CAMBRIA-JACKSON MINE
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1. GENERAL:

The Cambria-Jackson Mine operated on a six-day-per-week schedule throughout 1951. The total number of operating days amounted to 293, compared with 268 in 1950. As a result of two strikes by the United Steelworkers (C.I.O.), the mine did not operate from June 11th to 14th (4 days), and from July 3rd to 12th (8 days). The total tonnage produced in 1951 amounted to 353,394, compared with 445,071 tons in 1950. Considering the large amount of development work completed in 1951, it becomes apparent why the production was below that of 1950. The average production per day amounted to 1,205 tons in 1951, compared with 1,670 tons per day in 1950. There was a considerable decrease in tons per man per day, 5.93, as compared with 7.66 in 1950.

The large decrease in production was the result of three factors, two of which were totally unexpected. The first was the result of an unusually large amount of rock development, which is explained below. The second, the large amount of water entering the East Deposit where seven mining places were located. The third, an unexpected reduction in the size of the ore areas in the East Deposit and Fifth Level Cambria Deposit.

The main development work on the 8th Level was almost totally completed in 1951. The main level drift to the east, including two crosscuts, was finished in August. The west drift was completed by making a connection to the Mather Mine, "A" Shaft, in September. The total amount of main level drifting amounted to 2,600 feet, in addition to the advancement of twelve raises. At times, it was necessary to have as many men on development work as were mining above the 7th Level. Mining operations were started as soon as working places were available to such an extent that, by October, 64% of the total production was coming from the 8th Level.

The second factor causing the reduced production was the result of an unusually large amount of surface water entering the most productive working areas in the mine. The inflow during the spring months was almost double the normal pumping rate. It was necessary to move four of the seven producing contracts and put them on development work.

The third factor was the result of a pronounced reduction in the ore areas in the 5th Level Cambria Orebody, as well as the East Deposit. In the case of the former, the ore outline was reduced to less than half its normal expected size. In the East Deposit the reduction was considerably greater, due to extremely hard jasper intrusions protruding from the east footwall.

In general, conditions during 1951 were unfavorable, and a considerable amount of the reduced production was totally unexpected.

2. PRODUCTION SHIPMENTS & INVENTORIES:

a. Production by Grades:

	1951	1950	Increase	Decrease
Cambria Lease	21,631	36,031	-	14,400
Jackson Strip	331,763	409,040	-	77,277
Total Ore	353,394	445,071	-	91,677
Rock	41,412	11,944	29,468	-
Total Hoist	394,806	457,015	-	62,209

The above figures include a stockpile overrun of 10,307 tons.

2. PRODUCTION SHIPMENTS & INVENTORIES: (CONT'D)

b. Shipments:

	Pocket Tons	Stockpile Tons	Total Tons	Total Tons Last Year
Cambria Lease	11,533	15,793	27,326	31,412
Jackson Strip	180,106	168,676	348,782	415,874
Total 1951	191,639	184,469	376,108	447,286
Total 1950	258,194	189,092	447,286	-
Decrease	66,555	4,623	71,178	-

Shipments decreased 15.9% in 1951, and were 22,714 tons more than the product for the year. On December 31st, 1951, there were 39,562 tons remaining in stock.

c. Stockpile Inventories:

	Dec. 31, 1951	Dec. 31, 1950	Decrease
Cambria Lease	-	5,695	5,695
Jackson Strip	39,562	56,581	17,019
Total	39,562	62,276	22,714

d. Division of Product by Levels:

	1951	Percentage	1950	Percentage
6th Level	21,631	6.12	36,031	8.10
7th Level	239,564	67.79	409,040	91.90
8th Level	92,199	26.09	-	-
Total	353,394	100.00	445,071	100.00

e. Production by Months:

Month	Cambria Lease	Jackson Strip	Total Ore	Rock
January	5,211	35,162	40,373	3,408
February	2,775	32,941	35,716	4,092
March	1,140	30,030	31,170	6,008
April	708	23,839	24,547	5,956
May	1,464	21,857	23,321	4,780
June	2,962	18,539	21,501	4,236
July	2,524	13,079	15,603	3,156
August	1,911	27,177	29,088	3,296
September	1,865	29,370	31,235	2,268
October	188	29,861	30,049	1,988
November	-	29,691	29,691	1,164
December	-	30,793	30,793	1,060
	20,748	322,339	343,087	41,412
Overrun	883	9,424	10,307	-
Total 1951	21,631	331,763	353,394	41,412
Total 1950	36,031	409,040	445,071	11,944
Increase	-	-	-	29,468
Decrease	14,400	77,277	91,677	-

f. Ore Statement:

	Camb.Lease	Jack.Strip	Tot.1951	Tot.1950
On hand Jan. 1, 1951	5,695	56,581	62,276	64,491
Output for year	20,748	322,339	343,087	440,091
Overrun	883	9,424	10,307	4,980
Total	27,326	388,344	415,670	509,562
Shipments	27,326	348,782	376,108	447,286
Bal. on hand Dec. 31, 1951	-	39,562	39,562	62,276
Increase in output	-	-	-	14,235
Decrease in output	15,103	81,901	97,004	-
Increase in ore on hand	-	-	-	31,470
Decrease in ore on hand	5,695	17,019	22,714	

2. PRODUCTION SHIPMENTS & INVENTORIES: (CONT'D)

Days per Week Operating:

1951 - Six 2-8 hour shifts, 1-1-51 to 12-31-51.

1950 - Five 2-8 hour shifts, 1-1-50 to 8-28-50.
- Six 2-8 hour shifts, 8-28-50 to 12-31-50.

1949 - Six 2-8 hour shifts, 1-1-49 to 6-27-49.
- Five 2-8 hour shifts, 6-27-49 to 12-31-49.

g. Production or Mechanical Delays:

There were no delays under this caption during 1951.

h. Delays due to Lack of Current:

10-30-51, 1 hour delay - Loss of Product - 100 tons.
Power failure.

3. ANALYSIS:

a. Average Mine Analysis on Output:

Grade	Tons	Iron	Phos.	Silica	Sulphur
Cambria-Jackson	353,394	57.90	.091	9.70	.128

b. Average Mine Analysis on Straight Cargoes:

All ore shipped was mixed with other grades.

4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:

Assumption: 12.00 cubic feet equals one ton.
10% deduction for loss in mining and rock.

Percentage of Bessemer: None.

	Standard Ore				Sulphurous Ore	
	Negaunee		Ishpeming		Negaunee	Ishpeming
Area	Cambria Lease	Jackson Strip	Jackson Strip	Total	Jackson Strip	
Bet.5th&6thLev.-Dep.#1	6,823			6,823		
Bet.6th&7thLev.-Dep.#2		271,606		271,606	99,860	
Bet.6th&7thLev.-Dep.#3			692	692		
Bet.6th&7thLev.-Dep.#4						96,324
Bet.7th&8thLev.-Dep.#2		25,938		25,938	229,979	
Bet.7th&8thLev.-Dep.#3			5,625	5,625		
Bet.7th&8thLev.-Dep.#4						291,759
Gross as of July 31, 1951	6,823	297,544	6,317	310,684	329,839	388,083
Less August Production	1,911	16,000		17,911	4,000	7,177
Gross as of Aug. 31, 1951	4,912	*281,544	6,317	287,861	325,839	380,906
Less Prod.(Sept., Oct., Nov. & Dec.)	2,053	38,580		38,580	44,715	36,420
Gross as of Dec. 31,1951	2,859	242,964	6,317	249,281	281,124	344,486
Less 10% for Mng.&Rock	491	28,154	632	28,786	32,584	38,091
Net Tot.as of Dec.31,1951	2,368	*214,810	5,685	220,495	248,540	306,395

*Cambria reserves exhausted. Mining completed 11-1-51. Not included in total tons.

b. Total Developed Ore:

	Cambria Lease	Jackson Strip	Total
1951 Estimate	-	220,495	220,495
1950 Estimate	10,156	327,663	337,819
Decrease	10,156	107,168	117,324

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4. ESTIMATE OF ORE RESERVES: (CONT'D)

b. Total Developed Ore: (Cont'd)

The ore estimate of the Cambria-Jackson Mine, including the Cambria Lease and the Jackson Strip, is divided between the City of Negaunee and the City of Ishpeming limits. The estimate is also divided into standard and high-sulphur grades, as indicated by exploratory drifting and diamond drilling. The amount of ore developed during the course of mining operations, where the outline of the ore was found to be greater than originally anticipated, amounted to approximately 236,000 tons. To obtain the amount of ore developed in 1951, the estimated decrease in reserves of 117,324 tons is deducted from the 1951 production of 353,394 tons.

