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18. NATIONALITY OF EMPLOYEES

As to Parentage	1940	%	1939	%
Finnish	213	43.6	175	41.3
English	94	19.2	96	22.5
American	63	12.8	42	9.8
Italian	45	9.2	39	9.1
Swedish	29	6.0	30	7.0
French (Canadian)	17	3.6	20	4.5
German	10	2.2	9	2.1
Norwegian	7	1.4	7	1.6
Danish	4	.8	4	.9
Irish	2	.4	2	.5
Austrians	3	.6	1	.2
Polish	1	.2	2	.5
Total	488	100.0	427	100.0

	Total		American Born		Foreign Born	
As to Birth	1940	1939	1940	1939	1940	1939
Finnish	213	175	142	98	71	77
English	94	96	53	53	41	43
American	63	42	63	42	0	0
Italian	45	39	21	13	24	26
Swedish	29	30	24	22	5	8
French (Canadian)	17	20	17	19	0	1
German	10	9	8	7	2	2
Norwegian	7	7	6	6	1	1
Danish	4	4	4	3	0	1
Irish	2	2	2	2	0	0
Austrian	3	1	2	0	1	1
Polish	1	2	1	2	0	0
Total	488	427	343	267	145	160
Percentage			70.0%	62.0%	30.0%	38.0%

19. MAAS CRUSHER

The following table shows the years operations:

Mine	1940	1939	Incr.	Decr.
Cliff Shaft	9,998	12,380		2,382
Lloyd		37,128		37,128
Morris (Inland)	26,959	9,423	17,536	
Maas	19,527		19,527	
Total	56,484	58,931		2,447

The Maas crusher was in operation approximately the same time in 1940 as in 1939 and crushed very nearly the same amount. The chief difference was that the crusher was operated later, crushing 6,378 tons in November of 1940 as compared with 1,244 tons in November 1939. As this is the time of year when the ore is frozen and takes considerably longer to run through the crusher, the year figures show thatthe remainder of the tonnage took considerably less time to crush this year. The wooden bents supporting the structure carrying the conveyor belt were replaced in the spring as were also some of the main members in the loading pocket. The unloading pocket was completely dismantled and reinstalled before crushing started.

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1. GENERAL:

The Negaunee Mine operated on a five day per week schedule during the entire year. The five day schedule went into effect September 11, 1939. Production gradually increased until it became necessary to hoist ore on the third or midnight shift. Late in 1939 a few miners started working on the third shift in order to increase production. In September 1940 more miners were added to the third shift and in November the third shift crew was increased to about 50% of a normal day shift crew. This increase was made to bring the production up to the full capacity of the hoist on the three shift schedule. The December production reflected the increase but due to unusual conditions it has not yet proven possible to maintain the hoist at full capacity.

During the year The Negaunee Mine Company leased a body of ore, known as the "Maas Area", 250 ft. wide by 1080 ft. long, along the boundary adjacent to the 13th and 14th levels of the Negaunee Mine. It has been estimated to contain approximately 1,600,000 tons of high grade Non-Bessemer ore, before deducting for rock and loss in mining. Development of this area was started in December. A drift on the 13th level has been started and it will also be developed on the 14th level in 1941, but the main production is expected from the 13th level. The lease of this ore area will aid in maintaining a large production from the Negaunee Mine shaft as mining gangs will be transferred to this strip as they are crowded out of working places on the Negaunee property by the encroachment of the flat pitching footwall.

Production in 1940 was 855,811 tons, to which should be added 9,878 tons of current year's stockpile overrun, making a total of 865,689 tons. This exceeded by 34,896 tons the best previous production which was made in 1937. Prior to 1937 the largest production was 579,740 tons in 1930. This shows the large increase that has been made possible by the mechanization of the mine. The present operating schedule of five days per week is the best possible for the mine as it allows one week day for inspection of the shaft and equipment and necessary repairs. The employees are well satisfied with a five day week as they earn a good living and have some leisure time.

There were two fatal accidents in 1940. The last previous one occurred in 1937. The first fatality was due to a miner taking an unnecessary risk and the second was a trade risk as all the safety rules and regulations were being followed.

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1. GENERAL: (Cont'd)

The deep well that was being sunk and developed by the Layne-Northwest Company late in 1939 started to operate in February and continued in operation throughout the year with a few minor shut downs for alterations and late in the year a shut down to clean the well and wash the sand from the shutter screens. The amount of water pumped varied from 400 gallons per minute when pumping started to about 225 gallons per minute at the end of the year. The ground water level has been lowered 6 ft. or 7 ft. at the line of stand pipe holes 170 ft. to the East of the well. The amount of water coming in on the 9th level has decreased almost by the amount of water pumped at the well. This has proven a great benefit not only by improving mining conditions above the 9th level but also in reducing the cost for current used by the underground pumps.

Exploration of the ore body encountered in sinking No. 3 shaft Negaunee Mine from the 12th to the 13th level and also in surface diamond drill hole No. 17 about 900 ft. Southeast of the shaft was started in October from the 13th level plat and continued during November and part of December. It was then temporarily abandoned on account of development of the Maas Strip as it was impossible to handle high Sulphur ore and rock on the 13th level from which level the largest production of ore is obtained. This high Sulphur ore body was developed by a raise to the hanging and by an inclined drift on the pitch of the ore trough for a distance of approximately 150 ft. along the strike. This carried the development work slightly above the elevation of the 12th level. Cross-cuts to determine the width of the ore body shows a width of less than 40 ft. and the Sulphur content averaged over 1.0%. It is assumed that the ore body is wedge shaped with a width of about 40 ft. at the hanging and zero at the contact of the footwall and the fault. If there is no change in size there is only a small tonnage of non-merchantable ore here unless the Sulphur content changes as explorations are continued upward. The results thus far have been quite discouraging but as they are not completed no definite conclusions can be reached.

2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production by Grades:

	1940	1939	Increase
Negaunee Ore	864,459	551,362	313,097
Negaunee Special Ore	1,230		1,230
Rock	34,784	26,148	8,636
Total Hoist	900,473	577,510	322,963

b. Shipments:

	Pocket Tons	Stockpile Tons	Total Tons
Negaunee Ore	503,846	426,794	930,640
Total - 1939	279,687	399,993	679,680
Increase	224,159	26,801	250,960

Shipments increased 36.9% in 1940 and were 74,829 tons more than the product for the year.

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

c. Stockpile Inventories:

	Dec. 31, 1940	Dec. 31, 1939	Decrease	Increase
Negaunee Ore	86,784	90,074	3,290	
Negaunee Special Ore	1,230			1,230
Total	88,014	90,074	2,060	

Including estimated overrun there were approximately 100,000 tons in stock at the end of the year.

d. Division of Product by Levels:

	1940	% of Product	1939	% of Product
9th Level	188,322	22.0	102,321	18.5
11th Level	129,127	15.1	134,464	24.4
12th Level	184,073	21.5	223,441	40.5
13th Level	354,289	41.4	91,136	16.6
Current Years Stockpile Overrun..... ..	9,878			
Total	865,689	100.0%	551,362	100.0%

There was an increase in the product from the 9th level which furnished nearly one quarter of the ore hoisted in 1940. The total product from this level since reopening in 1936 is 364,042 tons. The main increase in 1940 occurred on the 13th level while both the 11th and 12th levels show decreases.

e. Production by Months:

Month	Negaunee Ore	Negaunee Special Ore	Total Ore	Rock
January	69,005		69,005	1936
February	62,078		62,078	2896
March	67,939		67,939	2552
April	66,848		66,848	3480
May	73,153		73,153	2345
June	72,979		72,979	2490
July	75,484		75,484	2740
August	68,205		68,205	2750
September	69,484		69,484	3295
October	78,178	538	78,716	3655
November	75,402	637	76,039	3190
December	75,826	55	75,881	3455
Total	854,586	1230	855,811	34784
Stockpile Overrun 1940	9,878		9,878	
Total	864,459	1230	865,689	34784
Total 1939	551,362		551,362	26148
Increase	313,097	1230	314,327	8636

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

e. Production by Months: (Cont'd)

The product was distributed as follows:

	1940	1939	Increase
Negaunee Mine Company	783,353	506,134	277,219
American Mining Co. Strip	82,336	45,228	37,108
Total	865,689	551,362	314,327

There remains 224,805 tons of ore to be taken by The Negaunee Mine Company from the American Mining Company's strip (S½ of Old D. S. S. & A. Right-of-way) to offset the balance of the tonnage from the Negaunee Mine lease heretofore delivered to the owners of the ore in the American Mining Co. strip.

f. Ore Statement:

	Negaunee Ore	Negaunee Special Ore	Total	1939
On hand Jan. 1, 1940	90,074		90,074	218,392
Product for Year	854,581	1230	855,811	551,362
Prior Years Stockpile Overrun.....	62,891		62,891	
Overrun - 1940	9,878		9,878	
Total	1,017,424	1230	1,018,654	769,754
Shipments	930,640		930,640	679,680
Balance on Hand	86,784	1230	88,014	90,074
Increase in Output			248,900	
Decrease in Ore on Hand	3,290		2,060	
Increase in Ore on Hand		1230		

1940 - Two 8 hour shifts, 5 days and 5 nights per week 9-11-39 to 12-31-40.

1939 - 2, 8 hr. shifts 3 days & 3 nights per week 11/1/38 to 1/9/39.
2, 8 hr. shifts 4 days & 4 nights per week 1/9/39 to 6/12/39.
1 & 2, 8 hr. shifts 5 days and 1 night per week 6/12/39 to 9/11/39. (1)
2, 8 hr. shifts 5 days & 5 nights per week 9/11/39 to 12/31/39.

(1) To give each man three days per week.

g. Delays:

While loading the skip on the day shift July 10th, a piece of pole passed through the 13th level loading pocket and into the skip unnoticed. This piece of pole protruded over the side of the skip just far enough so that when it was hoisted it caught the pocket and tore out one of the steel plates, resulting in a 2 hour delay while repairs were made. The loss in product was approximately 275 tons.

On August 28th the spring that takes up the tension on the skip hoist indicator broke and a piece fell between the bevel gears breaking two teeth. This caused a delay of about 2 hours with a resultant loss in product of 250 tons.

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

g. Delays: (Cont'd)

On Saturday, October 18th hoisting was stopped at 5 A.M. in order to give more time for repair of skip hoist motor. Several coils were burned out on the motor and the extent of the damage and the time required for repairs could not be determined until the rotor was removed. By stopping hoisting at 5 A.M. it was possible to remove the rotor and have the motor ready for repairs by 8 A. M. which gave a 48 hour period for repairs and reassembly of the motor before hoisting was resumed on Monday morning. Repairs were completed in 30 hours. The two and a half hour delay caused a loss of product of 412 tons.

On December 12th there was a delay of 55 minutes and a loss of product of 110 tons due to the shunt coils opening on the skip hoist motor.

Total loss of product in 1940 due to delays was 1047 tons.

h. Delays from lack of current:

On June 5th there was a delay of one hour due to the main service line oil switch burning out. This switch is located at the Maas Mine. The loss of product was about 150 tons.

3. ANALYSIS:

a. Average Mine Analysis on Output:

	1940					1939			
	Tons	Iron	Phos.	Sil.	Sul	Tons	Iron.	Phos.	Silica
Negaunee Ore	854,581	60.38	.107	7.29	.013	551,362	60.54	.110	7.06
Negaunee Special	1,230	59.53	.110	4.91	1.058				

b. Average Mine Analysis on Straight Cargoes:

	Mine			Lake Erie	
	Iron	Phos	Silica	Iron	Moisture
Negaunee Ore	60.40	.112	7.33		
Negaunee Crushed Ore	61.68	.112	5.90	61.32	11.85

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4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:

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

Above 9th Level	803,812
Between 10th and 11th Levels	5,825
Between 11th and 12th Levels	367,015
Between 12th and 13th Levels	1,144,834
Between 13th and 14th Levels	427,620
Below 14th Level	7,802
Total	2,756,908
Less 10% for Loss in Mining	275,691
	2,481,217
Less 10% for Rock	248,122
	2,233,095
Less December 1940 Production	67,457
Total Developed Ore - 1940	2,165,638
Total Developed Ore - 1939	2,616,848
Decrease - 1940	451,210

The gross tons is shown for each level again this year and the 10% deduction for rock and 10% for loss in mining deducted from the total gross tonnage. The product from the Negaunee Mine lease in 1940 was 783,353 tons. Deducting the decrease in estimate of 451,210 tons shows that 332,143 tons were developed during the year on the Negaunee Mine lease. This is an unusually large tonnage to be developed as a result of mining operations during a period of one year. The increase occurred in the area between the 12th and 14th levels. In the area between the 12th and 13th levels the increase was due to flattening of the hanging and extension of the ore beneath the hanging beyond the limits heretofore used in estimating. This extension occurred in a large area adjacent to the Maas boundary. The balance of the increase occurred in the ore adjacent to the 13th level and below the 13th level, where development work in 1940 proved the ore to extend beyond previous assumed limits. The increase is very fortunate as it gives a longer life for the mine.

The ore in the American Mining Company lease, also called the "Adams Strip", is mined by The Negaunee Mine Company, hoisted and stocked with the Negaunee Lease ore. The net estimated tonnage on the American Mining Company at the end of 1940 was 276,497 tons. The lease to The Negaunee Mine Company of an ore area over the Maas boundary line, comprising the C.C.I. Co.'s 1/3 of Right of Way strip and the North 1/6 of Right of Way strip otherwise called the "Adams Strip", together with an area approximately 250' x 1250' in the Maas Lease increases the total ore to be mined by the Negaunee Mine Company 1,241,316 net tons. The total ore to be mined by The Negaunee Mine Company therefore comprises the Negaunee Lease ore 2,165,638 tons, the "Adams Strip" or South 1/2 of Right of Way 276,497 tons, and the 1,241,316 tons North of the Negaunee boundary referred to in the previous sentence, or a grand total of 3,683,451 tons at the end of 1940. Including probable ore (not in the above estimates) there is approximately 4,500,000 tons to be mined giving the Negaunee Mine a probable life of about six years based on normal yearly production.

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

c. Estimated Analysis:

	Ore Reserves: Tons	Approximate Expected Natural Analysis: Iron	Phos.	Sil.	Mang	Alum.	Lime	Mag.	Sul.	Loss	Moist.
Negaunee Ore	2,165,638	53.20	.101	6.40	.195	2.40	1.00	.280	.010	1.94	12.00
Ore in Stock		**Average Natural Analysis:**									
Negaunee Ore	86,784	52.25	.089	7.08	.190	2.46	.69	.26	.011	1.82	12.34
Negaunee Special	1,230	52.18	.096	4.30	.190	2.46	.69	.26	.927	1.82	12.34

5. Labor And Wages:

a. Comments:

There were 391 men on the payroll on January 1, 1940 and 428 on December 31, 1940. A few men were hired in the Spring when loading from stockpile was started but the main increase occurred in November and December when men were taken on to increase production to the capacity of the hoist on the five day three shift schedule. The supply of skilled miners available in Marquette County was exhausted in 1939 and new mining contracts organized since have been made up of one skilled miner and one untrained man. Good results necessarily are not possible for several months during the training periods. Some former miners from the Calumet & Hecla Mining Company were hired but due to difference in method of mining, some time is required for them to learn the method of timbering and mining in the soft ore mines. During 1940 a total of 108 men were hired, two employees died, nine were transferred to other mines, twelve left for various reasons, fourteen were discharged, and seven were retired on small monthly payments.

Average wages earned per month increased $28.68 due to the longer working schedule. The employees are satisfied with the present working schedule and the wages earned.

b. Comparative Statement of Wages and Product:

	1940	1939	Increase	Decrease
PRODUCT	865,689	551,362	314,327	
No. of Shifts & Hours	1-8, 6 2-8, 256	1-8, 41 2-8, 187	2-8, 69	1-8, 35
AVERAGE NO. MEN WORKING:				
Surface	68	67	1	
Underground	360	318	42	
Total	428	385	43	
AVERAGE WAGES PER DAY:				
Surface	5.65	5.55	.10	
Underground	6.56	6.52	.04	
Total	6.40	6.35	.05	

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5. LABOR AND WAGES: (Cont'd)

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

	1940	1939	Increase	Decrease
AVERAGE WAGES PER MONTH:				
Surface	121.88	92.05	29.83	
Underground	134.62	105.97	28.65	
Total	132.28	103.60	28.68	
PRODUCT PER MAN PER DAY:				
Surface	48.20	41.37	6.83	
Underground	10.21	8.90	1.31	
Total	8.43	7.32	1.11	
LABOR COST PER TON:				
Surface	.117	.134		.017
Underground	.642	.733		.091
Total	.759	.867		.108
AVERAGE PRODUCT MINING:				
Stoping	22.61	22.03	0.58	
Development in Ore	9.01	8.73	0.28	
Total	22.24	21.34	0.90	
AVERAGE WAGES CONTRACT LABOR	7.30	7.27	.03	
TOTAL NUMBER OF DAYS:				
Surface	17,958¾	13,329¾	4,629	
Underground	84,773½	61,993½	22,780½	
Total	102,732½	75,323	27,409½	
AMOUNT FOR LABOR:				
Sur face	101,432.86	74,002.64	27,430.22	
Underground	555,842.60	404,383.83	151,458.77	
Total	657,275.46	478,386.47	178,888.99	
AVERAGE WAGES PER MONTH AS PER LABOR STATEMENT:(Less Captain & Clerks)				
Surface	115.98	89.68	26.30	
Underground	133.27	105.29	27.98	
Total	130.10	102.50	27.60	

Proportion of Surface to Underground Men:

1940: - 1 to 5.29 2, 8 hr. shifts, 5 days & 5 nights per week 9/11/39 to 12/31/40

1939:- 1 to 4.74 2, 8 hr. shifts3 days and 3 nights per week 11/1/38/ to 1/9/39.
2, 8 hr shifts 4 days and 4 nights per week 1/9/39 to 6/12/39.
1 and 2, 8 hr shifts 5 days and 1 night per week 6/12/39 to 9/11/39 (*)
2, 8 hr shifts 5 days and 5 nights per week 9/11/39 to 12/31/39.

(*) To give each man three days per week.

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6. SURFACE:

a. Buildings, Repairs:

Two new caps, three new legs, twelve ties and one new sill were installed on the coal dock in compliance with the recommendations of the Bridge Engineer of the Lake Superior and Ishpeming Ry. Co.

In June the roofs of the engine house and the office were treated with primer and seal-cote, and in September they were given an application of asphalt.

The steel members of the shaft house, up to the landing, 42' above, were painted to prevent corrosion.

The coal car trestle to the boiler house, which was in service for about 25 years, was rotted to such an extent that the cost of repairs warranted construction of an entire new structure. This work was started in September and completed in October. Upon completion of this work a small frame building with sheet metal covering was built to house the air hoist and cover the dump into the coal bin.

A frame building, with a sheet metal covering, was constructed adjacent to the shop building on the blacksmith shop end for the storage of stoker coal for the shop heating plant. This building or coal bin has a capacity of approximately 40 to 50 tons, sufficient for the Winter season.

b. Stockpiles:

A tractor bulldozer was hired and was employed for about 10 days. Several days were spent scraping the ore from under the permanent steel trestle near the stocking grounds and along the outer edge of the West steel stocking grounds. The ore under the tracks leading to the stocking area was the accumulated spillage from the top tram cars over a period of years and was not within reach of the steam shovel. When the West steel trestle stocking grounds are filled to capacity the foot of the pile extends to the edge of the fill for the pocket tracks. When the first cut is taken along this side each year the shovel loading track is laid along the line where the pile and fill meet. Over a period of 25 years or more, ore had accumulated here to a depth of from 2 to 3 ft. and this was all pushed over underneath the steel trestle. Over 500 tons of ore were recovered here.

Upon completion of this work the bulldozer filled and graded a 15 ft. shoulder along the North side of the North wood trestle stocking grounds. When this trestle is filled to capacity the foot of the pile extends to the edge of the fill for this stocking grounds, making it impossible to lay the shovel loading track on this side of the pile. The wood trestle erected here parallels the East steel trestle and when filled to capacity, these two piles run together making it difficult to lay a loading track between the two stockpiles. A 15 ft. shoulder along the North side permits the wood trestle to be located further to the North thereby providing room for both loading tracks. The fill for the shoulder required several thousand yards of sand. The material for the fill was obtained from a hill to the North. A small amount of excavating was also done to widen this stocking ground near the West end where a sand cut had originally been made.

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6. SURFACE: (Cont'd)

b-1. Rock Trestles:

Five additional bents were added to the Northeast rock trestle assuring sufficient stocking room until the Summer of 1941. These bents averaged about 60 ft. in height due to the trestle approaching the caved area.

b-2. Ore Trestles - Steel:

Some treated ties were installed on the steel trestles replacing those that had become rotted. A small amount of painting was also done to the braces and piers during June.

b-3. Ore Trestles: Wood:

Four wood bents were erected as an extension to the East steel trestle to provide stocking facilities for the Negaunee Special Ore coming from the exploration of the small high Sulphur ore body encountered in No. 3 shaft above the 13th level.

Materials for 26 bents was assembled late in the year for the East wood trestle that is located North and parallel with the East steel trestle. This trestle will be erected in January and will be used for stocking Negaunee Ore as soon as the steel trestles are filled. A section will be reserved for stocking the ore coming from the Maas Strip.

c. Tracks, Roads:

The private road to the mine required some grading and surfacing during the Summer to keep it in condition. During the past several years traffic on this road has increased due to the large number of automobiles used by employees and particularily due to the large amount of timber that is trucked to the mine by local jobbers.

d. Water Supply:

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

	1940	1939	1938	1937	1936	1935	1934
1st. Quarter	125.41	113.48	80.08	55.86	67.61	44.31	47.39
2nd Quarter	170.24	116.83	75.04	61.20	59.77	62.98	76.80
3rd Quarter	261.10	136.78	115.15	56.70	83.64	61.51	75.75
4th Quarter	269.08	150.92	115.22	67.76	81.75	62.55	35.98
Total	825.83	518.01	385.49	241.52	292.77	231.35	235.02
Product - Tons	865,689	551362	412000	820915	512,712	291318	235664
Cost Per Ton	.0009539	.000939	.000935	.000294	.000571	.000794	.001001

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6. SURFACE: (Cont'd)

d. Water Supply: (Cont'd)

The cost per ton for water was slightly higher in 1940 due to more shifts worked and more water used in rock drifting.

e. Grounds:

The grounds around the mine buildings were kept in good condition during the year. The shrubbery plantation was pruned and cleaned of weeds and grass, and the lawns and shrubbery fertilized.

