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5. LABOR AND WAGES:

a. Comments:

There were 424 men employed on January 1st, 1938 and 354 on December 31st, 1938. Eight men were home on December 31st on account of sickness and injuries leaving 346 men on the payroll. At the time of the curtailment on June 1st, 84 men were laid off and during the year four were transferred to other mines, one died and 12 left for various reasons. During the year 33 men were hired, most of whom were selected from the men laid off in June.

All requests made by the Marquette Range Industrial Union representatives were given immediate consideration and settled satisfactorily. The men seem to be contented and glad to have steady employment.

b. Comparative Statement of Wages and Product:

	1938	1937	Increase	Decrease
PRODUCT	412,000	820,915		408,915
No. Shifts and Hours	1-8 34	1-8 25	1-8 9	1-
	2-8 118	2-8 20	2-8 98	
	3-8 35	3-8 243		3-8 208
AVERAGE NO. MEN WORKING:				
Surface	62	73		11
Underground	284	351		67
Total	346	424		78
AVERAGE WAGES PER DAY:				
Surface	5.54	5.44	.10	
Underground	6.45	6.39	.06	
Total	6.26	6.22	.04	
AVERAGE WAGES PER MONTH:				
Surface	82.50	113.40		30.90
Underground	84.91	128.43		43.52
Total	84.45	125.84		40.39
PRODUCT PER MAN PER DAY:				
Surface	32.78	44.91		1.13
Underground	8.62	9.69		1.07
	6.83	7.97		1.14
LABOR COST PER TON:				
Surface	.169	.121	.048	
Underground	.748	.659	.089	
Total	.917	.780	.137	
AVERAGE PRODUCT MINING:				
Surface	22.24	21.50	1.26	
Development in Ore	8.28	8.30		.02
Total	21.17	20.94	.17	
AVERAGE WAGES CONT. LABOR	7.22	7.16	.06	

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5. LABOR AND WAGES: (Cont'd)

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

	1938	1937	Increase	Decrease
TOTAL NUMBER OF DAYS:				
Surface	12,568	18,276¼		5,708¼
Underground	47,774	84,674¾		36,900¾
Total	60,342	102,951		42,609
AMOUNT FOR LABOR:				
Surface	69,548.69	99,343.99		29,795.30
Underground	308,149.40	540,933.31		232,783.91
Total	377,698.09	640,277.30		262,579.21
AVERAGE WAGES PER MONTH AS PER LABOR STATEMENT, LESS CAPTAIN AND CLERKS:				
Surface	79.20	111.44		32.24
Underground	84.15	127.92		43.77
Total	83.25	125.17		41.92

There was an increase in wages of 10¢ per hour effective March 16th, 1937.

Proportion of Surface to Underground Men:

1938: 1 to 4.58 (1) 2-8-hr. shifts 6 days & 6 nights per week Dec. 6th, 1937 to March 28th, 1938.
(2) 3-8-hr. shifts 4 days & 4 nights per week March 28th to April 18th.
3-8-hr. shifts 3 days & 3 nights per week April 18th to June 1st.
2-8-hr. shifts 2 days & 2 nights per week June 1st to November 1st.
2-8-hr. shifts 3 days & 3 nights per week November 1st to December 31st.

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

1 1937: 1 to 4.81 3-8-hr. shifts 5 days & 5 nights per week from Jan. 1st to April 10th.
3-8-hr. shifts 6 days & 6 nights per week from April 10th to October 4th.
3-8-hr. shifts 5 days & 5 nights per week from October 4th to December 6th.
*2-8-hr. shifts 6 days & 6 nights per week from December 6th to December 31st.

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

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6. SURFACE:

a. Buildings, Repairs:

The South loading pocket at the shaft was repaired in May. The plank lining in the front of the pocket was entirely replaced as the old plank had rotted after twenty-five years of service. About one-half of the floor was replaced with new plank and new wearing plate.

Four worn out plates in the skip dumps in the shaft house were replaced with new plates in the Summer.

A small door 3' X 6' in size was installed in one of the large double doors at the engine house. It was difficult to open the large door in stormy winter weather.

The balance of the old 8 ft. doors on the side of the timber tunnel were replaced with 9' 6" doors. Nine foot legs and caps are now standard lengths in the mine instead of eight foot timber that was used until a few years ago.

b. Stockpiles:

During the shipping season three cuts were loaded from the West steel stocking trestle leaving only a few thousand tons in stock. One and one-half cuts were loaded from the East steel trestle which removed about 33-1/3% of the ore stocked from this trestle. The East steel trestle was entirely filled prior to loading by steam shovel. About 50% of the total available stocking capacity from the steel and wood trestles was filled at the end of the year.

b-1. Rock Trestle:

Due to shaft sinking in addition to the regular development work in rock it was necessary to extend the rock trestle to provide necessary stocking capacity. Six bents were erected in the Summer which provided stocking room until the Spring of 1939. The rock trestle is approaching the caved area West of No. 1 shaft and the last two bents are over 70 ft. in height.

b-2. Ore Trestles - Steel:

The balance of long ties, fifty in number, 3" X 5" X 18' in size were installed on the West permanent steel trestle in 1938. This completed the replacement of all the ties on the West permanent ore stocking trestle. The ties were treated with Chromated Zinc Chloride at the Athens timber treating plant which will prolong their life a number of years.

b-3. Ore Trestles - Wood:

Late in the fall three bents were erected at the East end of the East steel trestle, making a total of seven wood bents beyond the end of this steel trestle. This extension was necessary to insure ample stocking capacity for the winter of 1938-39.

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6. SURFACE: (Cont'd)

b-3. Ore Trestles - Wood: (Cont'd)

The wood trestle on the auxiliary stocking grounds North of the East steel trestle was extended thirty bents to the East to the limit of the stocking ground. Stocking from this trestle was started at the end of the shipping season in November. The two wood trestles have a stocking capacity of over 100,000 tons and will insure ample stocking space for the ore produced on any working schedule that may be in effect this winter.

c. Tracks, Roads:

The private road to the mine from the end of Lincoln Street and Mitchell Avenue was improved by application of gravel and frequent dragging during the Summer.

A section of the fill on the L.S. & I. Ry.'s main line to the mine was washed out by a leak in the mine water discharge line. A flat car was loaded with rock by mine labor and unloaded by the Railroad to fill the washout. The mine water discharge line extends for 1,000 ft. just below surface at the edge of the Railroad fill.

d. Water Supply:

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

	1938	1937	1936	1935	1934	1933	1932
1st Quarter	80.08	55.86	67.61	44.31	47.39	54.25	58.11
2nd Quarter	75.04	61.20	59.77	62.98	76.80	36.00	68.68
3rd Quarter	115.15	56.70	83.64	61.51	75.85	52.14	51.25
4th Quarter	115.22	67.76	81.75	62.55	35.98	36.29	40.43
Total	385.49	241.52	292.77	231.35	235.02	178.68	218.47
Product - Tons	412,000	820,915	512,612	291,318	235,664	61,761	84,046
Cost Per Ton	.000935	.000294	.000571	.000794	.001001	.002893	.0026

The total cost for water was the highest in the past seven years. The increase was due to more water used to settle dust in operation of fresh air blowers to supply pure air to men drilling in rock and to increased use of water on account of the diamond and churn drilling program on surface and in the mine.

e. Grounds:

The grounds at the mine were kept clean and neat throughout the Summer season. The unusual rainfall in July and August made it unnecessary to water the lawn and shrubbery. The heavy snowfall and storm on January 24th and the wet snow in October severly damaged the pine plantation on the sand slopes near the engine house. About 25% of the Norway and white pines were broken off at the ground and the balance more or less damaged and disfigured.

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7. UNDERGROUND:

a. Shaft Sinking:

In April 1938 sinking of No. 3 shaft from the 13th to the 14th level was started and was completed in October. Sinking was done on a three-day two-shift per week schedule with a crew of six men on a shift. There was no reason to speed up the work so that the sinking crew was purposely kept smaller than would have been the case if speed was essential. It was hoped to complete the work with a record of no lost time accidents and the smaller crew made accidents less likely to occur. There were no lost time accidents during the progress of the work. It was decided to open the 14th level at a depth of 121 ft. below the 13th. This was below the main Negaunee Mine ore body and also beneath the greater part of the other small ore bodies South of the main dike near the Northwest corner of the Negaunee Mine property. Two diamond drill holes were drilled, one from the Maas Mine 90' sub level and the other from the 50' sub level to determine the approximate depth at which the ore body passed off the Negaunee Mine on to the Maas Mine property. The amount of ore below the 14th level elevation is not assumed to be in excess of 10,000 tons which can be recovered by incline slicing. Sinking started in cherty slate formation which, as depth was gained, became harder. At first, 50 to 54 holes were drilled in each round, later this was increased to from 60 to 64 holes per round. Light sinking drill machines were used with jack rods and bits. The 117 ft. of sinking required 1,188 jack bits costing $344.53. The progress by months was as follows:

Month	Footage	Sets of Timber	Bearers
April	16'	1	0
May	19'	3	1
June	14'	2	0
July	19'	3	0
August	16'	3	0
September	27'	4	0
October	6'	3	0
Total	117'	19	1

As the 14th level will be the bottom level in the mine and will only handle a small tonnage, roughly 500,000 tons, it was decided to only sink 78 ft. for the skip pit. This will provide ample room for the shaft loading pockets and sufficient space below the pocket for loading the skip. The modern arrangement at the bottom of the shaft provides for the dirt spilled from the skip to go through open chutes into the skip pit drift where it is loaded in cars by a scraper hoist and slide. The skip pit drift is made wider than formerly when the spilled dirt was retained in a pocket at the bottom of the skip roads. Besides speeding up the handling of material spilled when loading the skip and thereby reducing the labor cost, the modern arrangement decreases the depth to sink below the level by 8 ft. to 9 ft.

When the elevation of the 14th level was reached in June, a drift was driven in 22 ft. from the cage compartment. This was done to avoid damage to the shaft timber when the plat is excavated. When sinking was completed in October, excavation of the skip pit drift, skip pit sump and pump house was started and completed by the end of the year. In this work there was excavated the equivalent of 125 ft. of standard size drift (9' X 9'). The pump house and sump was equivalent to 19 ft. of drift and the balance of 106 ft. was the drift from cage compartment and the side drift to the skip compartment. On December 28th the work of excavating the shaft pocket on

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7. UNDERGROUND: (Cont'd)

a. Shaft Sinking: (Cont'd)

the 14th level was started after the skip compartments had been cased off from the cage road. The rock from the pocket falls into the skip road and is loaded by scraper into cars in the skip pit drift at the bottom of the shaft. It is then hoisted and dumped into the shaft pocket on the 13th level. The excavation of the shaft pocket and plat will be done the days the mine operates so as to eliminate the cost of operating the compressor when the mine is idle. Part of the shaft crew have been transferred to rock drifting elsewhere in the mine and later some of the men will be transferred to ore production. The 14th level will be developed gradually so that the rock coming from the opening of the level will not interfere with the hoisting of ore. If it becomes necessary to speed up the opening of the 14th level, the rock can be hoisted on the midnight shift.

b. Development:

There was a large amount of development work done in 1938 in No. 1 and adjacent shaft pillars above the 9th level and in opening No. 2 shaft pillar for mining at the elevation of the old 4th level. Some development work was also done on various sub levels and the main levels in other parts of the mine. The total footage for the year however was less than in 1937 or 1936 during which years the 13th level was opened.

The most interesting development of the year was in No. 1 shaft pillar above the 9th level which was opened in 1938 to the elevation of the old 3rd level 236 ft. above the 9th. From this point an old raise was reopened which connected with the open stopes above the 2nd level where the previous operators had mined the ore by the room and pillar system. An accurate survey of this area was made and new maps prepared. The pillars and the ore in the side walls at the limit of mining were sampled and analyzed. A standpipe was put down by a churn drill to determine the depth of surface material directly above the old stopes. One churn drill hole was also put down at the point where the ore body would outcrop at ledge and a hole drilled 98 ft. into the ledge but no ore was found. It was, therefore, evident that No. 1 shaft ore body did not extend up to surface and that practically all of the available ore had been mined years ago. Estimates showed not more than 20,000 tons of ore in this area, not enough to warrant the extensive development work necessary to mine it. It was also evident that a cave to surface would occur when the ore pillars were mined which would bring in sand and water. The caved material with the accompanying water would seriously interfere with mining of No. 1 shaft and adjacent pillars below the old 3rd level where over 500,000 tons of high grade ore will be recovered during the next ten years. It is also true that the mining of No. 1 shaft pillar will not interfere with the mining of the pillars in the open stopes at some later date. It was, therefore, decided to start mining No. 1 shaft pillar at the elevation of the old 3rd level.

During the year extensive development work was underway in the ore pillars on both sides of No. 1 shaft pillar in order to accurately locate the 20 ft. ore pillars left between the stopes. This information was necessary to locate raises in the pillars as it is practically impossible to put up a raise through the caved material in the old stopes. One raise

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7. UNDERGROUND: (Cont'd)

b. Development: (Cont'd)

was put up in 1938 and no difficulty was experienced as a result of the accurate location of the ore pillars. Two other locations for raises have been selected and raising will be started early in 1939.

Late in 1937 development of No. 2 shaft pillar was started with the enlargement and cribbing of an old raise that had been used as a traveling road when mining was underway here in 1920 and 1921. This raise was completed in 1938 and one other raise was also put up in this ore body. These two raises were extended to the elevation of the old 4th level 180 ft. above the 9th level. Drifting has shown the ore body to be quite small and a large tonnage is not anticipated in this area.

Drifting to develop the main ore body on the 13th level was completed in 1938. Raising has been underway all the year and is not yet completed. Some diamond drilling was done underground to determine if there was any ore South of the main East and West dike at the elevation of the 13th level. The results of the drilling to date have been quite encouraging and in 1939 two cross-cuts will be extended into this area to develop the ore bodies found by the diamond drill.

b-1. Rock Development:

On the 9th level and sub levels above, in connection with the development of No. 1 shaft and adjacent pillars, there was a total of 450 ft. of rock drifting and 186 ft. of rock raising. In the development of No. 2 shaft pillar there was a total of 221 ft. of rock drifting and 234 ft. of rock raising. The grand total drifting and raising in rock on the 9th level was 1,091 ft.

On the 11th level the only development work in rock was in two raises in one of which there was 17 ft. of raising in dike and in the other 15 ft. raising in jasper. The total development in rock was 32 ft.

On the 370' sub level near the Maas Boundary, #1291 raise was cut out in jasper at the elevation of this sub level, a drift driven in jasper for 71 ft. and a raise put up 26 ft. in jasper to the 11th level. This development work in rock was done to provide an airway from the 11th to 12th level and also to aid in the ventilation of the mining places in this area.

On the 12th level a connecting drift from No. 1364 raise to No. 9 crosscut advanced 45 ft. in rock and there was 33 ft. of rock drift driven in starting a new footwall drift on the 12th level from which raises will be put up to mine the ore body between No. 1 and No. 2 dikes. In No. 7 crosscut on the 12th level No. 1277-A raise was put up 28 ft. in footwall jasper to mine a small pillar of ore on the North footwall. This raise replaced No. 1277 raise which had crushed. There was a total of 78 ft. of rock drifting and 28 ft. of rock raising on the 12th level.

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7. UNDERGROUND: (Cont'd)

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

On the 295' sub level a connecting drift from No. 1323 raise to No. 1324 raise passed through 10 ft. of jasper.

On the 235' sub level a drift was driven from No. 1310 raise 90 ft. in jasper and a raise extended 59 ft. in dike in making a connection to the ore drift on the 12th level located between No. 1 and No. 2 dikes. The connection was made to provide another airway from the 12th to the 13th level.

On the 220' sub level near the Southwest end of the 13th level in the area South of the main dike an exploratory drift was driven in dike and lean ore a distance of 53 ft. to the South to prove up the ore found in underground drill hole No. 28. This drift was advancing at the end of the year and should soon reach the ore.

On the 13th level the main level footwall drift in rock was driven 186 ft. in slate to make the connection to the drift that parallels the Maas boundary. The balance of rock development on this level was confined to raising. In the eight raises completed during the year there was 593 ft. of rock raising. The grand total rock drifting and raising on the 13th level was 779 ft.

On the new 14th level there was 22 ft. of standard size drift driven North from the cage compartment. The cost was charged to E. & A. No. 795 - Sinking Shaft and Development of the 14th Level.

In the skip pit drift, pump house and sump at the bottom of the shaft there was an equivalent of 125 ft. of standard size rock drift. This was also charged to shaft sinking, E. & A. No. 795.

A summary of development in rock follows:

Location	Drifting in Rock	Raising in Rock	Total
9th Level	671	420	1091
11th Level		32	32
12th Level	149	54	203
13th Level	339	652	991
14th Level	22		22
Skip Pit Drift, Sump & Pumphouse	125		125
Total	1306	1158	2464

The grand total drifting and raising in rock for the year was 2464 ft. as compared with 1303 ft. in 1937.

b-2. Development in Ore:

There was less development in ore in 1938 both in drifting and raising.

On the 9th level in No. 1 shaft and adjacent pillars there was 360 ft. of ore raising and 481 ft. of ore drifting. In No. 2 shaft pillar 57 ft. of ore raising and 20 ft. of ore drifting. The grand total on the 9th level was 918 ft.

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7. UNDERGROUND: (Cont'd)

b-2. Development in Ore: (Cont'd)

On the 11th level there was 73 ft. of ore raising in two raises near the South footwall.

On the 12th level there was 84 ft. of ore drifting to make a connection for a traveling road and ventilation airway from the 12th level cross-cuts to the top of two raises from the 13th level.

On the 13th level there was 453 ft. of raising in ore in ten raises that were completed during the year.

A summary of development in ore follows:

Location	Drifting in Ore	Raising in Ore	Total
9th Level	501'	417'	918'
11th Level		73'	73'
12th Level	84'		84'
13th Level		453'	453'
Total	585'	943'	1528'

The total raising and drifting in ore in 1938 was 1528 ft. as compared with 2504 ft. in 1937.

c. Stoping:

(1) General:

Mining in 1938 was confined to the same general areas as in the previous year with the addition of one old area above the 9th level, viz., No. 2 shaft pillar. In order to reduce pressure on the 13th level drifts, several new sub levels were opened for mining under the hanging between the 12th and 13th levels.

Although the mine operated most of the year on a reduced working schedule the production exceeded 400,000 tons. The production from the 9th level in 1938 was greater than in 1937 as also was the production from the 13th level. The large reduction in product occurred in the area between the 12th and 11th levels. The flattening of the footwall in this area is rapidly reducing the size of the ore body as the hanging wall has not receded a corresponding distance.

In 1938 ore was mined in No. 1 shaft and adjacent pillars above the 9th level on the old 3rd level, the 810', 747', 733', 700',690' and 673' sub levels, and in No. 2 shaft pillar above the 9th level at the elevation of the old 4th level, between the 10th and 11th levels on the 425' and 415' sub levels in the pillar on the North footwall adjacent to the Maas boundary, on the 450', 440' and 425' sub levels in the area between No. 1 and No. 2 dikes and on the 425' and 415' sub levels in the area between No. 1 dike and the South footwall.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

(1) General: (Cont'd)

The main ore body was mined between the 12th and 11th levels on the 360', 350', 335', 325' and 315' sub levels and also in one area under the hanging on the 12th level.

Between the 13th and 12th level ore was mined on the 295', 285' and 270' sub levels in the main ore body and on the 235' and 220' sub levels in the small ore body beyond the main dike near the Northwest corner of the Negaunee property.

In 1938 ore was mined on twenty-six sub levels as compared with twenty-seven in 1937 and seventeen in 1936.

(2) Detail of Stoping:

Subs Above the 9th Level

3rd Level - No. 1 Shaft Pillar above 9th Level

The old 3rd level at No. 1 shaft is at elevation 832' or 227' vertically above the 9th level. During 1938 this level was reached at five separate places in the area adjacent to No. 1 shaft. No. 901 raise was extended to the hanging at an elevation of 799' early in the year and an incline drift driven upward on a 15° angle from the raise to the old 3rd level elevation. The incline drift was located in the shaft pillar and passed 12 ft. North of No. 1 shaft on the line of an old 3rd level drift which was filled with caved rock. It was extended 70 ft. at the 3rd level elevation to the jasper footwall where an old raise was encountered which lead up to the open stopes Southeast of No. 1 shaft. At the end of the year after thorough exploration it was decided to start mining the shaft pillar at the elevation of the old 3rd level. The pillars beyond the main shaft pillar can not be mined at this elevation except in one area about 250 ft. North of No. 1 shaft where preparations for mining were completed at the end of the year when No. 903 raise was finished and was was being cut out at an elevation of 832 ft. A transfer raise 115 ft. Southwest of No. 1 shaft encountered caved jasper at an elevation of 832 ft. indicating that mining would have to be started at approximately an elevation of 810 ft. in this area. A drift from another transfer raise 220 ft. Northwest of No. 1 shaft driven at an elevation of 810 ft. was extended to the footwall 160 ft. North of No. 1 shaft. A raise in the jasper footwall was extended up to the main haulage drift on the old 3rd level which was found to be partly filled with caved rock. The drift from the transfer raise was mainly in a mixture of caved ore and jasper indicating that mining here could not be started above an elevation of 810 ft. At another point drifting from a transfer raise at an elevation of 832 ft. showed that the ore body was cut off on the North side by jasper and did not extend beyond the limits reached by the former operators.

As a result of the work done here in 1938 regular mining operations will be started in January 1939 in the shaft pillar and in one area outside the shaft pillar at the elevation of the old 3rd level.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

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

810' Sub - No. 1 Shaft Pillar

This sub level, located 205 ft. above the 9th level, was opened early in the year from a transfer raise 220 ft. Northwest of No. 1 shaft in one of the 20 ft. pillars North of No. 1 dike. A small area was mined Northwest of the raise. This area was approximately 30' X 40' in size and extended from the dike to the caved area where jasper and sand were encountered. A drift was also driven to the Northeast through two pillars and one stope filled with caved ore to the jasper footwall on the North side of No. 1 shaft ore body. A raise on the jasper showed the ore to extend 22 ft. above the 810' sub or to the 832' elevation (3rd level). Late in 1938 No. 903 raise from the 9th level reached this elevation at a point 15 ft. distant from this drift and at the end of December this raise was timbered over and mining was ready to be started.

