very bad shape and as soon as the shipping season was finished, this pocket was completely dismantled and repair work is now underway.

b. Location Dwelling Repairs

The program in the Cleveland-Cliffs Iron Company's Second Addition was greatly curtailed as compared with 1937 as there were only two main items remaining to be completed at the first of the year; namely, the painting of the second coat on the houses and the

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6. SURFACE

b. Location Dwelling Repairs (Cont.)

grading and seeding of the lots. The first work in the spring, as soon as the weather permitted, consisted of planting the trees between the sidewalk and curb and the final grading and seeding of the lots under the direction of Mr. Julian Payne, foreman of landscape operations. With two exceptions the trees came along in fine shape and by July the grass had sodded sufficiently to allow the painters to work around the houses. Therefore, four two-man crews were started and by the end of the season had completed the second coat on 22 houses, leaving only 13 to be done in 1939. This latter work and the painting of the fences is all that remains to be done under the two E & A's (Nos. 689 and 727) which were authorized for this work. The tenants have accomplished quite a lot with shrubbery and flowers and the white houses with green trimmings in their improved premises presented a very pleasing appearance this year.

A certain amount of necessary repairs to the other rented houses in addition to extensive repairs to two houses situated on Ann Street East of the Athens Mine, No. 178 purchased in 1937 and No. 182 purchased in 1938, both of which were in very bad shape, kept a very small crew busy most of the year on the curtailed schedule.

On December 31st, 1938, the Maas Mine owned 120 dwellings, a decrease of one as compared with 1937.

Single Family Houses	87
Two " "	24
Three " "	4
Four " "	1
Legion Club	1
Store	1
Funeral Home	1
Church*	1
Total	120

*The church is shown on our list of Rented Houses, but in reality this was acquired through an exchange and within a short time will be moved to Lot 16 in the Cleveland-Cliffs Iron Company's Second Addition which was deeded to the Finnish Evangelical Lutheran Church, after which it will revert to them.

The following houses were sold during the year:

C.C.I.CO. 1st Addition

House No.	Address	Lot	Block	Purchaser	Date
78	630 Lake St.	8	6	John Roberts	1-1-38
9	533 Elm St.	10	3	Wilfred Lyons	5-1-38
1	610 Lake St.	3	6	John Tregonning	8-1-38

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6. SURFACE

b. Location Dwelling Repairs (Cont.)

C.C.I.Co. 2nd Addition

House No.	Address	Lot	Block	Purchaser	Date
61*	916 Baldwin	15 & S ½ of 14	2	Finnish Evangel. Lutheran Church	8-19-38

The following houses were purchased in 1938:

House No.	Address	Lot	Block	Purchased From	Date
182	Ann St.	Unplatted		Alex Turppinen	6-1-38
183	Mitchell Ave. Parsonage	6	35 Pioneer Iron Cos. Plat	Finnish Evangel. Lutheran Church	8-19-38
184	Mitchell Ave. Church	"	"	" "	8-19-38

b. Stockpiles

On account of the low shipments in the year 1938 and even with the curtailed operation, the expectation of having approximately 600,000 tons in stock on May 1st, 1939, it was necessary to plan for new stocking areas and the erection of a considerable amount of wooden trestle. There was a sufficient amount of Bessemer and Race Course grades removed from under the steel trestle to make room for the production of these grades until next shipping season, but all the trestles containing ore of Maas grade were completely filled by October and so two single track trestles, one to the Southwest and one to the Southeast of the shaft, were erected during the year. The latter trestle required considerable work on the sollar before it could be erected and early in the year plans were made to remove a rock pile on the South side of the main rock pile at the extreme East end of the steel trestle which interfered with the loading of ore as there was insufficient room for a spotting track and when loading near the end of the steel, only one or two cars could be placed at a time. The caterpillar steam shovel was used at times when there was no loading of ore and trucks were rented from the other mines on the days they were not working. The rock was removed and placed one foot deep over the entire sollar of approximately 900' x 200', in addition to which the West end of a large gulley some twenty feet deep in the center was filled to the required elevation. There is a similar rock pile on the North side which interfered with loading and it it planned to remove this next year by completing the filling of the gulley to the East, thus increasing the length of the stockpile grounds in case the additional area should ever be needed.

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6. SURFACE

b. Stockpiles (Cont.)

Besides these two ore trestles a new rock trestle was erected running Northeast from the shafthouse and shortening the rock tram from 1500 to only 500 feet. The cost of this trestle was considerably in excess of that of a regular single track trestle as near the start it spans several of the railroad tracks and six special bents had to be erected. New trestle legs had to be ordered for all of these trestles as the old legs were tied up in the present full trestles.

Since late in the fall of 1937 the Mechanical and Electrical Departments have been working out designs for a larry car to be used for stocking ore and this necessitated the placing of a third rail along the trestle for a conductor. This new system has been installed on the new rock trestle and also on the South track of the steel trestle. The car is made of aluminum alloys, contains a motor and magnetic brake remotely controlled from the shafthouse, thus eliminating all ropes, spools and sheaves. The car has been in operation only a short time and mechanically seems to be satisfactory, although electrically it would appear that it is slightly under-powered. The Electrical Department is collecting operating data with a view to increasing the horse-power of the motor and is also working out a larger brake with quicker action.

As soon as the new system proves to be satisfactory in every way, all of the stockpile trestles will be equipped with electrical conductors and the track gauge will be increased from 30 to 36 inches, making a more stable car and one which should give very little trouble as all of the endless rope transfer equipment will be eliminated.

There was no stockpile overrun shipped in 1938 and therefore there is approximately 34,000 tons in stock in excess of the book figures, which total approximately 420,000 tons for all grades.

c. Tracks, Roads, Etc.

The only work done under this heading in 1938 was the grading of a new entrance to the Mine from the Southwest as the old road was cut off by the new trestle to the Southeast. This new road leaves the main highway some 700 feet West of the old entrance and although slightly longer, makes a much better connection between the mine grounds and the highway.

d. Timber Yard

There were 129 railroad cars of various kinds of mine timber unloaded during the year, besides a large amount of stull timber that was brought in by truck. Several months supply was kept on hand at all times and the oldest was used up first to insure fresh timber at all times.

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6. SURFACE

e. Drainage

The operations in connection with removing the surface water from the ledge before it enters the mine have been carried on throughout the year by the Layne Northwest Company and the results obtained from the test drilling have shown more favorable gravel structure than was encountered in the past. The pump installed in the well South of the shaft has only been in operation about two-thirds of the year as several times the fine sand, which continues to work its way into the well through the gravel which was introduced to keep it back, has cut the impellers and bearings of the pump so badly that it had to be hoisted to surface and repaired and in each case this work took considerable time. The capacity of the pump has varied from 150 to 300 gallons but this latter capacity has only been obtained since the last installation on November 28th. There has been very little decrease in the total water pumped from underground during the intervals of pumping on surface, but this is no doubt due to the fact that the pumping was so intermittent that the effect could not be noticed before the pump was down again. There has been a general increase in the amount of water pumped due probably to the caving of more hanging and this has offset what gain there might have been. On occasions, however, it has appeared that there was less water flowing from the North footwall above the Third Level and it is believed that this was the result of the surface pumping.

One test hole was drilled some 1200 feet South of the shaft where old Diamond Drill Hole No. 7 is located and through which approximately 150 gallons per minute is entering the mine above the Third Level. This water is piped through the mine and is used for drinking water and wherever they need water for drilling. It was, therefore, thought that there might be a large amount of water available on ledge at this point, but the test hole showed only very fine sand and no water to speak of. There would be nothing gained by plugging this hole underground as the water would then come through the adjacent workings and give more trouble as it is now controlled in pipes and does not interfere with mining.

The next hole, No. 10, was drilled about 200 feet East of the present well and 150 feet South of the shaft and this hole encountered 37 feet of fairly coarse gravel and considerable water which was more favorable than found in any of the other holes. They then moved to a location 1200 feet West and 100 feet North of the shaft near old Diamond Drill Hole No. 17, the log of which appeared very favorable and in this hole, No. 11, was found 28 feet of very coarse black sand interbedded with gravel and small boulders that was very active due to excessive water pressure. It is at this point that No. 2 well is to be put down.

Two other test holes to the North and West of No. 11 were also drilled but the results were very unfavorable and it was decided to put down a well rather than do any more exploring in this vicinity.

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6. SURFACE

e. Drainage (Cont.)

The log of all the holes drilled this year will appear in the geological report.

The Layne Northwest Company feel very confident that they can develop No. 2 well to such an extent that it will produce from 500 to 1,000 gallons per minute and if the sand will clear up in No. 1 well, as it appears to be doing at present and the well can continue to deliver 300 gallons per minute, the results underground should be very gratifying.

7. UNDERGROUND

a. Shaft Sinking

There was no shaft sinking in 1938.

b. Development

There were eight contracts on development during most of the year, six of which were raising while the other two were drifting. The raising was mostly in ore while the drifting was about one-third ore and two-thirds rock.

Third Level

There was no development on the Third Level in 1938.

Fourth Level

The new Cross-cut 340 feet East of and parallel to the East boundary of the Race Course Lease, started about the middle of last year, was completed early in 1938 and seven raises put up to the 195' Sub, which is in the most part just under the hanging. The purpose of opening this new block for mining was twofold; to work in a dryer part of the mine and to make room elsewhere so that the mining progress below the Fourth Level could be slackened somewhat. One contract was still putting up raises at the last of the year.

Near the end of the year it was decided to put in a transfer system half way between the Third and Fourth Levels to mine the so-called Third Level West Footwall Pillar. Mining above the Third Level will soon reach a point where the raises will be too shallow to handle the ore and as the footwall is too flat for raises to be put up direct from the Fourth Level, a transfer drift was necessary. The best place for the transfer raise was in the Northwest footwall drift at a point used for an underground powder house and therefore a new place nearer the shaft was cut out and prepared for a new powder house and at the end of the year one contract was raising in rock in the transfer raise.

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7. UNDERGROUND

b. Development (Cont.)
Fifth Level

In March of this year it was decided to drive No. 3 Cross-cut on the Fifth Level in order that the raises might be put up to the Fourth Level and above in time to replace the 600 series on the Fourth Level when mining descended far enough to make them unavailable. One contract continued drifting here and at the end of the year had about 100 feet left to complete the connection with the South footwall drift. This drift was partly in rock that required no timber but in the last half the ground became quite slabby and treated timber had to be used to support the back.

No. 7 Cross-cut was advanced 76 feet in rock to the Northeast along the Western boundary of the Race Course Lease.

Several raises were also put up from the Fifth Level during the year.

Detail of the development is as follows:

Location	Ore Drifting	Ore Raising	Rock Drifting	Rock Raising
385' Sub Level West Footwall	128'	32'	22'	
355' Sub Level Transfer		66		
Third Level				52'
Fourth Level	345	639		
Fifth Level	50	525	551	
Total	523'	1,262	573'	52'

c. Stoping
General

Mining was continued throughout the year 1938 at the Maas Mine in the same four general areas as in the preceding year with an average of 27 contracts engaged in stoping, three shifts per day on a four and three day per week schedule, for the first five months in the year and 36 on two shifts per day on a two and three day per week schedule for the last seven months. A timber crew consisting of 50 men was required to maintain the traveling ways and raises as crushing conditions were especially bad, partly due to the long idle periods each week under the two day per week operating schedule and also due to under-cutting

7. UNDERGROUND

c. Stoping
General (Cont.)

many jasper pillars, which always causes considerable weight on the drifts below until sufficient matt is established to form a cushion.

The water, which increased from an average of 1,487 to 1,590 gallons per minute including the amount diverted to the Negaunee Mine, continued to cause considerable trouble with a consequent increase in cost. Outside of the direct cost of pumping, it is very hard to determine just how much loss there is due to the delays caused by the wet ore, but they occur all along the line, from the contract (where the running water washes rock down through the old cover and ore from the breast, making it difficult as well as hazardous to put up timber and catch the back) where the scraping of the ore has to be delayed until a train is available at the chute, to the shaft where the train has to wait and dump directly into the skip; and on the top landing where the rush of wet ore spills over, requiring extra men to keep the cars operating.

There is another factor that enters very largely into the efficiency of underground operations and that is the grading of the ore. The Maas Mine produces four different grades of ore and as all of these grades have to be divided into two royalties, and when these are further complicated by being one-third wet and two-thirds dry, it makes a real problem. There are three pockets at the shaft from which the skips are loaded and the general plan is to keep two of these pockets full of dry ore of the grades which are in the majority on that particular level, but if a train comes out with other grades, then they must be dumped in the third pocket. If the skip is busy on another level while a second train comes in with another grade or wet ore that must be dumped through, then the train has to wait not only until the skip is available, but also until this third pocket is empty. Then a further complication arises whenever there are any contracts working in rock, but this and small amounts of the off grades are held in the chutes, as far as possible, until the evening hoisting shift, when there will not be so much interference.

There were ten contracts in the East Footwall Pillar above the Third Level working on three elevations during 1938. The ore was allof Maas grade and divided mainly between the Maas and Roman Catholic Cemetery Leases, with a small amount from the Cleveland-Cliffs Iron Company and American Mining Company strips. With the exception of the drifts along the North footwall, this area was comparatively dry and on the average the most efficient results came from this area, the ore being all of Non-Bessemer grade.

The West Footwall Pillar above the Third Level was occupied by

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7. UNDERGROUND

c. Stoping
General (Cont.)

three contracts for the first half of the year and by only two in the last half as this area became so small (due to the very flat dip of the North footwall while the hanging wall remained very steep) that more than two contracts could not work to advantage. Therefore, another small area in the vicinity of the old winze was reopened just above the Third Level. Both of the above areas are fairly dry, the first being in the Race Course and Maas Leases while the latter is all Maas, and all of Non-Bessemer grade.

