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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

(3) Comparison of Production:

Production - 1937	443,098
Production - 1936	310,888
Increase	132,210

(4) Comparison of Number of Men and Wages:

	No. Men	No. Days	Amount	Rate Per Day
1937	283	74,709 1/3	452,737.90	6.06
1936	221	54,124 3/4	264,932.80	4.89
Increase	62	20,584 2/4	187,805.10	1.17

(5) Tons Per Man Per Day:

	1937	1936	Increase	Decrease
Surface	27.92	23.95	3.97	
Underground	7.53	7.56		.03
Total	5.93	5.74	.19	

(6) Cost of Production:

	Total	Cost Per Ton
1937	739,692.43	1.726
1936	465,316.78	1.497
Increase	274,375.65	.229

	Labor	%	Supplies	%
1937	458,593.94	62.0	281,098.49	38.0
1936	271,288.68	58.3	194,182.77	41.7
Increase	187,305.26	3.7	86,915.72	
Decrease				3.7

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

(7) Detail of Accounts:

	1937	1936	Inc. or Dec.
Days Per Week	4, 5, & 6		
Shifts & Hours	1,2, & 3 8-hr	1 & 2 8-hr.	
Production - Tons	443,098	310,888	132,210
Avg. Daily Product - Tons	1,605	1,061	544
Number of Days Worked	276	293	

		Amount	Per Ton	Amount	Per Ton	Amount	Per Ton
	UNDERGROUND COSTS:						
1.	Exploring in Mine	137.59	.000	79.98	.000	57.61	
2.	Sinking in Shaft						
3.	Development in Rock	1112.94	.003	9228.41	.030	8115.47	.027
4.	Development in Ore	18277.89	.041	13144.97	.042	5132.92	.001
5.	Stoping	178550.31	.403	104306.98	.336	74243.33	.067
6.	Timbering	185123.14	.418	111359.40	.358	73763.74	.060
7.	Tramming	63356.81	.143	30152.40	.097	33204.41	.046
8.	Ventilation	5332.06	.011	3415.55	.011	1916.51	
9.	Pumping	20989.49	.047	21192.93	.068	203.44	.021
10.	Compressors and Air Pipes	37571.16	.085	30542.02	.098	7029.14	.013
11.	Back Filling						
12.	Underground Superintendence	14427.01	.032	9742.51	.031	4684.50	.001
13.	Cave-in						
14.	Maint: Comp. and Power Drills	1654.00	.004	1358.44	.004	295.56	
15.	Scr Scrapers & Mech. Loaders	21532.73	.048	9770.84	.032	11561.89	.016
16.	Electric Tram Equipment	12687.39	.029	6284.32	.020	6403.07	.009
17.	Pumping Machinery	1607.38	.004	1109.21	.004	498.17	
	Total Underground Costs	562159.90	1.268	351687.96	1.131	210471.94	.137
	SURFACE COSTS:						
18.	Hoisting	36507.21	.083	27779.06	.089	8728.15	.006
19.	Stocking Ore	9748.15	.022	4260.57	.014	5487.58	.008
20.	Screening-Crushing at Mine						
21.	Dry House	7194.68	.016	5615.25	.018	1579.43	.002
22.	General Surface Expense	7214.79	.016	4719.74	.015	2495.05	.001
23.	Maint: Hoisting Equipment	24509.25	.056	7808.26	.025	16700.99	.031
24.	Shaft	4569.20	.010	5114.16	.017	544.96	.007
25.	Top Tram Equipment	3520.07	.008	2399.27	.008	1120.80	
26.	Docks, Trestles & Pockets	1218.34	.003	713.92	.002	504.42	.001
27.	Mine Buildings	1006.48	.002	6012.03	.019	5005.55	.017
	Total Surface Costs	95488.17	.216	64422.26	.207	31065.91	.009
	GENERAL MINE EXPENSES:						
28.	Mining Engineering	2175.94	.005	1466.09	.005	709.85	
29.	Mech. and Elec. Engineering	1725.48	.004	1543.91	.005	181.57	.001
30.	Analysis and Grading	11226.92	.025	7686.77	.025	3540.15	
31.	Safety Department	1776.81	.004	1060.37	.003	716.44	.001
32.	Telephones and Safety Devices	3028.71	.007	2182.57	.007	846.14	
33.	Local and General Welfare						
34.	Special Expense, Pensions & Allow.	3090.70	.007	3449.38	.012	358.68	.005
35.	Ishpeming Office	8892.00	.020	5455.58	.018	3436.42	.002
36.	Mine Office	12633.24	.028	10683.69	.034	1949.55	.006
37.	Insurance	3783.15	.009	409.06	.001	2701.79	.008
38.	Personal Injury	13757.82	.031	8334.92	.027	5422.90	.004
39.	Social Security Taxes	14756.17	.033	2766.87	.009	11989.30	.024
40.	Employees Vacation Pay	5197.42	.012	4167.35	.013	1030.07	.001
	Total General Mine Expenses	82044.36	.185	49206.56	.159	32165.50	.026
	COST OF PRODUCTION	739692.43	1.669	465316.78	1.497	273703.35	.172

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

	1937		1936		Inc. or Dec.	
	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton
DEPLETION, DEPRECIATION & TAXES:						
Depletion-Original Cost	18232.48	.041	11856.47	.038	6376.01	.003
Increment	75719.96	.171	35786.95	.115	39943.01	.056
Depreciation-Plant and Equipt.	18240.41	.041	11191.97	.036	7048.44	.005
Development	25333.90	.057	15544.40	.050	9789.50	.007
Movable Equipt.	293.45	.001	586.90	.002	293.45	.001
41. Taxes	79398.95	.179	65642.79	.211	13756.16	.032
Total Depl'n, Deprn and Taxes	217219.15	.490	140599.48	.452	76619.67	.038
LOADING AND SHIPPING:						
Steam Shovel	12528.12	.050	6471.27	.038	6056.85	.012
At Pocket	7138.60	.032	2964.02	.017	4174.58	.015
Shipping Expense	10.00	.000	9.24	.000	.76	.000
Total Loading and Shipping	19676.72	.045	9444.53	.031	10232.19	.014
TOTAL COST AT MINE	976588.30	2.204	616033.09	1.982	360555.21	.222
Administrative and General Expense	49435.14	.112	27529.50	.088	21905.64	.024
Miscellaneous Income						.004
Supply Inventory Adjustment	542.00	.000	706.14	.002		
TOTAL COST	1020471.48	2.303	638807.50	2.055	381663.98	.248

UNDERGROUND COSTS

1. Exploring in Mine.

Covers a proportion of Geological Dept. expense. Increase of $57.61 in expense in 1937.

3. Development in Rock.

Total feet drifting and raising in rock 330 ft. in 1937 as compared to 919′ in 1936. Rock drifting and raising in 1937 on 7th level was 1491′ the cost of which was charged to E&A 725. Decrease in expense $8115.47 and $.027 per ton.

4. Development in Ore.

The increase in expense in 1937 was due to more drifting in ore account of developing the 7th level. Drifting increased 450 ft. in 1937 and raising in ore decreased 303 ft. The cost per ft. increased account of the advance in wages and the supply cost. The increase in expense was $5132.92 but the cost per ton decreased $.001 account the larger product.

5. Stoping.

Labor expense increased $64.481.07 and supply cost $9,762.26 account of the mine operating 265 more shifts in 1937, the advance in wages and supply cost. The increase in cost per ton was $.067. The decrease in tons per man per day stoping was due to decreased efficiency of new employees and to unfavorable operating conditions in some areas due to crushing.

6. Timbering

Labor expense increased $55,990.53 and cost for supplies $17,773.21.

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YEAR 1937

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

UNDERGROUND COSTS:

6. Timbering: (Cont'd)

The cost per ton increased $.060. The cost per ton per timber, lagging and poles decreased $.0026 in 1937 due to less raising. The cost per ton is higher due to more repair work.

7. Tramming:

The increase in expense was $33,204.41 and cost per ton .046. The product increased 132,210 tons and number of shifts worked 265. The cost per ton increased due to development of the 7th level and the addition of the 3rd shift on which there was only a small crew of miners.

8. Ventilation:

The increase in expense was $1,916.51, cost per ton was same as in 1936. Increase in electric power $687.78. Balance was for more repairs to fans and ventilation doors. No new fans were purchased in 1937 or in 1936.

9. Pumping:

Expense decreased $203.44 and cost per ton $.021.

Gallons water pumped in 1937	135,521,343
Gallons water pumped in 1936	135,098,491
Increase	422,852
Gallons per minute in 1937	257
Gallons per minute in 1936	256

10. Compressors & Air Pipes:

Expenditures increased $7,029.14 in 1937 and cost per ton decreased $.013.

Cu. ft. air compressed - 1937	884,565,000		
Cu. ft. air compressed - 1936	698,985,000		
Increase - 1937	185,580,000		
Cost of Electrid Power - 1937	$27,598.91	Per Ton	$.062
Cost of Electric Power - 1936	23,098.72	Per Ton	$.074
Increase - 1937	4,500.19	Decrease	$.012

More air used account heavier operating schedule.

12. Underground Superintendence:

The increase in expense was $4,684.50 and cost per ton $.001. The mine operated 265 more shifts in 1937 and one more boss was employed. An underground foreman was in charge from March 1st. to August 15th. during the time Capt. Rogers was home sick. Since March 15, 1937 the shift bosses have been on a monthly salary.

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3. COST OF OPERATING: (Cont'd)
b. Detailed Cost Comparison: (Cont'd)
(7) Detail of Accounts: (Cont'd)

UNDERGROUND COSTS:

14. Compressors & Power Drills:

There were six new R.B.12 drill machines charged in 1937 costing $1,150.20 with freight. In 1936 five R.B.12 machines and one S-49 wet type Jackstoper costing a total of $1,254.44 were charged.

Repairs to compressors $503.80 in 1937, while in 1936 they were $104.00. The expenditures increased $295.56 while the cost per ton remained the same as in 1936.

15. Scrapers & Mechanical Loaders:

In 1937 purchased:

1 new 25 H.P. Sullivan electric scraper hoist costing	$1,681.92.
4 new 15 H.P. and 1 - 20 H.P. Ingersoll-Rand electric scraper hoists costing	7,241.61
Cables and switches were also purchased for these new hoists.	
14 - Holcomb-Westeeco scrapers costing	2,209.91
Cost of new hoist and scrapers in 1937	$11,164.44

In 1936 purchased:

2 new 15 H.P. Sullivan electric scraper hoists were bought costing $2,334.35
No Holcomb-Westeeco scrapers purchased.

Expenditures in 1937 increased $11,561.89 and cost per ton $.016 due to purchase of more new equipment. More rope used account the heavier operating schedule.

16. Electric Tram Equipment:

Detail:	Generators	Locomotives	Wiring	M.L. Tracks	M.L. Cars
1937	212.08	3,498.76	1,349.23	5,298.32	2,329.00
1936	57.51	1,482.90	603.27	2,877.85	1,262.79
Incr. 1937	154.57	2,015.86	745.96	2,420.47	1,066.21

Total expenditures increased $6,403.07 and cost per ton $.009.

Increase in Generators, Locomotives and Wiring due to more repairs.

Increase in M.L. Tracks due to replacing 30 lb. rail with 40 lb.

Three new rocker dump cars charged in 1937 costing $1,605.66, none in 1936.

17. Pumping Machinery:

Expenditures increased $498.17, while the cost per ton remained the same. On August 2nd the electric pump at the Breitung shaft was burnt out during an electric storm. A new pump and motor was bought costing $452.92 and the old pump was taken out and repaired.

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

SURFACE COSTS:

18. Hoisting:

Ore and rock hoisted:

	Ore	Rock	Total
1937	443,098	19884	462,982
1936	310,888	7716	318,604
Increase 1937	132,210	12,168	144,378

Expenditures increased $8,728.15 and cost per ton decreased $.006.

19. Stocking Ore:

Tons stocked in 1937	209,974
Tons stocked in 1936	141,347
Increase in 1937	68,627

There was extra ordinary expense in 1937 taking down wooden stocking trestle to enable shovel to load ore and also to erecting trestle for winter stocking.

The expenditures increased $5,487.58 and cost per ton $.008.

21. Dry House:

Increase in expense due to mine operating 265 more shifts during the year and increase in wages, hence more labor and expense for fuel.

Expenditures increased $1,579.05, and cost per ton $.001 due to increase in wages and more operating shifts.

22. General Surface Expense:

Expenditures increased $2,495.05 and cost per ton $.001 due to increase in wages and more operating shifts.

23. Hoisting Equipment:

Detail:	Elec. Hoists	Ropes	Skips & Skip Roads	Sheaves
1937	2,240.29	6,857.26	14,666.72	744.98
1936	924.53	3,055.73	3,600.82	227.18
Increase 1937	1,315.76	3,801.53	11,065.90	517.80

The expenditures increased $16,700.99, and cost per ton $.031.

Hoists: There were more repairs to hoists and bell signals.

Ropes: 1937 - Four skip ropes costing $5,637.60
1936 - Two skip ropes costing 3,055.73

1937 - One cage rope costing 1,219.59

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

SURFACE COSTS: (Cont'd)
23. Hoisting Equipment: (Cont'd)

Skips & Skip Roads:
1937 - New aluminum double deck cage $2,154.78
Charges on 3 new spherical bottom skips being built at the General Shops 2,012.08
Replacing skip runner in circular shaft $4,066.38

Sheaves: More expense for rubber lined pulley stand sheaves. New equipment and new guides in skip roads in the circular concrete shaft account for the increase in cost per ton.

24. Shaft:

Detail:	Steel Sets		U. G. Pockets
1937	2948.59		1620.61
1936	4478.75		635.41
Decrease 1937	1530.16	Increase	985.20

The decrease in expense to steel sets in 1937 was due to reinforcing the sets in circular concrete shaft in 1936.

There were more repairs to underground pockets in 1937 and expense for building transfer pocket on 7th level. The 10th level pocket was repaired in 1937. The net decrease in expenditures was $544.96, and $.007 cost per ton.

25. Top Tram Equipment:

Detail:	Engines & Motors	Wire Rope	Sheaves, Rollers, etc.	Tracks & Cars
1937	583.73	787.76	482.26	1676.32
1936	1044.75	250.00	520.10	584.42
Increase 1937		537.76		1091.90
Decrease 1937	461.02		37.84	

Decrease in expense to Engines & Motors due to relocation top tram control house in 1936 and replacing old cables with asbestos covered or fire resisting cables.

There was more top tram rope charged in 1937.

Replaced less sheaves and rollers in 1937.

Increase in expense to tracks and cars due to building new car and more repairs to old cars.

There was a net increase in expenditures of $1,120.80. Cost per ton the same for both years.

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B. COST OF OPERATING: (Cont'd)
b. Detailed Cost Comparison: (Cont'd)
(7) Detail of Accounts:(Cont'd)

SURFACE COST: (Cont'd)

26. Docks, Trestles and Pockets:

The increase in expenditures was $504.42 and cost per ton $.001

Increase in 1937 due to replacing some of the decking timber on steel trestle and more repairs to rock trestle.

27. Mine Buildings:

Detail - 1937		
Warehouse	2.94	Repair doors.
Shops	36.51	Prop. new transformer, repairing steam lines.
Shaft House	188.80	Rebuilding enclosure at bottom of shaft house.
Engine House	328.52	Rewire and install new lights, painting floors.
Dry House	449.71	Putting in new windows and more lockers. Copper piping replaced the iron hot water pipes.
Total	1006.48	

Detail - 1936		
Shops	283.49	Rewiring
Shaft House	3831.01	Fire proof enclosure.
Engine House	979.71	New roof and other repairs.
Dry House	851.46	New entrance heating plant. Electric cap lamp room. Rewiring.
Top Tram Hse.	66.36	New fire proof control house.
Total	6012.03	

Expenditures decreased $5005.55, cost per ton $.017, due to extraordinary expense in 1936 for enclosing the shaft house with fire proof structure.

GENERAL MINE EXPENSES:

28. Mining Engineering:

Covers time and expense of mine engineer and helpers. Increase in 1937 due to increase in salaries and more engineering work account opening the 7th level.

29. Mechanical & Electrical Engineering:

Covers a proportion of time and expense of Mechanical & Electrical Dept. based on actual time spent on mechanical and electrical work at mine. Increase in expense due to increase in salaries and more time by these departments account of the heavier operating schedule.

30. Analysis and Grading:

Detail	Sampling at Mine	Central Laboratory Exp.	Shipping Dept. Exp.	Trucking Samples etc.
1937	3091.95	5730.90	2105.00	299.07
1936	1882.19	3994.84	1555.50	254.24
Increase 1937	1209.76	1736.06	549.50	44.83

Determinations:			
1937	21,218	Cost per determination	.270096
1936	18,043	Cost per determination	.221407
Increase 1937	3,175		.048689

More ore shipped in 1937 also more underground samples.

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

GENERAL MINE EXPENSE:

31. Safety Department:

Detail	First Aid Supplies	First Aid & Helmet Prac.	Ishp. Office Charge	Cash Safety Awards	Lunch Kits & Calendars
1937	64.53	92.51	824.00	485.00	310.77
1936	118.84	117.86	568.67	255.00	--
Increase 1937			255.33	230.00	310.77
Decrease 1937	54.31	25.35			

There was a net increase in expenditures of $716.44 and cost per ton $.001. The greater part of the increase was in cash and other awards for safety records.

32. Telephones & Safety Devices:

Detail:	Lights Shaft & Levels	Mine Telephones	Safety Gates and Underground Improvements	Sign Boards & Signals	Fire Equipt.
1937	2804.58	37.84	55.79	117.78	12.72
1936	1964.12	103.22	82.28	28.40	4.55
Increase 1937	840.46			89.38	8.17
Decrease 1937		65.38	26.49		

Net increase in expenditures $846.14, cost per ton same for both years.

34. Special Expense, Pensions & Allowances:

Covers special donations, dues and assessments in Lake Superior Iron Ore Association and Saranac Investigation expense.

There was a decrease in expenditures of $358.68, and in cost per ton $.005.

35. Ishpeming Office:

Proportion of Ishpeming Office expense prorated to various mines on basis of labor.

36. Mine Office:

Detail:	Salaries	Cent. Warehouse Expense	Misc.
1937	9259.50	2415.78	957.96
1936	8389.90	1486.11	807.68
Increase 1937	869.60	929.67	150.28

Increase in expenditures largely due to increase in wages and salaries. Decrease in cost per ton $.006.

37. Insurance:

Expenditures increased $2701.79, cost per ton $.008.

Covers insurance on property, employees group insurance, catastrophe and riot and civil commotion.

Employees group insurance went into effect October 1st., 1936

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

GENERAL MINE EXPENSE:

38. Personal Injury:

Detail:	Compensation & Doctors	Compensation Department	Hospital Loss	Catastrophe Insurance
1937	10894.44	774.00	2089.38	
1936	6669.85	560.77	882.91	221.39
Increase 1937	4224.59	213.23	1206.47	
Decrease 1937				221.39

In 1937 Catastrophe Insurance was transferred to the account "Insurance".

39. Social Security Taxes:

Detail:	Unemployment Insur. Tax	Old Age Benefit Tax	Cost per ton
1937	9867.33	4888.84	.033
1936	2766.87	---	.009
Increase 1937	7100.46	4888.84	.024

The Old Age Benefit Tax went into effect January 1st., 1937.

40. Employees Vacation Pay:

There was an increase of $1030.07 account of higher wages and decrease in cost per ton $.001.

41. Taxes:

There was an increase in taxes levied $13,756.16 and a decrease in cost per ton $.032.

9. EXPLORATIONS AND FUTURE EXPLORATIONS:

There was no diamond drilling on the Athens property in 1937 and no future explorations are under consideration at this time.