During the year two other driftswere driven from the transfer raise, one eastward 130 ft. to the East jasper footwall and one South on a downgrade a distance of 100 ft. to No. 901 raise which struck caved ground at an elevation of 799 ft. The drift being above the cave enabled the back to be secured over No. 901 raise after which the raise was cribbed through the 30 ft. opening that had caved into the raise.

There was a total of 320 ft. of drifting from the transfer raise in addition to the small area that was mined.

Another transfer raise, located 120 ft. Southeast of No. 1 shaft in one of the 20 ft. pillars, was cut out on the 810' sub and a drift driven Eastward 55 ft. in ore to caved jasper. A drift was also driven 60 ft. South through two stopes filled with caved ore and across one 20 ft. ore pillar when work here was abandoned as sufficient ore had been developed to warrant putting up a raise from the 9th level into this territory.

4th Level - No. 2 Shaft Pillar Above the 9th Level

No. 917 raise, which was started in 1937, was completed early in 1938 to the elevation of the old 4th level. The old drifts at this elevation were found to be caved and filled with a mixture of jasper and ore. A drift was driven through this caved material 95 ft. South of the raise where an opening was found to the old drift leading South toward No. 1 shaft and Eastward to No. 2 shaft. Considerable caving had occurred in these old drifts but it was possible to travel through them on top of the caved material. This connection established good ventilation. Mining of the pillars left at this elevation when mining stopped here in 1921 was then started and continued during the balance of the year. A small dike divides the ore body and the pillars mined thus far have been located on the North side of the dike. One drift was driven 70 ft. East on the South side of the dike until a heavy flow of water made it necessary to abandon work here until the water had been diverted from this area. Mining has been carried on here under a severe handicap due to rotting of the old lagging used for floor covering on the sub level above eighteen years ago. It has been necessary to forepole ahead of every set of

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

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

timber as the ground breaks up to the old sub level and jasper runs occur frequently. Great care is taken in covering the floors in order to make a mat that will hold back the jasper. Close poling is laid, then wire fencing with another layer of poles above the fencing. At the end of the year one pillar 35' X 50' in size had been mined and a drift was advancing into the other pillar North of the dike.

No. 915 raise was also completed to this elevation in 1938. It is located 100 ft. Southeast of No. 917 raise. After passing through the dike it was in ore for about 20 ft. then struck the hanging jasper in which it was continued to the 4th level elevation. Two drifts have been driven from this raise, one 45 ft. in jasper to the Northeast where a mined area was encountered. A drift was then driven due East 75 ft. to the footwall which showed the ore to be about 35 ft. wide. A small drift was extended 60 ft. into the footwall to hole to two uncribbed raises from the 9th level which carry several hundred gallons of water per minute that comes in from the old workings Northeast of this area. The old drift between these two water raises is at a lower elevation and at the end of the year the connection had not yet been established. The miners were temporarily moved back to the ore area and are putting up an uncribbed raise in the ore. At the end of the year the raise was up about 35 ft. It followed the hanging which dips at an angle of about 30°. The ore has an indicated thickness of from 10 ft. to 15 ft. and from the hardness of the hanging jasper it is evident that it can be mined in an open stope. Before mining is started it is planned to determine the approximate upward extent of the ore. The raise is headed toward No. 2 shaft from which it was 260 ft. distant at the end of December. The area of the stopes and pillars left to support the hanging must be such that no danger of caving will occur as No. 2 shaft is the airway from surface to the mine for the 100,000 cu. ft. fan. There is not enough information available to make an accurate prediction of the tonnage that can be mined by the open stope and pillar method in this area but the indications are favorable for the production of at least several thousand tons at low production cost.

747' Sub - No. 1 Shaft Pillar Above the 9th Level

This sub level was opened in 1937 from No. 920 raise on the North side of No. 1 dike in the main shaft pillar. After making a connection to No. 902 raise a small area was mined late in 1937 and early in 1938 to a mining limit established to protect No. 902 raise. During the year explorations were made from No. 902 raise to determine the condition of the small pillars and stopes on the South side of the main shaft pillar. Drifts were driven from No. 902 raise to No. 901 raise and from No. 901 to No. 900 raise. From No. 900 raise 385 ft. of drift was driven to prove up the possibilities for ore in the small stopes and pillars South of the main shaft pillar. This area was further explored by a transfer raise put up 73 ft. in ore above this sub level from the end of a cross-cut 180 ft. in length to the jasper footwall. As a result of the information gained from this work two raises have been located on the 9th level which will be extended into this area early in 1939 after which mining will be started.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

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

733' Sub - No. 1 Shaft Pillar Above 9th Level

This sub level was opened late in the year from No. 920 raise and after establishing a connection to No. 902 raise, mining of the shaft pillar North of the dike was started and several slices mined by the end of the year. All the ore in the shaft pillar will be mined to the limit of mining established to protect No. 902 raise. The area to be mined is roughly 100 ft. wide by 60 ft. in length.

700' Sub - No. 1 Shaft Pillar Above 9th Level

This sub level was opened from No. 922 raise late in 1937 on the North side of the dike. In 1937 and in January 1938 the ore was mined under the caved hanging across three stopes and three pillars, a distance of 120 ft. directly South of the main shaft pillar. The outline of the sub level was very irregular due to caved jasper in the stopes. The floor of the sub level was poled and wired very carefully in order to avoid runs of jasper on the next lower sub level. The area mined was roughly 120 ft. X 50 ft. in size.

690' Sub - No. 1 Shaft Pillar Above 9th Level

This sub level was mined from No. 922 raise along the North side of the dike in the first three stopes and three pillars South of the main No. 1 shaft pillar. It covered the area described in the previous paragraph under the 700' sub level but was larger with an extreme length of 190 ft. and an average width of 50 ft. The three stopes crossed by the slices were filled with high grade ore and the pillars showed no evidence of caving or crushing. Great care was given to covering the floor with tight poles and wire fencing. In September No. 924 raise was cut out at the elevation of the 690' sub level under the jasper hanging. Jasper was encountered on all sides within 5 ft. of the raise and work was abandoned here at the end of the month. The area opened here was directly South of the dike, whereas the mining operations described in the previous paragraph were on the North side of the dike. There is so much uncertainty in regard to elevations where ore may be found that exploration is essential even if no ore is found.

673' Sub - No. 1 Shaft Pillar Above 9th Level

On the completion of Nos. 920, 921 and 922 raises from the 9th level to the hanging in 1937 on the North side of the dike, they were connected by a traveling road at the elevation of this sub level. In June 1938 a traveling road was driven from No. 921 raise to No. 902 raise, a distance of 120 ft. to the East and from No. 902 to No. 901 raise, a distance of 40 ft. to the Southeast. No further work was done here until in October when mining was completed from No. 922 raise on the sub above and the contract moved down. At the end of the year three slices averaging 100 ft. in length had been mined Southeast from No. 922 raise to the dike. It is probable that the ore area will be larger on this sub level and found to extend beyond the three small stopes and pillars mined on the subs above.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

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

In November No. 924 raise on the South side of the dike was cut out at the elevation of 673' sub level. A drift was driven 30 ft. from the raise to the East in ore where caved jasper was encountered. The drift was then turned to the Northeast and the ore followed for a distance of 75 ft. when drifting was temporarily stopped and the contract moved back 15 ft. from the breast to put up a raise to prove the upward extension of the ore in the 4th narrow pillar South of the main shaft pillar. At the end of the year the test raise was up over 20 ft. with solid ore in the back. It was then decided to make the raise two compartment and use it for a regular transfer in developing the ore pillar under the jasper hanging. The discovery of ore at a higher elevation than the sub level proves how difficult it is to decide at what elevation mining should be started from a raise. No. 924 raisd is located in the second pillar South of the transfer raise that is now being put up and at this point the ore pillar had caved into the stopes on each side while the ore pillar 80 ft. to the North was found intact.

9th Level

The work done on the level in 1938 was confined to widening the haulage drift to make room for four raises - putting up two new raises and finishing two that were started in 1937.

No. 917 Raise in No. 2 shaft pillar was started in 1937 and at the end of the year was up 128 ft. It was extended to the 4th level elevation early in 1938. The raise was 205 ft. in height on the incline and was extended 77 ft. in 1938. The log of the raise is as follows: 0 - 130' slate, 130' - 161' lean ore, 161' - 205' ore.

No. 915 raise in No. 2 shaft pillar started in March 1938 and finished in August at the 4th level elevation. The log of the raise is as follows: 0 - 174' slate and jasper and dike, 174' - 198' ore, 198' - 209' jasper.

No. 914 raise was started in January 1938 in No. 2 shaft pillar and extended 5 ft. in slate then temporarily stopped until the ore body was developed from Nos. 915 and 917 raises.

No. 903 raise in No. 1 shaft pillar was started in February 1938 and completed in November at a height of 261 ft. The log of the raise is as follows: 0 - 167' slate and jasper, 167' - 261' ore. This raise was located in the third and last pillar North of the main No. 1 shaft pillar. Some difficulty was encountered in advancing it through an old drift at the elevation of the old 4th level. It also passed through the side of an old stope that was, fortunately, compacted tight enough to permit advance without caving.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

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

No. 901 raise, started in 1937, was completed in 1938. It is located in the main No. 1 shaft pillar where it was supposed the ground was solid. At two points it encountered old drifts that were filled with caved material which ran into the raise. The raise was recovered in both cases by drifting from another raise to the caved area and after securing the back the raise was cribbed up through the cave and the cribbing securely blocked. Each of the caves were about 30 ft. in height and it was very fortunate that the raise could be continued to completion. The log of the raise is as follows: 0 - 85' jasper, 85' - 205' ore.

Ground was also excavated in the 9th level haulage drift preparatory to starting No. 905 raise which will be put up in one of the narrow pillars South of the dike in No. 1 shaft territory.

From the above account of work done in 1938 on the 9th level and subs above, it is evident that time is required for development of any area for mining. There is no assurance in the development of a partially mined ore body that ore will be found in any given area until it has been thoroughly explored. Production from the 9th level increased in 1938 in spite of the reduction in working time and will continue to increase in 1939.

Subs Above the 11th Level

450' Sub - Ore Body Between No. 1 & No. 2 Dikes

Mining was started at the East end of this sub level near the footwall in January 1937 and was completed with the mining of four pillars in August 1938. About 20% of the ore area was mined in 1938.

440' Sub - Ore Body Between No. 1 & No. 2 Dikes

This sub level was opened in July 1937 at the East end near the footwall and was 25% mined at the end of the year. In 1938 mining was continued with two contracts until mining was finished on the sub above and two more contracts moved down after which the four contracts worked for the balance of the year. At the end of 1938 the sub level was 75% mined. An extension of the ore body to the West offset the contraction at the East end due to flattening of the footwall.

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

This sub level was opened at the East end near the footwall in April 1938 by one contract that had completed work on the sub above. Work was continued by the one contract for the balance of the year and approximately 12-1/2% of the ore mined. This sub level is the last one that can be opened above the 11th level, the lower ones will be mined from 12th level raises.

425' Sub - Area South of No. 1 Dike Near South Footwall

Mining was started on this sub level in August 1937 and was completed at the end of the year. There was a large decrease in the ore area as compared with the sub above.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

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

Some ore showing in No. 1 cross-cut on the 11th level 150 ft. Southwest of the area and mined on the 425' sub level was explored by a raise to this elevation in March and April 1938. The ore on the 425' sub level elevation was only drift width and was cut off by the jasper hanging after advancing 30 ft. Further explorations will be made in this territory from 12th level raises which will be put up into this area in 1939.

415' Sub - Area South of No. 1 Dike Near South Footwall

Mining on this sub level was started in December 1937 and completed in April 1938. The ore area decreased 25% as compared with the sub level above and was less than half the size that was mined on the 450' sub level elevation. Only one contract worked here. It is apparent that this ore body will soon be entirely cut off by jasper in the area that has been mined during the past ten years. An enrichment in the ore formation along the dike further to the West is the most promising outlook for ore in this area at lower elevations.

425' Sub - North Footwall Pillar Near Maas Boundary

This sub level was opened in August 1937 and mining was completed in July 1938. Two contracts mined the ore from the two 12th level raises that were put up to this elevation in 1937.

415' Sub - North Footwall Pillar Near Maas Boundary

Mining on this sub level was started in April 1938 by one contract that had finished mining on the sub above and in July a second contract moved down. By the end of the year 20% of the ore had been mined.

11th Level

The work done on this level in 1938 was confined to raising. One raise, No. 1109, was cut out North of No. 1 dike in the connecting drift driven in 1937 from No. 1 to No. 2 cross-cut. This raise was extended 60 ft. in ore to the 450' sub level and was used for mining an area near the hanging. It replaced a raise that had crushed in No. 2 cross-cut.

Two test raises were put up in No. 1 cross-cut to explore ore that was encountered in this cross-cut to find if it extended far enough above the level to warrant mining from the 11th level. One of the raises struck jasper hanging almost on the top of the timber sets in the cross-cut, the other was in ore to a height of 22 ft. above the level. In order to explore at this elevation the test raise was enlarged and cribbed. Drifting was started in ore at the elevation of the 425' sub level but the ore proved to be only 10 ft. wide and 30 ft. in length to the South of No. 1 cross-cut.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

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

Subs Above the 12th Level

370' Sub - North Footwall Pillar Near Maas Boundary

This sub level was opened from No. 1291 raise in September 1938 and a drift driven to the East a distance of 60 ft. in the jasper footwall. From the end of the drift a raise was put up to the footwall drift on the 11th level. This work was done to provide an airway from the 11th to 12th level in this area to replace the old airway which was in the ore body in the Railroad pillar and which would be cut off by mining on the 415' sub level. The new airway will provide ventilation for the contracts mining the North footwall pillar and also the gangs mining near the Maas Boundary in the main ore body near the elevation of the 12th level.

350' Sub - Main Ore Body

This sub level was originally opened under the hanging in 1936 and most of the ore in this area mined.

The 12th level raises were replaced in 1936 and 1937 in Nos. 1230 and 1240 cross-cuts by raises from the 13th level. In 1937 mining from the 13th level raises under the hanging was finished and also from 12th level raises in No. 1250 cross-cut. Mining was also underway from the 1290, 1290-A, 1260 and 1270 series of raises. The 1280 series of raises had been abandoned as they were too far back in the footwall. There were nine contracts mining on this sub level in January 1938. By the end of the year mining had been completed except one small pillar near the footwall adjacent to No. 1296-A raise. The jasper hanging in the area mined in 1938, adjacent to the 1260 and 1270 series of raises, is standing almost vertical while the footwall has flattened resulting in a decided decrease in the ore area.

335' Sub - Main Ore Body

This sub level was opened in September 1936 and by the end of 1937 the ore above the 1230, 1240 and 1250 series of raises had been mined with the exception of several small pillars adjacent to No. 1256-A raise. In 1938 mining was finished above the 1250 series of raises and nearly completed above the 1260 series. It was also underway from three 13th level raises adjacent to the old 1290 and 1290-A series of raises and also from one new raise in No. 7 cross-cut on the 12th level.

At the end of the year there were only five small pillars to be mined above the 1260 series of raises, one pillar from the raise in No. 7 cross-cut while about 30% of the ore had been mined adjacent to the old 1290 and 1290-A series of raises. Raises have been completed from the 13th level from which the entire main ore body above the 12th level will be mined on the subs below the 335' elevation. There were only five 12th level raises still in service in this area at the end of the year. There was no change in the dip of the jasper hanging so that a further decrease in the ore area occurred on the 335' sub level above Nos. 6 & 7 cross-cuts.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

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

325' Sub - Main Ore Body

Mining on this sub level started in January 1937 under the hanging from a 13th level raise. Ore was being mined from three 13th level raises under the hanging by the end of 1937. By the end of 1938 mining was underway from eight raises from the 13th level and approximately 30% of the main ore body had been mined. On this sub level the hanging flattened and the ore body extended to the Maas boundary under a very flat hanging. The hanging was soft and it was difficult to advance the slices. The 2 ft. of ore above the timber caved off the hanging as soon as a cut was blasted and the loose jasper hanging started to run immediately after. Constant forepoling was necessary in the entire new area directly under the hanging. The concentration of weight on this area due to mining on the Maas property and also the mining further South on the Negaunee property caused the jasper to break and run more freely than in an area not subject to this unusual pressure.

315' Sub - Main Ore Body

Mining on this sub level was started under the hanging from No. 1325 raise on the 13th level in June 1937 and was completed at this raise in October. Mining from No. 1324 raise was started in December 1937 and from No. 1323 raise in February 1938. After working two months one of the contracts was moved to another location and mining completed from the two raises by one contract in September 1938. The extension of the ore body along No. 2 dike to the West under the hanging made it necessary to put up another raise from the 13th level to this area. This raise was completed in August and early in September a contract started mining from the new raise. They continued to work here for the balance of the year by which time they had mined the ore extending to the West to the hanging and had only two small pillars to mine. On this sub level the main ore body has been mined for a distance of 250 ft. adjacent to the hanging.

12th Level

Mining at the elevation of the 12th level was started from No. 1325 raise in October 1937 and completed early in 1938. The ore area directly South adjacent to Nos. 1324, 1323 and 1324-A raises from the 13th level, reported as mined on the 315' sub level elevation, is so near to the 12th level elevation that it has also been put on the 12th level map as a mined area. The next mining in this area will be nearly on the elevation of the 295' sub and will be reported on this sub level.

During the year six of the raises that were not far from 12th level cross-cuts were connected by drifts to the 12th level cross-cuts when the raises reached the 12th level elevation. After the connection was completed the raises were extended to the sub levels where mining was later started. There was 115 ft. of drift driven to connect three 13th level raises to No. 9 cross-cut, 90 ft. of drifting to connect two raises to No. 6 cross-cut and 30 ft. of drift to connect one raise to No. 5 cross-cut.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

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

No. 1277-A raise, located near the West end of No. 7 cross-cut, was put up to the 335' sub level late in the year to mine a footwall pillar that could not be reached from the raises in No. 1260 cross-cut. It was extended 38 ft. in jasper and lean ore.

In November a new footwall cross-cut was started on the 12th level that will be extended 215 ft. to the East of the footwall drift. Raises will be put up from this cross-cut to mine the ore body between No. 1 and No. 2 dikes starting on the 415' sub level just above the 11th level. At the end of the year the curve had nearly been completed. The advance was 30 ft. in 1938.

Subs Above the 13th Level

295' Sub - Main Ore Body

This sub level was opened in September 1938 from No. 1323 raise and after driving a connecting drift to Nos. 1324 and 1325 raises, slicing was started to a limit of mining established 110 ft. North of No. 1325 raise. At this elevation the ore body extends North and Northwest to the Maas property where it was mined many years ago.

285' Sub - Main Ore Body

Mining on this sub level was started from No. 1310 raise in March 1937 and completed in May 1937. Only a small area was mined under the jasper hanging. Jasper was broken to start a cave in this new territory. No. 1311 raise, 100 ft. Southwest of No. 1310 raise, was completed to this elevation in November 1937 and mining started. The occurrance of ore beyond the hanging discovered from No. 1310 raise was due to a roll or irregularity in the hanging wall jasper. After mining the ore under the hanging in all directions from No. 1311 raise, which work was completed in February 1938, a drift was then driven through the jasper to the workings near No. 1310 raise where, in the meantime, the ore had been mined on the 270' sub level. The hanging jasper was blasted down over the area mined from No. 1310 raise until the broken rock was 25 ft. in thickness. This provided a cushion and eliminated almost entirely the danger of crushing of timber in case of caving of large masses of jasper hanging. The contract then blasted down the mined area near No. 1311 raise and moved down to the 270' sub level.

In July No. 1352 raise was completed to the elevation of the 285' sub level. It was located 140 ft. due North of No. 1310 raise and 80 ft. from the Maas boundary line. A small area was mined directly under the hanging from this raise and in November the contract moved down to the 270' sub level elevation. Mining was started here to undercut the hanging and relieve pressure on the 13th level drifts below.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

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

270' Sub - Main Ore Body

This sub level was opened from No. 1310 raise in May 1937 and mining adjacent to this raise was completed in December 1937. In February 1938 mining was started from No. 1311 raise and continued for the balance of the year. The ore was found to extend much further West on this sub level and a limit of mining has been established at the economical distance for scraper haulage. The ore on this sub level was found to connect to the ore mined from No. 1310 raise 100 ft. to the North where the hanging had cut it off on the 285' sub level. There may be a small area of jasper at the elevation of the 270' sub level in the pillar that has not yet been mined between the two raises but it will be quite small and will entirely disappear on the next lower sub level.

Mining on this sub level from No. 1352 raise was started in November. One slice has been driven Northwest which, from the present indications, will continue under the jasper to the old working on the Maas property. The area to be mined from No. 1352 raise will be larger than on the sub level above due to the Westward pitch of the hanging.

235' Sub - Main Ore Body

Late in 1937, the airway connection from No. 1310 raise to the 12th level was lost due to mining at the 12th level elevation in No. 3 cross-cut. In order to establish a connection to the 12th level it was decided to open No. 1310 raise at the elevation of the 235' sub and drift 220 ft. to the East to No. 2 dike and raise from this point to the 12th level ore drift between the dikes. This drift was started in December 1937 and completed in March 1938. The drift was 225 ft. in length and the raise 56 ft. in height. By maintaining a connection from No. 1310 raise to another raise from the 13th level the air can be diverted up from the 235' sub level through No. 1310 raise to the upper subs and down to the 13th level via other raises.