Mining started this year in the third block East of the Race Course Lease and above the Fourth Level as soon as some of the development raises were completed to a height of 90 feet above the Fourth Level where the hanging was encountered. Seven raises in all have been put up and all but two were connected on the 195' Sub Level by the end of the year with two contracts starting to mine. This area is all in the Maas Lease and so far has shown no sign of water.

Work in the first and second blocks East of the Race Course and above the Fourth Level was continued during the year with an average of six contracts working between the 170' and 140' elevations, the latter being 25 feet above the Fourth Level. In both of these areas the contracts are delayed to quite an extent by the flow of water, although conditions here are not as bad as they are below the Fourth Level. As was mentioned in last year's report, these areas were both reopened after a long idle period and it was not until the last of the year that enough new work had been done to establish a new matt and hold back the broken rock from breaking through and causing numerous delays. Conditions in this vicinity, which is mostly in the Maas Lease with a small amount in the Cleveland Cliffs Iron Company and American Mining Company Leases, should be very much improved in 1939. About 10% of the product from this area is of Bessemer grade.

The majority of the contracts in any one area, averaging 17 in number, were employed in the main ore body below the Fourth Level where they nearly completed mining the 75' Sub Level and at the end of the year had connected the raises and started work on the 65' Sub. This area is nearly 50% in both the Race Course and Maas Leases with a very small amount in the Cleveland Cliffs Iron Company and American Mining Company strips and is the wettest area in the mine as only four of the contracts have been consistently dry during the year. Nearly 90% of the Bessemer ore produced in 1938 came from this area as did also all of the two Special grade ores. It was thought from the analysis of the raises put up in this location that the 65' Sub would average at least 50%of Special grade, but up to the present time only four of the places have

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7. UNDERGROUND

c. Stoping
General (Cont.)

produced any high sulphur ore and even these have had it only about half of the time. This is, of course, very gratifying and it is possible that in the elevation below there will be considerably more of the regular grade ore than was originally estimated.

Subs Between the 2nd & 3rd Levels

East Footwall Pillar

435' Sub Level

With the exception of a small amount of ore lying to the South under the hanging wall which had been mined previously, this area was opened up in 1936 and worked continuously during 1937. At the end of that year there remained to be recovered several small pillars which were being mined by the three contracts still at work in this territory. During 1938 these pillars were completely recovered in the first two months of the year, finishing all operations on this Sub Level.

425' Sub Level

The Eastern end of this Sub Level was opened up in November of 1936 and worked continuously during 1937, mostly in the Roman Catholic Cemetery Lease and Railroad Pillar. The work of mining this territory to the West of the Roman Catholic Cemetery Lease was continued throughout 1938 with an average of seven contracts employed. Development above the new 355' Sub Level Transfer was continued with the addition of a fourth raise, No. 1115. At the end of the year mining had advanced to the point where it was necessary to move several of the crews to different working places. There are a number of large pillars left to be mined on this elevation, mostly in the Maas Lease with the remainder in the Roman Catholic Cemetery Lease. Operations along the footwall in this territory were greatly complicated by the presence of large quantities of water flowing into the working places with the result that progress was very slow. Numerous attempts to cut off and control the flow of this water have been only partially successful since there are times when complete control is practically impossible.

During December Contract No. 1 was slicing to the West of Raise No. 108A, Contract No. 2 was slicing to the South of Raise No. 1115, Contract No. 8 to the North of Raise No. 111A and Contract No. 35 to the North of No. 114 Raise, all in the Maas Lease with the exception of Contract No. 35 which was partly in the Roman Catholic Cemetery Lease. All of the remaining reserves on this Sub Level will probably be recovered during 1939.

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7. UNDERGROUND

c. Stoping (Cont.)

415' Sub Level

Mining in this territory was started in July, 1937, in the extreme Eastern end in the Roman Catholic Cemetery Lease and the Railroad Pillar. After the water had been drained off on the footwall side, mining proceeded rather rapidly throughout the remainder of the year. During 1938 additional crews were moved to this Sub Level and mining continued to the West. The development to the West consisted of connecting Raises Nos. 116 and 115 and the opening up of a working place at Raise No. 1112 above the 355' Sub Level Transfer.

During December No. 29 Contract was slicing to the North of No. 116 Raise in the Roman Catholic Cemetery Lease, Contract No. 7 was drifting to the West of Raise No. 115 in the direction of No. 113 and No. 9 was slicing to the Southeast of Raise No. 1112 up to the previously mined old workings in that vicinity. The operation of this new transfer system greatly facilitated the recovery of the ore to the South which could not be reached from the single main level drift to the North. At least two other transfer drifts will be necessary as mining is continued on lower elevations, one to the East and one to the West.

401' Sub Level

This Sub Level was originally opened up a good many years ago and partially mined by small drifts running Northeast and Southwest before the ore body had been developed to its full height. This mining was done during the World War when the demand for iron was very great. Since that time several connections between raises have been made for purposes of traveling and ventilation, most of which have subsequently been crushed and filled, as have the originally mined drifts. The presence of these old workings complicates to some extent mining operations at the present time since considerable amounts of old timber are encountered in the mining slices. The work of reopening this Sub Level was begun with a single contract in July of this year and consisted of connecting Raises Nos. 119, 120, 121 and 122, afterwhich mining was started to the Southwest of Raise No. 121 in the Roman Catholic Cemetery Lease. The ore to the South of this series of raises is now extending out under the hanging wall beyond the boundary of the Roman Catholic Cemetery Lease and into the Maas and will eventually require a sub level transfer drift on a lower elevation since scraping distances are rapidly becoming too long to be economical.

In December of this year a second contract (No. 5) was moved down to this elevation and startedthe work of drifting from Raise No. 120 to No. 116 in the Roman Catholic Cemetery Lease. The original crew, No. 6, was still slicing to the Southwest of Raise No. 121, partly in the Roman Catholic Cemetery Lease and partly in the Maas.

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7. UNDERGROUND

c. Stoping (Cont.)

355' Sub Level

The transfer Sub Level on this elevation was driven to the South from the top of No. 111 Raise in July and August, 1937, after which three raises were put up to the 425' Sub Level. This transfer has worked very satisfactorily throughout the year and the addition of a fourth raise to the West, No. 1115, has greatly increased the amount of ore which can be mined through this system. This fourth raise was put up in February and March, 1938, and mining was immediately started from the top of it on the 425' Sub.

325' Sub Level

The above discussion of operations in the East Footwall Pillar describes the mining in the territory lying to the West of the boundary line between the Maas and Negaunee Mines and to the East and North of a rather large territory which was mined out a number of years ago. A small pillar of ore remains to the West of this previously mined territory and lies just North of the 200 coordinate, between 800 and 1000 West. This small pillar was left to protect the old winze connecting the Third and Fourth Levels but for the past several years has been used only for an airway. During 1937 it was decided to resume the mining of this pillar since the old winze had crushed to the point where it was no longer of any value. Accordingly, Raises Nos. 4002 and 4004 were put up from the Fourth Level and at the end of 1937 the former had reached the elevation of the Third Level. The top of this raise was then connected with the old Third Level drift, after which a transfer drift was driven to the Northeast and a raise put up a few feet to the 325' Sub Level elevation. Mining was begun at this raise in March of this year and continued with one contract through October, when the last of the available ore was recovered and the crew moved to the Third Level elevation to continue mining in the same territory. The second raise from the Fourth Level, No. 4004, encountered the jasper hanging wall a short distance below the Third Level elevation and was stopped until mining operations will have reached this elevation.

Complete recovery of all the ore on the 325' Sub Level was impossible due to the presence of the old storage pocket and other structures through which material was handled when the winze was originally opened. As mining procedes to lower elevations, complete recovery will be possible.

Third Level

Work on the Third Level elevation in the East Footwall Pillar consisted of driving a small connection Northwest from Raise No. 4002 to the old Third Level drift. This connection was made in

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7. UNDERGROUND

c. Stoping (Cont.)

Third Level (Cont.)

lean ore and jasper but was necessary for traveling and ventilating purposes. After this connection was completed, an exploratory drift was driven to the East, also largely in lean material. As soon as the South limit of the ore had been definitely established, a third drift was driven to the Northeast in ore and a short raise put up at a point 50 feet from Raise No. 4002. It wasthrough this raise that the ore on the 325' Sub Level was mined. In October of this year, Contract No. 12 moved down to this elevation to continue mining. The original transfer drift was extended to the Northeast as a mining drift and stopped when it encountered the old Third Level workings. Slicing was continued through November and December.

The complete recovery of the reserves in this territory will be greatly facilitated as soon as mining has progressed down to the elevation where Raise No. 4004 can be used. At best, however, mining will be difficult due to the crushed and caved condition of the old winze, which will have its effect on the pillars around it.

West Footwall Pillar

385' Sub Level

The reserves in the West Footwall Pillar have been mined during the past several years through small open stopes lying above the 401' Sub Level and by regular top slicing methods in the larger area lying South of the stopes. By 1937 the ore available for stoping having been practically exhausted, mining was being continued by top slicing and by the end of that year had progressed down to the 375' Sub Level elevation. As was mentioned in the report for 1937, one of the mining slices on the 385' Sub Level to the Northwest of No. 16W Raise passed considerably beyond the previously established jasper footwall contact and a small amount of exploratory work was done in an attempt to find out if there was any connection between this ore extension and the small run of ore which was found at about the Third Level elevation in No. 2 Diamond Drill Hole. This exploratory work was continued in the first few months of 1938 with very disappointing results, since no appreciable quantity of merchantable ore was found in spite of the fact that quite a large amount of drifting and raising was done. These small exploratory drifts and raises extend above the 385' Sub Level elevation to include all of the Sub Levels from the 395' to the 450', inclusive, where a small amount of ore was developed and removed by stoping and then exploratory work was abandoned as the only indication of any more ore was to the West and extending below the 385' Sub Level. Any further exploration of this territory will have to be done by diamond drilling on the Third Level.

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7. UNDERGROUND

c. Stoping (Cont.)

385' Sub Level (Cont.)

Slicing was then continued in the remaining pillars in the vicinity of Raise No. 18W and completed in November of this year. All of the above described work was in the Race Course Lease.

375' Sub Level

The work of recovering the reserves on this Sub Level elevation was continued during the first few months of the current year by slicing from Raises Nos. 5W and 8W, the bulk of the ore being recovered from the Race Course Lease and a small amount from the City of Negaunee strip. Raises Nos. 18W and 20W, from which a large amount of this ore was mined on previous Sub Levels, are no longer of any value since they have been cut off by the flat pitch of the footwall. Operations on this Sub Level were completed in May of this year with only a small pillar remaining to the Northwest. This pillar was left to support the workings on the 385' Sub Level above, which had not yet been finished. The recovery of the small remaining pillar will be effected by means of a transfer drift on the 355' Sub Level lying immediately below.

355' Sub Level

This Sub Level was originally opened up several years ago from Raises Nos. 1E and 3W and a small amount of ore was mined to the East of Raise No. 1E. When the connecting drift was driven West from Raise No. 1E to No. 3W, it was found that the ore extended upward, which necessitated the extension of the Third Level drift to the North and West. Subsequently the ore was mined above the 401' Sub Level from Raises Nos. 8W, 10W and 18W. Slicing operations in the main ore body progressed down to this Sub Level during the current year and work continued from Raise No. 5W which was opened up in May. The work consisted of slicing the larger portion of the area to the North of this raise, the bulk of which was recovered from the Race Course Lease with a small amount from the City of Negaunee strip. This contract, No. 10, was slicing to the West during December. In the latter part of that month Contract No. 11 moved down to Raise No. 3W, from which a small drift had been driven some years ago, and started the work of driving a drift to the Northwest from which it is intended to recover the pillar which remains on the 375' Sub Level as it is probable that this ore can be handled much more economically by a transfer drift of this sort than it could be by mining it from Raise No. 18W which has about 20 feet of jasper and lean material lying between the raise and the ore. The reserves lying to the East of No. 3W Raise and West of Raise No. 1E will be mined as soon as Contract No. 10 finishes operations at Raise No. 5W. The bulk of this mining can be done from

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c. Stoping (Cont.)

355' Sub Level (Cont.)

Raise No. 1E which was repaired and made ready during December. The ore lying to the East is for the most part in the Maas Lease with a small amount in the City of Negaunee strip. The ore remaining below this elevation will be recovered by means of a transfer system now being started midway between the Third and Fourth Levels as the dip of the footwall is too flat to permit raises being put up directly from the Fourth Level without a very large amount of rock development which would be more expensive than the transfer.

Third Level

The only work done on the Third Level during 1938 was the routine repairs to timber, tracks and raises and periodic clean-ups which was done by an extra crew that was called out once in two weeks. This clean-up required a large amount of work since the large flow of water down the raises in the East territory causes a large accumulation of mud and ore in the ditches and tracks. A portion of this water is handled by piping it down the various raises and discharging it to the Twelfth Level, Negaunee Mine, where the pumps are working under less load than they are at the Maas. About 160 gallons per minute have been thus diverted, taking a proportionate load from the Third Level pumps.

Subs Between the 3rd & 4th Levels

195' Sub Level

The second block East of the Race Course, lying above the 600 series of raises on the Fourth Level, was reopened and mined out during 1936 and 1937 with the exception of a small pillar North of No. 625 Raise which was recovered from the 185' Sub Level below. During 1938 the development of the third block East of the Race Course was continued above the new 4000 drift which was started in 1937 and finished during the current year. Seven raises have been put up to date, six of which were completed by the end of the year. The development of this block to date consists of the connecting of all the raises from No. 4022 to No. 4031 with exploration under the hanging started to the East of the first and mining under the old covering to the Southwest of the last of the above raises. The material in the connecting drift between Raise No. 4022 and No. 4028 was very lean, showing that it is close to the hanging, and the first cross-cut from No. 4022 was driven along the North side of a jasper pillar which apparently is of considerable thickness. On the North side, however, it was found that the ore extends at least one sub level higher and therefore work was stopped until Raise No. 4020 could be put up and development of this area be continued directly

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7. UNDERGROUND

c. Stoping (Cont.)