It should be mentioned that, in previous years, the estimated reserves have been divided between standard and special grade. This is due to the fact that there was a fairly common horizon, above which standard was found, and below, for the most part, special ore was encountered. In subsequent reports these estimates will include one grade, inasmuch as only a single grade is produced.

c. Expected Average Natural Analysis:

Grade: Non-Bessemer Trade Name: Cambria-Jackson

Tons	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moisture
220,495	51.23	.080	8.79	.17	2.48	.50	.18	.052	2.12	12.53

Grade: Non-Bessemer Trade Name: Cambria-Jackson Special

Tons	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moisture
554,935	52.50	.105	6.56	.11	2.44	.61	.44	.224	1.69	12.50
775,430										

d. Ore in Stock: Average Natural Analysis:

Tons	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moisture
39,562	49.60	.083	9.32	.26	2.61	.56	.44	.168	2.32	12.90

5. LABOR AND WAGES:

a. Comments:

The relationship between the mine management and the union was, for the most part, satisfactory during the year. There was one grievance early in January, involving a young employee with few years of service and no mining experience versus two admittedly experienced miners, who had less seniority at this particular property but considerably more in other bargaining units. This grievance went through step 4, and was ultimately dropped in June after the aggrieved employee was assigned to a mining contract. This grievance could no doubt have been terminated sooner, if conditions at the mine were such that additional mining places were being opened. On the contrary during the late spring period, as previously mentioned, more miners were available than places for them.

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5. LABOR AND WAGES: (CONT'D)

a. Comments: (Cont'd)

There was no general wage increase during the year, although 8½¢ per hour was held in reserve for various employees pending the completion of the hourly rate equalization study. The general wage scale of contract miners continued high, due to the amount of development work as well as the fact that the production wage scale has always been slightly higher than those of other mines, because of the general setup in 1943 when the Republic Steel Corporation relinquished the mine.

There were 222 men on the payroll December 31st, 1951, as compared with 220 men on December 31st, 1950. There were no apparent shortage of men during the year, although some separations were the result of the inability of new employees to find adequate housing. It should also be mentioned that a large part of the labor turnover was the result of hiring college men during the summer months. These men made excellent workmen and often have a favorable effect on the working habits of regular employees.

The following is a compilation of accessions and separations:

Accessions:	
Straight hires	43
Temporary hires	10
Transferred from Athens Mine	1
Transferred from General Roll	1
Total	55
Separations:	
Accepted other employment	16
Transferred to Mather Mine, "B" Shaft	11
Returned to school (temporary hires)	11
Failed to return to work after being notified	2
Retired	2
Enlisted in Army Air Corps	2
Quit due to illness	2
Discharged	2
Transferred to General Roll	1
Deceased	1
Enrolled at U.S.Maritime Service School	1
Transferred to Maas Mine	1
Transferred to General Storehouse	1
Total	53

b. Comparative Statement of Wages and Product:

	1951	1950	Increase	Decrease
Product:	353,394	445,071	-	91,677
No. Shifts and Hours 1-8	1	3	-	2
2-8	292	265	27	-
Total	293	268	25	-
Average No. Men Working:				
Surface	51	54	-	3
Underground	153	165	-	12
Total	204	219	-	15

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5. LABOR AND WAGES: (CONT'D)

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

	1951	1950	Increase	Decrease
Average Wages per Day:				
Surface	13.64	11.51	2.13	-
Underground	15.42	13.39	2.03	-
Total	14.98	12.93	2.05	-
Average Wages per Month:				
Surface	329.87	254.15	75.72	-
Underground	376.74	296.24	80.50	-
Total	365.02	285.86	79.16	-
Product per Man per Day:				
Surface	23.88	31.10	-	7.22
Underground	7.88	10.16	-	2.28
Total	5.93	7.66	-	1.73
Labor Cost per Ton:				
Surface	.571	.370	.201	-
Underground	1.957	1.318	.639	-
Total	2.528	1.688	.840	-
Average Product Mining:				
Stoping	27.07	25.72	1.35	-
Development in Ore	8.87	10.28	-	1.41
Total	24.74	24.54	.20	-
Average Wages Contract Labor:	15.97	14.82	1.15	-
Total Number of Days:				
Surface	14,798	14,307	491	-
Underground	44,843	43,801	1,042	-
Total	59,641	58,108	1,533	-
Amount for Labor:				
Surface	201,881.56	164,687.20	37,194.36	-
Underground	691,699.43	586,551.54	105,147.89	-
Total	893,580.99	751,238.74	142,342.25	-
Avg.Wages per Mo.as per Labor Statement-Less Captain and Clerks:				
Surface	331.54	252.89	78.65	-
Underground	375.74	294.99	80.75	-
Total	365.30	285.15	80.15	-