235' Sub - Small Ore Body Near Southwest End of 13th Level

Mining of the small ore body West of the main dike was started in 1936 at the elevation of the 295' sub. During 1936 and 1937 it was mined on the 295', 285', 270' and 250' sub levels and partially on the 235' sub level. Mining was started on this sub level in June 1937 and completed in March 1938. The area mined was approximately 100' X 100' in size.

220' Sub - Small Ore Body Near Southwest End of 13th Level

This sub was opened in June 1938 from No. 1341 raise on completion of mining on the sub above and mining was continued here for the balance of the year. The ore was found to extend further to the Northwest and after holing to No. 1342 raise the contract transferred their equipment and mined from this raise for the rest of the year. For the first time the ore was found to extend to the Maas property where it was cut off by the dike. The area mined in 1938 was approximately 140' X 50' in size and unless cut off by the jasper hanging will be larger than on the subs above. This is the last sub level that can be mined above the 13th level as itis only 24 ft. above the level.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

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

When the 13th level drift was driven in 1936 a small ore body was encountered beyond a small dike about 80 ft. West of No. 1342 raise. The 13th level drift was in ore for 60 ft. then passed into the jasper hanging where it was stopped as any ore beyond would be below the 13th level elevation. In order to determine the height of this small ore body, No. 1344 raise was extended to the hanging which was encountered about 30 ft. above the 13th level. After underground diamond drill hole No. 28 was completed it was decided to cut out No. 1344 raise under the hanging and drift South to prove up the ore encountered in the drill hole about 40 ft. South of the 13th level drift. A small exploratory drift was driven in December a distance of 55 ft. Southeast from No. 1344 raise at the elevation of the 220' sub level. This drift was in ore for 10 ft. then in dike for 30 ft. when it encountered hanging wall jasper. It will be continued in 1939 up to the limit of scraper haulage as information regarding the ore found by No. 28 drill hole is required to determine the location of a cross-cut on the 13th level which must be driven to develop the ore if it is found to extend any distance above the 13th level.

13th Level

In August 1937 driving of the North footwall drift on the 13th level was started and continued until completed in April 1938 when it holed to the footwall drift parallel with the Maas boundary. The advance in 1938 was 186 ft. in footwall slate and jasper. The crew driving the drift also cut out three raises and extended them 5 ft. above the level. The driving of this drift completed drifting on the 13th level except for one or two cross-cuts that may be driven near the Southwest end of the level for mining the ore South of the main dike. All other work on the level was confined to raising.

No. 1362 raise in the footwall drift near the Maas boundary was started in January 1938 and was completed in April at a height of 157 ft. It was in jasper to a height of 106 ft. and in ore from 106 ft. to 157 ft.

No. 1364 raise in the same drift was started in March 1938 and completed in August at a height of 136 ft. This raise was in jasper for 136 ft. before ore was encountered a short distance above the 12th level elevation.

The above two raises, together with No. 1360 raise which was finished in 1937, were extended to the ore area mined above the 12th level from the 1290 and 1290-A series of raises.

No. 1370 raise in the North footwall drift was started in December 1937 and completed in March 1938 at a height of 131 ft. It was in jasper to a height of 87 ft. when ore was encountered.

No. 1372 raise in the North footwall drift was started in March and completed in August at a height of 138 ft. It was in jasper to a height of 94 ft.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

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

No. 1374 raise in the North footwall drift was started in August and completed in December at a height of 134 ft. It was in jasper to a height of 90 ft.

The above three raises in the North footwall drift were, at the end of the year, all in use on the 325' sub level above the 12th level for mining the ore formerly mined from the 1250 and 1260 series of raises on the 12th level.

No. 1324-A raise in No. 2 cross-cut on the 13th level was started in February 1938 and was completed in July at a height of 126 ft. This raise was in jasper to a height of 100 ft.

No. 1352 raise in the drift parallel to the Maas boundary was started in May 1938 and completed to the hanging in August at a height of 109 ft. This raise was in ore the entire distance.

No. 1312 raise in the drift parallel to the Maas boundary was started in December 1938 and was up 26 ft. in ore at the end of the year.

No. 1339 raise in the same drift was started in August 1938 and completed to the hanging jasper in September at a height of 73 ft. It was in ore for the entire distance of 73 ft.

No. 1344 raise in the same drift was started in September 1938 and completed in October at a height of 29 ft. It was in ore to a height of 26 ft. and in jasper for 3 ft.

A raise started on the Maas Mine property was extended to the elevation of the 13th level and a drift driven 35 ft. to the South to hole to the 13th level Southwest haulage drift. The connection was made to provide an airway to the 5th level Maas Mine.

d. Timbering:

The product decreased 49% in 1938 and the total cost per ton for timber, lagging, poles, etc., decreased 43%. The price per foot for timber decreased 8%. The feet of cribbing timber used in 1938 increased 14% while the feet of stulls decreased 46%. Exclusive of the cribbing the feet of stull timber per ton of ore in 1938 was .463 as compared with .430 in 1937. The increase in 1938 was due to more timber used in repair work and more timber in exploratory rock drifts in No. 1 shaft pillar above the 9th level. The cost per ton for cribbing in 1938 was $ .0107 compared with $ .0050 in 1937 due to the decrease in product. The cost per ton for all timber increased 13.5% as compared with the previous year due, as shownabove, to higher cost per ton for cribbing which accounts for over half the increase. The major portion of the balance of the increase was due to use of more stull timber per ton of ore.

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7. UNDERGROUND: (Cont'd)

d. Timbering: (Cont'd)

There was no change in use of timber as to length and size in 1938. The use of timber bulkheads as a safety measure near the raises was continued as they prevent the cavesthat follow blasting of the timber in the slices from extending back to the raises.

Statement of Timber Used:

	Lineal Feet	Avg. Price Per Foot	Amount 1938	Amount 1937
6" to 8" Cribbing	122,840	.0361	4432.60	4100.42
8" Stulls	50,702	.0695	3528.24	7930.91
10" Stulls	91,017	.0973	8857.22	16247.02
12" Stulls	49,162	.1356	6670.49	9053.96
Treated Timber			* 14.20	574.95
Total 1938	313,721	.0749	23502.75	
Total 1937				37907.26
Lagging - 7 ft.	1,215,595	.0079	9616.76	17865.09
Poles - 9-1/2 ft.	777,161	.0132	10272.94	20559.80
Total 1938	1,992,756	.0099	19889.70	
Total 1937				38424.89
Wire Fencing - Feet	6,930		396.07	427.46
Grand Total 1938			43788.52	
Grand Total 1937				76759.61

Product	412,000	820,915
Feet of Timber per ton of ore	.761	.564
Feet of Lagging per ton of ore	2.950	2.661
Feet of Lagging per ft. of timber	3.875	4.719
Feet of Wire Fencing per ton of ore	.0167	.0092
Cost per ton for Timber	.0570	.0462
Cost per ton for Lagging	.0233	.0218
Cost per ton for Poles	.0249	.0250
Cost per ton for Wire Fencing	.0009	.0005
Total Cost Per Ton	.1061	.0935
Equivalent of stull timber to board measure	506,318	985,062
Feet of board measure per ton of ore	1.22	1.20

Total Cost for Timber, Lagging, Poles, etc.

Year	Product	Amount	Cost Per Ton
1938	412,000	43788.52	.1061
1937	820,915	76759.61	.0935
1936	512,612	44983.10	.0877
1935	291,318	26935.69	.0924
1934	235,664	23441.91	.0985
1933	61,941	9147.82	.1477

(*) Treating only at Athens Mine

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7. UNDERGROUND: (Cont'd)

e. Drifting and Raising:

There was a small decrease in the total of ore and rock drifting and also in ore and rock raising this year as compared with 1937. The net decrease was only 3% which, considering the reduced operating schedule, shows a decided increase in number of men engaged in development work. In order to keep development in advance of mining operations it will be necessary to continue the heavy development program for at least two years. Several more raises must be put up on the 9th level as also on the 12th and 13th and there is also the 14th level to be completely developed. Rock drifting must be done on the 12th, 13th and 14th levels. The decrease in the size of the main ore body makes it necessary to speed up development work to keep the necessary advance ahead of mining operations. The following table gives a comparison of the total drifting and raising in ore and rock in 1938 and 1937:

	Drifting		Raising		Total
Year	Ore	Rock	Ore	Rock	
1938	585'	1306'	943'	1158'	3992'
1937	859'	1062'	1645'	579'	4145'
Increase		244'		579'	
Decrease	274'		702'		153'

f. Explosives, Drilling & Blasting:

The cost per pound for powder increased 2.4% in 1938 and the cost per ton increased 3.9%. The cost per pound for powder was increased in May 1937 from $ .1075 per pound for 50% Gelatin to $ .1225 per pound and there was no change from the higher price during 1938. The use of 50% Gelatin powder was discontinued in 1938 and was replaced entirely by Gelamite No. 1. The Gelamite No. 1 has 25 more sticks per 100 pounds and in blasting strength per pound rates as 60% Gelatin. The cost per pound is the same as the 50% Gelatin powder. The fumes from explosion are less harmful than the fumes of the Gelatin powder. The use of Gelamite No. 1 was started in 1937 and increased each month. Some objections to its use were made at first by the miners who claimed less breaking strength per stick and more objectionable fumes but since being assured on these points no further complaints have been made. There was no change in length of fuse used in 1938 from the standard length of 7 ft. adopted in June 1937. There was more mining in hard blue ore in 1938 which increased the pounds of powder per ton of ore 1.1%. The total increase in cost per ton for all explosives was 1.9% or $ .0012 per ton.

Blasting in raises over 100 ft. in height was done by electric exploders in 1938. In raises up to 100 ft., 10 ft. fuses were used. Late in 1938 waterproof cartridges were tested for use in high raises and wet places. These cartridges hold up to six fuses and are lighted with a pilot fuse which can be varied in length to give the necessary time for the men to light the pilot fuses and get to a place of safety. The fumes from lighting fifteen or more fuses are greatly decreased as only the three or four pilot fuses have to be lighted. This increases safety for the miners lighting the fuses as there is much less smoke in the raise. In blasting in wet places only the three to five pilot fuses have to be lighted instead of all the fuses, there are no missed holes and as much time as needed can be obtained by use of the proper length of pilot fuses. Intelligent use of the cartridges should eliminate entirely the danger from delays in lighting fuses which has in the past caused many accidents due to the miners staying too long.

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7. UNDERGROUND: (Cont'd)

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

Year	Cost Per Lb. for Powder	Lbs. Powder Per Ton of Ore	Cost Per Ton Powder	Cost Per Ton Fuse & Caps	Total Cost
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

Statement of Explosives Used: (Ore Development and Stoping)

	Quantity	Average Price	Amount 1938	Amount 1937
Gelamite No. 1	156,506	12.25	19,161.07	8,856.74
50% Gelatin	21,250	12.25	2,601.22	32,963.92
60% Gelatin	500	13.00	65.00	36.75
Total Powder 1938	178,256	12.25	21,827.29	41,857.41
Fuse - feet	606,257	4.96	3,010.02	6,858.82
No. 6 Blasting Caps	84,564	12.18	1,030.08	1,916.33
Tamping Bags	26,500	3.25	86.15	87.75
Fuse Lighters	14,000	6.75	94.54	150.39
Electric Detonators				4.18
Lead Wire - feet				2.60
Total Fuse, etc. 1938			4,220.79	
Total Fuse, etc. 1937				9,020.07
Total All Explosives 1938			26,048.08	
Total All Explosives 1937				50,877.48
Product			412,000	820,915
Pounds powder per ton of ore			.432	.427
Cost per ton for powder			.0530	.0510
Cost per ton for fuse, caps, etc.			.0102	.0110
Cost per ton for all explosives			.0632	.0620
Development in Rock				
Gelamite No. 1	7,350	12.25	899.41	42.88
50% Gelatin	6,800	12.27	834.89	1,063.96
60% Gelatin	600	13.00	78.00	1,134.95
Total Powder 1938	14,750	12.29	1,812.30	
Total Powder 1937				2,241.79
Fuse - feet	57,563	5.02	289.25	214.45
No. 6 Blasting Caps	7,726	12.24	94.58	62.31
Electric Detonators	180	11.54	20.78	9.41
Total Fuse, etc. 1938			404.61	
Total Fuse, etc. 1937				286.17

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7. UNDERGROUND: (Cont'd)

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

Statement of Explosives Used; (Development in Rock) - (Cont'd)

	Amount 1938	Amount 1937
Total All Explosives 1938	2,216.91	2,527.96
Total All Explosives 1937		2,527.96
Total Explosives Used 1938	28,264.99	
Total Explosives Used 1937		53,405.44
Explosives charged to Back Filling	127.04	
Explosives charged to Pumping Machinery	30.50	
Total as per Cost Sheet	28,422.53	
Average Price per pound for Powder 1938	.1225	
Average Price per pound for Powder 1937		.1195

g. Mining & Loading:

There has been no change in mining practice during the past year. There is a decided trend by all the mining companies to the use of larger scraper units, fewer raises and longer scraping distances. Our own experience has lead to the same conclusion which has been put in effect in new areas opened at the Negaunee Mine. The 25 H.P. continuous rated motor has proven ideal for continuous operation with hauls up to 250 ft. in length. For shorter hauls the 20 H.P. motor with higher speed and more power has proven superior to the 15 H.P. in general use until the past two years. The spacing of raises is not entirely based on haulage distances as communication must be established with another raise to give a second outlet and to provide for ventilation.

More care is being exercised each year in covering down the floors of sub levels as good covering makes mining conditions safer and eliminates delays and expense from runs of rock. It increases output and as the men learn this from experience they cooperate in the work for the reason that they make better wages.

h. Ventilation:

There was good ventilation in the mine during 1938. In some areas, due to lack of outlet for the hot air coming from oxidization of the timber mat, it has been necessary to use booster fans to force air to the sub level. These working places are hot due to high humidity but the actual temperature rarely exceeds 75° Fahrenheit. In order to prevent rotting of the mine timber, the 100,000 cu. ft. fan is run on the days the mine is idle so that the cost is about the same each year irrespective of the operating schedule. The actual cost in 1938 was $7,963.84 as compared with $8,284.27 in 1937 in which year some expense was incurred for timbering the main airway drift on the 9th level.

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7. UNDERGROUND: (Cont'd)

i. Pumping:

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

Month	1938	1937	1936	1935	1934	1933
January	1038	893	886	931	815	814
February	906	866	898	953	788	808
March	951	1025*	867	898	779	751
April	988	1075	866	878	796	816
May	1029	1062	992	887	807	926
June	1052	1089	798	895	826	876
July	1055	1107	931	911	837	984
August	1085	1148	952	917	854	882
September	1070	1161	959	936	857	889
October	1044	1162	951	944	859	866
November	994	1131	954	940	875	849
December	973	1105	916	927	876	826
Total Avg.	1015	1069	914	918	831	857

(*) Increase due to water diverted from Maas Mine and pumped by Negaunee Mine.

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

Year	Gallons Per Minute
1938	1015
1937	1069
1936	914
1935	918
1934	831
1933	857
1932	905
1931	914
1930	1060
1929	1230

There was a decrease in 1938 in the number of gallons pumped per minute which was due in a large measure to a decrease in the water coming in the mine on the 9th level. The decrease here was due to the ditch that was blasted on surface late in 1936 to drain the water that had formerly spread over a large area of swamp within 1,000 ft. of No. 2 shaft caves to surface. There was also a small decrease in the water diverted from the Maas Mine to the Negaunee Mine. There has been a slight increase in the water on the 13th level, probably about enough to offset the decrease in the Maas Mine water.

The diamond drilling on surface Northeast of No. 2 shaft indicated a deepening of the ledge to the North and churn drill holes put down here late in the year indicated that it may be profitable to sink a deep well to ledge and pump water here to divert it from the caves. The churn drill will resume this work next spring as it was impossible to continue it in severe cold weather.

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YEAR 1938

7. UNDERGROUND: (Cont'd)

i. Pumping: (Cont'd)

With the opening of the 14th level it will be necessary to make a change in the pumping plants on the lower levels. The electric pump now in the skip pit below the 13th level will be transferred to the 14th level skip pit. The 13th level pump will be overhauled and retained on the 13th level. The 11th level electric pump will be transferred to the 12th level and the 11th level sump abandoned. This pump will be set up as a spare in the 12th level pump house in a space already provided. It is an exact duplicate of the pump now in use on the 12th level. Some rearrangement of discharge lines will be necessary. The water now coming in on the 11th level will be siphoned to the 12th level sump. The above work will be done in 1939.

j. Underground in General:

The first of the year only the ore under the hanging wall in the main ore body above the 12th level was being mined from 13th level raises. By the end of the year only two of the 12th level raises were in use in the entire main ore body. A total of twelve raises from the 13th level have been completed to the subs a short distance above the 12th level and two more are planned, one of which is now being put up. The fourteen raises from the 13th level will replace forty raises on the 12th level which gives a clear picture of the effect of mechanization of a mine with modern equipment. Since haulage from the 12th level raises has been abandoned the drifts have been propped and replacement of broken crushed timber largely avoided. This has reduced repair costs on this level.

The mining of areas under the hanging just below the 12th level has transferred the pressure to the unmined areas and has caused considerable crushing in the haulage drift in ore that parallels the Maas boundary. In addition to crushing of the timber in this drift the tracks have heaved so badly as to require the bottom of the drift to be lowered several times. In order to overcome this pressure it is necessary to mine one or more sub levels under the hanging directly above the drift. Progress has been made in this work and pressure on the drift in the areas mined has materially decreased. Several repair gangs have worked steadily in these areas all year and on one of the idle days every weekend, six or more special repair crews have worked here. With the completion of three more raises mining can be started in the entire area and the pressure will soon be relieved.

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8. COST OF OPERATING:

a. Comparative Mining Costs:

	1938	1937	Increase	Decrease
PRODUCT	412,000	820,915		408,915
Underground Costs	1.228	1.030	.198	
Surface Costs	.156	.097	.059	
General Mine Expenses	.268	.171	.097	
Cost of Production	1.652	1.298	.354	
Taxes	.288	.146	.142	
Depletion & Depreciation	.369	.446		.077
Loading & Shipping	.020	.028		.008
Adm. & General Expense	.022	.013	.009	
Miscellaneous Income	.008	.004	.004	
TOTAL COST	2.343	1.927	.416	
No. of Days Operated	187	288		101
No. of Shifts & Hours	1-8 hr.	1-8 hr.		
	2-8 hr.	2-8 hr.		
	3-8 hr.	3-8 hr.		
Average Daily Product	2,203	2,850		647

COST OF PRODUCTION:

	1938	%	1937	%	Increase	Decrease
Labor	.950	57.5	.791	60.9	.159	
Supplies	.702	42.5	.507	39.1	.195	
Total	1.652	100.0	1.298	100.0	.354	

b. Detailed Cost Comparison:

(1) Days and Shifts:

Year	Days Mine Worked	Shifts & Hours	Men Employed	Total Shifts Worked
1938	187	1-8 2-8 3-8	346	60,342
1937	288	1-8 2-8 3-8	424	102,951
Decrease	101		78	42,609

(2) Wages:

A reduction in salaries was made April 16th, 1938 and restored December 16th, 1938.

(3) Comparison of Production:

Production - 1938	412,000 tons
Production - 1937	820,915 "
Decrease	408,915 "

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

(4) Comparison of Number of Men and Wages:

	No. Men	No. Days	Amount	Rate per Day
1938	346	60,342	377,698.09	6.26
1937	424	102,951	640,277.30	6.22
Decrease	78	42,609	262,579.21	
Increase				.04

(5) Tons Per Man Per Day:

	1938	1937	Decrease
Surface	32.78	44.91	12.13
Underground	8.62	9.69	1.07
Total	6.83	7.97	1.14

(6) Cost of Production:

1938	680,458.75	Cost Per Ton	1.652
1937	1,065,605.00	Cost Per Ton	1.298
Increase			.354
Decrease	385,146.25		

	Labor	%	Supplies	%
1938	391,246.14	57.5	289,212.61	42.5
1937	649,048.17	60.9	416,556.83	39.1
Increase				3.4
Decrease	257,802.03	3.4	127,344.22	

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

(7) Detail of Accounts:

	1938	1937	Increase	Decrease
Days Per Week	2, 3, & 4	5 & 6		
Shifts & Hours	1-8 2-8 3-8	1-8 2-8 3-8		
Production - Tons	412,000	820,915		408,915
Avg.Daily Product	2,203	2,850		647
Number of Days Worked	187	288		101

		1938		1937		Inc. or Dec.	
	UNDERGROUND COSTS:	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton
1.	Exploring in Mine	900.65	.002	767.31	.001	133.34	.001
2.	Sinking in Shaft						
3.	Development in Rock	19988.41	.049	11759.92	.014	8228.49	.035
4.	Development in Ore	10540.83	.026	12031.95	.015	1491.12	.011
5.	Stoping	171902.67	.417	337170.28	.411	165267.61	.006
6.	Timbering	137792.75	.334	224731.61	.274	86938.86	.060
7.	Tramming	48815.84	.118	101649.29	.124	52833.45	.006
8.	Ventilation	7963.84	.019	8284.27	.010	320.43	.009
9.	Pumping	37004.97	.090	34844.12	.042	2160.85	.048
10.	Compressors and Air Pipes	31312.84	.076	40577.96	.049	9265.12	.027
11.	Back Filling	127.04				127.04	
12.	Underground Superintendence	14520.16	.035	17576.20	.022	3056.04	.013
13.	Cave-in						
14.	Maint: Comp. & Power Drills	759.49	.002	1686.62	.002	927.13	
15.	Scrapers & Mech. Loaders	10966.30	.027	30705.29	.037	19738.99	.010
16.	Elec. Tram Equipment	11460.90	.028	22102.42	.027	10641.52	.001
17.	Pumping Machinery	1876.09	.005	1605.48	.002	270.61	.003
	Total Undg. Costs	505932.78	1.228	845492.72	1.030	339559.94	.198
	SURFACE COSTS:						
18.	Hoisting	24567.51	.060	33966.52	.041	9399.01	.019
19.	Stocking Ore	12384.03	.030	10837.59	.013	1546.44	.017
20.	Shop Machinery	1328.00	.003			1328.00	.003
21.	Dry House	6457.79	.016	7332.26	.009	874.47	.007
22.	General Surface Expense	7537.10	.018	8332.11	.010	795.01	.008
23.	Maint: Hoisting Equipment	6421.06	.016	10255.45	.013	3834.39	.003
24.	Shaft	2038.25	.005	2007.66	.003	30.59	.002
25.	Top Tram Equipment	2102.62	.005	3107.07	.004	1004.45	.001
26.	Docks, Trestles & Pockets	969.87	.002	1839.56	.002	869.69	
27.	Mine Buildings	506.11	.001	1664.59	.002	1158.48	.001
	Total Surface Costs	64312.34	.156	79342.81	.097	15030.47	.059
	GENERAL MINE EXPENSES:						
28.	Mining Engineering	2921.93	.007	2323.33	.003	598.60	.004
29.	Mech. & Elec. Engineering	2199.72	.005	2040.38	.003	159.34	.002
30.	Analysis and Grading	9495.31	.023	16117.85	.020	6622.54	.003
31.	Safety Department	1894.95	.005	2124.28	.003	229.33	.002
32.	Telephones & Safety Devices	2553.21	.006	4003.46	.005	1450.25	.001
33.	Local and General Welfare	6047.06	.015	5896.00	.007	151.06	.022
34.	Special Exp., Pen. & Allowances	13481.99	.033	8766.25	.011	4715.74	.022
35.	Ishpeming Office	15985.52	.039	19322.00	.023	3336.48	.016
36.	Mine Office	16483.54	.040	16211.21	.019	272.33	.021
37.	Insurance	826.49	.002	4616.69	.006	3790.20	.004
38.	Personal Injury	16618.07	.040	33215.02	.040	16596.95	
39.	Social Security Taxes	18645.74	.045	19801.78	.024	1156.04	.021
40.	Employees Vacation Pay	3922.44	.010	6199.00	.007	2276.56	.003
41.	Prop. Gen. Sthse. Vacation Pay	111.82		132.22		20.40	
	Total General Mine Expenses	110213.63	.270	140769.47	.171	29581.68	.099
	COST OF PRODUCTION	680458.75	1.654	1065605.00	1.298	384172.09	.356
42.	Taxes	118560.68	.288	120050.92	.146	1490.24	.142
	TOTAL COST OF PRODUCTION	799019.43	1.942	1185655.92	1.444	385662.33	.498

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

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

UNDERGROUND COSTS:

1. Exploring in Mine:
Increase due to more time spent by Geological Department on Negaunee Mine geological work account of the diamond drilling in 1938. Expenditures increased $133.34 and cost per ton $ .001.

