

MAAS MINE  
ANNUAL REPORT  
YEAR 1948

8. COST OF OPERATING

b. Detailed Cost Comparison (Cont.)

(6) Cost of Production

Year	Amount				Cost		
	Labor	%	Supplies	%	Labor	Supplies	Total
1948	1,448,650.25	71.3	581,994.81	28.7	2.180	.837	3.017
1947	1,305,236.64	70.8	539,799.55	29.2	1,807	.747	2.554
Increase	143,413.61	.5	42,195.26		.373	.090	.463
Decrease				.5			

It is interesting to note that in the last 10 years the proportion of labor to supplies has increased from 57% for labor and 43% for supplies to 71% for labor and 29% for supplies.

The cost of production showed an increase for 1948, over half of which was due to the increase in wages and also on account of working for a six-week period with the two large crews on afternoon and midnight shifts due to the shortage of electric power. Approximately 200 men received the extra shift differential of 5 cents per hour.

Some of the accounts where more explanation is necessary are listed below:

(7) Detail of Accounts

UNDERGROUND COSTS

3. Development in Rock

	Total Feet			Cost	
	Drifting	Raising	Total Feet	Per Foot	Per Ton
1948	641'	201'	842	21.44	.027
1947	195'		195	18.06	.005
Increase	446'	201'	647	3.38	.022

On account of the decrease in working places it was necessary to do more development work in 1948 and still more will be necessary in 1949 when the 7th Level will have to be opened.

4. Development in Ore

	Total Feet			Cost	
	Drifting	Raising	Total Feet	Per Foot	Per Ton
1948	418'	104'	522	14.63	.011
1947	0	0	0	0	0
Increase	418'	104'	522	14.63	.011

It was necessary to advance the 6th Level North footwall drift during 1948 in order to open three sub level stopes to help the production for 1949 when the 7th Level development will be in progress.

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(7) Detail of Accounts (Cont.)

5. Stoping

	<u>Labor</u>	<u>Cost Per Ton</u>	<u>Supplies</u>	<u>Cost Per Ton</u>	<u>Total</u>
1948	462,540.16	.687	80,750.19	.120	.807
1947	416,667.70	.577	68,954.22	.095	.672
Increase	45,872.46	.110	11,795.97	.025	.135

The increase in stoping outside of the increase in wages was due to the three sub-level stopes becoming exhausted and also having to abandon several areas on account of excessive water in two cases and a large intrusion of rock in another.

6. Timbering

	<u>Labor</u>	<u>Cost Per Ton</u>	<u>Supplies</u>	<u>Cost Per Ton</u>	<u>Total Cost Per Ton</u>
1948	389,757.50	.579	112,978.59	.167	.746
1947	342,529.93	.474	99,433.38	.138	.612
Increase	47,227.57	.105	13,545.21	.029	.134

Both the price of timber and wages increased in 1948 and there was also more repairing necessary on account of the excessive weight on the 4th and 5th Levels.

15. Scrapers & Mechanical Loaders

	<u>Amount</u>	<u>Cost Per Ton</u>
1948	59,186.24	.088
1947	46,531.66	.064
Increase	12,654.58	.024

To develop some of the ore bodies on the footwall, required the use of transfer drifts to avoid considerable rock drifting and raising on the main level and this necessitated the purchase of a number of large 25 h.p. scraper hoist units to accelerate the scraping cycle. To obtain the maximum efficiency of these hoists, larger scrapers were built and wire ropes of greater diameter used, both of which were more expensive.

Total Underground Costs

	<u>Labor</u>	<u>Cost Per Ton</u>	<u>Supplies</u>	<u>Cost Per Ton</u>
1948	1,199,166.62	1.781	397,705.70	.591
1947	1,082,512.55	1.498	342,347.46	.474
Increase	116,654.07	.283	55,358.24	.117

The decrease in production naturally raised the cost per ton for pumping, ventilation, supervision and other overhead costs. Despite the increase in wages during the year the supply cost showed the larger percentage of increase and this was partly due to increased prices but more to the purchase of new scraper hoist, drills, etc.

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(7) Detail of Accounts (Cont.)

SURFACE COSTS

23. Hoisting Equipment

	<u>Amount</u>	<u>Cost Per Ton</u>
1948	17,117.94	.025
1947	23,744.22	.033
Decrease	6,626.28	.008

The expense to this account was high for both years as in 1947 a new steel shell was installed on the skip hoist drum and in 1948 several changes, involving the removal of the new shell and sending it to the Lake Shore Engineering Company so that a central supporting spider could be installed. Both of these operations took place during the vacation periods.

24. Shaft

	<u>Amount</u>	<u>Cost Per Ton</u>
1948	22,274.93	.034
1947	11,783.84	.016
Increase	10,491.09	.018

This account also showed an increase in both 1947 and 1948 due to the excavation of a trench on 6th Level and a raise for cleaning the skip pit ore directly into the trench. A considerable amount of concrete was placed on the bed of the main line track and also in the trench and extensive guards were also installed for safety. This additional cost has been more than repaid by the speeding up of the tramping on the 6th Level due to being able to dump both wet and dry dirt without waiting for the skip.

Total Surface Costs

	<u>Labor</u>	<u>Cost Per Ton</u>	<u>Supplies</u>	<u>Cost Per Ton</u>
1948	96,841.54	.144	66,589.55	.099
1947	79,674.72	.110	68,192.39	.095
Increase	17,166.82	.034		.004
Decrease			1,602.84	

Labor naturally showed a larger percentage of increase in the Surface costs as outside of the repairs in the Engine House, there were no unusual supplies, and the price of electric current, which is the largest supply account on Surface, remained the same.

32. Personal Injury

	<u>Amount</u>	<u>Cost Per Ton</u>
1948	28,275.74	.042
1947	48,965.89	.068
Decrease	20,690.15	.026

There were two fatal injuries at the Maas Mine in 1947 as compared with none in 1948 and there were also 10 less lost time accidents.

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Analysis of Supplies Used

	<u>1948</u>		<u>1947</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
General Supplies	57,757.79	.086	40,407.92	.056
Iron & Steel	24,966.35	.037	14,090.56	.020
Oil & Grease	5,655.76	.008	4,001.09	.006
Machinery Supplies	45,800.17	.068	32,283.01	.045
Explosives	59,727.33	.089	51,915.00	.072
Lumber & Timber	107,524.64	.160	92,987.06	.129
Fuel	8,916.89	.013	8,197.72	.011
Electric Power	140,279.00	.208	147,663.68	.204
Total	<u>450,627.93</u>	<u>.669</u>	<u>391,546.04</u>	<u>.542</u>

Considerable new equipment such as drills, steel sets for timbering, scraper hoists, etc. were purchased in 1948 and there was also an increase in price for lumber, explosives, and many other items.

10. TAXES

	<u>1948</u>		<u>1947</u>	
	<u>VALUATION</u>	<u>TAXES</u>	<u>VALUATION</u>	<u>TAXES</u>
Maas Mine	\$ 1,935,000	85,750.11	\$ 1,525,000	67,506.26
Race Course	450,000	19,941.89	400,000	17,706.56
Stockpile & Equipment	755,000	33,458.05	860,000	38,069.10
Miscellaneous Parcels	8,665	383.98	8,665	383.56
Total Oprtg. Maas Mine	<u>3,148,665</u>	<u>139,534.03</u>	<u>2,793,665</u>	<u>123,665.48</u>
Collection Fees		<u>1,395.34</u>		<u>1,236.66</u>
Total		<u>140,929.37</u>		<u>124,902.14</u>
Tax Rate		4,431.53		4,426.64
Total City of Negaunee Tax		512,641.46		526,260.15
Maas Mine % of City Tax		27.6%		23.7%
Maas Mine Rented Houses	70,500	3,124.22	82,800	3,665.07
Mineral Lands, Etc.	16,270	721.02	15,035	665.55
Total Houses & Lands	<u>86,770</u>	<u>3,845.24</u>	<u>97,835</u>	<u>4,330.62</u>
Collection Fees		<u>38.46</u>		<u>43.31</u>
Total		<u>3,883.70</u>		<u>4,373.93</u>

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11. ACCIDENTS AND PERSONAL INJURY

	<u>1948</u>	<u>1947</u>
Fatal	0	2
Time Lost, over 4 months	1	1
Time Lost, 1 to 4 months	5	12
Time Lost, less than 1 month	9	10
Total Compensable Accidents	<u>15</u>	<u>25</u>

On December 31, 1948, payments were being made on six accidents which occurred prior to January 1, 1948.

The total amount paid out for accidents, occurring within the year, in 1948 was \$1,169.00 as compared with \$3,084.50 in 1947.

The following is a brief description of the more serious accidents.

<u>Date of Accident</u>	<u>Name of Injured Man</u>	<u>Description of Accident</u>
6-28-48	Edward Ecklid	Ecklid, a chuteman, was barring in a chute to dislodge the ore and struck his finger on the edge of the car. While the injury was not serious, it became infected and he lost two and one-half months.
8-28-48	Hugo Ammesmaki	Ammesmaki, a miner, was blocking the back while taking up a raise. He was pushing fore poles through an opening in the dividing cribbing and a chunk of ore fell from the back and struck the far end of the pole. This drove his end up fracturing his jaw. He lost about 3½ months.
10-5-48	Paul Freeman	Freeman, a chuteman, was dumping cars at the trench with a dump bar, and when the safety catch did not release the bar jammed. He signaled the motorman to back up and when he did so, Freeman's hand was caught between the bar and the car fracturing a finger. He lost almost 2 months.
12-31-48	Arne Laituri	Laituri, a miner, was drilling when a piece of ore fell from the back onto his leg. They had finished a standard timbered drift and were starting a dog drift. The last set was not properly lagged and blocked. He fractured his right leg and is still home.

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11. ACCIDENTS AND PERSONAL INJURY (Cont.)

The accidents, their causes and classification as to responsibility, are tabulated as follows:

<u>Causes</u>	
Falls of Ground	4
Falling Material	5
Slipping	1
Cars and Chutes	4
Wire Rope	1
 <u>Responsibility</u>	
Trade Risk	2
Injured Man	7
Others	1
Others & Supervision	2
Injured & Supervision	3

The record for the year as regards to Frequency and Severity is as follows:

<u>Hours of Labor</u>	<u>Total Lost Days Compensable &amp; Non-compensable</u>	<u>Total Injuries Compensable &amp; Non-compensable</u>	<u>Frequency</u>	<u>Severity</u>
901,618	655	53	58.78	.726

The Maas Mine rated No. 4 in Frequency and No. 1 in Severity as compared with the other five large Company mines.

12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

E & A CC-170

Total Estimate		\$5,200.00
Expended in 1947	\$ 210.99	
Expended in 1948	<u>4,891.21</u>	
Total Expended		<u>5,102.20</u>
Balance December 31, 1948		\$ 97.80

The purpose of this E & A, which was completed in 1948, was to replace the shaft cable installed in 1913 and no longer reliable to provide adequate service. This was charged to operating.

E & A CC-184

Total Estimate		\$6,500.00
Expended in 1947	\$4,531.09	
Expended in 1948	<u>813.64</u>	
Total Expended		<u>5,344.73</u>
Balance December 31, 1948		<u>\$1,155.27</u>

The purpose of this E & A was the purchase and installation of a Worthington plunger pump to provide adequate puming facilities on the 5th Level. This was completed during the year and charged to Plant & Equipment.

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

E & A CC-198

Total Estimate	\$25,718.00
Total Expended in 1948	<u>25,364.38</u>
Balance December 31, 1948	\$ 353.62

The purpose of this E & A was the erection of a steel stocking trestle, using the salvaged dirders from the Athens Mine trestle, to replace one of the wooden trestles and thus lower the maintenance cost. This E & A was completed in 1948 and charged to Plant & Equipment.

E & A CC-200

Total Estimate		\$29,000.00
Expended in 1947	\$11,467.65	
Expended in 1948	<u>15,494.65</u>	
Total Expended		<u>26,962.30</u>
Balance December 31, 1948		\$ 2,037.70

The purpose of this E & A was the purchase and installation of a synchronous motor, D.C. generator set, D.C. skip hoist motor and controls to replace the present equipment, part of which will be transferred to the Cambria Mine. Installation of some of this new equipment has been completed but work on the remainder has been stopped pending on a decision to use it at the Mather B Mine in case theirs does not arrive in time. When this is completed it will be charged to Plant & Equipment.

E & A CC-222

Total Estimate		\$2,300.00
Total Expended in 1948		<u>2,729.46</u>
Balance December 31, 1948		\$ 429.46

The purpose of this E & A was the purchase of a  $1\frac{1}{2}$ -ton drump truck to replace the present Chevrolet truck purchased in 1942. An International stake body dump truck was purchased in April of this year. This was charged to Movable Equipment.

E & A CC-231

Total Estimate		\$1,750.00
Total Expended in 1948		<u>1,727.19</u>
Balance December 31, 1948		\$ 22.81

The purpose of this E & A was the purchase and installation of a 2000 ampere, 250-Volt, D.C. circuit breaker to replace the present equipment, on the main haulage circuit, which was not large enough to carry the load. This was completed in 1948 and charged to Operating.

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12 NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION (Cont.)

E & A CC-285

Total Estimate	\$225,350.00
Total Expended in 1948	3,815.19
Balance December 31, 1948	<u>\$221,534.81</u>

The purpose of this E & A was the development of the 7th Level as the working places above the 6th Level are decreasing and this new level is necessary to maintain the present rate of production and extend the life of the mine.

No other new construction is contemplated for 1949.

13. EQUIPMENT AND PROPOSED EQUIPMENT

a. Steam Shovels

A new #54 Bucyrus Erie Electric Shovel was purchased in 1948 by the Company and was in use at the Maas Mine together with the #45 Caterpillar Steam Shovel throughout the year. The Electric shovel was given the number of 67 and will be so referred to in future reports. The No. 67 Shovel only requires a runner, oiler, and sampler as compared with a 5-man crew on the #45 and a 9-man crew on the railroad type shovel. They both can load faster as there is no delay in moving track and they are also much safer as they can quickly back away from a slide of ore. The railroad shovel required a jack arm for support and therefore the men had to work directly alongside the ore pile at each forward movement of the shovel.

b. Stocking Trestles

As has been previously stated, a single-track steel trestle was erected due West of the Shaft and consisted of 6 columns with a total length of 684 feet. The former Southeastern wooden trestle was dismantled and the Southwestern trestle is the only remaining one for stocking ore which is not of steel construction.

c. Scraper Hoists

There was one 25 h.p. scraper hoist unit purchased in 1948 and there is one more 25 h.p. and one 40 h.p. ordered for early delivery in 1949. The 40 h.p. is for use in the trench where the 25 h.p. unit was proved to be too small for the job.

d. Drills & Drilling Equipment

There were 2 Reverse feed Le Roi Drilling Machines, 6 RB-12 Ingersoll-Rand Drilling Machines, 2 Gardner-Denver Pneumatic Columns, and 6 Ingersoll-Rand Jack-legs purchased during 1948.



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13. EQUIPMENT AND PROPOSED EQUIPMENT (Cont.)

e. Skips & Cages

There were only minor repairs to the present skip and cages but one extra skip was built in the Company's Shops and delivered to the mine in 1948. This was to replace an old type that had been in use since a skip was dropped in the shaft in 1941. The estimated skip weight of 5.5 tons was continued.

15. POWER

The following is the rate charged per K.W. hour by months in 1948.

January	\$ .0138
February	.0134
March	.0134
April	.0132
May	.0134
June	.0136
July	.0138
August	.0134
September	.0136
October	.0134
November	.0134
December	.0134
Average 1948	<u>.0134</u>
Average 1947	.0134

17. CONDITION OF PREMISES

The usual care of lawns and shrubbery was maintained and except that there was very little rain and the grass dried out in some places in the late summer, the grounds presented a favorable appearance. Consideration was given to improving appearances along the old highway, but there is too much area involved and the expense would not be warranted.

18. MAAS CRUSHER

The Maas Crusher did not operate in 1948.

19. TREATING PLANT

There was no stall timber treated during 1948 as there was none delivered during the time in which it could be economically peeled; and in most cases where treated timber is necessary, it is being replaced with steel sets.

MATHER MINE "B" SHAFT  
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1. GENERAL:

Development of Mather "B" reached full stride in 1948 as compared to the preceding year when the ground was broken and the major part of the year was taken up with erection of temporary facilities and equipment. Both surface and shaft crews were much more experienced in their respective jobs and turned in better performance.

On surface, the complicated task of getting around the shaft with concreted tunnels and shaft house foundations was accomplished and the headframe batterleg and sheave hold-down foundations brought up to finished elevation. Backfill was then made to give a much more completed aspect to the immediate shaft area.

Shaft crews went through highly varied phases of jasper, slate, and greywacke formations and produced a total of 1639 feet of finished steel and concrete shaft.

Design of the permanent engine house and headframe were completed and contracts awarded for their construction. Main buildings planning was substantially finished and also the layouts of the belt conveyor to the stocking grounds. The stocking trestle conveyors design was in the final stage of blueprinting.

4. ESTIMATE OF RESERVES:

No exploration was done in the past year and the reserves remain the same as for 1947.

A Geological Department estimate of the ore reserves in Section One, as indicated by diamond drilling, places the tonnage assured as 2,864,000 and prospective as 8,650,000 tons for a total of 11,514,000. These tonnages were calculated using a 100 and 200 foot radius cylinder in the drill hole ore contacts and have been, as such, presented to the Tax Commission.

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5. LABOR AND WAGES:

<u>Statement of Wages</u>	<u>1948</u>	<u>1947</u>
<u>Average No. Men Working</u>		
Surface	48	39
Underground	38	18
Total	86	57
<u>Average Wages Per Day</u>		
Surface	\$11.18	\$10.17
Underground	19.02	14.40
Total	\$14.39	\$11.54
<u>Wages Per Mo. of 25 Days</u>		
Surface	\$279.50	\$254.25
Underground	475.50	360.00
Total	\$359.75	\$288.50
<u>Total No. Days</u>		
Surface	14,807	6,829
Underground	11,360	3,279
Total	26,167	10,108
<u>Amount for Labor</u>		
Surface	\$160,556.43	\$69,442.52
Underground	216,076.95	47,221.71
Total	\$376,633.38	\$116,664.23

Because of the fact that appropriations were granted for Mather "B" development according to the outline of E&A NM-44, an account of progress attained might logically follow the authorization pattern and is given in that manner in the following paragraphs.

44-B PREPARING SITE:

Grading for the stocking areas which had been started in December of 1947 by Lindberg and Sons on contract was finished in May with a total of 110,000 yards of material, mostly sand, placed to proper grade. This particular phase of site

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44-B PREPARING SITE (Cont'd)

preparation was hastened for two reasons, (1) to take advantage of the shaft excavation being in iron formation for 1600 feet so that this material could be laid as a sollar. From 1650 to completion of the shaft, and the immediately ensuing level development operations, slate would be produced which would not be suitable for sollar purposes. (2) Delivery of material such as pipe, 35 foot lengths of both 14" and 12" diameters, long timbers, etc. required a temporary storage site until use, to eliminate costly rehandling. The area has served also as a storage site for formwork made in advance of immediate need and as parking areas for automobiles and mobile equipment.

The timber yard terraces were also completed in the same month and trackage laid so that material delivered by rail would be unloaded and stored on the level terraces, relieving congestion in the area adjacent to the shaft and temporary buildings. Shaft steel, head and hold-down sheaves, permanent hoisting equipment parts have been handled in this manner. To preserve the banks, sod was laid on those slopes as quickly as possible and the roadways covered with shaft rock. Wind blown sand was and remains to some extent a nuisance to efficient working of men and equipment. This has been alleviated partially by sollar placement on the stocking areas and by similar action in the timber yards.

Three remaining houses with appurtenant sheds and garages were moved from the proposed main building and parking area by contract late in the summer. Company men and equipment graded the new dwelling areas and assisted in many small ways such as uprooting berry bushes, fruit trees by bulldozer for replanting by the owner at the new site, retaining general good will with the neighborhood. To achieve similar results a homemade muffler was mounted on the Euclid truck which hauls shaft rock, to soften the exhaust bark for the people living in the neighborhood.

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44-B PREPARING SITE (Cont'd)

Prior to shaft excavation reaching the slates the area east of the shaft extending to the parking lot was graded to provide access by truck to dump slates on the heavy fill to be required for permanent road approach to the mine. Slate disposal was started in late October.

In the area adjacent to the shaft and tunnels backfill was made as quickly as possible after concreting. The shaft collar except for the north approach was until late summer at a height of 12 - 20 feet above ground. This condition was not the easiest for handling of 35 foot lengths of heavy pipe on the south side, skip compartment side, of the shaft. At present the south and west sides of the shaft are within 2 feet of collar elevation with the shaft house concrete and with backfill around the tunnels.

44-C TEMPORARY BUILDINGS & TEMP. EQUIPMENT

In January of this year the second 400 H.P. motor was added to the hoist. A temporary liquid rheostat was constructed at the property to provide full starting power of both motors and was used satisfactorily until grids were received in February, at which time the full speed of nearly 1100 feet per minute was realized from the hoist.

The Nordberg compressor with installation of an aftercooler, from one of the Ingersoll-Rand PRE machines purchased for permanent service, has provided adequate air for shaft drilling. On several instances the Nordberg was down for repairs and air was supplied by the neighboring Cambria Jackson property to sustain shaft advance.

A 50 H.P. hoist was installed in the temporary engine house, idler sheaves erected and head sheave placed over east compartment of the ladder road to lower 35 foot sections of 14" pipe into template in upper section of shaft. With two sections welded into a 70 foot length the unit would be lowered into place by this hoist to the bottom of the pipe

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44-C TEMPORARY BUILDINGS & TEMP. EQUIPMENT (Cont'd)

column already installed in the shaft. The hoist operated satisfactorily with the only alteration being the installation of an improved type brake.

Two storage sheds were dismantled in sections at the Princeton property in Gwinn and reassembled on the south edge of the stocking area to house material such as electrical equipment until needed.

The temporary change houses have been adequate and satisfactory to date. With increased rate of shaft sinking and consequent earlier development of levels requiring expansion of the working force it is problematical as to whether the main buildings dry facilities will be in readiness for this expansion. This development will start, it is expected, by September 1, 1949 and it may be necessary to enlarge the present facilities which are now utilized to the last square foot.

44-D INITIAL EQUIPMENT

Very satisfactory service has been obtained from the Insley Crane and Caterpillar D-8 tractor and bulldozer. These two pieces of equipment have performed tasks too numerous and varied to mention and it would not be an exaggeration to state that development of the property would be one half of the present stage if these had not been available. On occasions several units could have been used.