Proportion of Surface to Underground Men:

1951 - 1 to 3.00
- Six 2-8 hour shifts, 1-1-51 to 12-31-51

1950 - 1 to 3.06
- Five 2-8 hour shifts, 1-1-50 to 8-28-50
- Six 2-8 hour shifts, 8-28-50 to 12-31-50

1949 - 1 to 3.44
- Six 2-8 hour shifts, 1-1-49 to 6-27-49
- Five 2-8 hour shifts, 6-27-49 to 12-31-49

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5. LABOR AND WAGES: (CONT'D)

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

Note:	1951	1950
Proportion of Vacation Pay for Surface	6,407.56	5,000.00
Proportion of Vacation Pay for Underground	24,732.64	19,698.50
Total	31,140.20	24,698.50

6. SURFACE:

a. Buildings:

There were no major alterations or changes in the general surface plant during the year. For the most part, all buildings were maintained and are in good condition. Major changes have been reduced to a minimum, due to the more or less limited life of the mine.

b. Ore and Rock Trestles:

For the fourth consecutive year it has been possible to maintain the two east ore trestles without dismantling during the shipping season.

In November, it was necessary to move a considerable portion of the rock pile in order to realign and repair the rock trestle, providing additional room for rock storage.

c. Railroad Tracks:

There was no change in the general railroad track layout on the mine property.

d. Fences and Caves:

During the year all fences, enclosing the caved ground south and west of the shaft, were inspected and repaired.

7. UNDERGROUND:

a. Shaft Sinking:

There was no sinking carried on in the main shaft during 1951.

b. Development:

The following table gives a comparison of the total footage of drifting and raising in ore and rock in 1951 and 1950:

	Drifting		Raising		Grand
Year	Ore	Rock	Ore	Rock	Total
1951	6,060'	3,637'	4,493'	790'	14,980'
1950	8,566'	1,356'	4,938'	119'	14,979'
Increase	-	2,281'	-	671'	1'
Decrease	2,506'	-	445'	-	-

Practically all the rock development and most of the ore development were performed in connection with the 8th Level. The remaining footage was the result of driving ore and rock ventilation and traveling connections, near active mining operations.

7. UNDERGROUND: (Cont'd)

c. Stoping:

(1) General:

At the end of 1951 there were 19 active contracts in operation, compared with 18 in 1950. However, in July the total number amounted to 14, of which 7 were carrying on rock or ore development. During the last nine months an average of approximately 40% of the active contracts were developing.

Mining operations were resumed in the extreme West Deposit near the middle of the year, after this area had been dormant for approximately two years. The ore in the West Deposit is considerably harder than that of the East or Central Deposits, and is mined by a combination of sublevel caving and stoping. The entire West Deposit is also totally high-sulphur, with the result that the sulphur content of output depends directly on the number of mining places located in this area.

An unfavorable mining condition, which has always existed at the Cambria-Jackson Mine, is the need of mining adjacent to or along various dikes, particularly in the East Deposit. During the year ore was mined adjacent to eight dikes of varying size and direction. Frequently, it is very difficult to keep the grade up while mining under these conditions, particularly if the dike is pitching at a relatively flat angle.

As previously mentioned, the East Deposit has been greatly reduced in size as mining has continued downward. Some loss of ore can be attributed to the fact that on one sub normal conditions exist while on the lower sub jasper horses and dikes prevent mining, despite the fact that a portion of the 25-foot sublevel distance may be merchantable ore.

The practice of taking down timber, steel sets, and other supplies was continued throughout 1951. Due to the large amount of rock from development, it was necessary to hoist rock on all three shifts. During the year several contracts were put on an intermittent 3-shift schedule, when regular mining areas were not available.