7. UNDERGROUND:

a. Shaft Sinking:

There was no shaft sinking in 1940. The work of sinking the shaft from the 13th to the 14th level was started in 1938 and completed in 1939.

b. Development:

The total amount of development work in ore and rock in 1940 was considerably more than in 1939. This increase is due to the development of the 14th level which is being rushed on a two shift schedule. The following table gives a comparison of the total footage during the past two years.

	Drifting		Raising		Grand Total
Year	Ore	Rock	Ore	Rock	
1940	471'	2268'	1189'	720'	4648'
1939	275'	1463'	1313'	827'	3878'
Increase	196'	805'			770'
Decrease			124'	107'	

The above table includes 1352 ft. of rock drifting on the 14th level in 1940 and 154 ft. of rock drifting in 1939 which is charged to E. & A. No. 795.

On the sub levels above the 9th level some development work was continued during the year in both No. 1 and No. 2 shaft pillar areas. This work consisted largely of drifting through caved jasper to determine the limits of the ore area and to enable recovery of the available ore. On the 9th level the development work was confined to putting up additional raises in the No. 1 shaft pillar area.

Development work on the 11th during the year consisted of new footwall ventilation drifts and raises. Due to mining progressing to elevations below the 11th level, former ventilation connections were abandoned and it became necessary to replace them with new ones in the footwall.

On the 12th level development consisted of two additional raises into the orebody between the dikes and two into the body South of the dikes, also a small amount of rock drifting from a mining sub level to provide a ventilation connection to the area adjacent to the Maas boundary near the North footwall.

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7. UNDERGROUND: (Cont'd)

b. Development: (Cont'd)

A new cross-cut was completed on the 13th level during the year to provide a means of mining the main ore body under the hanging adjacent to the Maas boundary. The narrow ore body between the dikes will also be mined from this crosscut. Three raises were put up in this cross-cut, two of which are in the ore body between the dikes. Transfer drifts on the 250' sub level elevation from both these raises were driven to the Northwest to enable mining to be started in the main ore body adjacent to the Maas boundary. Later in the year one of these transfer drifts was abandoned upon the completion of a third raise in this cross-cut North of the dikes and in 1941 the other transfer will be eliminated when this cross-cut on the 13th level is advanced further to the Northwest to provide for another raise North of the dikes. Drifts and raises in this area are subject to extremely heavy crushing and a considerable amount of repair work is required to maintain them. This cross-cut disclosed a considerable extension of the ore area South of the dikes although the height to which this ore extends above the 13th level has not as yet been determined definitely. An exploration raise from No. 1320 cross-cut was also put up into the area South of the dikes but failed to encounter the ore. During 1941 further exploration will be continued from this raise which will be cut out between the 12th and 13th levels to determine whether this ore body is continuous between the 12th and 13th levels. Two additional raises were also put up from the 13th main level footwall drift parallel to the Maas boundary, one of which replaced No. 1332 raise which had become so badly crushed that a new one was necessary. The second raise was put up to provide a means of mining the ore area directly under the hanging adjacent to the Maas boundary.

Some exploratory work was done in the ore body encountered in No. 3 shaft when sinking from the 12th to the 13th level. A detailed account of this work will be found under "Explorations and Future Explorations".

Development of the 14th level has been continued during the year by driving the main level drift Northwest towards the Maas boundary. Stripping of the shaft plat was completed early in the year and also the tail track drift was driven Southeast of the shaft. A small sump and pump house was also excavated. At the end of the year the main level drift to the Northwest had reached the junction between the two dikes and the footwall drift South of the dike was being advanced to the Southwest.

b-1. Rock Development:

On the 9th level and subs above, in both No. 1 and No. 2 shaft pillar areas, there was a total of 239 ft. of rock drifting and 266 ft. of rock raising, a grand total of 505 ft. of development in rock. In the No. 1 shaft pillar area the two additional raises that were put up from the footwall drift advanced 266 ft. in footwall slate and jasper before encountering the ore.

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7. UNDERGROUND: (Cont'd)

b-1. Rock Development: (Cont'd)

On the 10th level, 15' of rock drift was advanced to provide a new ventilation connection from a ventilation raise put up from the 11th level.

On the 11th level a total of 162 ft. of rock raising and 283 ft. of rock drifting was done to provide permanent new footwall connections.

On the 12th level and the 395' sub level, 36 ft. of rock drifting was advanced for ventilation connections and 103 ft. of rock raising was done to make a grand total of 139 ft. of rock development. Rock raising on the 12th level consisted of one raise into the ore body South of the dike which encountered only a small amount of ore near the 11th level elevation.

On the 13th level and four sub levels above this elevation a total of 187 ft. of rock drift was advanced and 179 ft. of rock raising to make a grand total of 366 ft. of rock development. On the sub levels the rock drifting was confined to footwall ventilation connections to provide adequate ventilation for the mining areas but on the 250' sub level some rock drifting was required when advancing a transfer drift through the main dike. Three of the six raises put up on the 13th level advanced through footwall slate and jasper before encountering the ore.

On the 14th level there was a total of 1352 ft. of rock drifting which was charged to E. & A. No. 795. The following table gives a summary of the rock development:

	Drifting In Rock	Raising In Rock	Total 1940	Total 1939
9th Level	239'	266'	505'	481'
10th Level	15'		15'	
11th Level	283'	162'	445'	
12th Level	36'	103'	139'	771'
13th Level	343'	189'	532'	984'
14th Level	1352'		1352'	154'
Total	2268'	720'	2988'	2390'
Increase			598'	

b-2. Ore Development:

On the 9th level in No. 1 shaft pillar area and three sub levels above there was a total of 397 ft. of ore raising and 20 ft. of ore drifting to make a grand total of 417 ft. of ore development. On the 810' sub level and also on the 720' sub level the raising in ore consisted of test raises put up to determine the upward extension of the ore. On the 4th level elevation 20 ft. of ore drift completed a short transfer drift that was used for mining during the year. The 9th main level ore development was all confined to raising. One raise was in ore for its entire length and was put up from the main level ore drift South of the dike. Two additional raises from the footwall drift advanced in slate and jasper above the level before encountering the ore and then advanced in ore to the hanging.

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7. UNDERGROUND: (Cont'd)

b-2. Ore Development: Cont'd)

On the 11th level there was 45 ft. of drift in ore in the ventilation and traveling connection South of the dike.

On the 12th level and also the 370' sub above this elevation there was a total of 211 ft. of ore raising. On the 370' sub there was 25 ft. of ore raising to provide a traveling connection to the 11th level and 186 ft. of raising in the two additional raises put up from the 12th level into the ore body between the dikes, one of which was started late in 1939. A third raise into the ore body South of the dikes constituted the balance of the ore raises.

On the 13th level and on three sub levels above this elevation there was a total of 406' of drifting in ore and 581' of raising in ore, to make a grand total of 987' of ore development. On the 285' sub level 20' of ore drift and 42' of ore raise was driven to provide a ventilation connection to the 12th level. On the 260' sub level 30' of ore drifting was done when developing the small ore body between the dikes, and on the 250' sub, 218' of ore drift and 103' of ore raising was done when driving two transfer drifts and putting up two raises above this elevation into the ore body North of the main dike adjacent to the Maas boundary. The balance of the development work was confined to the 13th level and raises above this elevation. There was 138' of ore drifting done to complete the new cross-cut and 436' of ore raising which consisted of 3 new raises from this cross-cut and two additional raises from the footwall drift parallel to the Maas boundary. The latter two raises were started in the footwall slate and jasper and advanced in this material before encountering the ore above the level. The following is a summary of the ore development in 1940:

	Drifting	Raising	Total 1940	Total 1939
9th Level	20'	397'	417'	642'
11th Level	45'		45'	60'
12th Level		211'	211'	236'
13th Level	406'	581'	987'	650'
Total	471'	1189'	1660'	1588'
Increase			72'	

c. Stoping:

(1) General:

The product in 1940 was obtained from the same mining areas as in the previous year but the proportion of the product from the various areas was materially changed. A small increase occurred in the product from the 9th level and a very large increase in the percentage of the total product from the 13th level. A decrease occurred in the percentage of the product from both the 11th and 12th levels due to the mining areas becoming smaller and also to the sub levels approaching the main level elevation. During the year it became necessary to transfer several mining contracts from the latter areas to sub levels above the 13th level.

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7. UNDERGROUND: (Cont'd)

c. Stoping:(Cont'd)

(1) General: (Cont'd)

A relatively small proportion of the product was obtained from the small ore body between the dike and the South footwall below the 11th level where one mining contract had been carrying on operations during the year. As mining of this small orebody continues to lower elevations it is quite possible that it will increase in size due to extension under the hanging.

The increased product from areas above the 9th level is due largely to more favorable mining conditions. In the two areas where mining is underway in the No. 2 shaft pillar a timber mat has been formed above the sub levels due to mining having been completed on several subs. On the first sub levels that were developed under the hanging, progress was extremely slow. This area has been cut up by old drifts also by mining which was carried on here years ago and the jasper hanging adjacent to these old areas had broken up and when advancing slices under this loose material it was necessary to fore-pole on the first sub levels. Rock runs occur frequently and hinder progress considerably. Upon completion of mining on the first sub level a complete covering of poles and wire was laid consequently progress on the next lower sub levels was materially improved. Similar conditions were also encountered in the No. 1 shaft pillar area where hanging jasper above the old square set stopes and pillars has caved and is badly broken up. Progress here was also extremely slow on the first sub levels opened under the hanging. The product from several of the mining contracts has improved considerably during the year due to the fact that caved ore is encountered when advancing the slices through the old square set stopes as mining progresses to lower elevations. In each new area that is opened directly under the hanging the only recoverable ore is that which remains in the pillars, the stopes being filled with a mixture of caved jasper and ore.

During 1940 ore was mined in both No. 1 shaft pillar on the 810, 795, 4th level, 773, 747, 733, 720, 6½, 653, 640, and 630' sub levels and in No. 2 shaft pillar on the 810, 795, 4th level, 773, and 764' sub levels.

On the 11th level and subs above ore was mined on the 425, 415, and 11th level elevations in the ore body between the dikes.

On the 12th level and subs above mining was continued in the main ore body and the north footwall pillar and also in the orebody South of the dikes on the 395, 385, 370, 325 and 12th levels.

Above the 13th level mining operations were underway in the main ore body on the 295, 285, 270, 260, 250, and 235' sub levels. A small amount of ore was also mined in the ore body on the 250' sub level between the dikes.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

(1) General: (Cont'd)

In 1940 ore was mined on a total of 29 sub levels as compared with 36 sub levels in the previous year. In spite of the larger product in 1940 mining was underway on less sub levels. This is due to the concentration of more contracts in the larger areas in the main ore body above the 13th level and also the fact that some of the ore areas principly above the 9th level have increased in size. The addition of a third shift increased production without the development of new mining areas.

(2) Detail of Stoping:

Subs Above the 9th Level

No. 2 Shaft Pillar:

Mining operations were continued in this area by two contracts on five sub level elevations during the year. One contract is mining the South half of this area adjacent to the footwall which was first developed in 1939 on the 825' sub level elevation. Mining was completed at this latter elevation late in 1939 and opening of the 810' sub level was underway early in 1940. On this elevation a large extension of the ore area occurred Southwest under the hanging and extended to an old open stope between the 4th and 3rd levels. Mining on the 795' sub and also the 4th level elevation was completed late in 1940 and development of the 773' sub level was begun. This South footwall area is very irregular in shape and due to the very flat pitch of the ore body to the West a large portion of the mining on each sub level is carried on under new hanging. Extension of this ore body below the 4th level elevation has not been accurately determined except at the point where it has been cut by one raise. Two dikes, one along the South side of this ore body and one along the North side meet at a point further to the West and limit any possible large extension. No. 915 raise which was put up to develop and mine this area encountered only a small amount of ore below the 4th level elevation. The ore body in the area mined thus far has averaged about 30' in thickness from foot to hanging wall.

In the North half of No. 2 shaft pillar one contract continued operations which started in 1939 at the 4th level elevation and late in that year about 50% of the mining on the 773' or 1st sub below the 4th level was completed. During 1940 the remainder of the ore on this sub level was recovered and also mining on the 764' sub level was completed. The major portion of the mining by this contract has consisted of recovering a small footwall pillar North of the dike which extends to the old mined area. This pillar was left when mining was abandoned here about 20 years ago. The pillar has been growing smaller in size on each sub level due to the footwall jasper pitching to the West.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

(2) Detail of Stoping: (Cont'd)

No. 1 Shaft Pillar and Adjacent Pillars: (Cont'd)

In the area North of the dike near the North footwall mining was completed at the 4th level elevation from both No. 903 and No. 918 raises. As mentioned previously, mining has been carried on here in a floor pillar that was left between the stopes when work was abandoned here by former operators. Normal progress was made when mining at this sub level elevation and also on the sub level above because a good mat has been formed above the slices. The ore area is limited along the Southwest side by an old stope that is filled with caved jasper but as mining progresses to lower elevations it is anticipated that ore will be encountered in the stopes and a larger area made available for mining.

In the South footwall area Southwest of the shaft pillar a small amount of mining was done on the 773' sub level under the hanging Northeast of No. 908 raise. This work was exploratory in nature to determine whether any extension of the ore occurred under the hanging and work was abandoned here upon its completion.

Late in the year mining was completed in the area North of the dike near the North footwall on the 773' sub level and the contract moved down to start the next lower sub level. Two contracts had previously worked at this elevation but one has now been transferred to another area to provide a more efficient operation for the remaining contract. The ore area here is still limited along the Southwest side by caved jasper. A mining limit has been established to the South and the ore beyond this limit which extends to the dike will be mined from No. 903-A raise when mining reaches this elevation. Late in the year the contract was cutting out the raise on the next lower sub level, the 764', and upon completion of this work they will resume mining this North footwall area.

During the year mining was resumed in the shaft pillar area directly North of the dike by one contract on the 747' sub level. This was the first area that was developed for mining above the 9th level when recovery of the pillars was begun in 1937 and mining was temporarily abandoned when areas at higher elevations were developed. The work at this elevation consisted of mining a small triangular pillar adjacent to the dike which did not extend beyond the limits of the shaft pillar to the Northeast. Mining of this pillar was also completed on the 733' sub level and late in the year was nearly finished on the 720' sub level. A small amount of mining was also carried on in this pillar further Northwest from No. 918 raise on the 733' sub level and work from this raise was also completed on the 720' sub level. Further mining from this raise was then temporarily abandoned until mining in the pillar adjacent to the dike reached a corresponding elevation. Late in the year this had been accomplished and more efficient operations provided for the one contract in the shaft pillar area North of the dike because slices of longer length are now provided. It is anticipated that the ore area will extend further Northwest under the hanging on lower sub levels and also further Southwest through the old square-set stopes and pillars to join the area that has been mined from No. 922 raise.

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7. UNDERGROUND: (Cont'd)

(2) Detail of Stoping: (Cont'd)

No. 1 Shaft Pillar and Adjacent pillars:

Mining has been continued in the No. 1 shaft pillar and adjacent areas in six separate mining areas. At the highest elevations in the No. 1 shaft pillar proper and also near the South footwall, three contracts have continued operations throughout the year. Near the South footwall a small area was mined on the 810' sub level from a raise put up from a transfer drift Southeast of No. 908 raise. Old open stopes that are filled with caved jasper limited the area mined on the South side and a mixture of sand and jasper in the old square set stopes limited the ore in other directions. Mining in the shaft pillar on the 810' sub level was carried on by one contract from the inclined transfer drift Southeast of No. 901 raise. A portion of this sub level in the shaft pillar was mined in 1939 and the remainder of the ore recovered in 1940. Mining did not extend far beyond the limits of the pillar on the Northeast side but on the Southeast side a small extension occurred through the old square-set stopes near the footwall. A mixture of caved jasper and sand in the old stopes on each side limited the ore area at this elevation.

Mining was completed on the 795' sub level near the South footwall and the ore area increased slightly in size as compared with the sub level above. The major portion of the available ore was found in the pillars, the stopes being filled with a mixture of jasper, sand, and ore. Normal production could not be obtained due to this condition.

Mining in the shaft pillar was still underway at this elevation late in the year but no extension of the ore area to the Northeast beyond the limits of the shaft pillar was disclosed. Caved jasper was encountered which fills the top portion of the square set stopes on this side. Better results are being obtained by this mining contract however as several sub levels have been completed above this elevation and a floor covering of poles and wire laid on each sub level. The shaft pillar ore area does not as yet extend South to join the South footwall area at this elevation but it is anticipated that on lower elevations the stopes will be found filled with ore and these will join. One contract completed mining a small area North of the dike from No. 903 raise adjacent to the North footwall and a small amount of mining was also completed from No. 903"A" raise which was put up in 1940. Late in the year this contract was mining in the area South of the dike directly Northeast of the shaft pillar, where a small amount of ore is being recovered from pillars near the footwall.

In the South footwall area Southwest of the shaft pillar two contracts were mining on the 4th level elevation late in the year. A portion of this sub level near the South footwall was mined from the raise above the transfer drift Southeast of No. 908 raise. Upon completion of a new raise from the 9th level in one of the narrow pillars directly Southwest of the shaft pillar, mining from the transfer raise was abandoned and the contract transferred to this latter raise. A considerable extension of the ore towards the foot-wall and also the hanging is indicated by the mining in this area. It is also apparent that this area will join the shaft pillar area which will make a large increase in the available tonnage at this elevation. Evidently this sub level is below the horizon to which the caved jasper extended in the stopes.

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7. UNDERGROUND: (Cont'd)

(2) Detail of Stoping: (Cont'd)

No. 1 Shaft Pillar and Adjacent Pillars: (Cont'd)

A mining limit has been established along the Northeast side of this pillar which extends into the area of old square-set stopes for a short distance and the ore beyond this limit to the Northeast which extends to the footwall is being mined from No. 903 and 903-A raises at higher elevations by two contracts.

A small amount of mining was done from 924-A transfer raise in the ore area South of the dike Southwest of No. 1 shaft pillar on the 720' sub level. This work consisted of developing another mining area which will be mined from raises in the ore drift on the 9th level. The work on this sub level was carried on directly under the caved jasper hanging and only a small amount of ore was recovered in the pillars. A mining limit has been established along the Southeast side and the ore beyond this limit which extends to the footwall will mined from raises from the 9th level footwall drifts. A sub level on the old 6-1/2 level elevation was also mined from the transfer raise and upon completion of work at this latter elevation mining was temporarily abandoned here and late in the year another 9th level raise from the ore drift was put up to eliminate the transfer. Early in 1941 a contract will be transferred to this new raise and will continue mining operations in this area.

In the ore area North of the dike and Southwest of the Shaft pillar two contracts carried on mining operations during the early part of the year. One of the contracts was removed in the Summer because the area they were mining was approaching the 9th level elevation from No. 923 raise. Mining from No. 922 raise was completed on the 653' sub and also the 640' sub level and late in the year work on the 630' sub level was nearing completion. Mining on this last sub level extended Northwest to the area mined thirty years ago. This is the last sub level that can be mined from these 9th level raises No. 922 and 923 and upon completion of work the contract will be transferred to the new raise that was put up to mine the area directly South of the dikes as described in the preceding paragraph.

9th Level

There was no drifting on the 9th level in 1940 but three additional raises were put up into the narrow pillars adjacent to No. 1 shaft pillar.

No. 903-A raise in the footwall drift Northeast of No. 1 shaft pillar was put up in one of the narrow ore pillars. This raise was started in February and was advanced for a distance of 85 ft. in footwall slate and jasper before encountering the ore and then advanced in ore to a total height of 156 ft. above the level to hole to a transfer drift on the 756' sub level. No. 903-A was connected to a short raise above this transfer drift which extended to the 810' sub level and this eliminated the transfer and provided another raise for mining the footwall area Northeast of the shaft pillar. The log of the raise is as follows: 0' - 85' jasper and slate; 85' - 156' ore.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

9th Level: (Cont'd)

No. 901-A raise in footwall drift Southwest of No. 1 shaft pillar was also put up into one of the narrow pillars. This raise was started in July and was advanced 132 ft. in slate and jasper and lean ore before encountering the ore body and then advanced to a total height of 214 ft. in ore to complete it at the elevation of the old 4th level. This provided a second raise for mining the South footwall area Southwest of No. 1 shaft pillar. The log of the raise is as follows: 0' - 132' slate; 132' - 214' ore.

No. 925 raise in the main level ore drift South of the dike was started late in November and completed late in December. This raise was started in ore and advanced 84 ft. in ore to hole to an old transfer drift on the 673' sub level. It was then continued one sub level interval above the transfer and cut out. In a short time a mining contract will be transferred here to mine the area South of the dike Southwest of No. 1 shaft pillar where mining was temporarily abandoned under the hanging early in the year.

10th Level

Upon completion of a footwall ventilation raise from the 11th level which holed near the switch to the first cross-cut, about 15 ft. of rock drift was advanced to provide a connection to the 10th level. This provided a third ventilation connection between the 11th and 10th levels, and is one of the several ventilation raises that was completed during the year under a program to improve the ventilation in the Negaunee and Maas Mines.

Subs Above the 11th Level

425' Sub - Ore Body Between No. 1 and No. 2 Dikes

This sub level was first developed in 1938 at the East end near the footwall by one contract. Mining was continued in 1939 and early in 1940 recovery of the remaining pillars was completed. This sub level is only about 20 ft. above the 11th level elevation and the major portion of the mining was carried on from 11th level raises. Raises from the 12th level into this area were completed early in 1940 and the remaining pillars recovered from these raises. This is the last sub level in the ore body between the dikes that was mined from 11th level raises.

415' Sub - Ore Body Between No. 1 and No. 2 Dikes

Same area as described in preceding paragraph.

Four contracts completed mining on this sub level early in the year from four 12th level raises that extended into this ore body. At this elevation a mining limit was established which divided the mining in this area into two separate units. At the West end of the area under the hanging two contracts were mining at a lower elevation. The East area is rapidly being reduced in size due to the encroachment of the jasper and lean ore footwall whereas the West mining area under the hanging where mining is underway at a lower elevation is increasing in size due to the ore extending further to the West under the hanging on each lower sub level.

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7. UNDERGROUND; (Cont'd)

c. Stoping: (Cont'd)

11th Level - Ore Body Between No. 1 and No. 2 Dikes

Same area as described in preceding paragraphs.

Late in the year one contract was completing the recovery of the last remaining pillar South of No. 1218 raise in the East area. The ore body on this sub level is smaller as compared with the sub level above. The reduction in size occurred in the East end adjacent to the footwall. The old 11th level cross-cuts and drifts were encountered in mining but no appreciable trouble was experienced due to the fact that they were completely crushed and filled with ore and timber.