The concrete aggregate batching plant built at the general shops has been well worth the financial investment in insuring efficient and rapid measurement of sand and gravel to provide accurate control of concrete mixes. In time and saving of labor the 1 yard capacity pumpcrete machine placed mixes that otherwise would have proven extremely costly if crane and bucket, concrete buggies, and runways had been used. The concrete crews became very adept at moving the 6 inch lines to keep pace with an almost constant flow of concrete, losing practically no time during a pour.

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44-D INITIAL EQUIPMENT (Cont'd)

Maintenance on the 5 ton International truck and the 1½ ton Chevrolet has been higher than normal due mainly to the fact that all loads are headed uphill to the shaft and no hard pavement exists on the property.

44-E SINKING SHAFT

The sinking crews were brought up to strength of 10 men and a shaft boss at the start of the year. Several months elapsed before the personnel became stabilized, because of the fact that young men, the majority of whom were entirely inexperienced in mining, made up the bulk of the three crews. It required considerable time to afford a fair opportunity to determine whether a man was cut out to be a shaft man and whether he could produce the team work necessary in such an operation. It had been determined from previous experience that young strong fellows, intelligent and with a willingness to learn a particular method of shaft sinking would in general produce the best shaft sinking team.

When the learning stage was over the shaft crews turned in excellent work. The footage advance for the year was commendable and the workmanship of the job was designed on the premise that only one chance was available to put down the shaft and therefore it must be done properly. Alignment checks of the shaft steel have shown on many occasions no necessity nor possibility of improvement with deviations of less than one sixteenth of an inch recorded. Accuracy of punching or fabrication of the shaft steel at times has been out as much as 3/16 of an inch. Installation practice has been to align the skip compartment corners and throw any inaccuracy of steel fabrication into the cage road where loads and rope speeds are much less than is required of the skip operation. A deviation of 1/4 of an inch in set alignment has been maximum to date.

Probably the two major features of sinking during 1948 was the extremely satisfactory use of the tungsten carbide tipped drill bit and the development in late summer of a hydraulically operated clamshell bucket for mucking purposes.

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44-E SINKING SHAFT (Cont'd)

A total gain of 1639 feet was made in sinking for the year. The depth of the shaft was 1961 feet below collar on Dec. 31, 1948 as compared to 322 at the end of 1947. The following monthly progress record gives information from which the general story of the sinking operation to date may be drawn. For example, January of 1948 had very good wall conditions requiring solid concreting of every other set according to plan and an advance of 142 feet was made. March had the same type of jasper rock from a hardness standpoint in drilling, but the blocky characteristic was much more pronounced, which factor demanded concreting of practically every set and required placement of 125 yards of concrete as compared to 41 yards in January. The cubic yards of rock hoisted per foot of advance was consequently high in March and the resultant gain was 118 feet as contrasted to the straight going 142 feet of January.

<u>Month</u>	<u>Days Worked</u>	<u>FOOTAGE</u>		<u>Cuts Blasted</u>
		<u>Advance</u>	<u>Depth</u>	
Prior 1947	-	128	128	19
November "	26	88	216	16
December "	26	107	322	20
January 1948	26	142	465	26
February "	25	101	566	21
March "	27	118	683	23
April "	26	144	827	27
May "	25	138	965	26
June "	26	138	1103	28
July "	26	140	1243	28
August "	20	112	1355	17
September "	24	153	1508	19
October "	26	170	1678	24
November "	21	138	1816	17
December "	25	145	1961	19



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44-E SINKING SHAFT (Cont'd)

<u>Month</u>	<u>Steel Sets</u>	<u>Sets Con-creted</u>	<u>Cu. Yards Con-crete</u>	<u>Cu. Yards Rock Hoisted</u>	<u>Cu. Yards per Foot</u>	<u>Advance per Day</u>
Prior 1947	15	12	494	640	-	-
November "	13	7	33	1446	16.4	3.4
December "	14	7	39	1466	13.7	4.1
January 1948	19	9	41	2210	15.5	5.5
February "	16	10	66	1606	16.1	4.0
March "	17	17	125	1900	16.1	4.4
April "	20	12	122	2409	16.7	5.5
May "	20	13	44	2480	18.0	5.5
June "	18	15	87	2311	16.7	5.3
July "	21	12	82	2680	19.1	5.4
August "	16	9	68	2238	20.0	5.6
September "	22	11	105	2810	18.4	6.3
October "	24	13	101	3198	18.8	6.5
November "	19	10	95	3054	22.1	6.6
December "	21	13	105	3354	20.3	5.4

44-F ENGINE HOUSE

An equipment layout was made by company engineers for the permanent engine house and H. Starin, Architect of Duluth employed to design a building to house the machinery. A contract was let in June to MacDonal & Kaake, Marquette for the construction of the building at a proposed base cost of \$217,000.00.

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44-F ENGINE HOUSE (Cont'd)

Progress has not kept pace with the contractors estimate of a completion date of November 15, 1948. The reasons for the delay are varied, lack of reinforcing rod, delay in obtaining electrical equipment plans from the manufacturer, lack of skilled labor on the job and extension of the actual building into winter weather which in itself snowballed the delays. It became necessary to have the contractor pour the cage hoist foundation, with the engineering control of the forming done by Mather "B" engineers, to maintain the equipment installation schedule. The same situation prevailed for the first of two compressor foundations. It is planned that the skip hoist foundation and the second compressor foundation will be done by "B" Shaft men and equipment.

44-G SHOPS, OFFICE, & DRY BUILDINGS

In a manner similar to what was done for the engine house planning, a general floor plan was laid out by Mather "B" engineers and H. Starin, architect, employed to work out the finished details of the main dries, shops, and office buildings. The overall design is similar to that of Mather "A", retaining the same areas for change rooms and office space. The shops sections have been somewhat enlarged in plan and because of the topographical features of the area, the lower service tunnel from the shaft can be advantageously extended under the shops wing. This same tunnel can serve as withdrawal route for supplies delivered by truck and trailer at a basement unloading ramp. Under the dry wing, with little excavation necessary, a concrete floor can be laid and this basement would serve as storage space for underground equipment such as hoists, fans, scrapers and other similar material, heavy and bulky to handle and which are a source of congestion and delay in the main mine warehouse.

Very careful consideration was given to utilizing every wall and floor to fullest extent with the idea in mind of putting as much working

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44-G SHOPS, OFFICE, & DRY BUILDINGS (Cont'd)

space under cover as possible. Much can be saved in ultimate efficiency if mechanical equipment and travelling ways are protected from the deleterious effects of the Upper Michigan winter. Time spent in thawing equipment and handling snow on supply routes to the shaft mouth is expensive non-productive time.

44-H HEADFRAME

Following the original flow sheet as planned by E. Keast, formerly of the Mechanical Dept. of the Company, the development and design was completed by R. E. Boeck design engineer of Milwaukee. Mr. Boeck also designed the important concrete features of the headframe foundation, shaft house, and tunnels and has served in the capacity of consultant.

The headframe was designed on the basic feature of dumping the ore skips as close to the collar of the shaft in height as practicable, and then convey it to the stocking areas by belt. The principles of keeping the ore stream moving and eliminating as much drop in height as possible, appear to be generally established as successful operating procedure with Marquette Range ores and the "B" Shaft headframe flow sheet adheres closely to these ideas.

Construction of the headframe and shaft house structural steel was awarded to McDowell Co. of Cleveland who propose to erect the structure by May 15, 1949. The structure will be approximately 125 feet in height and will require 375 tons of structural steel.

44-I SERVICE TUNNELS

Because of familiarity with equipment and methods the surface construction and shaft sinking servicing work done by surface personnel moved along with much more zip than in the previous season. Aware of the eccentricities of the Upper Peninsula summer interval which is extremely short

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44-I SERVICE TUNNELS (Cont'd)

for the average construction job, full advantage was taken of good weather. Regardless of the time of day many concrete pours were started the minute a welder moved away from the last reinforcing rod to permit bracing of formwork. Supervision was excellent and the surface men turned in very full days of work.

In volume the concrete placed in forms during the season amounted to 1425 yards. All headframe foundations including the back legs both west and south and hold-down sheave foundations were completed with setting of anchor bolts. Four small pier tops of one yard of concrete each for the south backleg framework were left unfinished because of the necessity of imbedding structural members which will be put in with headframe construction. The shaft house footings, walls and machinery foundations which include the crusher, screen, 48" conveyor belt tunnel and concrete supports for the structural beams carrying the lower pan feeder were all completed in readiness for anticipated erection of the headframe and structural frame work of the shaft house early in the spring of 1949. Ore handling equipment will be placed in the shaft house at that time with the enclosure of masonry to follow in the summer.

In conjunction with bringing the foundations up to finished elevation, the two service tunnels were poured in alternate stages. The lower tunnel was constructed westward 340 feet from the shaft with the upper timber tunnel following to a distance of 210 feet from the shaft to permit laying of a construction railroad track over the tunnel from the timberyard approach to the shaft area. The sides and top surface of the upper tunnel were waterproofed. Also, the service tunnel between the shaft and engine house was brought up from 3rd tunnel elevation to top tunnel grade, a cross-over connecting tunnel to the top timber tunnel put in, and the service tunnel advanced towards the engine house.

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44-I SERVICE TUNNELS (Cont'd)

Following concrete setting time and form removal the areas adjacent to the tunnels were back-filled and water tamped to provide dense settlement.

Construction of the top or first tunnel was also made south of the shaft and eastward to the main buildings area.

44-J PUMPING PLANT

Handling of the drainage water into the shaft was accomplished by pneumatic pumps at the bottom discharging successively into surge tanks feeding 120, 220, and 450 foot head, 50 g.p.m. motor pumps. The 450 foot head pumps were stationed at that interval in the shaft as the bottom progressed downward. In volume the drainage water was measured slightly in excess of 75 gallons per minute and inasmuch as the 450 foot head pumps were powered with 25 h.p. instead of the customary 20 h.p. motors they pumped at times as much as 115 g.p.m. Although this amount is not severe in comparison to some shaft excavation, it required close synchronization of volumes and pumping times to eliminate the necessity of cutting sump capacity outside of the shaft dimension and installation of larger pumping units.

With the past experience of other shaft sinking projects in this area which encountered high rates of water inflow at the contact of the slate at the bottom of the permeable iron formation and also with the knowledge that it would be necessary to pump skip pit drainage and lower level water to the common 6th level between Mather A and B Shafts, two pumps of 100 gallon per minute capacity and 1800 foot head were ordered sufficiently in advance to meet any slate contact drainage situation.

It had been planned in advance that should the contact zone produce excessive amounts of water

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44-J PUMPING PLANT (Cont'd)

the proposed 4th level cut out just within the impervious slates would be cut sufficiently large to provide adequate sump capacity and all drainage water collected from above down to this elevation be pumped to surface. The amount of water at this zone was fortunately not enough to necessitate additional pumping equipment and no delay to the actual shaft sinking was encountered.

44-K ELECTRIC HAULAGE

Much consideration was given to the type of electric locomotives and cars for Mather "B" operation. Ground work for comparison of types and methods was obtained from the observation and experience of Mather "A" personnel who have accomplished a great deal in eliminating weak points and inefficient features of previously accepted haulage equipment. A type of car was selected which has been developed to a very efficient state at Mather "A". The car is of the 100 cubic foot capacity, Granby type dump.

For haulage units a locomotive of the combination trolley-battery design was chosen. The initial order of 10 of these units was divided between the Jeffry and Goodman manufacture. These two companies were able to supply a machine very close to our requirements and little could be prognosticated on comparative performance between them. Usage in service will unquestionably bring out any superiority which will dictate future choice of equipment.

44-L MAIN LEVEL DEVELOPMENT

Study by the Geological department, with the Mather Mine staff, of drill records and observed geological features of Mather "A" in particular and this portion of the range produced a proposed level system wherein the 5th, 6th, and 7th would be the initial operating drifts. The bottom on 10th would be driven east to the Mather "A" Shaft for subsequent deepening of that shaft.

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44-L MAIN LEVEL DEVELOPMENT (Cont'd)

The 6th level is being driven at present from Mather "A" at a grade of three tenths foot rise per hundred feet and will intercept Mather "B" Shaft at an elevation of -713 or a depth of 2173 feet below Mather "B" collar. A vertical interval of approximately 175 feet will be established above 6th to the 5th and 4th levels which will be then cut at elevations of -545 for the 5th and -369 for the 4th. Development of the upper or 4th level will be determined by information obtained on 6th and 5th levels.

The 7th level will be cut at a vertical distance of 225 feet below the 6th, and the 8th, 9th, and 10th at a level interval of 200 feet. In the horizontal carry of approximately 8000 feet between the Mather shafts a 25 foot vertical interval is obtained at a nominal grade of .3 percent. To maintain complete accessibility by rail on any level, 6th and below, between the shafts, the plate elevations have been determined to provide most practicable vertical interval and will have coincident grade midway with the exception of the 10th which will rise from B shaft to A shaft with a 25 foot differential at Mather "A" in reversal of 6th level procedure.

As the 6th level progresses from Mather "A" towards "B" shaft, diamond drill exploration will be carried on as closely behind the drifting procedure as possible. The drift will be in the slate footwall and the holes are to be drilled south through the iron formation. Inasmuch as when the 6th level plate and pockets are excavated cross-cutting will commence immediately from the already established main level drift and it is of importance both economically and from a production schedule viewpoint that information be on hand for efficient placement of these cross-cuts. Information derived from a horizontal south hole from the 6th will be indicative of probable 7th level geology and an upward inclined hole will reveal 5th level information prior to the cross-cutting on those levels.

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44-L MAIN LEVEL DEVELOPMENT (Cont'd)

Studies are being made of drifting equipment such as drill jumbos, loaders, and methods of rock disposal to provide as quick access to ore mining as can be done. Mather "A" methods are providing an excellent pattern and will, it is hoped, have sufficient use of new improved types of loaders to determine proper choice for B shaft.

44-Q SEWERS

A survey and subsequent plans were made to provide a tie-in between the Mather "B" storm and sanitary sewers and the city of Negaunee sewer system. This connection will be made to the south from the property under the L.S. & I. track to Mather "A" and there to the nearest city line. A contract will be let early in 1949 for this work.

44-R CONVEYOR & POCKETS

A great deal of study has been made of ore handling by conveyor belts, specifically the handling of wet sticky ore under sub-zero weather conditions. Much wet material has been handled by belts and a number of sub-zero operations have been carried out successfully with dry or frozen material, but on investigation little has been accomplished with both conditions present. Exhaustive discussions have been carried out with representatives of conveyor belt manufacturers to determine the type of equipment offering least possible doubt to successful handling of Mather ore.

It is planned to extend the 36" belt, which as originally proposed would transport ore from the shaft house to the railroad pocket, north from the railroad pockets an additional 375 feet to a point just beyond the second east & west main stocking trestle. This 375 foot length will serve as the pioneer stocking trestle for the first year or so and will provide information necessary as to most efficient types of rollers, belt cleaners, minimum amount of heating, operation of belt tripper, and other factors relative to economical belt operation.



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44-R CONVEYOR & POCKETS (Cont'd)

A movable belt tripper is being designed for this section of stocking trestle which will spread the ore over this area and will also serve as the means of placing the ore ribbon on the east-west belts when they are put in service.

44-S TIMBER YARD

No level areas were naturally present at the B shaft site and the railroad berm was quickly filled with form lumber and other similar supplies that require piece unloading. To relieve this inefficient situation the timber yard was graded this year, track laid, and now the area serves as shaft steel storage site, and has provided an easily accessible location for unloading of material and equipment necessary for the project but for which there is no room around the shaft area.

Shaft steel for example, is placed on timber trucks in complete one set assemblies and is brought in from the storage yard to the lower tunnel in groups of 5 - 8 trucks. Double trackage provides both means of taking out empties and insertion of trucks of sheathing in proper sequence between sets. With steel supplies ready in advance, no time is lost by shaft sinking crews.

The timber yard grading is such that the lower and upper tunnel grades are equal at the west end of the yard so that a supply locomotive can quickly gather material for whatever tunnel offers greatest advantage. A rail of narrow gauge track is to be laid alongside the standard railroad rail for the smaller mine locomotives. A truck road will traverse the high south side of the yard for incoming trucks with mine timber. Roadways parallel to the tracks are also provided for unloading of railroad cars and loading of mine timber trucks by crane.

44-T STOCKING AND LOADING

Much consideration has been given the thought of placing all ore on stockpile and shipping ore by shovel loaded cars. Along this view a simple railroad pocket is planned which will be fed by the

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44-T STOCKING AND LOADING (Cont'd)

belt tripper on the north-south 36" belt from the shaft house. Elimination of unnecessary labor is the thought behind this proposed method and the simple form of railroad pocket will serve as means of car loading if stockpile shovel methods for some reason is unobtainable and also will eliminate a source of delay usually present in large capacity storage pockets handling sticky ores.

A Bucyrus-Erie 120B stockpile loading shovel has been ordered for promised delivery in the Spring of 1951.

10. TAXES

The taxes listed below were assessed Mather "B" and were taken up on Mather "A" cost sheet.

	<u>VALUATION</u>	<u>1948 RATE</u>	<u>TAXES</u>
Jackson Sec. 1, 47-27			
Real	\$ 550,000		\$ 24,373.42
Personal	145,000		6,425.72
Total	\$ 695,000	44.3153	\$ 30,799.14
Coll. Fee 1%		.4432	307.99
Total Mather "B" (Sec. 1, City of Negaunee)	\$ 695,000	44.7585	\$ 31,107.13

	<u>VALUATION</u>	<u>1947 RATE</u>	<u>TAXES</u>
Jackson Sec. 1, 47-27			
Real	\$ 550,000	44.2664	\$ 24,346.52
Coll. Fee 1%		.4427	243.46
Total Mather "B" (Sec. 1, City of Negaunee)	\$ 550,000	44.7091	\$ 24,589.98

11. ACCIDENTS AND PERSONAL INJURY

In frequency of accidents Mather "B" ranked 5th in rating of the 11 underground properties with a frequency rating of 50.69 which was below the group average of 56.88.

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11. ACCIDENTS AND PERSONAL INJURY (Cont'd)

Because of a fatal accident the severity rating of the property was last with a figure of 553.0 compared to a group average of 88.7.

Three lost time accidents occurred during the year and a brief description follows:

1. Rudolph Saari, shaft miner, was fatally injured on February 17, 1948 when, working at the bottom of the shaft, he was struck on the head by a tool which had twisted from the grasp of a fellow shaft miner who with other members of the shaft crew, was attempting temporary repair of a bent dumping bar on the cage.
2. Elmer LaChance, shaft miner, had two fingers broken on his left hand on April 19, 1948 when he was loading shaft steel onto the cage from an underground truck in the service tunnel. In attempting to free one end of a 6 inch H-Beam his hand became wedged between the beam and the tunnel floor.
3. Nels Tullila, surface laborer, had an old fracture of the left shin bone re-broken on November 10, 1948 when he was struck on the leg by sheets of corrugated iron that slid across the icy bottom of a truck as it jounced down a small road grade.

18. NATIONALITY OF EMPLOYEES

	<u>Total</u>	<u>American Born</u>	<u>Foreign Born</u>
Finnish	30	28	2
Italian	12	11	1
French	15	15	-
Swedish	21	20	1
English	12	9	3
German	1	1	-
Norwegian	1	1	-
Belgian	1	1	-
English-Swedish	2	2	-
English - Finnish	2	2	-
Total	<u>97</u>	<u>90</u>	<u>7</u>
		92.8%	7.2%

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1. GENERAL:

The Negaunee Mine hoisted ore on a six-day, twelve-shift per week schedule during 1948. Mining operations, however, were on a three-shift basis with a small crew on the third shift. Shortly after the middle of the year all contracts were on a three-shift basis due to the shortage of working places. At the beginning of the year there were seventeen contracts working and by the close of the year this had been reduced to nine contracts. During September the ore hoisting schedule was changed from day and afternoon shifts to afternoon and midnight shifts. This was done to divert some of the electrical power load to the night shift as a power conservation measure.

The production in 1948 was 382,076 tons as compared to 518,387 tons in 1947. All of the ore on stock was shipped by the first part of September. At the end of the year there were 24,213 tons of ore in stock. Total shipments for the year amounted to 428,675 tons which was 140,837 tons less than the preceding year. The large decrease is due to the reduction of ore reserves.

The production in the area under lease from the Maas Mine amounted to 47% of the total product, that from the Negaunee Lease 43% and from the South Shore Right of Way, 10%. The relatively high percentage of Negaunee Lease ore was maintained only because it was possible to continue stoping operations in the area along the south footwall.

Approximately 97% of the total product was trammed on the 14th Level, while the remaining 3% came from the 9th Level. One contract worked on the 9th Level until June and they were then transferred to the 14th Level.

The ore reserve estimate indicates a gross tonnage of 109,400 tons above the 14th Level at the end of the year. A portion of this will be unavailable to the Negaunee Mine shaft due to heavy, wet conditions which make it impossible to mine, particularly at the 14th Level elevation. In addition the available working places are being reduced so rapidly that a point will soon be reached at which it is no longer economical to continue operations. It is estimated that this time will be reached sometime in March or April, 1949. The ore remaining in the Maas Area will be recovered through the Maas Mine.

Development work during 1948 was confined to the small ore bodies southwest of the main Negaunee deposit. Two stopes were developed, one near No. 1401 Raise and one at the end of No. 1470 Drift. The latter stope had been opened previously but was enlarged during the year.