195' Sub Level (Cont.)

under the hanging, which is apparently very irregular. Mining to the South of No. 4028 Raise is all under old covering and can be continued while explorations to the North are in progress.

A bad breakdown, caused by a sudden movement of the jasper hanging above, occurred during the driving of the connecting drift from Raise No. 4026 to 4028 and required about a months work to spile through and repair the damage. During December of the current year, Contract No. 27 was drifting to the Southeast of Raise No. 4028 towards No. 4030, Contract No. 39 was continuing Raise No. 4030 above this Sub Level elevation and Contract No. 50 was driving the first mining drift to the Southwest of Raise No. 4031. Raise No. 4030 is being advanced one sub level interval higher than the rest of these raises in order to permit the recovery of a small pillar lying on the 200' Sub Level. All of the above work was in the Maas Lease.

185' Sub Level

As was discussed in the report for 1937, the ore lying in the Southern part of the block served by the 600 series of raises became very wet to the point where it was impossible to continue mining at this elevation on account of the hazard involved by the washing down of ore and rock from the back. Accordingly, the small amount of ore remaining above the 170' Sub Level was left to mix with the gob to form a protective matt and mining was continued on the 170' Sub Level below, where by leaving a solid back the water could not get through. The territory to the North was completely mined from Raise No. 625 by a single crew that was slicing there continuously through 1937. This work was completed early in 1938 and the crew moved down to the 170' Sub Level. The work was in the Maas Lease.

170' Sub Level

One small pillar lying in the above mentioned South portion of this territory was recovered during the year, an operation which practically completed the mining of this very wet territory and work was then stopped temporarily to enable the pillar to the North to be mined down to the same elevation. This work was carried on from Raises Nos. 625 and 626 with two crews of miners which worked continuously throughout the latter part of 1938. In December No. 25 Contract was slicing to the West of Raise No. 625 and Contract No. 45 to the West of No. 626.

As soon as the remaining pillars in the vicinity of these raises are recovered, the development of the 160' Sub Level will be

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7. UNDERGROUND

c. Stoping (Cont.)

170' Sub Level (Cont.)

started from No. 627 Raise. It is hoped that the abnormal amount of water which was encountered on the 170' Sub Level will prove to have been a temporary situation and in the future mining in this territory will be drier than formerly. The extremely wet conditions encountered here during 1936 and 1937 came as a direct result of the new surface cave and consisted of surface water which has since been drained off to some extent, while adjacent mining has also apparently diverted some of the water as there is much less coming through the raises. All of the above work was in the Maas Lease.

150' Sub Level

In December of 1937, the one remaining crew on the 160' Sub Level was moved down to the 150' elevation where mining was continued throughout the year with an average of three crews working from the tops of the new raises Nos. 529, 531, 526 and 528. These raises were put up from the Fifth Level for the purpose of mining the block of ore lying Southeast of the Race Course and North of the boundary line between the Maas and Negaunee Mines. As has been explained in previous reports, this territory is very heavy and difficult to handle due to continuous crushing and repairing of the main level drifts on the Fourth Level below this elevation. To add to the difficulties, most of the working places are extremely wet which, together with a poor matt due to the mining above having been done so long ago, complicates mining considerably. Mining was carried on South of Raises Nos. 526 and 528 in the Maas Lease, Cleveland Cliffs Iron Company strip and American Mining Company strip, with mediocre results due to the fact that a number of serious breakdowns and rock runs made it necessary to abandon several large pillars. Slicing operations Southwest of No. 529 Raise were somewhat more successful as regards the percentage of recovery. The single crew at work in the vicinity of Raise No. 531 has experienced considerable difficulty due to the presence of extremely hard blue steel ore which makes drilling very slow.

In December the two remaining crews, Nos. 41 and 46, were slicing South of Raise No. 529 and North of No. 531, respectively, in the Maas Lease.

140' Sub Level

During 1937 the territory in the first block East of the Race Course was reopened after having been abandoned for a number of years. Development of this block was effected by means of a series of raises put up from No. 4 Cross-Cut on the Fifth Level. From these Raises, Nos. 5420, 5424 and 5428, mining was continued

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7. UNDERGROUND

c. Stoping (Cont.)

140' Sub Level (Cont.)

throughout the latter portion of 1937 and during the entire year of 1938. Conditions here were almost identical with those described in the larger block Southeast of the Race Course with the exception that not quite as large a flow of water was encountered. Two crews worked throughout the year, one from Raise No. 5420 and the other from Raise No. 5424, with fairly good results in spite of adverse working conditions. Continual repairing of the Fourth Level drift below has caused a slumping of the old covering that was placed some years ago with the result that in a number of places the ore lying above this Sub Level elevation is not thick enough to permit mining. In some localities the old covering has crushed and pulled down to within two or three feet of the sub level floor. As a result of this, a number of pillars have been left unmined. The work from Raise No. 5420 was partly in the Maas Lease, City of Negaunee strip and Race Course, and from Raise No. 5424 in the Maas Lease and City of Negaunee strip only. During December Contract No. 28 was driving a slice to the East from Raise No. 5420 and Contract No. 37 was slicing North of Raise No. 5424, both in the Maas Lease.

A small amount of work was done on this Sub Level in the previously mentioned territory Southeast of the Race Course. Slicing was carried on for several months from Raise No. 5434 before conditions became so bad as to necessitate abandoning this working place. Further recoveries of these reserves will have to be effected by means of new raises put up from No. 3 Cross-Cut on the Fifth Level. In the Southeast portion of this block, Contract No. 44 moved down to this Sub Level elevation in November and proceded with the work of opening up at Raise No. 528. A connection was driven to No. 526 and at the end of December a mining drift was being driven to the South of No. 528.

A small amount of exploratory work was done in a little stringer of ore lying in the vicinity of Raise No. 304 in the Race Course Lease. A single contract spent several months testing this ore to the East of the raise with very disappointing results since the only material found was lean and mixed. Toward the end of the current year this work was abandoned and the crew moved elsewhere.

Fourth Level

A considerable amount of development work was done on this level throughout 1938, the main part of which consisted of continuing and finishing the new 4000 drift in the third block East of the Race Course and the putting up of the 4000 series of raises from this new drift. Seven raises were put up, Nos. 4020 to 4031, inclusive, and at the end of the year all had been completed with the exception of No. 4020 which was being driven by Contract No.

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7. UNDERGROUND

c. Stoping (Cont.)

Fourth Level (Cont.)

42. The jasper and lean material in which this drift was being driven at the end of 1937 proved to be 40' thick, after which the drift was continued in ore throughout. The driving of this drift and the putting up of the new raises serves to open up the third mining block East of the Race Course which, with a few small exceptions, is entirely under unmined territory. For this reason it is hoped that only a normal amount of water will be encountered and that mining can be carried on without the difficulties experienced in the other blocks which had previously been mined and temporarily abandoned. An airway connection was made with this new drift on the West side between Raises Nos. 4028 and 4030. This connection was a drift in ore from the top of Raise No. 531A which was put up from the 75' Sub Level late in the year. Improved ventilation conditions have already proved the value of this connection. In addition to the above development work, a connecting drift was driven at this elevation South of Raise No. 5422 to Raise No. 5424 and almost to Raise No. 5426 for traveling and ventilation to the 140' Sub Level.

Considerable difficulty has been experienced in maintaining the raises in the 5400 series due to conditions of extreme weight and crushing. Several of these raises, Nos. 5428 to 5436, inclusive, have been lost by crushing and will have to be replaced by new raises put up on the West side of No. 3 Cross-Cut on the Fifth Level. By keeping these new raises back in the solid unmined pillar close to the footwall, it is hoped that less difficulty will be encountered.

A small connecting drift was driven between Raise No. 531 and the main level drift to the West. This connection was made for purposes of traveling and ventilation.

In order to continue without interruption the mining of the ore body lying in the West Footwall Pillar above the Third Level, it was decided to begin the development of this area from the Fourth Level well in advance of mining operations above the Third which have now progressed as far as the 355' Sub Level. Within a comparatively short space of time it will be necessary to continue this mining by means of Fourth Level raises. The known pitch of this ore body is so flat that it makes it impossible to put up raises in ore from the Fourth Level and accordingly, a transfer system has been laid out through which to mine the above mentioned ore. A single raise No. 300 is now being put up in the footwall. It is expected that this raise will pass under the hanging wall of the small ore body and that at approximately the 200' elevation a transfer drift may be driven entirely in ore. From this transfer drift, which will be

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7. UNDERGROUND

c. Stoping (Cont.)

Fourth Level (Cont.)

driven in a Westerly direction from the top of the raise, three raises in ore will be put up above the Third Level and mining continued from them. The only proper location for this new raise was in the location of the powder house on the Fourth Level, just Southwest of the main switch. Therefore, a new powder house was excavated somewhat to the North on the West side of the same drift and the transfer raise started in the old location. Contract No. 31 spent the last several months working on this raise and at the end of theyear the ore had not yet been reached, the raise being only 68 feet above the level.

Subs Between the 4th & 5th Levels

100' Sub Level

The main area on this Sub Level, lying partly in the Race Course Lease and partly to the South of the Race Course boundary in the Maas Lease and the Railroad Pillar, was almost completely mined out prior to this year with the exception of a small pillar lying in the vicinity of Raise No. 5616 in the Northwest corner of the main area in the Race Course Lease. These reserves were completely recovered early in 1938 and no further mining has been done on the sub level since that time. Subsequent operations in the blocks lying above the Fourth Level to the East and Southeast of the Race Course will, in the course of the next few years, progress down to this elevation. In the meantime, there will probably be no further work done on this sub.

90' Sub Level

The main ore body on this Sub Level, similar to the one described on the 100' Sub Level above, was almost completely mined out previous to 1938 with the exception of a small area lying to the North, the small ore body South of the dike and some newly discovered reserves lying under the hanging wall to the West. Early in September Contract No. 24 was moved down to this Sub Level in the North area at Raise No. 5616 and began slicing operations to the East. This work was carried on in the Race Course Lease throughout the remainder of the year and was being continued in December.

In the 5500 series of raises the amount of water encountered was so great that mining operations in 1937 were stopped with the completion of the connecting drift between Raise No. 5510 and No. 5516. A new raise, No. 5512, was then put up with the hope that it would serve to drain the water from this territory and enable mining to be continued from No. 5516. When this latter raise was completed to the 90' Sub Level elevation, the flow

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7. UNDERGROUND

c. Stoping (Cont.)

90' Sub Level (Cont.)

of new water was so great that no further attempt has been made to use it since that time. The hazard involved in cutting out and timbering over an extremely wet raise was the chief reason for not attempting to use No. 5512 at the present time. As a last resort, Raise No. 5411 was then planned on the West side of No. 4 Cross-Cut since it was hoped that this raise, being in a relatively solid pillar, would be dry enough to enable the workmen to properly place the timber after it had been completed. This has proved to be the case, and in the near future it will be entirely feasible to drift from Raise No. 5411 to the top of No. 5512 and pick up the latter without any danger to the workmen. Before this latter task was attempted, however, a short exploratory drift was driven to the North, establishing the jasper contact 25 feet from the raise. A second drift was then driven to the Northeast with the intention of holing through to the Fourth Level for ventilation, traveling and the handling of supplies. All of the above work was in the Race Course Lease and during December the new drift had progressed to the East boundary of the Race Course. A very small amount of work was still needed to connect this drift to the Fourth Level by means of a short raise.

The small ore body South of the dike was developed in 1937 by a drift in ore that connected Raise No. 510 with No. 511. Mining was started during 1937 with the original drift to the East of Raise No. 511 and two small slices. During the current year, this ore body was completely mined out and the mining crew moved to the 75' Sub Level below. A Diamond Drill station was cut out to the South of Raise No. 510 and Diamond Drill Hole No. 28 was put in horizontally on course S. 10° East. This Diamond Drill Hole, which was driven at the expense of the Negaunee Mine for Negaunee Mine information, was driven through the Railroad Pillar and into the territory on the Negaunee Mine side of the boundary line. On the Maas Mine side, however, it showed up a small piece of ore lying North of the boundary line and about 55 feet in thickness. A further discussion of this drilling will be found in the report for the Negaunee Mine and the Geological Department.

In the area lying South of the Race Course to the West of the main ore body, an ordinary mining drift to the West of Raise No. 5645 disclosed the fact that a roll in the hanging contained ore lying considerably to the West of any previous contacts. Accordingly, it was necessary to extend the South end of No. 7 Cross-Cut in the Fifth Level and put up two raises from which to mine this extension of the ore. Development from these new raises was started early in the year with a connecting drift between Raises 5745 and 5742. Subsequent mining operations have revealed the fact that these reserves were not at all consistent and in spots were very lean and mixed. As mining progressed, however, it was necessary

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7. UNDERGROUND

c. Stoping (Cont.)

90' Sub Level (Cont.)

to extend No. 7 Cross-Cut still further to the North and put up a third raise, No. 5737, At the end of the year Contract No. 38 was mining from this latter raise in the last remaining pillar in this area, which has not as yet been entirely developed.