11th Level - North Footwall Pillar Near Maas Boundary

Two contracts have continued operations in this area throughout the year. This sub level was partially developed late in 1939 by connecting drifts between Nos. 1291 and 1290 raises and a small amount of mining was done to the North of these raises toward the footwall. During 1940 mining was completed on the remainder of this sub level which extended to the Maas boundary and to the old workings to the Southeast and Southwest. A dropper of jasper along the South side was encountered adjacent to the old mined area although this is gradually becoming smaller and on the next lower sub level has completely disappeared. About 30% of the mining on this sub level was confined to the railroad pillar and the remainder in the Negaunee lease.

11th Level - Ore Body South of No. 1 Dike

Upon completion of No. 1212 raise from the 12th level late in February to this elevation a small area was mined to the East along the dike and near the footwall. One short drift and two short slices encountered lean ore averaging about 53% in iron content. This ore body, at higher elevations, was fairly large in size but was gradually reduced until the 11th level elevation was reached where a roll in the footwall and also the hanging pinched it out. The ore body continues along the dike to the West beyond the area eliminated by the roll in the foot and hanging wall. In the past it was also assumed that an extension of this area occurred to the Southwest where the 11th level drifts had intersected some lean ore but development work in 1939 proved that there was no extension of merchantable ore at the elevation of the 11th level.

When the small body of ore was mined to the East of this raise a traveling connection was driven to the West which holed to the 11th level drift directly South of No. 1 dike. This drift provided a means of draining a large amount of water that originates on the 415' sub level directly above the drift where some mining was done in 1939. A traveling and ventilation connection from this raise was also completed to the Southeast in jasper and slate to the 11th level footwall drift.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

Footwall Ventilation Raise From the 11th to 10th Level

In connection with the program to improve ventilation in both the Negaunee and Maas Mines it was decided to put up one more permanent air way raise from the 11th level to 10th level in the footwall. This raise was started in May and a small pilot raise put up for a distance of 107 ft. and 36 ft. of small incline drift to hole to the 10th level footwall drift. This raise and drift was later stripped to about 8 ft. in diameter for its entire length and completed in August. By increasing the main airways and enlarging the old ones the back pressure on the fan at No. 2 shaft has been reduced and a larger volume of air delivered into the mine.

The old winze between the 11th and 12th levels had served as a ventilation connection in the past but due to mining near this area South of the dike the old drifts leading to the winze became crushed and this connection was lost in 1937. To provide a connection to the winze in rock which would be permanent and require very little maintenance work, an incline drift from the 11th level footwall drift was driven to hole the winze below the 11th level elevation in the footwall jasper and slate. About 55' of incline rock drift was required to make this connection.

Subs Above the 12th Level

395' Sub - North Footwall Pillar

Two contracts were mining in this area at the end of the year completing recovery of the remaining pillars. This area is gradually becoming smaller in size due to the jasper footwall which is advancing to the Southwest. The dropper of jasper hanging which was encountered adjacent to the old mined area to the Southwest on sub levels above has completely disappeared at this elevation and the slices in this direction now extend to the old mined area. This ore body will completely pinch out adjacent to the old workings to the Southwest about 55 ft. below this elevation.

395' Sub - Ore Body between No. 1 and No. 2 Dikes

Late in the year one contract was mining in the East half of this area. The number of contracts here was reduced to two several months ago to provide more efficient operation because this area is becoming smaller on each sub level. Three 12th level raises provide a means of mining this area but the one furthest to the East will be cut out by the footwall on the next lower sub level and will then be abandoned for mining. Normal production from the contract mining the East end is impossible because the ore body has become very narrow. This has shortened the slices to such an extent that a large amount of time is lost in starting new slices. Mining in the West half of this area near the hanging was completed early in December by the two contracts that had carried on operations in this area throughout the year. This area has been extending on each sub level further to the Southwest towards the junction of No. 1 and No. 2 dikes. Another 12th level raise was put up during the year from which mining of the ore under the hanging extension will be carried on a lower elevations.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

395' Sub - Ore Body South of No. 1 Dike

In May one contract cut out No. 1210 raise in the ore body South of the dike and started mining. A very small ore area was mined adjacent to the dike under the jasper hanging and upon completion of this work development of the sub level below was started. This raise was in jasper hanging at the 11th level elevation and it was necessary to move down to the 395' sub level elevation to begin mining under the hanging.

385' Sub - Ore Body South of No. 1 Dike

Same area as described in preceding paragraph.

One contract carried on mining operations at this elevation and completed recovery of the available ore under the hanging late in the year. A mining limit has been established as the East boundary of this area leaving a small ore pillar as a means of preventing the water which was encountered on sub levels above in this ore body from entering the area being mined. Early in 1941 it is hoped to divert this water on the 11th level elevation away from the ore area and if this can be successfully done the small amount of ore that is left as a pillar East of the mining limit will be recovered. Upon completion of mining from No. 1210 raise on the 385' sub level the contract was transferred to the 11th level to blast filling above the slices. Mining here is being carried on under new hanging and is similiar to developing a new ore body. The old 11th level drifts provided an entry South of the dike to blast jasper hanging so that a cushion of broken jasper was formed above the slices. Late in the year this work was temporarily completed and mining resumed in this area on the 370' sub level. As mining progresses to lower elevations it will be necessary to return to the 11th level elevation and blast additional filling until a large enough area is mined so that the hanging will begin to cave of its own accord.

385' Sub - Ore Area Between No. 1 and No. 2 Dikes

During December the two contracts in the West half of this area were engaged in driving the connecting drift between the raises and also a traveling connection and short raise to the 11th level. If the slices Southwest under the hanging extend beyond an economical scraping limit, one of the contracts will be transferred to the new raise into this area that is located further Southwest.

370' Sub - Ore Body South of No. 1 Dike

Late in the year this sub level had been partially developed upon the completion of the first drift and slice Southwest to the jasper footwall. This ore area is very irregular in shape and is relatively small in extent. As mentioned in previous paragraphs, if the water that is encountered on the 11th level elevation a short distance East of this area can be diverted, this contract will be transferred to the 11th level elevation and will start mining the pillar that was left to prevent the water from entering this area.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

325' Sub - Main Ore Body

This sub level was partially mined and developed late in 1939. At that time three contracts were carrying on operations here until about the middle of the year when this number was reduced to two because the encroachment of the footwall jasper to the West had reduced the ore area. Mining was completed early in the year on this sub level and then resumed on the next lower sub level. At this elevation due to lack of concentration this area is completely separated from the main ore area further to the South. Some exploration from a 13th level raise was done in the lean ore area that divides the main ore body at this point. This work was done in 1938 and no merchantable ore was encountered. However, mining at lower elevations indicates that these areas will again join and consequently the reduction in tonnage of the ore reserve is not as large as anticipated several years ago. About 40% of the mining during the year on this sub level was confined to the railroad pillar and the remainder to the Negaunee Lease.

12th Level - Main Ore Body

Mining in the area adjacent to the Maas boundary is described in the preceding paragraphs and was underway late in the year by three contracts. During 1940 a new mining area was started under the hanging from No. 1359 raise which was put up during the year. This raise was cut out in jasper hanging at the 12th level elevation and some drifting in the jasper was necessary before the ore was encountered to the Northeast. The ore area at this elevation is comparatively small but at lower elevations due to the pitch of the hanging to the Southwest a larger area will be made available for mining from this raise. In the remainder of this area to the Northeast two contracts were mining late in December adjacent to the Maas boundary and the footwall. The footwall has advanced a considerable distance to the West as compared with the sub level above and consequently there has been a reduction in this ore area. A lean ore area still separates this portion of the ore body from the main portion further to the South but on the next lower sub level these two areas are again joined. About 45% of the mining on this sub level during the year has been in the railroad pillar.

In the portion of the main ore body that extends from the East footwall West to the Maas boundary and the mined area under the hanging adjacent to the main dike, the mining during the year consisted of recovering pillars. This sub level was about 70% mined late in 1939 and the remaining ore was mined early in 1940. The irregularity of the footwall side of this area is due to the mass of lean ore which overlies the jasper footwall and the amount of this lean ore that can be mined is determined by the iron content. The rapid advance of this lean footwall material to the West on each sub level and the fact that extensions of the ore under the hanging has not offset the advance of the footwall, accounts for the gradual decrease in the size of the main ore body.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

12th Level

No. 1240 raise in No. 4 cross-cut on the 12th level was started in December 1939 and completed in January 1940. This raise was up 67' in ore on the first of the year and advanced 47' in ore to a total height of 114' above the level to complete it at the 11th level elevation. A mining contract has carried on operations in the ore body between the dikes from this raise during the entire year.

No. 1241 raise in the ore drift between the dikes was put up in September and advanced 74' in ore to a total height of 84' above the level to complete it to the 385' sub level elevation. This raise was put up into the ore body between the dikes to provide a means of mining the extension of the ore under the hanging to the Southwest. Early in the year a connecting drift from No. 1240 raise on the 385' sub level was completed to this raise and mining started.

No. 1216 raise in the main level ore drift South of No. 1 dike was started in February and completed the same month. This raise advanced 53' in ore to a total height of 63' above the level where the jasper hanging was encountered. This raise will become available for mining when operations in this small ore body South of the dike reached the 360' sub level elevation. At present mining is underway in this area on the 370' sub level by one contract.

No. 1212 raise, which is located in the drift that connects to the winze from the 11th level, was started in December 1939 and on the first of the year was up 38' in jasper and slate. This raise was completed in February at a height of 120' above the 12th level at the 11th level elevation. Jasper and lean ore were encountered in the top portion of this raise and no ore disclosed. The raise was used in mining the small ore body South of the dikes on the 11th level elevation and also two ventilation and traveling connections were driven to connect to the 11th level footwall drifts. The raise now serves as an additional ventilation connection between these levels and is also used to drain a large amount of water away from the mining area South of the dikes.

Subs Above the 13th Level

295' Sub - Main Ore Body

In the central portion of the main ore body four mining contracts were carrying on operations late in December recovering the several small remaining pillars. Extensions of the ore area occurred at this elevation under the hanging adjacent to the Maas boundary although a fairly large horse of jasper remained within the ore area West of No. 1355 raise. Late in the year it became necessary to put up a new raise from the 13th level cross-cut a short distance Northwest of No. 1331 raise. This latter raise has served as a means of mining an area in the main ore body on four sub levels but it became crushed so badly late in the year that it was decided to put up a new one nearby to replace it. To provide a traveling and ventilation connection between this sub and the 12th level about 60' of small drift was advanced through footwall jasper Southeast from No. 1330 raise and a short raise put up from the end of this drift to hole to No. 4 cross-cut on the 12th level.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

295' Sub - Main Ore Body (Cont'd)

Upon the completion of a new cross-cut on the 13th level early in the year two raises were put up and transfer drifts on the 250' sub were driven into the main level ore body adjacent to the Maas boundary. A raise from each of the transfer drifts was put up to provide means of mining the narrow ore area between the main dike and the Maas boundary. Mining was started on the 295' sub level elevation under the jasper hanging where a comparatively small ore area was disclosed. Apparently a roll in the hanging adjacent to the dike accounted for the extension of the main ore body to this elevation. Mining on this sub level was completed late in the year and operations resumed on the next lower elevation. A very small amount of ore was mined in the railroad pillar although the ore area did not extend to the Maas-Negaunee boundary.

285' Sub - Main Ore Body

This sub level was partially developed in three separate areas under the hanging in 1938. Late in 1939 a portion of the main ore body that is being mined from raises in No. 1320 cross-cut was also being developed. This latter area which extends Southwest from a mining limit to the jasper hanging and South to the jasper footwall was completely mined by three contracts which have carried on operations here for the past several years. Late in 1940 two contracts were mining in the main ore body near the Maas boundary and two additional contracts were mining at the extreme Southwest end of the main ore body between the dike and the Maas boundary. In this latter area one of the contracts was mining from the raise put up from the transfer drift Northwest of No. 1381 raise. At the end of the year 60% of the mining from this raise had been completed. The ore area here does not extend to the Maas boundary because a dropper of jasper hanging is encountered in the railroad pillar adjacent to the boundary. The other contract in this small area is mining a very narrow ore area that lies directly North of the dike and is limited along the North side by the jasper hanging. The transfer drift below this area Northwest from No. 1380 raise was eliminated upon the completion of another 13th level raise North of the dike. The raises and drifts in this portion of the ore body are subject to extremely heavy crushing and a large amount of repairing is required to keep them open. During 1941 the 13th level cross-cut below this area will be extended further to the Northwest to provide room for another raise North of the dike which will eliminate the transfer on the 250' sub Northwest of No. 1381 raise.

In the main ore body adjacent to the East footwall two contracts completed mining an area that extended West from the footwall to an established mining limit. In mining this area lean ore was encountered near the footwall when driving the connecting drift from No. 1374 to No. 1370 raise and also for a short distance in the slices West of the raise. The two contracts that completed mining in this area started developing the next lower sub level in December.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

285' Sub - Main Ore Body (Cont'd)

When putting up No. 1359 raise into the ore area near the North footwall adjacent to the Maas boundary the jasper hanging was encountered at this elevation and the raise was cut out and a connecting drift driven Northwest to No. 1360 raise. A test drift Northwest to the Maas boundary encountered ore and a small test raise was extended up 39' before the jasper was encountered. When the height of the ore above this level was determined, No. 1359 raise was extended to the 12th level elevation in jasper and mining under the hanging was then started as described in the work on the 12th level. From the mining carried on at this elevation it has become evident that no lean ore area divides the main ore body near the North footwall as has occurred on several sub levels above. The encroachment of the lean ore and jasper footwall to the West however has reduced the size of the main ore body but there has been a slight offset in this reduction by new extensions under the hanging.

270' Sub - Main Ore Body

Late in the year two contracts were developing a mining area adjacent to the East footwall from No. 1372 and 1374 raises. As mentioned in the previous paragraphs lean ore was encountered when mining this area on the sub level above but on this sub level it has become evident that only a small amount of merchantable ore can be mined from these two footwall raises. It has been possible to mine some of the footwall ore with an iron content of less than 60% due to the fact that it can be mixed with a much higher iron content ore and a desirable product obtained. However, the number of contracts working in these lean ore areas must be carefully governed to prevent too large amount of this lean ore from being produced which will lower the iron content of the total product. Mining from these two raises will be completed early in the year upon the recovery of the small remaining portion of the merchantable ore.

In the area being mined adjacent to the dike further to the West, one mining contract was completing recovery of a footwall pillar late in December South of No. 1324-A raise. A horse of jasper was encountered lying along the dike in this area on the sub level above, and the pillar now being mined at this elevation is directly below this jasper horse. The jasper footwall is very irregular adjacent to the dike and it has been rapidly reducing the size of the ore area. Three contracts have continued mining here, two of which completed their operations in their portion of this area and moved down to the next lower sub level late in the year.

260' Sub - Main Ore Body

Mining in the main ore body was carried on in three separate areas at this elevation during 1940. Work was completed in the small area developed under the hanging from No. 1352 raise and also in the small area that extends from the South footwall Northwest to the Jasper hanging which has been mined from No. 1308 raise. Adjacent to these two areas and to the East two contracts were mining at this elevation at the end of the year. This latter area is gradually becoming smaller in size due to the encroachment of the jasper footwall and on the increased working schedule mining is approaching the 13th level quite rapidly. Development work on the 14th level is being rushed and upon the completion of a cross-cut and raises into the several small ore bodies at the extreme Southwest end of the 13th level new areas will be provided for these contracts.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

260' Sub - Ore Body Between the Dikes

Upon the completion of the new cross-cut on the 13th level and No. 1380 raise into the ore body between the dikes a small amount of development was done under the jasper hanging. The ore area at this elevation was extremely small and irregular in shape and further development was temporarily abandoned and the contract transferred to the main ore body North of the dike at a higher elevation.

250' Sub - Main Ore Body

Mining the small ore area under the hanging from No. 1352 raise was completed late in the year. This contract then spent some time repairing the raise before they resumed mining on the sub level below. Late in December two contracts were carrying on mining operations in another mining area North of Nos. 1307 and 1308 raises. The ore remaining to be mined here consists of several small pillars. These two mining areas are approaching the 13th level elevation although it is possible that two more sub levels can be mined here from the 13th level raises. In the mean time 14th level raises will be put up to enable mining in these ore areas to be continued at lower elevations. Extensions of the ore area under the jasper hanging to the Northwest has not kept pace with the advance of the footwall jasper and consequently there has been a reduction in the size of the ore area on the last two sub levels.

Some development work in ore was done at this elevation from No. 1380 and 1381 raises where transfer drifts from each raise were driven through the dike Northwest into the main ore body. One raise from each of these transfer drifts was put up to the 295' sub level elevation where mining was started. The development work here proved up the width of the ore between the dikes at this elevation that heretofore had not been definitely known. Mining of the ore body between the dikes will however not be started until the transfer drifts have been abandoned.

235' Sub - Main Ore Body

No mining was carried on at this elevation during the year but preparations were underway late in December to start developing two areas, one from No. 1307 raise and the other from No. 1352 raise, both of which were being cut out preliminary to mining.

13th Level

The main work on the 13th level in 1940 consisted of completing the new cross-cut to the Northwest to replace that portion of the main level ore drift parallel to the Maas boundary which had crushed. In driving this cross-cut, additional information was disclosed of the geology of this area. Another dike branching off from the main dike and striking to the Southwest was encountered to verify the information obtained from a drill hole above this area. A small amount of ore was also encountered South of the dikes and also between the dikes. Two raises were put up from the cross-cut into the ore body between the dikes and a third raise put up from the cross-cut North of the dikes. Late in the year a development contract started advancing this cross-cut further to the Northwest

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

13th Level (Cont'd)

towards the Maas boundary to provide room for an additional raise North of the dike in the main ore body. The height to which the ore extended above the 13th level between the dikes was determined when No. 1380 raise was put up and encountered the jasper on the 260' sub level. Only a very small amount of ore was mined from this raise in the ore body between the dikes and mining will not be resumed here until the transfer drifts to the Northwest into the main ore body are abandoned for use. The extension of the ore area that was encountered South of the dike above the 13th level has not been definitely determined but it is quite probable that the two cross-cuts South of the dike intersected this ore near the jasper hanging and no mining can be done from these 13th level cross-cuts. A raise from the 14th level will be put up into this area in 1941 and explorations carried on to determine the extent of this ore body.

No. 1322 raise was cut out in No. 1320 cross-cut South of the dikes in August and completed in September to a height of 97' above the level. No ore was encountered in the raise for its entire distance which was quite disappointing because it was intended to intersect the ore body South of the dikes between the 12th and 13th levels. However, it is quite possible that the ore body may be located further to the South and early in 1941 test drifts will be driven from this raise about midway between these levels to determine whether the ore body is continuous from the 12th to the 13th level. It is hoped that sufficient ore area will be developed to enable mining to be started here at some point between these levels.

No. 1357 raise in the main level footwall drift parallel to the Maas boundary was put up to replace No. 1332 raise which had crushed beyond repair. This raise was started in the footwall jasper and slate and advanced 49' in this material before encountering the ore and then advanced 51' in ore to a total height of 110' above the level to the 295' sub level elevation. This raise was put up in the main ore body where mining is underway near the hanging.

No. 1359 raise in the main level drift parallel to the Maas boundary was started in May and completed in June. This raise was also started in the jasper and slate footwall and advanced 32' in this material before encountering the ore and then advanced 55' in ore to a total height of 97' above the level where the jasper hanging was encountered. This raise was put up into the ore area under the hanging that is being mined adjacent to the Maas boundary on the 12th level elevation at the present time. The extension of the ore area under the hanging to the Southwest necessitated putting up this raise to provide economical scraping distances in the extension of the ore body Southwest of No. 1360 raise.

No. 1380 raise in the ore body between the dikes was put up in April upon completion of the new 13th level cross-cut to the Northwest. This raise started in ore and advanced 60' to a total height of 70' above the level where the jasper hanging was encountered. A small amount of exploration work was carried on from this raise on the 260' sub level elevation and then a transfer drift to the Northwest through the dikes into the main ore body was driven on the 250' sub level.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

13th Level (cont'd)

No. 1381 raise in the ore body between the dikes was put up in May and advanced 64' in ore to a total height of 74' above the level. This raise also encountered the jasper hanging.

No. 1382 raise was put up from the new cross-cut into the main ore body directly North of the dike. The raise was started in ore and advanced 93' to a total height of 103' above the level where it holed to a connecting drift on the 295' sub level. Upon completion of this raise the transfer Northwest from No. 1380 raise was eliminated. The heavy pressure in this area has made it advisable to advance the 13th level cross-cut a short distance further Northwest towards the Maas boundary to provide room for another raise into the main ore body North of the dike. The purpose of this raise is to eliminate the transfer Northwest from No. 1381 raise and will thereby reduce the expense of repairs required to maintain it.

The work done in connection with the exploration in the high Sulphur ore body that was encountered when sinking from the 12th to the 13th level will be described under "Exploration and Future Explorations",

14th Level

Development work on this level is reported under "Development in Rock" elsewhere in this report. Due to the increase in the working schedule which makes it necessary to provide new working places for the contracts in ore areas that are rapidly decreasing in size, the development of this level is being rushed. The first cross-cut on this level will be driven under the small ore body that was mined on several sub levels in 1938 and 1939 at the Southwest end of the 13th level. Raises will be put up here as soon as possible to provide additional working places and from the Southwest extension of the main drift and two other cross-cuts other raises will be put up to develop other small ore areas shown by diamond drilling on the 13th level.

The work on this level during the year consisted of completing the excavation of the shaft plat and also pump room and sump. The tail drift Southeast of the shaft was also completed and at the end of the year the main level heading had advanced 980' and reached the main dike near the Maas boundary. Work was then started in advancing the footwall drift South of the dikes to the Southwest. A total of 1,352 ft. of rock drifting was done on this level in 1940.. Early in the year one shift was advancing the drift but later in the year a second shift was added to speed up the work. The Eimco Finalay loader has proven very satisfactory for loading rock and has been a factor in the good progress made in development of this new level.

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7. UNDERGROUND: (Cont'd)

d. Timbering:

Under this heading a paragraph is included on timbering repair work required in 1940. As in 1939 retimbering was required mainly on the 13th level in the drifts in the ore body and in the lean ore area near the footwall. However, less repairs were necessary as the pressure has decreased due to the ore being mined on the sub levels above extending beyond the drift toward the mined area on the Maas property. Mining in several small areas is approaching the 13th level and within a year will be underway from 14th level raises. Pressure on the 13th level drifts decreases rapidly after mining on the sub levels has advanced under the jasper hanging beyond the drift even though the sub level may be 50' to 90' above the 13th level. In some sections side pressure has been quite severe due to swelling ground which has broken the legs of the timber sets and also made it necessary to remove ground to maintain the grade of the haulage tracks. More trouble was experienced in 1940 with rotting, crushing, and wearing out of cribbing in raises than in 1939. Several 13th level raises were out of commission for from one to two months while they were recribbed. This was true also on the 9th level in several of the raises that are 200' in height. Production was decreased during the period the raises were undergoing repairs. Some repairs were necessary on the other levels but they averaged less than in the previous year.