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2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES:

a. Production by Grades:

	<u>1948</u>	<u>1947</u>	<u>Increase</u>	<u>Decrease</u>
Negaunee Ore	165,171	268,972		103,801
South Shore Right of Way Ore	36,801	34,083	2,718	
Negaunee-Maas Ore	180,104	215,332		35,228
Total Ore	<u>382,076</u>	<u>518,387</u>		<u>136,311</u>
Rock	8,460	12,550		4,090
Total Hoist	<u>390,536</u>	<u>530,937</u>		<u>140,401</u>

Skip capacity reduced from 5.5 tons to 5.3 tons 11/10/43.

b. Shipments:

	<u>Pocket</u> <u>Tons</u>	<u>Stockpile</u> <u>Tons</u>	<u>Total</u> <u>Tons</u>	<u>Total Tons</u> <u>Last Year</u>
Negaunee Ore	111,457	69,299	180,756	271,888
South Shore Right Way Ore	22,524	16,194	38,718	35,243
Negaunee-Maas Ore	114,640	94,561	209,201	262,381
Total 1948	<u>248,621</u>	<u>180,054</u>	<u>428,675</u>	<u>569,512</u>
Total 1947	<u>305,871</u>	<u>263,641</u>	<u>569,512</u>	
Decrease	57,250	83,587	140,837	

Shipments decreased 24.7% in 1948 and were 46,599 tons more than the product for the year.

c. Stockpile Inventories:

	<u>Dec. 31st, 1948</u>	<u>Dec. 31st, 1947</u>	<u>Decrease</u>
Negaunee Ore	8,866	24,451	15,585
South Shore Right of Way Ore	2,079	3,996	1,917
Negaunee-Maas Ore	13,268	22,991	9,723
Total	<u>24,213</u>	<u>51,438</u>	<u>27,225</u>

Including estimated overrun there were approximately 1,340 tons in stock at the end of the shipping season.

d. Division of Product by Levels:

	<u>1948</u>	<u>Percentage</u>	<u>1947</u>	<u>Percentage</u>
9th Level	12,651	3.32	58,235	11.23
14th Level	369,425	96.68	460,152	88.77
Total	<u>382,076</u>	<u>100.00</u>	<u>518,387</u>	<u>100.00</u>

Mining on the 9th Level was completed in June, 1948 and the contract was then transferred to the 14th Level.

(Note: In all the comparisons in this report of production, costs, etc., it should be remembered that the mine is rapidly being worked out and there was a considerable reduction in working places during the year.)

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2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES: (CONT.)

e. Production by Months:

Month	Negaunee	S/S/R/W	Neg.-Maas	Total Ore	Rock
January	16,689	2,382	17,344	36,415	925
February	13,188	3,275	18,164	34,627	1,210
March	12,729	6,540	19,768	39,037	1,060
April	16,399	2,842	18,081	37,322	1,555
May	15,128	385	16,926	32,439	945
June	16,198	3,183	18,653	38,034	90
July	16,374	3,931	10,694	30,999	235
August	12,967	1,744	6,220	20,931	420
September	14,856	2,369	13,655	30,880	780
October	12,446	1,891	15,128	29,465	520
November	6,356	5,710	12,590	24,656	150
December	8,349	1,710	12,881	22,940	570
Total 1948	161,679	35,962	180,104	377,745	8,460
Stkple.Overrun	3,492	839	----	4,331	----
Total 1948	165,171	36,801	180,104	382,076	8,460
Total 1947	268,972	34,083	215,332	518,387	12,550
Increase		2,718			
Decrease	103,801		35,228	136,311	4,090

The product by leases was distributed as follows:

	1948	1947	Increase	Decrease
Negaunee Mine Company	165,171	268,972		103,801
South Shore Right of Way	36,801	34,083	2,718	
Maas Lease	159,524	188,913		29,389
N 1/3 Right of Way	14,712	17,847		3,135
N 1/6 Right of Way	5,868	8,572		2,704
Total	382,076	518,387		136,311

f. Ore Statement:

	Negaunee	S.S.R/W.	Neg.-Maas	Total-1948	Total-1947
On Hand Jan. 1, 1948	24,451	3,996	22,991	51,438	102,563
Product for Year	161,679	35,962	180,104	377,745	518,387
Stockpile Overrun	3,492	839	19,374*	23,705*	----
Total	189,622	40,797	222,469	452,888	620,950
Shipments	180,756	38,718	209,201	428,675	569,512
Balance on Hand	8,866	2,079	13,268	24,213	51,438
Decrease in Product	107,293		35,228	140,642	
Increase in Product		1,879			114,405
Decrease in Ore on Hand	15,585	1,217	9,723	27,225	51,125

\* 19,374 tons prior year's stockpile overrun included.

g. Delays:

There were no delays at the mine during the year.

h. Delays from Lack of Current:

There was a delay of one day due to lack of current while repairs were made to one of the hydro generating plants. This was on September 4th, 1948.

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3. ANALYSIS:a. Average Mine Analysis on Output:

Grade	1948				1947			
	Tons	Iron	Phos.	Sil.	Tons	Iron	Phos.	Sil.
Negaunee	165,171	57.55	.096	9.73	268,972	59.07	.089	8.73
Neg.-Maas	180,104	57.89	.094	9.63	215,332	59.50	.089	8.59
S.S.R/W.	36,801	58.70	.090	8.83	34,083	59.67	.084	8.26

b. Average Mine Analysis on Straight Cargoes:

There were no straight cargo shipments during 1948.

4. ESTIMATE OF ORE RESERVES:a. Developed Ore:

Assumption: 12 cubic feet equals one ton.  
10% deducted for rock and loss in mining.

Area	Negaunee Lease	Leased from Maas Mine						Total Tons
		$S\frac{1}{2}$ R of W or $\frac{3}{4}$ of Adams Strip	N 1/6 R of W or $\frac{1}{2}$ Adams Strip	N 1/3 R of W or C.C.I.Co. Strip	Maas Area	Special Grade		
14th Level & Above	5,698	4,000	2,000	8,488	112,154	72,917	132,340	
Below 14th Level	—	—	—	375	40,046	72,917	113,338	
Total Gross Tons	—	—	—	—	—	—	—	
Nov. 30th, 1948	5,698	4,000	2,000	8,863	152,200	72,917	245,678	
Less Dec. Production	349	1,710	1,038	2,596	17,247	—	22,940	
Total Gross Tons	—	—	—	—	—	—	—	
Dec. 31st, 1948	5,349	2,290	962	6,267	134,953	72,917	222,738	
Less 10% for Rock & Mining Loss	570	400	200	886	15,220	7,292	24,568	
Total Net Tons	—	—	—	—	—	—	—	
Dec. 31st, 1948	4,779	1,890	762	5,381	119,733	65,625	198,170	

b. Prospective Ore:

All ore in the mine is developed.

c. Estimated Analysis:

Grade	Ore Reserves:				Approximate Expected Natural Analysis							
	Tons	Iron	Phos.	Sil.	Mang.	Alum	Lime	Mag.	Sul.	Loss	Moist.	
Negaunee	6,669	51.00	.079	8.40	.13	3.24	.27	.14	.014	1.54	12.00	
Neg.-Maas	125,876	50.60	.079	8.80	.13	3.24	.27	.14	.014	1.54	12.00	
Maas Spec.	65,625	52.80	.070	7.50	.18	2.00	.52	.16	.200	1.10	12.50	

The Negaunee ore includes all ore from the Negaunee Lease and the South Shore Right of Way; the Negaunee-Maas and Maas Special ore includes Parcels No. 1, 2 and 3, otherwise known as the Maas Strip, the North 1/3 and North 1/6 Rights of Way.

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4. ESTIMATE OF  
ORE RESERVES: (CONT.)

c. Estimated Analysis: (Cont.)

<u>Grade</u>	<u>Ore in Stock - Average Natural Analysis</u>										
	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moist.</u>
Neg. & S 1/2	2,945	49.437	.088	11.14	0.12	4.06	.42	.23	.014	1.58	11.53
Neg.-Maas	21,268	49.677	.088	10.86	0.11	3.94	.35	.22	.013	1.64	11.56
Total	24,213										

5. LABOR  
AND  
WAGES:

a. Comments:

There were 186 employees on December 31st, 1948 as compared with 238 men a year ago, a decrease of 52 men. These figures are derived from the Labor Statement and are statistical men. The actual number of men that worked in December, 1948 was 191, which includes the bosses, captain and office force. During 1948 23 men were transferred to other mines, 6 were retired, 5 quit and 1 died. During this same period 9 men were hired making a net loss of 26 men for the year.

Relations between the USW-CIO and the supervisory force continued to be very satisfactory. There were no major grievances between the union and the management and practically all minor grievances were settled by the supervisors. Effective July 16th there wa

Effective July 16th there was a pay increase which varied from nine cents to fourteen cents or more per hour depending on the job classification. The average increase amounted to nine or ten percent. For salaried employees the increase became effective August 1st, 1948.



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5. LABOR AND WAGES: (CONT.)

b. Comparative Statement of Wages & Product:

	<u>1948</u>	<u>1947</u>	<u>Increase</u>	<u>Decrease</u>
Product	382,076	518,367		136,311
No. Shifts & Hours	1-8 2 2-8 299	1-8 3 2-8 297	2-8 2	1-8 1
<u>Average Number Men Working:</u>				
Surface	44 $\frac{1}{2}$	49		4 $\frac{1}{2}$
Underground	158	185 $\frac{1}{2}$		27 $\frac{1}{2}$
Total	202 $\frac{1}{2}$	234 $\frac{1}{2}$		31 $\frac{1}{2}$
<u>Average Wages Per Day:</u>				
Surface	11.07	10.18	.89	
Underground	12.74	11.80	.94	
Total	12.38	11.45	.93	
<u>Average Wages Per Month:</u>				
Surface	276.99	251.72	27.27	
Underground	319.20	295.07	24.13	
Total	310.18	285.57	24.61	
<u>Tons Per Man Per Day:</u>				
Surface	27.94	34.02		6.08
Underground	8.02	9.27		1.25
Total	6.23	7.28		1.05
<u>Labor Cost Per Ton:</u>				
Surface	.403	.299	.104	
Underground	1.594	1.274	.320	
Total	1.997	1.573	.424	
<u>Average Product Mining:</u>				
Development in Ore	8.19	11.92		3.73
Stoping	30.43	30.76		.33
Total	27.39	28.36		.97
<u>Avg. Wages Contract Labor:</u>				
	13.58	12.69	.89	
<u>Total Number of Days:</u>				
Surface	13,675	15,236		1,561
Underground	47,610	55,941		8,331
Total	61,285	71,177		9,892
<u>Amount for Labor:</u>				
Surface	154,004.91	155,213.32		1,208.41
Underground	609,037.15	660,362.31		51,325.16
Total	763,042.06	815,575.63		52,533.57
<u>Average Wages Per Month as Per Labor Statement - Less Captains &amp; Clerks:</u>				
Surface	276.21	251.75	24.46	
Underground	318.20	294.25	23.95	
Total	308.93	285.58	23.35	
<u>Proportion of Surface to Underground Men:</u>				
1948	1 to 3.46			
1947	1 to 3.65			

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6. SURFACE:

a. Buildings & Repairs:

There were no new buildings erected during the year. The outside of an addition to the top tram transfer house was fireproofed by applying a coating of cement plaster. All other buildings were kept in good repair.

b. Fences:

Some repairs were made to the fence which encloses the caved area north-west of the Negaunee Mine.

c. Tracks & Roads:

All tracks and roads near the mine were maintained during the year.

d. Stockpiles:

The loading of ore from stockpile was started on April 9th, which was one of the earliest starts for many years. Loading was started with the steam shovel and later in the month a new 54B Bucyrus electric shovel was received and loading was then continued with the new shovel only. Loading was carried on quite successfully without much frost trouble. All the ore in stock was loaded out by early September and the electric shovel was then shipped to the Lloyd Mine where loading was continued until later in the season.

d-1. Ore & Rock Trestles:

New decking and planking was installed on the east trestle between the start of the rock trestle and the shaft house. An additional bent was also installed on the rock trestle to support the timber stringers. The steel trestles required very little maintenance during the year.

During vacation week new rabbit bearings were made for the large drive sheave on the top tram power unit.

e. Shaft House:

While the mine was shut down for vacation week the steel crew repaired and reinforced the top girders on the shaft house which support the head sheaves. In addition the skip sheaves were realigned in the plane of the rope leading to the engine house and the rope leading down the skip compartment.

f. Water Supply:

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

	<u>1948</u>	<u>1947</u>	<u>1946</u>	<u>1945</u>
1st Quarter	74.89	200.40	99.04	212.44
2nd "	101.14	248.14	142.23	306.94
3rd "	124.24	136.35	275.44	398.85
4th "	57.84	90.15	228.75	145.24
Total	<u>358.11</u>	<u>675.04</u>	<u>745.46</u>	<u>1,063.47</u>
Product - Tons	382,076	518,387	416,021	654,447
Cost Per Ton	.000937	.001302	.001792	.001409

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6. SURFACE: (CONT.)

g. Grounds:

The grounds around the mine were kept clean and in good condition throughout the year. Some of the old cinder paths on the south side of the office were filled in and seeded with grass. The shrubs around the mine buildings were pruned regularly and in the fall they were tied up to prevent injury from ice and snow during the winter.

h. District Sawmill Plant:

The sawmill operated intermittently throughout the year making ties and other timber supplies for other mines. A large amount of 12" x 12" timber was sawed for the Athens Mine to be used in block caving operations.

7. UNDERGROUND:

a. Shaft Sinking:

There was no shaft sinking during 1948.

b. Development:

There was a decrease in total development footage although it was not too great. Much of the ore development was done in advance of stoping operations.

The following table gives a comparison of the total drifting and raising in ore and rock for the years 1948 and 1947:

Year	<u>Drifting</u>		<u>Raising</u>		<u>Grand Total</u>
	<u>Ore</u>	<u>Rock</u>	<u>Ore</u>	<u>Rock</u>	
1948	2,313'	566'	1,167'	287'	4,333'
1947	2,560'	1,065'	1,553'	82'	5,260'

b-1. Rock Development:

The following table gives a summary of the rock drifting and raising in 1948 and 1947:

<u>Location</u>	<u>Drifting</u>	<u>Raising</u>	<u>Total 1948</u>
9th Level	39'		39'
185' Sub-level	171	132	303
150' Sub-level	46	26	72
140' Sub-level		29	29
125' Sub-level	49	62	111
115' Sub-level	82		82
100' Sub-level	95		95
90' Sub-level	8		8
14th Level	76	38	114
Total 1948	566	287	853
Total 1947	1,065	82	1,147

The greater proportion of rock development was done in connection with stoping operations along the south footwall. Many of the transfer drifts as well as a portion of main level drift were driven in rock in order to take advantage of the full vertical height of the ore in stoping operations. Rock development in the top slicing area was done almost entirely for ventilation and traveling connections.

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7.  
UNDERGROUND: (CONT.)

b-2. Ore Development:

The following is a summary of ore drifting and raising during 1948 and 1947:

<u>Location</u>	<u>Drifting</u>	<u>Raising</u>	<u>Total 1948</u>
235' Sub-level	211'	46'	257'
210' Sub-level	313	314	627
13th Level	30		30
185' Sub-level	234	181	415
160' Sub-level	41	14	55
150' Sub-level	33	63	96
125' Sub-level	243	65	308
100' Sub-level	278	149	427
90' Sub-level	559	242	801
14th Level	371	93	464
Total 1948	2,313	1,167	3,480
Total 1947	2,560	1,553	4,113

Approximately 85% of the ore development work was done in connection with sub-level stoping operations. The greater portion of this consisted of dog drifts and raises which are not timbered. Ore development in the top slicing area was on the 14th Level where some new extensions of crosscuts were driven to provide mining places.

c. Stoping:

(1) General:

The product for 1948 was mined from three main leases, viz., the Negaunee Lease, the South Shore Right of Way and the Maas Area. About 43% of the product came from the Negaunee Lease, 10% from the South Shore Right of Way and 47% from the Maas Area, which includes Parcels No. 1, 2 and 3.

The locations of the three territories from which ore was mined are as follows: No. 1 Shaft pillar above 9th Level, the main top slicing territory between the 13th and 14th Levels and the stoping area south of the main deposit.

The sub-levels on which mining was carried on above 9th Level include the 620' Sub, 9th Level and 595' Sub-level. The latter sub-level was below the 9th Level elevation and was mined by the use of an inclined slide which extended down from the 9th Level elevation. There was only one contract working in the 9th Level area at the beginning of the year and mining operations were completed by June. The contract was then transferred to the area between the 13th and 14th Levels. In this territory ore was mined on the following sub-levels: 140', 125', 115', 100', 90', and 14th Level. Stoping operations along the south footwall extended from the 100' Sub-level to the 235' Sub-level above the 13th Level. By the end of 1948 there was one stope operating in hard blue hematite at the end of No. 1470 drift. Top slicing operations had been carried on down to the 100', 90' and 14th Level. Two top slicing crews were mining in the Negaunee Lease and the remaining six were in the Maas Area.

The locations of mining contracts in 1948 and 1947 are listed below:

	<u>1948</u>	<u>1947</u>
	9 above 14th Level	1 above 9th Level
		15 above 14th Level
Total	9	16

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7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

(1) General: (Cont.)

The table on the preceding page gives the number of contracts as of December 31st of each year. At the beginning of the year there were three crews on a three-shift basis while the remainder operated two shifts. By the end of 1948 all the mining crews were working three shifts. Hoisting, however, was still continued on a two-shift basis. In September the hoisting schedule was changed from day and afternoon to afternoon and midnight shifts in order to distribute more electric power load to the night shifts.

(2) Detail of Stoping:

Subs Above the 9th Level

Negaunee Lease - No. 1 Shaft Pillar

At the beginning of the year mining operations were being carried on by one contract on the 620' Sub-level. This narrow body of ore is located adjacent to and on the south side of the east-west dividing dike. The area on the 620' Sub-level is about 120 feet long by 40 feet wide. Mining was completed on the 9th Level elevation and also on the 595' Sub-level which is one sub-level below the 9th Level. On the last two sub-levels the ore was loaded into cars by using a scraper slide. The 595' Sub-level was only one slice wide and mining was completed in June. The contract was then transferred to the 14th Level area.

10th, 11th, 12th and 13th Levels

There was no ore produced on any of the above levels. Some stoping was done above the 13th Level elevation but the ore was transferred and thence trammed on the 14th Level. Ventilation and traveling ways were maintained on the above levels by the regular timber repair crew.

Subs Above the 14th Level

Main Ore Body - Negaunee Lease & South Shore Right of Way

In January four contracts had just opened the 125' Sub-level in the area north of the dike and adjacent to the Maas Area. This area is triangular shaped with a total length of about 300 feet and an average width of 100 feet. Mining conditions were very good in this area with good ventilation and not too much pressure from the gob above.

By May the 115' Sub-level was pretty well developed but due to the reduction in total area by the encroachment of the southeast footwall there was only room for three contracts. Early in the year a new raise, namely No. 1442 was put up to the 125' Sub-level to provide one additional working place. This proved to be very helpful, particularly while developing new sub-levels as No. 1442 Raise, located just to the west, was wet. No. 1443 Raise would be cut out first and a connection was then driven west to No. 1442.

In August development of the 100' Sub-level was started by two contracts. The total area was very much reduced at this elevation, being only 275 feet long by an average width of 60 feet. By September mining was completed from No. 1433 Raise and this crew was disbanded and placed in other contracts to make up additional crews on the third shift. Mining was then continued by two contracts in the main Negaunee Lease ore body.

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7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

(2) Detail of Stoping: (Cont.)

In December No. 7 Contract completed four slices northeast from No. 1442 Raise. Only a small amount of ore remained to be mined at this time so by next month the crew will develop the 90' Sub-level. No. 8 Contract, working from No. 1443 Raise, completed two slices north to Jasper and old workings during December. Some mining was also done in the small pillar southwest of the raise.

Southwest Ore Body Between Main Dikes

South Shore Right of Way

Mining was completed in the area located at the end of No. 1460 Crosscut early in the year. No. 8 Contract mined three slices north of No. 1463 Raise completing recovery of all the ore in this area. Much of the material recovered was lean and the bottom of the slices were very lean. The contract was transferred to No. 1443 Raise where mining was continued in the main Ne-gaunee ore body.

Main Ore Body - Maas Lease

The area under consideration for the year 1948 was 250 feet wide and 350 feet long. This is becoming smaller due to the encroachment of the foot-wall on the northeast side although this has not been quite as rapid as on preceding sub-levels. During the year there were five to six contracts working in this area which is served by the 1430 and 1440 Crosscuts.

Top slicing operations were completed early in the year on the 115' Sub-level. At this same time development of the 100' Sub-level was being carried on. Some of the mining in the southwest end of the Maas Area was mined at a later date by caving operations on a lower sub-level. By July mining was completed on the 100' Sub-level and early in August the crews developed top timber cutouts on the 90' Sub-level. The area at this elevation was greatly reduced due to the encroachment of the southeast footwall. The mining crews were crowded together resulting in rapid depletion of each sub-level. By December the 90' Sub-level was near completion and the next sub will be on the 14th Level.

Operations were carried to the 14th Level during the year by two contracts. No. 21 Contract started a drift about 40 feet north of No. 1443 Raise and advanced it 150 feet along the old No. 1440 Crosscut. A mud run occurred in the end and it was necessary to abandon the drift. The contract then made a top timber cutout near the start of the drift and continued mining on the 90' Sub-level. Contract No. 17 also started a main level drift just north of No. 1442 Raise. This was extended about 175 feet to the north along the lean ore footwall. It was to be used for future mining in the Maas Area but it became very heavy and the timber crushed, making it necessary to abandon it. A second drift was then started from the same location but on the southwest side of the old crosscut and in December month it was advanced about 50 feet to the northwest. This drift will be advanced to the limit of the Maas Area and mining will be continued near the end by using scraper slides to load the ore into cars.

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7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

(2) Detail of Stopping: (Cont.)

In general mining conditions in the above area have been good although the area has been very warm. A good supply of air was blown into each of the contracts however, with the use of individual 5 H.P. booster fans. It has been necessary to keep several repair crews in the Maas Area crosscuts in order to keep them open for tramping. As the mining approached the mainlevel, the timber crushed so fast that many times it was necessary to discontinue mining temporarily in order that the contract could assist the timber repair crews.

In December there were five contracts working on the 90' Sub-level. Contract No. 23, located at Raise No. 1439, completed one short slice southwest to old workings north of No. 1438-A Raise. This completed operations on this sub-level and the crew moved down to the 14th Level where it was necessary to make repairs before they could continue mining on the 14th Level. Contract No. 36 also completed mining on the 90' Sub-level in December with a long slice west to old workings. They also worked on the 14th Level making repairs preparatory to opening a scraper slide cutout. No. 15 Contract continued mining north of No. 1434 Raise with slices that extend to the old workings west of No. 1438-A Raise. No. 14 Contract, located at No. 1480 Raise, completed four slices southwest to old workings. Only a small amount of ore remains to be mined from this raise and this crew will also start mining on the 14th Level. No. 21 Contract, working from a top timber cutout in No. 1440 Crosscut, completed two slices west to old workings and jasper. Some ore was recovered from the back by caving into the open slice.