The location and number of mining contracts at the end of 1951 as compared with 1950, are as follows:

Location of Contracts	December 31st, 1951	December 31st, 1950
Sixth level and above		
Fifth level	-	2
Seventh level and above		
60' sublevel	-	2
25' sublevel	-	3
10' sublevel	2	-
00' sublevel	2	-
-25' sublevel	-	3
-80' sublevel	-	4
Seventh level	4	3
Eighth level and above		
-115' sublevel	6	-
-140' sublevel	3	-
-165' sublevel	1	-
Eighth level	1	1
Total	19	18

7. UNDERGROUND: (CONT'D)

c. Stoping: (Cont'd)

(1) General: (Cont'd)

Occupation of contracts was as follows:

	Dec. 31st, 1951	Dec. 31st, 1950
Sublevel caving, or developing for sublevel caving	9	6
Drifting	3	8
Developing	6	2
Repairing	1	2
Total	19	18

(2) Detail of Stoping:

Cambria Lease:

Sublevels above the 6th Level:

5th Level Orebody:

The 5th level Cambria ore deposit, which was developed late in 1948, was mined to the 5th level elevation, 428 feet, in 1950. A very distinct reduction in size occurred at this elevation. Subsequent development of the 400-foot sublevel in 1951 proved an extension approximating the 5th level in size, and further development to the 370-foot sublevel showed the orebody to bottom at that elevation. This was a rather disappointing discovery, and seemed somewhat premature according to information available up to that point.

In 1951, 21,631 tons were mined, making a total of 65,232 tons of production in 1948, 1949, 1950, and 1951. This total came within 977 tons of our estimate of 64,255 tons. Mining operations in this area were completed in October, with the result that the last known available ore in the Cambria Lease has been mined.

Jackson Strip:

Sublevels above the 7th Level:

6th Level Pillar:

The orebody known as the 6th Level Pillar, or East Deposit, was mined during the year by 5 contracts, commencing on the 35-foot sublevel and extending to the 10-foot sublevel in the extreme south portion, to the 00-foot sublevel in the central portion, and to the -50-foot sublevel in the east portion.

The East Deposit is bounded on the west side by a dike, which strikes to the southwest. Below the 35-foot sublevel, a sizeable body of jasper was found to lie along this dike. The same was found to be the case upon exploring along two of the minor dikes, which branch to the east through the central portion of the orebody. These branch dikes are of a vacillating nature, and cannot be depended upon to follow a regular pattern. As a consequence, this encroaching jasper along the dikes plus the south-dipping jasper footwall to the north, have caused the ore area to decrease at an alarming rate. The present trend indicates that the ore north of the 7th Level will bottom at approximately the -60-foot elevation.

Generally speaking, the mining conditions have become more difficult with each succeeding sublevel. This has been caused by a great increase in water plus a marked tendency of the ore to become harder to drill and have a nature unsuitable to stoping, making a caving method of mining mandatory.

7. UNDERGROUND: (CONT'D)
c. Stoping: (Cont'd)
(2) Detail of Stoping: (Cont'd)

Jackson Strip: (Cont'd)

Sublevels above the 7th Level: (Cont'd)

6th Level Pillar: (Cont'd)

During mining operations east of Raise No. 774 on the 10-foot sublevel, indications of ore were found south of the dike which runs east from Raise No. 774. This area will be explored early in 1952 to ascertain the extent of the ore.

Central Deposit:

The Central Deposit was mined during 1951 by 3 contracts. Mining was carried out on the -80-foot sublevel from Raise No. 773 and Raise No. 717, and from top-timber cutouts in No. 730 Crosscut.

Generally speaking, the mining conditions in this deposit were favorable except for the ever-increasing water problem in the area, especially near No. 770 Crosscut. Continued mining has shown the jasper footwall to continue, decreasing the ore area because of its flattening as it dips to the south.

South Deposit:

Mining in the South Deposit took place on the -80-foot sublevel. Both sublevel caving and sublevel stoping methods were employed. All operations on the -80-foot elevation have been completed, and further development in this area will be done from the 8th Level.

7th to 8th Level Development:

In January, two headings were begun from the 8th level pocket station. One of these drifts extends to the east and terminates at the main north-south dike, which forms the west boundary of the 6th level pillar. Two crosscuts turn off from this drift and extend south to a point, comparable to the above 7th level workings in southing extension. This east drift and its crosscuts, No. 820 and No. 830, underlie the Central Orebody, which has been mined to approximately the -80-foot elevation, about 20 feet above the 7th Level. The east drift was driven almost entirely in slate and jasper. The only ore encountered at the level elevation, -190 feet, was a small portion in Crosscut No. 820.