The product increased 57% in 1940 and the total expense for timber, lagging, poles, and wire netting increased 38%. The price per foot for timber increased 9% while the price for lagging and poles was practically the same as in 1939. Due to 24% less feet of timber used per ton of ore, the cost per ton for timber decreased $.0093 or 17% in 1940 in spite of a higher cost per foot. The total cost per ton for timber, lagging, and poles decreased 12% in 1940 and was also 2% lower than in 1937. The large production in 1940 accounts for the lower cost per ton as timber used in repair work is more or less constant irrespective of the product. The total expense for lagging and poles was greater than the total amount paid for stull timber and cribbing, by over 10% while in the previous year it was nearly 3% less. The large increase in production accounts for the change in ratio of consumption.

Statement of Timber Used:	Lineal Feet	Avg. Price Per Foot	Amount 1940	Amount 1930
6" to 8" Cribbing	113,736	.0343	3,905.76	5,682.99
8" Stulls	139,608	.0666	9,305.27	5,128.51
10" Stulls	163,134	.0937	15,297.83	10,279.77
12" Stulls	64,297	.1294	8,323.59	7,443.47
Treated Timber	1,310	.3331	436.36	351.04
Total 1940	482,085	.0773	37,268.81	
Total 1939	407,810	.0708		28,885.78
Lagging - 7 Ft.	2,406,771	.0077	18,506.60	12,132.09
Poles - 9½ Ft.	1,763,037	.0131	23,069.65	15,949.86
Total 1940	4,169,808	.0100	41,576.25	
Total 1939				28,081.95
Wire Fencing - Ft.	7,590	.0641	486.34	640.93
Grand Total - 1940			79,331.40	
Grand Total - 1939				57,608.66

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7. UNDERGROUND: (Cont'd)

d. Timbering: (Cont'd)

	1940	1939
Product	865,689	551,362
Feet of Timber per ton of Ore	.557	.740
Feet of Lagging per ton of Ore	2.780	2.882
Feet of Lagging per ft. of Timber	4.992	3.897
Feet of Wire Fencing per ton of Ore	.009	.0203
Cost per ton for Timber	.0431	.0524
Cost per ton for Lagging	.0213	.0220
Cost per ton for Poles	.0266	.0289
Cost per ton for Wire Fencing	.0006	.0012
Total Cost per Ton	.0916	.1045
Equivalent of Stull Timber to Board Measure	1,004,810	826,888
Feet of Board Measure per Ton of Ore	1.160	1.499

Total Cost for Timber, Lagging, Poles, etc.

Year	Product	Amount	Cost per Ton
1940	865,689	79,331.40	.0916
1939	551,362	57,608.66	.1045
1938	412,000	43,788.52	.1061
1937	820,915	76,759.61	.0935
1936	512,612	44,983.10	.0877
1935	291,318	26,935.69	.0924
1934	235,664	23,441.91	.0985

e. Drifting and Raising:

Drifting in ore and rock increased in 1940. The larger increase was in rock drifting due to development of the 14th level. Raising in ore and rock was slightly less than in 1939. The total footage, drifting and raising shows a net increase of 20% in 1940. Development work was above normal for the mine in 1940 and will continue at above a normal rate until the 14th level and the Maas Strip is fully developed in 1942. The following table gives a comparison of the total drifting and raising in ore and rock in 1940 and 1939:

	Drifting		Raising		
Year	ore	Rock	Ore	Rock	Total
1940	471'	2268'	1189'	720'	4648'
1939	275'	1463'	1313'	827'	3878'
Increase	196'	805'			770'
Decrease			124'	107'	

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7. UNDERGROUND: (Cont'd)

f. Explosives, Drilling and Blasting:

The cost per pound for powder decreased 2.1% and the cost per ton of ore 4.2%. The total cost for powder, fuse and caps decreased 3.8% in 1940 and was about the same as in 1937 in which year the next largest hoist in the life of the mine was made. The powder cost decreases in years with large production. "Gelamite No. 1" was used exclusively in mining ore in both 1939 and 1940. This powder runs 25 more sticks per hundred pounds than "Gelatin" and has the strength of 60% Gelatin pound for pound. Fuse with caps attached in insulated metal containers are given the miners as they pass the fuse house in the tunnel leading to the shaft on surface. The powder is distributed from powder houses in the mine.

In hard ground, i.e., blue steel ore and some areas near the footwall section "A" auger drill steel is used. This drill steel is smaller in cross section, makes a smaller hole and drills more footage before changing steel than the other section in use, i.e., section "B". This section has a large cross section and larger bit, and gives excellent results in soft and sticky ground. Due to the twist it cleans the cutting from the hole much better than the section "A" steel. The auger steel used until recently was all imported from Sweden, but is now unattainable in this country. The Swedish firm recently started making steel in Massachusetts from which source steel will be supplied during the duration of the present war. It is doubtful whether steel of equal quality to the steel made in the small electric furnaces in Sweden can be manufactured in this country.

Blasting is closely supervised in the mine to increase safety. At least twice each year personal supervision is given each contract during the loading of holes and lighting of the fuse. Experiments to determine the best location for the blasting cap in the drill hole have been underway during 1940. Late in the year a new rule was added to the book of rules to cover this subject which provides that the blasting cap be inserted in the bottom stick of powder in the drill hole. This insures explosion of the powder at the bottom of the drill holes and prevents the most common cause of accidents, i.e., drilling into unexploded powder in bottom holes drilled by the previous shift.

Year	Cost per Lb. For Powder	Lbs.Powder per Ton of Ore	Cost per Ton Powder	Cost per Ton Fuse & Caps	Total Cost
1940	.1151	.4485	.0516	.0111	.0627
1939	.1176	.4584	.0539	.0113	.0652
1938	.1225	.4320	.0530	.0102	.0632
1937	.1195	.4270	.0510	.0110	.0620
1936	.1104	.4320	.0475	.0105	.0580
1935	.1168	.4270	.0498	.0102	.0600
1934	.1140	.4350	.0507	.0106	.0613
1933	.1196	.5110	.0610	.0130	.0740
1932	.1235	.4191	.0518	.0099	.0617
1931	.1268	.4025	.0510	.0091	.0602

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7. UNDERGROUND: (Cont'd)

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

Statement of Explosives Used: (Ore Development and Stoping)

	Quantity	Average Price	Amount 1940	Amount 1939
Gelamite #1	386,050	11.50	44,419.99	28,786.47
50% Gelatin	1,700	11.25	190.77	767.54
60% Gelatin	550	12.00	66.00	187.00
Total Powder 1940	388,300	11.51	44,676.76	
Total Powder 1939				29,741.01
Fuse- Feet	1,386,035	4.98	6,900.98	4,441.60
#6 Blasting Caps	195,077	12.20	2,380.99	1,498.76
Tamping Bags	31,000	3.35	104.00	110.51
Fuse Lighter s	29,300	7.21	211.33	142.55
Elec. Detonators	485	104.85	50.85	7.20
Master Fuse Lighters				50.86
Lead Wire - Feet	635	16.45	10.45	
Total Fuse, etc. 1940			9,658.60	
Total Fuse, etc. 1939				6,251.48
Total All Explosives 1940			54,335.36	
Total All Explosives 1939				35,992.49
Product			865,689	551,362
Pounds Powder per ton of Ore			.4485	.4584
Cost per Ton for Powder			.0516	.0539
Cost per Ton for Fuse, Caps, etc.			.0111	.0113
Cost per Ton for all Explosives			.0627	.0652

Development in Rock

Gelamite #1	3,250	11.50	373.75	1,092.33
50% Gelatin	1,800	11.25	202.52	490.53
60% Gelatin	2,050	12.00	246.00	1,042.00
Total Powder 1940	7,100	11.58	822.27	
Total Powder 1939				2,624.86
Fuse - Feet	27,425	5.05	138.46	371.99
#6 Blasting Caps	3,647	12.20	44.49	106.76
Electric Denoators	120	110.83	13.30	6.80
Lead Wire - Pounds	2	.40	.80	
Total Fuse, etc. 1940			197.05	
Total Fuse, etc. 1939				485.55
Total All Explosives - 1940			1,019.32	
Total All Explosives - 1939				3,110.41
Total Explosives Used - 1940			55,354.68	
Total Explosives Used - 1939				39,102.90
Average Price per pound for Powder 1940			.115	
Average Price per pound for Powder 1939				.118

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7. UNDERGROUND: (Cont'd)

h. Ventilation:

During the year a program to improve the ventilation in both the Negaunee and Maas Mines has been underway. After a study of the ventilation was made in 1939, it was found that improvement could be made by enlarging some of the existing airways and driving some additional ones to reduce the resistance of the flow of air. The cost of the work which will benefit both mines was on a 50-50 basis. In March a contract started stripping the short drift in rock on the 9th level that connects to an air raise to the 10th level. This connection was stripped to about 8' x 12' in size and insures an airway in rock of large size which will require very little maintenance. An additional footwall raise was also put up from the 11th to 10th levels. A short inclined drift was driven in rock to the winze on the 11th level to add another airway in rock from the 12th to 11th levels. Upon the completion of these connections sufficient airways of adequate size are provided for the present from No. 2 shaft on the $6\frac{1}{2}$ level where the air enters the mine down to the 12th level. Below this level the air is distributed to the mining areas and a large number of the raises that are used for mining also serve as ventilation connections between the levels. Upon the completion of the new cross-cut on the 13th level during the year a connection was made to a raise from the 5th level Maas Mine, this provided a second outlet for the air from the Negaunee to Maas Mines and improved the ventilation in both mines. This connection is in the ore body and will be lost when mining reaches this elevation but additional connections in rock will be made as the development of the 14th level progresses. Late in the year the first raise from the 14th to 13th levels was started to provide an airway between these levels.

Ventilation in the mining areas has been good during the year as connections from the sub levels where ever possible have been maintained with the main levels, thus insuring an abundant supply of fresh air. However several of the isolated mining areas where direct ventilation can not be provided are ventilated with booster fans.

i. Pumping:

The number of gallons pumper per minute in each month of the year for the past six years are shown in the following statement:

Month	1940	1939	1938	1937	1936	1935
January	892	947	1038	893	886	931
February	857	938	906	866	898	953
March	768	944	951	1025*	867	898
April	700	963	988	1075	866	878
May	747	995	1029	1062	992	887
June	678	1085	1052	1089	798	895
July	679	1177	1055	1107	931	911
August	685	1112**	1085	1148	952	917
September	757	1067	1070	1161	959	936
October	644	1033	1044	1162	951	944
November	640	979	994	1131	954	940
December	618	947	973	1105	916	927
Total Average	714	1015	1015	1059	914	918

(*) Increase due to water diverted from Maas Mine and pumped by Negaunee Mine.
(**) Diversion of water from Maas Mine stopped on July 31st.

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7. UNDERGROUND: (Cont'd)

i. Pumping: (Cont'd)

The following statement shows the average number of gallons pumped per minute for the past ten years:

Year	Gallons Per Minute
1940	714
1939	1015
1938	1015
1937	1069
1936	914
1935	918
1934	831
1933	857
1932	905
1931	914

The average number of gallons of water pumped per minute in 1940 showed a large decrease as compared with previous years. The average for 1937, 1938, and 1939 was increased due to pumping a portion of the Maas Mine water. This diversion was stopped in July 1939 since which time there has been a decrease nearly every month.

Pumping at the deep well on Section 32 a short distance West of the cave to surface near old No. 2 shaft was started early in the year and continued, with the exception of slight interruptions, throughout the year. The deep well pump immediately decreased the water entering the 9th level and has had a marked influence on the decrease that has occurred since. The weir readings on the various levels in the mine show a large decrease. If there is a further decrease in the water it is hoped to be able to eliminate one pumping shift thereby effecting a saving in the labor cost.

j. Underground in General:

Production from the mining contracts above the 9th level has continued to improve and has materially helped in the effort to obtain maximum production. Results from this area are not comparable however, to the other areas in the mine although continued improvement is anticipated as the work progresses.

The demand for increased production has made it necessary to concentrate mining in the regular mining areas and also speed up the development of the 13th and 14th levels to provide working places for the contracts as other areas are exhausted. The footwall areas in the main ore body and between the dikes are rapidly being worked out due to the rapid advance of the footwall to the Southwest. As mining progresses to lower elevations the footwall raises have to be abandoned for mining and new areas must be developed to replace them.

The rapid rate of depletion of the Negaunee ore body is due to the mining approaching the bottom of the synclinal trough where the footwall flattens. Also at lower elevations a larger amount of lean ore overlying the footwall is being encountered.

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

(2) Wages:

No increase in wages in 1940.

(3) Comparison of Production:

Production - 1940	865,689 Tons
Production - 1939	551,362 Tons
Increase	314,327 Tons

(4) Comparison of Number of Men and Wages:

	No. Men	No. Days	Amount	Rate Per Day
1940	428	102,732½	657,275.46	6.40
1939	385	75,323	478,386.47	6.35
Increase	43	27,409½	178,888.99	.05

(5) Tons Per Man Per Day:

	1940	1939	Increase
Surface	48.20	41.37	6.83
Underground	10.21	8.90	1.31
Total	8.43	7.32	1.11

(6) Cost of Production:

1940	1,092,527.63		Cost Per Ton	1.262
1939	834,943.51		Cost Per Ton	1.514
Increase	257,584.12			
Decrease				.252

	Labor	%	Supplies	%
1940	668,046.71	61.0	423,480.92	39.0
1939	490,416.83	58.5	344,526.68	41.5
Increase	178,629.88	2.5	78,954.24	
Decrease				2.5

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7. UNDERGROUND: (Cont'd)

f. Explosives, Drilling and Blasting: (Cont't)

Statement of Explosives Used: (Cont'd)

	Amount 1940
Explosives Used for Stoping and Development	55,354.68
Explosives Used for Blasting Stockpile, etc.	526.90
Total as per Cost Sheet	55,881.58

g. Mining and Loading:

Scraping distances averaged longer in 1940 due to the recent purchases of higher speed scraper hoists. In some territories ore is mined up to distances of 150' from the raises whereas in previous years 125' was considered the economical limit of scraper haulage. The long scraper hauls are mainly confined to areas reached by long raises 150' to 200' in height where tonnage available does not warrant the expense of additional raises. The output from the gangs in these areas were maintained at the general average for the mine which proved that even a scraping distance of 150' is within economical limits.

More timber bulkheads were built in 1940 to safeguard the tops of raises from crushing when blasting down the radical slices. The bulkheads also increase safety for the miners in case of sudden settlement of the timber gob on the mined sub level above. The heavy operating schedule of three shifts five days per week, has increased the mining hazard as the ore is removed on the new sub level before the gob has settled completely on the sub level above. As the area mined on the lower sub level increases, settlement is hastened and may occur quite suddenly without adequate warning. The bulkheads prevent the extension of crushing reaching the raises and thus provides a safety zone for the miners who run out when the settlement starts to break the caps and legs in the slice being mined, often some distance from the raise. As an added precaution in areas where it is known that the settlement is not complete props are installed in the slices to increase support and give more time for the miners to get to a safe area.

Areas under new jasper hanging also increase the mining hazard due to the ore above the slice settling away from the jasper without warning and throwing a heavy weight on the forepoles ahead of the last timber set in the slice. The flat pitch of the ore body, 15° on the average, carries the ore under the hanging a considerable distance in the vertical drop of 12' between sub levels. Mining is extended under the jasper hanging until the legs of the timber sets do not exceed 6' in length and one cut is then blasted beyond this point. There is however 3' or 4' of ore left between the jasper hanging and the floor of the sub level. The dangerous period on the lower sub level occurs when the slice leaves the covering poles on the sub above and advances under the 3' to 4' layer of ore directly under the jasper hanging. Short cuts are taken, 3' to 4', instead of the normal 5' cuts which reduces the area undercut and the sets being closer together increases the support under the new ground. The steel "H" beams are always installed with the forepoles as an added protection to prevent a breakdown in case the ore suddenly settles away from the jasper.

NEGAUNEE MINE
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7. UNDERGROUND: (Cont'd)

j. Underground in General: (Cont'd)

The acquisition of Maas Strip ore adjacent to the Negaunee boundary through an agreement with the fee owners increases the life of the Negaunee Mine. It also makes available additional working areas which are essential to maintain this maximum production. Development of this area from the 13th level is being rushed, but several months will elapse before any production from this strip is realized.

A large portion of the 13th level drift which parallels the Maas boundary has been subject to heavy crushing and necessitated a heavy repair program during the year to maintain it for haulage. It was necessary to put up two new raises from this drift to replace raises which had become badly crushed. Production ceases while repairs are made to a raise and if several are under repair at one time there is a temporary decrease in the product.

8. COST OF OPERATING:

a. Comparative Mining Costs:

	1940	1939	Increase	Decrease
PRODUCT	865,689	551,362	314,327	
Undg. Costs	1.000	1.174		.174
Surf. Costs	.094	.114		.020
Gen. Mine Expenses	.168	.226		.058
Cost of Production	1.262	1.514		.252
Taxes	.151	.219		.068
Depletion & Depreciation	.435	.375	.060	
Loading & Shipping	.033	.039		.006
Adm. & General Exp.	.063	.021	.042	
Miscellaneous Income	.003	.007		.004
Total Cost	1.941	2.161		.220
No. of Days Operated	262	228	34	
No. of Shifts & Hours	1 & 2 8-Hr.	1 & 2 8-Hr.		
Average Daily Product	3304	2418	886	

COST OF PRODUCTION:

	1940	%	1939	%	Decrease
Labor	.773	61.0	.889	58.5	.116
Supplies	.489	39.0	.625	41.5	.136
Total	1.262	100.0	1.514	100.0	.252

b. Detailed Cost Comparison:

(1) Days and Shifts:

Year	Days Mine Worked	Shifts and Hours	Men Employed	Total Shifts Worked
1940	262	1 & 2 8-Hr.	428	102,732½
1939	228	1 & 2 8-Hr.	385	75,323
Increase	34		43	27,409½

8. COST OF OPERATING:(Cont'd)

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

	1940		1939		Inc. or Decr.	
Days Per Week	5		3, 4, & 5			
Shifts and Hours	1-8 2-8		1-8 2-8			
Production - Tons	855,811		551,362		304,449	
Avg. Daily Product	3,304		2,418		886	
Number of Days Worked	262		228		34	
	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton
UNDERGROUND COSTS:						
1. Exploring in Mine	1642.71	.002	814.50	.002	828.21	
3. Development in Rock	8269.27	.009	18236.29	.033	9967.02	.024
4. Development in Ore	9628.57	.011	11328.90	.022	1700.33	.011
5. Stoping	360017.91	.416	236768.81	.429	123249.10	.013
6. Timbering	235767.82	.272	190229.95	.345	45537.87	.073
7. Tramming	89685.72	.104	56329.33	.102	33356.39	.002
8. Ventilation	10463.50	.012	8421.19	.015	2042.31	.003
9. Pumping	31974.08	.037	36103.13	.065	4129.05	.028
10. Compressors & Air Pipes	49049.81	.057	40471.53	.073	8578.28	.016
11. Back Filling	703.09	.001	90.91		612.18	.001
12. Underground Superintendence	23382.74	.027	18229.07	.033	5153.67	.006
14. Maint: Comp. & Power Drills	463.42	.001	697.31	.001	233.89	
15. Sc Scraper Equipment	21336.78	.025	12247.96	.022	9088.82	.003
16. Elec. Tram Equipment	18171.42	.021	14143.62	.026	4027.80	.005
17. Pumping Machinery	4743.49	.005	3453.68	.006	1289.81	.001
Total Underground Costs	865300.33	1.000	647566.18	1.174	217734.15	.174
SURFACE COSTS:						
18. Hoisting	36400.38	.042	28045.14	.051	8355.24	.009
19. Stocking Ore	9792.16	.011	7906.23	.014	1885.93	.003
21. Dry House	7172.48	.008	6957.67	.013	214.81	.005
22. General Surface Expense	8269.44	.010	7771.04	.014	498.40	.004
23. Maint: Hoisting Equipment	7681.15	.009	5625.33	.010	2055.82	.001
24. Shaft	2964.52	.003	1841.92	.003	1122.60	
25. Top Tram Equipment	1831.62	.002	2821.01	.005	989.39	.003
26. Docks, Trestles & Pockets	792.86	.001	456.34	.001	336.52	
27. Mine Buildings	6424.70	.008	1667.04	.003	4757.66	.005
Total Surface Expense	81329.31	.094	63091.72	.114	18237.59	.020
GENERAL MINE EXPENSE:						
28. Mining Engineering	4151.88	.005	3061.15	.006	1090.73	.001
29. Mechanical & Elect. Engineering	2134.57	.002	2617.94	.005	483.37	.003
30. Analysis and Grading	16389.08	.019	12693.75	.023	3695.33	.004
31. Safety Department	2216.49	.003	2081.99	.004	134.50	.001
32. Telephone & Safety Devices	3417.66	.004	3090.86	.006	326.80	.002
33. Local and General Welfare	6554.96	.007	6898.47	.012	343.51	.005
34. Special Expense & Allowances	15252.46	.018	12818.93	.023	2433.53	.005
35. Ishpeming Office	21043.03	.024	19889.83	.036	1153.20	.012
36. Mine Office	17571.81	.020	16542.86	.030	1028.95	.010
37. Insurance	3358.10	.004	3766.94	.007	408.84	.003
38. Personal Injury	16621.51	.019	13404.54	.024	3216.97	.005
39. Social Security Taxes	28827.27	.033	21370.50	.039	7456.77	.006
40. Employees Vacation Pay	7721.15	.009	5920.74.	.011	1800.41	.002
40-A. General Storehouse Vacation Pay	638.02	.001	127.11		510.91	.001
Total General Mine Expenses	145897.99	.168	124285.61	.226	21612.38	.058
COST OF PRODUCTION	1092527.63	1.262	834943.51	1.514	257584.12	.252
41. Taxes	130485.77	.151	120746.75	.219	9739.02	.068
Total Cost of Production	1223013.40	1.413	955690.26	1.733	267323.14	.320

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

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

1. Exploring in Mine:
Increase due to exploration of small high Sulphur ore body on 13th level at shaft.

3. Development in Rock:
Decrease due to less development work in rock. In 1940 the cost sheet showed 1111 ft. compared with 2056 ft. in 1939. The cost per foot in 1940 was 7.44 compared with $8.87 in 1939.

4. Development in Ore:
Decrease due less development work account less raising in ore.

5. Stoping:
Expenditures increased $123,249.10. In 1940 there were 37,847 shifts worked compared with 24,496 shifts in 1939. Labor costs increased $103,225.86 and supply costs increased $20,023.24. The cost per ton decreased .013 and tons per man per day increased to 8.43 tons from 7.32 tons in 1939. Average tons stoping for 1940 increased to 22.24 tons from 21.34 tons in 1939. There was also a decrease of .001 in cost per ton for explosives.