Negaunee Mine Lease

Sub-level Stopping Area South of the Main Dike

This stopping area is located just south and adjacent to the main dike in the vicinity of No. 1471 Raise. Operations were carried on between the 100' and 125' Sub-levels by No. 44 Contract. This area had been mined previously but there was a small amount of ore remaining along the north footwall of the previous stope. A transfer was driven at a lower elevation and nearly all of the ore was recovered. In January the back of the stope caved into the original stope filling it with caved jasper. The contract moved down to the transfer level on the 100' Sub-level and recovered the ore which remained in the back. The crew was then transferred to an old stopping area between No. 1441 and No. 1473 Raises. After recovering a small amount of ore on the old transfer and mill subs, the crew joined No. 20 Contract in developing a small stope in the vicinity of No. 1401 Raise.

Sub-level Stope Area in Vicinity of No. 1401 Raise

This area extended from the 150' Sub-level to the 210' Sub-level above 13th Level. Mining was being carried on by No. 20 Contract and they were scraping the broken ore directly from the stope into a transfer drift. When the stope began to enlarge to the east it was decided to put in another transfer drift and continue the mining by regular sub-level stopping methods. Early in the year No. 44 Contract joined No. 20 Contract to aid in the development work. This was well along by April and stoping was again resumed. By June the development work was practically completed and No. 44 Contract was transferred to an old stope area at the end of No. 1470 Drift. Stopping was continued by No. 20 Contract and the opening east of No. 1401 Raise measures almost 200 feet in length by 60 feet in width. Operations were completed in October and the crew transferred to the stope area at the end of No. 1470 Drift.

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7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

(2) Detail of Stoping: (Cont.)

Sub-level Stope Area at end of No. 1470 Drift

Mining was resumed in this area during the year by No. 34 and 44 Contracts. No. 34 Contract started development in January by driving a new main level drift to the southwest and parallel to the old No. 1470 Drift which had collapsed. After developing a short transfer, stoping was continued in the old stope. In June a second contract, namely No. 44, joined them in developing an extension of the ore to the west. Progress was slow due to the hard, vuggy nature of the ore making hard to drill. By June development on the 90' transfer sub was in full swing and this was done while stoping was continued in the old stope. Operations were carried on from the 90' Sub-level to the 140' Sub-level and by the end of the year the stope opening was enlarged to 110 feet in length by 60 feet in width.

d. Timbering:

The total cost of timbering remained about the same as in 1947 while the cost per ton increased from .613 in 1947 to .825 in 1948. This of course was due to the smaller tonnage produced in 1948. The cost of timber supplies remained about the same as in 1947 and labor costs increased due to a pay increase of approximately 9% effective July 16th, 1948. Most of the repair work was on the 14th Level Crosscuts extending into the Maas Area. As the mining approached the main level the pressure seemed to increase and it required several repair crews on week ends as well as during the week to keep the drifts open for tramping. It also became necessary at times to stop the mining crews in order that they might help to maintain certain sections.



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7. UNDERGROUND: (CONT.)

d. Timbering: (Cont.)

Statement of Timber Used:

	<u>Lineal Feet</u>	<u>Avg. Price Per Foot</u>	<u>Amount 1948</u>	<u>Amount 1947</u>
6" to 8" Cribbing	30,719	.0711	2,183.20	1,774.65
8" Stulls	44,864	.1138	5,107.02	5,906.20
10" Stulls	67,931	.1703	11,572.36	11,846.94
12" Stulls & Over	<u>45,338</u>	<u>.2426</u>	<u>10,999.59</u>	<u>13,627.85</u>
Total 1948	188,852	.1581	29,862.17	33,155.64
Lagging - 7 ft.	986,514	.0158	15,575.22	18,987.07
Poles - 9½ ft.	<u>646,601</u>	<u>.0304</u>	<u>19,639.47</u>	<u>19,548.78</u>
Total 1948	1,633,115	.0216	35,214.69	38,535.85
H Beams - 10' & 12"	2,424	.6020	<u>1,459.26</u>	<u>750.32</u>
Grand Total 1948			66,536.12	72,441.81

	<u>1948</u>	<u>1947</u>
Product - Tons	382,076	518,387
Feet Timber Per Ton of Ore	.494	.396
Feet Lagging Per Ton of Ore	2.582	2.481
Feet Poles Per Ton of Ore	1.692	1.663
Feet Lagging Per Foot of Timber	5.224	6.259
Feet H Beams Per Ton of Ore	.0063	.0038
Cost Per Ton for Timber	.0781	.0640
Cost Per Ton for Lagging	.0408	.0366
Cost Per Ton for Poles	.0514	.0377
Cost Per Ton for H Beams	.0038	.0015
Total Cost Per Ton	.1741	.1398

Total Cost for Timber, Lagging, Poles, Etc.

<u>Year</u>	<u>Product</u>	<u>Amount</u>	<u>Cost Per Ton</u>
1948	382,076	66,536.12	.1741
1947	518,387	72,441.81	.1398
1946	416,021	57,999.98	.1394
1945	654,447	92,666.50	.1409
1944	757,677	108,489.21	.1431
1943	954,990	129,718.86	.1358
1942	1,106,694	123,588.82	.1117

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7. UNDERGROUND: (CONT.)

e. Drifting and Raising:

This subject is discussed in general under the development heading.

f. Explosives, Drilling and Blasting:

The total cost per ton for all explosives increased slightly over that of 1947. This was due to an increase in the cost of powder, fuse, caps, etc. There was a slight decrease in the amount of powder used per ton of ore in 1947. In general there was no change in mining conditions or the nature of the ore. However, in the stope area at the end of No. 1470 Drift there was encountered some extremely hard, vuggy ore which made it difficult to drill. The total cost of all explosives used in mining operations was \$30,308.84 in 1948 and in 1947 it was \$40,092.71.

The general drilling practice for the soft ore remained the same as in previous years. Ingersoll RB-12 machines with auger steel has proven to be very satisfactory. In some of the stoping areas along the south footwall it was necessary to use larger machines with jackbits. Some of the new Carset jackbits were tried with moderate success. The bit withstands considerable use but the present type of connection to the rod fails or the threads within the bit fail, making it quite costly as the cost of each bit is approximately \$13.00.

Blasting practice was the same as in previous years, being done by fuse and caps. Some Primacord was used in the long holes in the stope to make sure that all of the powder in the holes was exploded. It was also used in some of the secondary blasting of large chunks out in the stope where the charges were placed by the use of long poles. Regular inspection of the blasting practice of each contract was made by the supervisors and reports of the same were made out.

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7. UNDERGROUND: (CONT.)

f. Explosives, Drilling and Blasting; (Cont.)

The following statement gives a comparison of powder costs, etc. for the past six years:

<u>Year</u>	<u>Cost per lb. for Powder</u>	<u>Lbs. Powder Per Ton of Ore</u>	<u>Cost Per Ton For Powder</u>	<u>Cost Per Ton Fuse &amp; Caps</u>	<u>Total Cost</u>
1948	.1412	.4383	.0619	.0148	.0767
1947	.1359	.4415	.0600	.0133	.0733
1946	.1245	.4222	.0526	.0111	.0637
1945	.1150	.4346	.0500	.0100	.0600
1944	.1150	.4723	.0543	.0107	.0650
1943	.1150	.4918	.0566	.0115	.0681

Statement of Explosives Used: (Ore Development & Stopping)

	<u>Quantity</u>	<u>Average Price</u>	<u>Amount 1948</u>	<u>Amount 1947</u>
Gelamite #1	46,800	14.68	6,872.76	7,095.06
Hercomite 2X	120,675	13.90	16,775.62	24,016.95
Total Powder 1948	167,475	14.12	23,648.38	31,112.01
Fuse - Feet	549,780	8.08	4,443.26	5,050.26
#6 Blasting Caps	72,035	13.84	996.91	1,549.33
Tamping Shells	4,900	7.73	37.87	84.12
Fuse Lighters	10,000	8.44	84.36	137.74
Primacord - Feet	3,000	32.00	96.00	256.00
Total Fuse, Etc. 1948			5,658.40	6,877.45
Total Cost All Explosives			29,306.78	37,989.46
Product - Tons			382,076	518,387
Pounds Powder Per Ton of Ore			.4383	.4415
Cost Per Ton for Powder			.0619	.0600
Cost Per Ton for Caps, Fuse, Etc.			.0148	.0133
Cost Per Ton for All Explosives			.0767	.0733
<u>Sinking, Rock Development, Etc.</u>				
Gelamite #1	4,900	14.25	698.26	1,339.88
Hercomite 2X	1,075	13.50	145.13	472.50
Total Powder 1948	5,975	14.11	843.39	1,812.38
Fuse - Feet	16,550	7.90	130.73	232.31
#6 Blasting Caps	2,040	13.70	27.94	58.56
Total Fuse & Caps 1948			158.67	290.87
Total Cost All Explosives 1948 Rock Development			1,002.06	2,103.25
Grand Total All Explosives Used 1948			30,308.84	40,092.71
Average Price Per Pound for Powder 1948			.141	.136
Explosives Used for Stopping & Development			30,308.84	40,092.71
Explosives Used for Other Work			117.46	243.79
Total as Per Cost Sheet			30,426.30	40,336.50

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7. UNDERGROUND: (CONT.)

g. Mining and Loading:

There were no changes in 1948 in the mining methods used for the past several years. Most of the ore came from the regular top slicing areas working in soft ore. Considerable tonnage was also recovered from small stopes along the south footwall where the ore is harder and there is less pressure on the necessary openings. In the top slicing areas the ore was loaded into cars through top timber chutes, short raises or timber slides and scrapers where the mining was being done on the 14th Level elevation.

h. Ventilation:

The Aerodyne fan at No. 2 Shaft was operated continuously during the year. During the winter months the heating plant at the fan was operated and there was little or no ice within the shaft. This is quite important as an accumulation of ice reduces the volume of air and also increases shaft maintenance.

The general underground ventilating system was the same as last year. The safety department made a ventilation survey in August and the total volume delivered to the 9th Level was 82,000 c.f.m. The air passes down through raises and various splits to the 14th Level where mining operations were carried on. The exhaust air goes to the Maas Mine through the workings and up the Maas Shaft. On the 14th Level it was necessary to use auxiliary fans in order to supply each slice heading with good ventilation. This system worked very satisfactorily and ventilation conditions remained good despite the fact that fresh air supplies were reduced at times due to the crushing of drifts.

i. Pumping:

The number of gallons pumped per minute in each month of the year for the past four years is indicated in the following statement:

<u>Month</u>	<u>1948</u>	<u>1947</u>	<u>1946</u>	<u>1945</u>
January	787	659	677	629
February	616	633	664	631
March	764	631	665	634
April	763	653	679	570
May	775	710	689	775
June	723	811	731	712
July	790	818	711	720
August	812	814	695	722
September	764	816	698	717
October	766	807	680	696
November	753	792	664	685
December	773	792	632	684
Total Average	757	745	682	681

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

<u>Year</u>	<u>Gallons Per Minute</u>
1948	757
1947	745
1946	682
1945	681
1944	713
1943	770
1942	656
1941	645
1940	714
1939	1,015

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8. COST OF OPERATING:

a. Comparative Mining Costs:

	<u>1948</u>	<u>1947</u>	<u>Increase</u>	<u>Decrease</u>
Product - Tons	382,076	518,387		136,311
Underground Costs	2.165	1.746	.419	
Surface Costs	.240	.187	.053	
General Mine Expense	<u>.399</u>	<u>.524</u>	<u>.075</u>	
<b>COST OF PRODUCTION</b>	<b>2.804</b>	<b>2.257</b>	<b>.547</b>	
Taxes	.080	.113		.033
Depletion & Depreciation	.064	.076		.012
Loading & Shipping	.077	.072	.005	
Adm. & Gen. Expense	.047	.047		
Miscellaneous Expense	<b>.002</b>			.002
<b>TOTAL COST</b>	<b>3.070</b>	<b>2.565</b>	<b>.505</b>	
Budget Estimate	3.123	2.421		
No. of Days Operated	292	297	2	
Total No. Shifts	600	597	3	
No. Shifts & Hours	1 & 2-8 hrs.	1 & 2-8 hrs.		
Average Daily Product	1,269	1,728		459

Cost of Production: (Total)

	<u>1948</u>	<u>Percent</u>	<u>1947</u>	<u>Percent</u>	<u>Increase</u>
Labor	2.109	69	1.673	65	.436
Supplies	<u>.961</u>	<u>31</u>	<u>.892</u>	<u>35</u>	<u>.069</u>
<b>Total</b>	<b>3.070</b>	<b>100</b>	<b>2.565</b>	<b>100</b>	<b>.505</b>

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison:

(1) Days & Shifts:

<u>Year</u>	<u>Days Mine Worked</u>	<u>Shifts &amp; Hours</u>	<u>No. Men Employed</u>	<u>Total Shifts Worked</u>
1948	299	1 & 2-8 hrs.	203	61,284
1947	297	1 & 2-8 hrs.	235	71,177
Increase	2			
Decrease			32	9,893

(2) Wages:

There was a wage increase of about 10% effective July 16th, 1948.

(3) Comparison of Product:

Production - 1948	382,076 tons
- 1947	518,387 "
Decrease	136,311 "

(4) Comparison of No. of Men & Wages:

<u>Year</u>	<u>No. of Men</u>	<u>No. of Days</u>	<u>Amount</u>	<u>Rate Per Day</u>
1948	203	61,284	763,042.06	12.45
1947	235	71,177	815,575.63	11.45
Increase				1.00
Decrease	32	9,893	52,533.57	

(5) Tons Per Man Per Day:

	<u>1948</u>	<u>1947</u>	<u>Decrease</u>
Surface	27.94	34.02	6.08
Underground	8.02	9.27	1.25
Total	6.23	7.28	1.05

(6) Cost of Production:

1948	1,071,402.60	Cost Per Ton	2.804
1947	1,169,950.68	Cost Per Ton	2.257
Increase			.547
Decrease	98,548.08		

	<u>Labor</u>	<u>Percent</u>	<u>Supplies</u>	<u>Percent</u>
1948	784,469.40	73.2	286,933.20	26.8
1947	840,976.61	71.9	328,974.07	28.1
Increase		1.3		
Decrease	56,507.21		42,040.87	1.3

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

	<u>1948</u>		<u>1947</u>	
Days Per Week	6		6	
Shifts & Hours	1 & 2-8 hrs.		1 & 2-8 hrs.	
Production - Tons	382,076		518,387	
Avg. Daily Production	1,269		1,745	
No. of Days Worked	299		297	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
<u>UNDERGROUND COSTS:</u>				
1 Exploring in Mine	-----	-----	570.55	.001
3 Development in Rock	7564.24	.020	12044.23	.023
4 Development in Ore	32130.51	.084	37417.66	.072
5 Stopping	236176.40	.618	282290.76	.545
6 Timbering	315030.71	.825	317976.24	.613
7 Trammig	69984.45	.183	84591.18	.163
8 Ventilation	13699.99	.036	16413.89	.032
9 Pumping	42067.68	.110	41395.73	.080
10 Compressors & Air Pipes	34348.46	.090	35044.38	.068
12 Underground Superintendence	42657.68	.111	38784.90	.075
13 Cave-in	49.33	----	79.83	----
14 Maint: Comp. & Power Drills	2686.38	.007	1598.63	.003
15     Scraper Equipment	10373.52	.027	17754.62	.034
16     Trammig Equipment	18576.30	.049	18647.19	.036
17     Pumping Machinery	1741.08	.005	1598.62	.003
Total Underground Costs	<u>827089.73</u>	<u>2.165</u>	<u>905067.31</u>	<u>1.746</u>
<u>SURFACE COSTS:</u>				
18 Hoisting	38061.50	.099	39809.09	.077
19 Stocking Ore	11051.90	.029	12989.83	.025
21 Dry House	10971.37	.029	11378.45	.022
22 General Surface Expense	16186.29	.042	15282.62	.029
23 Maint: Hoisting Equipment	4117.04	.011	6843.99	.013
24     Shaft	5806.24	.015	5659.91	.011
25     Top Tram Equipment	1534.22	.004	3208.98	.006
26     Docks, Trestles, Pockets	1478.48	.004	645.41	.001
27     Mine Buildings	2567.34	.007	1329.15	.003
Total Surface Costs:	<u>91774.38</u>	<u>.240</u>	<u>97147.43</u>	<u>.187</u>
<u>GENERAL MINE EXPENSES:</u>				
28 Geological	799.02	.002	583.77	.001
29 Mining Engineering	3032.57	.008	3568.58	.007
30 Mech. & Elec. Engineering	1981.04	.005	3256.98	.006
31 Analysis & Grading	17028.15	.044	18154.85	.035
32 Safety Department	2216.49	.006	2208.82	.004
33 Tel. & Safety Devices	6010.60	.016	5732.26	.011
34 Local & General Welfare	3023.44	.008	3550.14	.007
35 Spec. Exp., Pensions, All.	5730.11	.015	5452.71	.011
36 Ishpeming Office	19586.25	.051	19387.26	.037
37 Mine Office	21699.37	.057	22100.06	.043
38 Insurance	13476.27	.035	7770.77	.015
39 Personal Injury	11396.12	.030	20960.42	.041
40 Soc. Sec. Taxes	15225.74	.040	17662.56	.034
41 Employees' Vacation Pay	31363.32	.082	37346.76	.072
Total General Mine Expenses:	<u>152538.49</u>	<u>.399</u>	<u>167735.94</u>	<u>.324</u>
COST OF PRODUCTION	1071402.60	2.804	1169950.68	2.257
Taxes	30425.94	.081	58438.52	.113

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail of Accounts: (Cont.)

UNDERGROUND COSTS:

All accounts under this caption decreased with the exception of pumping, underground superintendence, and compressors and power drills. This was due to a reduction in tonnage produced and a reduction in the operating force.

Pumping:

This account increased 671.95.

Number of gallons pumped - 1948	402,702,133
- 1947	390,741,304
 Avg. No. Gallons per minute - 1948	 757
- 1947	745

Underground Superintendence:

Expenditures increased 3,872.78. Labor increased 3,328.74 on account of an increase in wages; increase of 544.04 in supplies and heating.

Compressors & Power Drills:

Expenditures increased 1,087.75 due to one set of coils for compressor.

SURFACE COSTS:

All accounts under this caption decreased except general surface expense, shaft, docks, trestles & pockets, and mine buildings due to a reduction in tonnage produced, also a reduction in the operating force.

General Surface Expense:

This account increased 903.67 due to increase in wages and proportion of cost of repairs to tractor.

Shaft:

Expenditures increased 146.33 due to repairs to shaft pockets.

Docks, Trestles & Pockets:

Expenditures increased 833.07 due to replacing decking on steel trestles.

Mine Buildings:

Expenditures increased 1,238.19 due to repairs to shaft house.



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8. COST OF OPERATING:

b. Detailed Cost Comparison: (Cont.)

GENERAL MINE EXPENSES:

Analysis & Grading:

	<u>1948</u>	<u>1947</u>	<u>Increase</u>	<u>Decrease</u>
Ishpeming Laboratory Charges	11640.62	12779.22		1138.60
Shipping Department Expense	2390.72	2563.00		172.28
Mine Sampling	2996.81	2812.63	184.18	
Total	<u>17028.15</u>	<u>18154.85</u>		<u>1126.70</u>

Telephones & Safety Devices:

Expenditures increased 278.34 account of charging out code and safety signs, trolley wire guards and safety belts.

Local & General Welfare:

	<u>1948</u>	<u>1947</u>	<u>Decrease</u>
General Welfare	2413.86	2828.24	414.38
Local Welfare	609.58	721.90	112.32
Total	<u>3023.44</u>	<u>3550.14</u>	<u>526.70</u>

Special Expense, Pensions & Allowances:

	<u>1948</u>	<u>1947</u>	<u>Increase</u>	<u>Decrease</u>
Pensions	315.06	426.92		111.86
Retirements	3892.93	3227.64	665.29	
Legal	360.14	375.97		15.83
Examinations	365.00	350.00	15.00	
Employment Office	796.98	748.81	48.17	
Other	-----	323.37		323.37
Total	<u>5730.11</u>	<u>5452.71</u>	<u>277.40</u>	

Ishpeming Office:

Expenditures decreased 198.99.

Mine Office:

Expenditures decreased 400.69.

Insurance:

	<u>1948</u>	<u>1947</u>	<u>Increase</u>	<u>Decrease</u>
Property	1573.72	2165.71		591.99
Group, Health & Life	9512.64	4643.19	4869.45	
Group Annuity	1715.08	738.35	976.73	
Catastrophe	674.83	223.52	451.31	
Total	<u>13476.27</u>	<u>7770.77</u>	<u>5705.50</u>	

Personal Injury:

	<u>1948</u>	<u>1947</u>	<u>Increase</u>	<u>Decrease</u>
Compensation & Doctors	2850.38	13511.89		10661.51
Compensation Department	904.23	779.48	124.75	
Hospital Loss	7636.79	6669.05	967.74	
Mine Charges	4.72	-----	4.72	
Total	<u>11396.12</u>	<u>20960.42</u>		<u>9564.30</u>

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail of Accounts: (Cont.)

Social Security Taxes:

	<u>1948</u>	<u>1947</u>	<u>Decrease</u>
Unemployment Insurance Tax	8601.26	10017.57	1416.31
Old Age Benefit Tax	<u>6624.48</u>	<u>7644.99</u>	<u>1020.51</u>
Total	15225.74	17662.56	2436.82

Employees' Vacation Pay:

Amount charged to operating mine was 31,363.32, a decrease of 5,983.44. Employees with a record of one year or more of continuous service were eligible for one week's vacation pay; employees with a record of five or more years of continuous service were eligible for two weeks' vacation pay, and employees with a record of twenty-five or more years of continuous service were eligible for three weeks' vacation pay. Employees were paid for forty-eight hours per week. Fourteen employees received one week's pay, one hundred and thirty three received two weeks' pay and sixty one received three weeks' pay, a total of two hundred and eight employees receiving vacation pay.

9. EXPLORATIONS AND  
FUTURE EXPLORATIONS:

There were no diamond drill explorations carried on during 1948 and no future explorations are anticipated at this time.