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10. TAXES:

A comparison of assessed valuation and taxes for 1937 and 1936 follows:

Description	1937 Valuation	1937 Taxes	1936 Valuation	1936 Taxes
Reality (Tax Comm.)	1,810,000	64,212.83	1,535,000	52,361.07
Ore in Stock,Equip.etc.	365,000	12,450.67	410,000	12,641.94
Total by Tax Commission	2,210,000	78,403.51	1,900,000	64,811.74
Sterling Addition	4,600	163.19	4,140	141.20
Harvey Plat	1,300	46.03	1,170	39.92
Total	2,215,900	78,612.83	1,905,310	64,992.85
Collection Fees		786.12		649.93
Total Operating Athens Mine		79,398.95		65,642.79
Rented Buildings:				
Harvey Lots	4,200	149.00	3,780	128.94
Sterling Addition	22,800	808.91	20,430	697.07
Total	27,000	957.91	24,210	826.01
Collection Fees		9.58		8.26
Total Rented Buildings		967.49		834.27
Total Athens Iron Mng.Co.	2,242,900	80,336.44	1,929,520	66,477.06
Tax Rate		3.54767		3.4111
Total Taxes City of Negaunee		491,453.00		406,945.23
Athens Iron Mining Co. % of City Taxes		16.34%		16.33%

11. ACCIDENTS & PERSONAL INJURY:

There were 7 lost time accidents in 1937, the same number as in 1936. The severity rate was much lower in 1937 so that the years record is an improvement over 1936. The improvement is more marked when consideration is given to the increase in the working force and the heavy operating schedule. The total compensation payments in 1937 for the accidents that occured during the year was $1,113.73. Three cases out of the seven were being paid compensation at the end of the year, two for accidents occuring November 29th and December 3rd. The accident occuring on December 3rd broke a record of over 8 years with no compensable accident on surface. The accident was unusual in one respect. The injury was due to man slipping in the timber tunnel while putting loaded truck on the cage, the truck running over his left foot fracturing the little toe. His hard toe shoes were at the shoe makers shop for repairs.

The following table gives the accident record for past 6 years:

	1937	1936	1935	1934	1933	1932
Fatal	0	0	0	0	0	0
Time lost over 4 months	1	3	1	1	0	2
Time lost one to 4 months	5	3	2	0	1	0
Time lost lees than one month	1	1	0	0	0	0
Total Compensable Accidents	7	7	3	1	1	2
Number of cases paid compensation for accidents prior to 1937	7	6	7	7	14	12
Number of cases paid difference in wages included in above total.	3	3	4	4	4	4

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

The nature of the injuries caused by accidents in 1937 were as follows; dislocation of ankle, two fractured legs, fracture of arm, contusion of ankle, collapsed right lung, and fracture of little toe.

12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION:

E&A 725 - "Development of the 7th Level"	Estimated Expenditure	Total to Date	Unexpended
1265 ft. rock drift and raise	18,975.00	21,866.16	2,891.16
Air Lock Doors	500.00	295.78	204.22
Powder House	200.00	204.50	4.50
Air Line	600.00	394.09	205.91
Water Line	100.00	9.41	90.59
Trolley	600.00	2,384.00	1,784.00
Total	20,975.00	25,153.94	4,679.66
Contingencies	2,097.50		2,097.50
Total	23,072.50		2,582.16

The only items that have been completed are the Air Lock Doors and the Powder House. The E&A was supposed to cover all the rock drifting on the level of which there remains about 300 ft. to be driven to complete the crosscuts. More rock was encountered in development than was anticipated. The air, water and trolley lines have to be extended in the 300 ft. of rock drift to be driven in 1938.

All other E&A's authorized in 1937 covered purchase of new equipment and will be referred to under No. 13 "Equipment & Proposed New Equipment."

No new construction is proposed for the Athens Mine at this time.

13. EQUIPMENT AND PROPOSED NEW EQUIPMENT:

a. Steam Shovels:

The ore shipped from the Athens Mine in 1937 was loaded by #42 Shovel owned by the C.C.I. Co. and rented to the Athens Mine.

b. Stockpiles, Trestles & Docks:

The ore in stock was nearly all shipped in September except for small rills left under each steel trestle and ore scattered over the stockpiles. At the lowest point not over 10,000 tons were in stock but by the end of the year there were 86,685 tons in stock and with overrun about 100,000 tons.

The wooden trestle erected in 1930 between the two steel trestles was completely dismantled when the ore in stock here was shipped in 1937. In the fall and early winter this trestle was erected again. Mitchell Lease ore will be stocked here this winter.

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13. EQUIPMENT, ETC.:

c. Scraper Hoists:

Following is a list of scraper equipment at the mine;

	On Hand 1-1-36	Purchased 1937	Total on Hand 12/31/37	Repair Cos Per Machine for Year
15 H.P. Sullivan Elec.	17	--	17	67.69
20 H. P. " "	2	--	2	10.60
25 H.P. " "	0	1	1	---
10 H.P. Ingersoll Rand	2	--	2	70.68
15 H.P. " "	0	4	4	6.74
20 H.P. " "	0	2	2	11.36
	21	7	28	Average 48.68

The purchase of (5) Ingersoll Rand 15 H.P. hoists were authorized on E&A 705 on October 13, 1936. Four 15 H.P. and one 20 H.P. were purchased early in 1937 and charged to E&A 705. The 20 H.P. substituted for one of the 15 H.P. hoists, did not involve any appreciable increase in cost. Later in the year one 25 H.P. Sullivan hoist and one 20 H.P. Ingersoll Rand was purchased and charged to operating mine. The equipment on hand is ample on the 3 shift basis and probably on 2 shifts but on a single shift operating schedule additional hoists would have to be purchased.

d. Drill Machines:

The following new drill equipment was purchased in 1937 on E&A 705 and later charged to operating mine.

Six RB-12 Ingersoll Rand Auger Machines $1,150.20
They were purchased account of increase in production.

e. Motor Haulage Cars Underground:

Under the following E&A's the purchase of eight 65 cu. ft. rocker dump cars were authorized. Six were delivered to the mine in 1937 and 2 will be delivered in January 1938.

	Cost
E&A - 705 Two 65 cu. ft. rocker dump cars	
E&A - 767 Two 65 cu. ft. rocker dump cars	
E&A - 782 Four Authorized, two delivered rocker dump cars	3232.96

Of the 6 charged to above E&A's in 1937 three have been charged back to operating the mine. The cars were bought to provide equipment for the 7th and 9th levels.

f. Double Deck Cage:

The double deck aluminum cage authorized on E&A 705 was not completed until August 1937. It went into service in August and has operated satisfactorily. Overtime for sending down timber was no longer necessary as all the supplies could be sent down on the 8 hr. shift. Less time was required for handling men on the cage and trips per day by the cage were reduced about 40%.

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13. EQUIPMENT, ETC.:

g. Spherical Bottom Skips:

The square box skips at the Negaunee Mine were replaced in 1936 with spherical bottom skips which on trial proved to clean themselves when dumping much better than the square bottom skips. In 1937 it was decided to make this skip standard for the soft ore mines. Construction of three spherical bottom skips for the Athens mine was started in the summer at the General Shops and was nearly completed at the end of the year. Before putting them in service it is planned to overhaul the skip dump and install cast steel guides for the skip wheels which guide the skip into the dump. On account of the difficulty of doing this work in severe cold weather it maybe postponed until spring. Expenditures in 1937 for the 3 new skips were $2,012.08.

14. MAINTENANCE & REPAIRS:

		Per Ton
Expenditures for maintenance in the accounts listed under "Underground Costs" - 1937	37,281.50	.085
Expenditures for maintenance in the accounts listed under "Underground Costs" - 1936	18,522.81	.060
Increase	18,758.69	.025
Expenditures for maintenance in accounts listed under "Surface Costs" - 1937	34,823.34	.079
Expenditures for maintenance in accounts listed under "Surface Costs" - 1936	22,047.64	.071
Increase	12,775,70	.008

	Compressors & Power Drills	Scrapers	Elec. Tram Equipment	Pumping Machinery
1937	1654.00	21,332.73	12687.39	1607.38
1936	1358.44	9,770.84	6284.32	1109.21
Increase	195.56	11,561.89	6403.07	498.17
Total Increase	$18,758.69			

The detail of Underground Maintenance Cost show that the major increases occured in Account Scrapers & Electric Tram Equipment.

	Hoisting Equip.	Shaft	Top Tram	Docks, Trestles & Pockets	Mine Bldgs.
1937	24,509.25	4,569.20	3,520.07	1,218.34	1,006.48
1936	7,808.26	5,114.16	2,399.27	713.92	6,012.02
Increase	16,700.99		1,120.80	504.42	
Decrease		544.96			5,005.55
Net Increase	$12,775.70				

The main increase was in account Hoisting Equipment.

The net increase in Maintenance Expense Underground and Surface Costs was $31,534.39 or $.033 per ton of ore.

Brief comment is made of the increases in the 3 accounts that caused the increase in cost per ton.

The expense in account "Scrapers" was due to purchase of scraper hoists and scrapers in 1937, costing $11,164.44 as compared with an expenditure of only $2,334.35 for this equipment in 1936.

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14. MAINTENANCE & REPAIRS: (Cont'd)

Expenditures in account "Electric Tram Equipment" was due to more repairs to locomotives, main line tracks and 3 new main line cars charged out.

The large increase in account "Hoisting Equipment" was due to charging out 4 skip ropes and 1 cage rope in 1937 costing $6,857.19 as compared to 2 skip ropes costing $3,055.73 in 1936. Also charged out in 1937, new aluminum double deck cage $2,154.78, three spherical bottom skips $2,012.08 and expense for new guides in circular concrete shaft $4,066.38.

The decrease in account "Mine Buildings" was due to expense of fire proof enclosure of the shaft house in 1936.

15. POWER:

Detail of Electric Current purchased compared with 1936:

	1937 - 12 Mos. Optg.		1936 - 12 Mos. Optg.	
	Cost	Per Ton	Cost	Per Ton
Stoping	1483.15	.003	771.07	.003
Ventilation	2969.37	.007	2281.59	.007
Pumping	15880.42	.036	16677.77	.054
Hoisting	27669.23	.063	21908.09	.070
Stocking Ore	762.79	.002	571.32	.002
Dry House	90.43	.000	91.21	.000
Lights at Levels	1667.60	.004	1129.65	.004
Compressor	27598.91	.062	23098.72	.074
Electric Haulage	2369.79	.005	1383.65	.004
Shops	294.18	.001	180.97	.001
Heating Plant	16.75	.000	16.72	.000
Office	16.54	.000	17.08	.000
Total	80,819.16	.183	68,127.84	.219

Main Line Meter - K.W.	5,837,186	4,634,958
Separate Meter Readings	5,813,096	4,635,022
Line Loss	24,090	
Product	443,098	310,888
K.W. Per Ton	13.17	14.91
Cost Per K.W. (Avg.)	.013846	.0147
15 Min. Demand (Avg.)	1217	1193
Load Factor (Avg.)	54%	43.5%

The K.W. per ton of ore were lower in 1937 due to larger product and the cost per K.W. was lower due to a better load factor on account of the three shift operation.

17. CONDITION OF PREMISES:

b. Athens Mine Houses:

Very little money was spent on repairs to the Athens Mine houses during the depression. They had not been painted for at least 12 to 15 years. Painting of the houses was started in 1936 and completed in 1937 with the exception of 4 houses.

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17. CONDITION OF PREMISES:

b. Athens Mine Houses: (Cont'd)

Before painting the houses they had to be thoroughly repaired. The repairs included new siding, foundation sills, new windows and frames, new sash, porches, steps, etc., in fact what ever was needed to put the house in condition for painting. In 1937 15 houses were repaired and painted. One large house had no cellar and the cedar posts supporting the house were rotted. A concrete cellar large enough for two families was excavated under part of the house and enclosed with concrete walls. The balance of foundation walls were made of stone. One new roof was put on in 1937. Nearly all of the tenants have cars of which a considerable number were purchased in 1937. In many cases the old Cow barns were badly rotted and could not be made over into garages. In 1937 12 Cow barns were torn down by the tenants and 8 double and 4 single garages built to replace them.

There were no vacant houses in the City of Negaunee and in two cases to relieve badly crowded conditions two room additions were built on two small houses. In one case the family consisted of the parents and 7 children in a two room house with kitchen in the basement, and in the other of parents, father and brother of the wife and 3 children in a four room house.

A house bought in 1937 was repaired, painted and an outside cellar entrance constructed of concrete and new plumbing and wiring installed.

The appearance of the location has improved beyond expectations due to painting the houses and removal of the old unsightly barns. The work was 85% completed at the end of the year. With the completion in 1938 of painting and repairing 4 houses and building of a few garages the entire location containing 31 houses will have been completely renovated. Repairs in the next 10 years (after 1938) should be very low.

The cost of painting 15 houses in 1937 exclusive of repairs preliminary to painting, was $2,412.09. The repairs to these 15 houses account for approximately $7,500.00 expense. The 8 double and 4 single garages cost about $2,200.00. New sills, foundation, cellar and new porches cost $1,500.00 on one large double house. The two additional rooms, with other alterations in interior arrangements at two houses cost $3,000.00. The following table gives total cost of repairs and cost per house for the past 5 years:

Year	No. of Houses	Amount	Cost Per House
1937	31	19,300.86	622.61
1936	30	6,680.02	222.67
1935	30	2.654.63	88.49
1934	30	2,088.70	69.32
1933	30	852.41	28.41

Number of families in Athens Mine houses - 47.

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18. NATIONALITY OF EMPLOYEES:

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

As to Parentage	1937	%	1936	%
English	47	16.6	43	19.5
Finnish	125	44.2	91	41.1
Italian	50	17.7	38	17.2
Swedish	20	7.0	16	7.2
French (Canadian)	26	9.2	20	9.0
Scotch	1	.4	1	.5
German	4	1.4	6	2.7
Austrian	2	.7		
Norwegian	5	1.7	3	1.4
Greek	1	.4	2	.9
Danish	2	.7	1	.5
Total	283	100.0	221	100.0

	American Born		Foreign Born	
As to Birth	1937	1936	1937	1936
English	33	37	14	16
Finnish	72	45	53	46
Italian	24	14	29	24
Swedish	17	14	3	2
French (Canadian)	26	20		
Scotch	1	1		
German	4	6		
Austrian	2	-		
Norwegian	5	3		
Irish		2		
Greek		0	0	-
Danish	2	1	1	-
Total	183	133	100	88
	64.7	60.2%	35.3	39.8%

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1. GENERAL:

This property has been idle for many years. It is necessary to make several inspections during the year of the fences around the open pits and the covering over the old shafts. Repairs necessary to keep the pits and shafts in safe condition were made in 1937.

10. TAXES:

	1937		1936	
	Valuation	Taxes	Valuation	Taxes
Various Parcels	$ 29,600	$ 1050.12	$ 37,260	$ 1271.04
Collection Fees		10.50		12.71
Total Taxes		$ 1060.62		$ 1283.75
City of Negaunee Tax Rate Per $100.00		$ 3.54767		$ 3.411

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1. GENERAL

The Maas Mine operated continuously through the year 1937 on a quite varied working schedule; from January 1st to April 17th, five days per week with two regular straight eight hour shifts and a smaller third shift composed of a tramming and hoisting crew and approximately sixteen contracts. On April 17th the time was increased to six days per week with one regular shift only on Saturdays, and this continued until October 3rd when the mine returned to five days per week, curtailing still further on December 6th when the men were placed on four days per week although the mine operated six days. This latter arrangement was considered the most practical for two reasons; first, the midnight shift, which is the least efficient, was eliminated; and second, by staggering the crews, the places are all being worked six days per week with less time to break down over the idle period.

Mining was in progress in four general areas in 1937, namely, the East and West footwall pillars above the Third Level, the area East and Southeast of the Race Course lease above the Fourth Level, and the territory between the Fourth and Fifth Levels lying West of the East boundary of the Race Course lease where all of the Bessemer grade and also the Special grade was produced. In both of these latter areas the water increased steadily after the new cave broke through to surface on February 14th and proved a very serious handicap, delaying not only the contracts but also the tramming and hoisting schedule and necessitating a large crew on one shift per week to clean the ditches and tracks.

With the exception of this increase in water, the mine generally was in very good condition with only the normal amount of crushing in the larger areas. Production was somewhat handicapped in opening up new areas under sub levels which had been stopped several years ago when it was desired to increase the percentage of Bessemer, but now had to be reopened to make more working places available.

There was considerable development work done in 1937, consisting of main level drifts on the Fourth and Fifth Levels and a large number of raises put up from both levels. A transfer system was also installed in the East footwall pillar above the Third Level.

This was the busiest year in the history of the Maas Mine, both the production and shipments being well over three-quarter million tons. On account of the desired increase, it was necessary to employ a large number of new men and these consisted mostly of young men, all inexperienced, but in many cases the sons of our old employees, and these latter were placed with their fathers to break in as miners. This worked out very satisfactorily and we now have a large crew of young miners who are very efficient and

also adapt themselves better to the increased mechanism of mining. A schedule of three continuous eight hour shifts, such as was worked in 1937, is very hard on equipment especially in the warm weather when the hoists and compressors become very hot. The only time for repairs was on Sunday, but the skip roads had to be inspected twice a week and therefore one of these trips necessarily held up the production.

Owing to the increased shipment it was possible to clean up all the older stockpiles, some of which had been in existence for several years, there remaining only one pile of Maas grade which had been stocked since March of this year. There were 39,445 tons of overrun shipped and there is probably some 40,000 tons still in stock in excess of the book figures. The total shipments from the Maas were 195,826 tons more than in 1936 and 1,442 tons less than this year's product.

On February 14th of this year a large cave, about 400 feet in diameter, appeared on surface at the junction of Main and Vine Sts. Immediately there was a decided increase in the water underground and as the Maas Mine pumps were already nearly to capacity, some 300 to 500 gallons were diverted on the Third Level to the Negaunee Mine Twelfth Level and the Negaunee Mine was still pumping this additional amount and charging the Maas Mine for the same at the end of the year. The average gallons per minute pumped during 1936 was 1,283 as compared to 1,510 gallons in 1937, the latter of course including the amount diverted to the Negaunee Mine.

An attempt was made to recover some of the water on surface before it reached the underground workings and a deep well pump was installed by the Layne-Northwest Company, but owing to the large quantity of very fine sand encountered in the water, they were unsuccessful until the early part of December at which time the pump ran continually for two weeks, producing 200 gallons per minute, which was fairly clear and would indicate that we might expect encouraging results underground in 1938.

