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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

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

UNDERGROUND COSTS: (Cont'd)

10. Compressors and Air Pipes: (Cont'd)

Electric Power Cost - 1940	$37,466.57
Electric Power Cost - 1939	26,464.34
Increase	$11,002.23

More air used account of more working days and operating compressor on a third shift.

The expense to air lines was also increased due to more operating time and extending 2" and 4" air lines on levels.

12. Underground Superintendence:

The increase in expense was $4103.89 while the cost per ton remained the same.

The increase in expense was due to two more shift bosses being added, one on the midnight shift and the other on 9th level. There was also an increase in amount paid for safety bonus due to more men working and more days operating.

14. Compressors and Power Drills:

The increase in expense was $372.55 while the cost per ton remained the same.

All the expense was for repairs to compressors and the increase was due to new valves for the Ingersoll-Rand compressor.

15. Scrapers and Mechanical Loaders:

The expense in 1940 increased $4,508.13 and the cost per ton .003.

There were no new scrapers or scraper hoists charged to this account in 1940, but two 15 H.P. motors were bought to replace two 10 H. P. motors used on Ingersoll-Rand hoists. The increase in expense was due to more repairs to scrapers and scraper hoists, more wire rope used and replacing circuit breakers and electric cables. There was also more current used due to more operating time.

16. Electric Tram Equipment:

	Generator	Locos.	Wiring	M.L. Tracks	M.L. Cars
1940	1136.91	2714.85	1536.47	4210.09	2844.47
1939	101.50	3112.39	1983.85	5748.76	4618.24
Increase 1940	1035.41				
Decrease 1940		397.54	447.38	1538.67	1773.77

Total expenditures decreased $3121.95 and cost per ton .014.

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8. COST OF OPERATING: (Cont'd)

b. Detail of Cost Comparison: (Cont'd)

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

UNDERGROUND COSTS: (Cont'd)

16. Electric Tram Equipment: (Cont'd)

Increase in expense to generators due to repairing armature burnt out on generator set.

Decrease in locomotives due less repairs.

Decrease in wiring due to replacing No. 2/0 Fig. 8 trolley wire on the 7th level with No. 2/0 ground and extension of trolley lines on 7th and 9th levels in 1939. Decrease in main line tracks due to replacing old 30 lb. rail on 6th and 9th levels with 40 lb. new rails in 1939. Decrease in main line cars due to overhauling 18 main line cars in 1939 while in 1940 only 8 were overhauled.

17. Pumping Machinery:

Expenditures increased $399.59 and cost per ton .007.

Increase in expense due to replacing 508 ft. of 10" pump discharge pipe in shaft at a cost of $2,559.33 and expense of repairing the old pipe before it was replaced. There were also more repairs to pumps.

SURFACE COSTS:

18. Hoisting:

Ore and rock hoisted during 1940 and 1939 was as follows:

Year	ore	Rock	Total
1940	515,725	11,782	527,507
1939	404,877	11,348	416,225
Increase - 1940	110,848	434	111,282

Expenditures increased $7448.35 and the cost per ton decreased .003.

The cost per ton for electric power was .061 in both years. The increase in expense was due to hoisting larger product and working more shifts.

19. Stocking Ore:

Tons Stocked in 1940	238,029
Tons Stocked in 1939	200,871
Increase - 1940	37,158

Expenditures increased $2849.69 and cost per ton .002.

The increase in expense was due to more ore stocked and expense for dismantling and erecting wood stocking trestle at end of Southeast steel stocking trestle.

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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)

21. Dry House:

Expenditures decreased $278.56 and cost per ton .005 - due to less expense for heating and miscellaneous supplies.

22. General Surface Expense:

Expense increased $759.14 and cost per ton was .002 less.

The increase in expense was due to more repairs to roads and fences around property, and more expense for care of grounds.

23. Maintenance: Hoistin g Equipment:

	Elec. Hoists	Ropes	Skips & Skip Roads	Sheaves
1940	2179.14	3178.40	3845.36	876.25
1939	2306.20	4592.75	3239.60	1046.39
Increase 1940			605.76	
Decrease 1940	127.06	1414.35		170.14

The expenditures decreased $1105.79 and cost per ton .008.

Decrease in expense to Electric Hoists due to less repairs.

In 1940 there were two 1 3/8" skip ropes costing $2852.27 and 326.13 on a third skip rope charged out while in 1939 one 1¼" cage rope and two 1 3/8" skip ropes were charged out.

The increase in expenditures for skips and skip roads was due to more repairs to skips and replacing shaft runners in skip roads.

The decrease in expense for sheaves was due to charging out 5 new rubber lined idler sheaves in 1939, less replacements in 1940 were required.

24. Shaft

There was an increase in expenditures of $1446.63 and .002 in cost per ton.

Detail:	Steel Sets	Casing & Guniting	U.G. Pockets
1940	1357.08	2214.61	781.90
1939	466.81		2440.15
Increase 1940	890.27	2214.61	
Decrease 1940			1658.25

The increase in expense to steel sets was due to replacing broken sets in circular shaft. This also made it necessary to case and gunite the shaft where new sets were put in.

The decrease in expenditures to U.G. Pockets was due to less repairs to pockets. In 1939 expense was high due to replacing rotted front of 4th level pocket with concrete.

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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)

25. Top Tram Equipment:

There was an increase in expense to this account of $1124.18 and .002 in cost per ton.

	Engines & Motors	Wire Rope	Sheaves Rollers Etc.	Tracks & Cars
1940	163.63	1080.40	504.83	1104.68
1939	159.34	702.99	538.72	328.85
Increase - 1940	4.29	377.41		775.83
Decrease - 1940			33.89	

There was a small increase in repairs to engines & motors.

The increase in expense for wire rope was due to more top tram rope used in replacements in 1940 due to more ore stocked.

The decrease in sheaves, rollers, etc. was due to less replacements of spools and rollers.

The increase in expenditures for tracks and cars was due to more repairs to top tram cars.

26. Docks, Trestles & Pockets:

The increase in expenditures was $773.25 and .001 cost per ton.

The increase in expense was due to erecting a new wood trestle for dumping rock hoisted and more repairs to pockets in shaft house.

27. Mine Buildings:

The expenditures increased $2786.53 and cost per ton .005

Building	1940 Amount	Explanation
Office Bldg.	22.70	Repair front porch and steps.
Warehouse	-	
Shops	24.17	Repair windows and doors.
Shaft House	15.16	Repair windows.
Engine House	236.62	Replacing windows and window frames
Heating Plant	29.21	Repair roof
Dry House	2691.95	Made first aid room & remodeling(E&A AM-1)
Timber Tunnel	371.51	Repair Sheet Iron Covering & Repair Frame and Painting
Storage Bldg.	263.54	New Roofing
Top Tram	25.28	Repair Roof
Total	3680.24	

125) 3075 (24 600
250
575
500
750
750

24600
12 1/2

[illegible]	46.47	3.88	112851
[illegible]	52.49	4.69	314407
Average	50.90	4.476	427258

4.55

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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)

27. Mine Buildings; (Cont'd)

1939

Building	Amount	Remarks
Office	6.88	Make trap door over coal bin.
Warehouse	20.40	Painting floor.
Shops	22.96	Repairs to windows & doors.
Shaft House	159.14	Enlarging the enclosure at base of shaft house.
Engine House	223.58	New base for stock. Cut hole for stoker & elec. wiring.
Heating Plant	1.93	Window repairs.
Dry House	119.69	Repair windows & doors, piping and lighting.
Timber Tunnel	305.58	Repair sheet iron covering & frame. Painting
Top Tram Bldg.	33.36	Built covering over sheaves.
Coal Dock	.19	
Total	893.71	

GENERAL MINE EXPENSES:

28. Mining Engineering:

Covers time and expense of mine engineers and helpers. Cost high due to time of Superintendent's Assistant charged to this acct for several months. The expense to this account increased $1429.48 and the cost per ton .001.

29. Mechanical and Electrical Engineering:

The expense to this account decreased $500.22 and the cost per ton .002.

The charge to this account covers a proportion of time spent on Mechanical and Electrical inspections and repairs at the mine by these departments.

30. Analysis and Grading:

	Sampling At Mine	Central Lab.Exp.	Shipping Dept.Exp.	TRucking Samples etc.
1940	2893.69	7435.99	2710.04	541.55
1939	2289.79	5784.62	2517.50	475.01
Increase 1940	603.90	1651.37	192.54	66.54

Determinations - 1940	25,567.	Cost per determ.	$.290843
Determinations - 1939	20,328	" " "	.284564
Increase 1940	5,239		.006279

The increase in expenditures to this account was $2514.35 and the cost per ton decreased .001. The increase in expense was due to more ore shipped from stockpiles and pockets.

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YEAR 1940

8. COST OF OPERATING: (Cont 'd)

b. Detailed Cost Comparison: (Cont'd)

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

31. Safety Department:

The expense to this account increased $52.42 and the cost per ton decreased .001.

	First Aid Supplies	First Aid & Helmet Practice	Ishp. Office Charge
1940	233.54	63.51	1737.73
1939	136.57	60.83	1748.96
Increase	96.95	2.68	
Decrease			11.23

More first aid supplies used account of more employees and mine operating more shifts.

32. Telephones and Safety Devices:

Expenditures to this account increased $669.44 while the cost per ton remained the same.

	Lights at Shaft & Levels	Mine Telephones	Safety Gates	Sign Bds. & Signals	Fire Equipt.
1940	3054.87	236.59	99.32	19.78	15.08
1939	2417.72	113.13	117.57	97.82	9.96
Increase 1940	637.15	123.46			5.12
Decrease 1940			18.25	78.04	

The increase in expense for lights at shaft and on levels was due to mine operating more shifts in 1940.

Increase in expenditures to mine telephones due to more repairs. There was also more expense for fire equipment and less to safety gates and signals.

34 .Special Expense, Pensions and Allowances:

	Legal	Saranac.Invest.	Curtail-ment	Retire-ment	Other
1940	419.81	2464.00	15.81	1189.24	1625.41
1939	436.57	1636.21	1375.50	825.00	1902.19
Increase 1940		827.79		364.24	
Decrease 1940	16.76		1359.69		276.78

There was a decrease in expenditures of $461.20 and in cost per ton .004.

35. Ishpeming Office:

Ishpeming office expense is prorated to various mines on basis of labor expense.

The decrease in expense to this account was $1123.95 and cost per ton .008.

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

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

GENERAL MINE EXPENSES: (Cont'd)

36. Mine Office:

	Salaries	Central Whse. Expense	Misc.
1940	9616.85	2862.09	833.95
1939	9601.72	2910.06	829.34
Increase 1940	15.13		4.61
Decrease 1940		47.97	

The decrease in expenditures was $32.23 and the cost per ton .007.

37. Insurance:

The expenditures decreased $409.20 and cost per ton .003.

	Property	Group	Catastrophe
1940	749.86	1814.24	366.72
1939	872.63	2181.99	285.40
Increase 1940			81.32
Decrease 1940	122.77	367.75	

38. Personal Injury:

	Compensation & Doctors	Compensation Dept.	Hospital Loss
1940	10616.66	764.78	4809.36
1939	8842.28	758.87	3439.45
Increase 1940	1774.38	5.91	1369.91

There was an increase in expense to this account of $3219.94 and the cost per ton decreased .001.

39. Social Security Taxes:

	Unemployment Insurance Tax	Old Age Ben. Tax
1940	17,992.16	5452.10
1939	14,510.04	4396.41
Increase 1940	3,482.12	1055.69

The increase in expenses was $4532.44 and the cost per ton decreased .002.

The expense in this account is based on the amount of the payrolls. The Unemployment Insurance Tax was 3% and the Old Age Benefit Tax 1% in both 1940 and in 1939.

The increase in expenditures was due to larger payrolls account of mine operating more shifts and more men employed.

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

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

GENERAL MINE EXPENSES: (Cont'd)

40. Employees Vacation Pay:
The expense to this account increased $1682.29 and cost per ton .001

In 1940 employees entitled to vacations with pay received pay for 40 hours while in 1939 they wer e given pay for only 32 hours. There were also more men entitled to vacations in 1940.

41. Taxes:
There was a decrease in taxes levied of $4099.61 and the cost per ton decreased .060 due to larger product.

9. EXPLORATIONS AND FUTURE EXPLORATIONS:

There was no diamond drilling on the Athens property in 1940 and no explorations are under consideration at this time.

10. TAXES

A comparison of assessed valuation and taxes for 1940 and 1939 follows:

	1940		1939	
	Valuation	Taxes	Valuation	Taxes
Realty (Tax Commission)	1,750,000	61,390.18	1,730,000	63,332.54
Ore in Stock, Equipt, Supps.	900,000	31,572.09	920,000	33,679.73
Total by Tax Commission	2,650,000	92,962.27	2,650,000	97,012.27
Sterling Addition	4,600	161.38	4,600	168.41
Harvey Plat	1,300	45.61	1,300	47.60
Total	2,655,900	93,169.26	2,655,900	97,228.28
Collection Fees		931.69		972.28
Total Optg. Athens Mine	2,655,900	94,100.95		98,200.56
Rented Buildings:				
Harvey Plat	4,700	162.90	4,700	172.10
Sterling Addition	22,800	801.93	22,800	834.72
Total	27,500	964.83	27,500	1,006.82
Collection Fees		9.65		10.07
Total Athens Rented Bldgs.	27,500	974.48	27,500	1,016.89
Total Athens Iron Mining Co.	2,683,400	95,075.43	2,683,400	99,217.45
Total Taxes City of Negaunee		517,964.88		560,092.01
Tax Rate per $100 Valuation		3.50801		3.66084
Athens Iron Mining Co. % of City Taxes		18.3		17.7

The total taxes for the City of Negaunee decreased $42,127.13 and the tax rate decreased $.15283. Consequently the Athens Iron Mining Company taxes decreased $4,142.02. There was no change made in the valuation by the State Tax Commission.

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11. ACCIDENTS AND PERSONAL INJURY:

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

	1940	1939	1938	1937	1936	1935
Fatal	1	0	1	0	0	0
Time Lost - Over 4 months	1	0	1	1	3	1
" " - 1 to 4 months	4	5	3	5	3	2
" " - Less than 1 month	5	3	1	1	1	0
Total Accidents	11	8	6	7	7	3
Number of Cases Paid Compensation for accidents prior to Jan. 1st.	4	5	7	7	6	7
Number of cases paid difference in wages (Included in above total).....	3	2	3	3	3	4

Nature and Classification of Compensable Accidents:

Acc. No.	Date of Accident	Name	Age	Nature of Injury	Days Lost
368	2-7-40	James Cain	57	Compound comminuted frac. both bones, left leg.	135
369	1-31-40	Angelo Carilli	23	Contused right knee.	25
370	3-6-40	Lauri Poutanen	46	Frac.bone left foot	28
371	3-13-40	Howard Langlois	29	Brush burn under left arm.	19
372	2-29-40	Harvey Pulkinen	28	Contused nose. Lacerated lip.	42
373	4-17-40	Lester Juchemich	33	Broken nose	16
374	5-9-40	James Dugone	41	General contusions	20
375	7-25- 40	Matt Pruiska	45	Bruised rt. Leg & ankle	20
376	8-16-40	Edward Windahl	41	Frac. left index finger.	37
377	11-8-40	Eino J. Kivisto	26	Severed tendon, left wrist.	35
378	12-12-40	John Battaglio	58	Basal skull fracture.	Fatal

The accident record in 1940 aside from the fatal accident was not as good as in the previous year due to more compensable accidents and to one severe injury which caused a loss of 135 days. The maximum days lost in 1939 on account of an injury was 87.

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

Fatal Accident:

John Battaglio, miner employed at the Athens Mine, who was injured on December 12th, 1940, died at the Ishpeming Hospital on the morning of January 4th. His death was due to meningitis which developed on account of a skull fracture by a blow from a sprag which was knocked out of a hitch in the breast and in falling struck Battaglio on the side of the head.

Battaglio and his partner, Adolph Tayra, work in No. 14 contract, on the -575' sub level above the 6th level. They were mining a pillar along the side of an old traveling road drift. They had scraped the dirt out, put up one leg on the pillar side, rested the cap on a piece of timber in the old drift, installed a prop under the center and spragged the cap in the center with a pole resting in a hitch in the breast of the slice. They had drilled a low cut leaving some ore in the back under the covering poles of the sub above in order to avoid trouble from a possible run from the back of the old caved drift. Some ground was breaking loose from the back near the breast and Battaglio, being the older miner, stood watching the breast while his partner was picking a hitch for the leg which they planned to install on the old drift side. A small piece of ore fell from the back about two feet above the sprag to the breast, struck the sprag, knocking it out and as it fell it struck Battaglio on the side of the head. He had called to his partner to look out and Tayra jumped back as also did Battaglio. The sprag first struck Battaglio and in falling struck Tayra on the leg but did not injure him.

A number of years ago it was decided where conditions in a slice were such that there might be some danger to a man picking a hitch, that the partner should stand and watch the back and breast in order to notify his partner of any danger. This rule was being observed as is evidenced by the fact that Battaglio called to his partner to look out and both men moved back in the slice as quickly as possible. The sprag evidently flew back in the slice instead of dropping vertically downward to the floor because Battaglio was standing further out in the slice than his partner and should have been out of danger. There was no evidence of carelessness , the rules and regulations were being followed, and in my judgement the accident was a trade risk.

Battaglio was 58 years of age, married, leaving his wife. He has been employed as a miner for about thirty years and was considered a good miner that did not take chances.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

E. & A. No. 858 dated 12/27/39 - Water Column in Shafts:

	Estimated Expenditure	Expended 1940	Unexpended Balance
508' Pipe with Flanges	1904.00	1904.52	.52
Labor Installing	425.00	649.70	299.81
Total	2329.00	2554.22	230.33
(Closed in August)			

E. & A. AM - 1 Dated 3/5/40 - Remodeling Change House

Addition	3083.00	4053.48	970.48
Inside Remodeling	2635.25	170.08	2465.17
Heating Changes	1550.00	946.00	604.00
Traps & Strainers	200.00	130.79	69.21
Controls	260.00		260.00
Piping - Installed	850.00		850.00
New Shower Room	275.00	130.10	144.90
Mixing Valves	237.00	144.00	93.00
New Piping	475.00	174.82	300.18
Benches & hangers	1800.00		1800.00
Repairing Lockers	716.00		716.00
Lighting	600.00		415.75
Painting	300.00		300.00
Total	12981.25	5933.52	7047.73

E. & A. No. AM-2 dated 9/17/40 - New Skip Hoist Control

New Skip Hoist Control	3000.00		3000.00

13. Equipment and Proposed Equipment:

a. Steam Shovels:

The ore shipped from stockpiles was loaded by No. 43 and No. 11 shovels, both owned by the Cleveland-Cliffs Iron Company and rented by the Athens Iron Mining Company.

b. Scraper Hoists:

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

	On Hand 1/1/1940	Purchased 1940	Total On Hand 12/31/40	Repair Cost Per Machine 1940	Repair Cost Per Machine 1939
Sull. 15 H.P. Elec.	17	None	17	66.71	96.46
" 20 " "	2	"	2	116.45	148.82
" 25 " "	1	"	1		
I. R. 10 " "	2	"	2	243.45	134.16
" 15 " "	4	"	4	72.18	48.17
" 20 " "	7	"	7	35.65	7.16
Total	33	None	33	72.49	74.20
			Average	72.49	74.20

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13. EQUIPMENT AND PROPOSED EQUIPMENT: (Cont'd)

b. Scraper Hoists: (Cont'd)

The 10 H.P. motors were changed to 15 H.P. in 1940. The cost of the two new 15 H.P. motors is included in the cost of repairs.

c. Drill Machines:

No new drill machines were purchased in 1940.

d. Motor Haulage Cars:

No new cars were purchased in 1940, as the number of cars in service is sufficient although several may be needed when the 4th level gets into full production. Eight of the cars were overhauled at the General Shops at a total cost of $1205.99 as compared with eighteen overhauled in 1939.

14. MAINTENANCE AND REPAIRS:

a. Steel Trestles:

No repairs were made to the steel trestles, but some fir decking was treated at the plant and will be used during 1941 to replace the rotted decking on the approaches and near the shaft house.

c. Water Column in Shaft:

During the last week in April 508 ft. of new 10" discharge line was installed below the collar of the shaft, replacing the portion of the old line which had become rusted very thin and developed serious leaks. Three days were required to complete the work, during which time the Athens Mine water was diverted to the Negaunee Mine through a pipe line in the drift which connects to the 11th level Negaunee Mine. The expense incurred in this work amounted to $2559.33 and was charged to E. & A. No. 858. In December this expense was charged to operating mine.

d. Comparison of Costs - 1940 With 1939:

Maintenance and repairs listed under underground costs:

	Amount	Cost Per Ton
1940	35,666.90	.069
1939	29,908.58	.073
Increase	5,758.32	
Decrease		.004

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

	1940	1939	Increase	Decrease
Comp. & Power Drills	1199.51	826.96	372.55	
Scraper Equipment	16330.58	11822.45	4508.13	
Elec. Tram Equipment	12442.79	15564.74		3121.95
Pumping Machinery	5694.02	1694.43	3999.59	
Total	35666.90	29908.58	5758.32	

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14. MAINTENANCE AND REPAIRS: (Cont'd)

d. Comparison of Costs - 1940 With 1939: (Cont'd)

Repairs to the compressor and the purchase of new valves for the Ingersoll-Rand compressor account for the expenses for compressor and power drills. Due to more working days in 1940 and the necessity of operating the compressor during the third shift and the cost of main - tenance was higher than the previous year.