3. Development in Rock:
Increase due to more development in rock. In 1938 the cost sheet showed 2,113 ft. compared with 1,291 ft. in 1937. The cost per foot in 1938 was $10.73 compared with $9.11 per foot in 1937. Expenditures increased $8228.49 and cost per ton $ .035.

4. Development in Ore:
Decrease in expenditures of $1491.12 and in footage in 1938 due to decrease in working schedule. Cost per ton increased $ .011 due to lower product.

5. Stoping:
Expenditures decreased $165,267.61. In 1938 there were 18,035 shifts worked compared with 37,522 shifts in 1937. Labor cost decreased $138,014.17 and supply cost decreased $27,253.44. Cost per ton increased $ .006 and tons per man per day decreased from 7.97 tons to 6.83 tons in 1938. Average tons stoping however, increased from 20.94 to 21.17 tons in 1938. There was an increase in cost per pound for powder in 1938.

6. Timbering:
Decrease in expenditures of $86,938.86 but cost per ton increased $ .060. More stull timber and lagging used for repair work and more cribbing timber used in raises in 1938. There was more labor cost for repair work than in 1937.

7. Tramming:
Expenditures decreased $52,833.45 and cost per ton $ .006. Electric current decreased $ 1,767.62, electric haulage expense decreased $ 1,275.13, also less labor cleaning tracks and skip pit account of less tonnage trammed.

8. Ventilation:
Expenditures decreased $320.43, cost per ton increased $ .009. Decrease in electric current $320.00. Fan operated on days mine was idle so that cost is almost the same as in 1937. The higher cost in 1937 was due mainly to cost of repairing airway drift on the 9th level.

9. Pumping:
Expenditures increased $2,160.85 and cost per ton $ .048. Cost for electric current increased $1,529.90. The increase in cost for current was due to higher charge per kilowatt hour due to unfavorable load factor caused by operating schedules. The labor cost increased account of operating and lowering pumps and repair of same in connection with shaft sinking. Increase in labor cost $667.37, oil and supplies decreased $ 36.44. There were 534,118,975 gallons of water pumped in 1938 and 562,395,718 gallons pumped in 1937, a decrease of 28,276,743 gallons.

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

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

UNDERGROUND COSTS: (Cont'd)

10. Compressors and Air Pipes:
Decrease in expenditures of $ 9,265.12, cost per ton increased $ .027. Decrease in cost for electric current $ 6,729.78, also decrease in supply cost operating compressor of $ 187.75 and decrease in expenses for air piping of $ 2,347.59.

Cu. Ft. Air Compressed - 1938	771,210,000
Cu. Ft. Air Compressed - 1937	1,096,200,000
Decrease	324,990,000

Decrease in expenditures due to less days mine operated account change in working schedule. Air compressed on idle days account of shaft sinking accounts for the increase in cost per ton.

11. Back Filling:
Increase of $ 127.04. No expenditures in 1937. Expense incurred in breaking hanging jasper in new area mined above the 13th level.

12. Underground Superintendence:
Decrease in expenditures of $ 3,056.04; cost per ton increased $ .013 due to mine operating less days per week. Bosses safety bonuses for 1938 amounted to $ 345.42 compared with $ 669.28 in 1937. Bosses were allowed to work one more day per week than the mine operated when the operating schedule was two and three days per week.

14. Compressors and Power Drills:
In 1938, one SAR85 stoper costing $365.88 was charged out compared with four RB12 drill machine and one stopehammer drill machine, amounting to $ 1,127.45, in 1937. Repairs to compressors $ 165.56 less than in 1937 when new valves for Ingersoll-Rand compressor were installed. The cost per ton same as in 1937.

15. Scrapers and Mechanical Loaders:
Expenditures decreased $ 19,738.99 and cost per ton $ .010. In 1937 there were seven scraper hoists and thirteen Holcomb-Westico scrapers amounting to $ 11,344.87 charged out. In 1938 there was none. In 1937 there were 82,865 ft. of wire rope used costing $ 7,920.45 compared with 52,308 ft. costing $ 5,191.51 in 1938. Also labor and supplies were $ 5,665.16 less for repairs than in 1937.

16. Electric Tram Equipment:
Decrease in expenditures of $ 10,641.52 and increase in cost per ton of $ .001. Decreases of $ 4,263.81 in repairs to locomotives, $ 1,068.12 in wiring, $ 3,882.53 in Main Line Tracks, $ 1,395.60 in repairs to cars and $ 31.00 in repairs to generator.

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

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

UNDERGROUND COSTS: (Cont'd)

17. Pumping Machinery:
Expenditures increased $ 270.61 and cost per ton $ .003. One pump and motor $992.00 charged out, also labor and supplies enlarging 13th level sump $127.00, but less repairs to pumps in 1938.

SURFACE COSTS:

18. Hoisting:
Expenditures decreased $ 9,399.01, cost per ton increased $ .019. Decrease in electric current of $ 7,156.03 also $ 7,256.00 in labor and supplies account less operating shifts and less tonnage hoisted. Cost per kilowatt hour higher in 1938 due to unfavorable load factor.

19. Stocking Ore:
Expenditures increased $ 1,546.44 and cost per ton $ .017. Labor and supplies erecting and repairing temporary wooden trestles - 33 bents of ore trestle and 6 bents of rock trestle, amounted to $ 5,060.90 compared with $ 1,021.05 in 1937. Decrease of $ 2,493.41 in cost of stocking ore due to less tons stocked in 1938.

20. Shop Machinery:
Expenditures increased $ 1,328.00. One Ideal flash boiler, used for heating shop building, $ 952.00 and one Pittsburgh lathe for Machine shop $ 468.00. This equipment borrowed from other mines years ago but not billed until this year. No expenditures in this account in 1937.

21. Dry House:
Expenditures decreased $ 874.47, cost per ton increased $ .007. Decrease of $ 237.44 in cost for heating Dry House., and $ 637.03 in Labor attending Dry account mine operating less days in 1938.

22. General Surface Expense:
Expenditures decreased $ 795.01, cost per ton increased $ .008 - less shifts worked repairing roads, cleaning grounds, mowing lawns, etc. account of reduced operating schedule.

23. Hoisting Equipment:
Expenditures decreased $ 3,834.39, cost per ton increased $ .003. In 1938 there were five 1-1/4" hoisting ropes charged out amounting to $ 2,888.07 compared with two ropes in 1937 amounting to $ 1,098.97. Three ropes were put on account of sinking the shaft to open up another level which required longer ropes. Also repairs to generator set amounting to $ 147.23 charged out. In 1937 ten coils for fly wheel set $ 1,500.00, signal cables $ 888.00, spherical bottom skips $ 1,010.00, four Whirlaire fans $ 154.80 and repairs to skips, cages and skip roads $ 2,217.92.

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

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

SURFACE COSTS: (Cont'd)

24. Shaft:
Expenditures increased $ 30.59 and cost per ton $ .002 due to repairing chute stoppers in shaft pockets.

25. Top Tram Equipment:
Expenditures decreased $ 1,004.45 and cost per ton increased $ .001. Less repairs to cars and tracks, and less wire rope used account of less time worked and smaller tonnage stocked.

26. Docks, Trestles and Pockets:
Expenditures decreased $ 969.69. Increase of $ 267.00 putting in new plate and fir timber in shaft house pockets in 1938. Decrease of $ 1,236.00 in labor and supplies for repairs to permanent steel trestle account of new decking and other repairs made in 1937.

27. Mine Buildings:
Decrease in expenditures of $ 1,158.48 and cost per ton of $ .001. Very little repair work required on mine buildings in 1938.

GENERAL MINE EXPENSES:

28. Mining Engineering:
Increase in expenditures of $ 598.60 and cost per ton of $ .004 account of more development work.

29. Mechanical and Electrical Engineering:
Increase in expenditures of $ 159.34 and cost per ton of $ .002.

30. Analysis and Grading:
Decrease in expenditures of $ 6,622.54 due to less sampling and analysis account of less ore mined and shipped.

Ishpeming Laboratory charges - 1937	$ 10,657.26
" " " - 1938	5,766.11
Decrease	4,891.15
Shipping Department expense - 1937	$ 2,995.00
" " " - 1938	2,386.63
Decrease	608.37
Mine sampling - 1937	$ 2,465.59
" " - 1938	1,342.57
Decrease	1,123.02

In 1938 there were 19,645 determinations compared with 39,457 determinations in 1937, a decrease of 19,812 determinations.

8. COST OF OPERATING: (Cont'd)

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

GENERAL MINE EXPENSES: (Cont'd)

31. Safety Department Expense:
Expenditures decreased $ 229.33, cost per ton increased $ .002. Safety awards to employees in 1938 amounted to $ 740.00 compared with $ 450.00 in 1937, an increase of $ 290.00. In 1937 280 lunch kits - $ 264.32 and 420 safety calendars - $ 120.44 were charged out and also an increase of $ 135.00 in Safety Department expense.

32. Telephones and Safety Devices:
Decrease in expenditures of $ 1,450.25, cost per ton increased $ .001. Electric current for 1938 was $ 692.20 compared with $ 1,039.84 for 1937, a decrease of $ 347.64. In 1937 water pipe was installed from Dry House to underground levels to provide drinking water costing $ 528.54, also more conduit, wire mazda lamps and electrical supplies used for main level lighting. In 1938 there were 90 pairs of safety goggles costing $ 120.26 charged out.

33. Local and General Welfare:
Expenditures increased $ 151.06 and cost per ton $ .008. Proportion of cost of the Visiting Nurse at Negaunee and other welfare expenses charged at Ishpeming Office.

34. Special Expense, Pensions and Allowances:
Expenditures increased $ 4,715.74 and cost per ton $ .022.

	1938	1937	Increase	Decrease
Pensions	3,998.43	4,571.00		572.57
Legal	453.37	558.00		104.63
Saranac Investigation	2,022.21	1,516.48	505.73	
Central Emp. Office & Other	2,869.22	2,120.77	748.45	
Curtailment Expense	4,138.76		4,138.76	
Total	13,481.99	8,766.25	4,715.74	

35. Ishpeming Office:
Expenditures decreased $ 3,336.48, cost per ton increased $ .016. Expense is based on total labor cost at mine.

36. Mine Office:
Expenditures increased $ 272.33 and cost per ton $ .021.

	1938	1937	Increase	Decrease
Clerks salaries	5,638.75	5,732.00		93.25
Mine Supt. "	4,233.60	4,730.00		496.40
Central Warehouse	4,262.09	3,263.63	998.46	
Total	14,334.44	13,725.63	408.81	

Decrease of $ 136.48 in mine office labor and supplies. Reduction in salaries made April 16th, 1938 restored Dec. 16th, 1938. Increase in Central Warehouse expense due to depreciation of warehouse building amounting to $ 448.11 - no depreciation in 1937. There was an increase in the rate of unemployment insurance tax which, with the old age benefit tax on all labor at the General Shops and Storehouse, is charged to Central Warehouse.

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

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

GENERAL MINE EXPENSES: (Cont'd)

37. Insurance:

Expenditures decreased $ 3346.17 and cost per ton $ .004.

	1938	1937	Increase	Decrease
Property	923.31	580.19	343.12	
Group	333.05	3389.63		3722.68
Catastrophe	236.23	646.87		410.64
Total	826.49	4616.69		3790.20

38. Personal Injury:

Expenditures decreased $ 16,596.05, cost per ton $ .000.

	1938	1937	Increase	Decrease
Compensation & Doctors	11274.62	26618.79		15344.17
Compensation Dept.	895.88	3423.46		2527.58
Hospital Loss	4447.57	3172.77	1274.80	
Total	16618.07	33215.02		16596.95

Decrease due to smaller payrolls for 1938.

39. Social Security Taxes:

Expenditures decreased $ 1,156.04, cost per ton increased $ .021.

	1938	1937	Increase	Decrease
Unemployment Ins. Tax	14721.48	13325.42	1396.06	
Old Age Benefit Tax	3924.26	6476.36		2552.10
Total	18645.74	19801.78		1156.04

The tax rate for unemployment insurance for 1938 was .03 compared with .02 for 1937.

40. Employees Vacation Pay:

Expenditures decreased $ 2,276.56, cost per ton increased $ .003. In 1938 employees were given a vacation of three days compared with five days in 1937. In 1938 207 employees were given vacations compared with 192 in 1937.

42. Taxes:

Expenditures decreased $ 1,490.24 account of lower valuation. Cost per ton increased $ .142 account of smaller product.

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9. EXPLORATIONS AND FUTURE EXPLORATIONS:

For the first time in many years a drilling program was undertaken at the Negaunee Mine in 1938 with several objects in view. The drilling on the 13th level Negaunee Mine was done to prove up ore bodies that might be found South of the main dike to give information of the size and extent of the ore body which extended below the 13th level and to locate cross-cuts on the 13th level from which raises would be put up to mine the ore above the 13th level. The two holes drilled from the Maas Mine, one on the 90' sub level, the other on the 50' sub level, were drilled to determine the elevation at which the ore passed from the Negaunee Mine property to the Maas Mine. This information was necessary to determine the depth at which the 14th level should be opened in order to mine all the ore on the Negaunee property.

Several holes were drilled on surface Northeast of No. 2 shaft to determine if the ore extended beyond the highest workings on the Negaunee property to the East and connected with the old Barasa Mine workings. An Armstrong churn drill outfit put down two standpipes Southeast of No. 1 shaft, one to determine the depth of surface material directly above the old stopes Southeast of the shaft. The other hole was put down at the point where the upward pitch of the ore would outcrop at ledge to determine if the ore extended that distance beyond the stopes. The churn drill also sunk a standpipe to ledge about 300 ft. Northeast of No. 2 shaft and this hole was continued by the diamond drill to the footwall slate to determine if the ore in No. 2 shaft pillar extended East of No. 2 shaft.

In order to determine if there was a water bearing channel in the ledge to the Northeast of No. 2 shaft, several standpipes were sunk to ledge North of the diamond drill holes put down in this area. The contour of the ledge as determined by the diamond drill holes showed a dip to the North toward the surface outcrop of the ledge. A definite channel was indicated by the standpipe holes but due to severe winter weather the work was not completed and one more standpipe will be put down next spring.

Following is the record of each hole and comments on results obtained:

E. & A. No. 795 - Development 14th Level
Hole No. 28, Maas Mine - Drilled South 9° East from the 90' sub level, Maas Mine. Started February 7th, 1938; completed March 18th, 1938.

Footage	Material
0' - 65'	Lean ore and jasper.
65' - 105'	Soft ore jasper.
105' - 170'	Bessemer ore.
170' - 195'	Lean ore.
195' - 205'	Bessemer ore.
205' - 215'	Lean ore.
215' - 234'	Ore.
234' - 359'	Lean ore and jasper.
359' - 379'	Ferruginous slate - (Stopped)
0' - 163'	On Maas property.
163' - 379'	On Negaunee property.

Ore on Negaunee property - 195' - 205' 57.80 iron, .023 phosphorous.
215' - 234' 57.89 iron, .255 phosphorous.

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

Hole No. 29, Maas Mine - Drilled from 50' sub level Maas Mine on dip 10° South 2° 27' East. Started March 26th, 1938; completed April 12th, 1938.

Footage	Material
0' - 145'	Ore.
145' - 198'	Lean ore and jasper - (Stopped)
0' - 198'	on Maas property.

These two holes were located nearly on the West property line of the Negaunee Mine at the Northwest corner where the ore would reach the lowest elevation. They gave information from which it was decided to open the 14th level at a depth of 121 ft. below the 13th level.

On completion of these two holes the drill was moved to the Southwest end of the 13th level Negaunee Mine and Negaunee Mine hole No. 28 was drilled to give additional information of the extent of the ore body that extended to the Maas property at a lower elevation.

Hole No. 28, Negaunee Mine - Southwest end 13th level, horizontal course South 35° 47' East. Started Arpil 19th, 1938; temporarily stopped May 4th at a depth of 168 ft. Drilling resumed November 28th and was completed December 13th, 1938.

Footage	Material
0' - 3'	Soft ore jasper.
3' - 20'	Dike.
20' - 30'	Lean ore.
30' - 75'	Ore - Iron 61.34 Phos. .097
75' - 105'	Lean ore.
105' - 120'	Ore - Iron 62.05 Phos. .033
120' - 150'	Lean ore.
150' - 168'	Jasper
168' - 175'	Lean ore.
175' - 180'	Ore - Iron 58.70 Phos. .020
180' - 205'	Lean ore.
205' - 260'	Ore - Iron 57.59 Phos. .021
260' - 265'	Lean ore.
265' - 306'	Jasper.
306' - 326'	Transition slate - (Stopped)

This hole apparently was close to a Westward pitching hanging as it passed in and out of the ore. It is also possible that it parallels a North-South dike and the ore is an enrichment along the dike.

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

Hole No. 29, Negaunee Mine - 220' sub level, horizontal course South 69° East, near Southwest end of 13th level. Started December 19th, 1938; not completed at the end of the year.

Footage	Material
0' - 76'	Ore - Iron 64.15 Phos. .109
76' - 80'	Lean ore.
80' - 83'	Jasper.
83' - 116'	Dike.
116' - 164'	Jasper.

This hole will be continued across the formation.to the transition slate. It will prove up the possibility of ore in a large area South of the main East-West dike on the 13th level.

E. & A. No. 735-A - Diamond Drilling Sec. 5, 47-26 & Sec. 32, 48-26
- Churn drill standpiping Sec. 5, 47-26 & Sec. 32, 48-26

The work done here in summer and fall of 1938 was all in the area a few hundred feet Northeast of No. 2 shaft and Southeast of No. 1 shaft Negaunee Mine.

Hole No. 3, Surface, Sec. 32 - Approximately 450 ft. Northeast of No. 2 shaft - vertical - elevation of collar of hole 1287.43 ft. Started June 20th, completed July 31st, 1938.

Footage	Material
0' - 123'	Sand, gravel and hardpan.
123' - 326'	Soft ore jasper (Stopped)

No water in this hole.

Hole No. 4, surface, Sec. 32 - 160 ft. North of hole No. 3 - vertical - elevation of collar of hole 1290.5 ft. Started August 2nd; completed August 31st, 1938.

Footage	Material
0' - 130'	Sand, gravel, boulders and hardpan.
130' - 200'	Soft ore jasper.
200' - 225'	Second class ore and lean ore.
225' - 235'	Bessemer ore.
235' - 278'	Jasper (Stopped)

Water level not accurately located - probably about 100 ft.

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

Hole No. 5, surface, Sec. 32 - 100 ft. North of No. 4 hole - vertical - elevation of collar of hole 1292.69 ft. Started September 8th; completed October 10th, 1938.

Footage	Material
0' - 149'	Sand, gravel, boulders and hardpan.
149' - 177'	Jasper.
177' - 180'	Lean ore.
180' - 210'	Jasper.
210' - 215'	Lean ore.
215' - 269'	Jasper.
269' - 284'	Dike.
284' - 325'	Jasper (Stopped)

Water level 104 ft.