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2. PRODUCTION, SHIPMENTS & INVENTORIES

a. Production by Grades

	1937	1936	Increase	Decrease
Maas Bessemer	78,915*	88,324		9,409
Race Course Bessemer	65,363*	57,178	8,185	
Maas	444,378*	243,484	200,894	
Race Course	182,957*	151,257	31,700	
Maas Special	1,984	1,767	217	
Race Course Special	31,664	6,463	25,201	
Total	805,261	548,473	256,788	
Rock	17,797	13,856	3,941	
Total Hoist	823,058	562,329	260,729	

*Includes current and previous year's stockpile overrun of 39,445 Tons:

Grade	1937	1936
Maas Bessemer	7,895	17,863
Race Course Bessemer	3,423	2,050
Race Course	3,055	5,159
Total	14,373	25,072

124,365 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	31,040	67,970	99,010	83,887
Race Course Bessemer	27,547	43,566	71,113	53,501
Maas	260,583	138,050	398,633	296,267
Race Course	99,073	82,105	181,178	140,192
Maas Special	1,359	1,284	2,643	1,079
Race Course Special	14,753	11,427	26,180	8,005
Total	434,355	344,402	778,757	582,931
Total Last Year	265,589	317,342	582,931	
Increase	168,766	27,060	195,826	

Included in the above is 42,012 tons shipped all rail to Charcoal furnaces.

c. Stockpile Inventories

Grade of Ore	12-31-37	12-31-36	Increase	Decrease
Maas Bessemer	6,116	26,211		20,095
Race Course Bessemer	9,329	15,079		5,750
Maas	89,004	43,259	45,745	
Race Course	23,961	22,182	1,779	
Maas Special	29	688		659
Race Course Special	5,647	163	5,484	
Total	134,086	107,582	26,504	

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d. Division of Product by Levels

	1937	%	1936	%
Third Level	215,163	27.6	137,828	25.0
Fourth Level	135,495	17.4	206,539	38.0
Fifth Level	429,531	55.0	204,106	37.0
Total	780,189	100.0	548,473	100.00

e. Production by Months

Month	Maas Bess.	Maas	Maas Spcl.	R. C. Bess.	Race Course,	R. C. Spcl.	Total	Rock
January	4,204	30,694	20	4,716	14,004	2,526	56,164	548
February	8,197	25,653		7,419	12,457	2,135	55,861	1,877
March	4,753	30,132	76	6,645	14,686	2,275	58,567	1,286
April	2,944	39,959	1,013	5,254	15,924	3,330	68,424	1,713
May	10,085	35,652	237	7,327	14,625	1,344	69,270	1,830
June	11,628	41,050	225	5,193	12,570	2,639	73,305	1,902
July	9,140	37,178	272	3,867	11,654	3,319	65,430	1,878
August	7,567	36,848	112	7,356	13,671	4,072	69,626	1,379
September	6,388	38,055		6,183	14,525	3,437	68,588	1,415
October	4,264	40,549	29	5,514	11,057	2,870	64,283	1,548
November	3,952	32,884		5,737	17,525	1,422	61,520	1,698
December	3,648	32,111		5,413	11,311	2,295	54,778	1,538
Total	76,770	420,765	1,984	70,624	164,009	31,664	765,816	18,612
1937 Stock-pile O'run.	7,895			3,423	3,055		14,373	
1936 "	17,863			2,050	5,159		25,072	
Gr. Total	102,528	420,765	1,984	76,097	172,223	31,664	805,261	18,612

The product was distributed as follows:

	1937	1936	Increase
George Maas Lease	418,971	265,312	153,659
Catholic Cemetery	69,451	42,670	26,781
American Mining Co.	8,853	6,479	2,374
C.C.I.Co.(Right of Way)	14,208	11,221	2,987
Race Course	279,984	214,845	65,139
City of Negaunee	13,794	7,946	5,848
	805,261	548,473	256,788

f. Ore Statement

	Maas Bess.	Maas	R. C. Bess.	Race Course	Maas Spcl.	R. C. Spcl.	Total	Total Last Year
On hand 1-1-37	26,211	43,259	15,079	22,182	688	163	107,582	142,040
Product for year	76,770	420,765	70,624	164,009	1,984	31,664	765,816	535,760
Trans. to & from	23,613	23,613	10,734	10,734				
1937 Overrun	7,895		3,423	3,055			14,373	3,702
1936 Overrun	17,863		2,050	5,159			25,072	9,011
Total	105,126	487,637	80,442	205,139	2,672	31,827	912,843	690,513
Shipments	99,010	398,633	71,113	181,178	2,643	26,180	778,757	582,931
Balance on hand	6,116	89,004	9,329	23,961	29	5,647	134,086	107,582
Increase in output							217,343	
Increase in ore on hand							26,504	

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f. Ore Statement (Cont.)

Estimated stockpile overrun end of 1937 season:

Maas Bessemer	0	tons
Maas	40,000	"
Race Course Bessemer	0	"
Race Course	2,000	"
Maas Special	0	"
Race Course Special	2,000	"
Total Estimated Stockpile Overrun	44,000	tons
Overrun Shipped 1937	39,445	tons

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-hrs. 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-hrs. shift, 6 days per week and 5 nights in six Bessmer 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.

1933 1 8-hrs. shift, 4 days per week, 2 crews working alternate weeks, January 1st to April 8th. Mine idle from April 8th to July 1st.
Six days per week, 3 crews 2 days each, April 8th to July 1st. 5th Level development.
6 days per week 3 crews 2 days each, July 1st to August 1st, Bessemer production and 5th Level development.
5 days per week, 2 crews working alternate weeks, August 1st to November 13th; 6 days per week and 5 nights, 3 crews working 3 or 4 days per week, November 13th to December 31st.

g. Delays
Electrical

Date	Shift	Duration	Loss In Product	Cause
June 25th	Day	2 hours	200 tons	Lack of current.
Aug. 25th	Day	2½ hours	250 tons	Trouble with contacts on skip hoist controll.

Delays
Non-electrical

Mar. 2nd	Night	3 hours	357 tons)	Skip caught in dump, breaking
Mar. 3rd	Day & Night	17 hours	1800 tons)	4 runners and 1 divider and bending 2 dividers.
Mar. 4th	Day	1 hour	200 tons	Repairing cage runner in shaft and skip hoist drum.
Apr. 20th	Night	2 hours	300 tons)	Damage to 5th Level pocket
Apr. 21st	Day	1 hour	)	caused by wood from car catching fingers.
Apr. 21st	Day	3 hours	500 tons	Replacing broken pulley sheave stand.
Apr. 22nd	Night	1 hour	100 tons	Top tram car off track.
Apr. 28th	Day	1 hour	100 tons	Repairs to skip & skip roads.
Apr. 30th	Day	1 hour	100 tons	Repairs to skip & skip roads.
May 31st	Day	4½ hours	450 tons	5th Level pocket opened and let 8 cars of ore on top of skip.
June 7th	Day	1½ hours	150 tons	Broken main air line.
July 1st	Aft'noon & Night	16 hours	2200 tons	Repairing main pump discharge.
July 6th	Aft'noon	2 hours	200 tons	Repairing skip hoist.
July 8th	Day	1½ hours	150 tons	Repairing skip runners.
July 10th	Day	1 hour	120 tons	Repairing skip.
Aug. 2nd	Night	1½ hours	150 tons	Low air pressure.

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g. Delays
Non-electrical (Cont.)

Date	Shift	Duration	Loss In Product	Cause
Aug. 20th	Day	2 hours	200 tons	Repairs to 5th Level pocket.
Sept 3rd	Day	2 hours	200 tons	Broken skip runner at 5th Level pocket.
Nov. 3rd	Day	1½ hours	150 tons	Skip hoist brake band out of order.
Nov. 19th	Night	1½ hours	150 tons	Repairs to skip.
Nov. 29th	Day	2 hours	200 tons	Loose plates in 3rd Level pocket.
Nov. 29th	Day	1 hour	100 tons	Broken butterfly in dump.
Nov. 30th	Day	1 hour	100 tons	Repairs to skip.
Dec. 11th	Night	4 hours	400 tons	Top tram rope broke, could only use one car.
Dec. 27th	Day	2 hours	200 tons	Changing skip.

3. ANALYSIS

a. Average Mine Analysis on Output

Grade	1937 Iron	1937 Phos	1937 Sil.	1937 Sul.	1936 Iron	1936 Phos	1936 Sil.	1936 Sul.
Maas Bessemer	62.68	.043	6.00	.014	63.14	.043	5.53	.012
Maas	60.66	.069	8.26	.015	61.52	.073	6.67	.014
Race Course Bess.	62.55	.044	6.63	.013	63.08	.042	5.71	.012
Race Course	60.78	.066	7.90	.015	61.55	.071	6.76	.013
Maas Special	61.28	.074	6.92	.173	58.81	.087	8.39	.283
Race Course Spcl.	60.76	.055	8.06	.142	61.26	.060	6.89	.173

b. Average Mine Analysis on Ore Shipped

Grade	Iron	Phos.	Sil.	Alum.	Mang.	Lime	Mag.	Sul.	Loss	Moist.
Maas & R. C. Bess.	62.70	.043	6.08	2.34	.21	.40	.12	.013	1.06	11.66
Maas & Race Course	61.00	.071	7.76	2.33	.22	.51	.12	.015	1.52	12.21
Maas & R. C. Special	61.25	.057	7.06	2.36	.20	.48	.20	.118	1.74	11.61

c. Average Analysis on Straight Cargoes

Grade	Mine Iron	Mine Phos.	Mine Silica	Lake Erie Iron	Lake Erie Phos.	Lake Erie Moist.
Lake Bessemer (Maas & Race Course Bessemer)	62.63	.042	6.08	62.70	.042	11.38
Maas (Maas & Race Course Non-Bessemer)	61.34	.065	7.37	60.77	.064	11.58

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e. Average Analysis of Ore in Stockpiles

Average Natural Analysis

Grade	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist
Maas Bessemer	54.13	.038	5.38	.19	1.99	.39	.16	.013	.88	11.49
Race Course Bess.	55.62	.040	5.46	.19	2.08	.76	.22	.013	.89	11.07
Maas	53.61	.066	6.90	.19	2.10	.74	.18	.012	1.55	11.78
Race Course	53.01	.061	7.77	.18	2.32	.77	.24	.015	1.76	11.74
Maas Special	48.82	.086	8.98	.19	2.10	.74	.18	.056	1.55	11.89
Race Course Spcl.	52.41	.043	9.50	.19	2.34	.77	.24	.107	1.78	11.09

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	78,005	632,696	176,797	10,087	31,346	928,931
3rd to 4th Levels	206,098	2,643,034	4,526	33,573	103,091	2,990,322
4th to 5th Levels	1,116,559	1,420,659		48,848	18,302	2,604,368
Total above 5th Level	1,400,662	4,696,389	181,323	92,508	152,739	6,523,621
Below 5th Level	396,479	25,734				422,213
Grand Total	1,797,141	4,722,123	181,323	92,508	152,739	6,945,834

8% of total tonnage of Maas and Race Course is estimated to be Bessemer grade - 555,667

The estimate of ore reserves was increased over the production for 1937 by 594,229 tons, of which 422,213 is below the Fifth Level and had not been shown heretofore; the balance of 172,016 tons is distributed as follows:

INCREASE IN ORE RESERVES

	Maas	Race Course	Total
3rd Level	59,704	16,698	76,402
4th Level	102,570	5,230	97,340
5th Level	137,407	135,681	1,726
Total	24,867	147,681	172,016

The increase from the Third to the Fourth Levels in the Maas was due to the increase in the outline of the North footwall. The increase from the Fourth to the Fifth Levels was due to the increase in the outline of the hanging on the 100' Sub Level. The decrease from the Fourth to the Fifth Levels in the Maas was due to the decrease in the outline of the South footwall on the 90' Sub Level.

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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 by grades on an operating basis of 4 days per week, 2 straight 8-hour shifts, and the expected analysis of the 1938 production from the Maas Mine.

Grade	Estimated Production 4 day per Week Basis
Maas & Race Course Bessemer	90,000 tons
Maas & Race Course Non-Bessemer	439,000 tons
Maas & Race Course Special (Low Phos.)	27,000 tons
Maas & Race Course Special (High Phos.)	50,000 tons
Total	606,000 tons

Expected Analysis of Above Tonnages

Grade	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist	Iron Natl.
Maas & Race Course Bessemer	62.70	.043	6.00	.22	2.30	.60	.20	.014	1.00	11.25	55.64
Maas & Race Course Non-Bessemer	61.00	.080	7.70	.22	2.40	.85	.25	.015	1.80	11.75	53.83
Maas & Race Course Special (Low Phos)	62.50	.043	6.20	.22	2.40	.85	.25	.200	1.80	11.75	55.16
Maas & Race Course Special (High Phos)	61.00	.080	7.70	.22	2.40	.85	.25	.300	1.80	11.75	53.83

5. LABOR & WAGES

a. Comments

1. Labor

The desired increase in production, together with the addition of a third shift of some 32 miners, made it necessary to employ 102 new men at the Maas, increasing the payroll from 368 to 470 men in 1937, the average age of these new men being 25. Very few experienced miners were without employment and therefore it was necessary to break in young men, not only for Company Account work, but also as miners. Where possible one of the miners took his son as a partner and in other cases a contract was split and each miner took

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5. LABOR & WAGES

1. Labor (Cont.)

a young fellow for a partner. These new men have proved very satisfactory, especially in the handling of the electrical and mechanical equipment.

A large number of men were also employed temporarily during the summer months at the Cleveland-Cliffs Iron Company's Second Addition. The largest proportion of these were laborers but there were also painters, carpenters and masons. Outside of a few of the painters and carpenters who were retained to complete the inside repairs and decorating of the houses, these men were all laid off in October and November, except for a few of the best workmen who were transferred to the Underground operations.

There was an increase in wages of ten cents per hour effective March 16th.

During July the men who had been employed by the Company since 1932, even though they had been laid off temporarily during the depression, were given a weeks vacation with pay and their places were filled by men from the Gardner-Mackinaw Mine which was shut down for repairs. Using these men accomplished two purposes, namely, giving these men employment and also keeping up the production in the mines where these men were used to replace those on leave.

All matters concerning changes in time schedules, vacations with pay and changes in wages was taken up with the employees' representatives and officers of the local union.

A different scheme was used in the safety campaign in 1937 whereby the mine had to go one month without a compensable accident and if such was the case, a ticket for each man was put in a revolving barrel and a drawing was made early in the following month. It seemed almost impossible for a large mine to go this long and the Maas Mine only had two drawings, although most of the accidents were not very serious. It is expected that a better plan will be used next year for the large mines, based on two weeks instead of a month, as in two cases the Maas Mine lost out by just one day. The new plan will probably be so regulated that one person cannot win more than one first prize during the year, and also anyone who has had a preventable accident will not participate in any of the drawings that year.

In April it was found necessary to remove Captain Prudom from his duties as Captain as a disciplinary measure and Captain William Nault was transferred to the Maas from the Cliffs Shaft Mine where he had been acting as assistant to Captain Olds. Captain Nault had been Captain of the Morris, Lloyd and Holmes Mines and was therefore familiar with soft ore mining and has been a very valuable addition to the Maas Mine Supervisory Department.

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5. LABOR & WAGES

1. Labor (Cont.)

The former Captain Tregonning who had been ill and at Saranac Lake since January, 1936, died on January, 1937. He was an exceptionally able Captain, having had charge of the Athens Mine since work was started there and later transferred to the Maas, and his loss has been felt very keenly by both the men and the Company officials.

2. New Construction

The following is a list of the E & A's on which work was done during 1937:

No. 689 Moving 30 Maas Mine Location houses.
" 702 Maas Mine Drainage.
" 706 Equipment to increase production.
" 712 Double Deck Cage.
" 715 250 K.W. motor generator set.
" 716 Maas Mine drainage--Layne Bowler Pump.
" 721 Fireproofing headframe.
" 726 Electric Haulage Cable.
" 727 Moving 28 Maas Mine Location houses.
" 739 Two Sullivan frames for scraper hoists.
" 744 Skip hoist drum.
" 770 Pump Feeder cable.
" 775 Crusher in shafthouse.

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

	1937	1936	Increase	Decrease
Product	780,189	548,473	231,716	
Number of Shifts & Hours				
1 8-hour		97		
2 8-hour	285	195		
AVERAGE NO. MEN WORKING				
Surface	67	57½	9½	
Underground	346	270	76	
Total	413	327½	85½	
AVERAGE WAGES PER DAY				
Surface	5.54	4.24	1.30	
Underground	6.22	5.10	1.12	
Total	6.11	4.95	1.16	

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5. LABOR & WAGES

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

AVERAGE WAGES PER MONTH 4½ Days per Week 1936 5½ Days per Week 1937	1937	1936	Increase	Decrease
Surface	126.97	94.66	32.31	
Underground	143.28	108.17	35.11	
Total	140.63	105.80	34.83	
PRODUCT PER MAN PER DAY				
Surface	42.36	34.98	7.38	
Underground	8.15	7.86	.29	
Total	6.84	6.42	.42	
LABOR COST PER TON				
Surface	.131	.121	.010	
Underground	.762	.650	.112	
Total	.893	.771	.122	
AVERAGE PRODUCT MINING				
Stoping	17.77	17.32	.45	
Ore Development	8.92	7.54	1.38	
Total	17.25	16.88	.37	
AVERAGE WAGES CONTRACT LABOR	6.528	5.564	.964	
TOTAL NUMBER OF DAYS				
Surface	18,417½	15,422½	2,995	
Underground	95,724½	68,657¼	27,067¼	
Total	114,142	84,079 3/4	30,062¼	
AMOUNT FOR LABOR				
Surface	102,083.64	65,316.91	36,766.73	
Underground	594,885.59	350,462.80	244,422.79	
Total	696,969.23	415,779.71	281,189.52	
AVERAGE WAGES PER MONTH BASED ON MEN CARRIED ON MINE PAYROLL				
Surface	125.82	92.88	32.94	
Underground	142.86	105.36	37.50	
Total	140.21	105.15	35.06	

Proportion of Surface to Underground Men

1937 - 1 to 5.2 2 8-hour shifts, 5 days per week, from January 1st to April 17th with a third 8-hour 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.

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5. LABOR & WAGES

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

Proportion of Surface to Underground Men (Cont.)

1936 - 1 to 5.9 — 1 8-hour 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.

1935 - 1 to 4.9 — 4 days per week, 2 crews working alternate weeks, January 1st to February 11th.
6 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.
1 8-hour shift, 4 days per week, 3 crews working 2 and 3 days per week, September 1st to December 31st.

1933 - 1 to 4.85 — 1 8-hour shift, 2 days per week, January 1st to April 8th.
Mine idle April 8th to July 1st.
1 8-hour shift, 2 days per week, April 8th to July 1st - 4th Level Development.
1 8-hour shift, 2 days per week, 2 crews working alternate weeks August 1st to November 13th.
1 8-hour shift, 6 days and 5 nights per week, 3 crews working 3 and 4 days per week, November 13th to December 31st.

6. SURFACE

a. Buildings, Repairs

There were no extensive repairs, erecting or dismantling of any of the main buildings at the Maas Mine during 1937 except in the Shafthouse where, under E & A No. 721 authorized last year, the old enclosure of wood covered with gunite was taken off and a fireproof sheeting was installed. A skeleton of small steel members was bolted to the regular steel braces from the top landing floor to the top of the headframe and to these was attached a covering of "Ferro Deck", which are interlocking six inch channels of thin sheet steel. The skip compartments were inclosed with one-quarter inch steel plates and the skip roads and

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6. SURFACE

a. Buildings, Repairs (Cont.)

skip dump were strengthened to withstand the shock of the additional load when dumping due to the larger skips installed last December.

A steel pulley stand was erected close to the engine house for the skip ropes to take the whip out of the rope before it entered the building.

The Maas Mine ships a considerable amount of ore to the local furnaces during the winter months when the district crusher is not available and as the lumps in this ore have to be broken up, it was decided to install a crusher at the shaft. This was authorized under E & A No. 775 and in November of this year a concrete pier was erected just South of the shafthouse and as all the material is at hand, it is expected that the crusher will be in operation early next year.

b. Location Dwelling Repairs

There was, however, a very large program of house moving and repairs carried on from May 1st to November 1st in the Cleveland-Cliffs Iron Company's Second Addition. There were 28 houses moved to thislocation from the Eastern end of Main, Case and Park Streets during 1936 and the balance of the 57 Company owned houses in this area were moved in 1937. There were two E & A's, No. 689 for last years moving and No. 727 for this year; this latter E & A included the completion of the streets, grading, lighting, etc., as well as the moving and repairs to the houses. As the houses were moved so late last year, there was almost as much repair work to be done on them as on those moved this year and as a consequence, a very large crew of some 150 men was employed most of the summer. The actual moving of the houses started on May 15th and was completed early in August as it was possible to obtain an earlier start in 1937 on account of having ten concrete basements constructed last year before the severe weather set in.

A large crew of painters completed the priming coat on all of the houses and after the streets were macadamized, thus eliminating the red dust blowing from the iron ore base material of which the roads had been constructed, they started to put on the second coat and at the end of the summer had completed 26. As was mentioned in last years report, these houses are all to be painted white and have green roofs which makes a very attractive appearance.

There were very extensive repairs in these houses due to so much of the plaster, which was of the old sand type, being cracked so badly that in many cases the whole room had to be done over. Also with the expectation of their being moved shortly, there had been very little work done on them for some time and the siding was in very poor condition as were also the porches and roofs. At the end

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6. SURFACE

b. Location Dwelling Repairs (Cont.)

of the season nearly all of the outside work had been completed and about two-thirds of the inside decorating which will be carried on during the winter, and as soon as the weather permits the final coat will be applied by the painters on the remaining houses. In many cases while the old plaster was removed, a re-arrangement of the partitions was made so that it would be possible to have bathrooms in the houses which were not so equipped. The general surface work in connection with the location will be taken up elsewhere in this report.

There were two houses in the older locations completely painted during 1937, three garages moved from the location dismantled this year to the Cleveland-Cliffs Iron Company's first addition and also three new garages erected for other houses. With these exceptions, the only work done this year on the houses outside of the second addition was repairs to windows and some interior decorating where either the material or the labor was furnished by the tenant.