The increase in maintenance expense of scraper equipment was also due to the increased working schedule. The principle repairs to scrapers include replacing worn out manganese lips, wire rope and blocks. Repairs to scraper hoists, circuit breakers and electric cables and two 15 H.P. motors to replace two 10 H.P. motors are also included in this expense.

The large decrease in expense for electric tram equipment as compared with 1939 is due to the large amount of main level haulage track and trolley line installed in the previous year on the 9th and 7th levels where a large development program was underway. During 1940 less new track was installed, but repairs to haulage locomotives and the rocker dump cars have increased due to the increased working schedule.

The large increase in expense to pumping machinery was due to re-placing 508 ft. of discharge line below the collar of the shaft. Consider-able repairs were also made to this line before replacement was made. Repairs to the pumps and motors make up the balance of this expense.

Maintenance and repairs listed under "Surface Costs":

	Amount	Cost Per Ton
1940	22638.52	.045
1939	17613.72	.043
Increase	5024.80	.002

Listed by the five accounts as shown on the Cost Sheet:

	1940	1939	Increase	Decrease
Hoisting Equipment	10079.15	11184.94		1105.79
Shaft	4353.59	2906.96	1446.63	
Top Tram Equipment	2854.08	1729.90	1124.18	
Docks, Trestles, & Pkts.	1671.46	898.21	773.25	
Mine Buildings	3680.24	893.71	2786.53	
Total	22638.52	17613.72	5024.80	

In 1940 two 1-3/8" skip ropes costing $2852.27 and $326.13 on a third skip rope was charged out, while in 1939 two 1-3/8" skip ropes and one 1-1/4" cage rope were charged out. Less repairs to hoist motors were re-quired but replacements of idler sheaves on the pulley stands was approx-imate the same as in 1939.

The increased expense of shaft maintenance was due principly to re-placing about 150 ft. of runners in the South skip road early in the year. Excessive wear in one portion necessitated installing new runners. Also due to the increased working schedule two inspections a week are made through the shaft. During the year several broken sets in the circular shaft needed replacing and new casing was also put in at this point and a gunite coating applied.

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14. MAINTENANCE AND REPAIRS: (Cont'd)

d. Comparison of Costs - 1940 with 1939: (Cont'd)

Rebuilding top tram cars and the use of more rope necessitated by the larger product in 1940 accounts for the increased expenditures for top tram equipment.

The expense for docks, trestles, and pockets was increased by the necessity of erecting a new wood trestle for dumping rock and also by the replacements and repairs to shaft house pockets.

The large increase in expenses to mine buildings is due mainly to the project of remodeling the dry house under E. & A. AM-1. One third of the 1940 expenditures under the project or $1977.84 was charged to this account. The balance of the increase was due to repairs to the various buildings, including a new roof on the storage buildings and replacing window frames in the engine house.

15. POWER:

Detail of electric current purchased compared with 1939:

	1940 - 12 Mos. Optg.		1939 - 12 Mos. Optg.	
	Cost	Per Ton	Cost	Per Ton
Stoping	1850.01	.004	1096.53	.003
Ventilation	3246.13	.006	3311.37	.008
Pumping	21767.46	.042	21940.79	.054
Hoisting	31227.20	.060	24614.38	.061
Stocking Ore	947.86	.002	804.38	.002
Dry House	151.26	.000	93.82	.000
Lights at Levels	1985.01	.004	1366.90	.004
Compressor	37466.57	.073	26464.34	.065
Electric Haulage	2882.67	.006	1863.50	.005
Shops	334.22	.001	395.72	.001
Heating Plant	16.80	.000	17.37	.000
Office	18.96	.000	18.97	.000
Storage Battery Locomotive	34.19	.000	48.52	.000
Total	101928.34	.198	82037.09	.203
Main Line Meter K.W.	7,349,247		5,768,463	
Separate Meter Readings	7,287,031		5,687,837	
Line Loss	62,216		80,626	
Product	515,725		404,877	
K. W. Per Ton (Inc. Line Loss)	14.25		14.27	
Cost per K. W. (Average)	.0138692		.014276	
15 Minute Demand "	1513		1360	
Load Factor (Average)	54%		47.2%	

The cost per ton for electric power decreased slightly as compared with 1939. The decrease of .005 in cost per ton was due to the more favorable load factor and larger product.

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17. CONDITION OF PREMISES:

a. Grounds:

The grounds around the mine were kept in good condition during the year. The shrubbery was trimmed regularly and the lawn given an application of fertilizer and seeded in spots and the roads were graded with cinders where needed.

b. Athens Mine Houses:

The following statement gives the total cost of repairs and the average cost per house of 1940 and 1939:

Year	No. Houses	Amount	Avg. Cost Per House	Rental Income
1940	31	4775.30	154.04	4881.95
1939	31	4862.60	156.86	4926.56

The decrease in cost of repairs to houses as compared with 1939 was due to the large amount of repairs that were made in previous years. To maintain the houses to the proper standard, minor repairs are required each year and which consequently eliminate costlier repairs in the future. The general repairs consisted of a new roof on three dwellings and in one second floor flat, the walls of each room were covered with sheet rock and some plastering and painting done. Four new chimneys were constructed replacing old ones that were in a poor condition. A new two car garage was also constructed for the tenents in a double house. Some extensive repairs were made to another house which was raised to allow new sills and joists to be placed. Plastering and papering was then required and new window frames installed. Some additional repairs is contemplated for several of the houses and this work will be done in 1941.

18. NATIONALITY OF EMPLOYEES:

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

As to Parentage	1940	%	1939	%
English	49	13.7	50	15.3
Finnish	165	46.2	148	45.4
Italian	64	17.9	60	18.4
Swedish	25	7.0	23	7.1
French -(France)	1	.3	0	0
French (Canadian)	30	8.4	27	8.3
Scotch	1	.3	1	.3
German	2	.6	3	.9
Austrian	6	1.7	3	.9
Norwegian	8	2.2	7	2.2
Irish	1	.3	2	.6
Greek	1	.3	1	.3
Danish	3	.8	1	.3
Polish	1	.3		
Total	357	100.0	326	100.0

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18. NATIONALITY OF EMPLOYEES: (Cont'd)

As to Birth	American Born		Foreign Born	
	1940	1939	1940	1939
English	36	35	13	15
Finnish	107	91	58	57
Italian	27	25	37	35
Swedish	20	18	5	5
French (France)	1	0		
French (Canadian)	30	27		
Scotch	1	1		
German	2	3		
Austrian	5	2	1	1
Norwegian	8	6		1
Irish	1	2		
Greek			1	1
Danish	3	1		
Polish	1			
Total	242	211	115	115
	67.8%	64.7%	32.2%	35.3%

JACKSON LEASE-CAMBRIA MINE
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1. GENERAL

The Jackson Lease being operated by the Republic Steel Corporation through its Cambria Mine Shaft was fairly active during the past year. The schedule of work started in January with two - eight hour shifts five days a week which was continued until the middle of February when it was reduced to two shifts a day - four days a week. In May, operations were increased to two shifts a day - five days a week and in August it was again stepped up, this time to three shifts a day, five days a week, which is the schedule at the present time.

Shipments from the pocket started in April and continued throughout the shipping season. Loading from the stockpile was started in May and around the first of November, the entire pile had been shipped crediting the Jackson Lease with an overrun of two hundred and eighty (280) tons.

2. PRODUCTION
SHIPMENTS &
INVENTORIES

a. Production by Grades

Grade	Tons	% of Product
Cambria (Non-Bessemer) - - - - - - - - - - - -	92,669	100
Violet (Bessemer) - - - - - - - - - - - - - -	0	0
Total -	92,669	100

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

Grade	1940 Tons	1939 Tons	1938 Tons	1937 Tons	1936 Tons	Total Tons
Cambria (Non-Bessemer)	92,669	62,036	21,663	66,116	7,791	250,275

b. Shipments

Grade of Ore	Pocket Tons	Stockpile Tons	Total Tons	Total Last Year
Cambria (Non-Bessemer)	47,943	43,747	91,690	79,953

Shipments include 280 tons of overrun from stockpile.

The following statement shows the difference in ore shipped and the minimum shipments as prescribed in the mining lease since it became operative.

YEAR	SHIPMENT	MINIMUM	DIFFERENCE
1936	2,324	66,667	64,343
1937	61,008	100,000	38,992
1938	0	100,000	100,000
1939	79,953	100,000	20,047
1940	91,690	100,000	8,310
Total*	234,975	466,667	231,692

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2. Production
Shipments &
Inventories (Cont.)

c. Stockpile Inventories

Grade of Ore	Dec. 31st 1940	Dec. 31st 1939	Increase
Cambria (Non-Bessemer)	15,590	14,611	979

e. Production by Months

Month	Cambria ore Tons	Rock Tons
January	11,052	0
February	9,212	0
March	3,983	0
April	6,557	0
May	6,370	42
June	5,092	134
July	5,267	0
August	6,919	118
September	7,857	284
October	7,361	38
November	10,262	416
December	12,737	329
Totals	92,669	1,361

3. ANALYSIS

The following are the analyses of the Cambria Ore produced from the Jackson Lease during 1940. These figures are compiled from the averages of the daily reports of production and analyses by underground cars of each contract for each day's operation:

Month	Grade	Cars	Dried Iron	Dried Phos.
January	Cambria	4,703	56.53	.076
February	"	3,920	58.05	.087
March	"	1,695	57.75	.073
April	"	2,825	58.79	.079
May	"	2,723	58.16	.071
June	"	2,136	57.52	.073
July	"	2,243	56.57	.088
August	"	2,944	57.66	.092
September	"	3,358	56.91	.082
October	"	3,099	55.55	.084
November	"	4,331	56.93	.084
December	"	5,420	56.02	.083
Total		39,397	57.08	.082

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6. SURFACE

Shipments from stockpile started in May and were entirely loaded out by the forepart of November with a credit to Jackson Lease of 280 tons overrun. The customary stocking trestles were erected.

7. UNDERGROUND

a. General

The average monthly production was 7,722 tons as compared to 7,298 tons in 1939 and represents an increase of 5.8%. This increase was due to an increase in working schedule.

The following table shows the number of days worked, average number of miners employed and the average number of tons per miner per 8 hour shift by months.

MONTH	TIME WORKED	AVG. NO. OF MEN	TONS PER MINER
January	23 - 2-8 hr.	13.52	17.77
February	20 - 2-8 hr.	14.50	15.88
March	16 - 2-8 hr.	9.56	13.02
April	19 - 2-8 hr.	11.84	14.57
May	23 - 2-8 hr.	11.38	12.17
June	21 - 2-8 hr.	16.16	7.50
July	23 - 2-8 hr.	13.40	8.02
August	22 - 3-8 hr.	12.54	8.37
September	21 - 3-8 hr.	13.24	9.18
October	22-2/3- 3-8 hr.	15.02	7.13
November	21 - 3-8 hr.	18.62	6.60
December	21-2/3- 3-8 hr.	21.74	5.06
Monthly Average	51.25 - 8 hr. Shifts	14.70	10.24
Monthly Avg. 1939	37.50 - 8 hr. Shifts	13.60	14.51

The decrease in tons per miner per 8 hour shift, as shown in the foregoing table is due to the fact that considerable more rock was broken and less open stope mining was done this year as compared with 1939.

The development of the Seventh Level has been fully completed on the Cambria side of the property line. The tail drift at shaft was advanced to the east to a point 160 feet from the center of the shaft, of which 35 or 40 feet of the eastern end opened to a width of 18 feet to serve as a repair station for motors and cars, advanced main haulage to the west and south into the Jackson property, cut pump station, installed pumps and excavated for a sump. That portion of the main haulage drift on the Cambria property was driven West 186 Feet from the center of the shaft; thence on a 150 foot radius curve to the left for 179 feet; thence approximately S 16° W for 315 feet to a point on the north boundary line of the Jackson Lease.

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7. UNDERGROUND (CONT.)

b. Development

Ore located by D. D. Hole No. 122 on 6th Level is now being developed. This ore lies both east and south of the East Deposit. A drift was driven 152 feet to the south from the property line, passing through the first run of ore in the hole but evidently was not extended far enough south to reach the second run. Instead of continuing this drift , a cross-cut was put in, starting from a point 30 feet back from the breast and heading directly for the ore as located in the hole. This drift encountered the ore at 72 feet, was advanced another 45 feet in ore and breasted in ore. A raise was also put up near the ore contact and is up 15 feet. No dimension of this ore in known as the D.D. Hole bottomed in ore but it looks as though it may be of considerable size. A raise was put up 55 feet in the aforementioned first run and cut-outs were made at the /128 foot and /152' elevations. On the/128 foot elevation , a drift was driven easterly 43 feet, all except the last 4 feet being in ore and on the /152 foot elevation, a drift was driven 130 feet to the southeast, the first 20 feet of it being in ore and the balance in jasper. It is very probable that if this drift had been advanced a little further it would have hit the second run of ore shown in the drill hole.

In the Center Deposit, ore was developed in the east end and south side. The development of ore in the east end is a continuation of last years work. A haulage drift was put in on the 6th level underneath this ore and was headed for ore located in D.D. Hole No. 120. A raise was put up at a point 26 feet from the breast to an elevation of /139 feet where a little drifting was done to the east and west along the hanging and northerly to old workings. When drifting west along the hanging, the east end of an old stope was encountered,and considerable ore was drawn from it. On the south side, the 6th Level main haulage drift was extended southerly 42 feet to ore located by D.D. Hole No. 124. Two raises were put up in this ore, both hitting the hanging 40 feet above the level.

Development work on the 7th Level consisted of 884 feet of main haulage drift and 183 feet of raising. No real good ore has as yet been encountered. The last 150 feet of drift has been the best and had a dried iron content of about 56.50. This may be accounted for by the fact that all the drifting has been adjacent to the foot, and therefore contaminated by seams of slate and dike. The east raise was put up 94 feet in very lean ore and a cut-out was made at the -65 foot elevation, where drifting westerely 60 feet along the foot showed nothing but very lean ore. The other raise which was put up 300 feet to the west is up 89 feet all in rich iron formation. It was intended that this raise should hit the ore located by D.D. Hole No. 119 drilled from 6th Level. As these drill holes were not tested for dip and course, the exact location of ore is not known but it seems that the raise is just underneath the hole and will eventually hit it, as the dip of the ore is less than that of the raise.

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7. UNDERGROUND

c. Stoping

East Deposit

Slicing on the 135' Sub on the Jackson side of the line was completed in January. From January to August, all work was confined to the Cambria and during the balance of the year the slicing of all the ore on the Jackson property, on the /123 foot elevation was finished.

Center Deposit

The eastern portion of this deposit was stoped as far east and as high as it was possible from developments of last year. This extraction carried to an elevation of /214 feet, 75 feet east of the most easterly development on the /135 foot sub. As previously stated under developments, this ore is being developed further east from the 6th Level.
In the central or slicing portion of the deposit, some slicing was done on the /135 foot and 120 foot Sub Levels and on the 6th Level.

West Deposit

The stoping of the ore in the west wing of the deposit has been completed from the 135 foot sub to the top or /180 foot sub and the remainder of the ore between the 6th Level and the /135 foot sub is being mined by driving drifts, on the level, to the limits of the ore and then blasting down the back as they retreat. To date about 25% of the area has been mined by this method. This method is also being employed in the east wing of the deposit, a drift having been driven on the 6th Level underneath the pillar and floors of the 120 foot sub , after mining all the ore possible on that sub by stoping. In the north central part of the deposit where the slicing method has been used, one east-west slice was taken along the hanging on the /135 foot Sub, completing the mining of this portion to this elevation.

9. EXPLORATIONS

In May an underground drilling campaign was started and extended through till October 15th when it came to an abrupt end as the drill machine being used was urgently needed at one of the Republic Steel Corporation's other properties. A total of thirteen holes were drilled and proved very effective as they revealed a considerable footage of unknown ore.

The following is a log of all the holes drilled showing the location, dip, course, total length, ore footage and analyses of same in iron and phos.

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No.	Level	Location	Dip	Course	Length	Ore Footage & Analyses	Iron	Phos.
116	6th	S 123' E 2692'	Vertical	-	179'	10'to 25'	60.98	.080
117	6th	S 123' E 2700'	Hor.	East	225'	110'to 115'	56.58	.095
118	6th	S 120' E 2662'	/10°	N 59° E	127'	None		
119	6th	S 80' E 3295'	-67°	South	197'	25'to 105'	62.21	.069
						170'to 190'	54.60	.114
120	6th	S 88' E 3295'	Hor.	S 2° E	120'	15'to 30'	61.03	.029
121	6th	S 5' E 3546'	-42°	S 38° W	40'	None		
122	6th	S5' E 3550'	Hor.	S 41° E	225'	5'to 60'	61.41	.261
						170'to 225'	59.82	.092
123	6th	S 115' E 3000'	-55°	South	275'	5'to 20'	63.45	.054
						35'to 70'	57.64	.120
						80'to 95 '	59.63	.047
						240'to 275'	54.28	.078
124	6th	S 115' E 2990'	Hor.	S 24° W	235'	4'to 20'	63.19	.061
						50 'to 90'	62.81	.049
						155'to 170'	55.89	.050
						220'to 235'	58.83	.045
125	7th	S 240' E 3600'	/5°	South	163'	None		
126	7th	S 233' E 3600'	/5°	North	110'	5'to 25'	57.06	.078
127	6th	S 82 ' E 3293'	-38°	S 2° W	279'	20'to 120'	64.71	.053
						130'to 279'	63.07	.079
128	6th	S 105' E 2552'	-47°	S 30° W	185'	None		

John Irving
Engineer

LUCY MINE
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1. GENERAL:

The fences around the open pits and the old shaft were inspected during the Summer and necessary repairs made.

10. TAXES:

	1940		1939	
	Valuation	Taxes	Valuation	Taxes
Various Parcels	$ 29,600	$ 1,038.41	$ 29,600	$ 1,083.63
Collection Fees		10.38		10.83
Total Taxes	$ 29,600	$ 1,048.79	$ 29,600	$ 1,094.46
City of Negaunee Tax Rate Per $100.00 Valuation		3.508		3.661

The City of Negaunee tax rate decreased with a consequent reduction in the taxes on this property.

MAAS MINE
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1. GENERAL

The Maas Mine operated continuously during the year 1940 on a five day per week schedule with two regular eight-hour shifts together with a small third shift to take care of the excess tonnage produced on the regular shifts and which could not be hoisted in sixteen hours. Near the middle of the year it was decided to further increase production and several third shift mining contracts were added from time to time until, at the end of the year, there were sixteen contracts on three shifts out of a total of forty-one. With the increased activity on the third shift, it was impossible to do the customary cleaning of tracks while tramming was in progress and it became necessary to work one extra week-end shift per month to clean up the accumulated mud, this work having to be paid for on an overtime basis as it was impossible to spare enough men to stay home one day a week to make up a crew sufficient for this purpose.

The Company's plan of having the older men retire and accept their Social Security was continued and during 1940 six of the Maas Mine employees between the ages of 68 and 70 stopped working. In addition to their Social Security, the Company agreed to pay them $10.00 per month and allow them to carry $500 of life insurance as a consideration for their service with the Company and to bring their total remuneration nearer to what they used to receive under the former Company pension plan.

Mining continued in the same areas as in 1939; namely, the East and West footwall pillars above the Third Level with the West pillar being almost completely mined out above the Third at the end of the year; the two blocks lying East of the Race Course Lease above the Fourth Level with that adjacent to the Race Course being mined on the 4th Level elevation at the close of 1940; and the main ore body in and South of the Race Course Lease below the Fourth Level. Very little was accomplished in the so-called 4000 block East of the Race Course and approximately 100 feet above the Fourth Level as the main cross-cut, which was entirely repaired last year, became so heavy that all the new timber again crushed and mining above was temporarily abandoned. Three repair crews were employed continuously here during the last three months of the year. Two new small areas were started in 1940, both on the North footwall, one above the Fourth and one above the Fifth, where mining limits could be set which would not disturb unmined pillars above. It was necessary to open these new areas and increase the number of contracts in others to make places for the contracts removed from the strip adjacent to the Negaunee Mine where the ore is to be removed through the Negaunee shaft to increase production in that mine.