The three drill holes in Sec. 32 were located about 200 ft. East of the old mine workings and approximately 100 ft. West of the Barasa Mine workings. Only one hole found ore which was only 10 ft. in thickness. It was on a steep dip indicating that it was actually narrower than indicated by the drill hole. As a result of the drilling here it was evident that no commercial deposit existed in this area that would warrant the heavy expense required for development. The increasing depth of the over-burden and the finding of water in the two Northerly holes indicated that it might be possible to locate a deep well in this area to catch a portion of the water that enters the Negaunee Mine throughthe caves to surface. Provision had been made in E. & A. No. 735 - Mining No. 1 and No. 2 Shaft Pillars, for cutting off the water East of the old workings so no new E. & A. was necessary.

Three holes were sunk to ledge by the Armstrong churn drill on the extension of the line to the North through Nos. 3, 4 and 5 drill holes.

Hole No. 6, churn drill, located 100 ft. North of No. 5 diamond drill hole - elevation of collar of hole 1294.51 ft. Started October 13th; abandoned October 25th account of collapse of cutting shoe on 4" standpipe.

Footage	Material
0' - 20'	Find sand and gravel.
20' - 30'	Fine sand, gravel and boulders.
30' - 61'	Fine sand and gravel.
61' - 84'	Fine sand.
84' - 96'	Fine gravel.
96' - 102'	Coarse gravel.
102' - 105'	Fine gravel.
105' - 112'	Fine quicksand.
112' - 118'	Clay and sand.
118' - 125'	Fine quicksand.
125' - 132'	Fine sand and gravel.
132' - 137'	Coarse sand.
137' - 141'	Quicksand.
141' - 147'	Fine gravel.
147' - 148'	Coarse gravel - hole abandoned

Water level 104 ft.

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

Hole No. 6-A, churn drill - located 16 ft. North of hole No. 6 - elevation of collar of hole 1294.0 ft. Started November 3rd; completed November 17th, 1938.

Footage	Material
0' - 21'	Fine sand and gravel.
21' - 30'	Sand and boulders.
30' - 52'	Fine gravel and clay.
52' - 68'	Fine sand and clay.
68' - 80'	Fine sand and gravel.
80' - 119'	Fine sand and gravel.
119' - 128'	Fine muddy sand.
128' - 132'	Fine sand.
132' - 140'	Fine muddy sand and gravel.
140' - 141'	Sand and fine gravel.
141' - 150'	Clean sand and gravel.
150' - 151½'	Broken jasper ledge, sand and gravel layers.
151½' - 153'	Sand and gravel layers.
153' - 158'	Sand and coarse gravel.
158' - 160'	Jasper ledge.

Water level 97 ft.

Hole No. 7, churn drill - located 100 ft. North of hole No. 6 - elevation of collar of hole 1301.35 ft. Started December 5th; abandoned December 22nd account of hole curving off line and impossible to drive pipe further.

Footage	Material
0' - 12'	Fine snad and clay.
12' - 26'	Fine sand and gravel.
26' - 27'	Clay seam.
27' - 32'	Fine sand.
32' - 40'	Gravel and boulders.
40' - 44'	Fine gravel and clay.
44' - 47'	Fine gravel.
47' - 80'	Fine sand.
80' - 84'	Fine gravel.
84' - 100'	Fine muddy sand and gravel.
100' - 113'	Fine sand.
113' - 118'	Gravel and sand.
118' - 121'	Medium brown sand.
121' - 126'	Brown sand.
126' - 130'	Medium fine sand.
130' - 137'	Fine brown sand.
137' - 141'	Clean fine sand.
141' - 148'	Fine muddy sand.
148' - 151'	Sand and gravel.
151' - 161'	Clean gravel and sand.
161' - 162'	Broken jasper ledge and gravel.
162' - 165'	Sand and gravel.

Water level 106½ ft.

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

Standpiping was abandoned with the pulling of the pipe in this hole but will be resumed in the spring when at least one more hole will be put down 130 ft. due North of No. 7 hole. The showing of gravel near ledge and depth of water above the ledge indicate that conditions warrant the sinking of at least one deep well to ledge. More accurate location of the channel is required to enable the well to be located at the deepest point in the channel.

E. & A. No. 735-A - Sec. 5, 47-26

Two churn drill holes were sunk Southeast of No. 1 shaft and one 300 ft. Northeast of No. 2 shaft on Section 5.

Hole No. 23, churn drill - located 400 ft. Southeast of No. 1 shaft - elevation of collar of hole 1301.60 ft. Started September 14th; completed September 22nd, 1938.

Footage	Material
0' - 82'	Sand, gravel, clay and hardpan.
82' - 97'	Jasper - sunk in ledge by churn drill.

No water in this hole.

Hole No. 24, churn drill - located 700 ft. Southeast of No. 1 shaft - elevation of collar of hole 1306.37 ft. Started September 27th; completed October 5th, 1938.

Footage	Material
0' - 75'	Sand, clay, gravel and hardpan.
75' - 173'	Jasper - sunk in ledge by churn drill.

No.water in this hole.

Hole No. 25, churn and diamond drill - located 300 ft. Northeast of No. 2 shaft. Elevation of collar of hole 1281.65 ft. Started churn drill October 7th; completed October 11th. Started diamond drill October 18th; completed November 11th.

Footage	Material
0' - 88'	Sand, gravel and hardpan.
88' - 95'	Jasper - sunk by churn drill.
95' - 270'	Jasper - diamond drill.
270' - 280'	Lean ore.
280' - 295'	Jasper.
295' - 305'	Lean ore.
305' - 350'	Jasper.
350' - 365'	Lean ore.
365' - 397'	Jasper.

No water in this hole.

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

Churn drill hole No. 23 was sunk to determine the thickness of overburden above the area mined by the room and pillar system by the former operators Southeast of No. 1 shaft. Hole No. 24 showed thickness of surface above ledge and also that the No. 1 shaft ore body did not extend to surface. Hole No. 25 showed that No. 2 shaft ore body did not extend East of the shaft.

10. TAXES:

A comparison of taxes paid by the Negaunee Mine Company in 1938 and 1937 follows:

	1938		1937	
	Valuation	Taxes	Valuation	Taxes
Realty - 213.19 Acres	2,170,000	81,519.09	2,600,000	92,239.42
Personal-Stockpile,Equip. & Supp.	830,000	31,180.11	645,000	22,882.47
Total by Tax Commission	3,000,000	112,699.20	3,245,000	115,121.89
Collection Fees		1,126.99		1,151.22
Total Optg. Negaunee Mine	3,000,000	113,826.19	3,245,000	116,273.11
Rented Buildings	19,100	717.54	22,500	798.26
Collection Fees		7.18		7.98
Total Negaunee Mine Co.	3,019,100	114,550.91	3,267,500	117,079.35
Tax Rate per $100 Valuation		3.7566		3.5476
Total Tax City of Negaunee		556,066.25		491,453.00
Negaunee Mine Co. % of City Tax		20.60%		23.82%

The State Tax Commission decreased the valuation of the mine $245,000.00 and the Negaunee City Tax Rate increased $ .20893 per $100.00 valuation. The valuation of rented buildings decreased $3,400.00 due to sale of houses.

11. ACCIDENTS AND PERSONAL INJURY:

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

	1938	1937	1936	1935	1934
Fatal	0	1	0	0	1
Time Lost - Over four months	4	2	0	1	1
" " - One to four months	6	5	3	1	1
" " - Less than one month	0	4	1	0	1
Total Compensable Accidents	10	12	4	2	4
Number of cases paid compensation for accidents prior to Jan. 1st, 1938	11	7	7	8	10
Number of cases being paid difference in wages (Included in above total)	4	2	2	4	4

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

There were ten compensable accidents in 1938, a decrease of two as compared with the previous year. Most of the severe accidents occurred in January, February and April. At the end of the year only one man injured in 1938 was still at home which was unusual considering the nature of the injuries. Nine of the accidents occurred prior to May 4th and only one after that date. The nature of the accidents was as follows: Five leg fractures, four contusions and one sprained knee.

During the year there were sixty-eight slight accidents that did not cause a loss of time of over one day. The two most frequent causes of these accidents were tools slipping and handling timber and lagging which accounted for twenty-two of the slight accidents. The balance of these accidents come under eleven different classifications.

12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION:

E. & A. No. 735 & 735-A - Mining No. 1 & 2 Shaft Pillars & Diamond Drilling

	Estimated Expenditures	Expended 1938	Expended 1937	Total Expenditures	Unexpended Balance
Trolley Lines, etc.	1200.00	27.00	1240.84	1267.84	67.84
Telephones,Lights,etc.	300.00	17.66	337.50	355.16	55.16
Air & Water Pipes	800.00	250.07	504.94	755.01	44.99
Plat	250.00		278.46	278.46	28.46
Air Doors	300.00		389.32	389.32	89.32
Retimbering	2000.00		2716.54	2716.54	716.54
Rail	2500.00		1808.67	1808.67	691.33
General Shop Work			430.34	430.34	430.34
Drifting & Raising	15000.00	3633.10	11973.22	15606.32	606.32
Scraper Hoists	6500.00		6789.50	6789.50	289.50
Drill Machines, etc.	800.00		800.00	800.00	
Water Cut-off - No. 2	10000.00	1249.99		1249.99	8750.01
Rocker Dump Cars	1080.00		1080.00	1080.00	
Rebuilding 9th L.Pockets	1500.00		2632.06	2632.06	1132.06
Approximately 1650 ft. Diamond Drilling	7000.00	5931.59		5931.59	1123.46
Total	49230.00	11109.41	30981.39	42090.80	7139.20
Contingencies	4110.00				4110.00
Total	53340.00	11109.41	30981.39	42090.80	11249.20

E. & A. uncompleted at the end of 1938.

An addition was made in 1938 to the original E. & A. No. 735 to cover estimated cost of diamond and churn drilling East of No. 1 and No. 2 shafts to determine if these ore bodies estended beyond the areas already mined. The results were negative. At the end of 1938 E. & A. No. 735 and 735-A were completed except in one account, "Water Cut-off at No. 2 Shaft" in which there will be additional expenditures in 1939.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION:

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

	Estimated Expenditures	Expended 1938	Expended 1937	Total Expenditures	Unexpended Balance
Sinking Shaft 140'	14700.00	14752.41		14752.41	52.41
Excavating Shaft Pocket, Skip Pit Pocket & Plat	10000.00	5711.33		5711.33	4288.67
Rock Drift - 2660'	31920.00				31920.00
Tail Drift at Shaft 100'	1200.00				1200.00
Raising in Rock - 1000'	10000.00				10000.00
Drum for Skip Hoist	1500.00	733.75		733.75	766.25
Trolley Wire, Hangers and Lights	2500.00	489.30		489.30	2010.70
Rails, Ties, Frogs, etc.	3600.00	155.17		155.17	3444.83
Air & Water Lines	1000.00	23.18		23.18	976.82
Air Lock Doors	500.00				500.00
Small Sump & Pump House	2000.00	176.41		176.41	1823.59
Powder House	100.00				100.00
Equipment	3525.00	2289.03		2289.03	1235.97
Diamond Drilling	5037.50	3281.06		3281.06	1756.44
Counter Balance		482.13		482.13	482.13
Total	87582.50	28093.77		28093.77	59488.73
10% for Contingencies	8758.25				8758.25
Total	96340.75	28093.77		28093.77	68246.98

E. & A. uncompleted at the end of 1938.

Work under this E. & A. started in February and was only partially completed at the end of the year. Shaft sinking and excavation of skip pit was completed in 1938. Less than one-third of the total estimated cost was expended in 1938. E. & A. No. 795 will be active for at least two more years.

There is no proposed new construction contemplated in 1939.

13. EQUIPMENT AND PROPOSED EQUIPMENT:

a. Steam Shovels:

No. 7 shovel, owned by the Negaunee Mine Company, was overhauled in the winter of 1937 and only minor repairs will be required prior to opening of shipping season in 1939.

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

b. Stockpile Trestles:

Wood Trestles:

Six bents were erected on the rock trestle in 1938, sufficient to last until the spring of 1939. Thirty bents were erected on the wood ore stocking trestle that parallels the East steel trestle and the four bents at the East end of the East steel trestle were extended three bents further to the limit of the stocking grounds.

The cost of erecting wood trestles in 1938 was as follows:

Labor	
Supplies	
Total	

c. Scraper Hoists:

Following is a list of scraper hoists at the mine:

Company	On Hand 1-1-1938	Purchased 1938	Total	Cost for Repairs Per Machine 1938	1937
Ing-Rand 10 H.P. Elec.	6		6	54.41	78.03
" 15 H.P. "	12		12	60.01	127.03
" 20 H.P. "	6		6	12.58	77.84
" 25 H.P. "	2		2	-	-
Sullivan 15 H.P. "	14		14	53.61	103.07
" 20 H.P. "	1		1	-	92.65
" 25 H.P. "	2		2	-	50.35
Gard-Den 15 H.P. "	2		2	-	26.49
Total	45		45		
Lake Shore Engine Works 25 H.P. Electric Scraper Slide	2		2		

The total amount expended in 1938 for repairs to scrapers and scraper hoists is as follows:

Labor	2188.76
Supplies	9227.54 *
Total	11416.30

(*) Includes $5191.51 expended for 1/2" and 3/8" wire rope and also expense for repair of scrapers, grease, oil, etc.

Due to reduced operating schedules in 1938, the repair cost per unit was much lower than in 1937. No scraper hoists were purchased in 1938 while in 1937, eleven were bought.

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

d. Underground Tram Cars:

There was no purchase of rocker dump 4-ton haulage cars in 1938. There were eight purchased in 1937.

e. Drill Equipment:

During the year the following drill machines were purchased:

1 SAR85 Ing-Rand Stoper - charged to operating mine
4 S-49 Ing-Rand Jackhammers - charged to E. & A. No. 795 - Sinking Shaft

f. Haulage Tracks:

Expense for material for track extension and replacements was decreased due to reopening the 9th level in 1937. The expenditure for tracks in 1938 and 1937 was as follows:

	1938	1937
40-lb. Rail	282.98	1307.57
Steel Ties & Tie Plates	42.27	104.99
Manganese Frogs		88.80
Total	325.25	1501.36

14. MAINTENANCE AND REPAIRS:

Expenditures for "Maintenance and Repairs" in the accounts listed under "Underground Costs" decreased $31,037.03 - $25,062.78 in 1938 compared with $56,099.81 in 1937. The cost per ton in 1938 was $ .062 compared with $ .068 in 1937.

Following is a list of purchases and repair costs:

1 Pump and Motor	$ 992.00	
1 SAR85 Ing-Rand Stoper	365.88	
Total Cost New Undg. Equipment		$ 1357.88
Repairs to Compressor	393.61	
Repairs to scraper hoists, rope, etc.	10966.30	
Repairs to generator & wiring	2524.99	
Repairs to Locomotives	5282.25	
Haulage Tracks	2765.90	
Repairs to Haulage Cars	887.76	
Repairs to Pumping Machinery	884.09	
Total Repair Costs		23704.90
Grand Total Purchases and Repairs		25062.78

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14. MAINTENANCE AND REPAIRS: (Cont'd)

Expenditures in the accounts listed under "Surface Costs" were $6836.42 less than in 1937 - $12037.91 in 1938 compared with $18874.33 in 1937. The cost per ton was .029 in 1938 compared with .024 in 1937, an increase of .005 due to less product.

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

Repairs to Hoists	$ 1512.57	
Hoisting Ropes	3234.92	
Repairs to Skips & Cages	1673.57	
Repairs to Top Tram Equipment - Engines, Ropes, Rollers, etc.	872.24	
Repairs to Tracks and Cars	1230.38	
Permanent Trestles	379.51	
Shaft House Pockets	590.36	
Mine Buildings	506.11	
Repairs to Shaft	2038.25	
Total		$ 12037.91

15. POWER:

The following is a detail of electric current purchased, charged as follows - also other data:

	1938 - 12 Months Optg.		1937 - 12 Months Optg.	
	Cost	Cost per Ton	Cost	Cost per Ton
Stoping	1645.00	.0040	1453.95	.0018
Timbering	65.43	.0002	87.25	.0001
Compressors	23930.47	.0581	30660.25	.0373
Ventilation	5700.85	.0138	6020.85	.0073
Pumping	26838.35	.0651	25308.45	.0308
Hoisting	16309.44	.0395	23465.47	.0286
Stocking Ore	320.34	.0008	285.80	.0003
Dry House Expense	228.39	.0005	192.12	.0002
Telephones & Safety Devices	692.26	.0016	1039.84	.0013
Mine Office	52.26	.0001	48.93	.0001
Electric Haulage	3798.96	.0093	5466.58	.0067
Shops	148.13	.0004	221.67	.0003
District Carpenter Shop	10.17	.0001		
Total	79739.99	.1935	94251.16	.1148
Main Line Meter - K.W. (*)	5,613,604		7,569,353	
Separate Meter Reading - K.W.	5,483,435		7,389,210	
Line Loss - K.W.	130,169		180,143	
Product - tons	412,000		820,915	
K.W. Per Ton (Inc. Line Loss)	13.62		9.22	
Cost Per K.W. (Avg. for Year)	.01421		.01322	
15 Min. Demand - K.W. (Avg. for Year)	1421		1280	
Load Factor " " "	48%		68.42%	

(*) Less Maas charges

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15. POWER: (Cont'd)

The load factor dropped 20% in 1938 due to the decrease in working schedule. The 15 minute demand increased 141 kilowatts. The combination of these two factors increased the cost per kilowatt 7-1/2% in 1938. The increase in cost for current based on increased price charged per kilowatt hour was $ 5557.47 in 1938. The increase in cost per ton for current was more striking as it amounted to $ .0787 or 68.5%.

17. CONDITION OF PREMISES:

a. Mine Grounds:

The usual care and attention was given to the mine grounds during the summer. The damage to the pine plantation and the shrubbery from the snow storm in January and October was quite severe and can never be entirely eliminated by new growth due to loss of many of the pine trees.

b. Negaunee Mine Houses:

One house was sold in 1938, leaving eleven houses owned by the Negaunee Mine Company out of the twenty originally owned. The cost of repairs in 1938 was $ 1040.46 as compared with $ 2148.61 in 1937. The income from rents in 1938 was $ 2468.70. The repairs this year cover siding, new window frames, storm windows, plumbing, plastering and interior decorating. There are twenty-two families living in the eleven houses.

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	1938	%	1937	%
Finnish	162	45.6	197	46.4
English	58	16.1	68	16.0
Italian	51	14.4	60	14.2
Swedish	31	8.8	37	8.8
French (Canadian)	29	8.3	32	7.6
Austrian	10	2.8	10	2.3
Norwegian	5	1.4	4	.9
German	5	1.4	7	1.6
Danish	2	.6	4	.9
Belgian	1	.3	3	.7
Irish	1	.3	1	.2
Polish			1	.2
Total	355	100.0	425	100.0

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18. NATIONALITY OF EMPLOYEES:

As to Birth	American Born		Foreign Born	
	1938	1937	1938	1937
Finnish	88	117	74	80
English	39	47	19	21
Italian	21	30	29	30
Swedish	19	22	12	15
French (Canadian)	27	32	2	1
Austrian	8	8	2	2
Norwegian	4	3	1	1
German	4	5	1	2
Danish	2	4	-	-
Belgian	1	3	-	-
Irish	1	1	-	-
Polish	-	1	-	-
Total	214	273	141	152

NORTH JACKSON MINE
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1. GENERAL:

This property has been idle for thirty years.

6. SURFACE:

The fences around the open pits were repaired in the summer. Minor repairs were made to the former mine office building which has been converted into a four apartment flat.

10. TAXES:

	1938		1937	
	Valuation	Taxes	Valuation	Taxes
47% of Jackson Realty Sec. 1-47-27	$ 220,900	$ 8298.42	$ 220,900	$ 7836.80
Collection Fees		82.98		78.37
Total		$ 8381.40		$ 7915.17
Rented Buildings				
Old Jackson Office	$ 700	$ 26.56	$ 700	$ 25.08
Grand Total		$ 8407.96		$ 7940.25
City of Negaunee Tax Rate Per $100.00		$ 3.7566		$ 3.54767

Taxes increased due to higher tax rate per $100.00 valuation.

SOUTH JACKSON MINE
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1. GENERAL:

There was no change in conditions at this idle property in 1938.

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:

Regular inspections were made to insure that the shaft was covered and fences in repair. The only building left at this property is the lower section of the shaft house which will soon have to be torn down as the sills are rotting.

10. TAXES:

	1938 Valuation	1938 Taxes	1937 Valuation	1937 Taxes
53% of realty as described, Sec. 1-47-27	$ 249,100	$ 9357.79	$ 249,100	$ 8837.25
Collection Fees		93.58		88.37
Total		$ 9451.37		$ 8925.62
City of Negaunee Tax Rate Per $100.00		$ 3.7566		$ 3.54767

Negaunee City taxes were higher and the rate per $100.00 valuation increased.

FRANCIS MINE
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YEAR 1938

1. GENERAL

This mine was abandoned in 1924. The steel headframe is the only structure remaining on the property. The ore remaining in stock is on an adjoining forty, the NE¼ of the SE¼ of Section 28,45-25.

2. PRODUCTION SHIPMENTS & INVENTORIES

	1938	1937	Decrease
b. Shipments			
Franport	0	36,366	36,366
c. Stockpile Inventories			
Franport	16,005	16,005	0

The above are book figures of ore in stock. The engineer's estimate shows 9,581 tons or an underrun of 6,424 tons.

3. ANALYSIS

b. Complete Analysis of Ore Shipped

No ore was shipped in 1938.

8. COST OF OPERATING

	1938	1937	Increase	Decrease
Underground Costs	0	0		
Surface Costs	0	0		
General Mine Expense	7.39	449.44		442.05
Loading & Shipping	0	4,112.09		4,112.09
Taxes	382.17	1,173.27		791.10
Total Cost at Mine	389.56	5,734.80		5,345.24

The large decrease is due to the fact that in 1937, 36,366 tons of ore were loaded and shipped, while in 1938 there were no shipments.