Five furnaces, three hot air and two hot water, were installed in the second addition, the tenants paying an increased rent.

On December 31st, 1937, the Maas Mine owned 121 dwellings.

Single Family Houses	90
Two " "	24
Three " "	3
Four " "	1
Legion Club	1
Store	1
Funeral Home	1
Total	121

The following houses in the Cleveland-Cliffs Iron Company's first addition were sold on time contracts:

House No.	Address	Lot	Block	Purchaser	Date
17	541 Elm St.	8	3	W. J. Skewis	2-1-37
76	525 Prince St.	7	1	Mrs. Elias Kangas	5-1-37
82	618 Lake St.	5	6	Jalmer Salo	6-1-37
108	517 Elm St.	14	3	Raymond Langlois	6-1-37
105	534 Lake St.	9	6	Lawrence Nylander	7-15-37
69	622 Lake St.	6	6	Elmer Rantanen	11-1-37

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6. SURFACE

b. Location Dwelling Repairs

The following houses were purchased during 1937:

House No.	Lot	Block	Addition	Purchased From	Date
178	Unplatted		Ann Street	Anton Hansen	5-27-37
179	13		Read & Winters	Elizabeth Gribble	7-28-37
180	1,2,3,4	1	Maitland	H. K. Maitland, Est.	8-2-37
181	11	32	Pioneer Plat	Margaret Corly	8-28-37

b. Stockpiles

There was a total clean up of the stockpiles in 1937 except for one pile of Maas grade ore lying to the Southwest of the shaft which had only been stocked since March of this year. The old piles of Maas ore which had been in stock for a long time were loaded out, thus leaving the grounds in good shape for future stocking.

There were 25,072 tons of previous years stockpile overrun and 14,373 tons of current years overrun developed in 1937 in the two Bessemer grades and the Race Course Non-Bessemer. The Maas grade ore remaining at the end of the shipping season would have been nearly all overrun were it not for the fact that approximately 20,000 tons of Maas ore that had been in stock for a long while and did not show on the book figures was shipped and credited against the current years hoist which, of course, was the only way it could be handled. However, even though no credit to the cost of operation for 1937 could be made, there was at the end of the season approximately 40,000 tons of overrun in stock.

c. Tracks, Roads, Etc.

There was no change made during the year in either the roads or the tracks at the Mine except the necessary repairs. There was, however, a very extensive program carried on in the Cleveland-Cliffs Iron Company's second addition where the main sidewalks, curbs and entrances to the houses were graded and concreted during the summer on all of the streets except the South part of Maple Street where the State intended to build a concrete highway this year. This was held up on account of acquiring some of the right-of-way and so nothing will be done here until it is definitely decided as to what move the State is going to make. The other streets were macadamized after which the lots were graded and fenced in. The seeding of the lots and planting of the trees and shrubbery will be done as early as the weather permits next spring. The ornamental lighting posts were installed and all of the cable was laid underground to keep away from overhead wires and when the current was turned on early in November, the whole location presented a very attractive appearance by night as well as in the day time.

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6. SURFACE

d. Timber Yard

There were 337 railroad cars of various kinds of mine timber unloaded during 1937 and at all times the timber yard was kept nearly filled on account of possible trouble between the labor organizations and the jobbers. They were fortunate, however, in having very little trouble and the mine was never short of the necessary supplies. A considerable quantity of the timber was also brought in by truck and at a fairly constant rate which saves having to maintain a large crew to unload the cars onto the skidways, the truck drivers unloading their own timber.

e. Drainage

Early in January the Layne Northwest Company assembled their equipment for installing a deep well pump on surface to catch as much water as possible before it could go down through the broken jasper hanging and thence into the mine.

Last year they drilled six test holes, after which they decided that the best location would be approximately 250 feet South and 200 feet West of the shaft. They first put down a cribbed shaft $7\frac{1}{2}$' x $7\frac{1}{2}$' inside and and then placed a pipe 72" in diameter and 15' long in the bottom extending 10' into the ground below. The next step was to place a 48" diameter pipe, the lower 20' of which was of the so called shutter screen type, extending from surface to a depth of 115'. This was completed early in April and they started to place a 38" diameter pipe inside of the 48", intending to extend the 38" very close to the ledge which is 219' from surface, but the hard pan and clay seams held the pipe from descending and after working until the middle of May this was abandoned, the 38" pipe pulled out and an entirely new idea put into practice.

The well was sunk from the bottom of the 48" pipe to the ledge with a rotary digger, the sides of the well being held back by forcing clay against the walls. A 26" diameter shutter screen pipe was then placed from the bottom of the 48" down to ledge and gravel introduced between the sides of the hole and the pipe. There were several delays and the first pump was not installed until September 2nd, after which they only pumped for two days before the pump broke down and it was found that the fine sand had cut out the impellors. After various attempts to clear up the sand by pumping, bailing, etc., they installed a 16" shutter screen pipe inside of the 26", hoping to introduce more gravel between the two and thus hold back the fine sand. The pump having again been repaired, it was installed about 40' above the ledge at the top of the 16" pipe on December 10th and pumped almost 200 gallons per minute for two weeks with the water carrying very little sand. About the middle of the month, in trying to lower the pump to the bottom of the well, a section broke loose, striking the top of the 16" pipe and bending it so that the pump could not enter. Since that time they have been

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6. SURFACE

e. Drainage (Cont.)

unsuccessful in straightening this pipe and therefore there has been no further pumping.

The whole venture has been very dissapointing and also very costly to the Layne Northwest Company as well as ourselves and it is ardently hoped that they can overcome their difficulties and resume pumping early in 1938. An 8" pipe line has been laid from the pump to the Maas Mine discharge North of the shaft and as soon as the water is clear enough this connection will be made and there should be a noticeable improvement underground in a very short time.

7. UNDERGROUND

a. Shaft Sinking

There was no shaft sinking during 1937.

b. Development

There were 8 contracts on development work during 1937, 6 of which were raising and 2 drifting, mostly in ore, although there was some rock development both in drifting and raising.

Third Level

Near the middle of the year it was decided to put in a transfer system in the East footwall pillar above the Third Level as the distance from the present raises to the Southern extension of the ore body was becoming too long for the scraping units to scrape ore efficiently. This transfer drift was installed on the 355' Sub Level about 40' above the Third Level and three raises were put up to the 425' Sub Level and mining from them started in November.

Fourth Level

About the middle of the year when the water condition became so bad, it was decided to drive a new cross-cut further to the East of the Race Course lease and put up raises to the hanging in an area where comparatively little mining had been done and where it was hoped that the mining would consequently be dry. Three contracts, 1 drifting and 2 raising, have been employed here during the last half of the year.

Fifth Level

The South footwall was extended some 250' to the Northeast, parallel to the Negaunee boundary and four raises put up to the Fourth Level and above, the drift and the first 50' of the raises

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7. UNDERGROUND

b. Development (Cont.)
Fifth Level (Cont.)

being in rock. No. 7 cross-cut was started from the West end of the South footwall drift and continued approximately 250' to the Southwest boundary of the Race Course lease, mostly in lean ore. Two raises are being put up here to mine the Western extension of the ore body South of the Race Course. The only other development in the Fifth Level was raising in No. 4 and No. 6 cross-cuts where several raises were put up in the former to the Fourth Level and above, and one in the latter to the hanging just below the Fourth Level and South of the main North dike.

Detail of the development is as follows:

Location	Ore Drifting	Ore Raising	Rock Drifting	Rock Raising
435' Sub Level			20'	
385' Sub Level		75'	10	
355' Sub Level		180		
Third Level	15'			
Fourth Level	736	582	75	44'
75' Sub Level		115	15	
Fifth Level	292	1,367	383	305
Total	1,043'	2,319'	503'	349'

c. Stoping
General

Mining was carried out in four general areas throughout 1937 with an average of 36 mining contracts. No. 1, the East footwall pillar above the Third Level where there was an average of 7 contracts mining between the 415' and 450' Sub Levels. There is considerable water in this territory but it was controlled by driving drainage drifts along the footwall, thus making the hanging wall side comparatively dry. The ore was entirely of Non-Bessemer grade and was mostly in the Maas and Roman Catholic Cemetery leases with a small amount in the Cleveland-Cliffs Iron Company and American Mining Company leases. No. 2, the West footwall pillar above the Third Level where 3 contracts were employed continuously in the Maas, City of Negaunee, and Race Course leases, the ore being dry and all of Non-Bessemer grade. No. 3, the territory East and Southeast of the Race Course lease, above

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7. UNDERGROUND

c. Stoping
General (Cont.)

the Fourth Level, which was reopened last fall after having been abandoned for several years during which it was desired to produce a large quantity of Bessemer ore and concentrate the mining in the Race Course lease to the West. It has been very difficult to obtain good results in this area as the old covering has become so rotten that it will not hold back the broken jasper and as a large quantity of water came in here after the cave to surface occurred in February, the water washes down the loose rock, causing numerous runs and thus delaying production. It was necessary to reopen this territory in order to make more places available as those in the main territory in the Race Course lease were too congested for efficient mining and also would be mining too much of the special grade if allowed to mine out the territory so rapidly.

The ore on two sub levels will have to be removed before the matt will be sufficient to hold back this rock and it is also hoped that the surface well is in operation by that time and then this area should produce very good results. There is some Bessemer ore here but the majority is of Non-Bessemer grade and mostly in the Maas Lease with a small amount in the City of Negaunee, Cleveland-Cliffs Iron Company and American Mining Company leases. There were about 8 contracts employed in this territory during the year. No. 4, the main area below the Fourth Level, in and South of the Race Course lease where the grade is almost 50% Bessemer and 10% Special grade. The majority of the ore mined at the Maas during 1937 came from this area which is cutting off on the South, due to the flattening of the footwall and enlarging slightly to the West under the hanging. This territory had been absolutely dry until last February when the cave to surface occurred and the water increased throughout the year until by December there were only 4 dry contracts left out of 20 in this area. This water problem is the greatest handicap at the present time, not only on account of loss in product, but also from a safety factor. It is a hazard in the working places as the water causes movements of ore in the breast and sides and if, by any chance, there is some ore left in the chute, the water which cannot be directed to run down the ladder compartment will accumulate on top of the ore and then when they open the chute a rush occurs which can be very dangerous. To avoid this and also to be able to catch at least 80% of the ore, it is generally held on the sub until there is a car underneath and then scraped directly into the car through the open chute. This causes lots of delays for the miners and then the cars have to be held at the shaft until a skip is spotted, instead of dumping into the storage pocket. Enough of the ore splashed over to fill the ditches and cover the track so that by the end of the week from 60 to 80 cars have to be cleaned up by extra labor, besides the extra wear on the moving equipment due to dirty tracks.

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7. UNDERGROUND

C. Stoping
General (Cont.)

With the large development program that has been in effect in 1937 it has been possible to keep the contracts further apart, mining in 100' blocks instead of 30' as heretofore and the result has been very gratifying. In fact, if this had not been planned and partially carried out before the sudden increase of water, it would probably have been almost impossible to average over 12 tons per man stoping in these last two areas, as they were extremely heavy and traveling roads and raises were constantly crushing, necessitating the stopping of the contracts to repair them as there was no other place available for them to move to.

In December when it was decided to curtail operations to a four day per week schedule for the men and eliminate the third shift, it was found necessary to stagger the men from the third shift, whom we did not want to lay off, with those from the other two shifts by working the mine six days per week with a smaller number of men. At this time also it was thought advisable to have as many of these crews on the staggered operation as possible, whereas before there had been about 26 on double shift only and therefore in December there were only 33 mining contracts as compared with 38 in November, while the development crews were decreased by one, leaving a total of seven.

Subs Between the 2nd & 3rd Levels

East Footwall Pillar

465' Sub Level

The only work done at this elevation during 1937 was the removal, in January, of a small pillar on the footwall and in the Roman Catholic Cemetery lease which was part of a pillar which had been left behind when mining below the Second Level in order to attempt to hold back the water on the footwall. After mining had reached a point so far below the Second Level that the surrounding ground became cracked up and let the water through, it was decided to mine this pillar, which was completed in January of this year, and the ore had to be transferred through the 450' Sub Level to the Third Level.

450' Sub Level

This Sub Level has been worked intermittently for the past several years and the few remaining pillars were completed in May of this year. These pillars were in the Maas and Roman Catholic Cemetery leases.

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7. UNDERGROUND

c. Stoping (Cont.)

435' Sub Level

With the exception of a small amount of ore to the South under the hanging which had been mined previously, this area was opened up in 1936 and worked continuously during 1937. The footwall side of the ore body was verywet and only by driving drainage drifts along the footwall prior to any other mining were we able to keep the hanging side at all dry, but by this method of mining the remainder of the ore body was worked very efficiently. The only two leases worked on at this elevation during the year were the Maas and Roman Catholic Cemetery and in December there were three contracts still employed on this Sub Level, all in the Maas lease, their locations being as follows: No. 35 moved from No. 115 Raise to No. 113 Raise in the latter part of the month; No. 8 completed mining at 108A Raise and moved to No. 1111 Raise on the 425' Sub Level toward the latter part of the month, while No. 7 was mining a pillar left near the footwall at 111A Raise.

425' Sub Level

The Eastern end of this Sub Level was opened last November and worked continuously during 1937, mostly in the Roman Catholic Cemetery lease with a small portion in the Railroad Pillar. In December one contract was connecting between Raises Nos. 116 and 115 along the South boundary of the Roman Catholic Cemetery lease. In October of this year there were three raises completed to this elevation from the transfer sub below, which method of mining was deemed advisable on account of the ore extending so far to the South from the regular line of raises that the distance required to scrape the ore was too long to be efficient for the scraper hoists. In November mining was started here connecting raises, then subsequently starting to mine under the hanging to the South and in December three contracts were employed at this elevation; Nos. 2 and 8 connecting raises from No. 1111 Raise, East and Northwest respectively, while No. 9 was mining from No. 1112 Raise, all in the Maas lease.

415' Sub Level

Mining in this territory was started in July, 1937, in the extreme Eastern end of the pillar and after the water had been drained off on the footwall side, as mentioned above, the two contracts mining here very rapidly removed the dry ore on the hanging side and even though the slices were of exceptional length, these two contracts had the best average tons per man for the entire year of all the contracts in the Maas Mine, and in December they were both still mining as follows: No. 29 at No. 119 Raise and No. 6 at No. 121 Raise, both in the Roman

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7. UNDERGROUND

c. Stoping (Cont.)

415' Sub Level (Cont.)

Catholic Cemetery lease, where most of the mining was in progress this year with the exception of a small portion in the Maas and Cleveland-Cliffs Iron Company strips.

There has been considerably more mining on this Sub Level and on the Subs above in the Roman Catholic Cemetery lease this year than in former years, due partly to increased production and also to the fact that the Fifth Level area became so wet that it was deemed advisable to transfer more contracts to the dry hanging ore in this area to facilitate production and lower the costs.

355' Sub Level

This transfer sub level was driven from the top of No. 111 Raise in July and August of this year, after which three raises were put up some 75 feet to the 425' Sub Level. The ore that has been subsequently mined from these raises is comparatively dry and this transfer system has worked very advantageously as the timberman who supplies the three contracts above with timber, scrapes out the ore on this transfer sub level in his spare time and without much additional cost. This transfer sub is in the Maas lease.

West Footwall Pillar

401' Sub Level

During 1936 a considerable portion of the ore removed on this elevation was taken from a system of open stopes raised up on the North footwall in which there was no timber required and as the hanging was fairly solid and did not permit much adulteration of the ore, proved a very favorable method of mining. However, near the last of the year, the most Westerly stope seemed to be entirely bounded by jasper and therefore this method of mining had to be discontinued and up to May, 1937, the Western end of this Sub Level was completed by the top slicing method, entirely in the Race Course lease.

395' Sub Level

This Sub Level was opened up in September, 1936, and was completed in October of this year. The area being mined here is very much smaller than that on the Sub Level above as the footwall isvery flat and cuts off the ore very rapidly on the North, while the hanging wall is much steeper and does not extend hardly any to the South as mining descends. The majority of the mining this year was in the Race Course lease with one pillar in the City of Negaunee strip.

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7. UNDERGROUND

c. Stoping (Cont.)

385' Sub Level

This Sub Level was opened up in January of this year by cutting out in No. 5W Raise and connecting to No. 20W Raise, after which mining was started which was all done by the top slicing method until November of this year, when it was found that the ore was again rising on a very flat footwall to the Northwest of any ore found on the Sub Level above. During November and December there has been considerable exploratory work done in this area and the ore has been found so far to extend as high as the 401' Sub Level and some 60' to the West of the supposed jasper limit which was found when that Sub Level was mined last year, thus proving that the jasper which was then supposed to be the hanging was apparently only a small seam.

It is hoped that there is some relationship between the ore body just mentioned and the ore found above the Third Level in No. 2 diamond drill hole from surface, some 300 feet to the Southwest of this point, although all indications on the Third Level and Sub Levels between would tend to show that the hanging separates these two ore bodies. There is a possibility, however, that there is a sheet of ore approximately 40' thick between two seams of jasper and extending to the Southwest towards this drill hole and explorations will be continued until it is definitely proven whether or not this condition exists.

Mining on this Sub Level was both in the City of Negaunee and Race Course leases and the work in December was entirely in the Race Course lease, No. 11 Contract mining from No. 18W Raise.

375' Sub Level

In August of this year one contract connected Raises Nos. 8W and 5W and started mining to the North of No. 5W Raise where this contract, No. 10, was still mining at the last of the year, partly in the Race Course and partly in the City of Negaunee lease. Later in the year No. 12 Contract was moved down from the Sub Level above and started mining to the North of No. 8W Raise. It was found that the footwall had again gained to the South some 25' in only 12' vertical height which so decreased the mining area that it was impossible for this contract to do any more mining on this footwall without interfering with No. 10, and therefore in December they started to open up under the hanging to the Northwest of No. 8W Raise, entirely in the Race Course lease. Although the ore on this and the above mentioned Sub Levels has been quite hard, the entire territory is very dry and on the whole the contracts have averaged better than normal production.

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7. UNDERGROUND

c. Stoping (Cont.)

Third Level

The only work done on this Level during 1937 was in the extreme West end where there was an attempt to explore to the West toward No. 2 Diamond Drill Hole by means of a Sullivan Deep Hole drilling machine but it was found that the jasper was too hard for this type of machine and after drilling some 30', this work was abandoned until such time as a diamond drill is available, when it is planned to do some further exploring in connection with that now being done on the 385' Sub Level.

Toward the latter part of the year a raise was put up on the footwall from the Fourth Level and upon reaching the elevation of the Third Level in the latter part of November, a small drift was driven in lean ore and jasper to the Northwest and holed to the main Third Level drift about 100' West of the old winze. There is one sub level above the Third Level yet to be mined out in this territory and it was thought advisable to resume operations here so that the pillar which would be left between the mining to the East and West would not become too heavy, as the mining to the East had advanced to a point 55' below this territory and when the mining to the West also advanced to that point, this area would become very heavy and hard to mine. This connection between No. 4002 Raise and the Third Level will be used for ventilation and traveling road while this pillar is being mined by No. 42 Contract, who also put up this Raise in the Maas lease.

The only other work on the Third Level during the year was that of continuously having to have an extra crew out once a week to clean the ditches and tracks as there is some 600 or 700 gallons of water coming down through these raises in the Eastern part of the Level where the footwall raises are used for mining, consequently a large amount of dirt is washed out on the tracks, making it almost impossible to keep them clean. About 300 gallons of the water in this area was diverted to the Negaunee Mine after the surface cave in February and as that is handled in a pipe from the bottom of the raises, it somewhat relieves this condition which may be still further improved in 1938 if the surface well functions as well as is expected.

Subs Between the 3rd & 4th Levels

195' Sub Level

Some time in 1936 when it was found that the market for Bessemer ore was not as great as it had been formerly and that it would be advisable to find some other territories for mining where a Non-Bessemer ore existed, it was decided to open up a block of

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7. UNDERGROUND

c. Stoping (Cont.)