There were three development programs in progress during the year besides the necessary raises being put up from time to time as needed. A cross-cut was driven on the Third Level in the East footwall pillar to eliminate one transfer system and also to enable the putting up of new raises to decrease the scraping distance from

the existing footwall raises and this development was all in ore. Another development project was on the 200' elevation approximately half way between the Third and Fourth Levels and mostly in rock. This transfer system had to be installed because, with the very flat dip of the footwall, the recovery of the ore lying immediately below the Third Level, by rock drifts and raises from the Fourth Level 200 feet below, would have entailed too large an expenditure. At the extreme West end of this transfer it is expected to open a stope as the shape of the ore body would appear to conform to this type of mining, which can be done at a considerable reduction in cost.

The main development was in connection with the exploration of the ore body below the Fifth Level to ascertain both its extent and grade. Under an E & A authorized about the middle of the year, the North footwall drift was extended to the West and a cross-cut turned off to the South where diamond drilling will be done at various stations to test the formation below. This cross-cut has been in lean ore and ore in which the sulphur content has varied from .100 to 2.000 but it is hoped that the diamond drilling will prove up an area below this sulphur horizon where the grade will be standard.

There was a continuation of the plan to try to recover water from the ledge before it enters the mine, the Layne-Northwest Company sinking five test holes some 300 feet apart and 500 feet West of the caved area, installing No. 3 well near the most favorable of these and improving No. 1 well South of the shaft, the detail of which will be taken up under Drainage. While No. 3 well proved to be pretty much of a failure, Nos. 1 and 2 wells pumped a total of 925 gallons and there was a decrease at the end of the year of approximately 300 gallons per minute underground. While most of the decrease occurred on the footwall and did not materially effect underground conditions, it shows however that there are still possibilities of recovering an even greater amount and the cost of pumping this surface water has been more than offset by the decrease in cost of pumping underground. It is hoped that further work along this line will be carried out as a large saving should be shown as soon as the water, coming through the hanging and directly into the working places, can be reduced.

There was a very large repair and maintenance program on the main levels due to the mining in several areas approaching so close to the levels and also due to crushing in one of the new Fourth Level cross-cuts, this latter having been partially repaired twice and then crushing again to such an extent that mining above had to be temporarily abandoned. There is a large jasper pillar above this drift and until the pressure can be removed by mining out several subs, considerable difficulty will probably be experienced.

Two new features were introduced this year at the Maas Mine in connection with the shipment of ore. Heretofore in removing ore

in stock, the wooden trestle had been completely dismantled and then rebuilt later, but it was decided this year to remove as much ore as possible without disturbing the trestle. This succeeded beyond our expectations, only four legs being broken out of ninety and in no case was the top of the trestle impaired while the additional cost due to slower loading at critical points was more than offset by the saving in not having to re-erect the trestle, especially as there was a third rail bonded for electric current to control the larry car.

On account of the demand for Maas grade ore near the end of the season when the stockpiles had been cleaned up with the exception of the wet ore (which amounts to approximately 35% and has to be stocked for several months before it is suitable for shipment) it became necessary to rent a tractor with a bulldozer blade and scrape the small rills of ore left in each cut by the steam shovel to one central place where this could be loaded. The total shipments from the mine showed an increase over last year of approximately 328,000 tons, with an all time record total of 950,426 tons, while at the end of the year there remained in stock only 100,968 tons as compared with 317,340 tons on December 31st, 1939. It will, therefore, be necessary to speed up production very materially if as much is to be shipped in 1941.

There were two major accidents to employees during the year. In March, two miners were drilling in the breast of their working place when the drill encountered powder in the bottom of a hole drilled for the preceding blast. The powder exploded, causing one man to lose the sight of an eye while the hearing of the other was partially damaged. Their faces and hands were also cut and impregnated with small particles of ore. It is very difficult to set a standard that will absolutely prevent accidents of this kind as conditions vary so much, but at the present time the primer cartridge is being placed in the bottom of the hole and therefore, if all of the shots go off in blasting a round, it is absulutely impossible to leave powder in the bottom of a hole. If there are any that do not go off, evidence can be found and these discharged in a safe manner.

The other accident occurred in December when the jasper hanging in a working place broke down the covering without warning and caught both men to such an extent that it took three hours before the last one could be rescued. Working conditions under new hanging are particularly hazardous and only by very constant supervision and the most careful planning can these accidents be avoided, especially as the rate of mining is so fast, due to working three shifts, that the matt does not have time to settle gradually. It was fortunate that neither of these men was hurt seriously.

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2. PRODUCTION, SHIPMENTS & INVENTORIES

a. Production by Grades

	1940	1939	Increase	Decrease
Maas Bessemer	21,371	40,203		18,832
Race Course Bessemer	12,553*	14,184		1,631
Maas	523,128*	356,037	167,091	
Race Course	106,109*	79,921	26,188	
Maas Special	20,166	2,829**	17,337	
Race Course Special	48,524	22,627**	25,897	
Maas Bess. Special		236		236
R. C. Bess. Special	2,203	4,907		2,704
Total	734,054	520,944	213,110	
Rock	10,987	11,356		369
Total Hoist	745,041	532,300	212,741	

*Includes current and previous year's stockpile overrun of 35,275 tons.

**Includes current and previous year's stockpile overrun of 3,893 tons.

33,169 tons or 4.7% of the actual production was Bessemer grade.

b. Shipments

Grade of Ore	Pocket Tons	Stockpile Tons	Total Tons	Total Last Year
Maas Bessemer	154	26,077	26,231	34,886
Race Course Bessemer		19,857	19,857	18,323
Maas	236,819	477,137	713,956	430,631
Race Course	42,819	99,685	142,504	102,464
Maas Special	7,206	8,245	15,451	2,681
Race Course Special	16,167	16,260	32,427	27,609
Maas Bess. Special				236
R. C. Bess. Special				5,873
Total	303,165	647,261	950,426	622,703
Total Last Year	200,920	421,783	622,703	
Increase	102,245	225,478	327,723	

Included in the above is 28,380 tons shipped all rail to Charcoal furnaces.

c. Stockpile Inventories

Grade of Ore	12-31-40	12-31-39	Increase	Decrease
Maas Bessemer	26,244	31,104		4,860
Race Course Bessemer	226	7,530		7,304
Maas	38,780	229,608		190,828
Race Course	9,954	46,349		36,395
Maas Special	5,169	454	4,715	
Race Course Special	20,595	929	19,666	
R. C. Bess. Special		1,366		1,366
Total	100,968	317,340		216,372

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d. Division of Product by Levels

	1940	%	1939	%
Third Level	219,250	31.3	160,082	31.0
Fourth Level	194,134	27.8	132,776	25.6
Fifth Level	286,593	40.9	225,041	43.4
Total	699,977	100.0	517,899	100.0

e. Production by Months

Month	Maas Bess.	Maas	Maas Spcl.	R. C. Bess.	Race Course	R. C. Spcl.	R. C. Bess. Spcl.	Total	Rock
January	5,952	34,557	121	3,036	5,228	1,524	823	51,241	360
February	6,267	35,763		4,338	5,678	1,116	1,303	54,465	254
March	2,915	39,227		2,299	8,683	1,882	77	55,083	200
April	172	40,664	424	1,305	8,249	2,369		53,183	773
May	193	47,831	2,464		9,406	2,228		62,122	700
June	2,877	37,528	712	594	9,455	4,396		55,562	1,080
July	2,284	38,803	3,808	1,064	7,113	8,689		61,761	1,620
August	1,929	35,652	4,010	230	8,227	6,233		56,281	1,070
September	989	41,500	2,071		9,351	4,878		58,789	1,165
October	577	53,837	1,895	108	8,926	4,335		69,678	1,530
November	526	47,081	1,654		9,349	4,120		62,730	1,285
December	468	40,422	2,742	226	7,558	6,468		57,884	950
Total	25,149	492,865	19,901	13,200	97,223	48,238	2,203	698,779	10,987
1940 Stock-pile O'run.					1,198			1,198	
Prev. Yrs. O'run		26,750		755	6,572			34,077	
Gr. Total	25,149	519,615	19,901	13,955	104,993	48,238	2,203	734,054	10,987

The product was distributed as follows:

	1940	1939	Increase	Decrease
George Maas Lease	464,751	331,080	133,671	
Catholic Cemetery	59,184	31,063	28,121	
American Mining Co.	8,886	9,498		612
C.C.I.Co.(Right of Way)	17,274	18,350		1,076
Race Course	169,389	121,639	47,750	
City of Negaunee	14,570	9,314	5,256	
Total	734,054*	520,944**	213,110	

*Includes current and previous year's stockpile overrun of 35,275 tons.
**Includes current and previous year's stockpile overrun of 3,893 tons.

f. Ore Statement

	Maas Bess.	Maas	R. C. Bess.	R. C. Bess. Spcl.	Race Course	Maas Spcl.	R. C. Spcl.	Total	Total Last Yr.
On Hand 1-1-40	31,104	229,608	7,530	1,366	46,349	454	929	317,340	419,099
Product for year	25,149	492,865	13,200	2,203	97,223	19,901	48,238	698,779	517,051
Trans. to & from	3,778	3,513	1,402	3,569	1,116	265	3,855		
1940 Overrun					1,198			1,198	
Prev. Years Overrun		26,750	755		6,572			34,077	3,893
Total	52,475	752,736	20,083		152,458	20,620	53,022	1,051,394	940,043
Shipments	26,231	713,956	19,857		142,504	15,451	32,427	950,426	622,703
Balance on Hand	26,244	38,780	226		9,954	5,169	20,595	100,968	317,340
Increase in Output								181,728	
Decrease in ore on hand								216,372	

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f. Ore Statement (Cont.)

Estimated stockpile overrun still in stock at end of 1940 shipping season:

	Current Year	Previous Year	Total
Maas Bessemer	913		913
Maas	23,201	23,250	46,451
Race Course Bessemer	1,626	1,245	2,871
Race Course*			0
Maas Special			0
Race Course Special			0
Total	25,740	24,495	50,235

*Race Course cleaned up with 7,770 tons overrun credited.

Total overrun shipped in 1940 was 35,275 tons.

1940 2 8-hr. shifts, 5 days per week with a small hoisting crew on the third 8-hour shift from January 1st to September 1st, and after that an increasing number of miners on the third shift until, at the end of the year, there were 16 contracts on three shifts. The men on each crew alternated as to day, afternoon and midnight shifts.

1939 1 8-hr. shift, 4 days per week, and 2 8-hour shifts, 1 day per week, with a small hoisting shift 3 8-hr. shifts per week with crews alternating to receive 3 days per week, January 1st to January 9th.

2 8-hr. shifts, 4 days per week, and a small hoisting third shift with crews alternating to receive 4 days per week, January 9th to June 12th.

1 8-hr. shift, 4 days per week, and 2 8-hour shifts one day per week, with a small hoisting shift 3 8-hour shifts per week with crews alternating to receive 3 days per week, June 12th to September 11th.

2 8-hr. shifts, 5 days per week, and a small hoisting third shift with crews alternating to receive 5 days per week, September 11th to December 31st.

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

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

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

1936 1 8-hr. shift, 6 days per week, 2 crews working alternate weeks, January 1st to February 1st; 6 days and 2 nights per week with 2 crews averaging 4 days per week, February 1st to May 1st. 2 8-hour shifts 5 days per week with 1 extra 8-hour hoisting shift from May 1st through the balance of the year. Starting November 15th, a few mining crews were gradually added to this third shift. About October 1st the straight 8-hour shift was put into operation. Under this schedule the men take their lunches underground with them and relieve their opposite partners in the working places, thus having the entire 8 hours for work instead of loosing part of their time in going to and from their working places. They do not take time out for lunch, arranging to eat when it does not interfere with their operation.

g. Delays
Electrical

Date	Shift	Duration	Loss In Product	Cause
June 4th	Af'noon	3/4 hrs.	100 tons	Low power.

Delays
Non-Electrical

Jan. 3rd	All	24 hrs.	2400 tons	Repairing leak in main discharge column.
Jan. 8th	Af'noon	6 hrs.	600 tons	Broken skip runner. Skip jammed in shaft.
Jan. 16th	Day	1 hr.	100 tons	Skip frozen in dump.
Jan. 16th to Jan. 21st.	Parts of All Shifts		900 tons	Delay on landing on account of frozen ore in cars. Very cold weather.
Feb. 20th	Day	½ hr.	55 tons	Repairing 3rd Level pocket.
Mar. 13th	Night	3 hrs.	300 tons	Skip caught in shaft.
Mar. 14th	Day	4 hrs.	400 tons	Skip caught in shaft.
April 3rd	All	2 hrs.	200 tons	Ice on 3rd rail on trestle.
April 12th	Af'noon	1 hr.	100 tons	Loose casing plank caught in skip road.

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g. Delays (Cont.)
Non-Electrical

Date	Shift	Duration	Loss In Product	Cause
June 4th	Day	1 hr.	100 tons	Repairing skip.
June 10th	Day	1 hr.	100 tons	Cutting off stretch in hoisting rope.
Aug. 20th	Day	1 hr.	100 tons	Repairing dump.
Sept. 5th	Day	3/4 hr.	75 tons	Repairing skip.
Sept. 16th	Night	1½ hrs.	200 tons	Repairing 4th Level pocket.
Sept. 19th	Af'noon	2 hrs.	300 tons	Broken air line in shaft.
Sept. 23rd	Night	1 hr.	100 tons	Derailed motor on 4th Level and repairing plate in dump.
Sept. 30th	Day	2 hrs.	300 tons	Broken main air line.
Oct. 30th	Day	1 hr.	150 tons	Repairing skip and shaft pocket.
Nov. 12th	Day	3/4 hr.	100 tons	Tram car frozen on landing.

3. ANALYSIS

a. Average Mine Analysis on Output

Grade	1940 Iron	Phos	Sil.	Sul.	1939 Iron	Phos	Sil.	Sul.
Maas Bessemer	62.19	.047	6.51	.021	62.15	.047	6.68	.016
Maas	60.92	.083	7.73	.022	61.05	.079	7.69	.017
Race Course Bess.	60.87	.046	6.14	.020	62.93	.047	6.02	.022
Race Course	61.49	.081	7.77	.025	61.85	.072	7.46	.018
Maas Special	61.44	.072	6.37	.224	60.66	.084	7.21	.094
Race Course Special	61.64	.069	6.70	.161	61.60	.058	6.90	.103
R. C. Bess. Spcl.	63.41	.040	4.88	.172	61.60	.046	7.38	.107
Maas Bess. Special					61.70	.042	6.98	.043

b. Average Mine Analysis on Ore Shipped

Grade	Iron	Phos.	Sil.	Alum.	Mang.	Lime	Mag.	Sul.	Loss	Moist.
Maas & R. C. Bess.	62.55	.043	6.37	2.32	.21	.38	.14	.015	1.12	11.85
Maas & Race Course	60.90	.082	7.89	2.36	.21	.57	.18	.018	1.49	11.78
Maas & R. C. Special.	62.05	.066	6.20	2.30	.26	.60	.18	.160	1.50	12.48

c. Average Analysis on Straight Cargoes

	Mine Iron	Phos.	Silica	Lake Erie Iron	Phos.	Moist.
Lake Bessemer (Maas & Race Course Bessemer)	62.63	.042	11.15	62.71	.041	10.43
Maas Bessemer (Maas & Race Course Bessemer)	62.55	.042	11.18	62.40	.043	11.18

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3. ANALYSIS

e. Average Analysis of Ore in Stockpiles

Average Natural Analysis

Grade	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist
Maas Bessemer	55.41	.043	5.56	.19	2.08	.36	.13	.013	1.00	11.28
Race Course Bess.	55.54	.042	5.32	.17	2.06	.35	.22	.018	1.00	11.73
Maas	52.46	.075	7.40	.18	2.06	.50	.16	.021	1.49	12.85
Race Course	52.73	.064	7.00	.18	2.12	.41	.15	.033	1.52	12.78
Maas Special	53.41	.066	5.29	.18	2.01	.52	.16	.229	1.60	12.80
Race Course Spcl.	54.11	.062	5.98	.18	2.31	.41	.24	.136	2.00	12.09

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	22,925	627,078	138,391	4,388	32,079	824,861
3rd to 4th Levels	271,774	2,004,344	5,587	21,352	10,717	2,313,774
4th to 5th Levels	292,410	1,382,160		62,284	17,338	1,754,192
Gross Total 11-30-40	587,109	4,013,582	143,978	88,024	60,134	4,892,827
Less 10% Mining Loss	58,711	401,358	14,398	8,802	6,013	489,283
Balance	528,398	3,612,224	129,580	79,222	54,121	4,403,544
Less 10% for Rock	52,840	361,222	12,958	7,922	5,412	440,354
Balance	475,558	3,251,002	116,622	71,300	48,709	3,963,190
Less Dec. 1940 Prod.	7,784	33,325	4,726	550	1,557	47,942
Total Standard Grade	467,774	3,217,677	111,896	70,750	47,152	3,915,248
Total Special Grade	718,164	33,283				751,447
Grand Total 12-31-40	1,185,938	3,250,960	111,896	70,750	47,152	4,666,695
N1/6 D.S.S.& A. Right of Way (Adams Strip)						17,787
Total Maas Group to be Mined Through Maas Shaft						4,684,482

200,000 tons of Maas and Race Course are estimated to be of Bessemer grade.

DECREASE IN ORE RESERVES

The above estimate of ore reserves for 1941, as reported to the Tax Commission, showed a decrease from that of 1940 of 1,770,484 tons, after the 1940 production is subtracted. This large decrease results from turning over a strip to the Negaunee Mine containing 1,241,315 tons and also from the eliminating of high sulphur ore below the Fifth Level which was reported in 1939 as 883,068 net tons. The high sulphur ore below the Fifth Level was left out as all the drilling so far has indicated no standard grade ore at depth and therefore it is not supposed that a new level will be opened. The amount of high sulphur ore above the Fifth Level was also shown this year for

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a. Developed Ore (Cont.)

the first time. There was, however, some increase in ore outline on the various levels, which is detailed as follows:

	Maas	Race Course	Total
Above 3rd Level	130,000	8,000	138,000
3rd to 4th Levels	20,000	40,000	60,000
4th to 5th Levels	50,000	42,000	92,000
Total	200,000	90,000	290,000

The large increase in the Maas (which consists of all the leases except the Race Course) above the Third Level is due to a very decided flattening of the hanging on the 395' Sub Level in the East footwall pillar, and also being able to recover more ore in the pillars between the old slices on the 401' Sub Level than was originally estimated. The other increases are fairly small and due to slight changes in the ore outline where development has taken place in areas that were formerly interpolated from information above and below.

c. Estimated Reserve Analysis

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

d. Estimated Production

The following is the estimated tonnage and expected analysis, by grades, of the 1941 production from the Maas Mine on an operating schedule of 5 days per week, 3 straight 8-hour shifts; the third shift somewhat smaller than the other two.

Grade	Estimated Production 5 Day per Week Basis
Maas & Race Course Bessemer	30,000 tons
Maas & Race Course Non-Bessemer	666,000 "
Maas & Race Course Special	120,000 "
Total	816,000 tons

Expected Analysis of Above Tonnages

Grade	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist	Iron Nat'l.
Maas & Race Course Bessemer	62.50	.043	6.50	.22	2.30	.60	.20	.015	1.00	11.25	55.47
Maas & Race Course Non-Bessemer	60.50	.082	8.30	.22	2.40	.85	.25	.020	1.80	11.75	53.69
Maas & Race Course Special	61.50	.070	6.50	.22	2.40	.85	.25	.250	1.80	11.75	54.63

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5. LABOR & WAGES

a. Comments

1. Labor

There has been a very large change of personnel among the Maas Mine employees during the year, largely on account of the necessity for increasing the force to enable the placing of more men on the third shift to speed up production and also to replace the large number of men who were dropped from the payroll for various reasons. All of the men hired for temporary work on the crusher and steam shovels during the shipping season were placed underground in the fall with the exception of those whose medical examination prohibited this type of employment and these latter were laid off at the end of the season. For a matter of record, the reasons for those being dropped from the payroll are listed as follows:

Died	4
Retired at 65 years of age or over	6
Unable to work further on account of ill health	5
Transferred to other properties	4
National Guard	2
Quit to go to school or in business	5
Total	26

To replace these and to increase the force there were 80 men hired during the year.

Relative to those employees who are over 65 years of age, two retired voluntarily in the spring and four others were asked to stop work in November as it was felt that these men were a distinct hazard both to the Company and to themselves. The Company allowed them to carry $500 life insurance and gave them $10.00 per month in addition to the amount which they received from Social Security, the latter probably averaging about $35.00 per month. At the end of the year there were only four men in the mine over 65 years of age, two of whom are bosses while the others are timbermen and are very active for their age. The average age of the employees at the end of the year was 39, a decrease of two years as compared with 1939 due to so many younger men being employed.

A total of 299 men who had worked for the Company five years or longer received five days vacation with pay during the week of August 11th, the mine continuing to work that week so the men inelligible for vacations would not lose any time and there also would not be as great a loss in product.

The only safety bonus in effect during 1940 was to the bosses and penalties were invoked not only for lost time accidents, but also for infractions of the standards by men under their supervision, these latter being noted by the Safety Inspector and Superintendent when going through the mine.