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10. TAXES:

Following is a comparative statement of taxes for 1948 and 1947;

<u>Description:</u>	<u>1948</u>		<u>1947</u>	
	<u>Valuation</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Taxes</u>
Negaunee Mine - Real Estate	150,000	6,647.30	565,000	25,010.52
Personal Property	550,000	24,373.42	760,000	33,642.46
Collection Fees		310.20		586.53
Total Negaunee Mine	<u>700,000</u>	<u>31,330.92</u>	<u>1,325,000</u>	<u>59,239.51</u>
Mather "B" - Real Estate	550,000	24,617.15	550,000	24,589.98
Personal Property	145,000	6,489.98	---	---
Total Mather "B"	<u>695,000</u>	<u>31,107.13</u>	<u>550,000</u>	<u>24,589.98</u>
Oprtg. Negaunee & Jackson Rented Buildings	14,895	666.69	8,975	401.26
<b>TOTAL CITY OF NEGAUNEE</b>	<u>1,409,895</u>	<u>63,104.74</u>	<u>1,883,975</u>	<u>84,230.75</u>
 <u>CITY OF ISHPEMING:</u>				
Mather "A" - Real Estate	2,125,000	84,435.60	1,875,000	67,137.56
Personal Property	1,175,000	46,687.92	765,000	27,392.13
Pipe Line "Cloverdale Tract"	250	9.93	250	8.95
<b>TOTAL CITY OF ISHPEMING</b>	<u>3,300,250</u>	<u>131,133.45</u>	<u>2,640,250</u>	<u>94,538.64</u>
<b>TOTAL NEGAUNEE MINE COMPANY</b>	<u>4,710,145</u>	<u>194,238.19</u>	<u>4,524,225</u>	<u>178,769.39</u>
 <u>DISTRIBUTION BY ACCOUNTS</u>				
Operating Negaunee Mine	700,000	31,330.92	1,325,000	59,239.51
Operating Mather Mine				
Mather Mine "A"	3,300,250	131,133.45	2,640,250	94,538.64
Jackson Sec 1, 47-27 B	695,000	31,107.13	550,000	24,589.98
Total Oprtg. Mather Mines	<u>3,995,250</u>	<u>162,240.58</u>	<u>3,190,250</u>	<u>119,128.62</u>
Oprtg. Negaunee Rented Buildings	14,895	666.69	8,975	401.26
<b>TOTAL NEGAUNEE MINE COMPANY</b>	<u>4,710,145</u>	<u>194,238.19</u>	<u>4,524,225</u>	<u>178,769.39</u>
 <u>DETAIL NEGAUNEE RENTED BUILDINGS:</u>				
#1 Jackson Off. Lot 30 W. Iron St.	665	29.47	665	29.44
2 Penhale Hse. W $\frac{1}{2}$ Lot 30 Block 4	855	37.89	855	37.85
3 Uren " " 3 " 7	950	42.10	950	42.05
4 Abbott " " 12 " 6	950	42.10	950	42.05
5 Toms " " 36 " 5	700	31.02	700	30.99
6 Portale " " 2 " 9	1,045	46.31	1,045	46.26
7 Bowden " " 21 " 8	700	31.02	100	4.43
8 Letcher " " 16 " 5	570	25.26	570	25.23
9 Senobe " " 9 " 7	760	33.68	760	33.64
10 Leaf " " 7 " 10	760	33.68	100	4.43
11 Harris " " 4 " 8	1,140	50.52	1,140	50.46
12 Dyer " " 1 " 5	475	21.05		
13 Peterson " " Parcel 39	380	16.84		
14 Stark " " 1 " 15	475	21.05		
15 Kutchie " " 14 " 7	950	42.10		
16 Jandron " Parcel A Block 2	1,710	75.78		
17 Gory " " 7 " 6	285	12.63		
18 Paavola " " 9 & 10 8	285	12.63		
19 Growe " Parcel 79	100	4.43		
37 CGI First Addition Parcel 7 Block 2	<u>1,140</u>	<u>50.52</u>	<u>1,140</u>	<u>50.46</u>
Collection Fee		6.61		3.97
<b>Total Rented Buildings</b>	<u>14,895</u>	<u>666.69</u>	<u>8,975</u>	<u>401.26</u>

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11. ACCIDENTS AND  
PERSONAL INJURY:

The safety record for the Negaunee Mine was better in 1948 than in 1947. The severity rate was slightly lower and was much lower than the average for underground mines. The position rating with respect to severity was fourth in eleven underground mines.

The following table lists the compensable accidents for the past five years:

	<u>1948</u>	<u>1947</u>	<u>1946</u>	<u>1945</u>	<u>1944</u>
Fatal	0	0	0	0	0
Time Lost - Over 4 Mos.	1	2	1	4	3
- 1 to 4 "	2	4	2	6	5
- Less than 1 Mo.	4	5	8	7	11
No. of cases paid compensation for accidents prior to Jan. 1st, 1948	7	8	8	10	8
No. of cases being paid difference in wages (Inc. in above total)	0	0	1	2	2

12. NEW CONSTRUCTION  
AND PROPOSED NEW  
CONSTRUCTION:

There was no new construction or proposed new construction work in 1948.

13. EQUIPMENT AND  
PROPOSED EQUIPMENT:

a. General:

All large equipment operated very satisfactorily during the year with no delays to the hoisting of ore.

The field coil on the induction motor for the Ingersoll-Rand Compressor was rewound during the year. This became necessary when several of the coils were burned out due to severe electrical storms in 1946.

There is no proposed new equipment as the mine will be worked out early in 1949.

b. Power Shovels:

Loading from stockpile was started with the steam shovel and later a new 54-B electric was delivered and loading was then continued with the new shovel. When loading was completed the shovel was transferred to the Lloyd Mine.

c. Scraper Hoists:

The total cost of repairs to scraper hoists for 1948 was 1,241.56 as compared with 998.28 for 1947. Following is a list of scraper hoists at the Negaunee Mine.

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13. EQUIPMENT AND PROPOSED EQUIPMENT: (CONT.)

c. Scraper Hoists: (Cont.)

	<u>Total</u> <u>Machines</u>	<u>1948</u>		<u>Cost of</u> <u>Each Mach.</u> <u>Repaired</u>	<u>1947</u>	
		<u>Total</u> <u>Machines</u> <u>Repaired</u>	<u>Total</u> <u>Machines</u> <u>Repaired</u>		<u>Total</u> <u>Machines</u> <u>Repaired</u>	<u>Cost of</u> <u>Each Mach.</u> <u>Repaired</u>
I.R. 15 H.P. Elec.	7	3	3	413.85	4	238.96
20 " "	12	--	--	---	-	---
25 " "	2	--	--	---	-	---
Sul. 15 " "	10	--	--	---	2	42.44
20 " "	1	--	--	---	-	---
Total	<u>32</u>	<u>3</u>	<u>3</u>	<u>---</u>	<u>5</u>	<u>---</u>

Total cost all repairs: 1241.56 998.28

d. Underground Tram Cars:

All underground tram cars were serviced and repaired at the mine during 1948 as has been the procedure for the past several years.

e. Drill Equipment:

There were 14 Ingersoll-Rand JB4 Jackhammers sold to the Cliffs Shaft Mine late in 1948. These machines were purchased for use at the Negaunee Mine in 1947.

f. Haulage Tracks:

There were no ties or rail charged out in 1948.

g. Timber Hoists:

There were no timber hoists purchased during 1948.

14. MAINTENANCE AND REPAIRS:

Expenditures for maintenance and repairs in the accounts listed under "Underground Costs" were 33,377.28 in 1948 as compared with 39,599.06 in 1947, a decrease of 6,221.78. The cost per ton in 1948 was .088 as compared with .076 in 1947.

The following is a list of purchased and repair costs for 1948 & 1947:

	<u>1948</u>	<u>1947</u>	<u>Increase</u>	<u>Decrease</u>
14,928' Wire Rope - Scrapers	2,013.38	9,924.19		7,910.81
1 Worthington Pump		286.00		286.00
Total Purchases	<u>2,013.38</u>	<u>10,210.19</u>		<u>8,196.81</u>

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14. MAINTENANCE  
AND REPAIRS: (CONT.)

<u>Repairs to:</u>	<u>1948</u>	<u>1947</u>	<u>Increase</u>	<u>Decrease</u>
Comp. & Power Drills	2686.38	1598.63	1087.75	
Scraper Hoists & Drags	8360.14	7830.43	529.71	
Generators	125.17	246.05		120.88
Locomotives	3737.89	5424.12		1686.23
Wiring	1812.27	1229.40	582.87	
Tracks	10015.18	9405.11	610.07	
Cars	2885.79	2342.51	543.28	
Pumping Machinery	1741.08	1312.62		
<b>Total Repairs</b>	<b>31363.90</b>	<b>29388.87</b>	<b>3782.14</b>	
<b>Grand Total</b>	<b>33377.28</b>	<b>39599.06</b>		<b>6221.78</b>

Expenditures for maintenance and repairs in the accounts listed under "Surface Costs" amounted to 15,503.32 in 1948 as compared with 17,687.44 in 1947, a decrease of 2,184.12. The cost per ton for 1948 was .041 as compared with .034 in 1947.

The following is a list of repairs for 1948 and 1947:

	<u>1948</u>	<u>1947</u>	<u>Increase</u>	<u>Decrease</u>
1 new hoisting rope	804.60	3020.35		2215.75
Sheaves	340.81	188.24	152.57	
Repairs to hoists	1595.84	1630.73		34.89
Repairs to Skips & Cages	1375.79	2004.67		628.88
Repairs to shaft	5806.24	5659.91	146.33	
Repairs to T.T. Motors	811.65	7.63	804.02	
Repairs to Tracks & Cars	425.97	610.01		184.04
Wire Rope, Sheaves & Rollers	296.60	2591.34		2294.74
Repairs to Steel Trestles	787.32	385.83	401.49	
Repairs to Pockets	691.16	259.58	431.58	
Repairs to Mine Buildings	2567.34	1329.15	1238.19	
<b>Total Repairs</b>	<b>15503.32</b>	<b>17687.44</b>		<b>2184.12</b>

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15. POWER:

Following is a detail of electric current purchased in 1948 and 1947,  
The distribution of charges to various accounts and other data:

	<u>1948 - 12 Months Optg.</u>		<u>1947 - 12 Months Optg.</u>	
	<u>Cost</u>	<u>Per Ton</u>	<u>Cost</u>	<u>Per Ton</u>
Stoping	2880.00	.0075	2880.00	.0056
Timbering	120.00	.0003	120.00	.0002
Compressors	22594.98	.0591	23241.19	.0448
Ventilation	6103.06	.0160	6131.70	.0118
Pumping	23904.72	.0626	27347.29	.0470
Hoisting	16792.33	.0440	20827.13	.0402
Stocking Ore	177.12	.0005	125.98	.0002
Dry House Expense	972.27	.0025	1023.36	.0020
Tel. & Safety Devices	1380.00	.0036	1380.00	.0027
Mine Office	78.06	.0002	78.06	.0002
Electric Haulage	6397.87	.0167	7380.75	.0142
Shops	511.83	.0014	584.19	.0011
Dist. Carpenter Shop			.30	
Surface Lighting			98.89	.0002
<b>Total</b>	<b>81912.24</b>	<b>.2144</b>	<b>88218.84</b>	<b>.1702</b>
Main Line Meter - K. W.		6,387,200		6,603,303
Separate Meter Readings		6,326,053		6,592,134
Line Loss - K. W.		61,147		11,169
Product - Tons		382,076		518,387
K. W. Per Ton (Inc. Line Loss)		16.72		12.72
Cost Per K.W. (Avg. for Year)		.01403		.01428
15 Min. Demand ( Avg. for Year)		1,380		1,509
Load Factor (Avg. for Year)		51%		50%

17. CONDITION OF  
PREMISES:

b. Negaunee Mine Houses:

During 1948 nine additional houses, located in Section 1, were purchased by the Negaunee Mine Company. Considerable repairs particularly to the interiors were necessary on several of the houses before they were suitable for tenancy.

The cost of repairs to all houses amounted to 3,484.72 during the year and the revenue from rents 6,219.90.

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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:

<u>As to Parentage:</u>	<u>1948</u>	<u>Percent</u>	<u>1947</u>	<u>Percent</u>
Finnish	101	53.4	114	51.4
English	30	15.9	39	17.6
Italian	19	10.1	24	10.8
Swedish	19	10.1	20	9.0
French (Canadian)	9	4.8	11	5.0
Austrian	4	2.1	4	1.7
Norwegian	1	0.5	2	0.9
German	3	1.6	3	1.4
Belgian			3	1.4
Irish	2	1.0	1	0.4
Polish	1	0.5	1	0.4
<b>TOTAL</b>	<b>189</b>	<b>100.0</b>	<b>222</b>	<b>100.0</b>

As to Birth:

	<u>American Born</u>		<u>Foreign Born</u>	
	<u>1948</u>	<u>1947</u>	<u>1948</u>	<u>1947</u>
Finnish	57	68	44	46
English	23	27	7	12
Italian	7	10	12	14
Swedish	15	15	4	5
French (Canadian)	8	10	1	1
Austrian	3	2	1	2
Norwegian	1	2		
German	3	3		
Belgian		3		
Irish	2	1		
Polish	1	1		
<b>TOTAL</b>	<b>120</b>	<b>142</b>	<b>69</b>	<b>80</b>



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1. GENERAL

The production was 197,256 tons compared with 160,442 tons in 1947 and shipments from the mine increased by nearly the same proportion and totalled 183,574 tons of Spies grade. The size of the labor force has remained practically the same and a working schedule of two, eight hour shifts, six days per week was in effect throughout the year.

The major development during the year comprised driving the 6th Level heading to the East Deposit and starting the development for stopes above the level. The size of the orebody, as delineated by the level development at the close of the year, was disappointing due to its persistent narrow width. Development has been driven about 800' along the strike and where the width has been explored an average of about 40' is indicated and the width is considerably less in an area near the center of the deposit where the ore nearly pinches out completely. The small orebody continues to cause development work to be hard pressed to keep pace with the rate the stopes are worked out and this is reflected in the abnormally high development cost. The remaining reserves above the 4th Level will be depleted early in 1949 making it imperative that development for new stopes be rushed above the 6th Level.

Some diamond drilling was done from the south end of the 4th Level. Two holes were drilled proving a narrow extension of the orebody in one hole beyond previously assumed limits. It is now quite evident that the only hope of proving significant new reserves lies in exploration to the south on the 6th Level but before development is driven to explore this possibility some drilling will be done in this area early in the coming year.

Operations on the 4th Level have continued to be hindered by the large amount of water encountered above this level. A favorable sign, however, is the near absence of water in the initial ore development on the 6th Level. The main level heading encountered a heavy flow of water in the hanging slate formation before the orebody was reached but in the ore development indications point to more favorable mining conditions on the 6th Level than experienced on the level above. Intercepting water in the old stopes and the drainage project development above the 4th Level is no doubt having the desired effect in reducing the amount of water that drains through the orebody.

A wage increase was granted hourly paid labor effective July 16 ranging from a minimum of 9½¢ to a maximum of 17¢ per hour. There were six holidays observed during the year and a one-week vacation was allowed eligible employees during the week of August 9.

2. PRODUCTION, SHIPMENTS AND INVENTORIES

a. Production by Grades

	<u>1948</u>	<u>1947</u>
Spies	197,256	160,442
Spies Hi-Sulphur	-	-
<u>Total</u>	<u>197,256</u>	<u>160,442</u>

There was no sulphur grade produced and operations in the coming year will also be based on the production of one grade.

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2. PRODUCTION, SHIPMENTS AND INVENTORIES (Cont.)

b. Shipments

The following table shows the shipments for the past five years:

<u>Year</u>	<u>Spies</u>	<u>Spies Hi-Sul.</u>	<u>Virgil</u>	<u>Virgil Hi-Sul.</u>
1948	183,574	-	-	-
1947	151,670	-	-	-
1946	45,120	2,394	3,987	-
1945	367	-	52,774	29,932
1944	-	-	21,274	80,544

The larger production accounts for the increase in shipments and the bulk of the tonnage was loaded from the pocket. A small tonnage was left in stockpile at the close of the shipping season and it was mostly overrun. Similarly as in the past two years the bulk of the shipments was mixed with the Cliffs Group cargoes.

c. Stockpile Inventories

<u>Grade</u>	<u>Tons</u>
Spies	38,174

The stockpile inventory was larger than at the end of the previous year and it does not include the 4,529 tons of estimated overrun.

d. Division of Product by Levels

4th Level	183,812
6th Level	13,444
<u>Total</u>	<u>197,256</u>

The small production from the 6th Level was obtained from the ore development.

e. Production by Months

<u>Month</u>	<u>Days</u>	<u>Spies Grade Tons</u>	<u>Total Rock Tons</u>	<u>Tons Per Man Per Day</u>
January	25½	13,086	5,152	5.36
February	24	11,266	5,224	4.90
March	27	20,242	2,604	8.32
April	26	14,301	3,764	6.00
May	25	16,543	2,980	7.01
June	26	17,386	3,848	7.94
July	25	12,568	4,244	6.46
August	25	17,215	1,716	8.07
September	25	19,678	2,608	7.90
October	26	21,748	592	7.48
November	25	16,683	644	5.87
December	25	16,540	464	5.60
	<u>304½</u>	<u>197,256</u>	<u>33,840</u>	<u>6.71</u>

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2. PRODUCTION, SHIPMENTS AND INVENTORIES (Cont.)

f. Ore Statement

	Spies Grade	Total	Total Last Year
On Hand January 1, 1948	24,492	24,492	15,720
Output for Year	197,256	197,256	160,442
Total	221,748	221,748	176,162
Shipments	183,574	183,574	151,670
Balance on Hand	38,174	38,174	24,492
Increase in Output		36,814	
Increase in Shipments		31,904	
Increase in Ore on Hand		13,682	

The operating schedule for the past five years follows:

- 1944 - 2-8 hr. shifts  $5\frac{1}{2}$  days per week January 1 to July 1.  
2-8 hr. shifts mining and 1-8 hr. shift hoisting, 5 days per week  
July 1 to December 31.
- 1945 - 2-8 hr. shifts mining and 1-8 hr. shift hoisting, 5 days per week  
January 1 to January 27.  
2-8 hr. shifts mining and 1-8 hr. shift hoisting, 6 days per week  
January 27 to December 31.
- 1946 - 2-8 hr. shifts mining and 1-8 hr. shift hoisting, 6 days per week  
January 1 to August 8.  
2-8 hr. shifts mining and hoisting, 6 days per week August 8 to  
December 31.
- 1947 - 2-8 hr. shifts mining and hoisting, 6 days per week January 1 to  
December 31.
- 1948 - 2-8 hr. shifts mining and hoisting, 6 days per week January 1 to  
December 31.

g. Delays

There were a number of delays to operations many of which were minor in nature so that it was possible in these cases to make up the loss in production on the following shifts. On two occasions interruptions to operations in the stopes was caused by caving from either the hanging or footwall side. The delays listed below are from other causes and their combined effect also resulted in a substantial loss in production.

During the day shift on January 19 a bad leak broke out in the pump discharge column in the shaft and due to sub-zero weather ice accumulated in the shaft at a very rapid rate. To repair the leak it was necessary to cut out a section of pipe where the break occurred and weld in a new section. Hoisting was delayed four hours on the day shift and there was no mining conducted on the afternoon shift making a total of twelve hours delay in operations. Estimated loss in production was 480 tons.

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2. PRODUCTION, SHIPMENTS AND INVENTORIES (Cont.)

g. Delays (Cont.)

On January 26 during the day shift the south skip rope developed a bad section making it necessary to remove the rope immediately and install a new one. There was a five-hour delay to hoisting on this account and an estimated loss in production of 200 tons.

On the night shift on May 8 a five-hour delay to hoisting occurred when the scraper hoist at the 4th Level loading pockets went out of order. Estimated loss in production was 200 tons.

On June 2 during the day shift a one and one-half hour delay to hoisting occurred when the skip caught in the shaft timber near the 4th Level loading pocket. It was possible to make up the loss in production in this case on the following shift.

On the night shift on July 21 the crusher went out of order due to a break in the ring gear. Hoisting was delayed for four and one-quarter days before repairs could be completed and operations were resumed on Monday, July 26. A used ring and pinion gear and bearings were obtained from the district crusher in Gwinn and these were installed replacing the broken and badly worn parts. Although no hoisting was done during this period, mining was continued excepting on Saturday, July 24, and the broken ore was left to accumulate in the stopes. Development on the 6th Level was conducted during this period without interruption. Estimated loss in production was 2600 tons.

On the day shift of July 28 a four-hour delay to hoisting occurred when it became necessary to replace the north skip rope with a new one. Estimated loss in production was 160 tons.

3. ANALYSIS

a. Average Mine Analysis on Output

<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Sul.</u>
Spies	197,256	57.32	.284	6.78	.106

The average analysis in 1948 was slightly lower in iron and higher in sulphur content compared with the previous year.

b. Analysis of Ore in Stock

<u>Grade</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moist.</u>
Spies Dried	55.70	.316	8.64	.244	2.39	.24	.21	.131	7.55	
Spies Nat'l.	50.31	.285	7.80	.220	2.16	.22	.19	.118	6.82	9.67

c. Analysis of Shipments

<u>Grade</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moist.</u>
Spies	58.00	.277	6.16	.24	2.29	.24	.21	.115	7.55	9.67

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3. ANALYSIS (Cont.)

d. High Sulphur Ore

There has been no production of high sulphur ore. Mining and development in the East Deposit to date has proven the sulphur to vary over a wide range and an average sulphur content of about .100% is now indicated. Contamination of the ore with slate that caved from the hanging or footwall side raised the sulphur considerably above the guaranteed limits on several occasions.

4. ESTIMATE OF ORE RESERVES

a. Developed Ore

The following is an estimate of the reserves made as of December 31, 1948 using a factor of 12 cubic feet per ton:

	<u>Spies</u>	<u>Total</u>
Above 4th Level	75,584	75,584
Between 4th and 6th Levels	682,344	682,344
Total Available as of November 30, 1948	757,928	757,928
Less December, 1948 Production	16,540	16,540
Total Gross as of December 31, 1948	741,388	741,388
Less 10% for Mining and Rock	75,793	75,793
Net Total as of December 31, 1948	665,595	665,595

The 6th Level development did not prove up new reserves to the extent it was hoped this level would. The new development did prove some additional ore and this tonnage is represented in more length along the strike than was assumed in the previous estimate. The narrow width of ore, however, continues to be very disappointing and unless considerably more width is found in unexplored extensions the outlook from the standpoint of developing large reserves is not very encouraging.

The estimated reserves, similarly as last year, includes only the ore that is available for mining and excluded is a substantial tonnage that must be left in place as supporting pillars. In the 1948 estimate the usual deduction of 10% for loss in mining and rock was also made although this deduction was not made in the estimate of the previous year. A comparison of the net reserves with a year ago shows about 140,000 tons of new ore that was developed.