195' Sub Level (Cont.)

ore lying from 150' to 250' East of the Race Course lease and about 400' long, extending some 80' above the Fourth Level. Raises were put up in this area from the Fourth Level and encountered the hanging at various elevations, and in the extreme Northern end it was found that the ore extended to the elevation of this Sub Level while the raises to the South struck the jasper at a point two Sub Levels lower down and early last fall mining was started at these various points. This year, however, it was found that those contracts mining at lower elevations had only encountered a sharp roll in the hanging and upon drifting to the Northeast, found the ore running much higher and in fact caving through to an old drift which had been driven in the hanging in this territory several years ago. Therefore, it was found necessary to put up a transfer raise from the 170' Sub Level to the 195' Sub Level and mine out as much of the ore as possible between this cave and the mining limit to the East. All the work on this Sub Level, which was entirely in the Maas lease, was completed in March of this year.

185' Sub Level

In mining the ore to the South in this area, as before mentioned, it was planned to cut out at this elevation and remove the ore between the 170' and 195' Sub Levels but when the cave to surface broke through, the territory became exceedingly wet and it was almost impossible to maintain mining here. Therefore it was decided it would be practical to complete the small amount of mining left on the 170' Sub and cover the floor with close poles, wire netting and as much old timber as possible to form a safe matt to work under, but in the Northern end, at No. 625 Raise, a contract was able to slice very efficiently in fairly dry ground and worked continuously from March to December, entirely in the Maas lease.

170' Sub Level

As mentioned above, this Sub Level was opened up in 1936 and then the central territory had to be abandoned until the mining had been completed on the Sub Level above, but on the Southern end an area some 150' square was mined out under the old covering with fairly good results until the water also made mining here prohibitive. All the mining on this Sub Level was in the Maas lease and No. 3 Contract remained here mining the last pillar at No. 629 Raise early in December.

160' Sub Level

Early this year it was found that the contracts mining in the area below the Fourth Level, mostly in and South of the Race

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7. UNDERGROUND

c. Stoping (Cont.)

160' Sub Level (Cont.)

Course lease, were too congested with the result that the traveling roads were too heavy and also some of the slices would break down before reaching the limit when two contracts were mining in the same direction in adjacent raises, and therefore raises were put up from the Fifth Level in No. 4 Cross-cut to the Fourth Level and above, Southeast of the Race Course in a territory which had not been mined in several years and it was hoped that it would take the place of the area in which appriximately one-third of the contracts were mining below the Fourth Level. It was found, however, that this territory was exceedingly heavy, the tops of the raises and the connecting drifts from the same on both the Fourth Level and this Sub Level crushing almost before any mining had been started. They all had to be re-opened and then when mining had started, the covering on the Sub Level above was found to be so badly rotted that it was constantly breaking and letting runs of jasper hanging through into the working places. Also towards the last of the year, this territory became very wet and as a result several pillars have had to be abandoned and mining has been very slow and inefficient. The same condition exists on the Sub Level below as the repairing of the old Fourth Level Cross-cuts and also the new connections have disturbed the ground so badly that it is all cracked up and only mediocre results can be expected until a good matt has been established over the entire area which will probably not be until the Fourth Level is reached. The only hope that this area may improve is that the surface well may take water away from this area and if the ore is dry, it will be easier to block up the old covering and stop the runs of rock. Mining here was mostly in the Maas lease with a small portion in the Right-of-Way.

150' Sub Level

This Sub Level was opened in March, Southeast of the Race Course and has been worked intermittently throughout the year, having to stop several times on account of the reasons mentioned under the above Sub Level. In December work was resumed at two of the raises and it is hoped that mining can progress here for some time. At the last of the year Contracts Nos. 44 and 36 were mining Northeast and Southwest, respectively, from No. 628 Raise. All the work this year was in the Maas lease.

140' Sub Level

It was likewise decided to open the territory immediately East of the Race Course lease for further places to remove contracts from the main ore body below the Fifth Level and almost identically the same conditions were found to exist here that existed

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7. UNDERGROUND

c. Stoping (Cont.)

140' Sub Level (Cont.)

Southeast of the Race Course. The drifts and tops of the raises had to be repaired twice before mining could start. However, near the last of the year it was found that the drifts in the North end of this area from Raises 5410 to 5428 were much more solid and are giving very little trouble; and although this territory is also wet, the covering seems to be considerably firmer above this a rea than it was to the South. In December there were three contracts mining as follows: No. 28 connecting Raises 5424 and 5426; No. 37 mining at No. 5428 Raise, and No. 41 mining to the South of No. 5434 Raise.

Fourth Level

During 1937 there was both mining and development work at this elevation, the mining being confined to the Northwest under the hanging in the Race Course lease and to the ore body South of the dike and along the Negaunee boundary at No. 511 Raise, both of these areas being mined out early in the year. All of the raises put up from No. 4 Cross-cut in the Fifth Level were connected on the Fourth Level before being raised to the Sub Level above, a new procedure for the Maas Mine being introduced at this time. Heretofore it had been the practice for each raise gang to cut out at the top of their raise, hoisting the timber for the same before leaving the place to start another raise and this work took from two to three weeks to accomplish. This year it was decided to only open one in every four or five raises in this manner and then have a mining contract connect the raises, putting timber over the raise as each connection was made, which was much more speedily accomplished when drifting than when working in the confined quarters at the top of a raise. The aforementioned drifts were also the ones that have closed and given so much trouble owing to thepillar in this area being so badly broken up.

In May it was decided to open still another block for mining on account of the trouble experienced in the other two areas above this level and where it was expected there would not be much water or heavy ground on account of the fact that there had been no mining previously above this block, which is from 275' to 400' East of the Race Course lease. This territory was developed by a footwall drift running East and West from the main shaft Cross-cut approximately 60' North of the old winze and when it had reached a point just North of the winze, the Cross-cut was turned off to the Southeast and by the last of the year had advanced approximately 300'. The footwall drift, contrary to expectations, was mostly in ore, it being thought to be far enough North to be in the footwall and the Cross-cut was entirely in a

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7. UNDERGROUND

c. Stoping (Cont.)

Fourth Level (Cont.)

good grade of ore with the exception of 40' which is evidently the bottom of a jasper trough descending from the hanging. No. 47 was driving this cross-cut in the Maas lease in December. From the footwall drift two raises were put up, one East and one West of the winze. The one to the West, No. 4002, reached the Third Level in November and was entirely in ore and No. 20, working in No. 4004, was 194' high at the end of the year and had passed through a seam of rock from 96' to 140'. The only other raise put up directly from the Fourth Level was that of No. 602A, which was used for a short time for traveling and timber road while connecting some of the raises from the Fifth Level. All of the other raises put up from the Fifth Level were extended to the various Sub Levels but the ore was taken out on the Fifth Level and therefore they are considered Fifth Level Raises. Also in December No. 34 Contract was driving a connection from the top of No. 531 Raise to the 600 Cross-cut on the Fourth Level in the Maas lease before extending this raise to the 150' Sub Level

100' Sub Level

This area which is partly in and partly South of the Race Course lease and which has been the main Bessemer area for the past several years, was completed this year with the exception of No. 24 Contract which is mining under the hanging in the Northwestern part of the ore body from No. 5616 Raise in the Race Course lease. As most of the mining done this year was done in the early part of the year and before the effect of the cave had been felt, the ore was dry and consequently the results obtained were very good with the exception that the contracts were probably too close together. After the cave this area too started to get wet and by the last of the year there were only two contracts mining dry ore in this entire area. It is certainly hoped that the surface well will improve these conditions in 1938.

90' Sub Level

This Sub Level has been the chief origin of the Bessemer ore for 1937, approximately 75% of the ore removed on this Sub Level being Bessemer grade. With the exception of a small pillar to the South and a medium one to the North, mining has been completed at this elevation in this territory. The ore removed was about evenly divided between the Race Course and Maas leases and in December No. 30 Contract was removing the small pillar along the North side of the dike from No. 5645 Raise, while No. 26 was mining South of the dike from No. 511 Raise, both in the Maas lease.

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7. UNDERGROUND

c. Stoping (Cont.)

75' Sub Level

Mining at this elevation was started in March, 1937, and has been continuous throughout the remainder of the year. This is also a Bessemer territory and while the ore on the Sub Level below in the Maas lease will probably also be mostly Bessemer, that in the Race Course lease will, without doubt, be at least 50% Special grade as the analysis of the raises put up in this territory show this Special grade to exist as high as the bottom of the 75' Sub Level. A drift was driven from No. 5616 Raise North to the dike and a raise put up to the Fourth Level to improve ventilation in this area and above. The ventilation is thus handled from the Fourth Level in the North end of the 5600 series of raise and also in the North end of the 5500 series via the 100' Sub Level from the Fourth Level, while the ventilation in the Southern end all comes from the Negaunee Mine Thirteenth Level which is reached by a rock drift in the footwall from No. 522 Raise to the Negaunee boundary and thence by a raise 140' high to the Thirteenth Level. Late in the fall it was decided that there was not adequate ventilation on the Fourth Level in the new areas being opened up Southeast of the Race Course and therefore a drift was driven in ore at this elevation from No. 528 Raise to the Negaunee boundary, and in December No. 31 Contract was raising in ore to the Thirteenth Level for an additional air outlet. In December the contracts were allocated as follows:

Cont. No.	Raise No.	Lease
51	5518	Race Course
43	5526	"
23	5528	"
32	5532	"
22	5626	"
50	5628	"
38	5636	"
48	5538	Maas
49	5542	"
46	5642	"

This territory was about 60% mined at the end of the year.

65' Sub Level

Mining was in progress in two places at this elevation during 1937, the first being a small pillar completed under the hanging to the North of No. 5623 Raise in the Race Course lease, while the other was in progress this fall. In December No. 45 Contract was connecting raises to the North of No. 5528 Raise in the City of Negaunee strip to make a traveling road nearer to the workings above.

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7. UNDERGROUND

c. Stoping (Cont.)

50' Sub Level

This Sub Level was started last December and completed in July of this year. It was entirely in the Race Course lease under the hanging to the West of No. 6 Cross-cut and was approximately 50% Special grade.

40' Sub Level

This Sub Level, just under the one mentioned above, was started in June of this year and was worked continuously until December. Two contracts, No. 33 at Raise No. 5637 and No. 40 at Raise No. 5623 were still mining on the Western side of the main connecting drift. The ore on this Sub Level has been almost entirely Special grade and is about 90% mined out.

Fifth Level

The work on the Fifth Level during 1937 has been entirely on a development order, consisting of three main level drifts and also raising which has been continuous throughout the year. The first drifting was that in the South footwall which was extended 250' to the Northeast in jasper from February to May. In July after a Western extension of the ore body had been found Southwest of the Race Course on the 90' Sub Level, it was decided to start No. 7 Cross-cut in order to put up raises to this territory, the hanging being too far from the present raises for efficient mining, and this Cross-cut was advanced to the Northwest about 250' in lean ore to the Southwest corner of the Race Course, reaching this point in October. This contract was then moved to the Shaft Cross-cut where a stub drift had been turned off in the footwall for the purpose of driving No. 3 Cross-cut at some later date and in November they started to extend this stub drift in the footwall towards the P.C. of the curve for No. 3 Cross-cut, but when the curtailment occurred in December and it was necessary to handle all the ore on two shifts rather than three as formerly, it was found that handling this rock was too much of a handicap, both as regards the underground pockets and the transportation by motor train, and therefore No. 19 Contract was removed from here about the middle of December and split up with other mining contracts for the time being. However, this work will be resumed as soon as the rock can be handled, as it is necessary to have raises to take theplace of the 600 series of raises on the Fourth Level when mining is advanced two more sub levels or to the 150' Sub Level.

The following raises were put up during the year: 5420, 5422, 5424, 5426, 5432, 5636, 5742, 5745, 526, 528, 529, and 531; all of them being raised to the Fourth Level except No. 5616 which stopped at the 100' Sub Level and Nos. 5742 and 5745 which stopped

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7. UNDERGROUND

c. Stoping (Cont.)

Fifth Level (Cont.)

at the 90' Sub Level. In addition the 5400 and 500 series were all extended some 40' or 50' above the Fourth Level, and in December the only contracts working on this level were No. 39 in Raise No. 5745 and No. 4 in Raise No. 5742.

d. Timbering

There was considerable repairing of main levels, especially on the Fourth Level during 1937, although the larger amount of the repair work was in the traveling roads, in the Sub Levels and the raises. There was excessive weight in the new area being opened up just East of the Race Course lease and the tops of the raises and connecting drifts crushed almost as soon as they were completed. They have been reopened twice and at the last of the year three gangs of timbermen were still employed here, but as soon as mining reaches the Fourth Level there should not be any more than normal weight here.

The percentage of 9' legs over 7' and 8' was increased from 60% to 80% by giving more attention to the slope of the floor in the working places, which formerly were inclined up hill towards the breast and consequently the miners had to cut their legs or order shorter timber as they came closer to the old covering above. This cut down the product as they had to complete the same cycle and use as much powder for considerably less ore.

From the timber statement it appears that in all types of timber the feet of timber per ton of ore was less in 1937 than in 1936 and this was made possible on account of the reason explained in the above paragraph. There was slightly more cribbing used on account of more raising this year, the cost per ton was greater even though there was less timber per ton used as the price of timber naturally was higher in 1937 than in 1936.

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7. UNDERGROUND

d. Timbering (Cont.)

Statement of Timber Used

Kind	Linnear Feet	Price	Amount 1937	Amount 1936
6" x 8" Cribbing Timber	151,800	.0371	5,631.90	3,618.22
8" x 10" Stull "	114,216	.0612	6,993.51	4,735.11
10" x 12" " "	141,407	.097	13,716.57	9,350.80
12" x 14" " "	74,604	.1292	9,642.17	5,213.57
12" x 14" Treated "	1,855	.1984	368.17	458.42
Total Timber - 1937	483,882	.0712	36,352.32	
Total Timber - 1936	352,852	.0662		23,376.12
7' Lagging	1,938,722	.7903	15,322.79	10,586.17
9½' Poles	1,349,219	1.320	17,809.70	12,529.20
Total - 1937	3,287,941		33,132.49	
Total - 1936	2,688,983			23,115.37
Wire Fencing - Sq. Ft.	30,250	.0069	210.60	460.81
Grand Total - 1937			69,695.41	
Grand Total - 1936				46,952.30

	Amount 1937	Amount 1936
Product, Tons	780,189	539,462
Feet of Cribbing & Stull Timber per ton of Ore	.6202	.654
Feet of Stull Timber per ton of Ore	.4256	.462
Feet of Lagging per ton of Ore	2.4849	2.806
Feet of Poles per ton of Ore	1.7293	2.1785
Feet of Wire Fencing per ton of Ore	.0387	.1350
Feet of Lagging per Foot of Timber	5.838	4.2900
Feet of Poles per Foot of Timber	4.062	3.3300
Cost per Ton for Timber	.0465	.0434
Cost per Ton for Lagging	.0196	.0196
Cost per Ton for Wire Fencing	.0003	.0008
Cost per Ton for Poles	.0228	.0232
Cost per Ton for All Timber	.0892	.0870
Equivalent of Stull Timber to Board Measure	1,030,464	720,956
Feet of Board Measure per Ton of Ore	1.321	1.336

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

Year	Amount	Cost Per Ton
1937	69,695.41	.0892
1936	46,952.30	.0870
1935	32,985.69	.0907
1934	29,435.36	.1055
1933	23,285.71	.1769

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7. UNDERGROUND

e. Drifting and Raising

The following is a comparison of the drifting and raising in the years 1937 and 1936:

Year	Drifting		Raising	
	Ore	Rock	Ore	Rock
1937	1,043	349	2,319	503
1936	540	369	1,347	397
Increase	503		972	106
Decrease		20		

With the exception of the rock drifting there was considerable increase in the amount of development during the year, the greatest increase being that of ore raising on account of opening up another block of ore to the East and Southeast of the Race Course lease above the Fourth Level with raises from the Fifth Level, which were 170' high. There were four drifts extended in 1937, three on the Fifth Level and one on the Fourth Level.

The development program for 1938 will be equally extensive as there are two main level cross-cuts to drive and several raises to put up from both the Fourth and Fifth Levels.

f. Explosives, Drilling and Blasting

Stoping and Ore Development

Kind		Quantity Pounds	Average Price	Amount 1937	Amount 1936
1¼" 60% Amonia Gel. Pwd.		19,300	.1292	2,494.00	
1¼" 50% " " "		207,175	.1164	24,116.31	24,631.55
1¼" Gelamite 1 "		70,800	.1224	8,672.12	
Total Powder - 1937		297,275	.1153	35,282.43	
Total Powder - 1936		222,705	.1106		24,631.55
Fuse	M Ft.	1,071,870	5.65	6,054.12	4,348.71
#6 Blasting Caps	M	158,300	12.61	1,996.18	1,246.26
Electric " "		3,173	.1101	349.52	270.99
Powder Bags		105	2.31	243.00	172.96
Tamping Bags					30.13
Fuse Lighters		25,800	6.82	176.10	125.35
Fuse Seal	Pt.	34	.558	19.00	19.60
Blasting Machines					35.00
Connecting Wire		1,000	12.00	12.00	34.00
Total Fuse, Caps, Etc.				8,849.92	6,283.00
Total All Explosives				44,132.35	30,914.55

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7. UNDERGROUND

f. Explosives, Drilling and Blasting (Cont.)

	Amount 1937	Amount 1936
Product, Tons	780,189	539,462
Pounds of Powder per ton of Ore	.381	.4128
Cost per ton for Powder	.0452	.0456
Cost per ton for Fuse, Caps, Etc.	.0113	.0116
Cost per ton for All Explosives	.0565	.0572

Rock Development & Filling

Kind	Quantity Pounds	Average Price	Amount 1937	Amount 1936
1¼" 60% Amonia Gel. Pwd.	3,450	.1278	441.00	
1¼" 50% " " "	4,025	.1161	467.56	591.71
1¼" Gelamite 1 "	200	.1225	24.50	
Total Powder - 1937	7,675	.1215	933.06	
Total Powder - 1936	5,265	.1123		591.71
Electric Blasting Caps	300	.111	33.30	
Fuse M Ft.	23,060	.565	130.29	103.34
#6 Blasting Caps M	3,280	11.70	38.40	29.30
Total Fuse, Caps, Etc.			201.99	132.64
Total All Explosives			1,135.05	724.35
Total Explosives used at Mine			45,267.40	31,638.90
Average Price per pound for Powder			.119	.112

Statement showing cost per ton for Explosives, exclusive of rock development, for the period 1933 to 1937:

Year	Cost per Ton	Production
1937	.0565	780,189
1936	.0572	548,473
1935	.0580	363,480
1934	.0614	278,985
1933	.0634	131,574

The cost per ton for powder was reduced in 1937, even though there was an increase in the price per pound, by the introduction of 23% of "Gelamite No. 1", a powder which is approximately equal in strength to 60% Amonia Gelatine. While the price per pound is the same, there are some 22 more sticks per 100 pounds, thereby effecting a saving. It is intended to experiment some with Gelatine No. 2 which is equivalent to 50% Gelatine and see if it is possible to cut the cost still further.

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7. UNDERGROUND

h. Mining and Loading

Several times during the year it was necessary to transfer the ore for a short time but there was only one main transfer sub in regular use and this was installed in the East footwall pillar 50' above the Third Level, and transfers the ore from three working places above. The remainder of the ore was removed by the regular top slicing system direct to the raises with electric hoists and scrapers.

All of the 6½ H.P. hoists have been discarded except for exploratory purposes and there were two Sullivan 25 H.P. frames purchased during 1937 to take the place of the old type frames which were formerly used for transfer work and are too large to go through the raises in placing them in a sub level. The old motors were transferred to these new frames, besides which was purchased one 15 H.P. Ingersoll hoist.

The percentage of 9' stull timber over 8' increased about 20% during 1937 with correspondingly better results from the mining contracts as in the larger place, for the same amount of work and cost, one-eighth more ore can be recovered.

The water that entered the Fourth and Fifth Level workings after the new cave to surface in February of this year was a very serious handicap as this territory had been quite dry and although handicapped by extreme weight, had been the most productive territory in the mine. It is hoped that when the deep well on surface is in operation that this territory will again be dry and it will be possible to show much better results.