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5. LABOR & WAGES

1. Labor (Cont.)

There was no change in the wage schedule during 1940. The Wage and Hour Act was strictly enforced with only the least amount possible of overtime being allowed. In most cases this can be avoided by having men stay home one shift during the week in order to come out Saturday or Sunday on repairs, but once a month it was necessary to employ a large crew to clean up the ore that has been removed from the tracks and ditches and piled up along the drifts. Enough men for this job can not be spared from the regular operations, therefore overtime has to be paid.

2. New Construction

The work carried out during 1940 on the following E & A's was not of such a nature as to require the hiring of any additional men with the exception of a few painters who are generally employed each summer.

No. 689 Moving 30 houses to the Cleveland-Cliffs Iron Co. Second Addition.
" 727 Moving 28 houses to the Cleveland-Cliffs Iron Co. Second Addition.
" 808A Increase capacity of No. 1 well.
" 844 Repairs to dry house roof.
" 855 Sinking of five test holes on surface by Layne-Northwest Co.
" CC7 Remodeling change house.
" CC11 Sinking of No. 3 well by Layne-Northwest Co.
" CC15 Purchase of three paving breakers for driving spiling underground.
" CC19 Purchase of two 2½ H.P. Anaconda ventilating fans.
" CC22 Development below Fifth Level.
" CC26 Purchase of two 15 H.P. motors for underground scraper hoists.

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

b. Comparative Statement of Wages & Product

	1940	1939	Increase
Product	699,977	517,899	182,078
Number of Shifts & Hours			
2 8-hour	249	230	19
AVERAGE NO. MEN WORKING			
Surface	71	64	7
Underground	356	324	32
Total	427	388	39

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5. LABOR & WAGES

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

	1940	1939	Increase	Decrease
AVERAGE WAGES PER DAY				
Surface	5.72	5.63	.09	
Underground	6.35	6.27	.08	
Total	6.26	6.16	.10	
AVERAGE WAGES PER MONTH				
4.4 Days per Week 1939				
5.0 Days per Week 1940				
Surface	122.74	107.48	15.26	
Underground	133.42	111.54	21.88	
Total	131.64	110.87	20.77	
PRODUCT PER MAN PER DAY				
Surface	38.26	35.31	2.95	
Underground	7.74	7.49	.25	
Total	6.44	6.18	.26	
LABOR COST PER TON				
Surface	.149	.160		.011
Underground	.814	.837		.023
Total	.963	.997		.034
AVERAGE PRODUCT MINING				
Stoping	18.03	17.46	.57	
Ore Development	11.25	8.77	2.48	
Total	17.85	17.20	.65	
AVERAGE WAGES CONTRACT LABOR	6.649	6.558	.091	
TOTAL NUMBER OF DAYS				
Surface	18,294 1/4	14,667 3/4	3,626 1/2	
Underground	90,398	69,160 3/4	21,237 1/4	
Total	108,692 1/4	83,828 1/2	24,863 3/4	
AMOUNT FOR LABOR				
Surface	104,573.21	82,544.97	22,028.24	
Underground	569,968.15	433,656.86	136,311.29	
Total	674,541.36	516,201.83	158,339.53	
AVERAGE WAGES PER MONTH BASED ON MEN CARRIED ON MINE PAYROLL				
Surface	120.76	104.67	16.09	
Underground	132.95	110.95	22.00	
Total	131.01	110.73	20.28	

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5. LABOR & WAGES

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

Proportion of Surface to Underground Men

1940 - 1 to 5.0 2 regular 8-hour shifts and a small third 8-hour shift with an increasing number of men employed as miners on this shift as theyear progressed, all alternating to receive 5 days per week from January 1st to December 31st.

1939 - 1 to 5.1 1 8-hour shift, 4 days per week, and 2 8-hour shifts 1 day per week, with a small hoisting shift 3 8-hour shifts per week with crews alternating to receive 3 days per week, January 1st to January 9th. 2 8-hour shifts, 4 days per week, and a small hoisting third shift with crews alternating to receive 4 days per week, January 9th to June 12th. 1 8-hour shift 4 days per week, and 2 8-hour shifts one day per week, with a small hoisting shift 3 8-hour shifts per week, with crews alternating to receive 3 days per week, June 12th to September 11th. 2 8-hour shifts 5 days per week, and a small hoisting third shift with crews alternating to receive 5 days per week, September 11th to December 31st.

1938 - 1 to 4.4 2 8-hour shifts, 6 days per week, from January 1st to April 16th, with a third 8-hour shift composed of a tramming and hoisting crew and approximately 16 mining contracts. April 16th to June 1st, the time was decreased to two days per week with the same crews. On June 1st the third shift mining crew was laid off and until November 1st operated 1 8-hour shift 4 days per week with a very small haulage crew on the second shift, the two crews alternating each week so that the men received only 2 days per week average. November 1st to December 31st, 1 8-hour shift 4 days per week and 2 8-hour shifts 1 day per week with staggered crews receiving 3 days per week.

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

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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. Six days and 2 nights per week with 2 crews averaging 4 days per week, February 1st to May 1st. Two 8-hour shifts, 5 days per week with 1 extra 8-hour hoisting shift from May 1st through the balance of the year. Starting November 15th, a few mining crews were gradually added to this third shift.

6. SURFACE

a. Buildings, Repairs

The very extensive project of remodeling the dry was started late in September and at the end of the year the new addition to take care of the electric cap lamp room, fuse room and first aid room was completed with the exception of the interior furnishings. A considerable amount of the new heating system had been installed and the contractor had also started to remove one of the inside partitions adjacent to the shower room. In November the sale of the old boiler plant in the rear of the engine house was made to a scrap iron dealer and by the end of the year this was completely dismantled and the removal of the old brick and concrete had been started. As soon as the building is cleaned out, the new partitions in the West end of this building will be erected and the fixtures for the surface dry, to be located here, will be installed. It was necessary to have a separate room for the surface men as the contemplated changes in the dry decrease the capacity and therefore, as the old boiler house was available, it was chosen for the surface dry and the East end of the building can be utilized as a storehouse for equipment.

Early in the summer a new roof was placed on the dry and therefore, when the remodeling is completed, this building should be in fine shape for a long time in the future. The new arrangement whereby the clean clothes room is kept separate from the dirty clothes romm will be very beneficial to the health of the men due to less dust throughout the dry and also to not having to keep the clean clothes room so hot with a less change in temperature during the winter months upon going outside after changing.

Work was continued around the shafthouse and pockets, three of the pockets being completely overhauled with new wood and steel members installed. Several members were replaced in the headframe itself and at the same time there was a rearrangement of supporting columns, making more room to change the South skip. An overhead trolley was put in to facilitate the handling of the skips when one has to be removed for extensive repairs and the place where

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6. SURFACE

a. Buildings & Repairs (Cont.)

this work has to be done was enclosed with ferroboard. The old samplers shanty located in the headframe at the collar was dismantled and a new fireproof building was erected, both of these new enclosures having concrete floors.

There were only a few minor repairs made to the other mine buildings during the year.

b. Location Dwelling Repairs

The temporary carpenter and painter crew employed during the summer consisted of fifteen men and with the exception of the painting of the second coat on fifteen houses in the Second Addition and also completely renewing the siding and painting two of the houses in the Eastern part of the city, the remainder of the work consisted of minor repairs to some of the remaining dwellings. Although this crew is carried on the Maas Mine pay roll, they do all the repair work for the Athens and Negaunee Mine houses also. There are still a number of houses in the Second Addition that need a second coat of paint next year.

On December 31st, 1940, the Maas Mine owned 87 dwellings, a decrease of 38 as compared with 1939.

Single Family Houses	66
Two " "	14
Three " "	2
Four " "	2
Legion Club	1
Store	1
Church*	1
Total	87

*It has been decided to do nothing further in connection with removing the church until the question of further mining to the West has been decided.

There were no houses purchased during 1940.

The following houses were sold during the year from the Cleveland-Cliffs Iron Company's First and Second Additions to the City of Negaunee:

House No.	Address	Lot	Block	Purchaser	Date
39	956 Baldwin Road	5	2	Leander Johnson	4-1-40
46	907 Oak Street	17	4	Henry Houseman	4-1-40
58	940 Baldwin Road	9	2	Edward J. Young	4-1-40
65	911 Oak Street	18	4	Harold Leaf	4-1-40
133	939 Pine Street	24	2	William Waters	4-1-40

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6. SURFACE

b. Location Dwelling Repairs (Cont.)

House No.	Address	Lot	Block	Purchaser	Date
63	952 Baldwin Road	6	2	Alex Talo	4-1-40
86	543 Lake Street	30	4	Alex Marcotte	4-1-40
146	936 Baldwin Road	10	2	Jacob Annala	4-1-40
159	968 Baldwin Road	2	2	Alex Bertell	4-1-40
167	946 Pine Street	6	4	William Richards	4-1-40
87	505 Prince Street	2	1	Cyprian Faucault	5-1-40
163	947 Pine Street	26	2	Frank Taccolini	5-1-40
27	948 Baldwin Road	7	2	Mrs. Amanda Kangas	5-1-40
91	545 Elm Street	7	3	Benjamin Jewell	5-1-40
138	907-09 Pine St.	17	2	Jack Hytinen	5-1-40
67	921 Pine Street	20	2	William J. Phillips	6-1-40
71	542 Elm Street	11	4	Charles Roseveare	6-1-40
100	718 Baldwin Road	16	3	William Hooper	6-1-40
57	943 Pine Street	25	2	Francis Phillips	7-1-40
64	1004 Pine Street	7	3	Elmer Lindstrom	7-1-40
66	925 Pine Street	21	2	John Peel	7-1-40
83	512 Prince Street	5	3	Adolph Anderson	7-1-40
134	919 Maple Street	14	6	Ragmar Sundberg	7-1-40
85	521 Prince Street	6	1	Victor Maki	8-1-40
132	944 Baldwin Road	8	2	John Warnstrom	8-1-40
136	930 Oak Street	5	6	Henry Johnson	8-1-40
150	944 Oak Street	1	6	Walter Lodholtz	8-1-40
148	916 Oak Street	19	4	Turri Lindstrom	9-1-40
29	970 Pine Street	31	2	S. A. Northey	10-1-40
60	953 Pine Street	5	4	John Anderson	10-1-40
103	923-25 Baldwin Rd.	13 & N½ 14	2	John Huhtala	10-1-40
127	958 Pine Street	28	2	Peter Bessolo, Jr.	10-1-40
145	935 Pine Street	23	2	George Preston	10-1-40
156	943-45 Pine St.	7	4	Gordon Chapman	10-1-40
157	931-33 Pine St.	S½ 9 & 10	4	Anthony Voegtline	10-1-40
168	929 Baldwin Road	12	2	Reuben Carlson	10-1-40
152	946-48 Oak St.	26	4	Charles Johnson	11-1-40
166	914 Pine Street	18	2	Howard Duquette	11-1-40

c. Stockpiles

All of the ores of Maas and Race Course grades, with the exception of some 45,000 tons which was too wet to ship, was loaded out during the shipping season and as a result the old piles lying to the South along the County Road were removed. This leaves the Southeast trestle available for ores of Special grade only which will be a great advantage, it being possible to load from the sides and not disturb the trestle while continued stocking of the wet ore will still be possible. There is just about enough space left under the steel trestle for all of the Race Course Non-Bessemer ore to be stocked to April 1st and it is hoped that it will not be necessary

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6. SURFACE

c. Stockpiles (Cont.)

to stock any of this grade to the West of the shaft with the consequent loss of stocking room due to leaving a gap between the two royalties.

Due to the decrease in the amount of Bessemer ore that it is possible to produce, it is intended to stock all of the Maas Bessemer at the extreme East end of the steel trestle and after the shipping season of 1941 the tonnage of this grade now remaining near the shaft can be removed and still more space made available for Race Course Non-Bessemer.

The stocking of wet ore (which consists of about 35% of the total) during the shipping season presents a very difficult problem at the Maas Mine as it is necessary to maintain available stocking trestles for each grade and royalty while the ore stocked previously is being removed, and although this problem can be handled much better from the steel trestle, it still is a handicap owing to the distance this material splashes and interfering with the loading even though 100 feet away. On the wooden trestles this problem becomes even greater as there is not room enough for duplicate trestles, for all the other grades and royalties, to be placed far enough from each other so that the run of the mud would not cover up the loading tracks and therefore this year an attempt was made to load out the ore under one of the trestles without dismantling the same. This scheme proved very satisfactory and all but a small rill in the center and about eight feet high was removed with some necessary delays when close to a leg, but only four legs out of ninety were broken and this delay was more than off-set by not having to reerect the trestle or having to discontinue stocking activities. Of course, this can only be carried out on the same trestle for a few years as the timber rots and has to be replaced, but by leaving considerable space between the piles from adjacent trestles, it will be possible to maintain a loading track and thus load in this fashion from alternate piles each year. It was also proved this year that if the wet ore could stand for about two and a half months, that it was then dry enough to be suitable for loading and by this plan of changing the location of the wet ore, it was possible to remove about 20,000 tons late last fall.

The ore was stocked by means of both larry cars and rope transfer cars during the season and this plan will be continued in 1941 as it makes an ideal arrangement owing to the larry cars being better for wet ore and the rope transfer available for use in very cold or sleety weather when the third rail conductor is not as efficient. It also gives two complete units for use in case there is a failure to either system and therefore there is less likelihood of trouble on the landing causing a loss in production.

At the end of the year there were 70 single bents of wooden trestle West of the shaft for Maas Non-Bessemer ore and 24 single bents

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6. SURFACE

c. Stockpiles (Cont.)

lying Southeast of the shaft for Special grade ores.

Stockpile overrun was developed in three grades during the shipping season, the Maas grade leading with 26,750 tons previous years overrun and the engineer's estimate showing approximately 23,000 tons overrun accumulated from this years stocking. The Race Course grade was all cleaned up, showing 6,572 tons previous years and 1,198 tons current years overrun, while the Race Course Bessemer accounted for 755 tons previous years overrun. At the end of the year there were 100,968 tons of all grades in stock as compared with 317,340 tons on December 31st, 1939.

d. Tracks, Roads, Etc.

There were no changes during the year to either the roads or tracks around the mine, the only work being a small amount of maintenance.

e. Timber Yard

The timber yard was kept amply supplied at all times with a sufficient amount of various types of mine timber, most of which was delivered by trucks direct from the woods operations. However, where the supply comes from a considerable distance, the railroad is still used and 142 cars were delivered at the mine during the year.

When purchasing a new tractor, it was found possible to get one that has been used by Forsythe Township for plowing and the plow was also purchased, making it possible to keep the timber yard in much better shape this winter than before as the large plows could not operate in such small quarters.

f. Drainage

The effect of the surface wells was noticed for the first time this year, it having evidently taken this long to lower the water on surface sufficiently to decrease the pressure with a consequently less amount flowing underground. The surface pumps averaged 844 gallons per minute as compared with 380 gallons per minute in 1939, while the average of the underground wiers showed a reduction from 1,227 gallons per minute in 1939 to 1,075 gallons per minute in 1940. Before the installation of the wiers it was impossible to obtain an accurate comparison of the amount of water pumped underground as the efficiency of the pumps depends on their mechanical condition, which varies from time to time, and upon occasions of repairs to the main plunger pumps it becomes necessary to operate the centrifugal units which vary in output even more than the plunger type.

No. 2 well, which was put into operation in August of 1939, operated continuously throughout the year at approximately 550 gallons per minute while No. 1 well was pumping only from the last of March as

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6. SURFACE

f. Drainage (Cont.)

previous to that time the Layne-Northwest Company was drilling into ledge and trying to further develop this unit. When their work was completed and a pump reinstalled, there was an increase of 100 gallons per minute over the former capacity and later in the season this increased to 375, making a total of 925 gallons per minute being pumped during the last quarter. This continued pumping lowered the water level in the various test wells an average of 26 feet during the year and the elevation of the water at ledge in the shaft was also lowered 14 feet, leaving an average height of water in the surface above the ledge at the end of the year of approximately 40 feet.

After completing five test holes along a line some 500 feet West of the caved area and approximately 300 feet apart, they chose No. 17 as being in the most favorable formation and started in March to put down a well at this location, which is on the North side of Park Street and about 100 feet West of the West boundary of the Race Course. They spent the remainder of the year trying to complete sinking and develop this well but finally had to give up as all their latter work only seemed to make it harder to recover any water. The solid 38 inch diameter pipe put down to the top of the water bearing formation settled down to a clay seam, cutting off this higher strata and then the sand filtered through the gravel in the developed area, tending to stop the flow there also. At the end of the year this well was pumping only 50 gallons per minute and the Layne-Northwest Company has signified their intention of putting down another well at their expense after a suitable location is found in this area as it is still felt that a good well in this area should cause a very immediate effect underground, being so close to the cave. It is hoped that their efforts will be more successful in this new well as the decrease in the amount of water pumped underground to date has all occurred on the North footwall where the water is already more or less controlled and does not interfere with mining operations as much as where it comes through the hanging and directly into the working places. One drift along the footwall on each succeeding sub level usually drains the water so that the remaining pillar is fairly dry, while under the hanging the water continues to follow each new slice in turn and causes considerably more trouble.

7. UNDERGROUND

a. Shaft Sinking

There was no shaft sinking in 1940 and whether or not there will be any in 1941 will depend on the results of the contemplated exploration by diamond drills of the ore formation below the Fifth Level to determine the grade. If it all contains high sulphur, as the drilling so far seems to indicate, thenthe deciding factor will be the amount of this grade that can be disposed of by the Sales Department.

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7. UNDERGROUND

b. Development

Four contracts were employed during most of the year on development, two putting up raises and two drifting.

Third Level

In August, a main level cross-cut was started to the South in the East footwall pillar and advanced 200' in ore to a dike which forms the North limit of an area mined out several years ago. Three raises, one of which has been started, are to be put up here to the 375' Sub Level 60' above the Third Level to decrease the scraping distance from the footwall raises and also to eliminate the transfer system at No. 111 Raise. These new raises will also prove of particular benefit as regards the water situation because mining can be carried on from the footwall raises at a lower elevation, thus draining off the water and leaving the area surrounding the new raises comparatively dry.

200' Sub Level

In the West footwall pillar, the dip of the ore body is so flat that in order to develop it from the Fourth Level 200' below the Third Level, above which mining was almost completed by the end of the year, there would have been required very extensive rock drifts and all the raises would have been in rock for a height of 150'. To cut down this high cost it was decided to install a transfer system half way between the Third and Fourth Levels and although 200' out of a total of 250' in this drift was in rock, the distance to raise in rock was very materially lessened. At the end of the year one transfer raise had been completed to the Third Level and four others put up to the ore contact which averaged approximately 40' above the transfer. As the area in the West end is very narrow, with a fairly firm hanging, it has been decided to mine this area by the open stope method and the development of this should be completed early next year.

Fourth Level

The only development work on this level was that of putting up No. 4022 Raise to take the place of old No. 4022 which had crushed beyond repair when the 400 Cross-cut, running parallel to and 340' East of the East boundary of the Race Course, took weight and practically closed. Hardly had the cross-cut been repaired and the new raise put up before weight was again noticed in this area and mining was temporarily abandoned while the cross-cut is being repaired once more. It is hoped that on the next occasion it will remain open long enough to mine out at least two sub levels under the hanging and thus remove the pressure of this jasper pillar which is now being transmitted to the level below.

Fifth Level

Early in July of this year there was an authorization under an E & A

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7. UNDERGROUND

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

to explore the formation below the Fifth Level to determine as to whether there was any standard grade ore below the high sulphur horizon existing between the Fifth Level and 70' above. Previous to this work, several diamond drill holes had been put down along the West boundary of the Race Course Lease and in this area the high sulphur content persisted to the footwall about 135' below. It was thought, however, that if the drilling could be carried on from a position considerably further to the West in the hanging, that the cross-section of the formation would then be at a much lower elevation due to the 15° pitch of the ore body to the West and that this lower strata might be of standard grade. The North footwall drift was extended to the West approximately 150' and then a cross-cut turned off to the South to reach the desired place from which to drill, with the expectation that this work would all be in rock. However, after drifting approximately 250' in lean ore and jasper apparently just under the true hanging, the cross-cut encountered ore and continued in this to the end of the year with the exception of cutting 40' of dike which had turned very sharply to the South from its general trend. The encountering of ore so far to the West shows a decided upturn and even though it has all been of high sulphur content, there may be a greater likelihood of finding standard grade ore below. One drill station had been started and a drift will be turned off to the West and into the jasper hanging for further exploration at a greater depth.

The detail of Diamond Drill holes Nos. 31, 32, and 33, mentioned above, appear in the Geological Annual Report and therefore is not repeated here. They all encountered the footwall at its previously estimated position and were in ore of both high iron and high sulphur content for their entire depth.