6. Timbering:
Expenditures increased $45,537.87. More stull timber, lagging and poles used on account more ore mined. Labor cost increased $21,829.00 account more shifts worked repairing drifts, etc. Cost per ton decreased .073.

7. Tramming:
Expenditures increased $33356.39. Cost per ton increased .002. Electric current increased $3176.23. Electric haulage expense increased account of larger tonnage trammed.

8. Ventilation:
Increase of $2042.31 due to increase in electric current of $1001.80. 1 belt - $207.00 and stripping ventilation raise from 10th to 11th level. Cost per ton decreased .003.

9. Pumping:
Expenditures decreased $4129.05. Electric current decreased $4478.72, Labor and supplies increased $350.00. Cost per ton decreased .028. No. of gallons pumped - 1940 377,169,415
1939 532,641,788
Decrease 155,472,373

10. Compressors and Air Pipes:
Expenditures increased $8578.28. Cost per ton decreased .016. Electric current increased $7391.82. Labor and Supplies for air piping increased $1186.46.

Cu. Ft. Air Compressed	1940 -	1,296,675,000
Cu. ft. Air Compressed	1939 -	1,026,945,000
Increase		169,730,000

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

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

11. Back Filling:
Increase of $612.18 due to blasting filling in contract No. 9 on 9th level and contract No. 20 on 11th level.

12. Underground Superintendence:
Expenditures increased $5153.67. One additional Shift Boss and one more underground foreman was put on late in 1940, also underground foreman and one shift boss added in 1939 worked the full year compared with part of a year in 1939. Cost per ton decreased .006. Bonus payments to bosses increased due to more employees and mine working more shifts in 1940.

14. Compressors and Power Drills:
Expenditures decreased $233.89. Valves for Nordberg Compressor $175.00 charged out in 1940, but in 1939 two RB12 Jackhammers, $400.00, charged out. There were more repairs to compressors in 1940.

15. Scrapers and Mechanical Loaders:
Expenditures increased $9088.82. Cost per ton increased .003. In 1940 - 82,384 ft. of wire rope costing $9545.31 charged out compared with 65,808 ft. costing $6306.41 in 1939. Converting 4, 10 H. P. Hoists to 15 H. P. hoists $1736.47, repairs to armatures $252.00, and repairs to scrapers and scraper hoists $3861.00.

16. Electric Tram Equipment:
Expenditures increased $4027.80. Decrease in cost per ton .005.

	1940	1939	Increase	Decrease
Locomotives	6291.64	4484.13	1807.51	
Wiring	1316.40	1817.49		501.09
Tracks	3930.65	4094.88		164.23
Cars	6437.11	3680.16	2756.95	
Generators	195.62	66.96	128.66	
	18171.42	14143.62	4027.80	

Increase in General Shop labor repairing locomotives and cars, also one new car $425.00 charged out in 1940.

17. Pumping Machinery:
Expenditures increased $1289.81. Cost per ton decreased .001. One 2KVA transformers 30.00, one 10 KVA transformer $100.00, charged out in 1940, also $1039.28 from E. & A. NM-3 Negaunee Mine drainage.

SURFACE COSTS

18. Hoisting:
Expenditures increased $8355.24. Cost per ton decreased .009. Electric current increased $6339.39, labor increased $1764.30. Oil and miscellaneous supplies increased $251.55 account tonnage hoisted in 1940 increased and more operating shifts.

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

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

19. Stocking Ore:

Expenditures increased $1885.93. Decrease in cost per ton .003. Labor and supplies erecting and repairing temporary wooden trestles decreased $ 175.75. Cost of stocking ore increased $1902.74 and cost of picking out wood and rock from stockpiles increased $158.94.

21. Dry House Expense:

Expenditures increased $214.81. Decrease in cost per ton .005. Increase due to more expense for heating dry house and labor attending dry account mine operating more days in 1940, and one 42" X 120" hot water tank $113.90 charged out.

22. General Surface Expense:

Expenditures increased $498.40. Cost per ton decreased .004. Snow fence and steel posts $75.74, 200 ft. of garden hose $20.12, repairing lawn motor $13.08, also increase in labor repairing roads, taking care of lawn and shrubbery.

23. Hoisting Equipment:

Expenditures increased $2055.82. Cost per ton decreased .001. Three new hoisting ropes amounting to $1384.38, repairs to 500 H.P. motor $547.50 and repairs to skip charged out in 1940.

24. Shaft:

Expenditures increased $1122.60 account of more repairs to shaft and shaft pockets.

25. Top Tram Equipment:

Expenditures decreased $989.39. Cost per ton decreased .003. One set of stator coils $178.21 charged out in 1939. Less repairs to cars, also less wire rope used in 1940.

26. Docks, Trestles and Pockets:

Expenditures increased $336.52. Increase due to more repairs to shaft house pockets.

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8. COSTOF OPERATING: (Cont'd)

b. Detailed Cost Comparison: Cont'd)

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

27. Mine Buildings: (Cont'd)

Expenditures increased $4757.66. Cost per ton increased .005.

Building	1940	1939	Increase	Decrease
Office	148.63	635.25		486.62
Warehouse		55.40		55.40
Shop Buildings	889.05	186.32	702.73	
Distric Carpenter Shop	7.10	38.56		31.46
Shaft House	375.35	228.55	146.80	
Engine House	256.79	102.40	154.39	
Boiler House	296.63		296.63	
Dry House	3854.47	219.77	3634.70	
Coal Dock & Trestle	60.54	87.92		27.38
Garage		6.28		6.28
Timber Tunnel	155.91	3.82	152.09	
First Aid Room		4.51		4.51
Fire Protection	15.54	45.46		29.92
Miscellaneous	364.69	52.80	311.89	
Total	6424.70	1667.04	4757.66	

One automatic stoker, E. & A. NM-1, $467.57 charged to shop buildings one-third of 1940 expenditures on remodeling change house, E. & A. NM-2, $3513.88 charged to dry house. Expenditures increased $4757.66. Cost per ton increased $ .005.

GENERAL MINE EXPENSES:

28. Mining Engineering:
Expenditures increased $1090.73. Cost per ton decreased .001
Part salary of Asst. Supt. charged to Engineering for several months in 1940.

29. Mechanical and Electrical Engineering:
Expenditures decreased $483.37. Cost per ton decreased .003. Less supervision of repair work required in 1940.

30. Analysis and Grading:
Expenditures increased $3695.33. Cost per ton decreased .004.

	1940	1939	Increase
Ishpeming Laboratory Charges	10,884.37	8026.29	2858.08
Shipping Dept. Expense	3,315.66	2788.17	527.49
Mine Sampling	2,189.05	1879.29	309.76
Total	16,389.08	12693.75	3695.33

In 1940 - 37,073 determinations compared with 28,115 in 1939. Increase due to larger production and more ore shipped.

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

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

31. Safety Department:

Charge to Negaunee Mine increased $134.50. Cost per ton decreased .001. Increase in expense for operating Safety Department.

32. Telephones and Safety Devices:

Expenditures increased $ 326.80. Cost per ton decreased .002. Electric current in 1940 was $1152.00 compared with $893.00 in 1939 an increase of $259.00, also one underground telephone $54.00 charged out.

33. Local and General Welfare:

Charge to Negaunee Mine decreased $459.44. Cost per ton decreased .005.

	1940	1939	Decrease
General Welfare	5689.66	6005.91	316.25
District Welfare	865.30	892.56	27.26
Total	6554.96	6898.47	343.51

34. Special Expense, Pensions and Allowances:

Expenditures increased $2433.53. Cost per ton decreased .005.

	1940	1939	Increase	Decrease
Pensions	6349.93	3887.83	2462.10	
Legal	513.63	483.50	30.13	
Saranac Invest.	3111.88	1772.24	1339.64	
Central Emply.Office	2619.20	4656.15		2036.95
Curtailment Exp.	9.02	2019.21		2010.19
Retirement Exp.	2648.80		2648.80	
Total	15252.46	12818.93	2433.53	

35. Ishpeming Office:

Charge to Negaunee Mine increased $1153.20. Cost per ton decreased .012. Expense is based on total labor cost at Mine.

36. Mine Office:

Expenditures increased $1028.95. Cost per ton decreased .010.

	1940	1939	Increase
Clerks Salaries	5917.58	5898.00	19.58
Mine Superintendent	4430.00	4164.28	265.72
Central Warehouse	4346.89	3827.08	519.81
Total	14694.47	13889.36	805.11

There also was an increase in printing, stationery and telephone tolls and one office desk and chair charged out in 1940.

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

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

37. Insurance:

	1940	1939	Increase	Decrease
Property	908.84	1134.54		225.70
Group	2003.41	2300.56		297.15
Catastrophe	445.85	331.84	114.01	
Total	3358.10	3766.94		408.84

38. Personal Injury:

Expenditures increased $6771.53. Cost per ton decreased $ .001.

	1940	1939	Increase
Compensation & Doctors	9872.02	7585.08	2286.94
Compensation Department	947.86	840.45	107.41
Hospital Loss	5801.63	4979.01	822.62
Total	16621.51	13404.54	3216.97

39. Social Security Taxes:

Expenditures increased $7450.32. Cost per ton decreased $ .006.

	1940	1939	Increase
Unemployment Insurance Tax	22123.23	16402.81	5720.42
Old Age Benefit Tax	6704.04	4967.69	1736.35
Total	28827.27	21370.50	7456.77

40. Employees Vacation Pay:

Expenditures increased $2311.32. Cost per ton decreased $ .001. In 1940 employees were given a vacation of five days compared with four days in 1939. In 1940 - 239 employees were eligible for vacations with pay compared with 233 in 1939.

41. Taxes:

Expenditures increased $ 9850.93. Cost per ton decreased $ .068.

9. EXPLORATIONS AND FUTURE EXPLORATIONS:

E. & A. No. NM-3 - Negaunee Mine Drainage

Two additional churn drill holes were put down to ledge in an attempt to find a location for another deep well on Sec. 32 Northwest of No. 2 shaft. Both of the holes were located North of the surface cave in the area where there is indication of a favorable gravel formation. Although coarse gravel was encountered in each hole, no water course was intercepted above the ledge. The fact that these holes failed to encounter any water indicates that water which enters the mine from this direction must flow through cracks in the ledge.

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9. EXPLORATIONS AND FUTURE EXPLORATIONS: (Cont'd)

Upon the completion of holes No. 10 and No. 11 to ledge the casing pipe was removed and salvaged and the drilling program was abandoned.

The following is a log of churn drill hole No. 10 which is located about 540 ft. Northwest of No. 1 deep well:

Footage	Material
0 - 6'	Sand and gravel
6' - 13'	Fine sand
13' - 50'	Gravel and sand
50' - 58'	Clay
58' - 71'	Coarse gravel
71' - 75'	Coarse sand
75' - 90'	Fine sand
90' - 105'	Fine sand and clay
105' - 128'	Clay
128' - 141'	Coarse gravel
141' -	Ledge (Hole dry)

The following is a log of churn drill hole No. 11 which is located about 640 ft. due West of No. 1 deep well:

Footage	Material
0 - 5'	Sand
5' - 8'	Gravel
8' - 30'	Sand and gravel
30' - 41'	Coarse gravel
41' - 44'	Red clay and sand
44' - 74'	Sand and clay seams
74' - 82'	Coarse gravel
82' - 88'	Sand
88' - 103'	Sand and gravel
103' - 112'	Sand
112' - 117'	Sand and clay seams
117' - 158'	Sand and clay seams
158' -	Jasper ledge (Hole dry)

Exploration in Ore Body Adjacent to No. 3 Shaft

In accordance with an agreement with the fee owners, exploration of the ore body that was encountered in No. 3 shaft when sinking from the 12th to 13th level was started late in the year to determine the quality and extent of the ore body. A raise from the 13th level plat near the shaft was put up to the jasper hanging and ore averaging 1.0% in Sulphur was encountered for the entire distance. Under the hanging on the 250' sub level, cross-cuts were driven North and South to the limits of the ore which was proven to be only about 40 ft. in width and of high Sulphur content. An inclined exploration drift to the Southeast was driven on a 25° upgrade for a distance of 166 ft. from the raise and ore averaging about 1.0% in Sulphur was also encountered here. Test drifts to the South and North were driven from the incline drift about 125 ft. from the raise at the approximate elevation of the 12th level to the limits of the ore which was about 30 ft. in width and of high Sulphur content.

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9. EXPLORATIONS AND FUTURE EXPLORATIONS: (Cont'd)

Further exploration was temporarily abandoned late in the year when a rock development program was started on the 13th level to develop the Maas Strip ore body for production. The major part of the product from the mine is hoisted from the 13th level and the storage capacity at the shaft is limited to the three pockets, only one of which can be spared for either rock or a special grade of ore. Due to the urgent necessity of developing the Maas Strip for production to provide additional working areas, further exploration of the ore body adjacent to No. 3 shaft will be delayed until this work is completed.

10. TAXES: A comparison of taxes paid by The Negaunee Mine Company in 1940 and 1939 follows:

	1940		1939	
	Valuation	Taxes	Valuation	Taxes
Realty - 213.19 Acres	2,070,000	72,615.81	2,185,000	79,989.35
Personal-Stockpile, Equip. & Supp.	835,000	29,291.89	975,000	35,693.20
Total by Tax Commission	2,905,000	101,907.70	3,160,000	115,682.55
Collection Fees		1,019.08		1,156.83
Total Optg. Negaunee Mine	2,905,000	102,926.78	3,160,000	116,839.38
Rented Buildings	15,500	543.77	17,300	633.33
Collection Fees		5.43		6.33
		549.20		639.66
Less Taxes on Houses Sold in 1940		211.11		
Total Rented Buildings	15,500	338.09	17,300	639.66
Total Optg. and Rented Bldgs.	2,920,500	103,475.98	3,177,300	117,479.04
Proportion of Adams Strip	75,000	2,657.32	90,000	3,327.71
Section 2 Mine - Realty				
City of Negaunee	470,000	16,652.53		
City of Ishpeming	227,200	7,911.05		
Total Negaunee Mine Company	3,692,700	130,485.77	3,267,300	120,806.75
Tax Rate per $100 Valuation				
City of Negaunee		3.5080		3.66
City of Ishpeming		3.4475		
Total Tax City of Negaunee		517,964.88		560,092.01
Total Tax City of Ishpeming		366,009.57		
Negaunee Mine Co. % of Negaunee Tax		25.19%		20.47%
Negaunee Mine Co. % of Ishpeming Tax		2.16%		
DIVISION OF PAYMENTS				
City of Negaunee	2,920,500	103,264.87	3,177,300	117,479.04
Payable to C.C.I.Co.-¾ Adams Strip	75,000	2,657.32	90,000	3,327.71
Payable to C.C.I.Co.-Sec. 2 Mine	697,200	24,563.58		
Total Negaunee Mine Company	3,692,700	130,485.77	3,267,300	120,806.75

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10. TAXES: (Cont'd)

The valuation of the Negaunee Mine as set by the State Tax Commission was $255,000.00 lower in 1940. With a slightly lower tax rate in the City of Negaunee, taxes decreased $13,712.60. Due to inclusion of taxes on Section 2 Mine, a new property being developed by the Negaunee Mine Company, amounting to $24,563.58, the total taxes paid by the Negaunee Mine this year increased $9,679.12.

11. ACCIDENTS AND PERSONAL INJURY:

The following table gives the number and class of accidents causing loss of time during the past five years:

	1940	1939	1938	1937	1936
Fatal	2	0	0	1	0
Time Lost - Over Four Months	4	3	4	2	0
- One to four months	8	2	6	5	3
- Less than one month	9	4	0	4	1
Total Compensable Accidents	23	9	10	12	4
Number of cases paid compensation for accidents prior to Jan. 1st, 1940	2	10	11	7	7
Number of cases being paid difference in wages (Included in above total)	0	3	4	2	2

The accident record was much worse in 1940 as there were two fatal accidents and four severe injuries causing a loss of time of over four months. There were more accidents causing a loss of time of from one to four months, and also a large increase in minor accidents causing a loss of time of less than one month. Several factors are responsible for the poor record in 1940, chief of which is the rapid rate of mining which does not permit settlement of the timber mat before mining is underway on the next lower sub level. The diminishing size of the Negaunee ore body has made it necessary to mine relatively small areas at a number of different elevations in order to maintain the production and this has created hazards that did not exist before as it has increased the number of working places that are advancing under new hanging. The flat pitch of the ore body leaves some ore under the hanging jasper beyond the area mined and this thin mass of ore often breaks away from the hanging and throws sudden weight on the forepoles ahead of the breast set on the next lower sub level. In order to make up contracts for the third shift, more green men have been transferred to mining from other work, also a number of partially trained new men have been placed in the mining contracts. This has created a hazard due to lack of experience. One of the fatal accidents was due to carelessness or in other words to a trained miner taking unnecessary chances. The other fatality was a trade risk as all the safety rules and regulations had been observed.

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

Accidents increase when the mine is operating three shifts per 24 hours and when the number of employees rises as more men are exposed to the hazards incidental to the work. The increased operating schedule has made it necessary to add several shift bosses and one additional mine foreman to insure careful and necessary supervision. Intelligent supervision with safety always in mind, and strict discipline for infraction of rules and safety standards are two essential requirements of a shift boss.

Fatal Accidents

On May 31st, at 5:45 P.M., Victor Vaisanen, a miner, was instantly killed by a fall of ground. Vaisanen and his partner, Eino Kivisto, were mining the ore pillar adjacent to the Maas boundary on the 11th level where they had worked for a number of years. They were slicing under the jasper hanging near an area mined a number of years ago. The mass of jasper in this area that extended downward due to a roll in the hanging had decreased in size on each succeeding sub level and had disappeared in a considerable area adjacent to the old workings. The slice had advanced a short distance under the jasper at the time of the accident with about four sets or 20 ft. still to advance to reach the old mined area. The afternoon shift had installed forepoles, also one steel H-beam, ahead of the breast set, and stood one leg of the set. After coming on shift at 4:00 P.M., Vaisanen and his partner had scraped out some ore and when the place was inspected at 5:00 P.M. by the shift boss, the miners were told to secure the back over the forepoles on the right side with lagging before doing any more work. Lagging was sent up from the 12th level on orders of the shift boss and Vaisanen took two pieces and walked into the slice. He separated the forepoles on the right side of the breast, climbed up into the open space above the forepoles and started to put in the lagging. His partner told him to get down as some loose ground was dribbling from the back which is a sign of danger as it nearly always occurs before a settlement of ground occurs. Vaisanen paid no attention to his partner's warning and a moment later was caught by a slab of ore that fell from the hanging jasper. His head was crushed between the slab of ore and the forepoles. Vaisanen had worked 37 years at the Negaunee Mine and was rated one of the best miners. He was 64 years of age and planned to retire after his 65th birthday on August 27, 1941. His death was due to the wrong method of doing the work as the lagging could have been inserted from the side without exposure to danger.

On December 20th at 10:30 A.M., Albin Seppanen, a miner, was instantly killed by being struck by a forepole that broke following a settlement of ore from the hanging jasper. Seppanen and his partner were advancing a slice on the 260' sub level above the 13th level under the hanging jasper and had installed forepoles and two steel H-beams ahead of the breast set.

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

At the time of the accident Seppanen was lying on his side on the broken ore under the forepoles attaching the head block to a gin pole extending from the cap to the breast. This operation was delayed due to kinking of the scraper rope and while the kinks were being straightened out by his partner, a slab of blue steel ore came off the hanging jasper, broke the forepoles and bent the steel H-beams. One pole struck Seppanen, breaking his neck. The rules and regulations were observed by Seppanen and his partner and accordingly this accident was classified as a trade risk. An area had been mined on several sub levels only a few feet ahead of the breast which threw weight on the wedge of jasper hanging that separated the two areas on the sub levels above. The place was being worked on three shifts per 24 hours schedule with an advance of 15 ft. per day. This rapid advance gave no time for the hanging to settle and being subject to more than ordinary pressure it broke and caught Seppanen.

12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION:

E. & A. No. 735, 735-A, & 735-B - Mining Nos. 1 & 2 Shaft Pillars, Diamond & Churn Drilling, & Deep Well

	Estimated Expenditures	Expended 1940	Expended 1939	Total Expenditures	Unexpended Balance
Test Hole No. 8	500.00		1177.72	1177.72	677.72
Base Cost of Well	12704.00	8381.32	8609.43	16990.75	1896.71
Trolley Lines,etc.	1200.00			1267.84	67.84
Telephones,Lights,etc.	300.00			355.16	55.16
Air & Water Pipes	800.00			755.01	44.99
Plat	250.00			278.46	28.46
Air Doors	300.00			389.32	389.32
Retimbering	2000.00			2716.54	716.54
Rail	2500.00			1808.67	691.33
General Shop Work	-			430.34	430.34
Drifting & Raising	15000.00			15606.32	606.32
Scraper Hoists	6500.00			6789.50	289.50
Drill Machines,etc.	800.00			800.00	
Water Cut-off - No.2	1451.96		201.97	1451.96	
Rocker Dump Cars	1080.00			1080.00	
Rebuilding 9th Pockets	1500.00			2632.06	1132.06
Approx. 1650 ft. Diamond Drilling	7000.00		9.84	5941.43	1058.57
Total	56276.00	8381.32	9998.96	60471.08	4195.08
Contingencies	4110.00				4110.00
Grand Total	60386.00	8381.32	9998.96	60471.08	85.08

This E. & A. was completed in May 1940.

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

E. & A. No. 795 - Development of 14th Level

	Estimated Expenditures	Expended 1940	Expended 1939	Total Expenditures	Unexpended Balance
Sinking Shaft 140'	14700.00			14752.53	52.53
Excavating Shaft Pocket Skip Pit Pocket and Plat	10000.00		6087.67	11792.00	1792.00
Rock Drift - 2660'	31920.00	12399.13	1592.26	13991.39	17928.61
Tail Drift at Shaft - 100'	1200.00	1108.25		1108.25	91.75
Raising in Rock-1000'	10000.00				10000.00
Drum for Skip Hoist	1500.00		25.65	759.40	740.60
Trolley Wires, Hangers and Lights	2500.00	776.64	659.10	1925.04	574.96
Rails, Ties, Frogs	3600.00	1508.56	128.23	1791.96	1808.04
Air & Water Lines	1000.00	951.77	97.12	1072.07	72.07
Air Lock Doors	500.00				500.00
Small Sump & Pump House	2000.00	394.37	206.34	777.12	1222.88
Powder House	100.00				100.00
Equipment	3525.00	1207.46		3496.49	28.51
Diamond Drilling	5037.50		2066.11	5151.17	113.67
Counter Balance	-		38.00	520.13	520.13
Total	87582.50	17346.18	10893.48	57137.55	30444.95
Contingencies	8758.25				8758.25
Grand Total	96340.75	17346.18	10893.48	57137.55	39203.20

E. & A. No. NM-1 - Stoker for Shop Boiler

	Estimated Expenditures	Expended 1940	Unexpended Balance
Stoker for Shop Boiler	432.00	467.57	35.57

This E. & A. was closed in March 1940 and the total amount expended charged to operating mine - Shop Building.