75' Sub Level

This large Sub Level, in the territory lying partly in the Race Course Lease and partly South of it, accommodated as many as twelve mining contracts during the greater part of the year. The area in the Race Course, with the exception of a small portion lying to the North that is now being mined on the Sub Level above, was completely finished West of the dike. In the area South of the Race Course, the flat pitch of the footwall is becoming more evident and the minable area is rapidly becoming smaller. At the end of the year this territory had been practically finished, with the exception of the extension to the West in the Maas Lease where Contract No. 33 was driving a connecting drift from Raise No. 5742 toward Raise No. 5745. In the main area Contract No. 30 was completing the mining of a small pillar West of Raise No. 512. In the area South of the dike Contract No. 26 drove a connecting drift from Raise No. 511 to No. 512 and then proceded to mine to the South of the former raise. Work in December consisted of two slices in the Maas Lease, Cleveland Cliffs Iron Company strip and American Mining Company strip. In the area Southeast of the Race Course a small amount of work was done for ventilation purposes. A connecting drift was driven North from Raise No. 528 and connected with Raise No. 531. This drift was then continued to the Northeast and holed through to the Fourth Level by means of a raise which has been numbered 531A. As has been described in previous reports, Raise No. 528 is connected to the South with the Thirteenth Level, Negaunee Mine, through which is received a large portion of the ventilating air.

65' Sub Level

As described in the 1937 report, a small amount of work was done at this elevation in the Race Course under the hanging wall to the West and along the 5400 series to the East. This latter operation was completed early in 1938 with the completion of a drift connecting Raise No. 5428 and No. 5426.

The opening up of the main mining area in the Race Course Lease and the territory South of the Race Course was carried on in the 5500 and 5600 series. In the 5600 series a connection was made with all the raises from 5618 to 5642, inclusive, and mining was

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c. Stoping (Cont.)

65' Sub Level (Cont.)

started to the East of several. In the 5500 side the connecting drift was completed from Raise No. 5518 to No. 5538, inclusive, with mining drifts started to the East of three of these in the Race Course. For the first time in several years an attempt was made to maintain a connection between the two series of raises. This was accomplished by a long drift connecting Raises Nos. 5624 and 5524 which has proved very valuable for ventilation and traveling purposes. A second connecting drift between the series is being driven to the Northeast of No. 5642.

From the raise samples it was predicted that the bulk of the ore mined on this elevation would be of Special grade but this has not been quite the case since by far the greater part of the ore mined to date has been of Bessemer and Non-Bessemer grade, similar to previous Sub Levels above, with only a small percentage of Special.

The work for December is as follows:

Cont. No.	Raise No.	Lease
51	5620 & 5622	Race Course
40	5630	"
23	5520	"
36	5528	"
43	5532	"
22	5640	Maas
49	5642	"
32	5538	"

50' Sub Level

The only previous work done on this Sub Level was the mining of a small area in the Race Course to the West of the 5500 series of raises which was done in 1936 and 1937, and the connection of Raises Nos. 5522, 5524 and 5526, which was done several years ago.

Subsequent to the drilling of Diamond Drill Hole No. 28 on the 90' Sub Level, a second hole was put in from Raise No. 510 at this elevation. This drilling was also done at the expense of the Negaunee Mine and is fully described in the report for that property. This hole, which was driven on course S. 2° 27" E., Dip -10°, showed a considerable run of ore on the Maas side of the line which extended for a distance of 145 feet from Raise No. 510. Subsequent to the finishing of this hole, a mining crew started to drift in the same general direction. In the meantime, a new Raise, No. 509, was put up on the South side of

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7. UNDERGROUND

c. Stoping (Cont.)

50' Sub Level (Cont.)

the South Footwall drift on the Fifth Level which intercepted the ore somewhat below the 50' Sub Level elevation. The two raises were connected by this first drift and a transfer drift was then planned to the South of Raise No. 509. A roll in the hanging wall rock prevented this being accomplished in ore so a second drift was swung off to the Southeast with the rock along the Southwest or right side of the drift. This transfer drift is necessary to mine the ore above this elevation shown up by the previously mentioned Diamond Drill Hole No. 28 on the 90' Sub Level.

The work for December consisted of a few feet of drifting in the Cleveland Cliffs Iron Company and American Mining Company strips and the beginning of the transfer Raise No. 509A by Contract 34.

40' Sub Level

The only previous work on this elevation consisted of a small amount of mining which was done under the hanging on the West side of the main ore body in the Race Course Lease. The mining of this small area was completed in 1938 and disclosed an apparent roll in the hanging wall which makes the ore area on this sub level much smaller than those on the 50' and 65' Subs above. The ore mined at this elevation during 1938 was approximately 80% Special grade.

25' Sub Level

The mining of the small block on the West side of the main ore body in the Race Course Lease was continued by a single crew which moved down to this elevation in the latter part of the current year. A connecting drift was driven South of Raise No. 5627 to No. 5633, showing further evidence of the roll in the hanging wall described on the 40' Sub Level.

Work for December consisted of a short drift and slice driven by Contract No. 48 Southeast of Raise No. 5633.

Fifth Level

The development work on this Level during 1938 consisted of a relatively small amount of drifting and raising. No. 3 Cross-Cut was continued in rock in the East Footwall territory and at the end of the year there remained approximately 100 feet of drifting to hole this Cross-Cut into the South Footwall drift. This work is being done to permit the mining of the ore in the second block East of the Race Course above the Fourth Level and will be necessary when mining is advanced to a point where the ore can no longer be trammed on the Fourth Level. Also several

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7. UNDERGROUND

c. Stoping (Cont.)

Fifth Level (Cont.)

raises will be put up on the West side of this cross-cut to take the place of those lost in the 5400 series. A small extension in the ore body to the West of the Race Course necessitated the putting up of a new Raise, No. 5737, to the 90' Sub Level and a short extension of No. 7 Cross-Cut to the North to provide tail track room. This was done in jasper and lean ore.

In addition to the above, Raise No. 5512 was put up on the East side of No. 5 Cross-Cut for the purpose of draining the water found in that territory. As was previously explained, this raise has not yet been used due to the hazard involved in placing the timber over the raise on the 90' Sub Level. Raise No. 5411 was put up on the West side of No. 4 Cross-Cut for the same purpose and the present plans call for a drift which will pick up Raise No. 5512 without danger. A fourth Raise, No. 5614, was put up on the East side of No. 6 Cross-Cut for the purpose of mining the reserves that could not be reached from the other raises. This was unfinished at the end of the year.

Work for December consisted of a continuation of No. 3 Cross-Cut to the Southeast by Contract No. 19 and a continuation of Raise No. 5614 by Contract No. 20 in the Race Course Lease.

There is no extensive development planned for the Fifth Level for 1939.

d. Timbering

There was more timbering done in 1938 in proportion to mining than in 1937, as with the curtailed production, the places had to remain open longer. Therefore, where there was pressure this necessitated repairing the traveling roads more often. In addition, the main level timber on the Fifth Level began to show signs of decay and had to be replaced. A crew of fifty men was employed on this type of work during the entire year on the regular schedule, there being no timbering on the idle shifts except for emergency breakdowns. Besides the fifty repair timbermen, there was also a crew of sixteen timbermen whose duties were to keep the raises in good condition, maintaining sollars and timber slides, and also doing the necessary repair work in the shaft.

The percentage of 9' timber increased last year and was continued through 1938, the 8' timber being used only for props and special repair work. All territories were well covered and when under new ground, close poles and wire netting was used to keep back the loose rock developed as the hanging became broken.

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7. UNDERGROUND

d. Timbering (Cont.)

Statement of Timber Used

Kind	Linnear Feet	Price	Amount 1938	Amount 1937
6" x 8" Cribbing Timber	104,819	.0359	3,764.96	5,631.90
8" x 10" Stull "	49,245	.0707	3,483.71	6,993.51
10" x 12" " "	84,710	.0981	8,312.64	13,716.57
12" x 14" " "	40,195	.1324	5,325.74	9,642.17
12" x 14" Treated "	812	.3184	258.55	368.17
Total Timber - 1938	279,781	.0755	21,145.60	
Total Timber - 1937	483,882	.0712		36,352.32
7' Lagging	1,209,995	.8061	9,754.76	15,322.79
9½' Poles	677,035	1.37	9,297.91	17,809.70
Total - 1938	1,887,030		19,052.67	
Total - 1937	3,287,941			33,132.49
Wire Fencing - Sq. Ft.	13,750	.0067	92.59	210.60
Grand Total - 1938			40,290.86	
Grand Total - 1937				69,695.41

	Amount 1938	Amount 1937
Product, Tons	423,570	780,189
Feet of Cribbing & Stull Timber per ton of Ore	.6605	.6202
Feet of Stull Timber per ton of Ore	.41306	.4256
Feet of Lagging per ton of Ore	2.8566	2.4849
Feet of Poles per ton of Ore	1.598	1.7293
Feet of Wire Fencing per ton of Ore	.03246	.0387
Feet of Lagging per Foot of Timber	6.9157	5.838
Feet of Poles per Foot of Timber	3.8696	4.062
Cost per Ton for Timber	.0499	.0465
Cost per Ton for Lagging	.023	.0196
Cost per Ton for Wire Fencing	.000218	.0003
Cost per Ton for Poles	.02195	.0228
Cost per Ton for All Timber	.0951	.0892
Equivalent of Stull Timber to Board Measure	585,481	1,030,464
Feet of Board Measure per Ton of Ore	1.382	1.321

Total Cost for Timber, Lagging, Poles, Etc. and Cost Per Ton

Year	Amount	Cost Per Ton
1938	40,290.86	.0951
1937	69,695.41	.0892
1936	46,952.30	.0870
1935	32,985.69	.0907
1934	29,435.36	.1055

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7. UNDERGROUND

e. Drifting and Raising

The following is a comparison of the drifting and raising in the years 1938 and 1937:

	Drifting		Raising	
Year	Ore	Rock	Ore	Rock
1938	523	573	1,262	52
1937	1,043	349	2,319	503
Increase		224		
Decrease	520		1,057	451

The curtailed schedule of operations accounted for the large decrease in the development program in both drifting and raising. However, there was an increase in rock drifting due to the fact that No. 3 Cross-cut on the Fifth Level was being driven and this was entirely in the East Footwall Pillar. The new Cross-cut in ore East of the Race Course Lease on the Fourth Level was completed and seven raises were put up from this drift, besides which there were a few transfer raises above the Third Level and four main level raises on the Fifth Level.

The development program for 1939 will be the completion of No. 3 Cross-cut on the Fifth Level with the raises from this Cross-cut put up to the Fourth Level and above. The only other development which is now planned is that of a transfer system in both the East and West Footwall Pillars above the Third Level.

f. Explosives, Drilling and Blasting

Stoping and Ore Development

Kind		Quantity Pounds	Average Price	Amount 1938	Amount 1937
1¼" 60% Amonia Gel. Pwd.		11,575	.13	1,504.75	2,494.00
1¼" 50% " " "		65,140	.1225	7,979.67	24,116.31
1¼" Gelamite 1		81,250	.1193	9,690.69	8,672.12
Total Powder - 1938		157,965	.1214	19,175.11	
Total Powder - 1937		297,275	.1153		35,282.43
Fuse	M Ft.	631,305	5.016	3,166.80	6,054.12
#6 Blasting Caps	M	85,776	12.20	1,047.14	1,996.18
Electric " "		991	.1111	110.13	349.52
Powder Bags		89	2.669	237.60	243.00
Tamping Bags	M	17,500	3.25	56.87	
Fuse Lighters		16,000	6.75	108.02	176.10
Fuse Seal	Pt.	40	.50	20.00	19.00
Connecting Wire	M Ft.	1,500	13.26	19.90	12.00
Total Fuse, Caps, Etc.				4,766.46	8,849.92
Total All Explosives				23,941.57	44,132.35

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7. UNDERGROUND

f. Explosives, Drilling and Blasting (Cont.)

	Amount 1938	Amount 1937
Product, Tons	423,570	780,189
Pounds of Powder per ton of Ore	.3729	.381
Cost per ton for Powder	.0453	.0452
Cost per ton for Fuse, Caps, Etc.	.0112	.0113
Cost per ton for All Explosives	.0565	.0565

Rock Development & Filling

Kind	Quantity Pounds	Average Price	Amount 1938	Amount 1937
1¼" 60% Amonia Gel. Pwd.	4,450	.1225	545.14	441.00
1¼" 50% " " "	2,425	.13	315.25	467.56
1¼" Gelamite 1				24.50
Total Powder - 1938	6,875	.1251	860.39	
Total Powder - 1937	7,675	.1215		933.06
Electric Blasting Caps	17,570	5.034	88.45	33.30
Fuse M Ft.	2,510	12.20	30.63	130.29
#6 Blasting Caps M				38.40
Total Fuse, Caps, Etc.			119.08	201.99
Total All Explosives			979.47	1,135.05
Total Explosives used at Mine			24,921.04	45,267.40
Average Price per pound for Powder			.1215	.119

Statement showing cost per ton for Explosives, exclusive of rock development, for the period 1934 to 1938:

Year	Cost per Ton	Production
1938	.0565	423,570
1937	.0565	780,189
1936	.0572	548,473
1935	.0580	363,480
1934	.0614	278,985

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7. UNDERGROUND

h. Mining and Loading

All of the ore mined during 1938 was handled by scraper hoists of from 10 to 25 H.P. and in all but one area this ore was dumped into chutes directly connected to the main levels. There was one transfer system serving three contracts in the East Footwall pillar above the Third Level and this proved very satisfactory as one extra man scraped all the ore on the transfer drift besides handling all the timber required by the three contracts. It is planned to install two more transfer systems near year, one about 150 feet East of the present one, with the transfer drift at the same elevation, and another half way between the Third and Fourth Levels in the West Footwall pillar.

There has been a continued increase in the percentage of 9' stulls over 8', the latter being used mostly for repair work and this materially increases the efficiency of the contracts as they are able to break more ore per foot of advance with the same amount of drilling and very little additional explosives. There has been the regular use of close poles and wire netting used under new hanging or broken matt and therefore there has not been very much trouble from runs of rock, except in reopening under old worked out sub levels and where the large flow of water washes down material from above.