Detail of the development is as follows:

Location	Ore Drifting	Ore Raising	Rock Drifting	Rock Raising
Third Level 200' & 215' Transfer & Stope	185	66	86	245
Fourth Level		155		
65' Sub Level		58		
Fifth Level		370		
Fifth Level (E&A CC-22)	518		138	
Total	880	649	275	245

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7. UNDERGROUND

c. Stoping
General

The mining areas were confined to the same territories where slicing has been in progress for several years with the addition this year of two small ore bodies which were developed on theNorth footwall between the Third and Fifth Levels. The mine operated five days per week during the entire year with an average of 40 contracts working two eight hour shifts per day and starting in September more men were hired to form three shifts in order to speed up production, there not being other working places available for new contracts. At the end of the year there were 16 contracts on three shifts and the average daily production without overrun was 2,850 tons, of which 15% was Special grade. There was also a small percentage of Bessemer but it varies considerably as this grade occurs in the same area as the high sulphur and a large amount of low phos. ore has to be hoisted as Special.

It was necessary to employ a large repair crew consisting of 60 men in order to maintain the traveling roads, main levels and raises. In addition to this force, 10% of the contract miners, or approximately 18 men, devoted their entire time to repairing in their own places. Mining, with its attendant weight, has progressed so close to the Third, Fourth and Fifth Levels that it required almost continuous work to keep the timbers clear of the cars. This weight is also evidenced in the tracks as the ground pushes up and destroys the grade and alignment to such an extent that the track crew have had to work nearly every Saturday and Sunday the past three months. With the very rapid progress of mining, it was necessary to develop new territories and therefore there has been an unusual amount of mining carried on under new hanging. This entails the building of a large number of bulkheads to support the tops of the raises and extra timbermen are required for this work and also the miners have to spend more time to put down the special covering of poles and wire netting used to form a safe matt. After this work has been completed, the jasper hanging has to be drilled and blasted until enough rock is broken to form a cushion to take up the jar of falling material from above. The very rapid progress of mining on three shifts, where often 15 to 20 feet is advanced in 24 hours, does not allow the matt to settle gradually and therefore extra props have to be put in to give extra support if a large mass comes down suddenly.

The difficulties attendant on the presence of water in the working places continued to present the same problems as in the last few years although the total amount of water pumped underground was decreased approximately 300 gallons by the end of the year. Most of this decrease, however, occurred along the footwall where it is always possible to more or less control the flow through drifts driven parallel to the foot and thus drain the remaining ore body. However, the amount of water that enters the working places in the areas under the hanging wall and where it generally follows each slice in turn did not show any material decrease, as the well that

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7. UNDERGROUND

c. Stoping
General (Cont.)

was put down from surface to ledge onthe West side of the ore body was a failure. It is intended to make another attempt to obtain a well in this vicinity and perhaps the new work will be more successful. This water not only causes delay in the working places and at the shaft pocket by having to be handled direct to cars and skips without storage, but also washes ore onto the tracks and into the ditches. The task of cleaning this up to protect the pumps and the transportation equipment necessitates the employing of some 12 to 15 men every day besides a large crew on one Saturday each month for which latter work overtime has to be paid.

There was an average of 10 contracts mining on four elevations in the East footwall pillar above the Third Level. At the end of the year mining had started on the 385' Sub Level 70' above the Third where for the first time this year it has been possible to get away from the old workings mined several years ago and where it has been necessary to remove considerable old timber with subsequent delays. The ore here has been of Non-Bessemer grade and mining has been carried on in the Maas and Roman Catholic Cemetery Leases and in the Cleveland-Cliffs Iron Company and American Mining Company strips. Two transfer systems have been in operation in this territory and a new cross-cut was driven here on the Third Level in the latter part of the year.

In the West footwall pillar above the Third Level, two contracts have been mining continuously and at the end of the year were both on the 325' Sub Level, which is directly on top of the Third Level timber and the last sub level to be mined through Third Level raises. Two raises from the 200' transfer drift have been put up to the Third Level and early next year a third will be completed so that mining in this area can be continued. The ore, which is quite hard, is of Non-Bessemer grade and has been removed from the Maas, City of Negaunee and Race Course Leases.

As explained under Development, there has been considerable development work done in the West footwall pillar above the Fourth Level, besides which a small area was opened for immediate mining under the hanging in the Race Course Lease between the dikes. Two sub levels approximately 100' above the Fourth Level were completed by the end of the year, the ore body being only about 100' x 50' and of Non-Bessemer grade.

In the most Easterly of the three blocks being mined above the Fourth Level, work was in progress during the first eight months of the year with two contracts completing the mining under the hanging on the 245' Sub Level approximately 130' above the Fourth Level. They had started the 230' Sub Level and a new raise had been put up to take the place of two which had previously crushed, when this main level cross-cut again became so heavy that mining had to be temporarily abandoned. Two crews were still repairing here on three shifts per day at the end

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7. UNDERGROUND

c. Stoping
General (Cont.)

of the year. It is hoped that when mining can be resumed that the drift will stand up long enough for the operations above to completely cut off the hanging and thus relieve the pressure.

Mining has been continuous during the year in the second block East of the Race Course Lease, and above the Fourth Level, with four contracts slicing in ore of Non-Bessemer grade. These contracts mined on two elevations and at the end of the year their workings were approximately 35' above the level, causing the main level drift to take weight. Two crews of repair men have been kept busy here the last two months and raises are being put up from the Fifth Level as rapidly as possible so that the ore can be handled on the Fifth Level, thus cutting out this repair cost and eliminating delays.

In the narrow block adjacent to the East boundary of the Race Course, two contracts were mining on the North end all year while the five others which were slicing in the South end and near the Negaunee Mine boundary were cut down to two at the end of the year on account of turning over a strip, 250' wide and parallel to the Negaunee boundary, to the Negaunee Mine. The two former contracts were mining on the Fourth Level elevation at the end of the year and were very much handicapped by having to cut through the old drifts and cross-cuts. The ore was all of Non-Bessemer grade and was removed mostly from the Maas Lease, although there was some work in the City of Negaunee Lease, the Race Course Lease, the Cleveland-Cliffs Iron Company and American Mining Company strips.

Another small area was being developed and mining had started at the end of the year at approximately 90' above the Fifth Level on the North footwall just East of the West boundary of the Race Course Lease. Only a small amount of work could be done here at present as, although a mining limit can be set to the East, the ore rises higher to the West and South and this will have to be removed first. It was in this territory that a serious breakdown occurred in December, almost burying two men with broken jasper from the hanging.

As usual, the large majority of the contracts in any one area were employed in the main area between the Fourth and Fifth Levels, in and South of the Race Course Lease, and adjacent to the Negaunee boundary. There were from 14 to 18 contracts slicing in this territory and from September to the end of the year most of these were on a three shift schedule. It was from this area also that the ores of Bessemer and Special grades were produced, the latter coming from the lower elevations which had reached to within 65' of the Fifth Level by the last of the year.

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7. UNDERGROUND

c. Stoping
General (Cont.)

The following is a detailed report of the mining operations at the Maas Mine. This subject will be covered briefly, stressing particularly the locations of the various gangs as well as the time of change. Immediately following each sub level that is now active, a table will be made showing the December work.

Subs Between the 2nd & 3rd Levels

East Footwall Pillar

415' Sub Level

Mining operations were just about completed on this sub level by the end of 1940. The majority of the territory mined during the year was located somewhat to the West and against the old workings which had been mined years ago. The mining of this sub level was marked by frequent changes and slow mining resulting from the jasper capping which had weaved both laterally and vertically throughout the ore body. Practically all the year's mining was in the Maas Lease and was carried on with an average of five working contracts. The mining on the 415' Sub Level above the West Transfer was carried on by Contract No. 3 and amounted to removing a small territory West and North of Raise No. 1073. This contract moved to the sub below in March. Early in January of 1940, Contract No. 5 continued mining from Raise No. 1071 until June, at which time an attempt was made by slice to the North to pick up Raise No. 108. However, due to the extreme amount of weight together with adverse water conditions, it was impossible and an attempt is being made on the sub below.

Considerable mining was done from Raise No. 1111 and No. 1115. In the case of the latter, No. 2 Contract mined the remaining pillar to the Northeast. In May, Contract No. 5 drifted to and picked up Raise No. 111A where a small amount of mining was continued to the North and East in an effort to cut off the water which would hamper operations while removing the pillar to the South.

Small remaining pillars were also removed in the vicinity of Raises Nos. 113, 114, 115 and 116 before moving to the 401' Sub.

Practically the entire production from the 415' Sub was removed from the Maas Lease with only a small tonnage credited to the Roman Catholic Cemetery Lease.

For the purpose of record, the activities of two contracts working in December are listed below:

Contract No. 2 completed two slices Northwest of Raise No. 1111.

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c. Stoping (Cont.)

415' Sub Level (Cont.)

Contract No. 5 completed two slices North of Raise No. 1111 and thereafter moved to Raise No. 111A.

401' Sub Level

The work for 1940 consisted principally of removing areas in the South end of the Roman Catholic Cemetery Lease as well as a portion to the South and West of this lease. Mining was continued from Raises Nos. 119, 116, 115 and 113. In most cases mining was directed first to the North footwall in an effort to drain the water which had continued to hamper operations on this as well as other sub levels.

This territory was originally mined during the war period of 1918 and as this mining has, of course, caved, some difficulty was experienced in crossing these old workings in an effort to remove the available ore. The extension of the ore to the South underthe jasper capping continued at this elevation. It might be added also that due to an unusually short sub level interval between the 395' Sub Level and the 401' Sub, most of the mining operations in the West end of the ore body were carried on at a somewhat higher elevation. At the present writing, attempts are being made, whenever new raises are being cut, to make up this difference which in some cases amounts to as much as four or five feet.

During the month of December, only one contract was active on this sub level. Contract No. 35 finished three slices and started a fourth to the old workings Southeast of Raise No. 113.

395' Sub Level

Mining on this sub level was commenced during September of 1939 in the Roman Catholic Cemetery Lease. At that time Raises Nos. 122, 121 and 120 were connected preparatory to mining. Operations were then started by Contract No. 6 in the extreme East end of the ore body in the vicinity of the American Mining Company, Cleveland Cliffs Iron Company and Roman Catholic Cemetery Leases. Inasmuch as the ore was rapidly making to the Southwest, necessitating extremely long slices from the above mentioned raises, a crosscut was started on the Third Level in August from which raises will be extended in an effort to more evenly distribute the territory removed from each raise. This work has been covered in detail under the development heading.

Throughout the year, Contracts Nos. 12, 29, 7, 9 and 3 spent practically their entire time in mining on this sub level. Contract No. 9 removed a comparatively large area to the Southeast of Raise No. 1112 and here again extremely long slices were necessary. In

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c. Stoping (Cont.)

395' Sub Level (Cont.)

September, Contract No. 3 drifted to and cut out Raises Nos. 1073 and 1071. This operation was soon after followed by regular mining from these raises. The jasper capping continued to reccede to the South and caused some delays by rock runs after the covering poles from the sub above had been passed.

During December five contracts were active in mining on this sub level:

In the Roman Catholic Cemetery Lease:

Contract No. 29 completed two slices to the Southeast of Raise No. 116 and started a third.
Contract No. 7 extended three slices to the North footwall dike from Raise No. 115.

In the Maas Lease:

Contract No. 9 was slicing South of Raise No. 1115.
Contract No. 3 was slicing to the West and Southeast of Raise No. 1073.
Contract No. 49 extended the drift to the North of Raise No. 1071 where an attempt will be made to timber and use Raise No. 108 for drainage purposes.

385' Sub Level

Mining operations were started on this sub level in September by Contract No. 6. The North series of raises were connected, including Nos. 122, 121, 120, 119 and 118. During the remaining months of the year, No. 6 Contract removed a large part of the ore lying in the American Mining Company and Cleveland-Cliffs Iron Company strips adjacent to the Negaunee Mine boundary.

In December, two contracts were active on this sub level. A greater part of the ore was removed from the Roman Catholic Cemetery Lease with a small portion coming from the Cleveland-Cliffs Iron Company strip.

Contract No. 6 completed slicing operations Southwest of Raise No. 122 and moved to Raise No. 121 where work was continued.
Contract No. 12 completed two short slices Northwest of Raise No. 119. A drift and raise were then extended to the North where a series of small raises drained off a large portion of the water coming from the Northeast. After the interception was made, it was found that due to crushing and moving ground, the water was following other

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7. UNDERGROUND

c. Stoping (Cont.)

385' Sub Level (Cont.)

courses. While this operation is of no immediate use, it is very likely that in the near future, after the water has been drained from the Second Level Maas through the Negaunee Tenth, that these openings may have a direct bearing on the drying up of this territory.

Third Level

The only new work done at the West end of the Third Level was that of extending the 200' Cross-Cut South to the old workings, a distance of approximately 124'.

In December, Contract No. 8 extended Raise No. 204 a distance of 22' at 65°. In the near future, Raise No. 203 will be started and extended to the 385' Sub Level. This entire operation is located in the Maas Lease.

West Footwall Pillar

345' Sub Level

Late in December of 1939, a small unmined pillar remained on the 345' Sub Level Northeast of Raise No. 8W. This sub level was completely mined out during February.

335' Sub Level

Mining operations were commenced on this elevation by Contract No. 10 in January when a small area was mined to the South and East of Raise No. 1E. As mentioned above, after completing the 345' Sub Level, No. 11 Contract moved to Raise No. 3W and commenced connecting Raises Nos. 5W and 8W before mining operations were started. Generally speaking, this area remained approximately the same size although the footwall seemed to be flattening to the South somewhat faster than that of the jasper hanging wall. In October, the last remaining area was mined Northeast of Raise No. 8W and No. 11 Contract moved to the 325' Sub Level where Contract No. 10 had already connected Raises Nos. 300 and 3W.

325' Sub Level

Due to the fact that this sub level is only a short distance above the Third Level elevation, operations were started from Raise No. 300 from the Fourth Level. However, due to the extremely wet conditions in the vicinity of this raise together with the fact that was being used on the 200' Sub Level where rock was being handled, it was decided to continue with the Third Level raises. In November, all usable raises had been connected and mining was continued

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7. UNDERGROUND

c. Stoping (Cont.)

325' Sub Level (Cont.)

to the West by Contract No. 11 and to the East by Contract No. 10.

During December the following mining operations were carried on on this sub level:

Contract No. 10 completed a drift and slice Northeast of Raise No. 1E in the Maas Lease.
Contract No. 11 extended a drift Northwest of Raise No. 5W in the Race Course Lease.

Subs Between the 3rd & 4th Levels

260' Sub Level

After the completion of a transfer drift on the 230' Sub Level, Raise No. 4020A was extended to the jasper capping and a cut-out was made preparatory to mining on the 260' Sub Level. During the year, Contract No. 16 did the majority of the mining in this area. The width of the ore at this elevation was approximately 90'. Generally speaking, the jasper capping seemed to dip to the Southwest very flatly while the North-South jasper also receded rather flatly to the North and South. In May, mining operations were completed and Raise No. 4020A was cut out on the 245' Sub Level. A second raise was then extended into this area and is known as No. 4020B.

245' Sub Level

An area somewhat similar to that on the sub above was mined by Contract No. 16 with a small portion being mined by Contract No. 47 from Raise No. 4020B. Considerable care had to be taken during the mining operations to make sure a sufficient amount of broken material was blasted as each slice was completed. In June, mining operations were completed on this sub level and Contract No. 16 commenced slicing to the Northwest along the old transfer drift from Raise No. 4020. Late in August, mining operations were temporarily given up in this area due to the extremely heavy ground which was continually crushing both the raises as well as the 4000 Cross-Cut on the Fourth Level. It might be added at this point that Raise No. 4024 was completed in August to the 230' elevation, but, due to the above conditions, no mining could be carried on.

215' Sub Level

All operations on this sub level were carried on by Contract No. 47 in the Race Course Lease in the area known as the West Footwall Pillar. A raise known as No. 300C was extended a distance of 12' on the South side of the 200' Sub Level transfer where a drift was then extended to the Southwest in the vicinity of drill hole No. 30

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7. UNDERGROUND

c. Stoping (Cont.)

215' Sub Level (Cont.)

which showed up approximately 80' of ore. This drift was extended to the jasper and the North and South limits were determined by small drifts, jasper being encountered to the North with the main dike being intercepted to the South. The average width of this ore body was approximately 80'. Small raises were extended up a distance of approximately 49' where jasper was encountered. All work was completed on this sub level in May and work was started on extending the transfer drift on the 200' Sub.

200' Sub Level

After completing work on the sub above where a somewhat harder ore was encountered, plans were made to develop a stope to mine a major portion of the ore lying below the Third Level. If an attempt were made to continue slicing in this territory, considerable expense would be required, not only to develop the ore body by raises, but also to break sufficient rock to protect mining operations as they continue down the plane of this comparatively flat ore body.

During the year, the 200' Transfer was extended to the Northwest approximately 65' from which three raises were extended to the ore, an average distance of approximately 50'. These raises will be used as mills and will be driven near the foot to a point slightly below the Third Level elevation. A vertical pillar will then be left below the Third Level as stoping operations are continued.

In December, Contract No. 31 completed these small raises to the ore where connections will be made in the near future. Later in the year Raise No. 300B was extended approximately 70' and will be continued to the 325' Sub Level where it will be used as a substitute for the present Third Level raises. This ore, together with that from the stope, will be transferred on the 200' Sub Level.

Early in 1940, Raise No. 305 was extended to the 200' elevation where Contract No. 27 commenced mining in a new territory just North of the main dike and South of the 200' Transfer. This area proved rather small at this elevation; however, indications are that the jasper would make to the North and to the West at an average of about 15' per sub level.

195' Sub Level

Early in July, Contract No. 27 moved to this sub level and continued mining to the Northeast and parallel to the dike. It was rather apparent that Raise No. 305 skirted the Southwest limit of the ore in this area inasmuch as no mining was done in this direction on the sub above. The ore to the Northeast extended approximately 105', or roughly 25' farther than that on the sub above, necessitating a

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7. UNDERGROUND

c. Stoping (Cont.)

195' Sub Level (Cont.)

mining limit to protect the unmined workings above.

In December, Contract No. 27 completed three short slices to the dike and only a small portion of unmined area remained to the South. This contract is operating in the Race Course Lease.

160' Sub Level

Mining in the second block East of the Race Course along the 600 series of raises was continued during the year and completed in December of 1940. Four crews were working on this sub level and carried on mining operations from Raises Nos. 125, 120A, 5326 and 5330.

During the year, No. 25 Contract mined a large area in the North end of the block from Raise No. 625, while No. 44 Contract completed the mining of a small area South and West of Raise No. 628A. Further mining was done by Contracts Nos. 49 and 50 from Raises Nos. 5326 and 5330 put up from the Fifth Level. In the case of the latter, mining was carried on under extremely unfavorable conditions. A large amount of water was encountered which resulted in delays as well as runs. General advance in this area was also retarded by the fact that all Fourth Level drifts in this South area had crushed and the ore had caved allowing the covering poles to move downward such that low covering was encountered frequently.

In December, Contract No. 25 completed two slices Northeast of Raise No. 625 and moved to Raise No. 626 on the 150' Sub Level.

150' Sub Level

This sub level was opened in this area in August by Contracts Nos. 44 and 46 in Raises Nos. 627 and 628A, respectively, and mining continued from these raises during the remainder of the year. Late in September, Contract No. 50 moved to Raise No. 5326 and commenced drifting toward Raise No. 5330.

In December, Contract No. 25 completed the connecting drift between Raises Nos. 626 and 625 and thereafter a drift Northwest to old workings preparatory to removing the area to the North. No. 44 Contract completed four slices Northwest of Raise No. 628A. Contract No. 50 continued drifting toward Raise No. 5330 but was considerably handicapped by water which washed down very fine broken jasper from above.

140' Sub Level

Mining was carried on in two blocks during 1940; in the first

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7. UNDERGROUND

c. Stoping (Cont.)

140' Sub Level (Cont.)

block East of the Race Course and the second block Southeast of the Race Course along the Negaunee boundary line. In the case of the former, a comparatively small pillar was removed from Raise No. 5327 which had been put up to this elevation late in 1939. In the second block, considerable activity was evidenced during the first half of the year. However, due to the leasing of that portion of the Maas Mine known as the Maas area, this second block was abandoned with the exception of a small portion on the North side which was removed in December of 1940. Due to the adverse mining conditions of considerable water accompanied by an unusual amount of weight, some difficulty was experienced in the mining of this area. In July 1940, this block was abandoned after mining was in progress in the vicinity of Raises Nos. 526, 527, 528, and 531. For the most part Mining was carried on in the various raises by Contracts Nos. 21, 36, 44 and 46.

As previously mentioned, the close proximity of this sub level with respect to the Fourth Level 30' below, caused some trouble by the caving of the areas immediately over old Fourth Level drifts.

In December, Contract No. 21 completed two slices Southwest of a small secondary raise to remove a large portion of the last remaining pillar in the Maas area. Shortly thereafter secondary scraping was given up and the transfer Northeast of Raise No. 5331 was abandoned. Late in the month, Contract No. 21 commenced mining operations West of Raise No. 5331 on the 130' Sub Level. All of the above mentioned work was located in the Maas Lease as a small portion which lies in the Cleveland-Cliffs Iron Company and American Mining Company strips had been mined late in 1939.