10. TAXES

	1938		1937	
	Valuation	Taxes	Valuation	Taxes
SW¼ of NW¼ Sec.27,45-25	(Paid by C.& N.W)	3.74		2.98
Personal property	20,000	374.68	63,000	1,158.70
Total		378.42		1,161.68
Collection Fee		3.75		11.59
Total Taxes		382.17		1,173.27

GARDNER MACKINAW MINE
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I. GENERAL

The mine production for the year 1938 amounted to a total of 48,824. tons as compared to 172,823 tons for the previous year. This decided decrease was due to the reduced working schedule in force during the first five months and to the closing of the mine June 30th.

Development and mining operations continued on the 6th, 7th, 9th and 10th Levels with most of the activity centering in the Northwest ends of the 6th and 7th Levels. Both of these Levels were extended to the Northwest. In the case of the latter, a comparatively lean high phosphorus ore was encountered during the entire 150' of drifting, while on the 6th Level, 375' of low phosphorus ore was developed with the remaining 175' showing a steady rise in phosphorus. The 10th Level was extended about 275' to the West and showed no change in the high phosphorus, high sulphur ore which has characterized almost the entire development to the Northwest on the 10th Level.

The control of the phosphorus and sulphur content by mixing ores from different sections of the mine was continued during 1938. However, this problem was far more difficult due to the fact that about 70% of the ore came from development while the remaining 30% was drawn from developed stopes. This condition made it rather hard to anticipate, within even a close range, what the average analysis would be from day to day.

2. PRODUCTION SHIPMENTS & INVENTORIES

a. Production by grades

Grade	1938	1937	Decrease
Gardner Ore	0	0	0
Mackinaw Ore	48,824	172,823	123,999
Total	48,824	172,823	123,999

b. Shipments

Grade of Ore	Pocket Tons	Stockpile Tons	Total Tons	Total Last Year
Gardner	0)	0	0	0
Mackinaw	n0	14,488	14,488	152,616
Total	0	14,488	14,488	152,616
Increase 1938	-	-		
Decrease 1938	83,390	54,738		

c. Stockpile Inventories

	Dec.31,1938	Dec.31,1937	Incr.	Decr.
Gardner	0	0	-	-
Mackinaw	125,028	90,692	34,336	
Total	125,028	90,692	34,336	

This total is divided as follows - Mackinaw 117,967 ; Gardner 7,061 (7,061 tons of Gardner from the C.& N.W.Lease dumped on Mackinaw stockpile)

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2. PRODUCTION
SHIPMENTS &
INVENTORIES (Cont.)

d. Division of Product by Levels

	1938	%	1937	%
6th Level	13,458	28	23,481	13
7th Level	16,598	34	38,806	23
8th Level	445	1	28,342	16
9th Level	9,605	20	38,944	23
10th Level	8,718	17	43,250	25
Total	48,824	100	172,823	100

e. Production by Months

	Mackinaw Ore
January	10,002
February	11,531
March	11,184
April	9,003
May	7,104
	48,824 tons

Mine inactive for the balance of the year.

f. Ore Statement

	Gardner	Mackinaw	Total	Total Last Year
On hand 1-1-38	5,859	84,833	90,692	70,485
Product for year	2,020	46,804	48,824	172,823
Total	7,879	131,637	139,516	243,308
Shipments	818	13,670	14,488	152,616
Balance on hand	7,061	117,967	125,028	90,692
Decrease in Output		123,999	123,999	13,131
Increase in ore on hand		34,336	34,336	20,207

1938 - Jan. 1st to Feb. 28th - 2-8 hr. shifts per day, 5 days per week.
Mar.1st to Apr.30th, 2-8 hr. shifts per day 4 days per week.
May 1st to May 31st, 2-8 hr. shifts per day 3 days per week.

g. Delays

		Tonnage Lost
Jan. 10 - 16 hrs. delay -	ice in shaft.....	500
24 - 6 hrs. delay -	skip off track, current off & signal bells out of order (heavy msnow storm).....	175
25 - 16 hrs. delay -	repairing shaft (heavy snow storm)	600
26 - 16 hrs. delay -	" " " " "	600
27 - 16 hrs. delay -	" " " " "	600
31 - 3 hrs. delay -	cave on 7th Level.....	150
Feb. 9 - 1 hr. delay -	repairing loose planking in shaft	40
14 - 4 hrsl delay -	repairing compressors & pumping out skip pit.....	200

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2. PRODUCTION
SHIPMENTS &
INVENTORIES (Cont.)

g. Delays (Cont.)

		Tonnage Lost
Mar. 2	- 6 hrs. delay - intermittently a/c water in skippit	200
28	- 1 hr. delay - repairing skip-road, incline shaft	75
30	- 1¾ hrs. delay - repairing generator damaged by electrical storm.....	75
Apr. 20	- 8 hrs. delay - change head sheave, incline shaft..	250
May 3	- 2 hrs. delay - skip off track & compressor motor burned out.....	150
4	- 16 hrs. delay - repairing compressor motor.....	550
18	- 1 hr. delay - repairing shaft plat, 9th Level...	100

h. Delays from lack of Current

The single delay from this cause occurred January 24 and amounted to 6 hours, loss amounting to 175 tons.

3. ANALYSIS

a. Average Mine Analysis on Output

Grade	Tons	Iron	Phos.	Sil.	Sul.
Mackinaw	48,824	59.99	.463	2.24	1.009

These figures represent a slight increase in iron and sulphur with a decrease in phosphorus. The change is the result of a large portion of the 1938 production coming from the 6th and 7th Levels where a generally lower phosphorus ore has been developed.

b. Average Analysis on Straight Cargos

There were no straight cargos forwarded from the mine, all shipments being graded with other ores.

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 phorphorus ore (unmerchantable)

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4. ESTIMATE OF ORE RESERVES (Cont.)

a. Developed Ore (Cont.)

Non-Bessemer	Merchantable Tons	Non-Merchantable Tons
5th to 6th Level	21,675	30,834
6th to 7th Level	20,382	88,475
7th to 8th Legel	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 12-31-38	114,984	825,271

High Sulphur and Phosphorus Ores

This heading, in previous years, has been listed individually.

It will be noted from the above column that the non-merchantable ore has been increased in this year's estimate by 225,000 tons. This is largely due to the fact that the 10th Level was extended an additional 275' in high phosphorus and high sulphur material. Thus for the second consecutive year, approximately 80% of the development indicated non-merchantable ore. It might also be added that by careful grading a portion of the total tonnage could be used by mixing with the ore developed this year on the 6th Level. Possibly a fair definition of non-merchantable ore in the Mackinaw Mine could be designated as that material running over .500% Phos. and 1.0% Sulphur.

Statement showing ore reserves and new ore developed for the following years:

	1934	1935	1936	1937	1938
Ore in Mine Jan. 1	164,858	382,337	306,116	309,082	218,072
Production	78,353	138,471	185,954	172,823	48,824
Balance	86,505	243,866	120,162	136,259	169,248
Ore in Mine Dec. 31	382,337	306,116	309,082	218,072	114,984
New ore developed	295,832A	62,250B	188,920C	81,813D	54,264 E

A. Large increase due to development of 8th and 9th Levels.
B. Increase due to northwest end development of 8th and 9th Levels.
C. Increase due to development of 10th Level.
D. Decrease due to elimination of high phosphorus ore from estimate.
E. Decrease due to reduction of areas on 6th and 7th Levels.

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4. ESTIMATE OF ORE RESERVES (Cont.)

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	53.571	.365	2.67	.24	1.70	2.21	.88	.867	2.88	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 66h Level.

5. LABOR AND WAGES

a. Comments
1. Labor
Once more during 1938 there was a general over supply of labor throughout this region. Wages for the most part remained the same up to the closing of the mine to production on May 31st.

Master Mechanic -	Jan.1,1938 to April 15,1938,	$190.00 and Bonus
	Apr.16 to June 30	176.00 and Bonus
	July 1st to Dec.31,	142.50 without Bonus
Surface Foreman -	Jan. 1 to April 15	170.00 and Bonus
	Apr. 16 to June 30	157.00 and bonus
	July 1st	127.50 without bonus
Mine Electrician-	Jan. 1st to April 15	175.00 and bonus
	Apr. 16 to June 30	162.00 and bonus
	July 1st	131.25 without bonus

On July 1st, all of the above salaries were reduced to 3/4 of the regular salary, on account of the mine being idle, making the Mechanic $142.50; Surface Boss $127.50 and Electrician $131.25.

2. New Construction
One of the cottages at the Cyr Location was moved to the mine premises in July for the use of the resident watchman.

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5. LABOR AND WAGES (Cont.)

b. Comparative Statement of Wages & Product

	1938	1937	Incr.	Decr.
PRODUCT	48,824	172,823		123,999
Number of Shifts & Hours	2-8 hr.	3-8 hr.		1-8 hr.
AVG. NUMBER MEN WORKING				
Surface	29	26	3	
Underground	105	110		5
Total	134	136		2
AVG. WAGES PER DAY				
Surface	5.53	5.37	.16	
Underground	6.07	5.96	.11	
Total	5.94	5.84	.10	
AVG. WAGES PER MONTH	(21 days)	(21 days)		
Surface	$ 116.13	$ 112.77	$ 3.36	
Underground	127.47	125.16	2.31	
Total	124.74	122.64	2.10	
PRODUCT PER MAN PER DAY				
Surface	19.24	25.74		6.03
Underground	6.22	7.01		.79
Total	4.70	5.49		.79
LABOR COST PER TON				
Surface	.287	.213	.074	
Underground	.976	.850	.126	
Total	1.263	1.063	.200	
AVG. PRODUCT MINING				
Stoping	27,074	115,723		88,649
Ore Development	21,750	57,100		35,350
Total	48,824	172,823		123,999
AVG. WAGES CONTRACT LABOR	$ 6.487	$ 6.304	$ .183	
TOTAL NUMBER OF DAYS				
Surface	2,540¾	6,839¾		4,299
Underground	7,846¾	24,649¾		16,803
Total	10,387½	31,489½		21,102

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5. LABOR AND WAGES (Cont.)

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

	1938	1937	Incr.	Decr.
AMOUNT FOR LABOR				
Surface	14,046.77	36,181.95		22,135.18
Underground	47,627.00	146,976.62		99,349.62
Total	61,673.77	183,158.57		121,484.80
AVG. WAGES PER MO. BASED ON MEN CARRIED ON MINE PAYROLL				
Surface	116.13	112.77	3.36	
Underground	127.47	125.16	2.31	
Total	124.74	122.64	2.10	

Proportion of Surface to Underground Men

1938 - 1 to 3.62 - 2-8 hr. shifts, 5 days per week, Jan.1 to Feb. 28
4 days per week, Mar. 1 to Apr.30
3 days per week, May 1 to May 31.
Mine idle from June 1st, 1938.

1937 - 1 to 3.60 - 3-8 hr. shifts, Jan. 1st to July 10.
Mine idle from July 10 to Aug. 30.
3-8 hr. shifts, August 30 to Oct. 8
2-8 hr. shifts, Oct. 8 to Dec. 31st.

1936 - 1 to 3.81 - 3-8 hr. shifts, 2-8 hr. shifts per day Jan. 1 to July 1 Mining and 1-8 hr. per day hoist for 4 days per week. During this time same same period, we worked 3-8 hr. shifts per day 2 days per week shaft sinking. After shaft sinking was completed we worked 3-8 hr. shifts per day for 5 days per week, two of which were mining and two tramming.

1935 - 1 to 3.42 - 1-8 hr. shift, 2 days per week Jan. 1 to Feb. 28,1935
3 days per week Mar. 1 to Dec. 31

6. SURFACE

a. Building Repairs

General Repairs on all mine buildings were made when needed during the year.

b. Roads

No new roads were constructed during the year and general maintenance of the old roads was carried on as their condition warranted.

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6. SURFACE (Cont.)

c. Stockpiles and Trestles
There was no new stockpile trestle erected during 1938. The entire production was dumped from the trestle which was built in 1937. This lies on the north side of the Mackinaw stocking area.

7. UNDERGROUND

a. Shaft Sinking
With a large amount of developing on the upper levels and due to the more or less uncertain conditions, no shaft sinking was necessary.

b. Development
Development was confined to exploring the present ore body to the northwest or at points on the various levels where development had terminated in 1937. The total footage of main level drifting amounted to 1006', with the large portion of it being carried on on the 6th Level.

The first indication that a lower phosphorus ore might be found on the 6th Level was the result of a small test drift being driven to the northwest from the top of No. 23 7th Level raise. This small drift was extended to a point approximately 100' northwest of the stope and a small raise was driven to and above the 6th Level elevation. Thereafter, the 6th Level was driven from two headings, one to the southeast from the exp oratory raise and the other to the northwest from the end of the 6th Level footwall drift. After this connection was made, the main level was driven to the northwest and raise locations were cut out as the various intervals were reached. For the most part, this 6th Level drift ran parallel and near the footwall with the exception of the last 150' which paralleled the hanging wall and likewise encountered a high phosphorus ore. A small test drift was driven to the foot which was located about 23' from the drift and showed an approximate ore thickness of 42'.

Development on the 7th Level consisted of extending the main level drift a distance of 141' to the northwest. After drifting 87', the slate hanging wall was encountered and the drift was then directed more toward the north a distance of 75'. At the end of the year 1937, a small rock drift was being driven to the west in an effort to locate any ore which might be found in the hanging in this particular area. In January this was extended an additional 30' in slate, bringing the total distance to 149'. This work was abandoned giving way to

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7. UNDERGROUND (Cont.)

b. Development (Cont.)
the continuation on the 7th Level mentioned above. Early in the year a development crew commenced raising at No. 24 raise location. This work was started in a high phosphorus area. However, knowing that the 6th Level had shown the considerably lower phosphorus ore, it was figured that a relatively well balanced product would result. At the completion of this raise to the 6th Level, a small traveling raise and connecting drift was completed to the Northwest and stoping operations followed soon after.

Possibly with the exception of a small amount of ore being drawn from a stope above the 8th Level, no development or stoping was carried on.

Development on the 9th Level was confined to the driving of No. 20 raise to the 8th Level. Had this work been completed, a ventilation and traveling road independent of the incline shaft would have been available between the 10th and 7th Levels. However, the work was interrupted by the closing of the mine.

At the end of the year 1937, the 10th Level was being driven in a westerly direction. This work was continued during the first three months of the year and was extended a total distance of 193'. Several small dog drifts were driven to the foot and hanging indicating that the actual ore body was approximately 87' wide with 15' of lean ore being found on the footwall. In March, two more drifts were driven showing that the ore width had been reduced to 74' with no change whatsoever in the character of the ore. This work was temporarily stopped late in March giving way to the opening of a new 10th Level sump replacing the sump at the bottom of the incline shaft. Early in 1936, when the incline shaft was extended to form the 10th Level, the shaft plat was cut out in the footwall and the southeast and northwest drifts were driven about 23' before entering the ore body. Thus, approximately 23' of ore remained over and to the southwest of the shaft plat. It is into this area that the sump drift was driven, commencing at a point about 40' southeast of the plat. The sump was completed early in May and work to dismantle an old 4th Level pump was just started when plans were formulated for the closing of the mine.

c. Stoping
Stoping operations were confined to levels below the 5th with the exception of the 8th and 9th Levels which were practically mined out as far as merchantable ore is concerned. During the year, seven stopes were in operation at one time or another, two on the 6th, four on the 7th, and one on the 10th. For the most part, their product was a low phosphorus-high sulphur ore and was balanced when possible with the

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7. UNDERGROUND (Cont.)

c. Stoping (Cont.)

other ores coming from the development on the various levels. The average analysis of the product for the first five months production showed a decided decrease in phosphorus with the average for the above mentioned period being .460%. The iron averaged slightly above 60% while the sulphur averaged slightly over 1%.

A more detailed description of the stoping operations follows:

6th Level - Northwest of Incline Shaft

During January stoping operations were concluded in No. 17 and 19 stopes above the 6th Level. Actual mining was completed late in December and the remaining ore was scraped to the chute in January.

No. 23 stope was started in March after the raise had been driven to an inclined height of 62' above the 6th Level. This stope was located at a point where the hanging wall makes quite a distinct roll reducing the ore thickness from 140' on the 6th Level to approximately 25' just above. Evidences of this roll can be traced from a point just below the 7th Level on up to the 5th Level in the vicinity of No. 19 stope. Due to the shortage of low phosphorus ore at that time, it was not possible to complete the development raise which ordinarily precedes all stoping operations. Had this raise been completed, considerably more information might be known as to the extent of the low phosphorus ore body in this area.

After development had been completed in No. 24 stope, mining operations were started and by the end of May had reached an inclined height of 78' above the 6th Level. The ore body just southeast of this stope was found to dip about 47°. No. 24 stope likewise produced a low phosphorus, high sulphur ore and as in No. 23 due to the necessity of lowering the phosphorus content of the product, most of the ore was drawn almost immediately after being broken.

The actual length of low phosphorus ore as developed this year on the 6th Level amounts to approximately 300' and, if in the future the mine is again opened, there is a possibility of stopes in No. 25, 25 and 27 locations. The result is that approximately 30,000 tons of low phosphorus ore still remain to be mined between the 6th and 5th Levels. This, of course, is true only if a uniform grade is encountered as the 5th Level is approached.

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7. UNDERGROUND (Cont.)

c. Stoping (Cont.)

7th Level - Northwest of Incline Shaft

No. 18 stope was continued after mining operations were started in December, 1937 and by the end of February had reached an inclined height of 124' above the 7th Level, a width of 31' and a stoping height of 32'. As stoping continued towards the 6th Level, the ore seemed to increase in phosphorus to such an extent that mining was temporarily stopped late in February. The last analysis of ore drawn from this stope showed iron at 59_, phosphorus .787% and sulphur 1.315%.

No. 20 stope was likewise continued toward the 6th Level during the five months of operation. After reaching the 6th Level elevation, it was necessary to temporarily stop stoping operations giving way to driving a small drift into the foot approximately 35' and thereafter raising a distance of 27' to the middle drift on the 6th Level. This work was completed late in April and no further mining operations were carried on due to the closing down of the mine. No. 20 stope still contains considerable broken ore which runs 60% iron, .268 phosphorus and 1.278 sulphur.

Conditions in No. 23 stope were very similar to those of No. 20 and it was necessary during April to drift into the footwall a distance of 35' and thereafter raise 33' to the 6th Level, thus during 1938 actual stoping amounted to only 14' although considerable ore was broken both from the footwall and hanging walls of the stope. The average analysis of No. 23 stope during its production was as follows: 59.20% iron, .289 phosphorus, and 1.442 sulphur. The roll of the formation mentioned on the 6th Level was likewise in evidence in No. 23 stope, the result being that any further mining would be carried on in almost a horizontal position and it is likely that the analysis of the remaining ore would be very similar to that of No. 23, 6th Level stope which is located just above.

Soon after, stoping operations got underway in No. 24 stope after an attempt was made to drive a connection to the floor of No. 24 hanging wall stope. However, a lean slaty material was encountered and regular stoping was continued toward the 6th Level. By the end of May the stope had reached an inclined height of 84' above the 7th Level, a width of 29' and a stoping height of 22'. The analysis of this ore was slightly higher in phosphorus than in No. 23 and 20 stopes. However, the development raise indicated that the lower phosphorus ore would be encountered as the 6th Level was approached.

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7. UNDERGROUND (Cont.)

c. Stoping (Cont.)

If, on the reopening of the mine, stoping operations were started to the northwest in Nos. 25, 26 and 27 locations, it is likely that a high phosphorus ore will be found almost the entire distance to the 6th Level, lacking perhaps 20 or 30 feet.

9th Level - Northwest of Incline Shaft

There was no actual stoping operations on this level, although approximately 9,000 tons were scraped and drawn from No. 23 stope.

10th Level - Northwest of Incline Shaft

No. 15 was the only stope that was mined during the year and its completion to an inclined height of 179' marked the end of the low phosphorus and sulphur area on this level. The entire production in No. 15 stope was an excellent grade, having an analysis of 62.70% iron, .220 phosphorus and .433 sulphur. In the future, there is a possibility of stoping a small amount of ore in No. 16 location. However, with the ore pinching out just 30' to the northwest of this point, it is likely that any stope would be very irregular.

During the first two months of the year, No. 2 contract continued driving the 10th Level in a westerly direction for a total distance of 265'. During this progress, two drifts were driven toward the foot and two toward the hanging of the ore body in an effort to determine the width of ore at these points. The average width of ore was found to be about 65', striking slightly north of west and dipping on the average at about 53° to the south. By the end of February, the breast was approximately 420' west of the 9th Level hanging wall, 120' above. There was no apparent change in the analysis for the above distance, which averaged about 59% iron, .980 phos. and .790 sulphur.

It is hard to say at this point just how far above the 10th Level this ore might continue. However, it is safe to assume that the present 10th Level is being driven in the hanging wall ore body which has been made possible by a large wedge-shaped slate intrusion. Likewise the extreme west end of the ore body has not been determined and from what work has been done to date, there is no indication that the ore is definitely cutting out.

In March work was temporarily abandoned in the driving of the 10th Level drift and No. 2 contract commenced opening a sump southwest of the 10th Level plat, as mentioned under "Development". The floor of this sump was 13' below the 10th Level plat and the sump was completely timbered and lagged to prevent any sloughing of the ore.

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7. UNDERGROUND (Cont.)

c. Stoping (Cont.)

The capacity of this sump was calculated to be about 75,000 gallons and its use would have considerably lengthened the interval at which the pump would have to operate. All work relative to the sump was completed in April, and No. 2 contract was then moved to the long cross cut 1200' northwest of the shaft, where a cutout was made for the proposed No. 6 diamond drill hole. This marked the end of activity on the 10th Level before the drilling took place and before the mine closed down.