In December, 1936, round bottom skips of six tons capacity, an increase of one ton over the old skips, were installed as it was impossible to hoist the increased product with the small skips. These new skips were first estimated to hold 5.1 tons and then later, after enough ore had been shipped to determine their average load, this was increased to 5.5 and later to 5.65 when it was decided to hold the overrun to approximately 5%.

A two deck aluminum cage was also installed on May 30th to take care of the increased amount of timber and also to carry the men to and from the levels more speedily.

i. Ventilation

On the whole, the ventilation of the Maas Mine during 1937 was very good although at times when mining was nearly completed in any given territory, the air movement was very slow and the place was uncomfortably warm. The velocity and volume of the air which comes from a 100,000 sq. ft. fan on surface via the Negaunee Mine was controlled by raises and doors and the traveling roads between the contracts were kept open as long as

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7. UNDERGROUND

i. Ventilation (Cont.)

possible. A new air way is being driven from the 65' Sub Level in the Maas at No. 528 Raise to the Thirteenth Level, Negaunee Mine, and this will be of very great benefit to the area being mined above the Fourth Level between the Race Course lease and the Negaunee boundary. Whenever the traveling roads become crushed, small ventilation fans pick up the air in the levels and conduct it through pipes in the raises to the working places above. During the winter months ice forms in the inlet air passage at No. 2 shaft, Negaunee Mine, and the fan has to be reversed over the week ends when the mine is idle.

j. Pumping

The number of gallons pumped per minute during 1937, 1936, 1935, 1934, and 1933 are shown below:

Month	1937	1936	1935	1934	1933
January	1,460	1,152	1,184	1,036	1,039
February	1,607	1,200	1,146	1,034	1,065
March	1,336	1,252	1,100	1,014	1,049
April	1,204	1,388	1,106	1,014	1,052
May	1,317	1,255	1,110	1,023	1,070
June	1,300	1,251	1,140	1,031	1,071
July	1,404	1,261	1,155	1,075	1,047
August	1,319	1,233	1,129	1,044	1,068
September	1,234	1,301	1,141	1,085	1,070
October	1,168	1,314	1,061	1,080	1,029
November	1,240	1,329	1,126	1,072	1,047
December	1,219	1,418	1,152	1,079	1,050
Total Average	1,327	1,280	1,130	1,049	1,055

The average gallons per minute pumped during 1937 increased by 47 gallons, bringing the total to 1,327. However, this does not represent the total amount ofwater coming into the Maas Mine as after the new cave broke through to surface in February, there was more water underground than the Maas Mine pumps could handle and therefore about 200 gallons per minute were diverted in the Third Level and discharged through a pipe to the Negaunee Mine Twelfth Level and the cost of the Negaunee Mine handling this extra water had to be borne by the Maas. As soon as there is enough water diverted from the underground pumps by the well on surface, that going to the Negaunee Mine will be turned into the Maas Mine ditches.

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8. COST OF OPERATING

a. Comparative Mining Cost

	1937	1936	Incr.	Decr.
Product	780,189	539,462	240,727	
Underground Cost	1.195	1.083	.112	
Surface Cost	.117	.116	.001	
General Mine Expense	.198	.187	.011	
Cost of Production	1.510	1.386	.124	
Depletion - Original Cost	.217	.358		.141
Increment	.000	.000		
Depreciation-Plant & Equip.	.031	.031		
Development	.033	.044		.011
Movable Equip.	.000	.000		
Taxes	.151	.180		.029
Loading and Shipping	.034	.029	.005	
Total Cost at Mine	1.976	2.028		.052
No. of Days Operated	285	292		7
No. Shifts and Hours	2-8	2-8		
Average Daily Product	2,727	1,847	880	

COST OF PRODUCTION

	1937	%	1936	%	Incr.
Labor	.915	60.6	.795	57.4	.120
Supplies	.595	39.4	.591	42.6	.004
Total	1.510	100.0	1.386	100.0	.124

b. Detailed Cost Comparison

(1) Days and Shifts

Year	Days Worked	Shifts & Hours	Men Employed	Total Days Worked
1937	285	2-8	413	114,142
1936	292	2-8	327½	84,080
Increase			85½	30,062
Decrease	7			

(2) Wages

There was a wage increase of ten cents per hour with a minimum of five dollars per day effective March 16, 1937. At this time also it was decided to pay time and one-half for all overtime.

(3) Comparison of Production

Year	Production	Average Daily Product
1937	780,189	2,727
1936	539,462	1,847
Increase	240,727	880

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8. COST OF OPERATING

b. Detailed Cost Comparison (Cont.)

(4) Comparison of Number of Men & Wages

Year	No. Men	No. Days	Amount	Rate Per Day
1937	413	114,142	696,696.23	6.11
1936	327½	84,080	415,779.71	4.95
Increase	85½	30,062	280,916.52	1.16

(5) Tons Per Man Per Day

	1937	1936	Incr.
Surface	42.36	34.98	7.38
Underground	8.15	7.86	.29
Total	6.84	6.42	.42

(6) Cost of Production

1937	$1,178,062.76	Cost per ton 1.510
1936	747,979.18	" " " 1.386
Increase	430,083.58	.124

	Total Cost				Cost per Ton		
	Labor	%	Supplies	%	Labor	Supplies	Total
1937	714,004.35	60.6	464,058.41	39.4	.915	.595	1.510
1936	428,957.68	57.4	317,765.52	42.6	.795	.591	1.386
Incr.	285,046.67	3.2	146,292.89		.120	.004	.124
Decr.				3.2			

(7) Detail of Accounts

	1937	1936	Incr.	Decr.
Avg. Days per Week	5½	4½	1	
Shifts & Hours	2-8	2-8		
Production, Tons	780,189	539,462	240,727	
Avg. Daily Product, Tons	2,727	1,847	880	
Number of Days Worked	285	292		7

Underground Costs	1937 Amount	1937 Per Ton	1936 Amount	1936 Per Ton	Increase Amount	Increase Per Ton	Decrease Amount	Decrease Per Ton
1. Exploring in Mine	566.10	.001	145.50	.000	420.60	.001		
2. Development in Rock	7,690.04	.010	4,860.10	.009	2,829.94	.001		
4. Development in Ore	23,274.17	.030	10,563.91	.020	12,710.26	.010		
5. Stoping	337,549.97	.433	214,331.30	.398	123,218.67	.035		
6. Timbering	253,438.07	.325	154,480.35	.287	98,957.72	.038		
7. Tramming	93,953.52	.120	49,768.66	.092	44,184.86	.028		
8. Ventilation	6,965.07	.009	9,114.32	.017			2,149.25	.008
9. Pumping	71,093.56	.091	56,266.42	.104	14,827.14			.013
10. Comp. & Air Pipes	51,132.87	.065	36,216.34	.067	14,916.53			.002
11. Back Filling	104.72	.000	1,192.22	.002			1,087.50	.002
12. Underground Supt.	22,619.91	.029	12,952.57	.024	9,667.34	.005		
13. Cave-In	373.64	.000			373.64			

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8. COST OF OPERATING

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

	1937		1936		Increase		Decrease	
Underground Costs	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton
14. Main. Compr. & Drills	2,771.42	.004	1,684.80	.003	1,086.62	.001		
15. Scrapers & M. Loaders	36,294.11	.047	22,182.72	.041	14,111.39	.006		
16. Elec. Tram Equipt.	16,646.37	.021	8,249.59	.015	8,396.78	.006		
17. Pumping Machinery	7,887.77	.010	2,008.64	.004	5,879.13	.006		
Total Undg. Costs	932,361.31	1.195	584,017.44	1.083	348,343.87	.112		
Surface Costs								
18. Hoisting	37,706.01	.048	26,566.70	.049	11,139.31			.001
19. Stocking Ore	14,294.78	.018	9,232.89	.017	5,061.89	.001		
21. Dry House	8,536.60	.011	7,018.87	.013	1,517.73			.002
22. General Surface	6,862.37	.009	5,305.87	.010	1,556.50			.001
23. Maint. Hoisting Equipt.	11,645.36	.015	8,113.63	.015	3,531.73			
24. Shaft	961.77	.001	579.85	.001	381.92			
25. Top Tram Equipt.	2,077.41	.003	3,904.30	.007			1,826.89	.004
26. Docks, T. & Pkts.	1,583.12	.002	554.69	.001	1,028.43	.001		
27. Mine Buildings	7,448.86	.010	1,556.37	.003	5,892.49	.007		
Total Surface Costs	91,116.28	.117	62,833.17	.116	28,283.11	.001		
General Mine Expense								
28. Insurance	5,500.35	.007	1,525.56	.003	3,974.79	.004		
29. Mining Engrg.	3,084.54	.004	1,916.98	.004	1,167.56			
30. Mech. & Elec. Engr.	2,021.76	.003	1,518.45	.003	503.31			
31. Analysis & Grading	31,908.32	.041	20,750.28	.038	11,158.04	.003		
32. Personal Injury	22,839.71	.029	13,944.39	.026	8,895.32	.003		
33. Safety Department	2,136.01	.003	1,493.64	.003	642.37			
34. Tel. & S. Devices	1,552.97	.002	1,230.72	.002	322.25			
35. Local & Gen. Welfare	6,428.00	.008	4,811.03	.009	1,616.97			.001
36. Sp. Exp. Pens. & All.	8,887.58	.011	10,515.36	.019			1,627.78	.008
37. Ishpeming Office	22,444.00	.029	16,357.24	.030	6,086.76			.001
39. Mine Office	18,459.98	.024	16,435.70	.030	2,024.28			.006
Social Security Taxes	21,421.45	.027	4,320.44	.008	17,101.01	.019		
Employees' Vacation	7,900.50	.010	6,308.78	.012	1,591.72			.002
Total Gen. Mine Exp.	154,585.17	.198	101,128.57	.187	53,456.60	.011		
Cost of Production	1,178,062.86	1.510	747,979.18	1.386	430,083.58	.124		
40. Taxes	117,773.35	.151	96,877.83	.180	20,895.52			.029
Total Cost	1,295,836.11	1.661	844,857.01	1.566	450,979.10	.095		

GENERAL

Practically all of the accounts showed a decided increase in the amount of money due to the larger production and also a slight increase in the cost per ton due to the increased wages, time and one-half for overtime and theincreased cost of supplies. That the cost per ton was not larger was due to the tons per man having increased .42, or from 6.42 to 6.84.

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8. COST OF OPERATING

(7) Detail of Accounts (Cont.)

UNDERGROUND COSTS

3. Development in Rock

	Drifting	Raising	Total Feet	Cost Per Foot
1937	349'	503'	852'	9.03
1936	369	397	766	6.34
Increase		106'	86'	2.69
Decrease	20'			

The increase in rock development is due to the large raising program on the Fifth Level and the increase in the cost per foot is due to the increase in wages and harder rock to drill.

4. Development in Ore

	Drifting	Raising	Total Feet	Cost Per Foot
1937	1,043'	2,319'	3,362'	6.92
1936	540	1,347	1,887	5.60
Increase	503'	972'	1,475'	1.32

The increase in ore development is also due to the large amount of development on the Fourth and Fifth Level and the increase in the cost per foot is partly due to so many very high raises, some over 200 feet.

5. Stoping

	Labor	Cost Per Ton	Supplies	Cost Per Ton	Total
1937	284,131.46	.364	53,418.51	.069	.433
1936	174,785.79	.324	39,545.51	.074	.398
Increase	109,345.67	.040	13,873.00		.035
Decrease				.005	

The increase in amount is due to larger production in 1937 while the increase in the cost per ton is due to wage increase and more wet areas.

6. Timbering

	Labor	%	Supplies	%	Total Cost Per Ton
1937	167,959.16	66.3	85,478.91	33.7	.325
1936	96,238.44	62.3	58,241.91	37.7	.287
Increase	71,720.72	4.0	27,237.00		.038
Decrease				4.0	

More timber was used on account of larger production and also more for repairing drifts and raises.

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8. COST OF OPERATING

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

7. Tramming

	Labor	Cost Per Ton
1937	82,485.26	.106
1936	43,264.51	.092
Increase	39,220.75	.014

Increase in amount is due to the larger production while the cost per ton increase is due to higher wages.

8. Ventilation

	Cost	Cost Per Ton
1937	6,965.07	.009
1936	9,114.32	.017
Decrease	2,149.25	.008

Decrease due to less work done in new airways.

9. Pumping

	Gallons Pumped	Gals. Per Min.	Cost for Power
1937	686,490,574	1,310	50,841.94
1936	674,297,310	1,283	46,104.74
Increase	12,193,264	27	4,737.20

The increase was due to more water being pumped after the cave to surface in February, 1937, there being 200 gallons per minute additional diverted to the Negaunee Mine and the cost charged to the Maas.

10. Compressors & Air Pipes

	Cu. Ft. Air Compressed
1937	1,251,710,000
1936	897,919,800
Increase	353,790,200

The large increase was due to two compressors working continuously for two shifts, besides which one and sometimes both had to be used on the third shift.

12. Underground Superintendence

The larger amount and increased cost per ton was due to the increase in the number of bosses on account of three shifts.

14. Main. Compressors & Drills

The increase is due to larger production and ten drill machines purchased in 1937.

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8. COST OF OPERATING

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

15. Scrapers and Mechanical Loaders

The increase is due to greater maintenance cost on account of equipment being used 24 hours per day, and also three additional hoists purchased.

17. Pumping Machinery

The increase is due to larger repairs to underground pumps in 1937; a broken crank shaft on the Aldrich pump and repairs and replacements of Y discharge on Third Level.

SURFACE COSTS

18. Hoisting

	Total Ore & Rock	Power Cost	Cost Per Ton For Power	Cost Per Ton
1937	798,801	29,302.77	.037	.048
1936	553,218	20,378.77	.037	.049
Increase	245,583	8,924.00		
Decrease				.001

There was a larger tonnage hoisted in 1937 than in 1936.

19. Stocking Ore

	Tons Stocked
1937	345,834
1936	268,803
Increase	77,031

More trestle had to be erected and more wet ore stocked during the 1937 shipping season than in 1936.

21. Dry House Expense

	1937	1936	Incr.	Decr.
Coal used in Heat. Plant, Tons	815	950		135
Cost per ton for Coal	5.60	5.25	.35	
Cost of Coal	4,569.15	4,989,37		420.22

Decrease due to warmer weather in 1937 than in 1936.

GENERAL MINE EXPENSE

31. Analysis and Grading

	No. Determination	Cost per Determination
1937	73,494	.43416
1936	58,781	.35301
Increase	14,713	.08115

There were more samples taken underground and therefore more determinations in the laboratory, due to more contracts and more shifts operated.

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8. COST OF OPERATING

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

32. Personal Injury

	1937	1936
Compensation Department	1,202.00	861.00
Hospital Loss	7,013.00	4,056.00
Reserve & Catastrophe, Compensation set up & Medical Service	14,624.71	9,027.39
	22,839.71	13,944.39

36. Special Expense, Pensions & Allowances

	1937	1936	Incr.	Decr.
Legal	610.00	528.00	82.00	
Pensions	4,984.00	5,598.00		614.00
Miscellaneous	3,293.58	1,930.72	1,362.86	
	8,887.58	8,056.72	830.86	

Analysis of Supplies Used

	1937		1936		Increase		Decrease	
	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton
41. General Supplies	30,631.08	.039	24,604.86	.046	6,026.22			.007
42. Iron & Steel	12,256.45	.016	7,676.71	.014	4,579.74	.002		
43. Oil & Grease	2,390.47	.003	1,955.01	.004	435.46			.001
44. Machinery Supplies	23,168.01	.030	17,468.72	.032	5,699.29			.002
45. Explosives	45,368.86	.058	31,736.43	.059	13,632.43			.001
46. Lumber & Timber	78,209.56	.100	52,517.66	.098	25,691.90	.002		
47. Fuel	4,569.15	.006	4,999.57	.009			430.42	.003
48. Electric Power	135,077.46	.173	108,985.68	.201	26,091.78			.028
49. Sundries	11,963.75	.015	4,700.86	.009	7,262.89	.006		
50. Other Mines & Accounts	386.36		183.97		202.39			
TOTAL	343,248.43	.440	254,461.53	.472	88,786.90			.032

The increase in total supplies was due to increased production and increased cost price of supplies.

9. EXPLORATIONS AND FUTURE EXPLORATIONS

There were no explorations during 1937 but it is proposed to do some diamond drilling to the West on the Third Level to determine the extent of the ore found in No. 2 Diamond Drill hole from surface, which shows some ore just above the Third Level elevation and some 300' to the West of any other known ore body at present.

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10. TAXES

	1937		1936	
	VALUATION	TAXES	VALUATION	TAXES
Maas Mine	$ 1,540,000	54,634.11	$ 1,350,000	46,050.45
Race Course	900,000	31,929.03	800,000	27,289.14
Adams Strip	170,000	6,031.04	180,000	6,140.06
Stockpile & Equipment	745,000	26,430.14	645,000	22,001.89
Miscellaneous Parcels	16,100	571.22	16,920	577.16
Total Mine	3,371,100	119,595.54	2,991,920	102,058.70
Collection Fees		1,195.96		1,020.59
Total Oprtg. Maas Mine		120,791.50		103,079.29
Adams Strip charged to Negaunee Mine	82,500	3,018.15	180,000	6,201.46
Maas Mine Total	$ 3,288,600	117,773.35	2,811,920	96,877.83
Tax Rate		3.54767		3.41
Total City of Negaunee Tax		491,458.09		406,945.23
Maas Mine % of City Tax		24.0%		23.8%
Maas Mine Rented Houses	224,500	7,964.81	193,020	6,587.93
Mineral Lands, Etc.	19,100	677.62	17,910	610.98
Total Houses & Lands	243,600	8,642.43	210,930	7,198.91
Collection Fees		86.42		71.99
Total		8,728.85		7,270.90

11. ACCIDENTS AND PERSONAL INJURY

	1937	1936
Fatal	0	0
Time Lost, over 4 months	0	4
" " 1 to 4 "	11	2
" " less than 1 month	7	3
Total Accidents	18	9
Number of cases paid compensation for accidents prior to Jan. 1st, 1937	6	7

There were twice as many lost time accidents in 1937 as in 1936 but there were also a third more days worked and the severity of the accidents was not as great, which makes the final record about the same as in 1936. It is hoped that 1938 will show better results as safety is being preached continuously and safety cash awards are given out each two weeks that the mine goes without a compensable accident.

There were 6 cases paid compensation in 1937 for accidents prior to January 1st, 1937 and 5 have been completed, leaving one to add to 3 more that will carry over into 1938.

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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 12-31-37	Description of Accident
1/21/37	Sam Jacobson	7½	$138.00	Jacobson was lagging the breast on the top of No. 5434 Raise when a piece of ore slipped out and pinned him against the leg, fracturing four ribs.
2/8/37	Evert Anderson	11	$201.00	Anderson was barring down a loose piece from the back and when the chunk fell, it rolled against him, knocking him down and fracturing his right arm.
2/12/37	Ferd. Leinonen	6 1/3	$114.00	Leinonen was picking down his ore pile after blasting to put up the scraper block when a piece of ore came from the back, causing a contusion of the right shoulder.
2/25/37	Donald Harrington	2½	$ 12.00	While operating a timber locomotive on the Second Level, Harrington stopped the motor to shut a ventilation door and then started the motor in reverse instead of forward and was squeezed between the motor and the door, puncturing his right thigh.
2/27/37	John Maki	3½	$ 30.00	Maki heard a movement of the ground and in jumping back, fell on his axe, causing a contusion of his left knee.
3/8/37	Leo Ronback	5 2/3	$ 69.00	While returning to his locker after taking a shower, Ronback fell on the floor, fracturing his right arm.
4/7/37	Nicholas Reichel	1	- -	Reichel, a chuteman on the Fifth Level, opened the disk to load the car when a sudden rush of ore overturned the car, pinning him against the platform and spraining his right knee.
4/12/37	Joseph Prisk	1	- -	Prisk was picking down the ore pile when a piece fell from the breast and bruised his left leg.