There was a decided increase in the tons per man per day stoping from 17.77 in 1937 to 19.12 in 1938, due partly to using the 9' timber, partly to better supervision and partly to the fact that the men were working on such a curtailed schedule that they actually worked harder in order to increase their wages. As a comparison with the average of all the contracts it was interesting to note that there were several contracts who throughout the entire year, which would include finishing up in one place, dropping down to cut out and starting a new place, averaged better than 22 tons per man, while one in particular averaged 28.8 without even a slight accident in their place in which conditions are in no way better than the average.

When the new round bottom skips were put into use in 1937, the skip weights were changed from 4.2 to 5.1 and this continued until the early part of the shipping season when the results from pocket loading indicated too large an overrun. Therefore, on June 1st they were changed to 5.5 and on August 16th to 5.65. As the actual skip weight from pocket loading was 6.00 tons, this still gave a 6% overrun which seemed ample, but the engineers report on ore in stock this year seemed to indicate very little overrun and therefore on December 1st, 1938, it was decided to go back to the 5.5 weight.

i. Ventilation

The Maas Mine continued to be ventilated through connecting drifts

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7. UNDERGROUND

i. Ventilation (Cont.)

and raises with the Negaunee Mine where the 100,000 Cu. Ft. per minute ventilation fan is installed. The former openings were kept repaired and additional drifts and raises were driven on the 75' Sub Level below the Fourth Level to connect between the Negaunee Mine and the Fourth Level to ventilate the new block being developed East of the Race Course Lease and above the Fourth Level. The flow of air in the mine generally was very good and in places which were being finished and therefore had no other outlet, the air was brought up the raises from the main ventilation drifts below by means of small 5 H.P. auxiliary fans.

j. Pumping

The number of gallons pumped per minute during 1938, 1937, 1936, 1935 and 1934 are shown below:

Month	1938	1937	1936	1935	1934
January	1,240	1,460	1,152	1,184	1,036
February	1,442	1,607	1,200	1,146	1,034
March	1,367	1,336	1,252	1,100	1,014
April	1,379	1,204	1,388	1,106	1,014
May	1,545	1,317	1,255	1,110	1,023
June	1,372	1,300	1,251	1,140	1,031
July	1,438	1,404	1,261	1,155	1,075
August	1,391	1,319	1,233	1,129	1,044
September	1,434	1,234	1,301	1,141	1,085
October	1,644	1,168	1,314	1,061	1,080
November	1,408	1,240	1,329	1,126	1,072
December	1,496	1,219	1,418	1,152	1,079
Total Average	1,430	1,327	1,280	1,130	1,049

The average gallons per minute pumped during 1938 increased from 1,327 to 1,430 gallons, this amount all being handled by the Maas Mine pumps, in addition to which there was approximately 160 gallons per minute diverted on the Third Level to the Negaunee Mine and the cost of the Negaunee Mine pumping this extra water was borne by the Maas. The slight decrease from 200 to 160 gallons diverted to the Negaunee Mine may be accounted for by the operation of the surface well, although its operation was so intermittent that this may not be so and the difference may be due to a movement of the hanging which would divert the water elsewhere. Wiers are being placed on all the levels and daily readings will be taken in 1939 to determine the amount of water entering the mine from various parts and when the new well is in operation it will be possible to tell very accurately in what areas and how much the water is decreased.

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8. COST OF OPERATING

a. Comparative Mining Cost

	1938	1937	Incr.	Decr.
Product	423,570	780,189		356,619
Underground Cost	1,385	1.195	.190	
Surface Cost	.178	.117	.061	
General Mine Expense	.296	.198	.098	
Cost of Production	1.859	1.510	.349	
Depletion - Original Cost	.176	.217		.041
Increment	.000	.000		
Depreciation-Plant & Equip.	.033	.031	.002	
Development	.032	.033		.001
Movable Equip.	.001	.000	.001	
Taxes	.359	.151	.208	
Loading and Shipping	.014	.034		.020
Total Cost at Mine	2,474	1.976	.498	
No. of Days Operated	237	285		48
No. Shifts and Hours	1-8*	2-8*		
Average Daily Product	1,787	2,727		940

In both years there was another small 8-hour shift for hoisting with a few mining contracts in 1937 and the first five months of 1938; none in the last seven months. Only a small percentageof regular 2 8-hour shifts in 1938.

COST OF PRODUCTION

	1938	%	1937	%	Incr.
Labor	1.064	57.2	.915	60.6	.149
Supplies	.795	42.8	.595	39.4	.200
Total	1,859	100.0	1,510	100.0	.349

b. Detailed Cost Comparison

(1) Days and Shifts

Year	Days Worked	Shifts & Hours	Men Employed	Total Days Worked
1938	237	1-8	416	69,786½
1937	285	2-8	413	114,142
Increase			3	
Decrease	48			44,355½

While the average number of men employed in 1938 shows an increase over 1937, this is because there were new men hired throughout the year and the general lay-off in 1938 did not occur until June. The following table shows a better comparison:

Total Men Employed in December of Each Year

	1938	1937	1936
Surface	78	79	63
Underground	324	363	313
Total	402	442	376

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8. COST OF OPERATING

b. Detailed Cost Comparison (Cont.)

(2) Wages

There was no further increase in wages in 1938, an increase of ten cents per hour with a minimum of five dollars per day having been made in 1937.

(3) Comparison of Production

Year	Production	Average Daily Product
1938	423,570	1,787
1937	780,189	2,727
Decrease	356,619	940

(4) Comparison of Number of Men & Wages

Year	No. Men	No. Days	Amount	Rate Per Day
1938	416	69,786½	430,151.66	6.16
1937	413	114,142	696,696.23	6.11
Increase	3			.05
Decrease		44,355½	266,544.57	

(5) Tons Per Man Per Day

	1938	1937	Decr.
Surface	28.95	42.36	13.41
Underground	7.68	8.15	.47
Total	6.07	6.84	.77

(6) Cost of Production

1938	$ 787,337.62	Cost per ton 1.859
1937	1,178,062.76	" " " 1.510
Increase		.349
Decrease	390,725.14	

	Total Cost				Cost per Ton		
	Labor	%	Supplies	%	Labor	Supplies	Total
1938	450,517.89	57.2	336,819.73	42.8	1.064	.795	1.859
1937	714,004.35	60.6	464,058.41	39.4	.915	.595	1.510
Incr.				3.4	.149	.200	.349
Decr.	263,486.46	3.4	127,238.68				

(7) Detail of Accounts

	1938	1937	Decr.
Avg. Days per Week	2.9	5.5	2.6
Shifts & Hours	1-8	2-8	
Production, Tons	423,570	780,189	356,619
Avge. Daily Product, Tons	1,787	2,727	940
Number of Days Worked	237	285	48

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8. COST OF OPERATING

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

	1938		1937		Increase		Decrease	
Underground Costs	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton
1. Exploring in Mine	605.43	.001	566.10	.001	39.33			
2. Development in Rock	6,222.35	.015	7,690.04	.010		.005	1,467.69	
4. Development in Ore	11,423.44	.027	23,274.17	.030			11,850.73	.003
5. Stoping	180,566.75	.426	337,549.97	.433			156,983.22	.007
6. Timbering	149,762.11	.354	253,438.07	.325		.029	103,675.96	
7. Tramming	56,957.68	.134	93,953.52	.120		.014	36,995.84	
8. Ventilation	6,852.65	.016	6,965.07	.009		.007	112.42	
9. Pumping	75,265.84	.178	71,093.56	.091	4,172.28	.087		
10. Comp. & Air Pipes	33,715.74	.080	51,132.87	.065		.015	17,417.13	
11. Back Filling	35.76	.000	104.72	.000			68.96	
12. Underground Supt.	17,359.46	.041	22,619.91	.029		.012	5,260.45	
13. Cave-In	17.03	.000	373.64	.000			356.61	
14. Main. Compr. & Drills	219.65	.001	2,771.42	.004			2,551.77	.003
15. Scrapers & M. Loaders	20,532.67	.048	36,294.11	.047		.001	15,761.44	
16. Elec. Tram Equipt.	13,889.24	.033	16,646.37	.021		.012	2,757.13	
17. Pumping Machinery	13,081.42	.031	7,887.77	.010	5,193.65	.021		
Total Undg. Costs	586,507.22	1.385	932,361.31	1.195		.190	345,854.09	
Surface Costs								
18. Hoisting	25,290.51	.059	37,706.01	.048		.011	12,415.50	
19. Stocking Ore	16,848.66	.040	14,294.78	.018	2,553.88	.022		
21. Dry House	6,999.29	.017	8,536.60	.011		.006	1,537.31	
22. General Surface	6,114.30	.014	6,862.37	.009		.005	748.07	
23. Maint. Hoisting Equipt.	6,586.19	.016	11,645.36	.015		.001	5,059.17	
24. Shaft	962.38	.002	961.77	.001	.61	.001		
25. Top Tram Equipt.	4,556.64	.011	2,077.41	.003	2,481.23	.008		
26. Docks, T. & Pkts.	7,319.54	.017	1,583.12	.002	5,736.42	.015		
27. Mine Buildings	794.46	.002	7,448.86	.010			6,654.40	.008
Total Surface Costs	75,473.97	.178	91,116.28	.117		.061	15,642.31	
General Mine Expense								
28. Insurance	146.47	.000	5,500.35	.007			5,353.88	.007
29. Mining Engrg.	3,905.48	.009	3,084.54	.004	820.94	.005		
30. Mech. & Elec. Engr.	2,268.86	.005	2,021.76	.003	247.10	.002		
31. Analysis & Grading	19,317.53	.046	31,908.32	.041		.005	12,590.79	
32. Personal Injury	17,520.56	.041	22,839.71	.029		.012	5,319.15	
33. Safety Department	2,168.10	.005	2,136.01	.003	32.09	.002		
34. Tel. & S. Devices	1,559.84	.004	1,552.97	.002	6.87	.002		
35. Local & Gen. Welfare	6,838.82	.017	6,428.00	.008	410.82	.009		
36. Sp. Exp. Pens. & All.	9,359.97	.022	8,887.58	.011	472.39	.011		
37. Ishpeming Office	18,528.95	.046	22,444.00	.029		.017	2,915.05	
39. Mine Office	18,776.96	.045	18,459.98	.024	316.98	.021		
Social Security Taxes	18,675.04	.044	21,421.45	.027		.017	2,746.41	
Employees' Vacation	5,289.85	.012	7,900.50	.010		.002	2,610.65	
Total Gen. Mine Exp.	125,356.43	.296	154,585.17	.198		.098	29,228.74	
Cost of Production	787,337.62	1.859	1,178,062.76	1.510		.349	390,725.14	
40 Taxes	151,963.79	.359	117,773.35	.151	34,190.44	.208		
Total Cost	939,301.41	2.218	1,295,836.11	1.661		.557	356,534.70	

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8. COST OF OPERATING

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

GENERAL

Practically all the accounts naturally show a decrease in the amount due to the curtailed production and in most cases this also caused an increase in the cost per ton as there is a certain amount of overhead in nearly every operation, due to repairs and maintenance.

UNDERGROUND COSTS

3. Development in Rock

	Drifting	Raising	Total Feet	Cost Per Foot
1938	573'	52'	625'	9.96
1937	349	503	852	9.03
Increase	224'			.93
Decrease		451'	227'	

There was very little rock raising in 1938 but the rock drifting increased due to driving No. 3 Cross-cut on the Fifth Level. The increased cost per foot was on account of this Cross-cut having to be timbered.

4. Development in Ore

	Drifting	Raising	Total Feet	Cost Per Foot
1938	523'	1,262'	1,785'	6.40
1937	1,043	2,319	3,362	6.92
Decrease	520'	1,057'	1,577'	.52

The development in ore decreased proportionately with the decreased schedule of operations, while the decreased cost per foot was due to less high raises put up in 1938.

5. Stoping

	Labor	Cost Per Ton	Supplies	Cost Per Ton	Total
1938	149,804.20	.354	30,762.55	.072	.426
1937	284,131.46	.364	53,418.51	.069	.433
Increase				.003	
Decrease	134,327.26	.010	22,655.96		.007

The decrease in amount is due to less production in 1938, while the decrease in cost per ton is due to increased tons per man, 17.77 in 1937 and 19.12 in 1938.

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8. COST OF OPERATING

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

6. Timbering

	Labor	%	Cost Per Ton	Supplies	%	Cost Per Ton	Total Cost Per Ton
1938	101,760.48	67.9	.240	48,001.63	32.1	.114	.354
1937	167,959.16	66.3	.215	85,478.91	33.7	.110	.325
Increase		1.6	.025			.004	.029
Decrease	66,198.68			37,477.28	1.6		

Less timber was used on account of less production. The increased cost per ton is due to the necessity of maintaining main drifts and traveling roads.

7. Tramming

	Labor	Cost Per Ton
1938	56,957.68	.134
1937	82,485.26	.106
Increase		.028
Decrease	25,527.58	

The decrease in amount is due to less ore trammed and the increase in cost per ton is due to an increase in wages, effective March 16, 1937, and also to less ore trammed per shift on account of more delays because of more wet ore.

8. Ventilation

	Cost	Cost Per Ton
1938	6,852.65	.016
1937	6,965.07	.009
Increase		.007
Decrease	112.42	

Decrease due to curtailed operating schedule.

9. Pumping

	Gallons Pumped	Gals. Per Min.	Cost for Power
1938	752,268,448	1,431	59,733.65
1937	686,490,574	1,310	50,841.94
Increase	65,777,874	121	8,891.71

The large increase in cost is due to the increase in the flow of water underground, causing more pumping, and also the use of three pumps at times which raised the peak loadwith a consequently higher rate per kilowatt hour.

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8. COST OF OPERATING

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

10. Compressors & Air Pipes

	Cu. Ft. Air Compressed
1938	742,635,000
1937	1,251,710,000
Decrease	509,075,000

The large decrease was due to the 1938 curtailed schedule.