In the coming year some drilling will be done in an area that offers the most favorable possibilities for a new find at the south end of the 6th Level. A drill hole from surface several years ago proved ore near the 6th Level elevation a considerable distance to the southwest of the present workings and the unexplored area in between holds promise of additional reserves that will be mineable from the 6th Level.

b. Estimated Analysis of Ore Reserves

<u>Grade</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alun.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moist.</u>
Spies Dried	57.70	.275	6.50	.246	2.31	.25	.21	.112	7.61	
Spies Nat'l.	51.64	.246	5.82	.220	2.07	.22	.19	.100	6.81	10.50

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5. LABOR AND WAGES

a. General

Employee membership in the union has remained at practically 100% but, despite the strong union position, relations have been on a satisfactory basis. There was a change in the officers in the mine Local during the year and also in the representation on the grievance committee. The younger officers have been very active in submitting complaints but these were mostly minor in nature and were settled in either Step 1 or 2 of the grievance procedure.

There were 115 employees on the payroll at the close of the year compared with 114 a year ago. The labor turnover was smaller than usual and there has been an adequate supply of labor in the area to maintain the force at the desired strength. There were 8 employees who quit, one died and one was discharged and there were 11 hired resulting in a net increase of one man.

The wage increase that was granted and became effective July 16 ranged from  $9\frac{1}{2}\phi$  to  $11\frac{1}{2}\phi$  per hour in most classifications. In several more specialized occupations increases to a maximum of 17¢ per hour were granted.

b. Statement of Wages and Product

Product	<u>1948</u>	<u>1947</u>
	197,256	160,442
Number of Shifts and Hours	2-8	2-8
 <u>Average Number of Men Working</u>		
Surface	32	$32\frac{1}{4}$
Underground	$79\frac{1}{4}$	$75\frac{3}{4}$
Total	<u><math>111\frac{1}{4}</math></u>	<u>108</u>
 <u>Average Wages Per Day</u>		
Surface	10.96	10.03
Underground	13.26	11.72
Total	<u>12.60</u>	<u>11.22</u>
 <u>Average Per Month of 22 Days</u>		
Surface	241.12	220.70
Underground	291.72	257.84
Total	<u>277.20</u>	<u>246.75</u>
 <u>Average Per Month of 24 Days</u>		
Surface	263.04	240.77
Underground	318.24	281.28
Total	<u>302.40</u>	<u>269.18</u>
 <u>Product Per Man Per Day</u>		
Surface	22.26	17.51
Underground	9.61	7.92
Total	<u>6.71</u>	<u>5.45</u>

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5. LABOR AND WAGES (Cont.)

b. Statement of Wages and Product (Cont.)

<u>Labor Cost Per Ton</u>	<u>1948</u>	<u>1947</u>
Surface	.496	.580
Underground	<u>1.347</u>	<u>1.470</u>
Total	1.843	2.050
Average Product Breaking and Trammig	41.12	36.71
Average Wages Contract Miners	15.81	13.57
<u>Total Number of Days</u>		
Surface	9,749	9,606 $\frac{1}{2}$
Underground	<u>24,122</u>	<u>22,610<math>\frac{1}{2}</math></u>
Total	33,871	32,217
<u>Amount of Labor</u>		
Surface	106,895.87	96,412.51
Underground	<u>320,002.43</u>	<u>265,106.92</u>
Total	426,898.30	361,519.43

Proportion Surface to Underground Men

1944	1 to 1.60
1945	1 to 1.38
1946	1 to 2.01
1947	1 to 2.35
1948	1 to 2.48

6. SURFACE

a. Buildings

A new boiler house was constructed at the south end of the dry house replacing the old wood frame building. The new boiler house is 32' x 32' and is considerably larger than the old building which was badly crowded and housed only one boiler compared with two in the new building. The new boiler house is of cinder block and concrete construction and it was erected with mine labor.

The rooms in the combined office and warehouse building were painted and several new bins were made in the warehouse and the shelves rearranged.

A small building was erected of steel sheeting on the east side of the shaft house for the oil burning heater that is used in the winter months to heat the intake air into the mine. The building was constructed with concrete footings and floor so the structure is completely fire-proof. On the north side of the shaft house an old wood frame addition was torn down and replaced with a small structure that was also made of steel sheeting with concrete floor and footings.

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6. SURFACE (Cont.)

b. Stockpiles

At the close of the shipping season after the stockpile was nearly cleaned up in the area to the northwest of the shaft, 18 bents of wood trestle were erected for stocking during the winter months. A small tonnage of Spies grade in the area to the north of the shaft was loaded out early in the season but no trestle was erected in this area.

To save erection of additional rock trestle the bull-dozer was employed to spread out the old rock piles in the area to the south of the shaft.

7. UNDERGROUND

a. Shaft Sinking

There was no shaft sinking done in 1948.

b. Development

A large part of the underground program was again confined to development and the major part of this program was conducted under E & A cc-181. Most of the development work was on the 6th Level although there was a substantial amount of stope development done above the 4th Level also.

Due to the extent of the development in ore and rock it will be described under the following sub level headings:

Stope Development

1240' Sub Level

Early in the year when development for No. 4 Stope was still underway some drifting was done on this sub to complete a connection between two mills and also to provide a connection to No. 3 Stope for ventilation. A total of 95' of small drift was advanced in ore along the strike to connect the mills and 75' of small drift was advanced to the north from the most northerly mill to connect with No. 3 Stope for ventilation. Upon completing two mills to this sub for No. 5 Stope a total of 160' of small drift was advanced in ore along the strike to connect the mills and provide a connection to the traveling raise in the pillar. Before mining was started two test holes were drilled to the southeast to explore the width of ore.

1210' Sub Level

The development for No. 4 Stope on this sub consisted of driving 95' of small drift in ore to connect the traveling raise in the pillar with the most northerly mill. The development for No. 5 Stope on this sub comprised driving 160' of small drift in ore along the strike to complete a connection from the traveling raise in the pillar to the most southerly mill.



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7. UNDERGROUND (Cont.)

b. Development (Cont.)

1180' Sub Level

The development for No. 5 Stope on this sub also consisted of driving 150' of small drift in ore along the strike to connect the most southerly mill with the traveling raise. Some test drilling was also done to determine the width of ore and from the south mill two holes were drilled proving 65' of ore and near the traveling raise in the pillar short holes to the east and west proved 38' of ore.

1150' Sub Level

A small amount of development was done on this sub for No. 4 Stope and it comprised driving 45' of small drift in ore to complete a connection between two mill raises. The development for No. 5 Stope again consisted of driving 150' of small drift in ore along the strike to complete a connection between the most southerly mill and the traveling raise in the pillar.

1125' Sub Level

Late in the year when mining was nearing completion in No. 4 Stope some development was driven at the south end of this area to enable recovery of a pillar along the footwall side. About 55' of small drift was advanced in ore and jasper in the pillar at the south end of the stope. Some additional development was driven for No. 5 Stope on this sub and it consisted of driving 105' of small drift in ore to connect two mills to existing development. From the end of the small test drift that was advanced to the southeast four short holes were drilled to explore for an ore extension but jasper was encountered in each of the holes.

1100' Sub Level

Development for No. 4 Stope on this sub consisted of driving 95' of small drift in ore to complete a connection between the traveling raise and the most northerly mill. A total of 150' of small drift was advanced on this sub for No. 5 Stope to also complete a connection between the traveling raise in the pillar and the most southerly mill.

1075' Sub Level

Some development was driven for No. 5 Stope on this sub late in the previous year. Upon completing the most southerly mill to this sub early in the year 105' of small drift was advanced northeast along the strike to hole to existing development. A short test hole to the west proved a width of 40' of ore.

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7. UNDERGROUND (Cont.)

b. Development (Cont.)

1050' Sub Level

Most of the development for No. 4 Stope on this sub was driven in the previous year and early in 1948 about 70' of small drift was advanced to complete a connection between two mills. The development for No. 5 Stope comprised driving 135' of small drift in ore to complete a connection from the most southerly mill to the traveling raise in the pillar.

Early in the year when mining was still underway in No. 3 Stope, caving from the footwall side interrupted operations until another mill was put up from the transfer leaving a pillar that confined the caving to the south end of the stope. About 120' of small raise was advanced from the west side of the transfer to complete the development so that mining could be resumed.

4th Level

Most of the development on this elevation consisted of driving the transfer for No. 5 Stope and putting up numerous mills, two of which were advanced to the top elevation of mining on the 1240' Sub Level. The transfer was driven to the southwest for a distance of 175' from a loading slide that was constructed over the south crosscut. About 60' of the drift was in ore and the balance in jasper and slate. At the south end in the slate footwall a diamond drill station was cut out from which two holes were drilled, one to the south and the other to the west to explore the south end of the orebody. Most of the development for No. 4 Stope was driven in the previous year and three additional mills were cut out early in 1948 from the west side of the transfer. Each mill was put up 25' in ore to the mill sub elevation for drawing the broken ore as operations in the stope retreated south.

Stope Development above the 6th Level

710' Sub Level

At the close of the year development was being rushed for new stopes above the 6th Level. This work was underway in four separate areas and had progressed so that mining could be started early in the coming year in the stope at the south end of the orebody. Two of the stopes will be developed for a shrinkage system of mining in which deep horizontal holes will be drilled and blasted to break the ore starting at the lower limits of the stope and progressing to the top of the block to be mined. It is hoped to minimize caving of the hanging and footwall slates by employing this method and realize the highest possible recovery.

The development for the most southerly stope on this sub comprised driving 85' of small drift in ore to connect a series of five mill raises. In each of the other three areas the development consisted of mill raises that have been driven to this elevation preliminary to driving the connecting drift in ore between the mills.

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7. UNDERGROUND (Cont.)

b. Development (Cont.)

Stope Development above the 6th Level (Cont.)

685' Sub Level

The development on this sub for each of the stopes consisted of driving a small drift in ore along the strike of the deposit for the full length of the proposed stope and short crosscuts were driven at 45' intervals to mill raises that were put up from the transfer directly below. Two branch raises will be put up from the end of each of the short crosscuts to the next higher sub level and these will serve for drawing ore from the stopes. For the stope at the south end of the deposit a total of 260' of small drift was advanced and 150' of mill raise was put up to complete the stope development on this sub. About 60' of small drift was also advanced to the southeast from the most southerly mill following along the strike of the orebody. Work was underway at the close of the year advancing the drift further in this direction to explore the extent of ore. For the stope in the center of the orebody a total of 135' of drift was advanced in ore, 20' of which comprised the first short crosscut to the east and the balance was driven north along the length of the stope. For the stope directly to the north of this area a total of 178' of small drift was advanced in ore to complete the drift along the strike and each of the two short crosscuts to the east. Two mills were put up from the end of each of the two crosscuts to a height of 25' to the next higher sub level to complete the development on this sub. For the stope at the north end a total of 218' of small drift was advanced to complete three short crosscuts branching to the north and the major portion of the drift east along the length of the stope. Four mills were put up to a height of 25' to the next higher sub level.

6th Level

Upon completing the initial development on the level, transfer drifts were cut out and driven along the strike of the orebody from the north and south crosscuts and also from the main level drift. Each transfer was driven on a -2% grade and a small drift was advanced from the end of the transfer to connect with the nearest point on the main level for drainage purposes. The transfer for the stope at the south end of the orebody was driven from a loading slide over the south crosscut and was advanced 175' in ore and 20' in slate to the northeast to complete it to the desired distance. Two mills that will serve as traveling raises were cut out on the northwest side near each end of the drift and advanced 50' in ore to the 710' Sub Level. On the southeast side three mills were cut out at 45' intervals and advanced 20' in ore to the grizzley sub elevation to complete the development at this elevation. A transfer drift 175' in length was driven to the south from a loading slide over the main level drift to connect with the end of the transfer for the south stope. This drift advanced in ore only a short distance from the loading slide and jasper was encountered for the balance of the distance. Four short test holes were drilled at intervals along the west side proving an average width of about 15' of ore. Work has been temporarily abandoned in this area because the ore nearly pinches out and unless subsequent development proves more width

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7. UNDERGROUND (Cont.)

b. Development (Cont.)

6th Level (Cont.)

at higher elevations it appears there is not sufficient tonnage to warrant developing a block for mining in this part of the deposit. A transfer was also driven to the north from the main level drift for a distance of 190' in ore. Two mills were cut out on the west side in the proposed pillar and the most northerly one advanced 20' to the next higher sub level and the south mill was advanced 50' in ore to reach the 710' Sub Level. On the east side of the transfer three mills were cut out at 45' intervals and advanced 20' in ore to the grizzly sub elevation. Another transfer was driven from the loading slide over the north crosscut to the south for a distance of 130' in ore and 35' in slate. Two mills were then cut out on the west side near each end of the transfer and advanced 20' in ore to the grizzly sub elevation. The latter mills are located in a pillar at each end of the stope and will serve as travel raises. Two mills were cut out on the east side and advanced 20' in ore to the grizzly sub elevation.

Due to a sharp turn in the strike of the deposit at the north end the transfer for the stope in this area was driven due east from a loading slide over the main haulage drift. The drift was advanced 30' in the hanging slate before it entered ore and then it was driven 210' in ore to the east to reach within 25' of the Bates Mine boundary. Two mills were cut out on the south side, one at each end of the transfer and advanced 50' in ore to 710' Sub Level. Both raises are located in the pillar at the ends of the stope and will serve as traveling raises. On the north side of the transfer four mills were cut out at 40' intervals and these were advanced 20' in ore to the grizzly sub elevation.

The following table shows the footage of stope development:

	<u>Drifting</u>		<u>Raising</u>		<u>Total</u>
	<u>Ore</u>	<u>Rock</u>	<u>Ore</u>	<u>Rock</u>	
Small Size	2752'	205'	1460'	73'	4490'
Large Size	866'	-	-	-	866'
Total	3618'	205'	1460'	73'	5356'

6th Level Development - E & A cc-181

The main heading was driven about 1400' to the southeast of the shaft at the close of the previous year and the drift was advanced 2343' further in the first half of 1948 and the orebody was reached early in July. Two crosscuts were then driven, one branching to the south and the other to the north in the hanging slate on the west side of the orebody to complete the initial level development. Only 28' of ore was proven where the main haulage drift crossed the orebody but more favorable width was proven in each of the crosscuts. A sharp turn in the strike of the orebody was disclosed by the north crosscut and it was driven for a distance of 215' in ore following the strike until the east boundary of the property was reached. A short branch to the northeast was driven from this crosscut in the hanging slate to enable a transfer for the stope at this end of the orebody to be driven from the loading slide directly over the level. The south crosscut was also driven through the orebody proving a width of 45' of ore and it was stopped when the slate footwall was encountered.

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7. UNDERGROUND (Cont.)

b. Development (Cont.)

6th Level Development - E & A cc-181 (Cont.)

Early in the year when the main heading reached a distance of 2600' from the shaft a heavy flow of water was encountered in a shear zone in the slate formation. An initial volume of 200 G.P.M. was measured but this decreased in a short time to a steady flow of about 140 G.P.M. To guard against another inflow of water that might temporarily exceed the capacity of the pumps a concrete and stop log dam was built at the shaft end of the main drift, similarly as on the 4th Level.

Upon completing the initial level development transfer drifts were driven along the strike of the orebody for the various stopes and upon completing this development short connecting drifts were advanced in rock from each of the crosscuts to the end of the transfer drifts for drainage purposes. One of these was driven from the east side of the south crosscut and connected to the end of the transfer that was driven for the most southerly stope. Another small drift for drainage purposes was driven to the east from the north crosscut to connect with the end of two transfer drifts that were driven for stopes in this area. At the close of the year all the development was confined to drifting and raising in ore for the various stopes above the level.

Due to the small extent of ore proven by the level development it is planned to explore the south end of the orebody early in the coming year first by diamond drilling and then by driving the south crosscut further in this direction.

The following table shows a classification of the development footage under E & A cc-181:

Rock Drift . . . . .	3175'
<u>Ore Drift . . . . .</u>	<u>323'</u>
Total	3498'

c. Stoping

Most of the production was obtained from three stope operations above the 4th Level and a relatively small tonnage was realized from the ore development on the 6th Level. Mining was completed in No. 3 Stope in the first quarter of the year and production was dependant on the operations in No. 4 Stope entirely until July when No. 5 Stope was brought into production. Mining was practically completed in No. 4 Stope at the close of the year so that production was again dependant on the operations in one stope until the first stope above the 6th Level is brought into production.

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7. UNDERGROUND (Cont.)

c. Stoping (Cont.)

Two areas above the 6th Level are being developed for a shrinkage system of mining with the hope that higher recovery can be realized and also caving of the hanging and footwall material minimized. Another aid to production that this method offers is that mining can be done by drilling and blasting deep radial holes which could not be employed satisfactorily in the sub level stopes because experience proved the heavy blasting promoted caving and aggravated the trouble from this source. The following is a detailed description of the mining that was conducted on the various sub levels:

1270' Sub Level

This is the top elevation of mining in the stopes above the 4th Level. In No. 3 Stope an area 50' x 60' was mined on this sub to retreat the north face of the stope to the pillar line. A small amount of mining was done in No. 4 Stope near the north end where an area 50' x 15' was recovered.

1240' Sub Level

In No. 3 Stope an area 50' x 50' was mined to retreat the north face to the pillar line and deplete the available ore on this sub. Mining extended for the full width of the ore on this sub exposing the jasper hanging on the west side and the slate footwall to the east. In No. 4 Stope an area 130' x 40' was mined to complete recovery of the available ore. This is the top elevation of mining in No. 5 Stope and an area 120' x 80' was mined starting at the south end and retreating north toward the pillar line. Mining exposed the jasper hanging on the west side and on the east side a small amount of ore was left in place to support the footwall slate. Mining was underway on this sub in December benching along the north face.

1210' Sub Level

No. 3 Stope was enlarged 40' x 50' by benching along the north side and retreating it to the pillar line. In No. 4 Stope an area 125' x 40' was mined starting at the north limits of the stope and retreating south to the pillar line. An area 100' x 50' was mined in No. 5 Stope on this sub and in December mining was underway benching along the north face.

1180' Sub Level

An area 60' x 30' comprising the north half of No. 3 Stope was mined on this sub to complete recovery of the available ore. In No. 4 Stope the mining comprised recovery of an area 120' x 40'. Mining was underway in No. 5 Stope on this sub in December and an area 90' x 50' was mined by the close of the year.

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7. UNDERGROUND (Cont.)

c. Stoping (Cont.)

1150' Sub Level

Two separate areas were mined in No. 3 Stope on this sub on each side of the pillar that was left near the center of the stope when caving from the footwall side occurred. In the south half of the stope an area 60' x 20' was mined and on the north side of the pillar an area 40' x 45' was mined to complete recovery of the available ore. In No. 4 Stope an area 110' x 45' was mined to complete recovery of the available ore on this sub. A small amount of mining was done in No. 5 Stope and it consisted of enlarging the most southerly mill to 45' x 35'.

1125' Sub Level

Two separate areas were mined in No. 3 Stope on this sub on each side of the pillar that was left as a barrier to confine the caving to the south end of the stope. An area 40' x 30' was mined on the south side of the pillar and on the north side an area 35' x 20' was mined. In No. 4 Stope the mining again consisted of recovering an area 120' x 50' that comprised the full size of the block that was developed for mining. In No. 5 Stope at the south end of the orebody an area 80' x 40' was mined and operations were underway in December benching along the north face.

1100' Sub Level

Two small areas were mined in No. 3 Stope and the original stope was enlarged to 90' x 45' before caving interrupted the mining. On the north side of the pillar an area 35' x 30' was mined. The mining in No. 4 Stope comprised recovery of an area 120' x 40'. In No. 5 Stope at the south end an area 65' x 35' was recovered and mining was underway at the end of the year retreating the north face toward the pillar line.

1075' Sub Level

In No. 3 Stope two small areas were again mined and the south half of the stope was enlarged to about 80' x 35' and on the north side of the pillar an area 25' x 25' was mined. Two separate areas were also mined in No. 4 Stope on this sub on each side of the small pillar that was left near the center to confine the caving to the north half of the stope. An area 60' x 35' was mined on the north side of the pillar and an area 50' x 35' on the south side. An area 40' x 70' was mined in No. 5 Stope and mining was underway late in December retreating the north face toward the pillar line.

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7. UNDERGROUND (Cont.)

c. Stoping (Cont.)

1050' Sub Level

In No. 4 Stope an area 130' x 30' was mined extending from the north limits of the stope south to the pillar line. A small amount of mining was done in No. 5 Stope on this sub and it comprised recovery of an area 60' x 25' and mining was underway in December benching along the north face. This is the bottom elevation of mining in the stopes above the 4th Level

d. Timbering

There was only a small amount of timber used and the cost per ton for this material was slightly lower than last year. Very little timber was used in the new development on the 6th Level and only several short sections of the main level drift required timber support. This was also the case in the ore development above the level and the only places where timbering was done was in short sections of the transfer drifts directly over the loading slides. In the stope transfer drifts above the 4th Level frequent repairs to timber were required at the mouth of the mill raises although the use of steel wearing plate at these points is reducing the amount of this repair work. There was no cribbing timber needed in the raise development during the year.

There have been substantial increases in the price of timber supplies and although the total timber expense was slightly higher than in 1947 the cost per ton was lower due to the larger production. The following is the comparative timber statement:

Kind	Lineal Feet	Avg. Price Per Foot	Amount 1948	Amount 1947
6" to 8" Cribbing			-	61.56
8" to 10" Stull Timber	57	.15	8.55	46.68
10" to 12" Stull Timber	396	.20	79.20	261.25
Total Timber	453	.1937	87.75	369.49
Lagging	21696	.0148	320.68	63.94
Poles	1076	.0265	285.44	213.16
Total Lagging & Poles			606.12	277.10
Product			197,256	160,442
Feet of Timber per Ton of Ore			.0023	.0183
Feet of Lagging per Foot of Timber			47.8940	1.4268
Cost Per Ton for Timber			.0005	.0023
Cost Per Ton for Lagging			.0016	.0004
Cost Per Ton for Poles			.0014	.0013
Cost Per Ton for Timber, Lagging & Poles			.0035	.0040
Equivalent of Stull Timber to Board Measure			878	4924
Feet of Board Measure per Ton of Ore			.0045	.0307
Cost of Timber, Lagging & Poles			693.87	646.59



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7. UNDERGROUND (Cont.)

f. Explosives, Drilling and Blasting

There was a large increase in the amount of explosives consumed due to the large development program that has been underway throughout the year. Substantial increases in the cost of all explosive supplies together with the large development program accounts for the increase in the explosives cost per ton. Late in the previous year Gelex No. 1 powder was introduced and it has been used almost exclusively in the development and mining since that time. Electric blasting has been continued in the development and mining because this method is best adapted to the wet conditions in the mine. Electric blasting is also favored from a ventilation standpoint and this is particularly important in the development on the 6th Level until a connection has been completed to the 4th Level for ventilation.