The log of this diamond drill hole is given under "Explorations".

d. Timbering
Statement of Timber Used

	Linear Feet	Amount 1938	Amount 1937
8" to 9" Timber	1,278	84.74	177.37
10" to 12" "	1,260	116.93	510.41
12" to 14" "	729	96.59	192.20
14" to 16" "			9.58
Total Timber	3,267	298.26	889.56
7' Lagging	10,100	75.75	203.97
9'6" Poles	19,326	240.91	792.40
Total Lagging & Poles		316.66	996.37
Product		48,824	173,823
Feet of timber per ton of ore		.0066914	.0055363
" " Lagging " " "		.0206865	.0165250
" " " " foot of timber		3.0915212	6.5275920
" " Poles " ton of ore		.3958299	.3613871
Cost per ton for timber		.0061088	.0051473
" " " " lagging		.0015515	.0011802
" " " " poles		.0049343	.0045850
Total cost per ton - All Timber		.0125946	.0109125
Equivalent of stull timber to board measure		11.7500437	34.4121271
Feet of board measure per ton of ore		.2406612	.1991177
Total cost for timber, lagging & poles		$614.92	$1,885.93

SUMMARY

YEAR	AMOUNT	COST PER TON
1938	614.92	.0126
1937	1,885.93	.0109
1936	1,727.83	.0092
1935	1,103.59	.0080
1934	1,184.87	.0212
1933	174.68	.0513
1932	238.81	.0097
1931	876.67	.0110
1930	2,300.66	.0184

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7. UNDERGROUND (Cont.)

e. Drifting and Raising

	Drifting			Raising			Combined
	Ore	Rock	Total	Ore	Rock	Total	Total
1937	3,480	89	3,569	2,471	0	2,471	6,040
1938	1,462	40	1,502	631	0	631	2,133

During the five months of production in 1938, there was proportionately the same amount of drifting and raising as in 1937. Very little rock work was necessary and this material, together with any lean ore encountered, was dumped in the old stopes. All ore produced by drifting and raising operations was included in the mine production.

f. Explosives, Drilling & Blasting
Statement of Explosives Used

	Quantity	Avg.Price	Amount 1938	Amount 1937
45% Gelex A #2	2,000	.1225	245.00	122.50
50% Gelatine Special	36,489	.1213	4,426.97	15,434.30
60% Gelex #1	3,250	.1225	398.13	
Total Powder	41,739	.1215	5,070.10	15,556.80
Fuse	60,000	.5558	288.12	1,631.63
Caps	11,190	1.1814	149.87	453.66
Connecting Wire				14.40
Tamping Bags	2,000	.9919	3.50	12.25
Exploders				65.42
Fuse Lighters	3,000	.6029	20.25	49.44
Total Fuse, etc.			461.74	2,226.80
Total All Explosives			5,531.84	17,783.60
Avg. Price per Hundred for Powder			.1215	.1106
Product			48,824	172,823
Pounds of powder per ton of ore			.8548	.7788
Tons of ore per pound of powder			1.1697	1.2839
Cost per ton - Powder			.1038	.0901
Cost per ton - Fuse, Caps, etc.			.0095	.0129
Cost per ton - All Explosives			.1133	.1030

Summary showing percentages of different grades of powder used during the past seven years

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7. UNDERGROUND (Cont.)

f. Explosives, Drilling & Blasting (Cont.)

7.8%	of all	powder	used in	1938 was	60%
87.4%	"	"	"	1938 "	50%
4.8%	"	"	"	1938 "	45%
99.3%	"	"	"	1937 "	50%
.7%	"	"	"	1937 "	45%
100.0%	"	"	"	1936 "	50%
95.1%	"	"	"	1935 "	50%
4.9%	"	"	"	1935 "	60%
11.2%	"	"	"	1934 "	50%
88.8%	"	"	"	1934 "	60%
100.0%	"	"	"	1933 "	60%
26.6%	"	"	"	1932 "	40%
4.3%	"	"	"	1932 "	45%
56.5%	"	"	"	1932 "	50%
12.7%	"	"	"	1932 "	60%

The following summary shows the cost per ton for explosives for the past six years exclusive of rock development:

Year	Cost per Ton	Product
1938	.1133	48,824
1937	.1030	172,823
1936	.1111	185,954
1935	.0963	138,471
1934	.1188	78,353
1933	.1688	3,405

The increase is due largely to the higher proportion of ore derived from development in 1938 production

i. Ventilation

There was no particular change in the ventilation of the working portion of the mine during the year. Just before the mine closed down in May, work was in progress towards completing a raise between the 9th and 8th Levels, which would have completed the air passage feeding the upper working territory. The completion of this arrangement would have allowed the air to follow down stopes and raises on the southeast side of the ore body, following along the 10th Level and ventilating the northwest area by upcast raises ending on the 5th Level, where the air would be drawn off by the help of the 3rd Level fan in the Gardner workings.

j. Faults

There was no new information brought to light by the development during this year as far as the northwest fault was concerned. The only peculiar thing found this year which may or may not be affected by a fault was that the 10th Level extended west approximately 400' farther than the apparent termination of the ore as outlined on the 9th Level. When the mine was shut down on May 31st, the 10th Level breast was still in ore.

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7. UNDERGROUND (Cont.)

k. Pumping

The average number of gallons per minute pumped during the first five months of 1938 showed a fairly consistent rise in the flow of water in the mine workings. The reduction of pumping to 82 gallons per minute in July was due to the fact that only the water collected on the 4th and 5th Levels was pumped during the month, the remainder being allowed to collect on the 10th Level.

Month	1938	1937	1936	1935	1934	1933
January	119	123	137	143	174	210
February	126	121	126	142	169	205
March	146	119	130	138	170	205
April	152	119	130	138	166	203
May	173	117.9	133	140	158	181
June	152	118	125	140	156	184
July	82	115	130	137	147	181
August		98	123	134	155	180
September		106	124	135	149	172
October		114	124	135	143	199
November	70	112	119	134	149	224
December	57	117	123	133	146	221
Total Avg.	102	115	127	138	157	196

8. COST OF OPERATING

a. Comparative Mining Costs

	May 31,1938	1937	Incr.	Decr.
Product - Tons	48,824	172,823		123,999
Underground costs	1.493	1.177	.316	
Surface Costs	.312	.277	.035	
General Mine Accounts	.304	.224	.080	
Cost of Production	2.109	1.678	.431	
Depreciation-Plant Acct.	.032	.032		
" - Development	.033	.033		
Taxes	.034	.023	.011	
Cost on Stockpile	2.208	1.766	.442	
Loading and Shipping	.035	.093		
TOTAL COST ON CARS	2.243	1.859		
Number of days operating	90	225		135
No. of shifts and hours	2-8 hr.	3-8 hr.		1-8 hr.
Average daily product	542	768		225
Cost of Production				
Labor	1.280	1.063	.217	
Supplies	.829	.615	.214	
Total	2.109	1.678	.431	

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8. COST OF OPERATING (cont.)
b. Detailed Cost Comparison

	1938	1937	Increase	Decrease
Days per Week	5 - 4 - 3	5		
Shifts & Hours	2-8 hr.	3-8 hr.		1-8 hr.
Production, Tons	48,824	172,823		123,999
Avg.Daily Product,Tons	542	768		226
Number of days worked	90	225		135

	1938 Amount	1938 Per Ton	1937 Amount	1937 Per Ton	Increase Amount	Increase Per Ton	Decrease Amount	Decrease Per Ton
Underground Costs								
1. Exploring in Mine	896.62	.018	372.99	.002	523.63	.016		
4. Development in Ore	19,315.55	.395	57,928.90	.335		.060	38,613.35	
5. Stoping	18,257.33	.374	59,580.92	.325		.029	41,323.59	
6. Timbering	5,075.21	.104	12,370.35	.072		.032	7,295.14	
7. Tramming	12,722.07	.261	42,912.63	.248		.013	30,190.56	
8. Ventilation	11.56	.000	20.75	.000			9.19	
9. Pumping	7,851.26	.161	10,016.55	.058		.103	2,165.29	
10. Compressors & Air Pipes	1,883.69	.039	3,593.49	.021		.018	1,709.80	
12. Underground Suptce.	2,962.70	.061	7,918.92	.046		.015	4,956.22	
14. Maint:Compressors & power drills			572.57	.003			572.57	.003
15. Maint: Hand Scrapers	527.79	.011	1,513.73	.009		.002	985.94	
16. Maint: Elec.TramEquipt.	2,219.33	.045	5,622.63	.033		.012	3,403.30	
17. Maint: Pumping Mach.	1,410.48	.029	928.64	.005	181.84	.024		
Total Underground Costs	73,133.59	1.498	203,353.07	1.177		.321	130,219.48	
Surface Costs								
18. Hoisting	7,650.13	.156	21,389.62	.124		.032	13,739.49	
19. Stocking Ore	2,274.08	.047	4,627.82	.027		.020	2,353.74	
21. Dry House	1,922.98	.039	5,048.93	.029		.010	3,125.95	
22. General Surface Exp.	617.70	.013	1,098.92	.006		.007	481.22	
23. Maint: Hoisting Equipt.	1,258.71	.026	7,010.62	.041			5,751.91	.015
24. Maint: Shaft	1,211.45	.025	3,662.28	.021		.004	2,450.83	
25. Maint: Top Tram Equipt.	176.12	.004	904.11	.005			727.99	.001
26. Maint:Docks,Trestles,etc.	58.42	.001	1,264.12	.007			1,205.70	.006
27. Mine Buildings	233.08	.005	2,818.09	.017			2,585.01	.012
Total Surface Costs	15,402.67	.316	47,824.51	.277		.039	32,421.84	
General Mine Expense								
27½.Vacation Expense	[illegible]	.007	2,829.90	.016			2,829.90	.016
28. Insurance	358.94	.007	2,609.98	.015			2,251.04	.008
29. Mining Engineering	1,164.83	.024	2,019.52	.012		.012	854.69	
30. Mech. & Elec. Engr.	128.57	.003	323.70	.002		.001	195.13	
31. Analysis & Grading	2,158.72	.044	4,560.86	.026		.018	2,402.14	
32. Personal Injury	1,473.35	.030	4,176.71	.024		.006	2,703.36	
33. Safety Department	418.68	.008	829.65	.006		.002	410.97	
34. Telephones & Safety Dev.	148.55	.003	540.93	.003			392.38	
35. Local & Gen. Welfare	686.69	.014	1,537.50	.009		.005	850.81	

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B. COST OF OPERATING (Cont.)
b. Detailed Cost Comparison (Cont.)

	1938		1937		Increase		Decrease	
General Mine Exp. (Cont.)	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton
36.Spec.Exp.Pensions,Allow.	984.61	.020	2,276.43	.013		.007	1,291.82	
37.Ishpeming Office	2,332.00	.048	5,749.00	.033		.015	3,417.00	
38. District Off.Soc.Sec.	2,802.08	.058	5,715.41	.033		.025	2,913.33	
39. Mine Office	2,308.28	.047	5,581.03	.032		.015	3,272.75	
Total Gen.Mine Exp.	14,965.30	.306	38,750.62	.224		.082	23,785.32	
COST OF PRODUCTION	103,501.56	2.120	289,928.20	1.676		.442	186,426.64	
40.Taxes	1,625.00	.034	3,903.33	.023		.011	2,278.33	
TOTAL COST	105,126.56	2.154	293,831.53	1.701		.453	188,704.97	
41.General Supplies	1,820.15	.037	5,257.03	.030		.007	3,436.88	
42.Iron and Steel	1,078.94	.022	2,565.90	.015		.007	1,486.96	
43.Oil and Grease	570.77	.012	1,312.36	.008		.004	741.59	
44.Machinery Supplies	2,171.05	.045	8,171.58	.046			6,000.53	.001
45.Explosives	5,531.84	.113	17,783.60	.103		.010	12,251.76	
46.Lumber & Timber	1,301.10	.027	5,847.99	.034			4,546.89	.007
47. Fuel	997.74	.020	2,366.91	.014		.006	1,369.17	
48.Electric Power	13,775.70	.282	32,060.58	.185		.097	18,284.88	
49.Sundries	1,657.30	.034	3,722.54	.022		.012	2,065.24	
50.Other Mines & Accts.	175.64	.003	568.26	.003			392.62	
TOTAL COST PER COST SHEET	28,728.95	.589	78,520.23	.454		.135	49,791.28	

Comparative Supply Balance

	May 31,1938	Jan.1,1938	Incr.	Decr.
1. General Supplies	2,952.91	1,661.42	1,291.49	
2. Iron & Steel	836.76	534.76	302.00	
3. Oil and Grease	175.02	198.02		23.00
4. Machinery Supplies	2,332.44	1,770.52	561.92	
5. Explosives	157.95		157.95	
6. Lumber & Timber	2,885.06	3,106.62		721.56
7. Fuel	720.78	1,907.66		1,186.88
Total	9,560.92	9,179.00	381.92	

1. Exploring in Mine
Ishpeming Office Charge. Extensive diamond drilling was done during the latter part of May, 1938.

2. Development in Ore
Mine idle since May, 31, 1938, showing large decrease.

5. Stoping
Mine idle since May 31,

GARDNER MACKINAW MINE
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8. COST OF OPERATING (Cont.)

b. Detailed Cost Comparison (Cont.)

6. Timbering
Mine idle since May 31st.

7. Tramming
Mine idle since May 31st.

8. Ventilation
Minor repairs to ventilation system made in 1937.

9. Pumping
Heavy pumping charges in 1938. Mine now being flooded below 5th Level.

10. Compressors & Air Pipes
Extensive repairs to compressors due to pin in crank end becomming loose and getting wedged in cylinder Nov.1937, causing babbit in cylinder to become broken up and the bulk of charges covering such pepairs were charged off in 1938. On May 3,1938, the coils on main compressors motor burned out. entailing very heavy expense to replace.

12. Underground Superintendence
Mine idle since May 31, 1938

14. Maint: Compressors & Power Drills
Mine idle since May 31.

15. Maint: Hand Scrapers
Mine idle since May 31st.

16. Maint: Electric Tram Equipt.
Mine idle since May 31st.

17. Maint: Pumping Machinery
Extensive repairs to pumping machinery during 1938.

18. Hoisting
Mine idle since May 31st.

19. Stocking ore
Mine idle since May 31st.

21. Dry House
Mine idle since May 31st.

22. General Surface Expense
Mine idle since May 31st.

GARDNER MACKINAW MINE
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YEAR 1938

8. COST OF OPERATING (Cont.)

23. Maint: Hoisting Equipt.
Mine idle since May 31st.

24. Maint: Shaft
Mine idle since May 31st.

25. Maint: Top Tram Equipment
Mine idle since May 31st.

26. Maint: Docks,Trestles,Pockets
Mine idle since May 31st.

27. Mine buildings
In 1937 ferro board was put on the Mackinaw shaft house, resulting in a large decrease in 1938.

27½. Vacation Expense
Vacation with pay ($219.16) will be included under labor in idle expense cost. This item is much less, as the men have been transferred to other mines.

28. Insurance
Ishpeming Office charge.

29. Mining Engineering
Mine idle requiring less engineering work.

30. Mech. & Electrical Engineering
Ishpeming office charge.

31. Analysis and Grading
Mine idle since May 31st.

32. Personal Injury
Mine idle since May 31st.

33. Safety Department
Mine idle since May 31st.

34. Telephones & Safety Devices
Mine idle since May 31st.

35. Local & General Welfare
Mine idle since May 31st.

36. Special Expense,Pensions,Allowances
Mine idle since May 31st.

GARDNER MACKINAW MINE
ANNUAL REPORT
YEAR 1938

8. COST OF OPERATING (Cont.)

37. Ishpeming Office
Mine idle since May 31st.

38. District Office, Soc. Sec.
Mine idle since May 31st.

39. Mine Office
Mine idle since May 31st.

40. Taxes
Mine idle since May 31st.

41. General Supplies
Less supplies used account mine closing down May 31st.

42. Iron & Steel
Less iron and steel used, "

43. Oil & Grease
Less oil and grease used. "

44. Machinery Supplies "
Less machinery supplies used.

45. Explosives
Less explosives used "

46. Lumber & Timber
Less timber used "

47. Fuel
Less Fuel used "

48. Electric Power
Less current used "

c. Idle Expense Account
Under this heading appears all costs chargeable to the Gardner Mackinaw Mine during the seven months period from June 1st to December 31st, 1938, inclusive, or the period after the mine closed.

GARDNER MACKINAW MINE
ANNUAL REPORT
YEAR 1938

8. COST OF OPERATING (Cont.)

c. Idle Expense (Cont.)

The following table shows the cost under four main headings:

1. Underground costs	$ 8,639.76
2. Surface Costs	2,670.61
3. General Mine Expense	8,919.56
4. Taxes	2,369.75
Total Cost	$22,599.68

A brief synopsis of the main headings follows:

1. The principal item amounting to $2,555.00 was charged to pumping which was in progress during five of the seven inactive months. This includes cost of labor as well as power. Closely related to this is an item of $2,010 for pump maintenance which was necessary to put the emergency pumps in operating condition.

2. Approximately half of this cost is charged to hoisting and in turn principally to labor.

3. This item includes the usual charges for miscellaneous office expense together with cost of $2,246 for the removing of portable equipment from the mine, reconditioning it, and placing it in storage for future use.

4. This is the proportion of the taxes incurred by the mine during the seven months inactive period.

9. EXPLORATIONS AND
FUTURE EXPLORATIONS

The only actual exploration at the Mackinaw Mine was that of drilling No. 6 drill hole from a cross-cut near the Northwest end of the 10th Level. The hole was directed S. 35° W. at a dip of -60°. This angle was approximately 15° steeper than the general dip of the formation. The hole was drilled to a depth of 370' and showed an average analysis for the first 140' of 59.08% Iron, .969% Phos. and .986% sulphur. Thereafter the hole encountered lean ore, black slate and arkose, the entire results being very disappointing.

Possibly under the heading of future explorations, the only information as yet unknown would be that of locating the actual end of the Mackinaw ore body to the northwest, together with outlining the upper trend of merchantable ore developed during 1938 on and above the 6th Level.

GARDNER MACKINAW MINE
ANNUAL REPORT
YEAR 1938

10. TAXES

	1938		1937	
GARDNER MINE - C.&.N.W.LEASE	Valuation	Taxes	Valuation	Taxes
SE¼ of SE¼,Sec.35,45-25.....	2,000	37.47	2,000	36.79
NE¼ of SW¼,Sec.35,45-25.....	1,000	18.73	1,000	18.39
NW¼ of NE¼ of Sec.2,45-25....	1,000	18.73	1,000	18.39
Personal property.....	130,000	2,435.42	125,000	2,299.00
Total.....	134,000	2,510.35	129,000	2,372.57
Collection Fees.....		25.10		23.72
TOTAL TAXES.....		2,535.45		2,396.29
MACKINAW MINE - DM&N LEASE				
N½ of SE¼ & SW¼ of SE¼,Sec.35,45-25	76,000	1,423.78	80,000	1,471.43
S½ of SW¼ of Sec.35,45-25....	1,125	21.07	1,125	20.69
Total.....	77,125	1,444.85	81,125	1,492.12
Collection Fees.....		14.45		14.92
TOTAL TAXES.....		1,459.30		1,507.04
TOTAL GARDNER MACKINAW MINE	211,125	3,994.75	210,125	3,903.33

11. ACCIDENTS AND PERSONAL INJURY

During the first five months of production, two minor accidents occurred at the Mackinaw. Because of the comparatively short operating period of the Mackinaw Mine, no comparison can be arrived at as far as a record with the other mines.

12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

There was no new construction during the year and not any is contemplated for 1939. Just after the mine closed in May, one of the cottages at the Cyr Location was moved to the mine premises near the Company's large barn. The building was put into good condition and will serve as a permanent residence for the watchman. All brush and other obstructions were cut out on the premises giving a full view of the mine shaft house and other buildings. Gates were put across the road leading to the mine premises proper and also across the road leading to Emil Railo's logging camp.

13. EQUIPMENT AND PROPOSED EQUIPMENT

a. Steam Shovels

Necessary minor repairs were made to the steam shovels early in the spring before the opening of the shipping season. There were no serious delays due to this equipment during the season.

GARDNER MACKINAW MINE
ANNUAL REPORT
YEAR 1938

13. EQUIPMENT AND PROPOSED EQUIPMENT

b. Stockpile Trestles

With the closing of the mine after five months operation, no change had to be made in stockpile trestles.

c. Pumping Equipment

During the month of June, all the small pumps on the lower levels were brought to surface, cleaned and reconditioned for future use. The large 1,000 gallon Aldrich and 1,000 gallon centrifugal pumps on the 4th Level were inactive until October when all water accumulating on the 4th and 5th Levels (87½ G.P.M.) was pumped. In November the electric motor for the centrifugal pump was rewound and the electric cable was renewed from the shaft to control box. Switchboard changes were made throughout the entire pump station. Late in November, work was in progress toward locating the three centrifugal pumps in #4 stope below the 5th Level. This pump station was located on the floor of the dirt pile which was levelled off and made safe for its use as a pump station. The three centrifugal pumps (100, 300 and 500 G.P.M.) were arranged on the floor of the pump station in such a way that any one can operate independent of the others or all can operate simultaneously. The water from these pumps is raised to the 4th Level and empties into the 4th Level sump which in turn is connected by valves with the main 4th Level sump. With this arrangement the water coming into the lower workings will be pumped in such a way to maintain the level at approximately 20' below the 5th Level. It is believed that the total water entering the mine amounts to about 250 gallons per minute and the present set-up is such that this water can be pumped very easily with two independent pumping systems.

d. Hoist at Incline Shaft

There were no serious delays due to the incline shaft hoist during the year.

e. Compressor

On May 30th, as a result of an electrical storm, the motor operating the Nordberg compressor was burned out, resulting in a minor delay inasmuch as the mine was closed down to production on May 31st. A small compressor was installed in the engine house to operate the diamond drill equipment in the northwest end of the 10th Level. The Nordberg compressor motor was repaired during the summer.