130' Sub Level

Mining operations on this sub level were confined chiefly to the same two blocks as mentioned on the sub above, that of the block just East of the Race Course in the Maas and City of Negaunee Lease as well as that block Southeast of the Race Course in the Maas Lease and the Maas area. Mining in the first block was confined to Raises Nos. 5410 and 5420. In the case of the former, a large jasper horse was encountered to the North and East of Raise No. 5410 which had previously been considered entirely ore. This horse has somewhat reduced the mining area in this block which has been carried on by Contracts Nos. 28 and 37.

Only a small amount of work has been done on the 130' Sub Level in the second block. Raises Nos. 526, 527, 5331 and 5327 were connected. A transfer was driven South of Raise No. 526 to remove a small remaining pillar by secondary raise on the sub

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7. UNDERGROUND

c. Stoping (Cont.)

130' Sub Level (Cont.)

above. This work was given up in July, as mentioned above under the 140' Sub Level heading. In October mining was commenced in the vicinity of Raise No. 5327 by Contract No. 41 and by December slicing was continued to the South with a new traveling road being driven to Raise No. 5331. As mentioned above, No. 21 Contract commenced drifting to the West of No. 5331 late in February.

Fourth Level

In July, slicing operations were commenced on the Fourth Level elevation by Contracts Nos. 28 and 37 from Raises Nos. 5420 and 5424. It was anticipated that the removing of the ore on this sub level would be somewhat handicapped due to the numerous old workings, including drifts and raises which have crushed and which must be crossed several times in mining the entire block.

In general, conditions on the Fourth Level were very heavy, necessitating continual repairs to timber and tracks. This work was largely concentrated in the footwall drift and the 4000 Cross-Cut as well as the 600 Cross-Cut from which approximately 90% of the ore above this level was removed. Immediately following the temporary abandonment of the footwall drift and the 4000 Cross-Cut, repair work was commenced and continued throughout the year. Indications are that a new footwall drift and cross-cut on the Fourth Level will have to be started in the near future to reduce the high cost of maintenance of the former.

In December, Contract No. 37 abandoned the cross-hauling slicing method and commenced regular radial slicing East of Raise No. 5424. Contract No. 28, after removing a portion of the territory Northeast of Raise No. 5420 earlier in the year, commenced mining operations to the Southwest in the City of Negaunee and Race Course Leases. In December two slices were completed and a third started.

90' Sub Level

The only work on this sub level was the completion of a small area North of Raise No. 5614 by No. 19 Contract. This work marked the end of all mining operations on this elevation in this particular area.

75' Sub Level

Mining operations on this sub level were confined to the North end of the ore body in the Race Course Lease, the entire area having been previously mined to the South. The active raises included Nos. 5614, 5616, 5512 and 5411. In the case of the first two, mining was

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7. UNDERGROUND

c. Stoping (Cont.)

75' Sub Level (Cont.)

carried on by Contracts Nos. 19 and 24 removing that ore lying Northeast of the raises between the old workings to the South and the jasper foot to the North. This area continued to be extremely wet, resulting in delays and added maintenance expense. Late in April, mining operations were commenced in the vicinity of Raises Nos. 5512 and 5411. No. 18 Contract experienced a great deal of trouble due to excessive water in mining a comparatively small area South of Raise No. 5512. Progress was greatly hampered by water despite the fact that the area was almost completely surrounded by old workings. No. 24 Contract, later in the year, mined an area North and East of Raise No. 5411 to the jasper and main dike. This territory was somewhat enlarged on this sub level due to further enrichment along the South side of the dike resulting in an extension of the ore approximately 30'.

Contract No. 18 completed three slices to the North and West of Raise No. 5512, thereafter moving to Raise No. 5411 on the same elevation and slicing South of the raise in December.

65' Sub Level

Most of the mining operations on this elevation included the removing of pillars preparatory to opening up the sub below as well as developing and mining from the smaller outlying ore bodies or extensions of the main ore body. Early in 1940, mining operations were concentrated on the hanging side of the 5500 series of raises and small remaing areas on the Northeast side of the 5600 series. This mining was carried on by Contracts Nos. 22, 23, 40, 46 and 51, moving from raise to raise as operations allowed. No. 36 Contract also removed small pillars in the Maas Lease in the South end of the ore body. During the entire year, operations were continuing from Raises Nos. 5737, 5742 and 5745 just Southwest of the Southwest corner of the Race Course Lease. This work is being done under the jasper hanging and was completed by No. 38 Contract in December with a small pillar being removed Northeast of Raise No. 5737. Due to the comparatively flat hanging wall, the extreme Southwest end of the ore body has moved to the Southwest approximately 15' per sub level. This condition continued on the sub below. Considerable activity was also evidenced South of the dike in an area South and East of Raise No. 511 adjacent to the Negaunee Mine and in the Maas, Cleveland-Cliffs Iron Company and American Mining Company Leases. No. 26 Contract spent the entire year in removing a greatly enlarged area from this raise. Indications are that this ore body may very well connect with the ore found to the Southwest and partially mined on the 50' Sub Level.

Late in the summer, Contract No. 48 commenced mining operations Northeast of Raise No. 5616 and in October moved to Raise No. 5614

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7. UNDERGROUND

c. Stoping (Cont.)

65' Sub Level (Cont.)

where mining was continued.

In August the exploratory raise, No. 5020, was extended to the jasper slightly above the 65' elevation in a separate ore body found by drifting operations of the Fifth Level some time ago. This ore body lies North of the dike and to the West of the small area found on the Fourth Level and above where mining is now in progress. No. 16 Contract commenced developing this area on the 65' Sub Level in September and the results proved that the ore body was considerably larger than that found on the Fifth Level. Later in the year, small raises indicated thatthe ore increased in height to the South as it approached the main dike and also to the West near the Race Course boundary. Further raises from the Fifth Level will be required before mining can be continued in this area. The ore in this latter area is of standard grade.

During December, four contracts were actively located on this elevation in the Race Course Lease:

Contract No. 16 completed three slices North and East of Raise No. 5020 before the area was abandoned for two further developments.
Contract No. 48 was slicing East of Raise No. 5614.

In the Maas Lease:

No. 30 Contract finished mining a small pillar North of Raise No. 5737.
No. 26 Contract continued slicing South of Raise No. 511.

50' Sub Level

A greater part of the mining activities during the year were concentrated on the 50' Sub Level. Throughout 1940 an average of 11 contracts were mining, divided almost equally between the Maas and Race Course Leases. Under the present rate of production in this, the largest ore area being mined on one elevation, about one sub is removed each year, thus in January of 1940 no mining with the exception of a small portion under the hanging had been done. The first raise opened on the 50' Sub Level was No. 5645 by Contract No. 30. Shortly thereafter, as remaining pillars were removed on the 65' Sub Level, the various contracts dropped to this elevation. For the most part, mining was commenced as soon as the raise was cut, thus reducing the chance for the continued maintenance of open raises and long traveling roads. Generally speaking, mining was commenced at the South end of the main ore body and continued to the North.

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7. UNDERGROUND

c. Stoping (Cont.)

50' Sub Level (Cont.)

At the 5500 series of raises, the following contracts mined for the most part to a limit to the Northeast - Nos. 23, 43, 46, 32 and 40. At the 5600 series of raises similar mining operations were carried on by Contracts Nos. 45, 51, 47 and 22. Late in the year operations were started in removing pillars at the South end of this area. Approximately 75% of the ore mined on this sub level North of the dike was of Special grade.

In the smaller ore body South of the Race Course divided by small dikes, mining operations were carried on by Contracts Nos. 38, 33, 1 and 30. No. 1 Contract completedthe mining of a rather irregular ore body Southeast of Raise No. 509. This operation was somewhat slowed up due to the hard nature of the ore as well as the necessity of breaking hanging wall material to protect the operations on subsequent sub levels. Due to the enlarged area Southwest of Raise No. 5737, mining was somewhat retarded. Late in the year No. 38 Contract commenced drifting operations on this sub level.

During December the operations of 13 contracts are listed below:

In the Race Course:

Contract No. 23 was slicing Northeast of Raise No. 5520.
Contract No. 24 was drifting Northeast of Raise No. 5524.
Contract No. 43 was slicing East of Raise No. 5526.
Contract No. 32 was slicing Southwest of Raise No. 5536.
Contract No. 16 completed a connecting drift between Raises Nos. 5620 and 5618.
Contract No. 45 was slicing Northeast of Raise No. 5620.
Contract No. 51 was slicing Northeast of Raise No. 5626.
Contract No. 47 completed a connecting drift between Raises Nos. 5628 and 5626; thereafter commencing slicing Southeast of Raise No. 5630.

In the Maas Lease:

Contract No. 22 completed mining Southeast of Raise No. 5636.
Contract No. 30 was slicing Northeast of Raise No. 512.
Contract No. 40 completed a drift and started a slice Southwest of Raise No. 520.
Contract No. 33 was slicing Northeast of Raise No. 5745.
Contract No. 1 completed a short raise and drift and commenced breaking filling over an area previously mined Southwest of Raise No. 510.

+25' Sub Level

A comparatively small amount of mining was carried on during the

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7. UNDERGROUND

c. Stoping (Cont.)

+25' Sub Level

early months of 1940 on this sub level. The entire operations were located under the jasper hanging wall in the Race Course Lease. Contract No. 48 completed mining an area to a limit on the North and jasper to the West of Raise No. 5623. This entire work was handicapped by an exceptionally large amount of water which apparently has followed the hanging down into the openings of this elevation. It might be added that this was the bottom sub level for this territory and its mining has had some effect on the maintenance of the 5600 drift approximately 35' below. The ore was all of Special grade at this elevation.

Fifth Level

In the second half of 1940, considerable activity was in progress on the Fifth Level in the area South and West of the Race Course. This development was authorized under E & A No. CC-22 and has been taken up in detail under the development heading.

A considerable amount of repair work and maintenance was carried on throughout the year on the Fifth Level due to the wet conditions of a portion of the working places above the Fifth Level. Each cross-cut carried quite a flow of water which considerably handicapped both repairs to the tracks and the drifts as well as washing down a considerable amount of ore onto the tracks and ditches.

During the year, four raises were extended to various elevations above the Fifth Level. Raise No. 5020 is mentioned under the 65' Sub Level heading and was completed, while Raise No. 5019, during December, was approaching this elevation in the same area. Contract No. 20 was extending Raise No. 5324 and No. 34 Contract was likewise raising No. 5322. These two raises will partially supplement the 600 series of raises on the Fourth Level at an elevation several subs above the Fourth Level. Contract No. 4 extended the 5800 Cross-Cut approximately 100' to the South where the jasper hanging wall was encountered. The South breast of this operation falls 45' short of intersecting the Pioneer and Arctic boundary line. Late in December this contract completed a diamond drill station, including 26' of drifting and a short raise East of the main cross-cut in the Maas Lease.

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7. UNDERGROUND

d. Timbering

Kind	Linnear Feet	Price	Amount 1940	Amount 1939
6" x 8" Cribbing Timber	58,853	.0364	2,142.18	3,455.46
8" x 10" Stull "	119,825	.0667	7,987.50	4,948.80
10" x 12" " "	144,571	.0947	13,693.15	11,024.27
12" x 14" " "	43,837	.1289	5,651.63	6,621.25
12" x 14" Treated "	1,565	.3283	513.81	61.71
Total Timber - 1940	368,651	.0813	29,988.27	
Total Timber - 1939	342,096	.0763		26,111.49
7' Lagging	1,563,198	.7950	12,427.12	11,476.41
91' Poles	1,413,501	1.3327	18,837.40	14,264.74
Total - 1940	2,976,699		31,264.52	
Total - 1939	2,653,037			25,741.15
Wire Fencing	113,438	.01414	1,603.93	1,158.02
Grand Total - 1940			62,856.72	
Grand Total - 1939				53,010.66

	Amount 1940	Amount 1939
Product, Tons	699,977	517,899
Feet of Cribbing & Stull Timber per ton of Ore	.5267	.6605
Feet of Stull Timber per ton of Ore	.4426	.4700
Feet of Lagging per ton of Ore	2.2332	2.8268
Feet of Poles per ton of Ore	2.0194	2.2958
Feet of Wire Fencing per ton of Ore	.1621	.3369
Feet of Lagging per Foot of Timber	5.0459	6.0143
Feet of Poles per Foot of Timber	4.5627	4.8844
Cost per Ton for Timber	.0428	.0504
Cost per Ton for Lagging	.0178	.0221
Cost per Ton for Wire Fencing	.0023	.0023
Cost per Ton for Poles	.0269	.0275
Cost per Ton for AllTimber	.0898	.1023
Equivalent of Stull Timber to Board Measure	761,851	729,203
Feet of Board Measure per Ton of Ore	1.088	1.409

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

Year	Amount	Cost Per Ton
1940	62,856.72	.0898
1939	53,010.66	.1023
1938	40,290.86	.0951
1937	69,695.41	.0892
1936	46,952.30	.0870

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7. UNDERGROUND

d. Timbering (Cont.)

The cost per ton for timber and the total feet of timber per ton of ore showed a decrease for the first time in five years. This was due, for the most part, to the fact that more of the contracts were working where the cover was higher and consequently they could use 9' instead of 8' timber. There was approximately the same proportion of the mining operation carried on under new hanging in 1940 as in 1939 and therefore the cost per ton for poles and wire fencing was nearly the same for the two years. There was considerably more repairing, especially on main levels, in 1940 but this extra amount of timber was more than offset by the 35% increase in product.

e. Drifting and Raising

The following is a comparison of the drifting and raising in the years 1940 and 1939:

	Drifting		Raising	
Year	Ore	Rock	Ore	Rock
1940	362	137	649	245
1939	50	149	1,312	158
Increase	312			87
Decrease		12	663	

The regular development in the Maas Mine was very slight during 1940, with the exception of 518' of ore drift and 138' of rock drift not included in the above. This latter occurred under E & A CC-22 on the Fifth Level and was for the purpose of extending the drifts to the West far enough to drill and explore the ore body below. There will have to be more development in 1941 as a new footwall drift will be opened on the Fourth Level and also one new cross-cut and raise in the fourth mining block East of the Race Course Lease.

f. Explosives, Drilling and Blasting

Stoping and Ore Development

Kind	Quantity Pounds	Average Price	Amount 1940	Amount 1939
1¼" 60% Amonia Gel Pwd.	1,250	.1180	147.50	
1¼" 50% " " "	5,500	.1120	616.27	3,645.85
1¼" Gelamite 1	269,055	.1150	30,940.75	19,290.37
Total Powder - 1940	275,805	.1150	31,704.52	
Total Powder - 1939	195,115	.1175		22,936.22

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f. Explosives, Drilling and Blasting (Cont.)

Kind		Quantity Pounds	Average Price	Amount 1940	Amount 1939
Fuse	M Ft.	1,070,886	.5043	5,400.55	3,923.19
#6 Blasting Caps	M	151,988	12.19	1,852.29	1,370.91
Electric " "	ea.	794	.112	88.90	46.15
Powder Bags	ea.	107	3.108	332.52	289.25
Tamping Bags	M	20,000	3.25	65.00	48.75
Fuse Lighters		32,500	6.751	219.42	141.79
Fuse Seal	Pt.	60	.50	30.00	22.00
Connecting Wire	M Ft.	325	12.00	3.90	18.07
Miscellaneous				94.55	10.50
Total Fuse, Caps, Etc.				8,087.13	5,875.61
Total All Explosives				39,791.65	28,811.83
Product, Tons				699,977	517,899
Pounds of Powder per ton of Ore				.3940	.3767
Cost per ton for Powder				.0453	.0442
Cost per ton for Fuse, Caps, Etc.				.0115	.0113
Cost per ton for All Explosives				.0568	.0553

ROCK DEVELOPMENT AND FILLING

Kind		Quantity Pounds	Average Price	Amount 1940	Amount 1939
1¼" 60% Amonia Gel. Pwd.		250	.1200	30.00	18.00
1¼" 50% " " "		500	.1125	56.26	289.51
1¼" Gelamite 1		3,300	.1150	379.50	17.25
Total Powder - 1940		4,050	.1150	465.76	
Total Powder - 1939		2,700	.1202		324.76
Fuse	M Ft.	13,644	.504	68.75	55.07
#6 Blasting Caps	M	1,957	12.21	23.89	19.10
Miscellaneous				7.71	
Total Fuse, Caps, Etc.				100.35	74.17
Total All Explosives				566.11	398.93
Total Explosives used at Mine				40,357.76	29,210.76
Average Price per Pound for Powder				.1150	.1175

Statement showing cost per ton for Explosives, exclusive of rock development, for the period 1936 to 1940:

Year	Cost per Ton	Production
1940	.0568	699,977
1939	.0555	517,899
1938	.0565	423,570
1937	.0565	780,189
1936	.0572	548,473

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7. UNDERGROUND

h. Mining and Loading

The entire product for the year, outside of the raise development, was handled with scraper hoist units of which there were 50 in service, one additional 25 H. P. unit having been rented from the Negaunee Mine in 1940 for use in a transfer. There was an average of five hoists being used for transferring ore during the year. There were no scraper hoists purchased in 1940.

There had been a very extensive development program over the last three years in opening the area adjacentto the Negaunee boundary and above the Fourth and Fifth Levels. This required a rock drift on the Fifth Level, several rock raises, and the employment of considerable time in blasting filling under new hanging, all of which naturally increased costs and delayed production in this area. Early this year it was decided to turn this territory over to the Negaunee Mine to enable them to keep up production, as their places are falling off with decreasing areas at depth. This change necessitated finding new places for the Maas Mine contracts which were being removed, and this development process had to be repeated in the new area. These gangs, added to the others which were advancing in a regular manner under a flat pitching hanging, made a total of 22 gangs or approximately one-half of the contracts which were delayed by having to close-pole, cover them with wire netting, and then drill and blast hanging to make enough filling for a cushion to protect the working places from a sudden drop of material from above.

Approximately one-half of the contracts were hampered to a more or less extent throughout the year with water in their working places. Where the water comes along this footwall it is possible to drive an initial drift parallel to the footwall and although this is very difficult and slow to drive, the extra cost is justified as this work generally drains the water from the remainder of the ore body. If the water is disseminated over the flat hanging, as is the case below the Fourth Level, then it follows the most recent slice and thus is a constant source of trouble.

Although one of the Maas grades of ore was eliminated during 1940, i. e. the Bessemer Special grade, there still remain three grades divided into two royalties that have to be stocked separately. The handling of all these grades, together with the wet ore that has to be dumped directly into the skips, requires the most careful cooperation between the shaft sampler andthe motormen to avoid more than necessary delays at the pocket.

The Fifth Level sump was again cleaned out during the fall, as were the catch basins stationed at various intervals along the main level drifts and the ditches themselves whenever the mud had accumulated sufficiently. A crew composed of the younger and more inexperienced men was maintained for this work and also a large crew, to whom overtime had to be paid, was employed on one Saturday per month to load this mud into cars, this being the only time that the work

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7. UNDERGROUND

h. Mining and Loading (Cont.)

would not interfere with the transportation of ore.

The skip weight was increased from 5.5 to 5.65 on July 6, 1940 when it was found from loading several thousand skips at the pocket during the early part of the shipping season that the actual skip capacity was 6.05 tons, which gives too large an overrun when based on 5.5.

i. Ventilation

The forced ventilation, which is supplied to the Maas Mine by a 100,000 cu. ft. fan located on surface at No. 2 shaft of the Negaunee Mine, was very ample in the territory above the Fourth Level but not as good in the area below the Fourth. This was due to crushing and constriction of the air passages on the Negaunee Thirteenth Level adjacent to the Maas boundary together with the raises and connections from the Maas 75' Sub to this level. Soon after the middle of the year a new connection was made on the Thirteenth Level and at the same time a raise crew completed repairing the Maas raise which allowed a much larger amount of air to be introduced in the Fifth Level South footwall drift. Small ventilating fans picked up this air and forced it into the working places above in a fairly satisfactory manner. However, as soon as the Fourteenth Level is completed to the Maas boundary, new connections will be made on the Maas side and as all of this work will be in rock, it should make a permanent passage for a much larger volume of air. With the aid of draft doors it will be possible to control the volume of air in the sub levels above without using fans as the air blocked by doors will be forced up to the sub under full pressure, thence along the traveling ways and down to the level again in each particular system of raises. This is the system in practice above the Third Level and has proved very satisfactory.

j. Pumping

The average gallons per minute pumped from underground in 1940 as compared with 1939 showed a decrease of 42 gallons as reported by the Mechanical Department and a decrease of 152 gallons as calculated from the daily readings on the wiers installed on all of the levels underground. These two sets of figures vary for two reasons; first, there is a small amount of water in the shaft that is not accounted for by the wier readings, and second, the plunger pumps become worn or the centrifugal pumps have to be used while repairs to the others are being made. Both of these latter conditions effect the readings as the efficiency of the pumps vary and this is not taken into account by the Mechanical Department, who assume 100% conditions at all times.