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

E. & A. No. NM-2 - Remodeling Change House

	Estimated Expenditures	Expended 1940	Unexpended Balance
Addition to Building	5184.00	5650.95	466.95
Inside Remodeling	2742.00	838.08	1903.92
Heating Changes	1470.14	1169.62	300.52
Traps & Strainers	196.13	86.31	109.82
Controls	249.90		249.90
Piping	875.00	873.15	1.85
Shower Room	214.50	132.32	82.18
Mixing Valves	237.00	128.49	108.51
Piping	450.00	240.18	209.82
Clothes Benches & Hangers	930.00	620.18	309.82
Repair & Relocate Lockers	300.00	200.31	99.69
Lighting	600.00	427.25	172.75
Painting	300.00	75.00	225.00
Relocating Hot Water Tanks	300.00	161.38	138.62
New Lockers	-	323.28	323.28
Total	14048.67	10926.50	3122.17

In 1940 $3513.88 was charged to operating mine - Dry House Building.

E. & A. No. NM-3 - Negaunee Mine Drainage

	Estimated Expenditures	1940 Expended	Unexpended Balance
400' Test Hole (Nos. 10 & 11)	1600.00		
Contingencies	160.00		
Total	1760.00	1039.28	720.72

This E. & A. was closed in September 1940, and the total amount expended charged to operating mine - Pumping Machinery.

E. & A. No. NM-4 - Double Deck Aluminum Cage

	Estimated Expenditures	Expended 1940	Unexpended Balance
One Double Deck Aluminum Cage	2600.00	49.88	2550.12

E. & A. No. NM-6 - Conversion of Three 10 H.P. Scraper Hoists to 15 H.P.

	Estimated Expenditures	Expended 1940	Unexpended Balance
Three (3) 15 H.P. Motors	1332.67	1332.67	-

This E. & A. was closed in July 1940 and the total amount of $1332.67 charged to operating mine - Scraper Equipment.

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

E. & A. No. NM-7 - Two Rocker Dump Cars

	Estimated Expenditures	Expended 1940	Unexpended Balance
Two 65 Cu. Ft. Rocker Dump Cars	850.00	425.00	425.00

The total amount expended in 1940 was charged to operating mine - Electric Tram Equipment - Cars.

E. & A. No. NM-13 - Drum For Skip Hoist

	Estimated Expenditures	Expended 1940	Unexpended Balance
Drum for Skip Hoist	5243.00	5229.75	13.25

13. EQUIPMENT AND PROPOSED EQUIPMENT:

a. Steam Shovels:

No. 7 shovel, owned by The Negaunee Mine Company, was overhauled at the General Shops in the Winter of 1939-1940 and loaded most of the ore shipped. No. 11 shovel was rented from The Cleveland-Cliffs Iron Company for a few weeks to speed up loading from stockpiles at the end of the East steel trestle.

b. Stockpile Trestles:

Wood Trestles:

Four bents of wood trestle were erected in the Fall at the end of the East steel trestle for stocking high Sulphur ore, designated at "Negaunee Special Ore", that comes from development work in the ore body encountered in sinking No. 3 shaft from the 12th to 13th level. Material for twenty-six bents of wood trestle was being assembled in December and will be erected in January 1941 parallel with and North of the East steel trestle for stocking Negaunee Ore after the steel trestles are filled. A section will be reserved for stocking the Maas Strip ore.

Steel Trestles:

A number of treated ties were installed at several points replacing those which had become rotted. A portion of one pier and the braces on the East steel trestle were also painted.

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

c. Scraper Hoists:

Following is a list of scraper hoists at the mine:

Company	On Hand 1-1-1940	Purchased 1940	Total	Cost for Repairs Per Machine 1940	1939
Ing-Rand 10 H.P. Elec.	6	4*	2	53.60	62.66
" 15 H.P. "	12	4*	16	170.91	75.03
" 20 H.P. "	9		9	43.75	10.48
" 25 H.P. "	2		2	82.77	33.56
Sullivan 15 H.P. "	14		14	118.23	43.01
" 20 H.P. "	2		2	29.58	9.10
" 25 H.P. "	2		2	11.72	-
Gard-Den 15 H.P. "	2		2	49.26	
Total	49	-	49		
Lake Shore Engine Works 25 H.P. Electric Scraper Slide	2	-	2	140.01	167.74

Scrapped, sold or transferred None

(*) No hoists were purchased in 1940 but four 10 H.P. Ingersoll-Rand electric hoists were converted to 15 H.P. hoists at a cost of $1759.73.

The total amount expended in 1940 for repairs, including new wire ropes for scrapers which cost $9545.31, was $21336.78. For repairs to scrapers, scraper blocks, chains, etc., $5010.46 was expended. The balance was expended for repairs of scraper hoists.

d. Underground Tram Cars:

Two new rocker dump cars were purchased late in 1940 at a cost of $425.00 each, of which one was charged out in December. During the year a number of cars were repaired in the General Shops.

e. Drill Equipment:

There were two Ingersoll-Rand SBR-85 stopers purchased in 1940 at a cost of $366.23 each. These were charged to E. & A. No. 795 - Development of 14th Level.

f. Haulage Tracks:

Due to development of the 14th level and new cross-cut on the 13th level, more new track was installed than in 1939. The expense for both 1940 and 1939 was as follows:

	1940	1939
40-lb. Rail	946.25	417.26
Steel Ties & Tie Plates	236.47	155.82
Manganese Frogs	240.00	94.25
Total	1422.72	667.33

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14. MAINTENANCE AND REPAIRS:

Due to the increased working schedule maintenance expense was higher in 1940. Expenditures for maintenance and repairs in the accounts listed under "Underground Costs" increased $14172.54. The amount expended in 1940 was $44715.11 compared with $30542.57 in 1939. The cost per ton decreased $ .003 in 1940.

Following is a list of purchases and repair costs:

1 Rocker Dump Car	$ 425.00	
39 Circuit Breakers	920.24	
4 - 15 H.P. Motors	1759.73	
1 - 40 H.P., A.C. Motor for Deep Well	434.00	
1 - 10 KVA Transformer	100.00	
Total Cost New Undg. Equipment		$ 3638.97
Repairs to Compressors	463.42	
Repairs to Scraper Hoists, Scrapers, etc.	9111.50	
Cost of 3/8" & 1/2" Wire Rope for Scrapers	9545.31	
Repairs to Generator & Wiring	1512.02	
Repairs to Locomotives	6291.64	
Haulage Tracks	3930.65	
Repairs to Haulage Cars	6012.11	
E. & A. No. NM-3 - Negaunee Mine Drainage	1039.28	
Repairs to Pumping Machinery	3170.21	
Total Repair Costs		41076.14
Grand Total Purchases and Repairs		44715.11

Expenditures in the accounts listed under "Surface Costs" increased $7283.21. The cost per ton decreased $ .001 in 1940. The amount expended in 1940 was $19694.85 compared with $12411.64 in 1939.

Following is a list of the items making up the charges in each account:

3 New hoisting ropes	$ 1985.82
Repairs to skip hoist motor	669.93
Repairs to skips and cages	3203.09
Repairs to hoists, etc.	1822.31
Repairs to top tram engines	297.55
Repairs to tracks and cars	653.02
Wire rope, sheaves, and rollers	881.05
Repairs to permanent trestles	117.29
Repairs to shaft house pockets	675.57
One-third of 1940 expenditures on modernization of dry house - E. & A. No. NM-2	3513.88
Stoker for shop building	467.57
Repairs to mine buildings	2443.25
Repairs to shaft and pockets	2964.52
Total	19694.85

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15. POWER:

The following is a detail of electric current purchased, distribution of charges to various accounts, and other data:

	1940 - 12 Months Optg.		1939 - 12 Months Optg.	
	Cost	Cost Per Ton	Cost -	Cost Per Ton
Stoping	2400.00	.0028	1923.00	.0035
Timbering	96.00	.0001	85.12	.0002
Compressors	39870.06	.0467	32488.24	.0589
Ventilation	7353.25	.0086	6351.45	.0115
Pumping	21118.86	.0247	25597.58	.0465
Hoisting	25921.85	.0303	19582.46	.0355
Stocking Ore	195.49	.0002	206.50	.0004
Dry House Expense	236.51	.0003	235.40	.0004
Tel. & Safety Devices	1152.00	.0013	893.00	.0016
Mine Office	63.78		58.47	.0001
Electric Haulage	8130.65	.0095	4954.42	.0090
Shops	332.44	.0004	182.98	.0003
District Carpenter Shop	11.67		10.27	
Total	106882.56	.1249	92568.89	.1679
Increase Expenditures - 1940	14313.67			
Decrease Cost Per Ton - 1940	.0430			
Main Line Meter - K.W. (*)		7,898,240		6,658,912
Separate Meter Reading - K.W.		7,823,416		6,541,717
Line Loss - K.W.		74,824		117,195
Product - Tons		865,689		551,362
K.W. Per Ton (Inc. Line Loss)		9.12		12.06
Cost Per K.W. (Avg. for year)		.0135		.0139
15 Min. Demand - K.W. (Avg. for year)		1629		1547
Load Factor (Avg. for year)		60%		52%

(*) Less Maas charges

Due to the increase in the operating schedule in 1940 the load factor was more favorable resulting in a decrease of $ .0004 in the cost per K.W. Attention is called to the decreased expenditures for electric current for operating pumps of $ 4478.72 and due to larger product $ .0218 per ton.

17. CONDITION OF PREMISES:

a. Mine Grounds:

The premises at the mine were kept in good condition during the year. The shrubbery plantations were given more than ordinary attention as severe pruning was necessary, also all weeds and grass were removed. The pine plantation on the hill side between the engine house and the shaft was cleaned, all dead limbs and trees being removed. The severe storms of the past three years have played havoc with the pine trees in this plantation.

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17. CONDITION OF PREMISES: (Cont'd)

b. Negaunee Mine Houses:

There were seven houses sold in 1940. There are now only four houses owned by The Negaunee Mine Company. There are eight families living in the four houses. The cost of repairs in 1940 was $ 808.90 compared with $ 3037.08 in 1939 for repair of eleven houses. The revenue from rented buildings in 1940 was $ 1552.05.

18. NATIONALITY OF EMPLOYEES:

The nationality record of employees is submitted in two forms, one as to parentage, the other as to country of birth.

As to Parentage	1940	%	1939	%
Finnish	214	47.1	182	46.6
English	67	14.8	57	14.6
Italian	66	14.5	57	14.6
Swedish	41	9.0	36	9.3
French (Canadian)	35	7.7	31	7.9
French (France)	1	.2	1	.2
Austrian	11	2.4	10	2.6
Norwegian	2	.5	3	.8
German	7	1.5	7	1.8
Danish	3	.7	3	.7
Belgian	2	.5	1	.2
Irish	2	.5	2	.5
Polish	1	.2	1	.2
Dutch	1	.2		
Jugoslavia	1	.2		
Total	454	100.0	391	100.0

As to Birth	American Born		Foreign Born	
	1940	1939	1940	1939
Finnish	135	105	79	77
English	52	39	15	18
Italian	37	29	29	28
Swedish	33	25	8	11
French (Canadian)	34	30	1	1
French (France)			1	1
Austrian	9	8		2
Norwegian	2	2		1
German	7	7		
Danish	3	3		
Belgian	2	1		
Irish	2	2		
Polish	1	1		
Dutch	1			
Jugoslavia	1			
Total	319	252	135	139
	70.2%	64.4%	29.8%	35.6%

NORTH JACKSON MINE
ANNUAL REPORT
YEAR 1940

1. GENERAL:

This property has been idle for thirty-two years.

6. SURFACE:

During 1939 new fences were erected around the West half of the North Jackson pit and around some of the pits South of the old Jackson office. During 1940 an inspection was made and minor repairs made where they were needed.

The interior of the four apartment building which was formerly the old mine office was completely redecorated in 1939 and therefore required very little attention during 1940.

10. TAXES:

	1940		1939	
	Valuation	Taxes	Valuation	Taxes
47% of Jackson Realty Sec. 1-47-27	220,000	$ 7,749.20	220,000	$ 8,086.81
Collection Fees		77.49		80.87
Total	220,000	$ 7,826.69	220,000	$ 8,167.68
Rented Buildings				
Old Jackson Office	700	$ 24.81	700	$ 25.90
Grand Total	220,700	$ 7,851.50	220,700	$ 8,193.58
City of Negaunee Tax Rate Per $100.00 Valuation		3.508		3.661

Taxes decreased due to a lower city tax rate.

SOUTH JACKSON MINE
ANNUAL REPORT
YEAR 1940

1. GENERAL:

There was no change in conditions at this idle property during 1940.

4. ESTIMATE OF ORE RESERVES:

a. Available Ore:

Above present pit available by present system of mining:

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

Below present pit and above drainage tunnel available by milling:

West of crusher	186,000 tons
Area below bottom of present pit shown by churn drilling	105,226 "
Total	291,226 "
Grand Total	334,226 "

c. Estimated Analysis:

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

6. SURFACE:

The fences and shaft covering were inspected during the year and repairs madewhere necessary.

10. TAXES:

	1940 Valuation	1940 Taxes	1939 Valuation	1939 Taxes
53% of Realty as described Sec. 1-47-27	249,100	$ 8,738.45	249,100	$ 9,119.14
Collection Fees		87.39		91.19
Total	249,100	$ 8825.84	249,100	$ 9,210.33
City of Negaunee Tax Rate Per $100.00 Valuation		3.508		3.661

The taxes decreased due to a decrease in the City of Negaunee tax rate.

SECTION 2 DEVELOPMENT

ANNUAL REPORT

YEAR 1940

1. GENERAL:

Diamond drill exploration of Section 2, 47-27 proved sufficient ore reserve to open a mine on the completion of hole Nos. 44 and 45 in August. During the time drilling was underway earlier in the year, information had been gathered on modern deep shafts of large capacity so that many of the details could be settled immediately the decision was reached on opening the property.

The several agreements relative to the ownership and operation of the mine were signed by the Company and the Bethlehem Steel Corporation on October 31st. These provide for the sinking and equipping of a shaft capable of handling at least 1,600,000 tons per year. The location of the shaft was agreed upon by the partners in September at which time it was agreed that the equipment should be capable of hoisting 1,800,000 tons per year from a shaft having a depth of 3500 feet. Construction of a spur track to the shaft site was started by the L. S. & I. Rd., and the grading for this line was finished at the end of the year. Meanwhile temporary buildings and a timber headframe had been erected in readiness for shaft sinking operations expected to start on January 6, 1941.

4. ESTIMATE AND ANALYSIS OF ORE RESERVES:

It is estimated that the ore now disclosed by drilling on Section 2 represents at least 10,000,000 tons and that future possibilities are very great.

Without considering the ore disclosed in holes Nos. 44 and 45 in the $SE\frac{1}{4}$ of Section 2, the composite analysis of the 412 feet of ore disclosed in holes Nos. 16, 27a, 37, 38, 39 and 40 on the $S\frac{1}{2}$ of the $NE\frac{1}{4}$ of the Section is as follows:

Fe	Phos.	Sil.	Mang.	Sul.	Alum.	Lime	Mag.	Ignition Loss
60.75	.139	5.80	.28	.016	3.00	.66	.69	2.25

5. LABOR AND WAGES:

A. Comments:

There was an oversupply of carpenter and common labor necessary for the construction of the temporary surface plant. The working schedule of 40 hours per week was maintained, and the wage schedule followed has been in effect since March 16, 1937. It is planned to draw upon the most capable and experienced miners available at

the Company properties for the shaft sinking crews at the beginning of 1941.

b. Statement of Wages:

Average No. Men Working	
Surface	25
Average Wages per Day	
Surface	5.53
Wages per Mo. of 22 Days	
Surface	121.66
Total No. Days	
Surface	2326
Amount for Labor	
Surface	$12,860.04

6. SURFACE:

a. Buildings:

Construction of the temporary buildings for the initial shaft sinking period was completed in December. North and west of the shaft a dry-warehouse-office building, a shop building and an engine house were erected, as well as a 55' timber headframe over the shaft. The buildings are of frame construction lined and insulated with 1/2" nu-wood.

The heating boiler was placed in the shop building with overhead lines and gravity returns from the other 3 structures. Water is purchased from the City of Ishpeming, the City having extended a six-inch main a distance of 2500' to the site in November. Sewage disposal is through a septic tank located 500' east of the buildings so as to eliminate any chance of contaminating Lake Bacon to the west of the property. Construction of the buildings, and installation of a rented hoist and compressor was authorized under E&A No. NM-10, detail of which appears later in the report.

The permanent buildings will be located south of the shaft, and a large U shaped dry, shops and engine house, and separate office are proposed. The steel headframe, in order to handle the large future mine production will be the highest in the Lake Superior District, extending about 190' above the shaft collar. Permanent steel trestle leads are planned which will provide for stocking ore in 3 piles to a height of 60'. Bids have been received on several of these projects, and work is expected to get underway in the Spring.

Two dwellings which were located immediately west of the shaft site were moved by a contractor in October. Concrete foundations were prepared on Company owned lots at the east end of Wabash Street, and the houses transported to their new sites on rollers. E&A No. NM-9 in the amount of $3,458.00 covered this expense.

b. Transmission Lines

The Cliffs Power and Light Co. early in September constructed a pole line approximately 4000' long running in a general northwesterly direction to the shaft site from the main Ishpeming-Negaunee transmission line. The line is 30,000 volts, No. 2 conductor, and is stepped down to 2,300 volts and less, at a temporary transformer station 300' southwest of the shaft.

c. Railroad Tracks

The location of the railroad spur to the new mine was studied carefully in connection with the ore developed by drilling in the east half of Section 2. The route selected was to branch westerly from the main line of the L. S. & I. Railroad along Bluff Street in the City of Negaunee. Thence north of Lily Pond and to the north of the thin sections of ore disclosed by drill holes 16 and 39, and continuing due west from the shaft a short distance into Section 3. This line will be about 2 miles in length, and together with side tracks for timber and stockpiles, the total length of tracks will be about 6 miles.

The necessary property was acquired and the City of Negaunee immediately consented to vacating part of Bluff Street. A contract was then let by the Railroad Co. to Alfred Lindberg & Sons of Ishpeming, and the grading for the tracks to the shaft was finished shortly before the end of the year. About 120,000 cu. yds. of material was handled and practically all of the construction was in sand or gravel. The L. S. & I. section crew was ready to begin laying track and, weather permitting, expected to reach the shaft before the end of January.

7. UNDERGROUND:

a. Shaft Sinking

The site selected for the Section 2 hoisting shaft was near the center of the northwest quarter. Many layouts were compared before this position was chosen as affording the best combination of favorable surface topography, location of the footwall quartzite at depth, and relationship of the "corner" position of the shaft to the probable trend of the ore so far developed by deep drilling. Depth of overburden was tested using a 9" churn drill rented from the Tilden Mine. Hole No. 47 disclosed the water level at 42' and continued in sand, gravel and boulders to the diorite ledge at a depth of 74'. Hole No. 48, 50' to the northeast in the direction of the outcrop, intersected the ledge just below the water level at a depth of 43 to 44'. This hole was continued as an initial opening to break to in the shaft blasting operation, and stopped in hard jasper at a depth of 463' after disclosing the diorite-jasper contact at a depth of 448'. Shaft sinking is expected to continue in jasper to a depth of approximately 1800', the footwall Siamo slates to about 2500' and in quartzite below. Plans were completed at the end of the year to start sinking in the overburden. The shaft will be timbered in this section to provide the outside form for setting the steel in a 2' concrete wall extending from below the ledge to the collar.

b. Shaft Design

The size of the Section 2 Shaft, in combination with the rope speed, has been designed for a capacity of about 2500 tons per 8 hour shift, or 1,800,000 tons per year. This large capacity was provided in a two skip shaft by holding to a medium hoisting

speed of 2400' per minute, and increasing the skip size to 12 tons. This heavier weight in turn is to be guided by 80 lb. rails instead of wood runners, and the rails are to be supported by 25 lb. H sections of alloy steel spaced on 7' centers.

The cage compartment on the west side is sufficiently large to provide space for 70 to 75 men on a double deck cage, and four wood runners instead of the usual two are included in the design. The pipe and ladder compartment is placed between the cage and skips for convenience in reaching either for repairs, but with a 3/16" steel plate dividing on the skip side to confine spillage to that compartment.

The outside dimensions of the shaft are 13'-0½" by 18'7". The cage road is 12'-0" by 6'-6" inside, the pipe and ladder compartment 12' by 4', and the 2 skip compartments each 5'-9" by 6'-0". The steel sets are spaced by corner studdle angles 6"x6"x½" size, and 4 smaller interior studdles. The 50-lb. 12" I-beam bearers will be spaced approximately every 100'. Except for the 80-lb. rail guides, the shaft steel will all be of Bethlehem Mayari-R low-alloy, high strength steel, which has a corrosion resistance about 6 times that of ordinary carbon steel.

9. EXPLORATIONS AND FUTURE EXPLORATIONS

Diamond drill exploration of Section 2 was resumed early in March, having been stopped in June 1939 due to the general curtailment. Hole numbers 44 and 45 were completed in the Siamo footwall slates after the former had penetrated 218', and the latter 73' of high grade ore. The disclosure of ore in these holes at greater depth than those in the north half of the section revealed a complicated structural relationship, the details of which are covered in the annual report of the Geological Department.

Additional drilling to more clearly define the ore outlines in the east half of the Section will probably be the next exploration step, but this can be deferred until the Section 2 shaft is well underway toward the initial 2900' depth.

10. TAXES

The Negaunee Mine Co. taxes on Section 2 in the City of Ishpeming for the year 1940 amounted to $7,911.05 made up as follows:-

	Valuation	Taxes
NE¼ of Sec. 2-47-27 Ex. N. 600' NE of NE	$200,000	$6,894.98
NW¼ of Sec. 2-47-27	12,300	424.05
N½ of SE¼ of Sec. 2-47-27	4,200	144.80
S½ of SE¼ of Sec. 2-47-27 Ex. R.'s of Way	3,300	113.77
NE¼ of SW¼ of Sec. 2-47-27	1,700	58.61
W½ of SW¼ of Sec. 2-47-27 Ex. R.'s of Way	4,000	137.90
SE¼ of SW¼ of Sec. 2-47-27 Ex. R. of Way	1,700	50.61
Total -	$227,200	$7,832.72
Collection fees -		78.33
Total Taxes -		$7,911.05

The additional ore located on the SE¼ and the starting of the shaft on the NW¼ is bound to result in a large upward revision of both valuations and taxes in 1941.