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11. ACCIDENTS AND PERSONAL INJURY

Date of Accident	Name of Injured Man	Weeks Lost	Compensation Paid to 12-31-37	Description of Accident
5/25/37	Jacob Hahka	15½	$282.00	Hahka was repairing a raise and when he removed a piece of old cribbing, a chunk of ore rolled out from behind and fractured his left leg.
6/18/37	Adolph Laitinen	1	- -	Laitinen and his partner were putting up a leg when it slipped and fell against Laitinen, causing a contusion of his back.
6/30/37	Wilfred Hegman	14½	$210.00	Hegman was operating a scraper hoist when the brake band broke, causing the handle to revolve and strike him on the foot. He lost one toe.
7/16/37	Louis Meloni	12	$ 90.23	Meloni was shoveling out a hitch for a leg when a piece of ore fell from the side, hitting him on the back and fracturing a transverse process vertabrae.
9/30/37	Albert Jenkins	10	$166.09	While charging the holes with powder, a piece of ore fell from the covering and struck Jenkins on the back of the neck, causing a slight fracture of the vertabrae.
10/13/37	Gust Dahlstrom	7½	$135.00	Dahlstrom was repairing a traveling road and picked down a piece of pole which he had partly sawed through. It fell, striking him on the foot and fracturing two bones.
11/10/37	Alfred Beauchaine	3	$ 54.00	Beauchaine was picking to make a hitch for timber when a piece of ore or steel from the pick flew in his left eye, becoming imbedded behind the eye ball.
11/23/37	Jack Kusisto	2	$ 36.00	Kusisto was cutting bark off a cap when a piece flew in his eye and later infection set in.
12/2/37	Paul Heggaton Attilio Pizziola	2 1 1/3	$ 18.00 $ 6.00	Heggaton and Pizziola were going to load a car at No. 528 chute on the Fifth Level when a sudden rush of ore turned the car over on them and a piece of pole came out of the raise and held the car from releasing. They both received bruised knees and legs.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

E & A No. 689

Total Estimate		$ 81,262.50
Total Expended in 1936	$ 78,047.87	
Total Expended in 1937	22,233.57	
Total Expended to 12-31-37		100,281.44
Balance Dec. 31st, 1937		19,018.94

The purpose of this E & A was the moving of 30 houses to the Cleveland Cliffs Iron Company's second addition and while the houses were moved in 1936, there was considerable work done in 1937 both on the houses themselves and on outside preparation. On all of the work done this year there has been an increase of approximately 25% in both labor and supplies over that set up in 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 in 1936	24,920.92	
Total Expenditure in 1937	259.54	
Total expenditure to 12-31-37		25,180.46
Balance Dec. 31st, 1937		$ 4,930.46

This account was completed in 1937.

Repairs

Total Estimate		$ 15,000.00
Total Expenditure in 1936	17,144.79	
Total Expenditure in 1937	3,945.71	
Total Expenditure to 12-31-37		21,090.50
Balance Dec. 31st, 1937		$ 6,090.50

This account was completed in 1937.

Interior Decorating

Total Estimate		$ 3,000.00
Total Expenditure in 1936	2,634.60	
Total Expenditure in 1937	3,249.08	
Total Expenditure to 12-31-37		5,883.68
Balance Dec. 31st, 1937		$ 2,883.68

There is still a small amount of work to be done in 1938.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION (CONT.)

E & A No. 689 (Cont.)

Outside Painting

Total Estimate		$ 3,900.00
Total Expenditure in 1936	1,764.89	
Total Expenditure in 1937	3,582.34	
Total Expenditure to 12-31-37		5,347.23
Balance Dec. 31st, 1937		$ 1,447.23

There are a few houses to be given the second coat in 1938.

Garages and Sheds

Total Estimate		$ 4,500.00
Total Expenditure in 1936	7,201.41	
Total Expenditure in 1937	1,360.31	
Total Expenditure to 12-31-37		8,561.72
Balance Dec. 31st, 1937		$ 4,061.72

There were two garages built in 1937 and the remaining expense was for painting, which will be completed in 1938.

Electrical Wiring

Total Estimate		$ 450.00
Total Expenditure in 1936	2,319.49	
Total Expenditure in 1937	291.16	
Total Expenditure to 12-31-37		2,610.65
Balance Dec. 31st, 1937		$ 2,160.65

This account was completed in 1937 and the large expenditure was due to replacing the former poor wiring in the basements and where easily attainable with the proper type of material which would conform to the building code.

Water and Sewer Connections

Total Estimate	$ 1,350.00
Total Expenditure in 1936	2,453.08
Balance Dec. 31st, 1937	$ 1,103.08

This account was completed in1936.

Outside Preparation
Walks Inside Yards

Total Estimate	$ 1,500.00
Total Expenditure in 1937	771.20
Balance Dec. 31st, 1937	$ 728.80

This account was completed in 1937.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION (CONT.)

E & A No. 689 (Cont.)

Fencing

Total Estimate		$ 4,500.00
Total Expenditure in 1937		2,721.50
Balance Dec. 31st, 1937		$ 1,778.50

This account will be completed early in 1938.

Grading and Seeding

Total Estimate		$ 1,500.00
Total Expenditure in 1936	549.56	
Total Expenditure in 1937	3,935.77	
Total Expenditure to 12-31-37		4,485.33
Balance Dec. 31st, 1937		$ 2,985.33

The grading was all completed in 1937 and the seeding will be done in the spring of 1938.

Temporary Lighting

Total Estimate	$ 350.00
Total Expenditure in 1936	540.47
Balance Dec. 31st, 1937	$ 190.47

This account was completed in 1936.

General Expense

Total Estimate		$ 3,325.00
Total Expenditure in 1936	3,271.63	
Total Expenditure in 1937	1,748.44	
Total Expenditure to 12-31-37		5,020.07
Balance Dec. 31st, 1937		$ 1,695.07

This account was completed in 1937 except for the tax and personal injury expense that will accrue in 1938 when completing a few of the accounts.

E & A No. 702

Total Estimate		$ 7,494.85
Total Expenditure in 1936	5,225.41	
Total Expenditure in 1937	246.44	
Total Expenditure to 12-31-37		5,471.85
Balance Dec. 31st, 1937		$ 2,023.00

The purpose of this E & A was the drilling of eight test holes from surface to ledge by the Layne Northwest Company, under contract at $3.00 per foot. The information obtained from this drilling was to be used in deciding the location of a deep well pump to remove the

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION (CONT.)

E & A No. 702 (Cont.)

water from the ledge before it enters the mine. Only 7 holes were drilled which accounts for the large unexpended balance.

This account was completed in 1937.

E & A No. 706

Total Estimate		$ 7,907.00
Total Expenditure in 1936	4,233.99	
Total Expenditure in 1937	3,251.36	
Total Expenditure to 12-31-37		7,485.35
Balance Dec. 31st, 1937		$ 421.65

The purpose of this E & A was the purchase of new equipment to be used on account of increased production and this account was completed in 1937.

E & A No. 712

Total Estimate	$ 2,200.00
Total Expenditure in 1937	1,946.13
Balance Dec. 31st, 1937	$ 253.87

The purpose of this E & A was the building of an aluminum double deck cage to accelerate the movement of timber and men on account of the increased production, and this account was completed in 1937.

E & A No. 715

Total Estimate	$ 6,500.00
Total Expenditure in 1937	8,438.25
Balance Dec. 31st, 1937	$ 1,938.25

The purpose of this E & A was the purchase of a 250 K.W. motor generator set to replace two 100 K.W. sets which are heavily overloaded due to additional electrical equipment. This set is not completely installed but will be completed early in 1938.

E & A No. 716

Total Estimate	$ 19,940.00
Total Expenditure in 1937	9,547.09
Balance Dec. 31st, 1937	$ 10,392.91

The purpose of this E & A was the sinking of a large bore well and installing a Layne and Bowler pump to remove as much water as possible before it enters the mine. The pump is now installed and the Layne Northwest Company is still developing the well, after which the final payment will be made if the operation is successful.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION (CONT.)

E & A No. 721

Total Estimate	$ 3,685.00
Total Expenditure in 1937	5,612.22
Balance Dec. 31st, 1937	$ 1,927.22

The purpose of this E & A was the fireproofing of the head frame which had formerly been enclosed with wood, gunite and asbestos. This account was nearly completed in 1937 and the increase in expenditures is partly accounted for by the increased cost of supplies and labor, since this E & A was prepared in 1936.

E & A No. 726

Total Estimate	$ 1,600.00
Total Expenditures in 1937	2,146.32
Balance Dec. 31st, 1937	$ 546.32

The purpose of this E & A was the purchase and installation of 1650' of electrical cable in the shaft to be used for the Mine Haulage Circuit, as the old cable was overloaded beyong the safety factor.

This account was completed in 1937.

E & A No. 727

Total Estimate	$132,660.00
Total Expenditure in 1937	148,382.90
Balance Dec. 31st, 1937	$ 15,722.90

The purpose of this E & A was the moving of 28 houses from three additions in the Eastern end of the City of Negaunee to the Cleveland Cliffs Iron Company's second addition on account of the probable caving of the surface caused by future mining at the Maas Mine. This E & A allows for the completing of the streets, sidewalks, grounds, etc. As this E & A was prepared in 1936, there has been an additional expenditure due to an increase in wages and supplies of approximately 25%.

The accounts are detailed as follows:

Moving Houses

Total Estimate	$ 14,500.00
Total Expenditure in 1937	17,445.98
Balance Dec. 31st, 1937	$ 2,945.98

This account was completed in 1937. One additional house and three garages were moved which were not intended in the original E & A.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION (CONT.)

E & A No. 727 (Cont.)

Foundations

Total Estimate	$ 21,800.00
Total Expenditure in 1937	24,471.78
Balance December 31st, 1937	$ 2,671.78

This account was completed in 1937.

Repairs

Total Estimate	$ 17,600.00
Total Expenditure in 1937	42,209.23
Balance Dec. 31st, 1937	$ 24,609.23

The houses were found to be much worse condition than had been estimated, especially as regards plaster and siding, and there still remains considerable to be done in 1938.

Interior Decorating

Total Estimate	$ 3,150.00
Total Expenditure in 1937	7,923.87
Balance Dec. 31st, 1937	$ 4,773.87

There will be some additional expense to this account in 1938.

Outside Painting

Total Estimate	$ 4,400.00
Total Expenditure in 1937	4,371.21
Balance Dec. 31st, 1937	$ 28.79

There are still several houses that have not received their second coat and these will be completed in 1938.

Garages and Sheds

Total Estimate	$ 4,200.00
Total Expenditure in 1937	6,068.37
Balance Dec. 31st, 1937	$ 1,868.37

The only uncompleted work in this account is the painting of several of the garages.

Electrical Wiring

Total Estimate	$ 2,200.00
Total Expenditure in 1937	2,524.92
Balance Dec. 31st, 1937	$ 324.92

This account was completed in 1937.

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YEAR 1937

12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION (CONT.)

E & A No. 727 (Cont.)

Water and Sewer Connections

Total Estimate	$ 5,100.00
Total Expenditure in 1937	5,780.43
Balance Dec. 31st, 1937	$ 680.43

This account was completed in 1937.

Outside Preparation

Surfacing Streets

Total Estimate	$ 21,175.00
Total Expenditure in 1937	7,732.56
Balance Dec. 31st, 1937	$ 13,442.44

This account was completed in 1937. The surfacing of South Maple Street was not included in the E & A as the State intends to build a concrete highway passing through the location on this street.

Sidewalks and Curbs

Total Estimate	$ 14,175.00
Total Expenditure in 1937	10,696.68
Balance Dec. 31st, 1937	$ 3,478.32

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

Fencing

Total Estimate	$ 4,500.00
Total Expenditure in 1937	3,464.06
Balance Dec. 31st, 1937	$ 1,035.94

There still remains considerable fencing to install in 1938.

Grading and Seeding

Total Estimate	$ 1,500.00
Total Expenditure in 1937	4,773.35
Balance Dec. 31st, 1937	$ 3,273.35

The grading was completed in 1937 and the grass seed and tree planting will be done early in 1938.

Permanent Street Lighting

Total Estimate	$ 1,500.00
Total Expenditure in 1937	3,338.04
Balance Dec. 31st, 1937	$ 1,838.04

This account was completed in 1937. Poles, cable, and labor were much higher than originally estimated.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION (CONT.)

E & A No. 727 (Cont.)

General Expense

Total Estimate	$ 4,800.00
Total Expenditure in 1937	7,582.42
Balance Dec. 31st, 1937	$ 2,782.42

There will be a tax and personal injury on the labor employed in 1938 to add to this account. It was found best to employ more watchmen than had originally been intended.

E & A No. 739

Total Estimate	$ 2,270.00
Total Expenditure in 1937	2,270.00
Balanced Dec. 31st, 1937	0

The purpose of this E & A was the purchase of two 25 H.P. Sullivan Machinery Company scraper hoist frames to replace old type frames which were too large for Sub Level work. This account was completed in 1937.

E & A No. 744

Total Estimate	$ 4,000.00
Total Expenditure in 1937	4,004.39
Balance Dec. 31st, 1937	$ 4.39

The purpose of this E & A was the purchase and installation of a new skip drum to replace the old drum which was cracked. This account was completed in 1937.

E & A No. 770

Total Estimate	$ 3,051.50
Total Expenditure in 1937	2,942.84
Balance Dec. 31st, 1937	$ 108.66

The purpose of this E & A was the purchase and installation of 1500' of electric cable to give additional current carrying capacity to the underground pumps. This account was completed in 1937.

E & A No. 775

Total Estimate	$ 2,612.50
Total Expenditure in 1937	1,915.44
Balance Dec. 31st, 1937	$ 697.06

The purpose of this E & A was the installation of a No. 5 gyratory crusher at the shafthouse to crush ore shipped all rail to charcoal

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION (CONT.)

E & A No. 775 (Cont.)

furnaces. This account will be completed early in 1938.

PROPOSED NEW CONSTRUCTION

The E & A's which will carry over into 1938 are Nos. 689,715,716, 721, 727, and 775.

New E & A's that have been authorized for next year are:-

No. 783	Three Larry stocking cars	$ 18,150.00
No. 792	Spare crankshaft for Aldrich Pump	1,875.00

13. EQUIPMENT AND PROPOSED EQUIPMENT

a. Steam Shovels

There were only two steam shovels used at the Maas Mine during 1937 and there were only two serious delays, one to the railroad type shovel, No. 44, when the crankshaft broke and as the Bucyrus Co. was closed on account of a strike, the shovel was idle for about three weeks. The other accident involved the No. 45 catterpillar type shovel when the mast head broke. They are both stored at the Maas Mine for the winter and will be thoroughly overhauled before the shipping season starts.

b. Stocking Trestles

During the year there were 33 bents erected on the trestle lying Southwest of the shaft, which is entirely for Maas grade. Another trestle of 30 bents due West of the shaft was assembled and partly erected in December and will be completed as soon as stocking on the Southwest trestle is completed. This latter will be for Maas and Race Course grades. At present there are four grades being stocked from the steel trestle to the East of the shaft but it is planned to erect another trestle to the Southeast of the shaft entirely for Special grade ore. There were extra bents erected in the rock trestle at the extreme East end of the steel trestle but there is also going to be a change here as the rock tram is entirely too long and the accumulated rock is interfering with the loading out of the ore. A new rock trestle will be erected to the Northeast of the shaft and on both of these new trestles there will be used an independent motor driven car controlled from the shafthouse by current through a collector rail, thus eliminating the rope transfer as is in use at present. If this method proves satisfactory, the rope system on the main trestles will probably be changed to the motor system next year.

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13. EQUIPMENT AND PROPOSED EQUIPMENT

c. Scraper Hoists

The hoists on hand December 31st, 1937, were as follows:

Ingersoll-Rand	15	H.P. Electrics	12
" "	10	" "	3
Sullivan	25	" "	2
"	20	" "	1
"	15	" "	23
"	7½	" "	1
"	6½	" "	4
Total Electric Hoists			46

Ingersoll-Rand Air Hoists, rebuilt to handle timber (single drum)	16

There were also four spare motors, three of which were purchased this year to insure against electrical trouble as it was so difficult to obtain quick delivery on spare parts. The 6½ and 7½ H.P. Hoists were used only on surface at the crusher and timber yard and for exploring work or handling material underground. The new hoists purchased this year consisted of one 15 H.P. Ingersoll-Rand hoist and two Sullivan 25 H.P. new type frames to be used with 25 H.P. motors which were on old frames that were both worn out and also were too large to handle in the sub levels.

d. Skips and Cages

One double deck aluminum cage, built in the Cleveland Cliffs Iron Company's shops in Ishpeming was installed on May 30th.

14. MAINTENANCE AND REPAIRS

Last year it was discovered that the shell of the skip drum was cracking and a new one was ordered from the Lake Shore Engine Works in Marquette. They had considerable difficulty in making this and as a result it was early in April before it could be installed. The drum was brought from Marquette in four sections and a large crew of men worked continually in three 8-hour shifts for three days at election time and thus the job was completed without any loss of production. The new drum has been entirely satisfactory during the remainder of the year.

The main discharge of the Third Level pumps, which is in the shape of a "Y" and gave so much trouble last year, again cracked and had to be replaced. Since that time it has repeatedly sprung leaks and had to be welded. This casting is subject to a very severe strain and vibration as the pumps have to work continuously with the large amount of water we are now pumping and therefore this is an added

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14. MAINTENANCE AND REPAIRS (CONT.)

reason why the surface well would be of so great value.

The crankshaft on the Aldrich pump on the Third Level also broke in November and only by crews working continuously on Saturday and Sunday were they able to regulate the job so that hoisting could go on as usual Monday morning.

The North skip rope was changed in January, having been in service slightly less than one year. This was a new rope purchased from the Williamsport Wire Rope Co. The South skip rope was changed in September, having been in service for eleven months and was a new rope purchased from the J. A. Roebling Co. The South skip rope was changed in November after 44 days service. This was an American Cable Company rope purchased through the Service and Supply Company.

The reason the South skip rope was changed in November so shortly following the change in September, was that the rope put on in September was found to be too short, allowing only one turn on the drum and after waiting for a while hoping that it would stretch as is usually the case, it was decided that another one would be safer. The old rope was therefore removed and will be used at some other mine where they can use a shorter length.

15. POWER

The following is the rate charged per K.W.H. by months during 1937:

January	$ .0134
February	.0134
March	.0134
April	.0134
May	.0134
June	.0132
July	.0132
August	.0132
September	.0132
October	.0132
November	.0134
December	.0134
Average	$ .013317

17. CONDITION OF PREMISES

There were no improvements of the buildings in 1937 but some of the shrubbery was rearranged and the grass and walks were kept in good condition.

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18. NATIONALITY OF EMPLOYEES

As to Parentage	1937	%	1936	%
Finnish	183	39.0	138	35.8
English	105	22.4	99	25.7
American	66	14.1	23	6.0
Italian	42	8.9	37	9.6
Swedish	35	7.4	44	11.4
French (Canadian)	17	3.6	25	6.5
German	6	1.3	7	1.8
Norwegian	5	1.1	3	.8
Danes	4	.8	3	.8
Irish	4	.8	5	1.3
Austrians	2	.4	0	.0
Crotians	1	.2	1	.3
Total	470	100.0	385	100.0

	Total		American Born		Foreign Born	
As to Birth	1937	1936	1937	1936	1937	1936
Finnish	183	138	106	70	77	68
English	105	99	55	57	50	42
American	64	23	64	23	0	0
Italian	42	37	14	14	28	23
Swedish	35	44	26	30	9	14
French (Canadian)	17	25	17	24	0	1
German	8	7	5	6	3	1
Norwegians	5	3	3	2	2	1
Danes	4	3	3	2	1	1
Irish	4	5	4	5	0	0
Austrians	2	0	1	0	1	0
Crotians	1	1	0	0	1	1
Total	470	385	298	233	172	152
Percentage			63.5%	61%	36.5%	39%

19. MAAS CRUSHER

The following table shows the years operations:-

Mine	1937	1936	Incr.	Decr.
Cliff Shaft	14,711	3,877	10,834	
Lloyd	63,075	45,253	17,822	
Morris (Inland)	7,290	1,927	5,363	
Maas	28,895	16,959	11,936	
Negaunee	3,461	5,928		2,467
Total	117,432	73,944	43,488	

The Maas crusher was started in April of this year which necessitated considerable work in thawing the ice which had accumulated during the winter months. This was the earliest that the crusher had ever operated and entailed additional cost. There was only one major breakdown during the year and this happened to the driving gear of the

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19. MAAS CRUSHER (CONT.)

crusher itself. There was an increase of 43,488 tons crushed during the year and the plant operated 64 shifts as compared with 69 shifts in 1936. This better operating condition was due to two reasons; having a foreman with more mechanical ability than the preceding year, and receiving more ore at one time.