The number of gallons per minute pumped during 1940, 1939, 1938

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7. UNDERGROUND

j. Pumping

1937 and 1936 are shown below, as calculated by the Mechanical Department from the power consumption of the pumps:

Month	1940	1939	1938	1937	1936
January	1,370	1,565	1,240	1,460	1,152
February	1,339	1,525	1,442	1,607	1,200
March	1,382	1,339	1,367	1,336	1,252
April	1,386	1,430	1,379	1,204	1,388
May	1,411	1,327	1,545	1,317	1,255
June	1,434	1,290	1,372	1,300	1,251
July	1,380	1,224	1,438	1,404	1,261
August	1,321	1,356	1,391	1,319	1,233
September	1,245	1,397	1,434	1,234	1,301
October	1,276	1,385	1,644	1,168	1,314
November	1,280	1,434	1,408	1,240	1,329
December	1,318	1,370	1,496	1,219	1,418
Total Average	1,345	1,387	1,430	1,327	1,280

Following is the number of gallons per minute as calculated from the underground wier readings and from the surface pumping for 1939 and 1940:

1939

Month	1st Level	2nd Level	3rd Level	4th Level	5th Level	Total	Surface
January	102	20	412	465	252	1,251	300
February	92	18	460	455	243	1,268	0
March	76	18	505	440	215	1,254	250
April	73	17	526	414	213	1,243	250
May	73	17	527	397	210	1,224	250
June	73	17	518	374	218	1,200	250
July	73	17	518	391	223	1,222	250
August	73	42	509	375	229	1,228	800
September	73	53	500	367	242	1,235	550
October	73	53	500	338	236	1,200	550
November	73	53	490	338	241	1,195	550
December	73	53	504	336	246	1,212	550
Average	77	31	497	391	231	1,227	380

1940

January	73	53	500	338	248	1,212	550
February	73	53	500	324	247	1,197	550
March	73	53	518	324	247	1,215	800
April	73	53	482	310	252	1,170	900
May	73	53	482	298	264	1,170	900
June	73	53	423	290	241	1,080	900
July	73	53	383	283	235	1,027	900
August	98	53	368	271	252	1,042	925
September	98	53	345	258	223	977	925
October	62	25	338	264	224	913	925
November	73	22	346	271	218	930	925
December	98	22	352	271	218	961	925
Average	78	45	420	292	240	1,075	844

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8. COST OF OPERATING

a. Comparative Mining Cost

	1940	1939	Incr.	Decr.
Product	699,977	517,899	182,078	
Underground Cost	1.277	1.368		.091
Surface Cost	.127	.154		.027
General Mine Expense	.265	.290		.025
Cost of Production	1.669	1.812		.143
Depletion - Original Cost	.140	.135	.005	
Increment	.000	.000		
Depreciation-Plant & Equip.	.035	.033	.002	
Development	.035	.033	.002	
Movable Equip.	.001	.001		
Taxes	.203	.295		.092
Loading and Shipping	.064	.051	.013	
Total Cost at Mine	2.147	2.360		.213
No. of Days Operated	249	230	19	
No. of Shifts and Hours	2-8	2-8		
Average Daily Product	2,829	2,252	577	

COST OF PRODUCTION

	1940	%	1939	%	Decr.
Labor	.998	59.8	1.037	57.2	.039
Supplies	.671	40.2	.775	42.8	.104
Total	1.669	100.0	1.812	100.0	.143

b. Detailed Cost Comparison

(1) Days and Shifts

Year	Days Worked	Shifts & Hours	Men Employed	Total Days Worked
1940	249	2-8	427	108,692¼
1939	230	2-8	388	83,828½
Increase	19		39	24,863 3/4

There were two regular 8-hour shifts operating five days per week throughout 1939 and 1940 with a small 8-hour hoisting shift in 1939 and three-quarters of 1940. In September of 1940 it was decided to increase production and the third shift was increased until, at the end of the year, there was a total of 38 miners and 22 Company account men. The following table shows the comparison at the end of the year:

Total Men Employed in December of Each Year

	1940	1939	1938
Surface	71	71	78
Underground	388	357	324
Total	459	428	402

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8. COST OF OPERATING

b. Detailed Cost Comparison (Cont.)

(2) Wages

There was no change in the wage scale in 1940.

(3) Comparison of Production

Year	Production	Average Daily Product
1940	699,977	2,829
1939	517,899	2,252
Increase	182,078	577

The increase in the working force accounted for the increase in product in 1940.

(4) Comparison of Number of Men & Wages

Year	No. Men	No. Days	Amount	Rate Per Day
1940	427	108,692 1/4	674,541.36	6.26
1939	388	83,828 1/2	516,191.83	6.16
Increase	39	24,863 3/4	158,349.53	.10

(5) Tons Per Man Per Day

	1940	1939	Increase
Surface	38.26	35.31	2.95
Underground	7.74	7.49	.25
Total	6.44	6.18	.26

The increase in the tons per man underground was due to the increase in tons per man stoping, with a slightly larger percentage of miners to Company account men in 1940.

(6) Cost of Production

1940	$ 1,168,523.28	Cost per ton	1.669
1939	938,307.36	" " "	1.812
Increase	$ 230,215.92		
Decrease			.143

	Total Cost				Cost Per Ton		
	Labor	%	Supplies	%	Labor	Supplies	Total
1940	698,743.39	59.8	469,779.39	40.2	.998	.671	1.669
1939	537,094.85	57.2	401,212.51	42.8	1.037	.775	1.812
Incr.	161,649.04	2.6	68,566.88				
Decr.				2.6	.039	.104	.143

(7) Detail of Accounts

	1940	1939	Incr.
Avge. Days Per Week	5	4.23	.77
Shifts & Hours	2-8	1 & 2-8	
Production, Tons	699,977	517,899	182,078
Avge. Daily Product, Tons	2,829	2,252	577
Number of Days Worked	249	230	19

MAAS MINE
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8. COST OF OPERATING

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

	1940		1939		Increase		Decrease	
Underground Costs	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton
1. Exploring in Mine	6,462.00	.009	1,269.34	.002	5,192.66	.007		
2. Development in Rock	2,210.49	.003	2,760.23	.001		.002	549.74	
4. Development in Ore	6,061.38	.009	8,335.14	.016			2,273.76	.007
5. Stoping	314,172.65	.449	234,353.61	.454	79,819.04			.005
6. Timbering	249,715.35	.357	195,111.46	.378	54,603.89			.021
7. Tramming	92,761.13	.132	70,268.80	.136	22,492.33			.004
8. Ventilation	11,101.96	.016	7,120.85	.014	3,981.11	.002		
9. Pumping	66,695.56	.095	68,006.02	.131			1,310.46	.036
10. Comp. & Air Pipes	50,120.82	.072	42,023.49	.081	8,097.33			.009
11. Back Filling	1,028.61	.001	119.20	.000	909.41	.001		
12. Underground Supt.	24,431.10	.035	21,579.40	.042	2,851.70			.007
13. Cave-In	8.41	.000	397.99	.001			389.58	.001
14. Main. Compr. & Drills	2,943.49	.004	764.75	.001	2,178.74	.003		
15. Scrapers & M. Loaders	37,642.30	.054	24,691.18	.049	12,951.12	.005		
16. Elec. Tram Equipment	19,340.04	.028	13,430.99	.026	5,909.05	.002		
17. Pumping Machinery	9,405.02	.013	18,439.11	.036			9,034.09	.023
Total Undg. Costs	894,100.31	1.277	708,671.56	1.368	185,428.75			.091
Surface Costs								
18. Hoisting	35,827.44	.051	29,748.45	.057	6,078.99			.006
19. Stocking Ore	13,306.47	.019	13,262.25	.027	44.22			.008
20. Screening, Crushing at Mine	283.81	.000	230.51	.000	53.30			
21. Dry House	9,708.20	.014	8,439.81	.016	1,268.39			.002
22. General Surface	5,507.85	.008	4,866.20	.009	641.65			.001
23. Main. Hoisting Equip.	8,369.54	.012	7,965.94	.015	403.60			.003
24. Shaft	2,457.30	.004	1,192.58	.002	1,264.72	.002		
25. Top Tram Equip.	2,232.53	.003	3,897.33	.008			1,664.80	.005
26. Docks, T. & Pkts.	4,822.53	.007	8,282.77	.017			3,460.24	.010
27. Mine Buildings	6,165.65	.009	1,668.21	.003	4,497.44	.006		
Total Surf. Costs	88,681.32	.127	79,554.05	.154	9,127.27			.027
General Mine Expense								
28. Insurance	3,636.19	.005	4,047.91	.008			411.72	.003
29. Mining Engrg.	4,742.88	.007	5,020.30	.010			277.42	.003
30. Mech. & Elec. Engrg.	2,141.76	.003	2,563.81	.005			422.05	.002
31. Analysis & Grading	29,226.47	.042	22,759.49	.044	6,466.98			.002
32. Personal Injury	23,376.15	.033	19,764.63	.038	3,611.52			.005
33. Safety Department	2,294.07	.003	2,308.04	.004			13.97	.001
34. Tel. & S. Devices	2,125.41	.003	1,823.39	.004	302.02			.001
35. Local & Gen. Welfare	6,612.94	.009	7,467.35	.014			854.41	.005
36. Sp. Exp. Pens. & All.	28,697.98	.041	11,410.45	.022	17,287.53	.019		
37. Ishpeming Office	23,430.61	.033	23,240.39	.045	190.22			.012
39. Mine Office	20,691.31	.030	19,297.07	.037	1,394.24			.007
Social Security Taxes	29,127.29	.042	22,571.30	.044	6,555.99			.002
Employee's Vacation	9,638.59	.014	7,807.62	.015	1,830.97			.001
Total Gen. Mine Exp.	185,741.65	.265	150,081.75	.290	35,659.90			.025
Cost of Production	1,168,523.28	1.669	938,307.36	1.812	230,215.92			.143
40. Taxes	142,234.06	.203	153,033.24	.295			10,799.18	.092
Total Cost	1,310,757.34	1.872	1,091,340.60	2.107	219,416.74			.235

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8. COST OF OPERATING

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

GENERAL

Practically all of the accounts show an increase in amount and a corresponding decrease in cost per ton due to theincreased production in 1940 and also a very considerable expense to pumping machinery in 1939.

UNDERGROUND COSTS

3. Development in Rock

	Drifting	Raising	Total Feet	Cost Per Foot
1940	137'	245'	382'	5.79
1939	149	158	307	8.99
Increase		87'	75'	
Decrease	12'			3.20

The rock development at the mine during 1940 occurred for the main part in the development of the stope in the West footwall pillar above the Fourth Level but there was also a short crosscut into the footwall above the Third Level in order to catch some of the footwall water. The decrease in cost per foot in 1940 was due mostly to the increased footage of rock raising.

4. Development in Ore

	Drifting	Raising	Total Feet	Cost Per Foot
1940	362'	649'	1,011'	6.00
1939	50	1,312	1,362	6.12
Increase	312'			
Decrease		663'	351'	.12

The increase in ore drifting in 1940 was due to drifting in the Third Level East footwall pillar. Raises will be put up here next year to decrease the size of the mining blocks above. The small amount of raising was mostly on the Fifth Level with an addition of one raise on the Fourth and one from the 200' Transfer to the Third Level.

5. Stoping

	Labor	Cost Per Ton	Supplies	Cost Per Ton	Total
1940	266,950.42	.382	47,222.23	.067	.449
1939	197,329.93	.382	37,023.68	.072	.454
Increase	69,620.49		10,198.55		
Decrease				.005	.005

The increased amount in 1940 was due to a 35% larger production, while the cost per ton for labor and supplies remained practically

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8. COST OF OPERATING

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

5. Stoping (Cont.)

the same due to there being no change for the better in the water situation. There was also approximately the same large proportion of the contracts stoping under new hanging, which also tends to increase the cost.

6. Timbering

	Labor	%	Cost Per Ton	Supplies	%	Cost Per Ton	Total Cost Per Ton
1940	162,097.81	65.3	.228	87,617.54	34.7	.129	.357
1939	138,498.56	71.0	.268	56,612.90	29.0	.110	.378
Increase	23,599.25			31,004.64	5.7	.019	
Decrease		5.7	.040				.021

More timber was used on account of larger production; also more repairing of main levels in 1940 due to mining on sub levels very near the level elevation.

7. Tramming

	Labor	Cost Per Ton
1940	82,361.10	.132
1939	56,757.26	.110
Increase	25,603.84	.022

The increased cost per ton was due to working overtime cleaning up the spillage from chutes and along the tracks.

8. Ventilation

	Cost	Cost Per Ton
1940	11,101.96	.016
1939	7,120.85	.014
Increase	3,981.11	.002

The increase is due to the ventilation system operating a greater number of hours during 1940 on account of the increased operating schedule. A considerable amount of work was done at the Negaunee Mine enlarging and making new air passages, part of the cost being charged to the Maas.

9. Pumping

	Gallons Pumped	Gals. Per Min.	Cost for Power
1940	710,849,782	1,345	52,335.16
1939	726,916,014	1,387	53,302.34
Decrease	16,066,232	42	967.18

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8. COST OF OPERATING

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

The slight decrease in amount was due to less water being pumped from underground on account of the surface wells. The extra cost of pumping in these wells was more than offset by the saving underground. The reduction in gallons per minute pumped underground was 152 as calculated from the wier readings and this is more accurate than that calculated from the pumps as they were overhauled early in 1939 and therefore were more efficient than at present.

10. Compressors & Air Pipes

	Cu. Ft. Air Compressed
1940	1,288,665,000
1939	1,005,165,000
Increase	283,500,000

The increase of cu. ft. of air compressed in 1940 was due to the five day per week working schedule in 1940 as compared with an average of 4.23 days per week during 1939.

12. Underground Superintendence

	Cost	Cost Per Ton
1940	24,431.10	.035
1939	21,579.40	.042
Increase	2,851.70	
Decrease		.007

The decreased cost per ton was due to the increase in working schedule in 1940, no more supervision being required until the last of the year.

14. Main. Comp. & Drills

	Cost	Cost Per Ton
1940	2,943.49	.004
1939	761.71	.001
Increase	2,181.78	.003

Increase is due to more repairs to compressors and one jackleg, cost $66.72, charged in 1940.

15. Scrapers and Mechanical Loaders

	Cost	Cost Per Ton
1940	37,642.30	.054
1939	24,691.18	.049
Increase	12,951.12	.005

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8. COST OF OPERATING

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

15. Scrapers and Mechanical Loaders (Cont.)

The increase was due to the increased operating schedule in 1940 necessitating more repairs, more wire rope, and more other scraper equipment in 1940.

16. Electric Tram Equipment

	Cost	Cost Per Ton
1940	19,340.04	.028
1939	13,430,99	.026
Increase	5,909.05	.002

The increased cost is due to more repairs to underground locomotives, cars, tracks and wiring during 1940.

17. Pumping Machinery

	Cost	Cost Per Ton
1940	9,405.02	.013
1939	18,439.11	.036
Decrease	9,034.09	.023

In 1939 the pumping equipment was given a general overhauling and the shaft discharge column was equipped with new hangers throughout. In 1940 a cost of $4,360.00 for surface test holes was charged to this account, making the cost high in both years.

SURFACE COSTS

18. Hoisting

	Total Ore & Rock	Power Cost	Cost Per Ton For Power	Cost Per Ton
1940	700,927	26,112.12	.037	.051
1939	529,255	21,018.42	.041	.057
Increase	171,672	5,093.70		
Decrease			.004	.006

There was a larger tonnage hoisted in 1940, making a greater power cost necessary.

19. Stocking Ore

	Tons Stocked	Amount	Cost Per Ton
1940	395,932	13,306.47	.019
1939	316,980	13,262.25	.027
Increase	78,952	44.22	
Decrease			.008

Why the cost of stocking ore did not increase in proportion to the

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8. COST OF OPERATING

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

19. Stocking Ore (Cont.)

increase in product was due to removing the ore from under approximately 40 bents of wooden trestle without dismantling the same and therefore saving the cost of re-erecting. There was an extra charge this year due to cleaning up with a tractor bull dozer the stocking grounds where Maas grade ore had been in stock and where it had become necessary to stock Special grade next year. Approximately 35% of all the ore has to be stocked during the shipping season as it is too wet to be handled at the dock.

21. Dry House Expense

	1940	1939	Decrease
Coal Used in Heat. Plant, Tons	662	940	278
Cost Per Ton for Coal	5.298	5.485	.187
Cost of Coal	3,507.45	5,155.87	1,648.42

Decrease in tons of coal used was due to extensive repairs to heating boilers in 1940, using a small portable boiler during this time. The boiler was also more efficient after repairs.

22. General Surface

	Cost	Cost Per Ton
1940	5,507.35	.008
1939	4,866.20	.009
Increase	641.65	
Decrease		.001

Increased cost due to more general surface repairs in 1940.

23. Hoisting Equipment

	Cost	Cost Per Ton
1940	8,369.54	.012
1939	7,965.94	.015
Increase	403.60	
Decrease		.003

There were two new ropes and two second hand ropes charged to this account in 1940 as compared with two new and one second hand rope in 1939. Also more general repairs in both years.

24. Shaft

	Cost	Cost Per Ton
1940	2,457.30	.004
1939	1,192.58	.002
Increase	1,264.72	.002

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YEAR 1940

8. COST OF OPERATING

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

24. Shaft (Cont.)

Increase due to more repairs to shaft and shaft level pockets in 1940.

25. Top Tram Equipment

	Cost	Cost Per Ton
1940	2,232.53	.003
1939	3,897.33	.008
Decrease	1,664.80	.005

Decrease is due to completing the installation of larry car system in 1939.

26. Docks, Trestles & Pockets

	Cost	Cost Per Ton
1940	4,322.53	.007
1939	8,282.77	.017
Decrease	3,460.24	.010

Decrease is due to repairs to shafthouse pockets and grading for additional stocking grounds in 1939.

27. Mine Buildings

	Cost	Cost Per Ton
1940	6,165.65	.009
1939	1,668.21	.003
Increase	4,497.44	.006

The cost in 1940 is for completing repairs to shafthouse building and for a new roof on dry house. Also part of E & A No. CC-7, extensive repairs to dry building in 1940. The charge in 1939 is for repairs to shafthouse building.

28. Insurance

	1940	1939	Incr.	Decr.
Property	922.27	1,056.11		133.84
Group	2,169.63	2,539.94		370.31
Catastrophe	544.29	451.86	92.43	
Total	3,636.19	4,047.91		411.72

Decrease due to premiums on property and group insurance less in 1940.

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8. COST OF OPERATING

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

29. Mining Engineering

	Cost	Cost Per Ton
1940	4,742.88	.008
1939	5,020.30	.010
Decrease	277.42	.002

Decrease is due to less expense to mine surveys and stocking trestle alignment in 1940.

30. Mechanical & Electrical Engineering

	Cost	Cost Per Ton
1940	2,141.76	.003
1939	2,563.31	.005
Decrease	422.05	.002

Decrease is due to proportion of mechanical and electrical engineering charge less in 1940.

GENERAL MINE EXPENSES

31. Analysis and Grading

	No. Determination	Lab. Expense Cost Per Determination	Analysis & Grading
1940	62,334	.295856	.468869
1939	48,094	.290084	.473229
Increase	14,240	.005772	
Decrease			.004360

There was 50% more shovel loading in 1940 and therefore more samples taken and more determinations worked. There were also more determinations worked on underground samples to test for sulphur in the areas where the Special grade ore occurs.

32. Personal Injury

	1940	1939	Increase
Compensation Department	960.91	909.73	51.18
Hospital Loss	8,740.27	8,252.70	487.57
Reserve & Catastrophe, Compensation set up & Medical Service	13,674.97	10,602.20	3,072.77
	23,376.15	19,764.63	3,611.52

33. Safety Department

	Cost	Cost Per Ton
1940	2,294.07	.003
1939	2,308.04	.004
Decrease	13.97	.001

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8. COST OF OPERATING

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

33. Safety Department (Cont.)

The cost to Safety Department work was about the same in both years.

34. Telephones & Safety Devices

	Cost	Cost Per Ton
1940	2,125.41	.003
1939	1,823.39	.004
Increase	302.02	
Decrease		.001

The increase was due to more safety equipment charged on account of more new men employed.

35. Local and General Welfare

	Cost	Cost Per Ton
1940	6,612.94	.009
1939	5,999.00	.014
Increase	613.94	
Decrease		.005

Increase is due to more aid to employees during 1940.

36. Special Expense, Pensions & Allowances

	1940	1939	Increase
Saranac Invest.	3,223.36	1,923.23	1,300.13
Legal	527.43	438.00	89.43
Pensions	20,945.48	3,546.00	17,399.48
Miscellaneous	4,001.71	3,795.00	206.71
	28,697.98	9,702.23	18,995.75

The miscellaneous expense is mostly for retiring old employees.