15. Scrapers and Mechanical Loaders

	Cost	Cost Per Ton
1938	20,532.67	.048
1937	36,294.11	.047
Increase		.001
Decrease	15,761.44	

Decrease in amount due to fewer operating days, requiring less maintenance.

16. Electric Tram Equipment

	Cost	Cost Per Ton
1938	13,889.24	.033
1937	16,646.37	.021
Increase		.012
Decrease	2,757.13	

Decrease due to fewer general repairs to Locomotives, Tracks, Cars and trolley wire.

17. Pumping Machinery

	Cost	Cost Per Ton
1938	13,081.42	.031
1937	7,887.77	.010
Increase	5,193.65	.021

Increase due to several emergency repairs to pumping equipment during 1938.

SURFACE COSTS

18. Hoisting

	Total Ore & Rock	Power Cost	Cost Per Ton For Power	Cost Per Ton
1938	438,359	18,587.41	.042	.059
1937	798,801	29,302.77	.037	.048
Increase			.005	.011
Decrease	360,442	10,715.36		

There were fewer tons hoisted in 1938 than in 1937.

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8. COST OF OPERATING

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

19. Stocking Ore

	Tons Stocked	Amount	Cost Per Ton
1938	380,942	16,848.66	.040
1937	345,834	14,294.78	.018
Increase	35,108	2,553.88	.022

The increase in amount is due to more tons stocked and more expense to erecting and dismantling temporary stocking trestle.

21. Dry House Expense

	1938	1937	Incr.	Decr.
Coal Used in Heat. Plant, Tons	748	815		67
Cost per Ton for Coal	5.70	5.60	.10	
Cost of Coal	4,274.06	4,569.15		295.09

Decrease in coal used due to fewer working days.

22. General Surface

	Cost	Cost Per Ton
1938	6,114.30	.014
1937	6,862.37	.009
Increase		.005
Decrease	748.07	

Decrease due to less general repairs in 1938.

23. Hoisting Equipment

	Cost	Cost Per Ton
1938	6,586.19	.016
1937	11,645.36	.015
Increase		.001
Decrease	5,059.17	

Decrease due to less repairs to skips and skip roads in 1938.

25. Top Tram Equipment

	Cost	Cost Per Ton
1938	4,558.64	.011
1937	2,077.41	.003
Increase	2,481.23	.008

Increase due to rewiring for top tram controls and rebuilding top tram car which were damaged in 1938.

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8. COST OF OPERATING

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

26. Docks, Trestles & Pockets

	Cost	Cost Per Ton
1938	7,319.54	.017
1937	1,583.12	.002
Increase	5,736.42	.015

Increase due to grading and extending new stocking grounds and erecting additional ore and rock trestles.

28. Insurance

	1938	1937
Property	517.68	419.38
Group	1,269.54	4,128.74
Catastrophe	898.33	952.23
Total	146.47	5,500.35

Decrease due to adjustment in Group Insurance account of 25% increase in insurance effective December 20, 1937.

29. Mining Engineering

	Cost	Cost Per Ton
1938	3,905.48	.009
1937	3,084.54	.004
Increase	820.94	.005

Increase due to more expense to general mine surveys and stocking trestle alignments.

30. Mechanical & Electrical Engineering

	Cost	Cost Per Ton
1938	2,268.86	.005
1937	2,021.76	.003
Increase	247.10	.002

Increase due to proportion of mechanical and electrical engineering charged greater in 1938.

GENERAL MINE EXPENSES

31. Analysis and Grading

	No. Determination	Cost Per Determination
1938	40,511	.47685
1937	73,494	.43416
Increase		.04269
Decrease	32,983	

There were less samples taken and therefore fewer determinations worked in the laboratory. The increased cost per determination is due to the necessary laboratory overhead.

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8. COST OF OPERATING

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

32. Personal Injury

	1938	1937	Incr.	Decr.
Compensation Department	1,013.16	1,202.00		188.84
Hospital Loss	7,681.26	7,013.00	668.26	
Reserve & Catastrophe, Compensation set up & Medical Service	8,826.14	14,624.71		5,798.57
	17,520.56	22,839.71		5,319.15

35. Local and General Welfare

	Cost	Cost Per Ton
1938	6,838.82	.017
1937	6,428.00	.008
Increase	410.82	.009

Increase due to necessity of more aid to employees during 1938 curtailed operations.

36. Special Expense, Pensions & Allowances

	1938	1937	Incr.	Decr.
Saranac Invest.	2,081.26	1,693.49	387.77	
Legal	512.73	610.00		97.27
Pensions	4,522.03	4,984.00		461.97
Miscellaneous	2,243.95	1,600.09	643.86	
	9,359.97	8,887.58	472.39	

37. Ishpeming Office

	Cost	Cost Per Ton
1938	19,528.95	.046
1937	22,444.00	.029
Increase		.017
Decrease	2,915.05	

Decrease in amount due to general curtailment in 1938.

39. Mine Office

	Cost	Warehouse Overhead	Cost Per Ton
1938	18,776.96	5,569.53	.045
1937	18,459.98	4,174.03	.024
Increase	316.98	1,395.50	.021

The increase in General Warehouse overhead more than off-set the salary adjustment.

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8. COST OF OPERATING

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

40. Taxes

	Cost	Cost Per Ton
1938	151,963.79	.359
1937	117,773.35	.151
Increase	34,190.44	.208

The increase in taxes is due to the increase in the Maas Mine valuation in 1938.

Analysis of Supplies Used

	1938		1937		Increase		Decrease	
	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton
41. General Supplies	23,747.46	.056	30,631.08	.039		.017	6,883.62	
42. Iron & Steel	9,340.12	.022	12,256.45	.016		.006	2,916.33	
43. Oil & Grease	2,612.93	.006	2,390.47	.003	222.46	.003		
44. Machinery Supplies	16,875.53	.040	23,168.01	.030		.010	6,292.48	
45. Explosives	24,921.04	.059	45,368.86	.058		.001	20,447.82	
46. Lumber & Timber	47,224.76	.111	78,209.56	.100		.011	30,984.80	
47. Fuel	4,274.33	.010	4,569.15	.006		.004	294.82	
48. Electric Power	115,597.38	.273	135,077.46	.173		.100	19,480.08	
49. Sundries	7,034.71	.017	11,963.75	.015		.002	4,929.04	
50. Other Mines & Accounts	307.63	.001	386.36			.001	78.73	
TOTAL	251,320.63	.593	343,248.43	.440		.153	91,927.80	

The general decrease in total supplies was due to the curtailed schedule of operations during 1938. One exception to this was the increase in No. 43, Oil and Grease, which was due to using $950.00 worth of oil on the pumps in 1938 as compared with $550.00 worth in 1937.

9. EXPLORATIONS AND FUTURE EXPLORATIONS

The only exploration done in the Maas Mine during 1938 was the drilling of two diamond drill holes by the Negaunee Mine from the Maas side of the boundary line to determine the position of the South footwall in order to better determine the elevation of the proposed Negaunee Mine 14th Level and will be described in detail in the Negaunee Mine report. Both of these holes encountered small runs of ore in Maas Mine territory and these are being developed at the present time from the 50' Sub Level South of the dike.

There is no exploration planned for 1939.

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10. TAXES

	1938		1937	
	VALUATION	TAXES	VALUATION	TAXES
Maas Mine	$ 2,260,000	84,900.06	$ 1,540,000	54,634.11
Race Course	850,000	31,931.44	900,000	31,929.03
Adams Strip	140,000	5,259.30	170,000	6,031.04
Stockpile & Equipment	850,000	31,931.44	745,000	26,430.14
Miscellaneous Parcels	10,160	381.43	16,100	571.22
Total Mine	4,110,160	154,403.67	3,371,100	119,595.54
Collection Fees		1,544.04		1,195.96
Total Oprtg. Maas Mine		155,947.71		120,791.50
Adams Strip charged to Negaunee Mine	105,000	3,983.92	82,500	3,018.15
Maas Mine Total	4,005,160	151,963.79	3,288,600	117,773.35
Tax Rate		3,7566		3.54767
Total City of Negaunee Tax		561,742.78		491,458.09
Maas Mine % of City Tax		27.0%		24.0%
Maas Mine Rented Houses	202,500	7,607.51	224,500	7,964.81
Mineral Lands, Etc.	19,100	717.51	19,100	677.62
Total Houses & Lands	221,600	8,325.02	243,600	8,642.43
Collection Fees		83.26		86.42
Total		8,408.28		8,728.85

11. ACCIDENTS AND PERSONAL INJURY

	1938	1937
Fatal	0	0
Time Lost, over 4 months	2	0
" " 1 to 4 "	9	11
" " less than 1 month	1	7
Total Accidents	12	18
Number of cases paid compensation for accidents prior to Jan. 1st, 1938	5	6

While there were not as many lost time accidents in 1938 as in 1937, the percentage of accidents to man hours worked was greater and the severity of the accidents was greater, and this coupled with a large number of minor accidents, made a rather poor showing for the safety record of the Maas Mine for 1938. The safety glass goggles were introduced toward the latter part of the year and it is intended to equip the men 100% as early in 1939 as possible and by their aid (as there have been considerable eye injuries) and a more rigid enforcement of all of the safety rules, it is hoped that the year 1939 will show a much better record.

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11. ACCIDENTS AND PERSONAL INJURY

The following is a brief description of the lost time accidents:-

Date of Accident	Name of Injured Man	Weeks Lost	Compensation Paid to 12-31-38	Description of Accident
3/1/38	Walfred Lehtonen	10 2/3	$195.00	Lehtonen and his partner were starting a raise and a piece of pipe his partner was using to bar down a chunk was knocked out of his hands and hit Lehtonen, standing some distance away, fracturing his right cheek bone.
3/22/38	Jethro Collins	15	$273.00	Collins was poling the back of his working place to make it safe when a chunk broke through and knocked him down, bruising his right foot, left hip and back.
3/30/38	John Iskola	10½	$189.00	Iskola was trimming the breast of his working place, where they were crossing an old raise, when a piece of cribbing fell from the back, fracturing the second and third metatarsals of his left foot.
2/1/38	Joseph Prisk	8½	$153.00	Prisk was hit by a chunk of ore which rolled down the ore pile, bruising his right leg.
5/23/38	Ferd. Leinonen	Still Home	$540.00	Leinonen went into an adjacent slice, which had been blasted down, to get a piece of timber which he saw lying in there instead of getting the timber from the main level as he was supposed to do. In pulling out the timber it struck a leg which was supporting the back and then jammed. Leinonen then went into the old slice again to bar the timber past the leg and was struck by a large amount of falling ore which had been jarred loose by the blow on the leg of the supporting set. He was very badly hurt, both internally and externally, and will probably be a total disability, which is very much to be regretted as this accident should never have occurred, the men having all received orders never to go into a blasted down slice.

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11. ACCIDENTS AND PERSONAL INJURY

Date of Accident	Name of Injured Man	Weeks Lost	Compensation Paid to 12-31-38	Description of Accident
6/24/38	William Gauthier	2	$ 18.00	Gauthier was lifting a valve cover in the pump house while in a straddling position and received a sacro-iliac strain.
6/20/38	Leonard Lehtonen	15	$270.00	Lehtonen was using a spanner wrench while working on a pipe line and felt considerable soreness in his hand. He immediately went to the doctor but infection had already set in and he lost the use of the index finger on his right hand.
7/28/38	Fred Johns	Still Home	$360.00	Johns and his partner were preparing to raise a leg when some soft ore fell down; hearing the noise, Johns jumped back and fell, twisting his left knee.
8/8/38	Robert Smith	6 2/3	$123.00	Smith and his partner were putting in back poles when a chunk of ore rolled down the pile and hit his left ankle, causing a contusion.
9/6/38	Abbo Niskonen	9	$162.00	Niskonen was working in a raise making a wedge when the handle of the axe hit the cribbing, causing it to deflect and fracture his left thumb.
11/16/38	Joseph Petroni	Still Home	$ 72.00	Petroni was making room for a leg when a chunk rolled from the side onto his leg, fracturing the first metatarsal of his left foot.
11/17/38	Werner Prussi	Still Home	$ 18.00	Prussi was moving a stage plank and in some manner loosened the switch box which was hanging above him. It fell, striking him on the back and causing a fracture of the fifth lumbar vertabra.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

E & A No. 689

Total Estimate		$ 81,262.50
Total Expended to 12-31-37	$ 100,351.34	
Total Expended in 1938	1,360.09	
Total Expended to 12-31-38		101,711.43
Balance Dec. 31st, 1938		20,448.93

The purpose of this E & A was the moving of 30 houses to the Cleveland Cliffs Iron Company's second addition on account of future mining causing the surface to cave at their present location. The houses were moved and partly repaired in 1936, repairs and most of the interior decorating completed in 1937 and outside painting, fencing and grading of the lots practically completed in 1938. On all of the work done in 1937 and 1938 there has been as increase of approximately 25% in both labor and supplies over the original estimate.

The accounts are detailed as follows:

Moving 30 Houses

Total Estimate	$ 14,250.00
Total Expenditure	15,601.53
Balance Dec. 31st, 1936	$ 1,351.53

This account was completed in 1936.

Foundations

Total Estimate	$ 20,250.00
Total Expenditure	25,180.46
Balance Dec. 31st, 1937	$ 4,930.46

This account was completed in 1937.

Repairs

Total Estimate		$ 15,000.00
Total Expenditure to 12-31-37	21,090.50	
Total Expenditure in 1938	196.68	
Total Expenditure to 12-31-38		21,287.18
Balance Dec. 31st, 1938		$ 6,287.18

This account was completed in 1938.

Interior Decorating

Total Estimate		$ 3,000.00
Total Expenditure to 12-31-37	5,883.68	
Total Expenditure in 1938	130.33	
Total Expenditure to 12-31-38		6,014.01
Balance Dec. 31st, 1938		$ 3,014.01

This account was completed in 1938.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

E & A No. 689 (Cont.)