The area from the 8th Level to the -80-foot elevation has been divided into four sublevels for mining, the -165', -140', -115', and 7th level elevations. The top mining elevation, over Crosscut No. 820, is the -115-foot sublevel. Two raises, No. 821 and No. 823, extend from Crosscut No. 820 to the -115-foot elevation, under the west half of the Central Deposit. The raises are connected by a transfer which runs to Crosscut No. 730, where a short raise from the transfer to the crosscut affords a route for travel and ventilation. Two crosshaul caving drifts have already been completed to the west off this transfer, and two more to the east are nearing exhaustion. The crosshauls north of Raise No. 821 have had excellent ore for sublevel caving. The two crosshauls off Raise No. 823 have had extremely hard ore, hard to drill and hard to cave. This, along with excessive water, has made production in this particular area very difficult.

In Crosscut No. 830, Raise No. 834 was put up under the South Deposit to the 7th level elevation. The raise was in rock until the 7th Level was reached. This would indicate that the ore might not extend to depth in the South Deposit.

7. UNDERGROUND: (CONT'D)
c. Stoping: (Cont'd)
(2) Detail of Stoping: (Cont'd)

Jackson Strip: (Cont'd)
Sublevels above the 7th Level: (Cont'd)

7th to 8th Level Development: (Cont'd)

Raise No. 832 in Crosscut No. 830, and Raise No. 808 near the east end of the main drift, were put up to the -140-foot sublevel, and connected by a transfer which lies at the bottom of the Central Deposit. From this transfer, raises have been put up to the 7th level elevation, and through these raises the east half of the Central Deposit will be mined.

The second heading from the 8th level pocket station was the west main drift, which was driven due west to a point just short of the Jackson Strip west property line. From a point near the end of this drift a small travel drift and ventilation drift was driven to the northwest, and connected with the ventilation raise from the Mather Mine, "A" Shaft.

The west drift was entirely in slate and jasper, requiring timber throughout, as was the case in the east drift. All "timber" consisted of 4" WF steel sets.

Two raises, No. 851 and No. 853 on the 8th level west, were put up to the -115-foot elevation under the ore area near Crosscut No. 750 on the 7th Level. The raises are connected by a transfer, from which several crosshauls have been completed. Three raises, No. 854, No. 856 and No. 858, have been put up from the 8th Level to the -115-foot sublevel. These raises are under the West Deposit proper. The ore was intersected at approximately 45 feel over the level. Eventually the raises will be connected by transfers, and short raises up from these transfers to the 7th level elevation will provide for mining of the West Deposit. Operations off Raise No. 854 on the 7th Level have already begun, with two crosshauls nearing exhaustion.

Generally speaking, the mining conditions in the West Deposit have been highly unfavorable in the initial stages. The ore, though easy to drill in some areas, has a tendency to break into very large pieces, necessitating much chunk breaking in the transfers. In other areas, the ore is hard to drill and has no good caving characteristics. Two contracts, off Raise No. 854, have ore that is of such a nature that the maximum amount of effort has produced an average of approximately 15 cars per shift. The ore breaks into very large pieces, which must be reduced by secondary blasting.

Except for some minor difficulties which have been worked out, the conveyor system is operating satisfactorily. Both wet and dry ore is being handled with comparative ease. The "soupy" ore is dumped in the small 30-foot trench, which was constructed west of the feeder pocket. This "soupy" ore is reduced to a thicker consistency by mixing it with several cars of dry ore. The wet, but manageable, mixture is then scraped into the feeder pocket, and conveyed to the 7th level pockets. These 7th level pockets have disk-type gates, which are actuated by air cylinders. This new method of operating these disks is proving very worthwhile. Larger loads can be placed in the ore cars in a shorter time, and with greater safety for the operator. The disk is under very close control at all times.

7. UNDERGROUND: (CONT'D)

d. Timbering:

There was slightly more timber used in proportion to the production in 1951. This increase is due to the extensive development work done during the year. The use of steel sets in the 8th level development held the use of stull timber to a relatively low figure, when considering the large amount of drifting completed.

The table below gives a statement of all types of timber used, as well as the cost and amount used per ton.