37. Ishpeming Office

	Cost	Cost Per Ton
1940	23,430.61	.033
1939	23,240.39	.045
Increase	190.22	
Decrease		.012

Increase was due to more expense in 1940.

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8. COST OF OPERATING

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

39. Mine Office

	Cost	Warehouse Overhead	Cost Per Ton
1940	20,691.31	5,452.94	.030
1939	19,297.07	5,125.82	.037
Increase	1,394.24	327.12	
Decrease			.007

Increase was due to more expense to printing and stationery, petty office expense, proportion of district manager's salary and proportion of warehouse overhead greater in 1940.

Employees' Vacation

	Cost	Cost Per Ton
1940	9,638.59	.014
1939	7,807.62	.015
Increase	1,830.97	
Decrease		.001

Increase was due to more men receiving paid vacations and each man allowed five days in 1940 as compared with 4 in 1939.

40. Taxes

	Cost	Cost Per Ton
1940	142,234.06	.203
1939	150,033.24	.295
Decrease	7,799.18	.092

Decrease is due to lower tax rate in 1940.

Analysis of Supplies Used

	1940		1939		Increase		Decrease	
	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton
41. General Supplies	38,657.40	.055	29,824.38	.057	8,833.02			.002
42. Iron & Steel	13,227.73	.019	10,108.24	.020	3,119.49			.001
43. Oil & Grease	3,023.50	.004	2,434.66	.005	588.84			.001
44. Machinery Supplies	18,528.66	.026	20,183.81	.039			1,655.15	.013
45. Explosives	39,881.62	.057	29,289.16	.057	10,592.46			
46. Lumber & Timber	65,544.11	.094	58,872.15	.114	6,671.96			.020
47. Fuel	3,507.45	.005	5,166.87	.010			1,659.42	.005
48. Electric Power	138,101.11	.197	122,246.30	.236	15,854.81			.039
49. Sundries	12,383.78	.018	22,485.50	.043			10,101.72	.025
50. Other Mines & Accounts	529.37	.000	274.95	.001	254.42			.001
TOTAL	332,325.99	.475	300,336.12	.580	31,989.87			.105

There was an increase in most of the supply accounts due to the increase in production in 1940. The decrease in machinery supplies

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8. COST OF OPERATING

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

Analysis of Supplies Used (Cont.)

was due to less repairs to pumping machinery, and in fuel to the use of a smaller boiler while the main heating plant was being repaired. The decrease in sundries was due to shop labor being charged out as labor while in 1939 it was charged to supplies.

9. EXPLORATIONS AND FUTURE EXPLORATIONS

There were three diamond drill holes put down from the Fifth Level during 1940 to determine the depth of the footwall below the level and also to obtain information relative to the grade of the ore body. Diamond drill hole No. 31 was drilled from a point 140' East of the West boundary of the Race Course Lease and 120' South of the North dike. This hole was drilled at a dip of 30° in a Southwesterly direction and reached the footwall at 305' or 165' vertically below the Fifth Level. The ore was all of Special grade. No. 32, drilled at 60° from the same location as it was thought that No. 31 was too much in the hanging, encountered its footwall at approximately 135' vertically and here too the ore was all of Special grade. No. 33, located 40' East of the West boundary of the Race Course and 100' North of the North dike, was drilled at 45° to the Southwest and encountered its footwall at 285' or 200' vertically and here also the ore was of Special grade. This information was very disappointing as it appears that there is no standard grade ore below the Fifth Level. However, it was decided to extendthe North footwall and turn off a cross-cut to the South some 400' to the West of the Race Course and well in the hanging so that more drilling can be done in 1941 to cut a much lower horizon of the ore body and thus determine if the sulphur cuts out at depth.

10. TAXES

	1940		1939	
	VALUATION	TAXES	VALUATION	TAXES
Maas Mine	$ 1,895,000	66,476.79	$ 1,745,000	63,881.66
Race Course	700,000	24,556.07	820,000	30,018.89
Adams Strip	100,000	3,508.01	120,000	4,393.01
Stockpile & Equipment	1,385,000	48,585.94	1,535,000	56,193.89
Miscellaneous Parcels	9,390	330.00	8,880	325.37
Total Mine	4,089,390	143,456.81	4,228,880	154,812.82
Collection Fees		1,434.57		1,548.13
Total Oprtg. Maas Mine		144,891.38		156,360.95
Adams Strip Charged to Negaunee Mine	75,000	2,657.32	90,000	3,327.71
Maas Mine Total	4,014,390	142,234.06	4,138,880	153,033.24

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10. TAXES

	1940		1939	
	VALUATION	TAXES	VALUATION	TAXES
Tax Rate		3.50801		3.66084
Total City of Negaunee Tax		517,957.83		530,092.01
Maas Mine % of City Tax		27.4%		28.8%
Maas Mine Rented Houses	188,600	6,616.69	207,700	7,604.36
Mineral Lands, Etc.	19,200	673.59	19,200	702.91
Total Houses & Lands	207,800	7,290.28	226,900	8,307.27
Collection Fees		72.90		83.07
Total		7,363.18		8,390.34

11. ACCIDENTS AND PERSONAL INJURY

	1940	1939
Fatal	0	0
Time Lost, over 4 months	4	1
" " 1 to 4 "	9	7
" " less than 1 month	4	6
Total Accidents	17	14
Number of cases paid compensation for accidents prior to Jan. 1st, 1940	2	9

The total amount paid on compensation in 1940 was $2,958 as compared with $1,136 in 1939 and this was because the severity of the accidents was greater. In 1939 there was only one injury that kept the man home over four months, while in 1940 there were four accidents of this nature. One man also lost the use of his eye in a blasting accident and another died after having received a leg injury that would not heal, due apparently to a poor condition of his blood. Although it is regretted that the number of accidents is so large, when the increased production with more men and a faster rate of mining is taken into consideration, the accident rate is less than last year. No new safety measures were adopted this year but conferences were held with the Captains and Bosses at frequent intervals at which safety was the predominating feature and Mr. Conibear and his assistant, Captain Rogers, made several trips underground each month. Thus the bosses received the benefit of their suggestions and passed these along to the men in an effort for all to work as safely as possible.

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

Date of Accident	Name of Injured Man	Lost Wk.Da.	Compensation Paid to 12-31-40	Description of Accident
1/22/40	Jacob Koski	7 4	$159.00	Koski was covering the spiling when a chunk dropped off the side lagging and struck his left foot, causing a fracture of two bones.

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11. ACCIDENTS AND PERSONAL INJURY

Date of Accident	Name of Injured Man	Lost Wk.	Lost Da.	Compensation Paid to 12-31-40	Description of Accident
2/15/40	Matt Hill	Died 12/31/40		$543.00	Matt Hill and his partner were standing a leg for a set of timber when a piece of ore fell and hit his left leg, causing a bruise which never entirely healed. Although he worked at various intervals, his blood condition was poor and he subsequently suffered a stroke and died.
3/19/40	Alex Talo	17	5	$720.00	Alex Talo and his partner, Ben. Jewell, while drilling a hole in the breast, encountered some powder left in a hole from the preceding blast and this exploded. They were knocked down and badly peppered with small particles of ore about the face and body. Talo lost the sight of his right eye and Jewell had the hearing of his left ear impaired. This was the most serious accident of the year at the Maas Mine.
	Ben Jewell	5	1	108.00	
2/9/40	Nick Aho	2	3	$ 33.00	Nick Aho scratched the side of his left hand with his axe and it later became infected.
7/23/40	Wm. Richards		6	- -	William Richards was inspecting a working place when a piece of ore fell from the back and fractured his cheek bone.
8/26/40	Clarence Sharp	12	5	$267.00	Clarence Sharp was repairing the air cylinder which raises the fingers at the shaft pocket when the top of the piston hit him in the face and broke his nose.
9/3/40	Nestor Sarkela	Still Home		$288.00	Nestor Sarkela was hit in the leg by a piece of timber caught by the scraper when he signalled for it to be moved. He could not get out of the way fast enough and his left ankle was fractured.
9/19/40	Guido Della Corte	Still Home		$234.00	Guido Della Corte was riding on the motor when a car became derailed and the sudden stop threw him against the car immediately in front of him, breaking his nose.
9/7/40	John Rowse	5	1	$108.00	John Rowse hit his right leg against a piece of rail when repairing the track and later this wound became infected.

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11. ACCIDENTS AND PERSONAL INJURY

Date of Accident	Name of Injured Man	Lost Wk.	Lost Da.	Compensation Paid to 12-31-40	Description of Accident
10/23/40	Sam Davey	8	5	$180.00	Sam Davey was trimming the back when a chunk of ore fell and broke a bone in his right foot.
11/6/40	Eino Grayes	Still Home		$108.00	Eino Grayes was replacing an air pipe in a raise when a miner above, in trying to help him to lower the pipe, let a piece of pole slip out of his hands. This fell about 80' and struck Grayes on his shoulder, causing a fracture and a collapsed lung.
11/11/40	Gerolomo Armatti	5	1	$108.00	Gerolomo Armatti was attempting to move the scraper hoist when it turned over on him, bruising his right thigh and leg.
12/12/40	Ellsworth Cleven	Still Home		$ 18.00	Ellsworth Cleven was endeavoring to escape from his working place, which closed quickly, and in so doing fell over his scraper and dislocated his shoulder.
12/12/40	Adolph Anderson	Still Home		$18.00	Adolph Anderson and William Pietila were both caught when the jasper hanging above their working place broke through the covering and partially buried them. Pietila was rescued first and escaped with slight bruises and lacerations but Anderson was caught in such a manner that it took about three hours of very careful work to free him. Very fortunately his only serious injury was a fractured left wrist. This could easily have been a very serious accident and it was very fortunate that the men were not disabled.
	William Pietila	2	6	42.00	
12/13/40	Isaac Hulkoff	2	6	$ 42.00	Isaac Hulkoff was attempting to move the scraper hoist when the ring to which the rope was attached broke and allowed the pig tail, or tying device on the end of the rope, to hit him on the chest, fracturing a rib and causing a slight internal injury.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

E & A No. 808 & 808A

Total Estimate		$ 20,445.00
Total Expended to 12-31-39	$ 18,973.59	
Total Expended in 1940	5,225.33	
Total Expended to 12-31-40		24,198.92
Balance Dec. 31st, 1940		$ 3,753.92

The purpose of this E & A was the sinking of a test hole, No. 13, and a large bore well, called Maas No. 2, approximately 1000' West of the shaft to remove some of the surface water before it enters the mine. This part of the E & A was completed in 1939 but an additional amount was set up under No. 808A to allow further work on No. 1 well to increase the capacity. This work was completed during 1940.

E & A No. 844

Total Estimate	$ 1,151.00
Total Expended in 1940	1,239.26
Balance Dec. 31st, 1940	$ 88.26

The purpose of this E & A was the renewal of the roof on the Maas Mine change house and the work was completed in 1940.

E & A No. 855

Total Estimate		$ 3,916.00
Total Expended to 12-31-39	$ 174.09	
Total Expended in 1940	3,261.22	
Total Expended to 12-31-40		3,435.31
Balance Dec. 31st, 1940		$ 480.69

The purpose of this E & A was the sinking of five test holes along the Western side of the caved area to decide on the location of a well and the work was completed early in 1940.

E & A No. CC-7

Total Estimate	$ 13,577.50
Total Expended in 1940	6,317.37
Balance Dec. 31st, 1940	$ 7,260.13

The purpose of this E & A was the remodeling of the change house to eliminate overcrowding and also dust conditions by having the clean and dirty clothes in separate rooms. Further expense will be charged to this E & A in 1941. The accounts are detailed as follows:

Addition to Building

Total Estimate	$ 1,117.25
Total Expended in 1940	2,530.00
Balance Dec. 31st, 1940	$ 1,412.75

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

It was found necessary to increase the size of the addition, after the E & A had been prepared, to take care of a first aid room.

Inside Remodeling	
Total Estimate	$ 2,264.25
Total Expended in 1940	124.37
Balance December 31st, 1940	$ 2,139.88
Heating Changes	
Total Estimate	$ 1,250.00
Total Expended in 1940	1,042.13
Balance Dec. 31st, 1940	$ 207.87
Traps & Strainers	
Total Estimate	$ 175.00
Total Expended in 1940	241.45
Balance Dec. 31st, 1940	$ 66.45
Controlls	
Total Estimate	$ 225.00
Total Expended in 1940	0
Balance Dec. 31st, 1940	$ 225.00
Pipe	
Total Estimate	$ 800.00
Total Expended in 1940	558.29
Balance Dec. 31st, 1940	$ 241.71
Shower Room	
Total Estimate	$ 209.00
Total Expended in 1940	130.04
Balance Dec. 31st, 1940	$ 78.96
Mixing Valves	
Total Estimate	$ 237.00
Total Expended in 1940	125.37
Balance Dec. 31st, 1940	$ 111.63
Piping	
Total Estimate	$ 450.00
Total Expended in 1940	83.63
Balance Dec. 31st, 1940	$ 366.37
Clothes Benches & Hangers	
Total Estimate	$ 1,200.00
Total Expended in 1940	0
Balance Dec. 31st, 1940	$ 1,200.00
Repair & Relocate Lockers	
Total Estimate	$ 750.00
Total Expended in 1940	387.60
Balance Dec. 31st, 1940	$ 362.40

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

E & A No. CC-7 (Cont.)

Lighting	
Total Estimate	$ 600.00
Total Expended in 1940	444.87
Balance Dec. 31st, 1940	$ 155.13
Painting	
Total Estimate	$ 300.00
Total Expended in 1940	0
Balance Dec. 31st, 1940	$ 300.00
New Surface Dry	
Total Estimate	$ 4,000.00
Total Expended in 1940	649.62
Balance Dec. 31st, 1940	$ 3,350.38

E & A No. CC-11

Total Estimate	$ 15,770.00
Total Expended in 1940	15,313.39
Balance Dec. 31st, 1940	$ 456.61

The purpose of this E & A was the sinking of a large bore well 500' West of the West limit of the caved area and on the North side of Park Street. It was thought that this well being nearer to the caved ground, the pumping would show more immediate effect underground, but so far the well has been a failure and more work will have to be done here in 1941

E & A No. CC-15

Total Estimate	$ 585.00
Total Expended in 1940	585.00
Balance Dec. 31st, 1940	$ 0

The purpose of this E & A was the purchase of three paving breaker drill machines for driving spiling through loose material underground, from the Ingersoll-Rand Company

E & A No. CC-19

Total Estimate	$ 685.38
Total Expended in 1940	685.38
Balance Dec. 31st, 1940	$ 0

The purpose of this E & A was the purchase of one No. 2½ Anaconda ventilating fan to improve air conditions in the working places.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

E & A No. CC-22

Total Estimate	$ 19,470.00
Total Expended in 1940	7,814.66
Balance Dec. 31st, 1940	$ 11,655.34

The purpose of this E & A was to drift and diamond drill on the Fifth Level to explore the extent and grade of the ore body below. There will be further expense to this E & A in 1941. The accounts are detailed as follows:

500' of Drifting

Total Estimate	$ 7,500.00
Total Expended in 1940	7,529.17
Balance Dec. 31st, 1940	$ 29.17

This account will be overcharged on account of more drifting being necessary than was first estimated.

Two Drill Stations

Total Estimate	$ 200.00
Total Expended in 1940	0
Balance Dec. 31st, 1940	$ 200.00

2,000' Drilling

Total Estimate	$ 10,000.00
Total Expended in 1940	23.76
Balance Dec. 31st, 1940	$ 9,976.24

Personal Injury
Unemployment Tax
Old Age Tax
10% for Contingencies

Total Estimate	$ 1,770.00
Total Expended in 1940	261.73
Balance Dec. 31st, 1940	$ 1,508.27

E & A No..CC-26

Total Estimate	$ 700.48
Total Expended in 1940	660.88
Balance Dec. 31st, 1940	$ 39.60

The purpose of this E & A was the purchase of two 15 H.P. motors for replacement on scraper hoist units. This was completed in 1940.

E & A No. CC-34

Total Estimate	$ 556.60
Total Expended in 1940	610.46
Balance Dec. 31st, 1940	$ 53.86

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

E & A No. CC-34

The purpose of this E & A was the purchase of a new coupe for the Superintendent's use. A Ford was purchased instead of the Chevrolet listed in the E & A.

E & A No. CC-45

Total Estimate	$ 600.00
Total Expended in 1940	600.00
Balance Dec. 31st, 1940	$ 0

The purpose of this E & A was the purchase of a Cletrac tractor and plow from Forsythe Township.

PROPOSED NEW CONSTRUCTION

The E & A's which will carry over into 1941 are Nos. CC-7, CC-11 and CC-22.

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

13. EQUIPMENT AND PROPOSED EQUIPMENT

a. Steam Shovels

The No. 45 or caterpillar shovel was repaired at the mine during the winter months and operated almost continuously throughout the shipping season. In November 1940, when this shovel was tied up, the boom was sent to the Ishpeming Shops for repairs. No. 44 shovel was taken to the shops at the end of the 1939 season and in the spring it was decided to use No. 43, which is also a railroad type shovel similar to No. 44, as it is lighter to move around. Loading as many different grades as there are at the Maas Mine requires a lot of moving during the season. This shovel was returned to the shops for repairs about the last of November.

b. Stocking Trestles

All of the trestles erected in the spring and fall of 1940 were of the single two leg type, instead of the former three leg bent with a long cap to carry two parallel tracks, it having been necessary to abandon the side dump car when changing to the remote controlled larry car. This saddle back car, with its accompanying motor, was the limit in weight that the steel trestle could carry. The side dump car weighs considerably more so its use on the steel trestle was out of the question and therefore on the wood also as the same car has to travel on both. The 30" gauge of the track was increased to 36" to make a more stable unit and there were two larry car units together with one

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13. EQUIPMENT AND PROPOSED EQUIPMENT

b. Stocking Trestles (Cont.)

rope transfer unit used during the year. All of the wooden trestles with the exception of the one lying due West of the shaft were dismantled and the ore cleaned up by November. Almost all of the ore under the West trestle was loaded out without disturbing the trestle, thus making it possible to stock the wet ore that can not be loaded into cars at the pocket during the shipping season. This scheme worked out very satisfactorily and saved considerable expense also, as this trestle had an insulated third rail conductor for the larry car in addition to the regular members, which would have had to be dismantled.

The fact that it was possible to ship all of the ore of Maas grade stocked Southeast of the shaft leaves this stocking area for Special grade only and this will allow sufficient trestle so that the wet ore can be dumped during shipping season, even though the dry ore is being loaded from the same trestle. It will also be possible to stock all of the Maas grade West of the shaft on two parallel trestles, while the Race Course ore and the two Bessemer ores will be dumped on the steel trestle lying East of the shaft.

c. Scraper Hoists

There were no scraper hoist units purchased in 1940, however, one 25 H. P. Sullivan was rented from the Negaunee Mine for use in one of the transfer systems.

The list of equipment on hand at the end of the year is as follows:

Ingersoll-Rand	10	H. P.	Electrics	3
" "	15	"	"	16
" "	20	"	"	2
Sullivan	25	"	"	4
"	20	"	"	1
"	15	"	"	24
"	7½	"	"	1
"	6½	"	"	4
Total Electric Hoists				55

Ingersoll-Rand air timber hoists (Single drum)	16

The smaller powered hoists are used for exploration and repair work while the 25 H. P. units are mostly in transfer systems.

d. Cages and Skips

There were only the necessary repairs to both skips and cages during 1940. The estimated skip capacity was changed from 5.5 tons to 5.65 tons on July 6th.

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14. MAINTENANCE AND REPAIRS

Starting in the fall of the year, the main heating plant boiler located in the East end of the change house was completely overhauled and an entire set of new tubes installed. While this work was in progress, a small diamond drill boiler was set up outside the building and while not entirely adequate to take care of the large volume of hot water for the showers, was forced to the utmost and by putting on a third shift regular fireman, it was possible to keep operating. The work was completed in November and should show considerable saving in coal during the coming winter.

The small tractor, which had been repaired several times, was finally declared inadequate and a larger tractor and plow was purchased from Forsythe Township. This unit had not been used very much and when the County took over the Township roads, was no longer needed by them, so it was possible to acquire it at a very reasonable price. The plow will be of very great advantage in keeping the snow removed from areas where the city plows are too large to operate.

Hoisting ropes were installed on both the North and South skips and the cage during the year. The rope which had been on the cage since January, 1939, was removed in September of this year and put on the South skip, there having been another new rope purchased and put in service at this time on the cage. Another new rope was purchased in August and placed on the North skip. The records show that since lubricating the hoisting ropes regularly, the tonnage has been increased very materially.

15. POWER

The following is the rate charged per K.W. hour by months during 1940:

January	$ .0138
February	.0134
March	.0134
April	.0138
May	.0134
June	.0134
July	.0136
August	.0136
September	.0136
October	.0134
November	.0134
December	.0132
Average	$ .0135

17. CONDITION OF PREMISES

There was no work done about the grounds other than the routine work of keeping the lawns and shrubbery in good condition.