Outside Painting

Total Estimate		$ 3,900.00
Total Expenditure to 12-31-37	$ 5,347.23	
Total Expenditure in 1938	971.15	
Total Expenditure to 12-31-38		6,318.38
Balance Dec. 31st, 1938		**$ 2,418.38**

There still remains a little work to be done in 1939.

Garages and Sheds

Total Estimate	$ 4,500.00
Total Expenditure to 12-31-37	8,561.72
Balance Dec. 31st, 1937	**$ 4,061.72**

This account was completed in 1937.

Electric Wiring

Total Estimate	$ 450.00
Total Expenditure to 12-31-37	2,610.65
Balance Dec. 31st, 1937	**$ 2,160.65**

This account was completed in 1937.

Water and Sewer Connections

Total Estimate	$ 1,350.00
Total Expenditure to 12-31-37	2,467.10
Balance Dec. 31st, 1937	**$ 1,117.10**

This account was completed in 1937.

Outside Preparation
Walks Inside Yards

Total Estimate	$ 1,500.00
Total Expenditure to 12-31-37	771.20
Balance Dec. 31st, 1937	$ 728.80

This account was completed in 1937.

Fencing

Total Estimate	$ 4,500.00
Total Expenditure to 12-31-37	2,721.50
Balance Dec. 31st, 1937	$ 1,778.50

This account was completed in 1937 except for the fences which will be painted in 1939.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

E & A No. 689 (Cont.)
Grading and Seeding

Total Estimate		$ 1,500.00
Total Expenditures to 12-31-37		4,485.33
Balance Dec. 31st, 1937		$ 2,985.33

This account was completed in 1937.

Temporary Lighting

Total Estimate		$ 350.00
Total Expenditure to 12-31-36		540.47
Balance Dec. 31st, 1938		$ 190.47

This account was completed in 1936.

General Expense

Total Estimate		$ 3,325.00
Total Expenditure to 12-31-37	5,089.97	
Total Expenditure in 1938	61.93	
Total Expenditure to 12-31-38		5,151.90
Balance Dec. 31st, 1938		$ 1,826.90

There will be some expense to this account in 1939.

E & A No. 715

Total Estimate		$ 6,500.00
Total Expenditure to 12-31-37	8,438.25	
Total Expenditure in 1938	142.54	
Total Expenditure to 12-31-38		8,580.79
Balance Dec. 31st, 1938		$ 2,080.79

The purpose of this E & A was the purchase and installation of a 250 K.W. motor generator set to replace two 100 K.W. sets which were heavily overloaded. This account was completed in 1938. The set purchased was slightly larger than had originally been intended but it was felt that the larger capacity was well worth the increased cost and could be obtained without any delay.

E & A No. 716

Total Estimate		$ 19,940.00
Total Expenditure to 12-31-37	9,547.09	
Total Expenditure in 1938	9,658.42	
Total Expenditure to 12-31-38		19,205.51
Balance Dec. 31st, 1938		734.49

The purpose of this E & A was the sinking of a large bore well and installing a deep well Layne and Bowler pump to pump the water from the ledge before it enters the mine. The balance of $734.49 remaining was

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

E & A No. 716 (Cont.)

due to the installing of a smaller pump at less cost on account of not being able to develop as much water as had been expected.

This account was completed in 1938.

E & A No. 727

Total Estimate		$132,660.00
Total Expenditure to 12-31-37	148,369.64	
Total Expenditure in 1938	13,557.64	
Total Expenditure to 12-31-38		161,927.28
Balance Dec. 31st, 1938		$ 29,267.28

The purpose of this E & A was the moving of 28 houses to the Cleveland Cliffs Iron Company's second addition. The increase in expenditure was due to this E & A being prepared in 1936, after which there was a 25% increase in both wages and supplies. There was also one additional house moved besides there being more repairs needed than had been originally expected.

This E & A also allows for the completing of the streets, sidewalks, grounds, etc., and was completed in 1938 except for the outside painting of a few houses and the fences.

The accounts are detailed as follows:

Moving Houses

Total Estimate		$ 14,500.00
Total Expenditure to 13-31-37	17,445.98	
Total Expenditure in 1938	128.23	
Total Expenditure to 12-31-38		17,574.21
Balance Dec. 31st, 1938		$ 3,074.21

This account was completed in 1938. One additional house and three garages were moved which were not estimated in the original E & A.

Foundations

Total Estimate		$ 21,800.00
Total Expenditure to 12-31-37	24,471.78	
Total Expenditure in 1938	89.61	
Total Expenditure to 12-31-38		24,561.39
Balance Dec. 31st, 1938		$ 2,761.39

This account was completed in 1938.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

E & A No1 727 (Cont.)

Repairs

Total Estimate		$ 17,600.00
Total Expenditure to 12-31-37	42,209.23	
Total Expenditure in 1938	1,219.75	
Total Expenditure to 12-31-38		43,428.98
Balance Dec. 31st, 1938		$ 25,828.98

This large expenditure was due to finding the plaster and siding in the houses in very bad shape, necessitating the removal of the old plaster from a whole room instead of being able to patch the poor places as had been originally intended. This account was completed in 1938.

Interior Decorating

Total Estimate		$ 3,150.00
Total Expenditure to 12-31-37	7,923.87	
Total Expenditure in 1938	3,135.45	
Total Expenditure to 12-31-38		11,059.32
Balance Dec. 31st, 1938		$ 7,909.32

This account was completed in 1938.

Outside Painting

Total Estimate		$ 4,400.00
Total Expenditure to 12-31-37	4,371.21	
Total Expenditure in 1938	2,640.02	
Total Expenditure to 12-31-38		7,011.23
Balance Dec. 31st, 1938		$ 2,611.23

This account will be completed in 1939.

Garages and Sheds

Total Estimate		$ 4,200.00
Total Expenditure to 12-31-37		6,068.37
Balance Dec. 31st, 1938		$ 1,868.37

This account was completed in 1937.

Electric Wiring

Total Estimate		$ 2,200.00
Total Expenditure to 12-31-37	2,524.92	
Total Expenditure in 1938	599.35	
Total Expenditure to 12-31-38		3,124.27
Balance Dec. 31st, 1938		$ 924.27

This account was completed in 1938.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

E & A No. 727 (Cont.)

Water and Sewer Connections

Total Estimate		$ 5,100.00
Total Expenditure to 12-31-37	5,780.43	
Total Expenditure in 1938	49.55	
Total Expenditure to 12-31-38		5,829.98
Balance Dec. 31st, 1938		$ 729.98

This account was completed in 1938.

Outside Preparation

Surfacing Streets

Total Estimate		$ 21,175.00
Total Expenditure to 12-31-37	7,732.56	
Total Expenditure in 1938	2,553.83	
Total Expenditure to 12-31-38		10,286.39
Balance Dec. 31st, 1938		$ 10,888.61

This account was completed in 1938.

Sidewalks and Curbs

Total Estimate	$ 14,175.00
Total Expenditure to 12-31-37	10,696.68
Balance to Dec. 31st, 1938	$ 3,478.32

This account was completed in 1937 except for making extensions from the present walks and curbs to those on Maple Street when completed by the State Highway Department.

Fencing

Total Estimate		$ 4,500.00
Total Expenditure to 12-31-37	3,464.06	
Total Expenditure in 1938	735.94	
Total Expenditure to 12-31-38		4,200.00
Balance to Dec. 31st, 1938		$ 300.00

This account was completed in 1938 except for the painting of the fences which will be done in 1939.

Grading and Seeding

Total Estimate		$ 1,500.00
Total Expenditure to 12-31-37	4,773.35	
Total Expenditure in 1938	1,839.79	
Total Expenditure to 12-31-38		6,613.14
Balance to Dec. 31st, 1938		$ 5,113.14

This account also included the transplanting of trees between the curb and sidewalk and had not been estimated originally. This account was completed in 1938.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

E & A No. 727 (Cont.)
Permanent Street Lighting

Total Estimate		$ 1,500.00
Total Expenditure to 12-31-37		3,338.04
Balance Dec. 31st, 1938		$ 1,838.04

This account was completed in 1937.

General Expense

Total Estimate		$ 4,800.00
Total Expenditure to 12-31-37	7,569.16	
Total Expenditure in 1938	566.12	
Total Expenditure to 12-31-38		8,135.28
Balance Dec. 31st, 1938		$ 3,335.28

There will be a slight addition to this account in 1939.

E & A No. 775

Total Estimate		$ 2,612.50
Total Expenditure to 12-31-37	1,915.44	
Total Expenditure in 1938	3,691.65	
Total Expenditure to 12-31-38		5,607.09
Balance Dec. 31st, 1938		$ 2,994.59

The purpose of this E & A was the installation of a No. 5 gyratory crusher in the shafthouse to crush the ore shipped all rail to charcoal furnaces and this installation required considerable more work than had originally been thought necessary. This account was completed in 1938.

E & A No. 783

Total Estimate	$ 18,150.00
Total Expenditure to 12-31-38	13,707.39
Balance Dec. 31st, 1938	$ 4,442.61

The purpose of this E & A was the purchase of three larry cars and the installation of the motors, controls and conductors for use on the stocking trestle in place of the present endless rope system. This account will be completed early in 1939.

E & A No. 792

Total Estimate	$ 1,875.00
Total Expenditure to 12-31-38	1,880.64
Balance Dec. 31st, 1938	$ 5.64

The purpose of this E & A was the purchase of a forged steel crank shaft replacement for the Aldrich pump on the Third Level and this E & A was completed in 1938.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

E & A No. 801

Total Estimate	$ 1,250.00
Total Expenditure to 12-31-38	1,765.91
Balance Dec. 31st, 1938	$ 515.91

The purpose of this E & A was the purchase of a complete rotating element and necessary parts for a replacement for the Allis Chalmers Centrifugal pump on the Third Level. This E & A was completed in 1938.

E & A No. 803

Total Estimate	$ 600.00
Total Expenditure to 12-31-38	947.50
Balance Dec. 31st, 1938	$ 347.50

This E & A was for the purpose of sinking a churn drill test hole to determine the amount of water on the ledge about 200' South of the shaft. This E & A was completed in 1938.

E & A No. 806

Total Estimate	$ 1,535.00
Total Expenditure to 12-31-38	2,069.16
Balance Dec. 31st, 1938	$ 534.16

The purpose of this E & A was the sinking of two churn drill test holes approximately 1,000 feet West of the shaft and the cost of an additional hole was also included in this E & A, which was completed in 1938.

E & A No. 808

Total Estimate	$ 22,803.00
Total Expenditure to 12-31-38	2,260.35
Balance Dec. 31st, 1938	$ 20,542.65

The purpose of this E & A was the sinking of test hole No. 13 and also a large bore well approximately 1,000 feet West of the shaft to remove the water at ledge before it enters the mine. There were three different charges set up based on different size pumps to be determined when the well is developed. This E & A will be completed in 1939.

PROPOSED NEW CONSTRUCTION

The E & A's which will carry over into 1939 are Nos. 689,727, 783 and 808.

There have been no new E & A's authorized for next year.

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13. EQUIPMENT AND PROPOSED EQUIPMENT

a. Steam Shovels

There were only two steam shovels at the Maas Mine in 1938 and these were not used very extensively as there were only 95,930 tons shipped from stockpile during the year as compared with 344,401 tons in 1937. The caterpillar or No. 45 shovel, however, was used to quite an extent in removing the rock pile to the Southeast of the steel trestle to make a new stockpile sollar South of the trestle and at the same time provide more room for spotting tracks when loading ore at the East end of the steel trestle. There was only one major repair, that being to a broken axle on the No. 45 shovel and both are stored at the Mine for the winter.

b. Stocking Trestles

There were three entirely new single track trestles erected during 1938, two of which were for ore and one for rock. When it was decided to make another grade of Special ore, namely that of Bessemer Special, it was necessary to provide a new place to stock it as every grade means two piles, one for Maas and one for Race Course. As the Special grade was being stocked on the steel trestle, the new grade would require two more gaps between piles or a loss of 30,000 tons in capacity. It was, therefore, decided to make a new stocking grounds to the South of the steel trestle and stock both grades of Special ore from this new trestle. From the sales of ore for the year 1938 it was thought that there would not be enough Special ore, but the sales were curtailed and at the end of the shipping season there was still some 5,000 tons under the last bent on the steel, tying up capacity for 20,000 tons.

There was enough rock removed from the Southeast rock pile to partially fill a gulley and provide a sollar for the 41 bents erected to the Southeast of the shaft and space has been provided here for the four Special grade piles and the last 19 bents for Maas grade ore. A trestle of 23 bents was also erected along the South side of the ore piles lying West of the shaft and this is entirely for Maas grade and will probably have to be extended before shipping season next year. The two Bessemer grades and the Race Course ore will be stocked from the steel trestle. A new rock trestle was planned and erected Northeast of the shaft in order to cut down the long haul which is over a quarter mile in length at present. Here six very elaborate permanent bents were erected to span the railroad tracks and 19 regular bents added so that stocking of rock could start just North of the coal dock. It is planned to use one of the new larry cars on this trestle and it will probably be in operation early in January.

The Electrical Department is still working on the new larry car

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13. EQUIPMENT AND PROPOSED EQUIPMENT

b. Stocking Trestles (Cont.)

system and it is expected that it will be working satisfactorily soon after the first of the year, as they intend to increase the size of the motor and brake.

c. Scraper Hoists

There were no scraper hoists or motors purchased during 1938 but there was, however, one 15 H.P. Sullivan hoist rented from the Gardner-Mackinaw Mine in June when that mine shut down. It is desired to convert the three 10 H. P. Ingersoll hoists to 15 H.P. as the former are not of sufficient strength to handle the ore efficiently.