15. POWER

Electric power was furnished by the Cliffs Power & Light Company at varying rates throughout the year. The detail of power used in 1937 and 1938 follows:

GARDNER MACKINAW MINE
ANNUAL REPORT
YEAR 1938

15. POWER (Cont.)

	K.W.H.USED 1938	1937	Incr.	Decr.	Remarks
Gardner Hoist	0	0			Mine idle.
Mack.Hoist & Lighting	117,198	367,319		250,121	" " 5-31/38
Compressors	566,080	1,232,290		666,210	"
Electric Haulage	69,900	171,400		101,500	"
Shops	1,180	2,928		1,748	"
Top Tram-Mackinaw	12,986	26,099		13,113	"
Underground Hoist	38,320	149,520		111,200	"
Pumping & Lighting	143,124	210,568		67,464	"
Analysis (Crusher)	0	71		71	"
" (Drier)	0	9,480		9,480	"
Flood Light-Mackinaw	0	0			"
Heating Plant	926	1,659		733	"
Dry House	2,126	3,689		1,563	"
Office	303	526		223	"
Timbering	926	2,100		1,174	"
Total	953,069	2,177,669		1,224,600	
In Cash	$ 13,775.70	$32,060.58		$18,284.38	
Cost per KWH	.0145	.0147		.002	

17. CONDITION OF PREMISES

The premiss were kept as neat and clean as possible and the flowers, shrubs and trees which were planted in 1936 have been maintained by the surface crew.

18. NATIONALITY OF EMPLOYEES

As to Parentage	1938	%	1937	%
English	10	6.9	10	6.8
Finnish	44	30.3	50	34.2
Italian	34	23.4	29	19.9
Swedish	21	14.5	19	13.0
Canadian (French)	19	13.1	19	13.0
German	3	2.1	3	2.1
Norwegian	9	6.2	10	6.8
Dutch	2	1.4	2	1.4
Belgian	2	1.4	2	1.4
Austrian Hungarian	1	.7	2	1.4
Total	145	100.0%	146	100.0%

GARDNER MACKINAW MINE
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YEAR 1938

18. NATIONALITY OF EMPLOYEES

As to Birth	Total 1938	Total 1937	American Born 1938	American Born 1937	Foreign Born 1938	Foreign Born 1937
English	10	10	5	5	5	5
Finnish	44	50	16	20	28	30
Italian	34	29	14	10	20	19
Swedish	20	19	12	10	8	9
French-Canadian	19	19	16	15	3	4
German	3	3	3	3	0	0
Norwegian	10	10	8	7	2	3
Dutch	2	2	2	2	0	0
Belgian	2	2	2	2	0	0
Austrian-Hungarian	1	2	0	0	1	2
Total	145	146	78	74	67	72
Percentages			54%	51%	46%	49%

GWINN DISTRICT GENERAL ANNUAL REPORT YEAR 1938

1. GENERAL

The general conditions and activities in the Gwinn District were considerably less favorable than for a number of years.

From January 1st to June 1st the Mackinaw Mine operated five days per week, the men working on a staggered basis, each man getting three shifts per week.

The Mine closed down on June 1st, leaving the district without an operating mine. Fortunately for the men, the greater part were given employment at our Negaunee, Ishpeming and North Lake Mines.

Due to the reduced schedule of operation at the mines and paper mills, there was very little work for the local timber jobbers and then their work was wholly stopped by a very heavy snow fall or blizzard which occurred on January 23rd. This fall was so heavy that the afternoon shift at the Mackinaw was marooned at the mine for nearly two days.

Schools

Gwinn maintains an excellent graded school and has a large enrollment. For the 1937-1938 season it was:

Elementary grades	309
7th to 12th grades	278
Total	587

In the above enrollment are 42 children from Wells Township who are transported 20 miles morning and afternoon through a wooded unsettled country by bus. Turin Township also transports 8 pupils about 15 miles to Gwinn.

Theatres

Early in the year the Gwinn Theatre which occupied one of the store rooms in the hotel building, closed. It could not stand the competition of the New Hiawatha Theatre which was built about a year ago. The Hiawatha is very modern, air-conditioned, etc.

Houses & Lots

Practically all of the Company houses were rented throughout the year, most on a reduced rental due to the men working less than half time.

At the Mackinaw Location one double house was dismantled to provide repair material for houses in Gwinn. A cottage in this location was moved to the Mackinaw Mine to be used as living quarters for the watchman. There remains only one house in this location - a

GWINN DISTRICT GENERAL
ANNUAL REPORT
YEAR 1938

1. GENERAL (Cont.)

Houses & Lots (Cont.)
small cottage - which most likely will be moved to the Tilden Mine for the watchman.

In Gwinn, single house #95 located on Pine Street, was sold. Two lots were sold in the business section to the proprietor of the Gwinn Oil Company.

In the Princeton Location, houses #8 and #13 were sold.

Women's Study Club
Early in the year this organization started a campaign to beautify Gwinn. They developed three projects, and deserve credit for the work they accomplished. The projects were as follows:-

Project No. 1. This consisted of replanting of Norway Pines in t the Boulevard. This was undertaken and completed by the Boy Scouts. Nineteen trees, from 6 to 8 feet in height, were planted. Wire fencing material was used as tree guards.

Project No. 2. The planting of ten Mountain Ash trees along the river bank was done by the Ex-Service's Men's Club, also by the Gwinn High School Agricultural Class.

Project No. 3. The Girl Scout Troup, cleaned the Gwinn Common, or park.

The first week in May, 1st to 7th, was set aside for "Clean Up" week in Gwinn. This, with the advertising through the school, and co-operation of towns people, was very effective. Considerable interest was taken and posters, prepared by the students in the school, were posted at various points in the town.

Sidewalks
During the year, Forsyth Township supported by a WPA project, constructed 5' cement sidewalks the whole length of Pine Street, from the business district to the north edge of the town.

Community Tree
A large spruce tree was planted in the northwest corner of the Gwinn Common opposite the Gwinn Bank, to be used as, or called, the Community Tree. The ground at this point was bare and the tree adds greatly to the Common's appearance.

This work was done by the Gwinn Fire Department.

GWINN DISTRICT GENERAL
ANNUAL REPORT
YEAR 1938

1. GENERAL (Cont.)

Conservation Department Station
The grounds of the new Fire Control Auxiliary Unit of the Department of Conservation, located on the County road just west of Gwinn, were graded and planted and present a very neat appearance.

Civilian Conservation Corps.
Escanaba River Camp #1620, located 18 miles west of Gwinn, continued throughout the year. This is the only camp left in Marquette County. There are six in the Upper Peninsula.

a. Statement Showing Total Ore Produced in District by C.C.I.Co. 1903 to 1938 Inclusive

Year	AUSTIN	PRINCETON	STEPHENSON	GWINN	FRANCIS	GARDNER MACKINAW	TOTAL
Total to 1938	1,589,018	1,584,333	3,835,157	988,665	504,667	1,240,294	9,742,134
1938	0	0	0	0	0	48,824	48,824
	1,589,018	1,584,333	3,835,157	988,665	504,667	1,289,118	9,790,958

b. Statement Showing Total Ore Shipments by C.C.I.Co. from 1905 to 1938

Year	AUSTIN	PRINCETON	STEPHENSON	GWINN	FRANCIS	GARDNER MACKINAW	TOTAL
Total to 1938	1,589,018	1,463,377	3,753,895	988,325	488,662	1,152,998	9,436,275
1938	0	57	19,466	0	0	14,488	34,011
	1,589,018	1,463,434	3,773,361	988,325	488,662	1,167,486	9,470,286

c. Ore in Stock at Mines, December 31, 1937

Princeton	Stephenson	Francis	Gardner Mackinaw	Total
120,899	55,806	16,005	125,028	317,738

5. LABOR AND WAGES

The number of shifts worked by employees in the Gwinn District, including the Mackinaw Mine, in 1938 was 13,076 as compared with 36,364 in 1937.

There was no general increase or decrease in wages during the year 1938. During the year, however, there were adjustments in the wages for Surface Foreman, Mechanic, etc.

GWINN DISTRICT GENERAL
ANNUAL REPORT
YEAR 1938

10. TAXES

The following statement gives the taxes in detail for 1938 and 1937 for all company properties in the district. The mine taxes in the summary, shows 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 that paid by the Land Department.

Forsyth Township		1938		1937	
Mineral Lands, Gwinn		Valuation	Taxes	Valuation	Taxes
SW¼ of SW¼ of Sec.26,45-25,	45.A.	100	1.88	100	1.85
S½ of SE¼ of Sec.27,45-25,	80 A.			Land Department	
NW¼ of SE¼ of Sec.27,45-25,	40 A.			" "	
NE¼ of SE¼ of Sec.28,45-25	40 A.	100	1.88	100	1.85
N½ of NE¼ of Sec.34,45-25	80 A.	200	3.75	200	3.68
SE¼ of NE¼ of Sec.34,45-25	40 A.	100	1.88	100	1.85
NE¼ of NW¼ of Sec.34,45-25	40 A.	100	1.88	100	1.85
NE¼ of SE¼ of Sec.34,45-25	40 A.	100	1.88	100	1.85
NW¼ of Section 35,45-25	160 A.	400	7.49	400	7.35
Lots 1,2 and 3 " 36,45-25	52 A.	125	2.35	125	2.31
Lots 7,8 & 9 " 36,45-25	98.42 A.	260	4.89	260	4.80
Lot 11, Sec. 36,45-25	13.3 A.	25	.47	25	.45
Und.½ of S½ of N½ of Sec.22,45-25	160 A.	500	9.38	500	9.20
" " S½ of NE¼, Sec.28,45-25	80 A.	142	2.67	142	2.62
" " N½ of NW¼, Sec.2,45-26	87.08A	100	1.88	100	1.84
" " NE¼ of Sec.2,45-26	165.61A	200	3.75	200	3.67
TOTAL		2,452	46.03	2,452	45.17
Collection Fee			.46		.45
Total Taxes			46.49		45.62

Gwinn Townsite - Surface Only				
NE¼ of SW¼, Sec.21,45-25, not included in Plat, 6 acres	100	1.88	100	1.85
NE¼ of SW¼, Sec.21,45-25, 17.4 acres	150	2.82	150	2.76
That part of S½ of NW¼, Sec.21,45-25 not included in Plat of Gwinn, 25.01 A	200	3.75	200	3.68
E½ of SE¼ of Sec.21,45-25, 65.84 A	150	2.82	150	2.76
That part of W½ of SE¼,Sec.21,45-25 not included in Plat of Gwinn, 38.80 A	300	5.63	300	5.52
Gwinn Townsite Plat	86,405	1,618.37	89,345	1,645.74
Part of W½ of SE¼,Sec.21,45-25, Supts.Res. 1/2 acre	3,000	56.20	3,000	55.18
NW¼ of NE¼,Sec.21,45-25, except 5 A. in cemetery, 35 acres	100	1.88	100	1.85
Part of S½ of NE¼,Sec.21,45-25, 50.88 A	300	5.63	300	5.52
TOTAL	90,705	1,701.21	93,645	1,724.86
Collection Fee		16.99		17.24
TOTAL TAXES		1,718.30		1,742.10

GWINN DISTRICT GENERAL
ANNUAL REPORT
YEAR 1938

10. TAXES (Cont.)

	1938		1937	
Gardner Mackinaw Dwellings	Valuation	Taxes	Valuation	Taxes
N½ of NE¼ of Sec.35,45-25, 87.35 A.	500	9.38	5,000	91.97
Collection Fee.....		.09		.92
		9.47		92.89
Central Water Plant, NW¼ of NE¼ of Sec.28,45-25.....	100	1.90	400	7.42
Personal District Office.....	500	9.48	500	9.29
District Crusher, N½ of NW¼,Sec.27 45-25.....	1,000	18.91	1,000	18.57
	1,600	30.29	1,900	35.28
Austin Location				
Part of Lot 5, SW¼ of NE¼,Sec.20,45-25	3,500	65.57	3,500	64.37
NW¼ of SE¼, Sec.20,45-25.....	3,500	65.57	5,000	91.97
NE¼ of SW¼ of Sec.20,45-25, BH....	260	4.88	260	4.78
Total.....	7,260	316.02	8,760	161.12
Collection Fee.....		1.36		1.61
Total Taxes.....		137.38		162.73
Summary				
Stephenson Mine.....	92,100	1,742.64	127,100	2,361.00
Princeton Mine.....	241,260	4,564.98	246,260	4,574.98
Francis Mine.....	20,000	382.17	63,000	1,173.27
Gardner Mackinaw Mine.....	211,125	3,994.75	210,125	3,901.84
Austin Location.....	7,260	137.38	8,760	162.73
Mineral Lands.....	2,452	46.49	2,452	45.62
Gwinn Townsite.....	90,705	1,718.30	93,645	1,742.10
Gardner Mackinaw Location.....	500	9.47	5,000	92.89
Central Water Plant.....	100	1.90	400	7.42
Personal District Office.....	500	9.48	500	9.29
District Crusher.....	1,000	18.91	1,000	18.57
Total C.C.I.Co. Including 1% Fee	667,002	12,626.47	758,242	14,089.71
Less: Francis,Paid by Cleveland		3.74		2.98
Less 1933 Taxes on NE¼ of SW¼,Sec.21		2.33		
Refund: C.& N.W. (NE of SE Sec.35)				1.49
To Pay.....1.....		12,620.40		14,088.22
The Cliffs Power & Light Co.....	98,665	1,848.55	98,600	1,831.97
TOTAL.....	765,667	14,468.95	856,842	15,920.19

GWINN DISTRICT GENERAL
ANNUAL REPORT
YEAR 1938

10. TAXES (Cont.)

Taxes Levied - Forsyth Township

	1938	1937	1936	1935
Forsyth Township Valuation	1,322,780	1,446,395	1,429,110	1,478,347
Rate per $100.00.....	1.873	1.839	1.851	1.851
Amount of Tax Roll				
State Tax.....				7.61
County Tax.....	8,329.33	9,437.28	10,003.77	10,130.05
County Debt Service.....	138.71	405.87	494.36	548.03
County Road.....	2,520.19	2,375.04	928.92	1,114.30
Township Tax.....	2,671.36	3,635.11	4,215.87	4,368.58
Township Debt Service.....	1,102.96	805.86	800.00	818.23
School.....	6,461.27	6,344.02	6,288.08	6,684.35
School Debt Service.....	3,746.01	3,712.87	3,704.48	3,742.34
Road Repair Tax.....				3.81
Highway Improvement Tax...				3.66
Rejected.....			187.92	
Total.....	24,969.83	26,716.05	26,623.40	27,420.96
Amount paid by C.C.I.Co...		15,920.19	16,347.81	16,798.32
Percent paid by C.C.I.Co..		59.59%	60.08%	60.66%

16. WATER SUPPLY
GWINN DISTRICT

The Pumping Plant at the Jopling Shaft (Kidder) operated throughout the year. One 500 gallon pump was able to carry the load except in extreme cold weather when it became necessary to change to the 1,000 gallon pump. This was due to tenants opening faucets to prevent freezing of lines running into their houses.

There was experienced considerable difficulty in maintaining pressure to supply the booster pump in the Austin Location. It was necessary to install automatic valves which were regulated by the line pressure. These have been in operation a couple of months and seem to be working satisfactorily.

On the 1st and 15th of each month water samples are sent to the State Health Department laboratory at Houghton for analysis.

The cost of operating the new pumping plant for 1938 showed a decrease of $4,090.83 under the cost of operating this same plant for 1937. This is accounted for in that during 1937 new iron pipe was purchased for new water line running from a point near the Austin Booster Station through to the Princeton Location. All of the old pipe in this section

GWINN DISTRICT GENERAL
ANNUAL REPORT
YEAR 1938

16. WATER SUPPLY
GWINN DISTRICT (Cont.)

was taken out and replaced with new iron pipe.

The total cost of operating the Kidder Pump Station for the year 1938 was.....$ 6,415.14

Total cost of operating the Kidder Pump Station for the year 1937 was.....l..... 10,505.97

Total cost of operating the Old Escanaba River Plant for the year 1936 was..... 8,724.86

The following gives the cost of operating the Pump Station for the years 1938 and 1937:

	1938	1937	Incr.	Decr.
General Expense	39.60	38.35	1.25	
Maintenance Labor	691.27	2,363.88		1,672.61
" Material	883.13	2,034.77		1,151.64
Operating Labor	757.19	609.85	149.34	
" Supplies	4,043.95	5,461.12		1,417.17
Total	6,415.14	10,505.97		4,090.83

General Expense
The small increase is due to slight change in charge for "Telephone".

Maintenance Labor
The decrease is due to less repairs to water mains in 1938, and also laying a new iron pipe from the Austin booster station through to the Princeton Location.

Maintenance Material
The decrease here is the same as under Maintenance Labor.

Operating Labor
The increase in this account is due to more attendance labor required at the regular pump station, also booster station, in 1938 than in 1937.

Operating Supplies
Practically all of the decrease in this account is from the fact that the electric power cost was $1,369.15 less in 1938 than in 1937.

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16. WATER SUPPLY
GWINN DISTRICT (Cont.)

Operating costs were charged off as follows:

	1938	1937
1. C. C. I. Co. Mines	35.00	127.50
2. Water Charges Receivable	2,124.38	2,230.51
3. Gwinn Townsite Expense General	4,255.76	8,147.96
	6,415.14	10,505.97

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 Locations follows. The rents accrued in 1938 were smaller than 1937 on account of half rent being charged most of the year.

Gwinn Townsite	1938	1937	1936	1935
Number of Houses - 121				
Rents Accrued	8,756.35	11,590.99	10,391.71	7,604.74
Repair Expense	2,007.88	14,887.99	5,945.19	2,558.91
ACCRUED RENT over Repair Cost	6,748.47	3,297.00	4,446.52	5,045.83
Actual Rent collected	7,144.59	11,123.67	9,095.45	6,162.81
Amount credited by men owing back rent	0	276.54	632.29	2,095.93
Total Collection	7,144.59	11,400.21	9,727.74	8,258.74

Single House #95 on Pine Street, located on Lot 6 of Block 13 was sold to Thomas Roberts.

The cost of repairs to buildings decreased $12,880.11 as compared with 1937. This is accounted for in that in 1937 extensive repairs were carried on generally, 12 double houses having been raised and placed on new sills and concrete posts.

Also, fourteen double houses and four single houses were painted, also the exterior woodwork on the Gwinn Hotel Block, Bank Building and Club Houses was painted.

There was no work of this kind performed in 1938, the work being confined only to necessary repairs.

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17. CONDITION OF PREMISES (Cont.)

Austin Location	1938	1937	1936	1935
Number of Houses - 41				
Number Occupied	38	37	32	32
Rents Accrued	1,559.75	1,684.08	1,463.97	1,168.25
Repair Expense	300.26	1,441.05	436.30	1,328.68
ACCRUED RENT OVER REPAIR COST	1,259.51	243.03	1,027.67	160.43
Actual Rent Collection	1,513.00	1,710.07	1,596.49	1,022.13
Amount credited by men owing back rent	16.00	0	7.04	294.28
Total Collection	1,529.00	1,710.07	1,603.53	1,316.41

The Repairs for 1937 were quite extensive in that some of the houses were re-roofed while in 1938 the repairs were confined to only the absolutely necessary work.

Princeton Location	1938	1937	1936	1935
Number of Houses - 11				
Number Occupied	10	9	9	11
Rents Accrued	419.15	596.00	581.90	437.50
Repair Expense	144.12	468.40	165.99	436.66
ACCRUED RENT OVER REPAIR COST	275.03	127.60	415.91	.84
Actual Rent Collection	412.86	635.00	471.59	458.00
Amount credited by men owing back rent	0	0	7.04	114.18
TOTAL COLLECTION	412.86	635.00	478.63	572.18

During the year two houses at the Princeton Location were sold. No. 6 was sold to W. H. Burrows and Mrs. Eliza Burrows; No. 13 was sold to Hazen Thomas.

Gardner Mackinaw Location	1938	1937	1936	1935
Number of Houses - 2				
Number occupied	1	0	2	5
Rents Accrued	0	104.00	279.90	245.50
Repair Expense	9.29	15.27	91.00	88.21
ACCRUED RENT OVER REPAIR COST	9.29	88.73	188.90	157.29
Actual Rent Collections	42.00	80.98	237.90	262.00

During the year Double House #46-47 was dismantled by company carpenters. The material saved from this house has been stored and is to be used in repairs to other buildings from time to time.

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17. CONDITION OF PREMISES (Cont.)

The only houses remaining at the Mackinaw Location is one single cottage which is not occupied. The other cottage was moved during the year from the location to a point near the Gardner Mackinaw Mine. This building is occupied by the watchman at this property.

Statistical Statement of Rented Buildings 1938

Location	Vacant	Occupied	Total	Cost of Repairs	Repair Cost Per House	Rent Accrued	Rent Collected
Princeton	1	10	11	144.12	13.10	419.15	412.66
Austin	3	38	41	300.26	7.32	1,559.75	1,513.00
Gardner Mackinaw	1	1	2	9.29	4.64	0	42.00
Gwinn Townsite	6	115	121	2,007.88	17.45	8,756.35	7,144.59
	11	164	175	2,461.55 (1)	14.07	10,735.25	9,112.45 (2)

(1) Actual cash expenditure for repairs $ 2,461.55
(2) Actual cash received, (as above) 9,112.45
Amount credited by journal voucher for labor performed 16.00

Included in the above total rent collection there is an amount of $162.43 which was credited to rent accounts which have previously been charged off the books.

The large decrease for 1938 is due to the fact that in 1937 a large program was carried on for painting, raising houses, etc.

19. GWINN ASSOCIATION
GWINN HOTEL

1. Gwinn Association

A detailed annual report is furnished to the Welfare Department of the Company, the following being a brief synopsis taken mostly from that report.

The Gwinn Association Clubhouse completed its 29th year of offering the residents of the district a modern place in which to enjoy their social and recreational activities.

The Superintendent of the Association still supervises all physical educational programs for the Gwinn school, for which, and for the use of the Association Building, the Forsyth Township Board of Education pays $2500.00 per year and also donates one car of coal. This arrangement, which has been in effect for several years, helps materially in maintaining the Clubhouse.