Carboloy insert bits have been used in the mining and development in hard ground. The bit was first used when driving the main haulage drift to the orebody in hard slate formation and the rate of advance was improved materially after a complete change was made to this type of bit. After the orebody was reached the use of the bit was continued in the development where ground conditions warranted it and the favorable rate of advance that was realized has justified general use of the bit when developing or mining in hard ground.

Statement of Explosives Used

<u>Ore Development &amp; Stopping</u>	<u>Quantity</u>	<u>Average Price</u>		<u>Amount 1948.</u>	<u>Amount 1947</u>
No. 1 Gelamite 60%					9,212.52
No. 1 Gelex	115,368	.1480	Lb.	17,073.01	1,273.24
No. 2 Gelex	400	.1425		57.00	
Electric Caps	43,421	17.381	C	7,546.97	4,062.87
Connecting Wire	2,110	.800	Lb.	1,688.00	998.40
Fuse (Feet)	3,546	7.735	M	27.43	99.52
No. 6 Blasting Caps	2,110	1.392	C	29.38	17.23
Hot Wire Fuse Lighters	300	.92	C	2.76	11.26
Master Fuse Lighters	300	2.333	C	7.00	3.79
Powder Bags	39	1.85	Ea.	72.15	29.60
Tamping Bags					1.72
Primacord	500	.32	X	16.00	32.00
Charging Sticks					26.28
<b>Total Expense</b>				<b>26,519.70</b>	<b>15,768.43</b>
<b>Production - Tons</b>				<b>197,256</b>	<b>160,442</b>
<b>Lbs. Powder Per Ton of Ore</b>				<b>.5868</b>	<b>.4587</b>
<b>Cost Per Ton for Powder</b>				<b>.0868</b>	<b>.0654</b>
<b>Cost Per Ton for All Explosives</b>				<b>.1344</b>	<b>.0983</b>

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7. UNDERGROUND (Cont.)

f. Explosives, Drilling and Blasting (Cont.)

Statement of Explosives Used

<u>Rock Development</u>	<u>Quantity</u>	<u>Average Price</u>		<u>Amount 1948</u>	<u>Amount 1947</u>
No. 1 Gelamite 60%					1,428.67
No. 1 Gelex	1,265	.1489	Lb.	188.41	
Electric Blasting Caps	718	18.129	C	130.16	672.27
Connecting Wire	22	.800	Lb.	17.60	100.80
Fuse (Feet)					.91
No. 6 Blasting Caps					.41
Powder Bags	1			1.85	
Total Expense				338.02	2,203.06

<u>E &amp; A Development</u>	<u>Quantity</u>	<u>Average Price</u>		<u>Amount 1948</u>	<u>Amount 1947</u>
No. 1 Gelamite 60%					3,021.90
No. 1 Gelex	41,846	.1457	Lb.	6,096.60	1,113.31
Duplex Special	16,000	.1625	Lb.	2,600.00	
Electric Blasting Caps	19,843	16.707	C	3,315.28	1,249.08
Connecting Wire	633	.800	Lb.	506.40	208.00
Fuse - Feet	1,750	7.44	M	13.02	160.72
No. 6 Blasting Caps	200	1.375	C	2.75	49.19
Hot Wire Lighters	100	.92	C	.92	4.06
Powder Bags	3	1.85	Ea.	5.55	7.40
Tamping Shells					33.57
Total Expense				12,540.52	5,847.23
Total Expense All Explosives				39,398.24	23,818.72

g. Ventilation

The Aerodyne Fan at the collar of the ventilation shaft has been operating satisfactorily and has maintained good ventilation conditions in the mining areas above the 4th Level. During the summer the fan delivered a volume of 29,000 C.F.M. into the mine and in the freezing weather the volume was reduced to approximately 15,000 C.F.M. to retard ice formation in the hoisting shaft. The fan is operated continuously upcasting air through the ventilation shaft and downcast into the mine through the hoisting shaft. Early in the year installation of an oil burning heater was completed at the collar of the hoisting shaft to pre-heat the intake air and since it has been in service troublesome icing conditions in the shaft have been practically eliminated.

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7. UNDERGROUND (Cont.)

g. Ventilation (Cont.)

The development headings on the 6th Level have been ventilated with several Sturtevant #45 Fans that are connected in series in a 14" metal pipe line extending from the various headings to the shaft where the air is discharged into the skip roads. The heading was ventilated with one fan until the drift reached a point about midway to the orebody and then a second fan was installed in series with the first one and upon completing the main level development a third fan was installed inside near the orebody. A survey showed a volume slightly in excess of 3,000 C.F.M. being delivered by the series of fans and this was divided into three separate branches each ventilating an area in which work was underway. Late in the year work was started driving two mill raises from the 6th to the 4th Level for a ventilation connection. Both raises are located in a proposed pillar in the orebody and after they have been driven to the 4th Level to provide the first connection for ventilation a raise will be driven in rock on the west side of the deposit to serve as a permanent connection between the levels.

The old workings in the Virgil property have continued to be sealed off on each of the levels from the rest of the mine. The fire in the old workings is apparently dormant and there has been no trouble from leakage of foul air into the active levels.

8. COST OF OPERATING

a. Comparative Mining Costs

	<u>1948</u>	<u>1947</u>
Product	197,256	160,442
Underground Costs	2.065	2.202
Surface Costs	.404	.436
General Mine Expense	.389	.431
Cost of Production	2.858	3.069
Depreciation & Depletion	1.031	.995
Taxes	.065	.092
Loading & Shipping	.079	.070
Total Cost at Mine	4.033	4.226
Budget Estimated Cost at Mine	3.760	4.313
Number of Operating Days	304½	298
Number of Shifts and Hours	304½ 2-8 Hr.	298 2-8 Hr.
Average Daily Product	648	538

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

	1948		1947	
	Amount	Per Ton	Amount	Per Ton
<u>Underground Costs</u>				
1. Exploring in Mine	3653.76	.019	30.71	.000
3. Development in Rock	2497.66	.013	15998.29	.100
4. Development in Ore	60332.05	.306	37195.66	.232
5. Stopping	103482.88	.525	95333.68	.594
6. Timbering	9682.51	.049	6887.51	.043
7. Trammig	67964.68	.345	61584.74	.384
8. Ventilation	2194.33	.011	4092.79	.026
9. Pumping	45389.85	.230	53322.64	.332
10. Compressors & Air Pipes	19822.77	.100	17306.32	.108
12. Underground Superintendence	15257.08	.077	13753.24	.085
14. Compressors & Power Drills	3011.61	.015	2811.36	.017
15. Scrapers & Mech. Loaders	44658.46	.226	23776.69	.148
16. Electric Tram Equipment	9293.29	.047	10711.27	.067
17. Pumping Machinery	20118.54	.102	10537.60	.066
Total Underground Costs	407359.47	2.065	353342.50	2.202
<u>Surface Costs</u>				
18. Hoisting	19445.15	.099	18445.16	.115
19. Stocking Ore	14072.57	.071	11708.70	.073
20. Screening-Crushing at Mine	10294.52	.052	7476.19	.047
21. Dry House	7711.93	.039	8121.58	.051
22. General Surface Expense	9777.41	.050	9963.14	.062
23. Hoisting Equipment	5729.97	.029	2380.97	.015
24. Shaft	2810.61	.014	6172.69	.038
25. Top Tram Equipment	1274.45	.007	2313.42	.015
26. Docks, Trestles & Pockets	587.99	.003	1312.52	.008
27. Mine Buildings	7846.39	.040	1984.34	.012
Total Surface Costs	79550.99	.404	69878.71	.436
<u>General Mine Expenses</u>				
Geological	1386.98	.007	986.45	.006
28. Insurance	5554.40	.028	3783.64	.024
29. Mining Engineering	6207.94	.032	5962.34	.037
30. Mech. & Elec. Engineering	566.95	.003	687.18	.004
31. Analysis & Grading	6556.04	.033	5369.96	.033
32. Personal Injury	2585.61	.013	2824.59	.018
33. Safety Department	1268.12	.006	1376.13	.009
34. Telephones & Safety Devices	1666.68	.008	1422.24	.009
35. Local and General Welfare	1719.44	.009	1816.71	.011
36. Special Exp., Pensions & Allow.	2965.53	.015	3170.56	.020
37. Ishpeming Office	9423.69	.048	7940.16	.050
38. Social Security Tax	8807.79	.045	9148.61	.057
39. Mine Office	15875.36	.080	14526.60	.090
Employees Vacation Pay	12196.54	.062	10211.88	.063
Total General Mine Expenses	76781.07	.389	69227.05	.431
Cost of Production	563691.53	2.858	492448.26	3.069

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

	<u>1948</u>		<u>1947</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
41. General Supplies	18585.72	.094	13280.77	.083
42. Iron & Steel	10202.69	.052	6582.59	.041
43. Oil & Grease	4055.10	.021	3206.83	.020
44. Machinery Supplies	30371.51	.154	21500.10	.134
45. Explosives	26896.83	.136	18198.60	.113
46. Lumber & Timber	4336.34	.022	4231.50	.026
47. Fuel	7156.97	.036	5440.15	.034
48. Electric Power	44553.31	.226	41789.30	.260
50. Other Items of Expense	8571.36	.043	8537.70	.054
Total Per Cost Sheet	154729.83	.784	122767.54	.765

The following are explanations of operating costs that show significant variations compared with the previous year.

1. Exploring in Mine

The large increase is due to the diamond drilling that was done on the 4th Level. There was no drilling done in the previous year.

3. Development in Rock

The smaller expense is due to very little rock development charged to operating. The large rock development program on the 6th Level was under E & A cc-181.

4. Development in Ore

The large increase in this expense is due to the larger ore development program which was confined mostly to the 6th Level.

5. Stoping

The total expense in this account increased due to a larger mining program but the cost per ton was less due to the larger production.

7. Tramming

The total expense was slightly higher but the cost per ton decreased due to the larger production.

9. Pumping

The smaller expense is due to a slight decrease in mine water and a reduction in the amount of sump cleaning that has been necessary. The mud settling sumps that were provided near the orebody last year have reduced the maintenance on the pumps and increased their efficiency materially. At the end of the year a total of 792 G.P.M. was being pumped compared with 830 G.P.M. at the close of 1947. The large volume of mine water has required a pumping schedule of three, eight hour shifts per day for seven days a week.

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8. COST OF OPERATING (Cont.)

b. Detailed Cost Comparison (Cont.)

12. Underground Superintendence

The total expense was larger due to adding two sub foremen to the supervisory force for part of the year and the increase in salaries is also reflected in the larger expense. A Christmas bonus of \$100.00 was paid each salaried boss.

15. Scrapers & Mech. Loaders

The large increase is due to the purchase of new equipment and there was more maintenance required on scraper hoists.

17. Pumping Machinery

The large increase is due to the purchase of several small pumps and there were some replacement parts purchased for the Aldrich Quintuplex pump.

18. Hoisting

19. Stocking Ore

The total expense in each of these accounts was higher due to the increase in wages but the cost per ton was lower due to the larger production.

20. Screening-Crushing at Mine

The large increase is due to the major repairs to the crusher when the ring gear on this unit broke.

23. Hoisting Equipment

The increase is due to more maintenance and the increase in wages is also reflected in the higher cost.

24. Shaft

The decrease is due to less repair work in the skip roads. In the previous year major repairs were made to this compartment in the shaft during the vacation period.

27. Mine Buildings

The large increase is due to erecting the new boiler house at the south end of the change house. There were very little repairs and maintenance expense on the other buildings.

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8. COST OF OPERATING (Cont.)

b. Detailed Cost Comparison (Cont.)

28-41. Inclusive

The total expense in these accounts was higher in nearly every case due to the increase in wages and salaries but the cost per ton was less due to the larger production.

9. EXPLORATION AND FUTURE EXPLORATION

Two holes were drilled from the south end of the 4th Level but no important ore extension was proven by this drilling. The drilling was done from the south end of the transfer drift that was driven for No. 5 Stope and one hole was drilled from this station to the south and another to the west. No ore was encountered to the south but the hole to the west crossed the orebody at a slight angle proving 35' of ore. The drilling proved ore a short distance beyond previously assumed limits but the narrow width indicates insufficient tonnage to warrant driving the main level in rock further south to develop this area for mining.

The 6th Level development has outlined the deposit along the strike for a distance of 800' proving a narrow orebody that turns sharply at the north end and enters the Bates Mine property. The unexplored south end of the orebody offers the only hope of proving additional reserves and exploration by drilling and development will be concentrated in this area in the coming year. The following is a log of the drill holes.

<u>D.D.H. No. 40</u>		
<u>4th Level</u>	<u>Dip 0°</u>	<u>Due South</u>
0' - 6'		Cherty Iron Formation
6' - 18'		Laminated Slate
18' - 65'		Slate Breccia
65' - 177'		Mottled Slate
177' - 229'		Mottled Laminated Slate
229' - 277'		Mottled Laminated Slate
277' - 289'		Slaty Iron Formation
289' - 342'		Iron Formation
342' - 352'		Slate Breccia
352' - 392'		Chert

<u>D.D.H. No. 41</u>		
<u>4th Level</u>	<u>Dip 0°</u>	<u>Due West</u>
0' - 10'		Slaty Lean Ore
10' - 25'		Ore
25' - 45'		Sulphurous Ore
45' - 50'		Lean Ore
50' - 65'		Second Class Soft Ore
65' - 127'		Cherty Iron Formation
127' - 180'		Grey Slate
180' - 189'		Cherty Oxidized Iron Formation
189' - 215'		Slaty Iron Formation
215' - 255'		Slate
255' - 284'		Ferr. Grey Slate

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10. TAXES

The following is a comparison of the taxes paid in 1948 and 1947 in Iron County:

<u>Description</u>	<u>1948</u>		<u>1947</u>	
	<u>Valuation</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Taxes</u>
<u>Iron County</u>				
<u>Iron River Township</u>				
<u>Spies Mine</u>				
NE $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 24, 43-35, 40A)				
SE $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 24, 43-35, 40A)				
<u>Virgil Mine Lease No. 51</u>				
SW $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 24, 43-35, 40A)	40,000	800.00	50,000	1,115.00
Per. Prop., Stkple., Supp., & Equip.	195,000	3,900.00	125,000	2,787.50
Total Spies Mine	235,000	4,700.00	175,000	3,902.50
Spies Dwellings	1,250	25.00	1,250	27.89
Total Iron River Township	236,250	4,725.00	176,250	3,930.39
Tax Rate		2.000		2.230
 <u>Village of Mineral Hills</u>				
<u>Spies Mine</u>				
NE $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 24, 43-35, 40A)				
SE $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 24, 43-35, 40A)				
<u>Virgil Mine Lease No. 51</u>				
SW $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 24, 43-35, 40A)	40,000	253.57	50,000	282.49
Per. Prop., Stkple., Supp., & Equip.	195,000	1,236.18	125,000	706.22
Total Spies Mine	235,000	1,489.75	175,000	988.71
Spies Dwellings	1,250	7.93	1,250	7.06
Total Village of Mineral Hills	236,250	1,497.68	176,250	995.77
Tax Rate		.63394		.564975
 <u>City of Iron River</u>				
<u>Spies-Johnson (East Deposit)</u>				
SE $\frac{1}{4}$ of NE $\frac{1}{4}$ of Sec. 24, 43-35, 40A	95,000	3,336.40	130,000	4,784.00
NE $\frac{1}{4}$ of SE $\frac{1}{4}$ of Sec. 24, 43-35, 40A	95,000	3,336.40	130,000	4,784.00
<u>Mineral Lands</u>				
NE $\frac{1}{4}$ of NE $\frac{1}{4}$ of Sec. 24, 43-35, 40A	2,000	70.24	2,000	73.60
NW $\frac{1}{4}$ of NE $\frac{1}{4}$ of Sec. 24, 43-35, 40A	1,600	56.19	1,600	58.88
NW $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 24, 43-35, 40A *	2,000	70.24	2,000	73.60
NW $\frac{1}{4}$ of SE $\frac{1}{4}$ of Sec. 24, 43-35, 40A	1,600	56.19	1,600	58.88
NE $\frac{1}{4}$ of SW $\frac{1}{4}$ of Sec. 24, 43-35, 25A	1,400	49.17	1,400	51.52
(Exc. Carlson's Maple Valley Add.)				
Lots in Carlson's Maple Valley Add.	1,005	36.02	1,005	36.91
Total	199,605	7,010.85	269,605	9,921.39
Collection Fees		70.11		99.21
Total City of Iron River		7,080.96		10,020.60
Paid in August, 1948		4,032.02		5,446.02
Paid in January, 1949		3,048.94		4,574.58
Total		7,080.96		10,020.60
Tax Rate		3.51190		3.680

\*The C.C.I. Co. paid the taxes on NW $\frac{1}{4}$  of NW $\frac{1}{4}$  of Sec. 24, 43-35 and billed the James Mining Co. for the amount of \$70.24 and \$.70 collection fee.



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10. TAXES (Cont.)

<u>Description</u>	<u>1948</u>		<u>1947</u>	
	<u>Valuation</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Taxes</u>
<u>Bates Township</u>				
<u>Spies East Deposit</u>				
Mineral Rights only in SW $\frac{1}{4}$ of Sec. 19, 43-34, 125.5 Acres	Leased to M.A. Hanna Co.	20,000	20,000	600.00
Collection Fees				6.00
Total Bates Township			20,000	606.00
Tax Rate				3.00

Note: Iron River Township and Village of Mineral Hills taxes are assessed on the same valuation.

11. ACCIDENTS AND PERSONAL INJURY

The accident frequency and severity rate was better than last year with two compensable accidents compared with three in 1947. There was a total of 33871 man days worked and the days lost on account of all injuries was 180 compared with 208 in the previous year. The favorable record from the standpoint of both frequency and severity was the best among the company's underground properties and the mine was awarded the safety banner for 1949. The following table shows a comparison of the severity and frequency rates:

	<u>Frequency Rate</u>	<u>Severity Rate</u>
1948	21.43	0.643
1947	33.97	0.785

Frequency Rate - Number of accidents per 1,000,000 man hours.

Severity Rate - Number of days lost per 1,000 man hours.

The following is a detailed description of the compensable accidents:

Accident No. 170, October 11, 1948, John Wojner, Miner. Wojner was using a pick to break and move a large chunk on the edge of the bench while his partner was barring the chunk at the same time. The loose dirt on the edge of the bench under his feet gave way causing him to lose his balance and fall about 45' onto the broken ore in the stope. Fracture of ulna of right arm and zygomatic bone - time lost to end of year - 69 days.

Accident No. 171, December 21, 1948, John Haapanen, Jr., Miner. As Haapanen was changing a drill in the machine a small chunk that dropped from the stope above struck the footwall and bounced onto the bench striking him on the shoulder. Contusion of right shoulder - time lost - 16 days.

12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

a. Surface

Erection of the new boiler house and the two small sheet metal structures on the east and north sides of the shaft house comprised the only new building construction. The usual erection of trestle at the close of the shipping season was also done and 18 bents were erected in the stocking area to the northwest of the shaft.

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

a. Surface (Cont.)

A portion of the mine water ditch was re-located to bypass the **Virgil** Location. About 1300' of new ditch was excavated along the north and west sides of the highway leading to the mine to re-route the mine water away from the residential area in the location and eliminate the need of maintaining flowage rights with a number of private property owners. About 700' of 24" concrete pipe was laid in a portion of the new ditch where it was necessary to excavate to a depth of 5' to 10' and this portion was then back-filled and the balance or approximately 600' is open ditch. Concrete throats were constructed at the intake and outlets ends of the pipe line and a man hole was constructed at a point in the line where a sharp turn occurs.

It is planned to remodel and enlarge the change house in 1949 to remedy the crowded conditions and provide modern facilities for the employees. Due to the larger labor force employed, conditions are very crowded in the present change house and the shower and toilet facilities are obsolete. It is also planned to provide an approved system of sewage disposal from this building. A small addition will be constructed to the north end of the change house to provide a separate change room for the surface employees and a new bosses' quarters and a lamp and check room is included in the plans.

b. Underground

The pumping capacity through the air shaft was increased by installing another pump at the bottom of the shaft and diverting additional water to this station by installing a pump on the 4th Level near the orebody. A dam was constructed in the drift leading to old No. 1 Stope and a part of the drift is utilized as a sump. Water draining from the north end of the orebody is collected in the sump and pumped to the 1330' Sub through a discharge line that was installed in a raise leading to this elevation. At the close of the year about 37% of the total mine water was being pumped to surface through the air shaft.

13. EQUIPMENT AND PROPOSED EQUIPMENT

There was a large amount of new equipment purchased and most of it was charged to operating. Early in the year when drifting was underway on the 6th Level another Model 21 Eimco Loader was purchased and the drill sharpener was equipped with accessories for fabricating the drill rods used with the carset bits. A substantial amount of new equipment was also purchased for stoping operations and these consisted mostly of new scraper hoists and drill machines. The following is a list of the important items of the new equipment added to the inventory:

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13. EQUIPMENT AND PROPOSED EQUIPMENT (Cont.)