The list of equipment is as follows:

Ingersoll-Rand	15 H.P. Electrics	12
" "	10 " "	3
Sullivan	25 " "	2
"	20 " "	1
"	15 " "	24
"	7½ " "	1
"	6½ " "	4
Total Electric Hoists		47
Ingersoll-Rand Air Hoists, rebuilt to handle timber (single drum)		16

There were considerable repairs made to these hoists in 1938 but at the end of the year they were all in very good condition.

d. Skips and Cages

There were no changes in the skips or cages during the year.

14. MAINTENANCE AND REPAIRS

In October of this year there occurred the only serious breakdown for the year and this was occasioned by the burning out of the skip hoist motor, due partly to a skip being stuck in the shaft and partly to the excessive use this motor received on 24 hour service in 1937. The motor got very hot at times, especially in the hottest weather, and the insulation was found to be baked very hard and brittle. Three crews of men alternating on 8-hour shifts worked continuously for eight days to repair the burned out coils and replace the rotor in the motor.

The main discharge on the Third Level, which is in the shape of a "Y", was continually leaking and having to be welded until September

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14. MAINTENANCE AND REPAIRS

when a new steel "Y" was purchased and installed in place of the old one and since that time there has been no further trouble.

The Mechanical Department has been changing the design of the bearings on the Aldberger centrifugal pump on the Third Level and it is expected that this pump will be in much better shape than even when it was first purchased.

The amount of water pumped from the Third Level is so great that it required the almost continuous operation of the two plunger pumps with several hours additional by one of the two centrifugals and therefore it is very essential that all four pumps be in as near perfect shape as possible.

Both skip ropes as well as the cage and counterweight ropes were changed during 1938. All of the ropes had given normal service and no doubt could have been used longer but it was decided to remove them according to the Company's rules for safe usage.

15. POWER

The following is the rate charged per K.W. hour by months during 1938:

January	$ .0136
February	.0136
March	.0138
April	.0138
May	.0142
June	.0146
July	.0152
August	.0158
September	.0152
October	.0152
November	.0142
December	.0142
Average	$ .01445

The rate increased in the months June to October, inclusive, when the flow of water underground increased and when there was the most trouble with the discharge pipe which necessitated shutting down and then having to pump with three pumps at one time to lower the water dammed back while they were shut down. This increased load increased the 15 minute demand and therefore the rate was higher.

17. CONDITION OF PREMISES

The grounds and shrubbery were kept in good condition at all times.

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18. NATIONALITY OF EMPLOYEES

As to Parentage	1938	%	1937	%
Finnish	162	40.4	183	39.0
English	96	23.9	105	22.4
American	33	8.3	66	14.1
Italian	37	9.3	42	8.9
Swedish	30	7.5	35	7.4
French (Canadian)	19	4.7	17	3.6
German	8	2.0	6	1.3
Norwegian	8	2.0	5	1.1
Danes	4	1.0	4	.8
Irish	2	.5	4	.8
Austrians	1	.2	2	.4
Crotians	1	.2	1	.2
Total	401	100.0	470	100.0

	Total		American Born		Foreign Born	
As to Birth	1938	1937	1938	1937	1938	1937
Finnish	162	183	85	106	77	77
English	96	105	50	55	46	50
American	33	64	33	64	0	0
Italian	37	42	9	14	28	28
Swedish	30	35	21	26	9	9
French (Canadian)	19	17	18	17	1	0
German	8	8	6	5	2	3
Norwegian	8	5	6	3	2	2
Danes	4	4	3	3	1	1
Irish	2	4	2	4	0	0
Austrians	1	2	0	1	1	1
Crotians	1	1	1	0	0	1
Total	401	470	234	298	167	172
Percentage			58.4%	63.5%	41.6%	36.5%

19. MAAS CRUSHER

The following table shows the years operations:-

Mine	1938	1937	Decr.
Cliff Shaft	3,580	14,711	11,131
Lloyd	12,004	63,075	51,071
Morris (Inland)	1,578	7,290	5,712
Maas	1,257	28,895	27,638
Negaunee	0	3,461	3,461
Total	18,419	117,432	99,013

The Maas crusher only crushed approximately 15% of the tonnage crushed in 1937 and therefore operated very intermittently during the shipping season. There were very few repairs needed as the operations were so curtailed, the crusher only working 16 shifts as compared with 64 shifts in 1937. The cost per ton was higher on account of the small amount of cars received in any one shift, the longer time interval between crushing and two lots of ore crushed after freezing weather had set in.

NEGAUNEE MINE
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1. GENERAL:

The Negaunee Mine operated six days and six afternoon shifts from January 1st to March 28th to give each man on the 3-8-hr. shifts four days per week. From March 28th until April 18th the working time for each employe was reduced to three days per week and on June 1st it was reduced to two days for each employe. At this time one shift or eighty-four men were laid off. The two day two shift schedule was continued from June 1st to November 1st when the working time was increased to three days per week and continued on this schedule for the balance of the year.

Shaft sinking from the 13th to the 14th level was started on April 1st on a three day two shift schedule and continued until completed late in October. The skip pit drift at the bottom of the shaft, the skip pit pocket, skip pit pump house and sump were completed and the excavation of the shaft loading pocket on the 14th level started by the end of the year. It is gratifying to report that no lost time accident occurred during the nine months this work was underway.

Production in 1938 was 412,000 tons which has been exceeded in eleven years out of the thirty-five years the Company has operated the mine. Shipments of 331,176 tons was the smallest since 1934 but was larger than the shipments from the other mines in the Negaunee District.

The development of No. 1 and No. 2 shaft pillars above the 9th level was continued during the year and is not yet completed. Several additional raises must be put up after which mining of the entire area will be underway. At the end of the year production from the pillars was increasing and a further increase will be made in 1939. Surface diamond drilling in 1938 proved that there was no extension of the ore bodies beyond the limits developed by the Oliver Iron Mining Company prior to 1903. The ultimate recovery of ore from the pillars will probably be somewhat larger than was anticipated prior to development of the areas.

Surface diamond drilling showed the ledge growing deeper Northeast of the mine workings and three churn drill holes were then put down to determine if there was a well-defined channel through this area that contained sufficient clean gravel to warrant installing a deep well pump. The results were quite encouraging but owing to difficulty in carrying on this work in severe winter weather, it was decided to postpone further standpiping until next spring when one or more additional holes will be put down. It is hoped that a deep well can be sunk in this area that will divert several hundred gallons of water from the mine workings, thereby decreasing pumping expense and also improving mining conditions in No. 2 shaft pillar.

There was no fatal accident in 1938 but early in the year there were several severe injuries. The safety record for the balance of the year was excellant. Cash prizes were awarded to the men every two weeks if there were no compensable accidents. There were seventeen drawings during the year for the two-week periods in which there were no accidents. A total of $785.00 was awarded to 189 men out of a total of 346 employes. The cash bonus for the shift bosses if no preventable accidents occurred in their territories was continued during 1938. The plan of a cash award every three months for a record of no preventable accidents kept the bosses active in prevention work and thus decreased accidents. A number of safety meetings were held during the year for the Superintendents, Captains and bosses at which time all accidents were discussed and recommendations made to avoid recurrence.

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1. GENERAL: (Cont'd)

Eternal vigilance is necessary to avoid accidents and the schemes outlined in this paragraph are among the aids designed to keep the bosses and men safety conscious and active in prevention work.

The increase in working time effective November 1st from two to three days per week and the announcement of a further increase to four days in January 1939 was welcomed and appreciated by the employes. There has been no request made by the Marquette Range Industrial Union representatives during 1938 that have not been given immediate attention and a prompt satisfactory settlement effected. The men seem contented and I believe most of them are loyal to the Company.

2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production by Grades:

	1938	1937	Increase	Decrease
Negaunee Ore	412,000	820,915		408,915
Rock	27,588	18,160	9,428	
Total Hoist	439,588	839,075		399,487

b. Shipments:

	Pocket Tons	Stockpile Tons	Total Tons	Total Last Year
Negaunee Ore	123,464	207,712	331,176	792,506
Total 1937	458,075	334,431	792,506	
Decrease	334,611	126,719	461,330	

Shipments decreased 58.2% in 1938 and were 80,824 tons less than the product for the year.

c. Stockpile Inventories:

	Dec. 31, 1938	Dec. 31, 1937	Increase
Negaunee Ore	218,392	137,568	80,824

Including estimated overrun there were approximately 260,000 tons in stock at the end of the year.

d. Division of Product by Levels:

	1938	%	1937	%
9th Level	40,161	9.8	33,238	4.1
11th Level	112,681	27.3	219,307	26.7
12th Level	222,260	53.9	517,701	63.1
13th Level	36,898	9.0	50,669	6.1
Total	412,000	100.0	820,915	100.0

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2. PRODUCTION, SHIPMENTS & INVENTORIES: (Cont'd)

e. Production by Months:

Month	Negaunee Ore	Rock
January	50,895	1,248
February	51,112	3,288
March	62,701	4,680
April	40,810	3,952
May	37,981	3,280
June	20,730	1,388
July	18,491	1,332
August	21,401	1,232
September	19,022	1,832
October	24,077	1,972
November	34,980	1,800
December	29,800	1,584
Total	412,000	27,588
Total 1937	820,915	18,160
Decrease	408,915	
Increase		9,428

The product by leases was distributed as follows:

	1938	1937	Increase	Decrease
Negaunee Mine Co.	375,408	789,563		414,155
American Mining Co.	36,592	31,352	5,240	
Total	412,000	820,915		408,915

f. Ore Statement:

	Negaunee Ore	
	1938	1937
On Hand January 1st	137,568	90,925
Product for year	412,000	820,915
Overrun		18,234
Total	549,568	930,074
Shipments	331,176	792,506
Balance on Hand	218,392	137,568
Decrease in Output	408,915	
Increase in Ore on Hand	80,824	

1938 - (1) 2-8-hr. shifts 6 days & 6 nights per week 12/6/37 to 3/28/38.
(2) 3-8-hr. shifts 4 days & 4 nights per week March 28th to April 18th.
3-8-hr. shifts 3 days & 3 nights per week April 18th to June 1st.
2-8-hr. shifts 2 days & 2 nights per week June 1st to Nov. 1st.

(1) Equivalent to four shifts per week for each crew on the 3-8-hr. shift schedule.
(2) Shaft sinking started April 1st on 3-2-8 hr. shift schedule and continued to completion.

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2. PRODUCTION, SHIPMENTS & INVENTORIES: (Cont'd)

f. Ore Statement: (Cont'd)

1937 - 3-8-hr. shifts 5 days & 5 nights per week from Jan. 1st to April 10th.
3-8-hr. shifts 6 days & 6 nights per week from April 10th to Oct. 4th.
3-8-hr. shifts 5 days & 5 nights per week Oct. 4th to Dec. 6th.
*2-8-hr. shifts 6 days & 6 nights per week from Dec. 6th to Dec. 31st.

(*) Equivalent to four shifts per week for each crew on the 3-8-hr. shift schedule.

g. Delays:

The mine was idle on January 25th and 26th due to a severe snow storm. The product lost on the four shifts amounted to approximately 4,600 tons.

There was a 1-1/2 hr. delay on March 14th due to cutting 16 ft. off the South skip rope. No loss of product.

The mine was idle on the afternoon and night shift April 10th due to a short circuit in the skip hoist motor. The product lost due to this delay was approximately 1,700 tons.

The mine was idle two shifts May 10th on account of trouble with the skip hoist motor. There was no loss of production on account of the mine working May 13th to make up the time lost.

There was a 50 minute delay on November 16th on account of an accident to the skip. There was no loss of product.

h. Delays from Lack of Current:

There was an eight hour delay January 27th due to lack of current. The loss of product was approximately 1,150 tons.

3. ANALYSIS:

a. Average Mine Analysis on Output:

	1938				1937			
Grade	Tons	Iron	Phos.	Silica	Tons	Iron	Phos.	Silica
Negaunee Ore	412,000	59.50	.114	7.60	811,130	60.60	.120	7.43
Neg. Special					9,785	61.55	.089	6.41

The grade of output was lower in 1938 due to more mining in new areas. An improvement occurred in November and December which, it is expected, can be maintained.

b. Average Mine Analysis on Straight Cargoes:

				Lake Erie	
Grade	Iron	Phos.	Silica	Iron	Moisture
Negaunee Ore	59.76	.118	7.73		None

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4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:

Assumption: 12 cu. ft. equals one ton
10% deducted for rock
10% deducted for loss in mining
% of Bessemer - none

Above 9th Level

No. 1 Shaft Pillar	829,985	
No. 2 Shaft Pillar	76,372	
Total Above 9th Level		906,357
Between 10th and 11th Levels		171,883
Between 11th and 12th Levels		665,503
Between 12th and 13th Levels		999,437
Below 13th Level		290,882
Total Developed Ore		3,034,062

A comparison of the estimates of 1938 and 1937 shows a decrease in 1938 in the ore above the 9th, 11th, 12th and 13th levels and a small increase in the ore below the 13th level. Giving consideration to the product in 1938, the two shaft pillars above the 9th level show a net decrease of 135,681 tons. The development work in these pillars in 1938 resulted in the elimination of areas heretofore considered to contain ore. In 1938, after taking the product into consideration, there were 76,919 tons of ore developed above the 11th level, 51,850 above the 12th and an increase in estimated ore below the 13th level of 75,782 tons or a total increase of 204,551 tons. This increase was offset by a decrease of 135,681 tons above the 9th level and 9,989 tons above the 13th level, making a net increase of 58,881 tons in developed ore in 1938. The actual decrease in the total estimated ore in 1938 was 353,119 tons. As this was less than the product by 58,881 tons, this amount represents the net developed ore in 1938. The increases on the 11th and 12th levels were due to extensions under the hanging beyond the limits formerly used in estimates. The decrease in the ore above the 13th level was due to jasper horse on the dike which area had previously been assumed to be ore.