Statement of Timber Used:

	Lineal Feet		Average Price per Foot		Amount	Amount
	1951	1950	1951	1950	1951	1950
8" Stulls	17,310	13,851	.1297	.1189	2,245.49	1,647.28
10" Stulls	24,768	26,386	.1968	.1838	4,874.10	4,849.77
12" Stulls	6,369	12,120	.2708	.2655	1,724.70	3,218.37
14" and Over	878	2,772	.3171	.3091	278.38	856.91
Total	49,325	55,129	.1850	.1918	9,122.67	10,572.33
Hdwd. Cribbing 4"x6"	5,387	24,728	.0801	.0847	431.67	2,094.09
6" Cribbing	26,587	5,092	.0734	.0702	1,951.72	357.46
Lagging - 7'	563,541	437,395	.0170	.0148	9,595.26	6,468.90
Poles - 9½'	182,772	285,785	.0312	.0297	5,706.42	8,494.35
Total	778,287	753,000	.0227	.0231	17,685.07	17,414.80
Grand Total					26,807.74	27,987.13

	1951	1950
Product	353,394	445,071
Feet of timber per ton of ore	.140	.124
Feet of cribbing per ton of ore	.090	.067
Feet of lagging per ton of ore	1.595	.983
Feet of poles per ton of ore	.517	.642
Cost per ton for timber	.0258	.0238
Cost per ton for cribbing	.0067	.0055
Cost per ton for lagging	.0272	.0145
Cost per ton for poles	.0161	.0191
Total cost per ton	.0759	.0629

e. Drifting and Raising:

A direct comparison by years as to the amounts of drifting and raising in ore and rock has been given under the "b. Development" heading.

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7. UNDERGROUND: (CONT'D)

f. Explosives, Drilling and Blasting:

There was an increase in the amount of powder used per ton of ore produced, and the cost of powder increased $1.11 per 100 pounds. A detail of the consumption and cost is given below:

Year	Cost per Lb. for Powder	Lbs.Powder per Ton of Ore	Cost per Ton for Powder	Cost per Ton Fuse&Caps	Cost per Ton Total
1951	.1605	.4681	.0750	.0153	.0903
1950	.1494	.4214	.0629	.0124	.0753

Statement of Explosives Used: (Ore Development and Stoping)

	Quantity	Average Price	Amount 1951	Amount 1950
Gelamite #1 - Lbs.	5,983	16.75	1,002.14	648.13
Hercomite #2X - Lbs.	159,430	16.00	25,508.80	27,353.00
Total Powder	165,413	16.03	26,510.94	28,001.13
Primacord - Feet	-	-	-	48.00
Fuse - Feet	466,586	9.12	4,255.28	4,369.64
Caps - #6	59,485	15.62	929.39	912.28
Fuse Lighters - Hot Wire	22,500	9.00	202.50	202.50
Total Fuse, Etc.			5,387.17	5,532.42
Total All Explosives Stoping, Etc.			31,898.11	33,533.55

	1951	1950
Product	353,394	445,071
Pounds of powder per ton of ore	.4681	.4214
Cost per ton for powder	.0750	.0629
Cost per ton for fuse, caps, etc.	.0153	.0124
Cost per ton for all explosives	.0903	.0753

Statement of Explosives Used: (Sinking, Rock Development, Etc.)

	Quantity	Average Price	Amount 1951	Amount 1950
Gelamite #1 - Lbs.	6,550	16.75	1,097.14	305.00
Hercomite #2X - Lbs.	5,175	16.00	828.00	483.50
Total Powder	11,725	16.42	1,925.14	788.50
Fuse - Feet	38,740	9.26	358.64	87.80
Caps - #6	5,232	15.69	82.11	19.14
Tamptite Shells	540	6.44	3.48	-
Primacord - Feet	-	-	-	16.00
Detonators - Electric	150	21.45	32.18	-
Total Fuse, Etc.			476.41	122.94
Total All Explosives Rock Development, Etc.			2,401.55	911.44
Total All Explosives Used in Mine			34,299.66	34,444.99
Average Price per Pound for Powder			.1605	.1494
Charged to General Surface Expense			-	56.25
Charged to Pumping			50.79	-
Charged to Loading by Power Shovel			72.33	-
Charged to Ventilation			176.78	-
Charged to Tramming Equipment			661.16	-
Total as per Cost Sheet			35,260.72	34,501.24
Charged to E&A #CC-373 (8th Lev.Development)			12,515.46	1,056.98
Charged to E&A #CC-278 (Dev. below 7th Lev.)			-	2,400.39
Charged to Loading by Power Shovel			-	23.10
Grand Total			47,776.18	37,981.71