SECTION 2 DEVELOPMENT
ANNUAL REPORT
YEAR 1940

11. ACCIDENTS AND PERSONAL INJURY:

The temporary surface plant preparatory to shaft sinking was built without loss of time from accidents. The moving of heavy machinery parts entailed probably the greatest hazard, and this work particularly was closely supervised. Skilled miners and foremen will be selected for the shaft work soon to start and, drawing on the long experience of the safety department, accident prevention will be studied and planned to use this experience to the fullest advantage.

12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION:

Construction of the temporary surface plant under Estimate and Authorization No. NM-10 was started September 18th. The four main units built were the office-changehouse, shops, timber headframe and engine house. All were ready for use at the end of the year, and a detail of the estimate and expenditures to December 31st follows:-

	Estimate	Expenditures
Transfer of Equipment	$4,700.00	$4,298.32
Temporary Buildings		
Tool Shed	700.00	196.13
Office-changehouse	6,675.00	4,329.87
Shop Building	4,925.00	1,836.12
Engine House	5,300.00	3,287.08
Headframe	3,300.00	2,846.13
Heating and Plumbing	1,000.00	1,652.18
Miscellaneous	1,700.00	4,541.40
Total	$28,300.00	$22,987.23
10% for Social Security, etc.	2,830.00	841.05
Grand Total -	$31,130.00	$23,828.28

The tool shed will be converted for use as an oil house, and the interior of the shop building will be finished after installation of the drill sharpener, bit grinder, etc. The large expenditure under miscellaneous includes some charges not directly applicable to the temporary buildings, but for which separate accounts had not yet been set up at the end of 1940.

A record construction program is planned for development of the property in 1941. While shaft sinking is underway construction of the permanent surface plant is scheduled to include erection of the steel headframe and part of the permanent trestle system, the U-shaped main building and the office building and shaft tunnels, together with grading for tracks, stockpile grounds, roads, etc. Contracts for the headframe, trestles and buildings are expected to be let shortly after the first of the year with construction expected to get underway early in the Spring. A progress schedule has been prepared in conjunction with the purchasing department listing the construction and equipment needs in order to facilitate control of the work and material deliveries.

SECTION 2 DEVELOPMENT
ANNUAL REPORT
YEAR 1940

13. EQUIPMENT AND PROPOSED EQUIPMENT:

Part of the temporary equipment installed for the initial shaft sinking period was rented from other Company mines. The single drum Ottumwa hoist was moved from the Lloyd Mine, and a 1000 C.F.M. Ingersoll-Rand compressor from the Cliffs Shaft Mine. These are to be returned when the Section 2 equipment is ready for use. The first equipment E.&A. approved was No. NM-8 which authorized the purchase of a 5-ton truck and an RD-8 diesel tractor with hydraulic trail builder and a 13 cu.yd. Athey trailer. The amount was $18,575.00, and the equipment was received and placed in use in December at a cost of $18,289.42.

The next E.&A. was No. NM-11 which authorized the purchase of drill sharpening and bit grinding equipment, an acetylene outfit, etc., for the temporary shops. This equipment will later be transferred to the permanent building and the estimated cost was $5,700.00. These two preliminary E&A's are to be followed early in 1941 by an estimate of the cost of developing the Section 2 property to the production stage, which will list the proposed equipment, plant and operating expenditures. The major equipment installation in 1941 will be the permanent hoisting and electrical plant which is expected to cost in the neighborhood of $500,000.

14. MAINTENANCE AND REPAIRS:

The compressor, the hoist electrical equipment and the heating plant boiler were overhauled when installed. The compressor and hoist motors were taken to the central shops, thoroughly cleaned and the windings repainted. Major repairs were necessary on the 50 H.P. boiler which came from the Gwinn District Pumping Plant, and the rental charge on this unit was therefore adjusted accordingly.

The initial shop equipment at Section 2 will be sufficient to take care of minor repairs and adjustments. The permanent shops will be more thoroughly outfitted, but still with the intention that general overhauling jobs and major electrical and machinery repairs will be handled in the Ishpeming central shops.

18. NATIONALITY OF EMPLOYEES:

	American Born	Foreign Born
American	5	
English	2	1
Finnish	2	
Canadian		1
Swedish	3	1
French	1	
Norwegian	2	
Irish	1	
Total -	16	3
	84%	16%

FRANCIS MINE
ANNUAL REPORT
YEAR 1940

1. GENERAL

This mine was abandoned in 1924. The steel headframe is the only structure remaining on the property. The last of the stockpile ore was shipped in 1939.

10. TAXES

	1940		1939	
	Valuation	Taxes	Valuation	Taxes
SW¼ of NW¼ Sec.27,45-25	0	0		3.80
Personal property			20,000	376.60
Total				380.40
Collection Fee				3.77
Total Taxes				384.17

GARDNER MACKINAW MINE
ANNUAL REPORT
YEAR 1940

1. GENERAL

The Gardner Mackinaw Mine has been closed to production since June 1st, 1938, with the result that no ore was produced. On December 10th word was received from Cleveland to arrange to abandon the mine. Work was immediately started to remove all usable equipment or that material which could be salvaged. By December 31st the hoisting equipment on the 5th Level had been removed and work was underway toward salvaging rail and other merchanical equipment on the 5th Level.

The only work which was performed during the year, with the exception of pumping operations which will be described under that heading, was to maintain the Mackinaw shaft and 3rd, 4th and 5th Level drifts. In the following pages of this report, only those headings will be used which have resulted in any change during the year, with the exception of the estimate of ore reserves which have been recopied. Any other information necessary can be found in its complete form in the 1938 annual report.

2. PRODUCTION SHIPMENTS & INVENTORIES

b. Shipments

Grade of Ore	Pocket Tons	Stockpile Tons	Total Tons	Total Last Year
Gardner	0	3,725	3,725	2,775
Mackinaw	0	62,221	62,221	46,366
Total	0	65,946	65,946	49,141

c. Stockpile Inventories

	12-31-40	12-31-39	Decrease
Gardner	561	4,286	3,725
Mackinaw	9,380	71,601	62,221
Total	9,941	75,887	65,946

f. Ore Statement

	Gardner	Mackinaw	Total
On hand 1-1-40	4,286	71,601	75,887
Shipments	3,725	62,221	65,946
Balance on hand	561	9,380	9,941

GARDNER MACKINAW MINE
ANNUAL REPORT
YEAR 1940

3. ANALYSIS

b. Average Analysis on Straight Cargos

There were no straight cargos forwarded from the mine, all shipments being graded with other ores, however the analysis of ore shipped is as follows:

Grade	Tons	Iron	Phos.	Sil.	Mang.	Al.	Lime	Mag.	Sul.	Ign.	Moist.
Mackinaw	65,946	59.80	.422	.270	.29	1.95	2.89	.97	1.057	2.80	11.72

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
Estimate is of available ore (merchantable) as well as high phosphorus ore (unmerchantable)

Non-Bessemer	Tons-Merchantable	Tons-Nonmerchantable
5th to 6th Level	21,675	30,834
6th to 7th Level	20,382	88,475
7th to 8th Level	34,560	81,044
8th to 9th Level	22,223	91,713
9th to 10th Level	2,728	308,388
Below 10th Level	13,416	224,817
Total developed ore 12-31-40	114,984*	825,271*

Due to the room and pillar mining method, this figure represents 50% of the total ore reserves.

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

,	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Ign.	Moist
Mackinaw	52.64	.445	3.08	.22	1.92	2.38	.89	.898	1.78	11.00

Ore in Stock; Average Natural Analysis

Mackinaw	53.40	.379	2.51	.27	1.70	2.20	.88	.947	1.99	10.70

The slight change in the expected analysis is the result of a reduction in moisture and to a somewhat better grade of ore developed on the 6th Level.

GARDNER MACKINAW MINE
ANNUAL REPORT
YEAR 1940

7. UNDERGROUND

d. Timbering

Vertical Shaft
During the month of June a careful inspection of the vertical shaft was made and as a result a considerable footage of casing plank was replaced. The shaft was gauged and all runners in the cage road were brought to their proper gauge.

3rd Level
An inspection was made during the summer to determine the condition of the drifts and raises which have ordinarily been used from the Mackinaw Mine proper to the Gardner shaft. As a result a small amount of retimbering was done at the junction of the 3rd Level drift and the ore body. In most cases, the timber was renewed largely due to its rotted condition and not because of any ground movement or shifting weight.

4th Level
A small amount of timbering and general repair work was done on the 4th Level in an effort to maintain the drift leading from the pump house to a raise in the ore body leading to the 5th Level. This raise was used to carry the pipes which were used during pumping operations. This repair work was necessary due to the fact that the pumpman's helper made daily inspection trips from the 4th and 5th levels.

5th Level
Several new steel sets and treated timber sets were put in on the main 5th Level drift in the vicinity of the incline shaft pockets. Minor repairs were also made when necessary on this level at points where travel was necessary.

k. Pumping

4th Level
The general pumping shcedule during the year 1940 was the same as that in 1939. The gallons per minute pumped as indicated by the accompanying table, do not fluctuate to any great extent, although the average shows an increase of 8 gallons per minute for the year. During July the Prescott centrifugal pump, which had been used to maintain one pump for an emergency, was boxed in with heaters to prevent moisture from getting into the motor. All pumping was done by the 1000 gallon Aldrich pump.

5th Level.
There was no change in the general pumping set-up in the sump located in No. 4 stope, approximately 20' below the 5th Level. Two centrifugal pumps were used intermittently, although one was connected to an automatic shut-off to allow pumping to continue during periods when the regular pumps were inactive.

GARDNER MACKINAW MINE
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YEAR 1940

7. UNDERGROUND (Cont.)

k, Pumping (Cont.)

Month	1940	1939	1938	1937	1936
January	259	122	119	123	137
February	276	187	126	121	126
March	273	252	146	119	130
April	268	258	152	119	130
May	277	246	173	117.9	133
June	246	256	152	116	125
July	254	259	82	115	130
August	257	255		98	123
September	255	260		106	124
October	251	258		114	124
November	249	255	70	112	119
December	241	261	57	117	123
Total Average	247	239	102	115	127

8. COST OF OPERATING

	1940 Amount	1940 Per Ton	1939 Amount	1939 Per Ton
Underground Costs				
Geological Dept. Expense.....	$ 39.61		-	
Timbering.....	465.52		$ 3,449.75	
Pumping.....	16,791.75		17,512.03	
Compressors and Air Pipes.....	291.68		6.81	
Underground Suptnce.....	115.39		889.22	
Maint: Pumping Machinery.....	1,541.68		1,673.24	
Total Underground Costs....	19,245.63		23,531.05	
Surface Costs				
Hoisting.....l.....	648.81		1,353.15	
Dry House.....	-		52.11	
General Surface Expense.....	1,345.33		1,345.27	
Maint: Hoisting Equipment.....	1,445.48		339.07	
Shaft.....	212.67		78.99	
Mine Buildings.....	163.18		66.18	
Total Surface Costs.....	3,815.47		3,234.77	
Total General Mine Expense	7,336.03		6,513.03	
Loading & Shipping				
Steam Shovel.....	5,840.58	.099	3,658.12	.074
District Crusher.....	4,136.08	.071	2,531.30	.052
*Total Loading & Shipping....	9,976.66		6,189.42	
Taxes.....	3,466.31		4,015.10	
TOTAL COST.....	45,862.10		43,483.37	
Supply Inventory Adjustment,....	2.16		39.39	
TOTAL.....	45,859.94		43,443.78	

* Increase over 1939 due to larger stockpile shipments

GARDNER MACKINAW MINE
ANNUAL REPORT
YEAR 1940

10. TAXES

	1940		1939	
GARDNER MINE - C&NW LEASE	Valuation	Taxes	Valuation	Taxes
SE¼ of SE¼, Sec.35,45-25	2,000	41.32	2,000	37.66
NE¼ of SW¼, Sec.35,45-25.....	1,000	20.66	1,000	18.83
NW¼ of NE¼, Sec. 2,44-25.....	1,000	20.66	1,000	18.83
Personal property.....	80,000	1,652.70	125,000	2,353.66
Total.....	84,000	1,735.34	129,000	2,428.98
Collection Fee.....		17.25		24.29
Total Taxes.....		1,752.69		2,453.27
MACKINAW MINE - DM&N LEASE				
N½ of SE¼ of SW¼, Sec.35,45-25.....	81,000	1,673.40	81,000	1,525.18
S½ of SW¼ of Sec. 35,45-25.....	1,125	23.25	1,125	21.19
Total.....	82,125	1,696.65	82,125	1,546.37
Collection Fee.....		16.97		15.46
Total Taxes.....		1,713.62		1,561.83
TOTAL GARDNER MACKINAW MINE..	166,125	3,466.31	211,125	4,015.10

15. POWER

K. W. H. USED

	1940	1929
Mackinaw Hoist & Lighting	10,059	12,289
Compressors.....	11,580	7,030
Electric Haulage.....	6,600	4,500
Shops.....	1,794	1,153
Underground Hoist.....	4,904	11,921
Pumping & Lighting.....	624,629	704,392
Total.....	659,566	741,285
In Cash.....	$ 12,796.90	$ 13,302.12
Cost per KWH.....	.0194	.0180

GWINN DISTRICT GENERAL
ANNUAL REPORT
YEAR 1940

1. GENERAL

Conditions in the District were about the same as in 1939. Since the active operations at the Mackinaw Mine stopped on June 1st, 1938, most of the mining men of the district have found employment at the Company mines in Negaunee, Ishpeming or North Lake. They commute morning and evening. The Mackinaw Mine continued pumping throughout the year but orders were received December 10th to abandon the mine as soon as underground equipment could be salvaged. This was started immediately. Pumping will stop about the middle of January.

There was considerable work by local timber operators getting out mine timber and saw logs.

Schools

The enrollment for the year was as follows:

Elementary grades	289
7th to 12th grades inc.	272
Total	561

an increase of 5 over 1939.

In the above are 45 pupils from Wells Township who are transported 20 miles, through unsettled country, each morning and afternoon.

A brick three bus garage was built at the High School during the year. The school grounds, running track, sidewalks were improved by W.P.A. labor.

Houses & Lots

Although there is now no regular established industry in the district, practically every house was occupied. One old Princeton house was sold.

Townsite

In the spring 47 White Pine and 27 Norway Pine trees were planted in the park area between the roadways on Pine Street, while 20 trees of several varieties were planted in the Common. This work was done by W.P.A.

Company men replaced trees destroyed on Ash, Maple, Elm and Oak Streets.

1. GENERAL (Cont.)

New Highway Bridge
During the latter part of the summer, the Michigan State Highway Department let a contract to A. R. Proksch of Iron River for a new steel and concrete bridge over the East Branch near the Gwinn railroad station. This was opened for traffic in November. It is on M-35 and is located 200 feet east of the old bridge leading to the station. The latter was too light for present day service. The new bridge is of pleasing design and the approach on both sides will be attractively landscaped.

Civilian Conservation Corps
Escanaba River Camp #1620 located 18 miles southwest of Gwinn, continued through the year. There is an enrollment of about 180 boys from Marquette and Dickinson Counties.

Municipal Skating Rink
W. P. A. labor was used to build an ice rink in Gwinn. It is well attended by the people of Gwinn and vicinity. It is located on Lots 11, 12 and 13 of Block 14, Gwinn.

Gwinn State Savings Bank
This bank started business in November 1908 and has operated successfully ever since. During the past summer the directors thought that it might be wise to liquidate the bank, as most of the stockholders and all of the directors were not residents of Gwinn. The matter was laid before a committee of Gwinn residents. They felt the town could not afford to lose the bank. A subscription committee received pledges from Gwinn residents to buy the stock held by the old stockholders; this stock to be paid for partly in cash and partly in Preferred Stock in a re-vamped capital structure approved by the Michigan Banking Department. The transfer was made about the middle of November, a new board of directors being chosen at that time. There was no interruption in business. The present bank should do well if it receives proper local support.

Township Marshall
A TownshipMarshall (Deputy Sheriff) has been employed in Gwinn since 1908. His salary is borne jointly by Forsyth Township and the Company on about a 50-50 basis. The Company donation is on account of his supervision over the Company watchmen and Company interests in general.

During the year the Marshall who had been employed for several years was transferred to Ishpeming to supervise the Company watchmen in the Ishpeming, Negaunee and North Lake Districts. He was succeeded in Gwinn by a local resident and former Company employee.

1. GENERAL.(Cont.)

a. Statement Showing Total Ore Produced in District by C.C.I.Co. 1903 to 1940 inclusive.

YEAR	AUSTIN	PRINCETON	STEPHENSON	GWINN	FRANCIS	GARDNER MACKINAW	TOTAL
Total to 1940	1,589,018	1,584,433	3,835,157	988,665	504,667	1,289,118	9,790,958

b. Statement Showing Ore Shipments by C.C.I.Co. from 1905 to 1940

YEAR	AUSTIN	PRINCETON	STEPHENSON	GWINN	FRANCIS	GARDNER MACKINAW	TOTAL
Total to 1940	1,589,018	1,463,636	3,778,792	988,325	502,131	1,216,627	9,538,529
1940	0	273	28,541	0	0	65,946	94,760
	1,589,018	1,463,909	3,807,333	988,325	502,131	1,282,573	9,633,289

c. Ore in Stock at Mines, December 31, 1940

Princeton	Stephenson	Gardner Mackinaw	Total
120,424	21,834	9,941	152,199

10. TAXES

The following statement gives the taxes in detail for 1940 and 1939 for all company properties in the district. The mine taxes in the summary show totals only, as the detail for each mine is included in the mine report.

The summary also includes the taxes paid by the Cliffs Power & Light Company in order to show the total taxes paid in Forsyth Township by the company, exclusive of those paid by the Land Department.

Forsyth Township		1940 Valuation	1940 Taxes	1939 Valuation	1939 Taxes
Mineral Lands, Gwinn					
SW¼ of SW¼, Sec. 26,45-25	45 A.	100	2.06	100	1.89
NE¼ of SE¼, Sec. 28,45-25	40 A.	100	2.06	100	1.89
N½ of NE¼ of Sec.34,45-25	80 A.	200	4.14	200	3.76
SE¼ of NE¼, Sec. 34,45-25	40 A.	100	2.06	100	1.89
NE¼ of NW¼, Sec. 34,45-25	40 A.	100	2.06	100	1.89
NE¼ of SE¼, Sec. 34,45-25	40 A.	100	2.06	100	1.89
NW¼ of Sec. 35,45-25	160 A.	400	8.26	400	7.53
Lots 1, 2 and 3, Sec.36,45-25	52 A.	125	2.61	125	2.36
Lots 7, 8 and 9, Sec.36,45-25	98.42 A.	260	5.36	260	4.91
Lot 11, Sec. 36,45-25	13.3 A.	25	.51	25	.48
Und. 1/2 of S½ of NE¼, Sec.28,45-25	80 A.	300	3.10		
TOTAL		1810	37.36	1510	28.49
Collection Fee			.36		.29
TOTAL TAXES			37.72		28.78

10. TAXES (Cont.)

Gwinn Townsite - Surface Only	1940 Valuation	1940 Taxes	1939 Valuation	1939 Taxes
Lot 2, Section 21,45-25 (Purchased 1940)	100	2.06		
NE¼ of SW¼, Sec.21,45-25, not included in plat, 6 acres	100	2.06	100	1.89
NE¼ of NW¼, Sec.21,45-25, 17.54 acres	150	3.11	150	2.82
That part of S½ of NW¼, Sec.21,45-25 not included in Plat of Gwinn, 25.01 A.	200	4.14	200	3.76
E½ of SE¼, Sec. 21,45-25, 65.84 Acres	150	3.11	150	2.82
That part of W½ of SE¼, Sec.21,45-25 not included in Plat of Gwinn, 38.80 acres	300	6.20	300	5.66
Gwinn Townsite Plat	86,300	1,785.33	86,300	1,625.17
Supt. Res. 1.2 A. part W½ of SE¼,Sec.21	1,500	30.99	1,500	28.25
NW¼ of NE¼,Sec.21,45-25, except 5 Acres	100	2.06	100	1.89
Part of S½ of NE¼,Sec.21,45-25, 50.88 A.	300	6.20	300	5.66
TOTAL	89,200	1,845.26	89,100	1,677.92
Collection Fee		18.45		16.78
TOTAL TAXES		1,863.71		1,694.70
Gardner Mackinaw Dwellings				
N½ of NE¼, Sec. 35,45-25, 87.35 Acres	500	10.33	500	9.42
Collection Fee		.10		.09
Total Taxes		10.43		9.51
Machinery in Warehouse	900	18.59	0	0
Central Water Plant, NW¼ of NE¼ of Sec. 28,45-25	100	2.08	100	1.91
Personal District Office	500	10.44	500	9.50
District Crusher, N½ of NE¼, Sec.27,45-25	1,000	20.87	1,000	19.02
Total	2,500	51.98	1,600	30.43
Austin Location				
Part of Lot 5, SW¼ ofnNE¼, Sec.20,45-25	3,500	72.31	3,500	65.91
NW¼ of SE¼, Sec.20,45-25	3,500	72.31	3,500	65.91
NE¼ of SW¼ of Sec.20,45-25 BH	260	5.37	260	4.90
TOTAL	7,260	149,99	7,260	136.72
Collection fee		1.50		1.37
TOTAL TAXES		151.49		138.09
Summary				
Stephenson Mine	62,100	1,295.76	67,100	1,276.08
Princeton Mine	241,260	5,034.13	241,260	4,588.19
Francis Mine	0	0	20,000	384.17
Gardner Mackinaw Mine	166,125	3,466.31	211,125	4,015.10
Austin Location	7,260	151.49	7,260	138.09
Mineral Lands	1,810	37.72	1,510	28.78
Gwinn Townsite	89,200	1,863.71	89,100	1,694.70
Gardner Mackinaw Location	500	10.43	500	9.51
Central Water Plant	100	2.08	100	1.91
Personal District Office	500	10.44	500	9.50
District Crusher	1,000	20.87	1,000	19.02
Total C.C.I. including 1% fee	569,855	11,892.94	639,455	12,165.05
Cliffs Power & Light Co	148,035	3,080.81	152,535	2,900.94
TOTAL TAXES	717,890	14,973.75	791,990	15,065.99
Rate		2.068		1.883

10. TAXES (Cont.)

Taxes Levied - Forsyth Township

	1940	1939	1938	1937
Forsyth Township Valuation	1,182,035	1,339,590	1,322,780	1,446,395
Rate per $100.00	2.068	1.883	1.873	1.839
Amount of Tax Roll				
County Tax.....	7,092.21	7,974.55	8,329.33	9,437.28
County Debt Service.....	0	0	138.71	405.87
County Road.....	2,600.48	2,742.10	2,520.19	2,375.04
Township Tax.....	2,718.68	4,018.30	2,671.36	3,635.11
Township Debt Service.....	2,985.00	1,427.39	1,102.96	805.86
Schooll.....	5,319.16	5,357.62	6,461.27	6,344.02
School Debt service	3,704.48	3,705.10	3,746.01	3,712.87
Rejected Tax.....	27.65			
Total.....	24,447.66	25,225.06	24,969.83	26,716.05
Amount paid by C.C.I.Co.	14,973.75	15,065.99	14,468.95	15,920.19
Percent paid by C.C.I.Co.	61.2	59.7	58.00	59.59

16. WATER SUPPLY
GWINN DISTRICT

The main pumping plant at the Jopling Shaft (Kidder Shaft) and the auxiliary booster plant on the East bank of the Escanaba near the Austin location, operated throughout the year. Water meters installed during the year at all business places in Gwinn and Princeton have increased the water revenue.