NEGAUNEE MINE
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1. GENERAL:

The Negaunee Mine operated on a schedule of five days per week, two shifts with a full crew and a small crew on the third shift from January 1st to April 10th when the day shift crew started working six days per week. The third shift crew was gradually increased during the summer until it reached 75% of the contracts. On October 4th the working schedule was reduced to five days by eliminating the day shift crew on Saturdays. This schedule was continued until December 6th when the working time was reduced to four shifts three crews of men. On the four shift schedule the mine operates six day and six afternoon shifts which gives each man four days time.

Production from the mine in 1937 was 820,915 tons which was the largest hoist in one year. It exceeded by 241,175 tons the next largest product in 1930 of 579,740 tons. Shipments were 792,506 tons which also exceeded any previous years record, the next largest being 637,961 tons in 1929.

Development work was continued during the year on the 13th level and on the 9th level. A raising program has been underway all year and is gradually being increased. The heavy production in 1937 makes it necessary to open additional territory for mining as the ore areas above the 12th level are decreasing in size. Thus far the development of ore in No. 1 shaft pillar above the 9th level has exceeded expectations. It was considered very doubtful whether much if any ore could be recovered from the 20 ft. pillars left between the square-set rooms. The development work in a few of the pillars has shown them to be solid to points from 30 ft. to 50 ft. below the hanging and the stopes on each side filled with caved ore. The caved ore is packed tightly and drifts are being extended across the stopes to develop all the pillars left in this area. Late in the year raising to develop No. 2 shaft pillar was started and production will be underway here in 1938.

There was one fatal accident during the year due to a miner taking a chance which cost him his life. Considering the heavy production schedule with three crews of men working which made it necessary to hire many additional men, the accident record aside from the fatality, was as good as could be expected. The cash prizes given monthly if there was no compensable accident kept the men safety conscious. There were five drawings held during the year for the five months in which there was no compensable accident. The cash prizes amounted to $450.00 and were shared by 81 men. The cash bonus paid bosses if no accidents occurred in their territories kept them active in accident prevention work and also has improved discipline. There is splendid cooperation in safety work all the way down from the Manager to the men. A joint safety meeting for Superintendents, Captains and bosses was held every two months at which the lost time accidents and also accidents involving no lost time were discussed. The safety rules and mining standards were also gone over and safety suggestions invited. These meetings increased the interest of the bosses in safety work.

The employees appreciate the weeks vacation with pay, the payment of time and one-half for all time over forty hours per week or eight hours in one day, the Group Insurance Plan and the increase in wages last spring. They are contented and the vast majority loyal to the Company. During the year all requests made by the Employees Representatives were given immediate consideration and settled promptly. No appeal was taken from the decisions made by the Management.

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1. GENERAL: (Cont'd)

The number of men employed increased from 262 late in 1936 to a maximum of 430 in July and August 1937. Due to a lay-off of a few men on seasonal work the number employed at the end of December was 425.

2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production by Grades:

	1937	1936	Increase	Decrease
Negaunee Ore	820,915	512,612	308,303	
Rock	18,160	18,212		52
Total Hoist	839,075	530,824	308,251	

b. Shipments:

Grade of Ore	Pocket Tons	Stockpile Tons	Total Tons
Negaunee Ore	458,075	334,431	792,506
Total 1936	308,510	240,374	548,884
Increase	149,565	94,057	243,622

Shipments increased 44% in 1937 and were 28,409 tons less than the product for the year.

c. Stockpile Inventories:

	Dec. 31, 1937	Dec. 31, 1936	Increase
Negaunee Ore	137,568	90,925	46,643

Including estimated overrun there were approximately 180,000 tons in stock at the end of the year.

d. Division of Product by Levels:

The ore hoisted from the various levels was as follows:

	1937		1936	
	Tons	%	Tons	%
9th Level	33,238	4.1	-	-
10th "	-	-	-	-
11th "	219,307	26.7	159,634	31.2
12th "	517,701	63.1	331,327	64.6
13th "	50,669	6.1	21,651	4.2
Total	820.915	100.0	512,612	100.0

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

e. Production by Months:

The production by months was as follows:

Month	Negaunee Ore	Rock
January	53,338	500
February	57,334	868
March	63,247	1,616
April	70,013	1,372
May	73,224	1,860
June	70,593	1,524
July	72,966	2,416
August	74,146	2,692
September	80,080	1,160
October	74,910	1,508
November	69,858	1,212
December	61,206	1,432
Total	820,915	18,160
Total 1936	512,612	18,212
Increase	303,303	
Decrease		52

The product by leases was distributed as follows:

	1937	1936	Increase
Negaunee Mine Co.	789,563	490,880	298,683
American Mining Co.	31,352	21,732	9,620
Total	820,915	512,612	303,303

f. Ore Statement:

	Negaunee Ore 1937	Total 1936
On Hand Jan. 1, 1937	90,925	127,197
Product for Year	820,915	512,612
Overrun	18,234	-
Total	930,074	639,809
Shipments	792,506	548,884
Balance on Hand	137,568	90,925
Increase in Output	308,303	221,294
Increase in Ore on Hand	46,643	
Decrease in Ore on Hand		36,272

1937 - 3 8-hr. shifts 5 days & 5 nights per week from Jan. 1st to April 10th.
3 8-hr. shifts 6 days & 5 nights per week from Apr. 10th to Oct. 4th.
3 8-hr. shifts 5 days and 5 nights per week from Oct. 4th to Dec. 6th.
*2 8-hr. shifts 6 days & 6 nights per week from Dec. 6th to Dec. 31st.
* Equivalent to 4 shifts per week for each crew on the 3 8-hr. shift.

1936 - 1 8-hr. shift 6 days per week to Feb. 1st.
1 8-hr. shift 6 days & 2 nights per week from Feb. 1st to May 4th.
2 8-hr. shifts 5 days & 5 nights per week from May 4th to Dec. 7th.
3 8-hr. shifts 5 days & 5 nights per week from Dec. 7th to Dec. 31st.

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

g. Delays:

Four hours delay on January 20th account of broken runner at skip dump. Two hours delay on February 26th due to repairing skip runners at the skip dump. One and three-quarters hours delay on September 17th due to cutting new skip rope account of stretching of rope. Four hours delay on October 1st due to overloaded skip jamming in skip dump in shaft house.

There was no loss of product on account of these delays as the ore was hoisted on the following shifts.

h. Delays From Lack of Current:

There were no delays from lack of current in 1937.

3. ANALYSIS:

a. Average Mine Analysis on Output:

	1937			Total	1936			Total
Grade	Iron	Phos.	Silica	Tons	Iron	Phos.	Silica	Tons
Negaunee Ore	60.60	.120	7.43	811,130	61.08	.122	6.56	512,612
Meg. Spec. Ore	61.55	.089	6.41	9,785	--	--	--	--

b. Average Mine Analysis on Straight Cargoes:

				Lake Erie	
Grade	Iron	Phos.	Silica	Iron	Moisture
Negaunee Ore	60.23	.133	7.35	--	--
Neg. Spec. Ore	61.51	.090	6.67	61.62	11.09

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

Above 9th Level

No. 1 Shaft Pillar	968,293 tons	
No. 2 Shaft Pillar	113,906 tons	
Total Above 9th Level		1,082,199 tons
Between 10th and 11th levels		207,645 "
Between 11th and 12th levels		835,913 "
Between 12th and 13th levels		1,046.324 "
Below 13th level		215,100 "
Total Developed Ore in Mine		3,387,181

The estimated tonnage below the 13th level in the main ore body is included this year for the first time. Excluding this tonnage and giving consideration to the product in 1937 shows that 106,174 tons were developed in 1937.

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4. ESTIMATE OF ORE RESERVES: (Cont'd)

c. Estimated Analysis:
Ore Reserves: Approximate Expected Natural Analysis:

Grade	Iron	Phos.	Silica	Mang.	Alum.	Lime	Mag.	Sul.	Igni.	Moist.
Neg.	50.20	.110	6.40	.210	2.40	.80	.280	.011	1.94	12.00

Ore in Stock: Average Natural Analysis:

Grade	Tons	Iron	Phos.	Silica	Mang.	Alum.	Lime	Mag.	Sul.	Igni.	Moist.
Neg.	137,568	53.07	.112	6.44	.190	2.25	.70	.250	.010	1.79	11.91

5. LABOR AND WAGES:

a. Comments:

(1) Labor:

During the year 168 men were hired, an increase of 64% over the number on January 1st. Trained men were scarce and only a relatively few skilled miners were secured. Most of the men put in mining contracts had no previous training which decreased efficiency and increased the liability of accidents. Unskilled labor was plentiful at all times. There is a good feeling among the employees and they are well satisfied. There is a feeling of apprehension at the close of the year over the effect of the low rate of operation in the steel plants and it is hoped the miners can continue to work on the four day per week schedule.

The outstanding event of the year from the standpoint of the labor situation at the mine was the formation of the "Marquette Range Industrial Union". Some of the men want no union at all but the majority have joined and until all danger from outside unions is past will continue their memberships. The men were entirely satisfied with the Company Union which, through its representatives, got every reasonable request granted without delay. The same service is given the requests made by the Marquette Range Industrial Union.

(2) New Construction:

There was no new construction in 1937.

b. Comparative Statement of Wages and Product:

		1937	1936	Increase	Decrease
PRODUCT		820,915	512,612	303,303	
No. Shifts and Hours	24	1-8 hr.			
	20	2-8 hr.			
	243	3-8 hr.			
	288		272	16	
AVERAGE NO. MEN WORKING:					
Surface		73	50	23	
Underground		351	212	139	
Total		424	262	162	

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5. LABOR & WAGES: (Cont'd)

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

	1937	1936	Increase	Decrease
AVERAGE WAGES PER DAY:				
Surface	5.44	4.31	1.13	
Underground	6.39	5.31	1.08	
Total	6.22	5.10	1.12	
AVERAGE WAGES PER MONTH:				
Surface	118.40	81.89	31.51	
Underground	128.43	100.89	27.54	
Total	125.84	96.90	28.94	

Increase in wages of 6¢ per hour effective 11/16/36.
Increase in wages of 10¢ per hour effective 3/16/37.

PRODUCT PER MAN PER DAY:				
Surface	44.91	38.61	6.30	
Underground	9.69	10.14		0.45
Total	7.97	8.03		0.06
LABOR COST PER TON:				
Surface	.121	.112	.009	
Underground	.659	.524	.135	
Total	.780	.636	.144	
AVERAGE PRODUCT MINING:				
Stoping	21.50	25.07		3.57
Development in Ore	8.30	14.17		5.87
Total	20.94	24.30		3.36
AVERAGE WAGES CONT. LABOR:	7.16	6.54	.62	
TOTAL NUMBER OF DAYS:				
Surface	18,276½	13,262¾	5,013½	
Underground	84,674½	50,551¼	34,123½	
Total	102,951	63,814	39,137	
AMOUNT FOR LABOR:				
Surface	99,343.99	57,199.54	42,144.45	
Underground	540,933.31	268,488.19	272,445.12	
Total	640,277.30	325,687.73	314,589.57	

AVERAGE WAGES PER MONTH AS PER LABOR STATEMENT, LESS CAPTAIN AND CLERKS:				
Surface	111.44	80.56	30.88	
Underground	127.92	100.32	27.60	
Total	125.17	96.47	28.70	

Increase in wages of 6¢ per hour effective 11/16/36.
Increase in wages of 10¢ per hour effective 3/16/37.

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5. LABOR AND WAGES: (Cont'd)

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

Proportion of Surface to Underground Men:

1937: 1 - 4.81 -- 3 8-hr. shifts 5 days and 5 nights per week from Jan. 1st to April 10th.
3 8-hr. shifts 6 days and 5 nights per week from April 10th to Oct. 4th.
3 8-hr. shifts 5 days and 5 nights per week from Oct. 4th to Dec. 6th.
*2 8-hr. shifts 6 days and 6 nights per week from Dec. 6th to Dec. 31st.
(*) Equivalent to 4 shifts per week for each crew on the 3 8-hr. shift.

1936: 1 - 5.24 -- 1 8-hr. shift 3 days per week to Feb. 1st.
1 8-hr. shift 4 days per week from Feb. 1st to May 1st.
2 8-hr. shifts 5 days per week from May 4th to Dec. 7th.
3 8-hr. shifts 5 days per week from Dec. 7th.

Operating Schedules:

Month	Shifts Worked	Days Mine Worked Per Week	Days Worked Per Month	Days Men Worked Per Week	Avg. Shifts Worked Per Month by Each Man	Size of Crew
January	3 8-hr. shifts	5 days 5 nights	22	5	21	324
February	" "	5 " 5 "	21	5	20	348
March	" "	5 " 5 "	24	5	22	385
April	" "	6 " 5 "	25	6	23	393
May	" "	6 " 5 "	26	6	23	409
June	" "	6 " 5 "	25	6	24	413
July	" "	6 " 5 "	26	6	24	430
August	" "	6 " 5 "	26	6	23	430
September	" "	6 " 5 "	25	6	23	428
October	" "	5 " 5 "	22	5	21	426
November	" "	5 " 5 "	23	5	22	422
December	*2 8-hr. "	6 " 6 "	23	6	19	425
Avg. for Year	$5\frac{1}{2}$	$5\frac{1}{2}$	24	$5\frac{1}{2}$	22	403

(*) Equivalent to 4 days - 3 8-hr. shifts.

6. SURFACE:

a. Buildings, Repairs:

In order to facilitate the changing, repairing and oiling of the skips the shaft house enclosure east of the shaft on the skip road side was widened four feet on both the north and south sides. The enclosure has a wooden frame and is covered with galvanized sheet iron.

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6. SURFACE: (Cont'd)

a. Buildings, Repairs: (Cont'd)

The plank enclosing the skip roads from the collar at surface to the landing on the cage road side were removed early in 1937 and replaced with 1/4" steel plate. This reduced the fire hazard and is a permanent job. The plank formerly used for lining had to be replaced every five years due to wear from ore spilled when the skips dump.

New steps and porch at entrance to the office were installed in the summer, also a new floor in the entrance hall. The former ones were worn out by the employees coming in for due bills and pay checks.

Some charges were incurred in 1937 in completing the rewiring of the shop building. Most of this work was done in 1936.

The hot water pipe lines in the dry house were badly corroded and were replaced in the summer with copper pipe. The hot water pipe lines were quite extensive as they run from the hot water tank to all the shower baths in the wash room and also to the shower in the shift bosses' change room.

The coal dock was repaired in the spring. Several rotted stringers were replaced as also a few legs.

The roofs of buildings that were not given a treatment of primer and sealcote in 1935 and 1936 were treated in 1937.

Several doors on the timber tunnel were replaced in the summer. The doors were originally built for eight foot mine timber and since nine foot is now used it has been necessary to replace them with longer doors during the past four years.

b. Stockpiles:

All the ore in stock under the west steel trestle was shipped in 1937 and all but about 15,000 tons from the east steel trestle stocking grounds. The ore under the auxiliary wooden stocking trestle was partially loaded leaving only 15,000 tons here.

b-1. Rock Trestle:

In the summer five bents were erected on the rock trestle which provided stocking room for about a year.

b-2. Ore Trestles - Steel:

The long ties on the west permanent steel trestle were replaced in 1937. The 4-1/2 ft. ties on the south tracks of the west steel stocking trestle were replaced and also on the south track of the east steel trestle. New nailing strips were installed along with the new ties. All the ties were treated with Chromated Zinc Chloride solution at the Athens timber treating plant which will prolong their life several years.

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6. SURFACE: (Cont'd)

b-3. Ore Trestles - Wooden:

In November four wooden bents were erected at the east end of the east steel stocking trestle to provide for stocking Negaunee Special Ore. It is planned to stock about 10,000 tons of this grade during the winter.

In order to provide stocking room for the ore hoisted during the winter of 1937-38, trestle legs and timber were purchased early in the fall. It has been framed and partly assembled for erection on the auxiliary stocking grounds north of the east steel trestle stocking grounds. Material for twenty bents has been assembled which will stock about 80,000 tons. Deducting the 15,000 tons already in this stockpile there will be room to stock about 65,000 tons.

c. Tracks, Roads:

The tracks from timber tunnel were extended 50 ft. to the west along the side of the old rock pile to make more room for disposal of rotted timber sent to surface on the timber trucks.

The private road to the mine from Lincoln Street was dragged during the summer and about fifty loads of gravel spread. The rock road bed is wearing out and more gravel must be applied to build it up again.

d. Water Supply:

The cost of water purchased from the City of Negaunee and used at the mine for the last seven years is as follows:

	1937	1936	1935	1934	1933	1932	1931
1st Quarter	55.86	67.61	44.31	47.39	54.25	58.11	104.72
2nd "	61.20	59.77	62.98	76.80	36.00	68.68	57.41
3rd "	56.70	83.64	61.51	75.85	52.14	51.25	76.41
4th "	67.76	81.75	62.55	35.98	36.29	40.43	46.55
Total	241.52	292.77	231.35	235.02	178.68	218.47	284.99
Product - Tons	820,915	512,612	291,318	235,664	61,761	84,046	338,696
Cost Per Ton	.000294	.000571	.000795	.001001	.0022893	.0026	.00084

The cost per ton was the lowest since City water has been used at the mine due to the large product. On account of rains in the summer it was not necessary to water the lawn and shrubbery which kept costs in the third quarter lower than in the previous year.

e. Grounds:

The grounds around the mine buildings were kept in good condition. The lawn was given an application of fertilizer in the spring. The shrubbery was pruned and all dead wood removed.

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6. SURFACE: (Cont'd)

f. Mine Water Ditch to Carp River:

The ditch or old drainage channel in which the mine water flowed to the Carp River, two miles east of the mine, filled with fine ore that settled from the water. The water spread over more than eighty acres of swamp land and at one place was less than a thousand feet from No. 2 shaft. It was thought that possibly some of the water reached the ledge and came back to the mine through the cave near No. 2 shaft. A ditch 2,050 ft. in length was blasted across the swamp. It was 6 ft. wide on the top, 3 ft. wide at the bottom and averaged 3 ft. in depth. It required 800 lbs. of ditching dynamite which was fired in sections varying from 50 ft. to 400 ft. in length. One electric exploder fired by a blasting battery was used for each section. One-half stick of powder was inserted 18 inches below surface every 15 inches on the line of the ditch. The explosion was self propogated, that is, the first stick exploded by the battery exploded the balance of sticks in the section. The explosion seemed to be almost instantaneous. Very little hand cleaning was necessary after blasting. The cost of the blasted ditch was $200.04 or approximately 10¢ per running foot. On account of more than seasonal rainfall in the fall no change was observed in the mine water until in December when the water coming in on the 9th level from the old workings near No. 2 shaft showed an appreciable decrease. It will require several months to determine how much water has been diverted from the mine by the ditch.

g. Portable Sawmill:

A portable sawmill was set up at the mine in September to saw dimension timber from oak logs. The contract with the owner specified that he furnish two skilled men to run the mill. The mine furnished four men to make up the crew of six men required. The sawmill ran the last week of September and four days in October in which time 45,102 ft. of lumber and dimension timber was sawed. Most of the logs were supplied by the Negaunee Mine with a few trucked from the Athens and Maas Mines. Following is a detail statement of costs, etc.:

	Labor	Supplies	Total	
Cost incurred at mine	373.28	11.63	384.91	
Contractor - 45,102 ft. at 7.75 per M		394.54	394.54	
Cost of sawing 45,102 ft. lumber				734.45

	No. Logs	Lineal Ft.	Cost Logs	
Maas Mine	67	752	72.67	
Athens Mine	97	873	127.29	
Negaunee Mine	462	4498	462.89	
Cost of Material				662.85
Grand Total Cost				1397.30
Total Cost per M at Negaunee Mine			30.54	
Add trucking charges			2.45	
Cost Per M at General Storehouse Yard				32.99