<u>Item</u>	<u>Number</u>	<u>Cost</u>
Scraper Hoist, I.R. 25 MM 3C	1	\$ 2,671.00
Scraper Hoist, Joy CF211A 40 HP	1	3,933.00
Sludge Pump, CP-7	1	238.00
Motor Pump, 2MRV 40	1	933.50
Cameron Pump, 5B	1	704.54
Paving Breakers, PB6	2	560.00
Drill Machine, HC 23	2	1,245.00
Drill Machine, H 10	1	581.29
Fire Extinguishers, 2½ Gal. Anti-Freeze	11	205.55
Trane Unit Heaters	2	207.63
Transformers, 50 KVA	3	1,113.84
Reinforced Concrete Pipe, 24" Dia., 700'		2,002.00
Wrench Set	1	95.37
Chain Hoist, 1½ Ton	1	140.00
Eimco Loader, Model 21	1	4,444.57 (1)
Accessories to Drill Sharpener		298.30 (1)

(1) New Equipment charged to E & A cc-181

14. MAINTENANCE AND REPAIRS

a. Mine

Maintenance expense has continued to be high and a large portion of it was again confined to pumping. The difficult water conditions in the East Deposit makes it advisable to continue diverting a portion of the mine water to the pump station at the air shaft to lighten the load on the main pumps at the Spies shaft. Water that is draining from two of the old stopes above the 4th Level has become very acid and despite the fact that lime is being introduced as a neutralizing agent the water is very corrosive on pump parts. On this account it was necessary to equip these pumps with corrosive resistant parts and a new motor pump that is completely equipped to handle acid water was ordered late in the year. Maintenance on the main pumps, however, has been reduced by diverting the water through mud settling sumps near the orebody to settle out the gritty solids before it reaches these pumps. The settling sumps have been cleaned regularly each weekend to maintain the sumps clean and operating properly. Repairs to the main discharge line in the shaft were required on one occasion when a bad leak developed and it was necessary to cut out a section of pipe where the leak occurred and weld in a new section. Frequent trouble was experienced with the large belt breaking on the Aldrich Quintuplex pump since it was installed on the 6th Level in 1945. An extra heavy belt was purchased and also a new drive pulley for the motor and since then no further trouble has been experienced from this source.

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14. MAINTENANCE AND REPAIRS (Cont.)

a. Mine (Cont.)

There was less repair work required in the shaft due to the large repair program that was conducted in the previous year. Most of the shaft repairs were conducted during the vacation period and this work was confined mostly to installing new casing plank between the skip and cage compartments wherever wear or rot indicated weakness. Occasional replacement of worn out or damaged runners was made in both skip roads. A weekend shaft inspection program has been in effect throughout the year. During the vacation week some repairs were also made to the shaft loading pockets and this consisted of relining the pockets with new plate. The grizzly chute leading to the crusher was also repaired and a number of new manganese steel bars were installed.

There was more repair work on scraper hoists than last year due to the larger mining program. Most of the hoists are the 25 h.p. size and the smaller sized hoists that have been in service for many years now serve mostly as spares. Repairs to power drills have been small because a large number of new drill machines have been purchased in the past two years to replace worn out and obsolete machines. The Grandby type cars that are in use in the underground tram are requiring more maintenance and repairs and this work has consisted of overhauling the dumping mechanism and replacing worn out wheels and bearings.

There was very little repair work done on the surface buildings. Excepting the engine house and the dry house, the other surface buildings have deteriorated badly. The wood frame shop and office building will need to be replaced with a new structure in a short time. The present location of these buildings is very unsatisfactory due to their close proximity to the shaft and when construction of a new building is considered another location must be selected.

b. Location

The maintenance expense on the two dwellings in the location was slightly higher than last year and most of the cost was expended on interior decorating. The rooms on the first floor of the captain's house were wall-papered and the woodwork was painted and some minor repairs were made on the house occupied by the mine clerk. The following table shows the cost of maintenance on rented houses:

	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>	<u>1947</u>
Interior Decorating & Repairs	139.22	116.79	256.01	55.67
Sanitary Sewer Connection				192.59
Total	139.22	116.79	256.01	248.26

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15. ELECTRIC POWER

The mine was idle for one day due to lack of electric power. On Monday, August 2, there was a general shortage of electric power and all the mines in the district were idle because of a breakdown of one of the Wisconsin-Michigan Power Company's generating plants. There were several other interruptions in the power supply but these were of such short duration that they were of no consequence. The maximum demand and total power consumption was higher than last year due to the larger underground operation.

<u>Year</u>	<u>Average Maximum Demand</u>	<u>Rate Per K. W. H.</u>	<u>Total K. W. H.</u>	<u>Cost Per Ton</u>
1948	729	.0127	4,005,600	.226
1947	617	.0127	3,386,900	.260

16. WATER SUPPLY

There were no extensions or alterations made in the water mains. The water supply for the mine and the location has continued to be furnished by the Homer Mine.

17. CONDITION OF PREMISES

There have been no improvements made on the premises and it is difficult to maintain the grounds around the shop and office buildings in neat condition because the spillage from hoisting wet ore spreads in this area.

18. NATIONALITY OF EMPLOYEES

	<u>American Born</u>	<u>Foreign Born</u>	<u>Total</u>	<u>Percent</u>
Finnish	16	6	22	19
Polish	14	5	19	17
English	12	7	19	17
Italian	12	4	16	14
French	11	-	11	9
Swedish	8	1	9	7
Danish	6	-	6	5
German	1	2	3	3
Lithuanian	3	-	3	3
Austrian	-	2	2	2
Scotch	2	-	2	2
Irish	1	-	1 )	
Yugoslavian	1	-	1 )	2
Welsh	1	-	1 )	
Total	88	27	115	100

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1. GENERAL:

Mining operations at the Agnew Mine were carried forward throughout the entire year on a two-shift, six day a week basis, In addition to time lost on holidays, one week was lost in December, when mining operations were suspended for necessary repairs. An average of eleven gangs were employed, with nine slicing and two developing. From January 1st to April 3rd, ore was placed in stockpile. Loading direct into cars started on April 5th and continued until November 3rd, at which time stockpiling was resumed for the balance of the year. The stockpile was loaded out from April 7th to May 6th.

The Oliver Iron Mining Company completed stripping, and loaded ore intermittently during the shipping season from the Agnew-Hull line under cross-mining agreement. Butler Brothers, also operating under cross-mining agreement, continued stripping along the Agnew-South Agnew line and made one small shipment of ore encountered in this work.

2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES:

a. Production:

Agnew, -----	327,136 tons
Agnew-Hull, -----	79,781 "
Agnew-South Agnew-----	<u>5,635 "</u>
Total, -----	412,552 "

b. Shipments:

Agnew, -----	359,003 "
Agnew-Hull, -----	79,781 "
Agnew-South Agnew, -----	<u>3,142 "</u>
Total, -----	441,926 "

c. Stockpile Inventories:

Agnew, -----	23,856 "
Agnew-South Agnew, -----	<u>2,493 "</u>
Total, -----	26,349

d. Production by Months:

	<u>AGNEW</u>	<u>AGNEW-</u> <u>SOUTH AGNEW</u>	<u>AGNEW-</u> <u>HULL</u>	<u>TOTAL</u>
January,	21,768			21,768
February,	24,621			24,621
March,	26,451			26,451
April,	27,530		19,996	47,526
May,	33,628		10,607	44,235

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2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES:  
(continued)

d. Production by Months: (Continued)

	<u>AGNEW</u>	<u>AGNEW- SOUTH-AGNEW</u>	<u>AGNEW- HULL</u>	<u>TOTAL</u>
June,	27,744		31,312	59,056
July,	27,962		6,235	34,197
August,	24,233		1,873	26,106
September,	29,943		2,587	32,530
October,	38,436		7,171	45,607
November,	25,656	3,142	-	28,798
December,	19,164	2,493	-	21,657
<b>Total,</b>	<b>327,136</b>	<b>5,635</b>	<b>79,781</b>	<b>412,552</b>

f. Ore Statement:

The Oliver Iron Mining Company loaded for our account 79,781 tons of Agnew line ore, and Butler Brothers loaded 5,635 tons of line ore for our account.

3. ANALYSIS:

b. Tonnage & Analysis of Direct Ore Produced:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Moist.</u>	<u>Iron Nat.</u>
Agnew,	327,136	58.02	.048	8.76	.63	1.44	12.75	50.62
Agnew-Hull,	79,781	56.32	.053	9.44	.83	1.80	12.45	49.31
Agnew-South Agnew,	5,635	58.06	.046	10.91	.58	1.18	12.00	51.09
<b>Total,</b>	<b>412,552</b>	<b>57.69</b>	<b>.049</b>	<b>8.92</b>	<b>.67</b>	<b>1.51</b>	<b>12.68</b>	<b>50.38</b>

c. Tonnage & Analysis of Ore Shipped:

Agnew,	359,003	58.03	.048	8.62	.64	1.46	12.73	50.64
Agnew-Hull,	79,781	56.32	.053	9.44	.83	1.80	12.45	49.31
Agnew-South-Agnew-	3,142	58.00	.047	12.36	.54	1.13	10.85	51.71
<b>Total,</b>	<b>441,926</b>	<b>57.72</b>	<b>.049</b>	<b>8.80</b>	<b>.68</b>	<b>1.51</b>	<b>12.67</b>	<b>50.41</b>

d. Mine Analysis of Ore in Stockpile:

Agnew,	23,856	58.33	.047	8.44	.70	1.37	13.01	50.74
Agnew-South Agnew,	2,493	58.13	.045	9.08	.64	1.24	13.46	50.31
<b>Total,</b>	<b>26,349</b>	<b>58.33</b>	<b>.047</b>	<b>8.44</b>	<b>.70</b>	<b>1.37</b>	<b>13.01</b>	<b>50.74</b>

e. Complete Analysis of Shipments:

Agnew,	441,926	57.72	.049	8.80	.68	1.51	.34 Lime	
							.20 Mag.	
							.011 Sul.	
							5.52 Loss	

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4. ESTIMATE OF ORE RESERVES:

a. Factors Used:

	Cu. Ft. Per Ton Crude	% Recovery
Merch. Ore,	14	100.00

b. Ore Reserves:

	RESERVE 12-31-47	MINED 1948	BALANCE AFTER MINING	RESERVE 12-31-48
NE-NE $\frac{1}{2}$ 11,57-21	1,689,751	412,552	1,277,199	1,277,199

c. Analysis of Ore Reserves:

	Tons	Iron	Phos.	Sil.	Mn.	Al.	Moist.	Fe. Nat.
NE-NE 11,57-21	1,277,199	58.13	.053	8.21	.75	1.42	14.50	49.70

5. LABOR & WAGES:

a. Comments:

The labor supply was plentiful throughout the year, but there continued to be a shortage of experienced miners. However, a program of training miners was carried on continuously and no serious shortage was experienced. Labor relations with the Union were very good. There was a general wage increase in July.

b. Comparative Statement of Production and Wages:

Production:

Direct Ore, -----	327,136 tons
Number of Days Operated, -----	299
Average Daily Product (tons), -----	1,094.1
Average Number of Men Working, -----	95-1/2
Tons Per Man Per Miner, -----	24.47
Tons Per Man Total Underground, -----	15.43
Tons Per Man Total Mine, -----	11.52
Average Rate Per Day:	
Surface, -----	\$ 10.69
Underground, -----	\$ 13.82
Contract Miners, -----	\$ 14.53
Total Mine, -----	\$ 13.24
Amount Paid for Labor, -----	\$402,550.60
Labor Cost Per Ton, -----	\$ 1.230



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6. SURFACE:

a. Buildings, Repairs:

A program of light repairs, together with both interior and exterior painting of mine buildings, was carried on throughout the year. Two small buildings for equipment storage were constructed.

b. Roads, Transmission Lines, etc:

A new overhead transmission line was constructed from the mine to the deep-well pump in the South Agnew pit, to replace power cable.

7. UNDERGROUND  
MINING:

a. Shaft:

Minor repairs were made to the shaft timbers.

b. Development:

No extensive development. A few short drifts and raises were put in to open up blocks for mining.

c. Mining:

The regular method of mining was by top slicing, with an occasional gang sub-level caving, where conditions warranted this type of mining. Slices averaged 14 feet in height and from 10 feet to 12 feet in width. Pillars were mined back in an orderly manner on the various sub-levels. Operations all entailed the use of two tuggers with scrapers, one transferring ore from the slice and the second delivering ore to the chute for transfer to the main haulage level.

The Oliver Iron Mining Company completed stripping along the Agnew-Hull line and shipped 79,781 tons of Agnew ore, as per cross-mining agreement. It is expected this operation will be completed in 1949.

During October, two gangs were engaged in scrambling ore, with tuggers and scrapers, from the pillars which the Oliver were unable to recover with shovel and rail haulage.

Butler Brothers stripped intermittently along the Agnew-South Agnew line, preparatory to mining Agnew ore from this area on a cross-mining agreement. A total of 5,635 tons of ore was produced from this operation, with 3,142 tons shipped and 2,493 tons placed in stockpile.

d. Timber, Explosives, etc:

Although the cost of timber increased over previous year, the supply was ample and of good quality.

Lineal feet timber used per ton of ore produced,	0.860
Cost per ton for timber, lagging, poles, boards and wire	\$0.267
Cost per ton for Explosives,	\$0.082

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7. UNDERGROUND  
MINING:  
(Continued)

e. Pumping and Drainage:

Pumping cost of \$0.175 per ton for the year continues high at this property, due to workings being below both Oliver Iron Mining Company and Butler Brothers' pit operations and making it necessary for the Agnew Mine to handle all drainage in this area. In addition to pumps in the Agnew Mine, it was also necessary to operate a 1,500 gallon per minute deepwell pump in the South Agnew shaft in order to hold the water level in this property below the gangs working along the south side of the Agnew. Due to Butler Brothers' stripping operations in the South Agnew property, it was necessary, twice during the year, to remove this pump and re-install it at a lower elevation. During one of these changes, the pump was completely overhauled.

8. COST OF  
OPERATION:

a. Comparative Cost Statement:

	1948 <u>BUDGET</u>	1948 <u>COST PER TON</u>	1947 <u>COST PER TON</u>
<u>Product:</u>			
Direct Ore,	323,000	327,136	198,519
<u>Underground Costs:</u>			
Exploring in Mine,	\$ .015	\$ .018	\$ -
Stoping,	.720	.762	.733
Timbering,	.390	.338	.399
Tramming,	.130	.129	.137
Ventilation,	.012	.010	.014
Pumping,	.220	.175	.223
Compressors & Air Pipes,	.030	.025	.031
Underground Superintendence,	.050	.054	.060
Maint. Compressors and Power Drills,	.012	.018	.011
Maint. Scrapers & Mechanical Loaders,	.035	.050	.044
Maint. Tramming Equipment,	.010	.021	.024
Maint. Pumping Machinery,	<u>.025</u>	<u>.029</u>	<u>.022</u>
Total Underground Costs,	\$ 1.649	\$ 1.629	\$ 1.698
<u>Surface Costs:</u>			
Hoisting,	\$ .050	\$ .041	\$ .046
Stocking Ore,	.015	.020	.020
Dry House,	.040	.045	.041
General Surface Expense,	.025	.039	.052
Maintenance Hoisting Equipment,	.006	.005	.005
Maintenance Shaft,	.005	.006	.022
Maintenance Top Tram Equipment,	.001	.001	.001
Maintenance Docks, Trestles & Pockets,	.001	.001	.001
Maintenance Mine Buildings,	<u>.001</u>	<u>.002</u>	<u>.000</u>
Total Surface Costs,	\$ .144	\$ .160	\$ .188

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8. COST OF  
OPERATION:  
(Continued)

a. Comparative Cost Statement: (Cont'd)

	1948 BUDGET	1948 COST PER TON	1947 COST PER TON
<u>General Mine Expense:</u>			
Geological	\$ .001	\$ .002	\$ .001
Mining Engineering	.025	.013	.027
Mechanical & Electrical Engineering	.002	.007	.003
Analysis and Grading,	.015	.013	.012
Safety Department,	.006	.006	.006
Telephones & Safety Devices,	.005	.005	.005
Special Expenses,	.005	.004	.005
Ishpeming Office,	.000	.004	.001
Mine Office,	.080	.070	.089
Insurance,	.009	.014	.011
Personal Injury,	.015	.031	.004
Social Security Taxes,	.023	.023	.023
Employees Vacation Pay,	.040	.028	.036
Hibbing Office,	.009	.018	.006
<b>Total General Mine Expense,</b>	<b>\$ .235</b>	<b>\$ .238</b>	<b>\$ .229</b>
<b>Cost of Production,</b>	<b>\$ 2.028</b>	<b>\$ 2.027</b>	<b>\$ 2.115</b>

The cost of production for 1948 was \$0.001 lower than the budget and \$0.088 lower than the 1947 cost. The decrease from the budget was only nominal and a decrease from the 1947 costs, due to greatly increased production.

"Total Underground Costs" were \$0.020 lower than the budget and \$0.069 lower than the 1947 cost per ton. Practically all items under this caption were lower. "Maintenance" was higher than both the budget and 1947, due to considerable repair work necessary on run-down equipment.

"Total Surface Costs" were \$0.016 higher than the budget and \$0.028 lower than the 1947 costs. These differences were only nominal and were distributed throughout the various items making up this caption.

Under the caption "General Mine Expense", the 1948 cost per ton was \$0.003 higher than the budget and \$0.009 higher than the 1947 cost. The increase over the budget was slight and spread generally throughout the various items. The increase over 1947 costs was mostly in items "Personal Injury" and "Hibbing Office".

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9. MAINTENANCE  
& REPAIRS:

A continuous program of maintenance and repairs was carried on throughout the year. All operations were suspended for one week in December to allow for drift repairs and overhaul of air compressor. During the year, practically all heavy equipment was completely overhauled.

10. EXPLORATION  
AND FUTURE  
EXPLORATION:

A drilling program was started on June 25th, with the E. J. Longyear Company drilling under contract, to check the ore in the south end of the mine, below the main level, and on the east side of the fault zone. Two holes were drilled, one for 156 feet and the other, 150 feet. No conclusive information had been obtained when drilling was temporarily suspended on August 21st, as drillers were required on another job. It is expected this program will be continued in 1949, when drill crew is available.

11. TAXES:

The following is a statement of the taxes for the years 1948 and 1947:

	<u>1948</u>	<u>1947</u>	<u>Increase</u>	<u>Decrease</u>
Agnew Mine,	\$19,248.94	\$19,153.01	\$ 95.93	
Personal Property,	<u>496.93</u>	<u>366.02</u>	<u>130.91</u>	
Total,	\$19,745.87	\$19,519.03	\$226.84	
Average Tax Rate,	84.04	86.07	2.03	

The figures shown for taxes on mineral valuation are not comparable, as those for 1947 represent only 5/6ths of the total. The International Harvester Company paid 1/6th of the 1947 taxes.

The Personal Property tax for 1948 includes tax on stockpiled ore amounting to \$201.86. There was no tax on stockpiled ore in 1947.

The reduced tax rate of 84.04 mills in 1948, as compared to 86.07 mills in 1947, is accounted for by the fact that the County rate is down, and, also, a generally increased mineral valuation in connection with per capita limitation for levying taxes, has the effect of lowering the mill rate.

12. ACCIDENTS AND  
PERSONAL INJURY:

There were eight lost-time accidents at this property during the year 1948 and these are described as follows:

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12. ACCIDENTS AND  
PERSONAL INJURY:  
(Continued)

Alvin Stone, Skiptender. Injured February 15th. Stone was shoveling track, when he felt a sharp pain in his back.

Paval Lulich, Miner. Injured February 10th. Lulich was on a ladder, about to trim the back off the cap timber; he lost his balance and jumped down, landing hard on his right Achilles tendon.

Frank Ruperich, Surface Timber Framer and Carpenter. Injured June 24th. Was engaged in rolling timber up on pile, using a hand hook. While in the act of getting a new hold with hook, he would hold timber with his left leg from the knee down. Over a period of a few months doing this, his left leg became bruised.

Joe Minerich, Company Account Miner. Injured July 26th. Minerich was walking from the open pit into the underground drift with a jackhammer and hose, and slid down approximately four feet into a raise with hackhammer and hose, injuring his right wrist.

Ray Atkinson, Miner. Injured August 12th. Injured party was lifting a cap and felt a pain in his right side. Examination showed indirect right inguinal hernia.

Joe Talarico, Miner. Injured July 17th. Talarico was stepping down from a ladder and his foot slipped off a rung; his right knee struck a rung of the ladder, bruising same.

Fred McBride, Miner. Injured October 22nd. The miners were pulling dirt on the back pole and the backpole slid out and dropped down approximately 1/2 foot from the breast. McBride held the back pole until his partner dug a lower hitch. When the new hitch was made they tried to slide the back pole into the hitch. Some chunks of dirt, approximately one-half car, came down, bringing that section of the back with it, catching McBride and covering him to the waist.

John Wirtanan, Skiptender. Injured September 18th. Was using a pick to pry on a car back to its normal position. The box being stuck to one side, when the pick slipped, and the handle of the pick struck him on the ribs of left side.

14. EQUIPMENT RECEIVED  
AND PROPOSED  
NEW EQUIPMENT:

The following equipment was purchased and put into use during the year:

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14. EQUIPMENT RECEIVED  
AND PROPOSED  
NEW EQUIPMENT:

- 4 - RB-12 Jackhammers
- 2 - 22KW Woodborers
- 4- Sullivan 15 H.P. Double-Drum Tuggers
- 2 - 15 H.P. Blowers
- 1 - 100 KW Motor-Generator Set (used)
- 1 - MSA Electric Cap Lamp Installation (Lease)

Proposed New Equipment

- 1 - I-4 International Tractor
- 4 - 15 H.P. Double-Drum Tuggers

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1. GENERAL:

A regular cycle of operations was carried forward throughout the year. The stripping program, which was in progress at the end of 1947, was continued until January 17th. Operations were then suspended and the equipment moved to the shops for repairs.

During the winter months, a repair program was conducted on a 5-day per week basis, overhauling mining and pit equipment which had not previously had a thorough overhaul. During the same period, a pan feeder and a crusher was installed in the pit screening plant.

Stockpile loading was started on April 10th and the entire pile of 41,890 tons was loaded for shipment by the 29th. Pit operations got underway late in April on a 3<sup>rd</sup> shift, 5-day per week basis. Ore was mined when haulage conditions in the pit bottom permitted and the material was either shipped or stocked.

Stripping operations in the pit extension were conducted during the wet periods in order to keep the operating crews employed and to avoid as much of the costly winter stripping as possible. Alternating mining and stripping on the above basis was carried forward until the end of the shipping season. At times during the season it was necessary to load from stockpile to meet boat requirements.

Immediately after the ore season, surface stripping operations in the pit extension to the southeast were stepped up to a 20-shift per week basis and continued through the balance of the year.

In the pit, during September, the screening plant and the lower section of the conveyor system were dismantled. The latter had to be abandoned after a rock slide on the north side of the pit in September. In the pit bottom, a partial sump and a drainage ditch were excavated in order to afford drainage for the 1949 operations. The ore removed in this operation was stocked on the aluminumiferous stockpile.

2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES:

a. Production by Grades:

Atkins-Merritt, -----	30,204 ✓ tons
Atkins Extension Lease, -----	453,501 ✓ "
Total, -----	483,705 ✓ "

b. Shipments:

Atkins-Merritt, -----	30,204 ✓ "
Atkins Extension Lease, -----	443,833 ✓ "
Total, -----	474,037 ✓ "