When the old pumping plant above Princeton on the Escanaba River was abandoned and the present plant went into operation, the pressure required to furnish water to Austin and Princeton was too great for the wooden mains in Gwinn to withstand. The booster pump installation has reduced this pressure to a minimum and has insured a regular supply to Princeton.

Samples of water are sent twice each month to the Michigan Department of Health laboratory at Houghton. All samples have been satisfactory and have shown no contamination.

The following is the cost of operating the Pump Station for the years 1940 and 1939:

	1940	1939	Incr.	Decr.
General Expense	42.43	41.81	.62	
Maintenance Labor	571.42	1,238.67		667.25
" Material	1,884.96	1,333.89	551.07	
Operating Labor	664.21	612.68	51.53	
" Supplies	5,042.89	5,316.82		273.93
Total	8,205.91	8,543.87		337.96

Decreased cost on account of decrease in power cost of $235.40, also decrease in cost of maintaining water mains.

16. WATER SUPPLY
GWINN DISTRICT (Cont.)

This statement does not show revenue for Fire Hydrant service charged Forsyth Township. To give the pumping full credit the statement should show as follows:

	1940	1939
Total Cost Operating Pumping Plant	$ 8,205.91	$ 8,543.87
Revenue		
C.C.I.Co. Mines.....	25.00	7.50
Water Charges Receivable (residents, business places, etc.).....	2,386.73	2,087.24
Fire Hydrant Service to Township...	1,435.00	956.67
Net Operating Loss.....	$ 4,359.18	$ 5,492.46

17. CONDITION OF PREMISES

The rents accrued, collected and repair expense for the company houses in Gwinn and in the Austin, Princeton and Gardner Mackinaw Location follows. The rents accrued in 1940 were larger than in 1939 on account of increased working schedules - thus the increase in rentals shown.

Gwinn Townsite	1940	1939	1938	1937
Number of Houses - 121				
Rents Accrued.....	11,306.26	9,454.31	8,756.35	11,590.99
Repair Expense.....	7,256.55	5,562.68	2,007.88	14,887.99
Accrued rent over repair cost...	4,049.71	3,891.63	6,748.47	3,297.00
Actual rent collected *.....	10,999.01	8,215.61	7,144.59	11,123.67
Amount credited by men owing back rent.....	0	0	0	276.54
Total collection	10,999.01	8,215.61	7,144.59	11,400.21

There were no house or lot sales during the year.

* Cash collected for regular running accounts	$10,919.43
Cash collected for old charged off accounts	79.58
Total	10,999.01

Austin Location	1940	1939	1938	1937
Number of Houses - 41				
Number occupied.....	39	38	38	37
Rents Accrued.....	1,980.25	1,651.73	1,559.75	1,684.08
Repair Expense.....	1,902.69	1,065.51	300.26	1,441.05
Accrued rent over repair cost...	77.56	486.22	1,259.49	243.03
Actual rent collection *.....	1,962.90	1,567.38	1,513.00	1,710.07
Amount credited by men owing back rent.....	0	110.00	16.00	0
Total collection.....	1,962.90	1,677.38	1,529.00	1,710.07

More general repairs in 1940 account for the increase of $837.18

* Cash collected for regular running accounts	$1,941.90
Cash collected for old charged off accounts	21.00
	1,962.90

17. CONDITION OF PREMISES (Cont.)

Princeton Location	1940	1939	1938	1937
Number of Houses - 9				
Number occupied	9	8	10	9
Rents accrued	597.00	472.25	419.15	596.90
Repair expense.....	580.40	588.77	144.12	468.40
Accrued rent over repair cost..	6.60	116.52	275.03	127.60
Actual rent collection *.....	567.50	453.50	412.86	635.00

During the year Princeton House #10 was sold to Frank Arrieri.

*Cash collected for regular running accounts	$555.50
Cash collected for old charged off accounts	12.00
	$567.50

Gardner Mackinaw Location	1940	1939	1938	1937
Number of Houses - 2				
Number occupied.....	1	1	0	2
Rents accrued.....	43.87	0	0	104.00
Repair Expense.....	88.10	0	9.29	15.27
Accrued rent over repair cost..	44.23	0	9.29	88.73
Actual rent collection.....	33.87	19.02	42.00	80.98

There is only one cottage remaining at the location. The other cottage has been moved to a point near the Mackinaw Mine for the watchman. This rental is donated as part of his salary. If the rental were credited it would show rents received $93.87 instead of $33.87.

Statistical Statement of Rented Buildings 1940

Location	Vacant	Occupied	Total	Cost of Repairs	Repair Cost per House	Rent Accrued	Rent Collected
Princeton	0	9	9	580.40	64.49	597.00	567.50
Austin	2	39	41	1,902.69	46.41	1,980.25	1,962.90
Gardner Mackinaw	1	1	2	88.10	44.05	43.87	33.87
Gwinn Townsite	3	118	121	7,256.55	59.97	11,306.26	10,999.01
	6	167	173	9,827.74	56.81	13,927.38	13,563.28

Actual cash received	$13,563.28 (includes $112.58 on old accts.)
Actual cash expended for repairs	9,827.74
Difference	$ 3,735.54

19. GWINN ASSOCIATION
GWINN HOTEL

The Welfare Department gives a detailed report on the Gwinn Association. Following is a brief synopsis of this annual report covering the activities of the Community Club House for the year 1940.

19. GWINN ASSOCIATION
GWINN HOTEL (Cont.)

The Club house, besides being under the direction of officials of The Cleveland Cliffs Iron Company, receives financial assistance from the company and also from the Cliffs Power & Light Company. The local Board of Education pays a rental fee for the use of the building and local residents pay a membership fee.

During the year much interior decorating was done and the building is now in very good condition. Supplies and equipment were purchased so that all departments are functioning properly.

The membership roll shows an increase over the previous year, monthly membership averaged 249 of which 175 are employees of The Cleveland-Cliffs Iron Company and the remainder residents of Gwinn and vicinity.

All the usual activities were carried on and some new organizations were given time for regular weekly or monthly events. The club sponsored bowling leagues for men and women; cribbage and bridge leagues for men and women; a library and reading room which receives 3 daily and 2 weekly newspapers; 5 weekly and 19 monthly magazines; a recreational room with pool, billiard and table tennis tables and other miscellaneous games; meeting rooms with kitchen and dining room facilities used by all the different churches, scout troops, and other organizations; a gymnasium used for class work, basketball games and dance floor.

The number of meetings of a business, social, educational or recreational nature held at the building during the year totaled 454. Of this number 9 were annual community affairs; church organizations used the building on 105 occasions; the 3 scout troops held 146 meetins; 25 dances were held; 15 committee meetings; 57 meetings by Federal agencies; card playing groups, women's study club, the Sportsmen's association, musical organizations, dinner parties and other groups used the building 102 different times. Equipment in club kitchen was used 266 times and equipment was loaned for family parties 37 times.

The gymnasium was used 472 periods for supervised class work with 9905 participants. There were 19 regular basketball games held and 87 junior league games and the total spectator attendance was 5,900. The gymnasium is used by the local school for all their physical education program and has facilities for bar work, tumbling, basketball, badminton, archery, handball, volleyball, rope climbing and other apparatus.

A total of 22,000 spectators and participants enjoyed the outdoor activities sponsored by the Club. This included all baseball and softball leagues for senior members, junior boys and girls. Also tennis court and small playground with horseshoe court and the supervision of Bass Lake Camp and Grounds during the summer.

19. GWINN ASSOCIATION
GWINN HOTEL (Cont.)

The local school conducted 166 all day kindergarten sessions in the club rooms provided for that purpose and there were 132 noon day hot lunches served to bus pupils with club equipment.

Gwinn Hotel
The Gwinn Hotel operated during the year under the management of Eugene LaRochelle. The west store building in the hotel block was occupied the entire year by the Frank C. Schilling Company (Cash Way) store. New sheet rock ceiling was placed in the main lobby of the Hotel.

20. GWINN DISTRICT
CRUSHER

The crusher operated 36 days during 1940. The ore crushed was as follows:

	1940	1939
Gardner Mackinaw	65,946	49,141

The cost for the years 1940 and 1939 was as follows:

	1940		1939	
	Amount	Per Ton	Amount	Per Ton
General Expense	39.12	-	37.82	.001
Maintenance	699.19	.011	178.99	.004
Operating	2,750.77	.042	1,809.59	.037
Total Operating Cost	3,489.08	.053	2,026.40	.042
Switching	649.00	.010	504.90	.010
Grand Total	4,138.08	.063	2,531.30	.052
Tons crushed	65,946			
Increase	16,805			

Following is a statement of the transfer of equipment from the Gwinn District:

Gwinn District Storage Shed
Following sent to Lloyd Mine:
1 General Electric Motor, A.C. Purchased Feb.1919 - Original Cost $2290.57. Present value in use $1000.00
1 Aldrich Pump, Vertical Triplex, 13 x 16 Electric. Purchased in February 1917. Original Cost $7170.00. Present value $3000.00.
1 A.C. Starting Compensator. General Electric. Serial No. 940908 Purchased 1914 cost $402.00. Present value in use $200.00.

Old Princeton Pump Station (Escanaba River)
1 Prescott steam condensor pump, bought 1906, cost $1725.00, present value in use $500.00 (Scrapped)
1 " " "
1 Prescott steam condensor pump, bought 1906, cost $100.00 no value (Scrapped)
1 " " " "
1 old steam boiler taken to point near district office shops for storage.
1 " " " purchased in Feb. 1905, cost $618.60, present value in use $50.00.

Kidder Pump Station
1 bench vice received from Gardner Mackinaw Mine.

Princeton Mine
12 lockers to Cliffs Shaft Mine.
3 Lockers to Engineering Dept. Ishpeming

Central Power Plant
1 Heavy duty cross air compressor, 2 stage. Purchased in 1905 at a cost of $22,000.00 Scrapped.

Austin Shops
1 Model No. 3 C.F.M. 689 RPM 4811 Blower transferred October 8 to Gardener Mackinaw Mine.

PRINCETON MINE
ANNUAL REPORT
YEAR 1940

1. GENERAL

This mine has been idle since 1921. During the year, 273 tons of ore were loaded by hand and shipped. This ore was used in the manufacture of paint.

During the year three steel clothes lockers from the change house were sent to the Engineering Department and twelve to the Cliffs Shaft Mine, Ishpeming.

2. PRODUCTION SHIPMENTS & INVENTORIES

b. Shipments

	1940	1939	Increase
Cambridge	273	202	71
Princeport	0	0	0

c. Stockpile Inventories

Cambridge	104,807	105,019
Princeport	1,750	1,750
Sec. 19 Cambridge	13,612	13,673
Section 19 Princeport	255	255
	120 424	120,697

3. ANALYSIS

a. Stockpile Analysis

Grade	Tons	Iron	Phos	Sil.	Mang.	Al.	Lime	Mag.	Sul.	Loss	Moist.
Princeport	2,005	61.24	.273	5.76	.46	1.49	1.42	.72	.052	1.20	11.95
Cambridge	118,419	59.80	.822	3.60	1.20	1.21	3.42	.89	.016	1.43	12.95

b. Average Analysis of Shipments for 1940

Cambridge	273	60.66	.871	3.77	1.14				.014		

4. ESTIMATE OF ORE RESERVES

a. Developed Ore

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

4. ESTIMATE OF ORE RESERVES (Cont.)

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

b. Prospective Ore

Ore below 6th Level	20,000	418,815	5,000	46,921	490,736
Total Ore					1,222,531

c. Estimated Analysis

Grade-Princeport	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Ign.	Moist.
Dried 212°	59.50	.300	7.73	,505	1.214	1,605	1.037	.023	2.235	
Natural	50.60	.256	6.57	.429	1.032	1.365	.862	.020	1.900	15.00
Cambridge										
Dried 212°	59.75	.853	4.42	1.193	.937	3.676	.840	.023	1.447	
Natural	50.80	.725	3.76	1.014	.797	3.125	.714	.020	1.230	15.00

d. Estimated Tonnage as Required by State Tax Commission

Non-Bessemer Ore

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

The above estimates of ore were made in December 1921.

PRINCETON MINE
ANNUAL REPORT
YEAR 1940

8. COST OF OPERATING

a. Comparative Costs

	1940	1939	Incr.	Decr.
Underground Costs	2.25	49.15		46.90
Surface Costs	1,704.89	1,678.44	26.45	
General Mine Accts.	139.36	130.17	9.19	
Total	1,846.50	1,857.76		11.26
Taxes	5,034.13	4,588.19	445.94	
Loading & Shipping	174.64	99.90	74.74	
Supply Inventory Adjust.		4.44		4.44
Total Cost Sheet	7,055.27	6,550.29	504.98	

The only work at the mine during the year was the loading of 273 tons of ore by hand.

Watchman service was employed throughout the year. The watchman from the District Office covering both the Princeton and Stephenson Mines. Taxes increased $445.94. Loading and shipping shows an increase on account of more ore loaded by hand in 1940.

10. TAXES

	1940		1939	
	Valuation	Taxes	Valuation	Taxes
NE¼ of NE¼, Sec.19,45-25 (N&NW)	10,000	206.59	10,000	188.29
158.27 acres in Sec.18,45-25	15,000	309.89	15,000	282.44
160 acres in NW¼ Sec.20,45-25	100,000	2,065.92	100,000	1,882.93
NW¼ of NE¼, Sec. 19,45-25 (Loc.)	420	8.68	420	7.91
S½ of NE¼, Sec.19,45-25 (Loc.)	840	17.36	840	15.82
Personal property	115,000	2,375.85	115,000	2,165.37
Total	241,260	4,984.29	241,260	4,542.76
Collection Fees		49.84		45.43
Total Taxes		5,034.13		4,588.19
Tax rate per $100.00		2.086		1.883

STEPHENSON MINE
ANNUAL REPORT
YEAR 1940

1. GENERAL

This mine was abandoned in 1927 but the Company is still paying the taxes on the original description, the S½ of the SW¼ of Section 20,45-25, as well as the adjoining 80 acres to the south, i.e. the N½ of the NW¼ of Section 29,45-25, on account of the ore in stock. The latter description is owned by the Chicago & Northwestern Railway Company.

2. PRODUCTION SHIPMENTS & INVENTORIES

b. Shipments

	1940	1939
Stephenson Stephenwood Northdale Northwood	28,541	5,431
Total	28,541	5,431

c. Stockpile Inventories

Stephenson Lease S½ of SW¼ of Sec.20,45-25	2,858	31,399
C. & N. W. Lease N½ of SW¼ of Sec.29,45-25	18,976	18,976
Total	21,834	50,375

Ore Statement

	Stephen-son	Stephen-wood	North-dale	North-wood	TOTAL
On hand 12-31-39	171	31,228	227	18,749	50,375
On hand 12-31-40		2,858	227	18,749	21,834

3. ANALYSIS

b. Average Analysis on Shipments

Grade	Tons	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
Stephenwood	28,541	59.85	.710	4.27	.85	1.10	2.96	.90	.015	2.25	12.73

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8. COST OF OPERATING

a. Comparative Mining Costs

	1940	1939	Incr.	Decr.
Underground costs	1.35	0	1.35	
Surface Costs	1,704.90	1,671.44	33.46	
General Mine Accounts	410.54	163.09	247.45	
Total	2,116.79	1,834.53	282.26	
Loading and Shipping	2,962.06	546.18	2,415.88	
Taxes	1,295.76	1,276.08	19.68	
Total Cost Sheet	6,374.61	3,656.79	2,717.82	

Increase in cost is due to larger tonnage shipped in 1940

In 1939 there were 5,431 tons loaded
In 1940 there were 28,541 tons loaded.

10. TAXES

	1940		1939	
	Valuation	Taxes	Valuation	Taxes
80 acres W½ of SW¼, Sec.20, 45-25	1,000	20.66	1,000	18.83
80 acres E½ of NW¼, Sec.29, 45-25	200	4.14	200	4.14
Personal property, Ore in stock	60,000	1,239.54	65,000.	1,223.90
Personal property, in warehouse	900	18.59	900	16.95
Total	62,100	1,282.93	67,100	1,263.44
Collection Fee		12.83		12.64
Total Taxes		1,295.76		1,276.08
Rate		2.086		1.883

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1. GENERAL

For the fourth successive year there was a substantial increase in production; and in contrast with 1939, shipments were in excess of production. The output of 143,727 tons was an increase of 31,356 tons over 1939. Shipments from stockpile and pocket totaled 172,090 tons, an increase of 142,547 tons. These shipments were almost six times as great as those of 1939. Due to a substantial increase in the rate of operations in the steel industry, it was possible to operate throughout the year without the expected shutdown. The schedule of four days per week was maintained until November 16, when operations were advanced to five days per week, 2-8 Hr. shifts per day.

The even working schedule and the increase during the latter part of the year had the effect of leveling the production rate and substantially decreasing the cost of production. The number of employees remained approximately the same until November when several young men were hired due to the increased working schedule.

Mining operations were continued in the stopes above the 8th Level on the Virgil property. A fairly heavy development program was maintained in advance of these stoping operations. In spite of this, there was an occasional decline in production due to falls of rock in the stopes. These delays were not particularly serious at any time.

Ventilation conditions continued excellent throughout the year with one exception. Poor air was encountered for several days following a cave in No. 6 stope which connected the working area with the 6th Level. This condition was quickly remedied and work continued.

There was no work done on the Sherwood Property from the Virgil Mine. Shaft sinking operations were begun by the Inland Steel Company in the latter part of the year.

2. PRODUCTION, SHIPMENTS & INVENTORIES

a. Production by Grades

	1940	1939
Virgil	143,360	112,371
Virgil High Sulphur	367	0
Total	143,727	112,371

The increase in production was 31,356 tons, 367 of which were of High Sulphur grade. None of this grade is hoisted unless it is absolutely necessary to make available the standard Virgil product.

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2. PRODUCTION
SHIPMENTS &
INVENTORIES (Cont.)

b. Shipments

Grade	Pocket	Stockpile	Total	Total Last Year
Virgil	63,706	108,384	172,090	29,543
Virgil High Sulphur	0	0	0	0
Total	63,706	108,384	172,090	29,543
Total Last Year	12,817	16,726	29,543	
Increase	50,889	91,658	142,547	

Shipments during 1940 were almost six times as great as in 1939. This large increase made it possible to advance the working schedule from four to five days per week.

c. Stockpile Inventories

Grade	Tons
Virgil	137,575
Virgil High Sulphur	4,898
Total	142,473

This figure compares with 170,836 tons at the end of 1939, or a decrease of 28,363 tons and was effected in spite of a large production figure.

d. Division of Product by Levels

6th Level	0 Tons
8th Level	143,727 Tons

There has been no mining above the 6th Level since February 1938 when that area was sealed from the ventilation circuit due to foul air created by the oxidizing of High Sulphur rock. During the latter part of 1940 preparations were made to re-open one of the 6th Level areas for further mining. A thorough inspection of this area was made with the aid of the mine rescue oxygen apparatus, and it was found that the oxidation in these stopes had stopped.

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2. PRODUCTION SHIPMENTS & INVENTORIES (Cont.)

e. Production by Months

Month	Shifts	Days	Virgil Ore	Hi-Sul. Ore	Total Ore	Tons Per Day Ore	Tons Per Man Per Day	Rock
January	2-8 Hr.	19	12,122		12,122	638	8.19	128
February	2-8 Hr.	17	11,176		11,176	657	8.22	508
March	2-8 Hr.	16	10,582		10,582	661	8.05	304
April	2-8 Hr.	18	11,728		11,728	651	8.61	156
May	2-8 Hr.	18	13,713	73	13,786	766	10.09	220
June	2-8 Hr.	16	10,120		10,120	633	8.08	168
July	2-8 Hr.	19	12,893	179	13,072	688	8.87	300
August	2-8 Hr.	15	9,249		9,249	617	7.72	8
September	2-8 Hr.	17	12,505		12,505	735	9.86	
October	2-8 Hr.	19	13,002	106	13,108	690	9.63	124
November	2-8 Hr.	17	12,070	9	12,079	710	9.09	12
December	2-8 Hr.	21½	14,200		14,200	660	8.29	
Total	2-8 Hr.	212½	143,360	367	143,727	676	8.72	1,928

f. Ore Statement

	Virgil	Virgil Hi-Sulphur	Total	Total Last Year
On Hand January 1, 1940	166,305	4,531	170,836	88,008
Output for Year	143,360	367	143,727	112,371
Total	309,665	4,898	314,563	200,379
Shipments	172,090	0	172,090	29,543
Balance on Hand	137,575	4,898	142,473	170,836
Increase in Output			31,356	
Decrease in Ore on Hand			28,363	

The operating schedule follows:

1938 - 2-8 Hr. Shifts 4 days per week Jan. 1 to Apr. 16
2-8 Hr. Shifts 3 days per week Apr. 16 to June 1
1-8 Hr. Shifts (2 crews alternating) 4 days per week June 1 to Oct. 31
1-8 Hr. Shifts (2 crews alternating) 5½ days per week Oct. 31 to Dec. 31

1939 - 1-8 Hr. Shift (2 crews alternating) 5½ days per week Jan. 1 to Jan. 9
2-8 Hr. Shifts 4 days per week Jan. 9 to June 12
1-8 Hr. Shift (2 crews alternating) 5½ days per week June 12 to Nov. 1
2-8 Hr. Shifts 4 days per week Nov. 1 to Dec. 31.

1940 - 2-8 Hr. Shifts 4 days per week Jan. 1 to Nov. 15 inclusive
2-8 Hr. Shifts 5 days per week Nov. 16 to Dec. 31.