7. UNDERGROUND: (CONT'D)

g. Mining and Loading:

During 1951 all production was derived from development and mining by the sublevel caving method. There were no areas opened which would lend themselves to sublevel stoping. For the most part the ore in the East and Central Deposits was quite soft, while the long, narrow West Deposit contained a considerable amount of relatively hard ore. In the mining of this area a combination of open sublevel stoping and caving was necessary. The ground pressure in the active mining areas was not excessive, and the contract miners spent 85% of their time in productive work.

With reference to loading, and in particular from raises to tram cars, there were only a few raises over 100 feet in height. The active sublevels of the remaining were all within 25 feet from the 7th Level. Due to the lack of storage room, this condition has a definite effect in slowing down tramming between the mining raises and the shaft.

h. Ventilation:

During the first half of 1951 the ventilating conditions became rather poor, due to the extensive development underway. However the last half of 1951 saw a vast improvement, with the result that at the end of the year the ventilating system was probably better than it has ever been in the past.

The connection with the Mather Mine, "A" Shaft, furnishing a second way out of the mine and a source of air, was completed. The fan from Crosscut No. 730 on the 7th Level was installed on the 8th Level near this ventilation raise. The results of this installation have been quite satisfactory.

A ventilation survey in the fall of 1951 showed 25,000 cfm of air coming from the Mather Mine. A total of 40,000 cfm was reported exhausting to the shaft on the 7th Level. This is considerably better than in the past.

i. Pumping:

The number of gallons per minute pumped in each year for the past eight years is shown in the following statement:

Month	1951	1950	1949	1948	1947	1946	1945	1944
January	267	334	289	313	281	285	317	333
February	249	297	278	315	294	293	284	285
March	268	292	254	287	279	309	315	328
April	416	325	315	345	319	396	456	344
May	651	687	363	410	538	362	460	425
June	508	603	341	362	471	314	453	389
July	614	431	337	358	460	308	439	378
August	504	378	395	335	376	289	374	347
September	485	337	375	312	359	272	341	410
October	538	305	355	299	343	255	315	408
November	517	257	333	276	323	250	299	423
December	518	277	305	293	323	276	292	397
Avg.G.P.M.	461	377	328	325	364	301	362	372

As shown above, the average gallons per minute pumped in 1951 were 84 gallons above that shown in 1950. It should also be noted that the 1951 figure is the highest reported, and all indications show that the increase will continue throughout 1952. The continued high rate throughout October, November, and December is very likely the result of the unusually high amount of rainfall during the summer and fall period.

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8. COST OF OPERATING:

a. Comparative Mining Costs:

	1951	1950	Increase	Decrease
Product	353,394	445,071	-	91,677
Underground Costs	2.705	1.822	.883	-
Surface Costs	.318	.269	.049	-
General Mine Expenses	.522	.416	.106	-
Cost of Production	3.545	2.507	1.038	-
Taxes	.237	.197	.040	-
Depletion & Depreciation	.185	.061	.124	-
Loading & Shipping	.084	.048	.043	-
Total Cost at Mine	4.051	2.813	1.238	-
No. of Days Operated	293	268	25	-
Tot.No.of Shifts Operated	585	533	52	-
Average Daily Product	1,205	1,670	-	465

Total Cost at Mine:

	1951	Percent	1950	Percent	Increase
Labor	2.682	66.2	1.795	63.8	.887
Supplies	1.369	33.8	1.018	36.2	.351
Total	4.051	100.0	2.813	100.0	1.238

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8. COST OF OPERATING: (CONT'D)

b. Detailed Cost Comparison:

(1) Days and Shifts:

Year	Days Mine Worked	Shifts & Hours	Men Employed	Total Shifts
1951	293	585 - 8 Hr.	204	59,641
1950	268	533 - 8 Hr.	219	58,108
Increase	25	52	-	1,533
Decrease	-	-	15	-

(2) Wages:

There was no increase in wages granted during the year. However, an 8½¢-per-hour increase is still being negotiated.

(3) Comparison of Production:

Year	Tons
1951	353,394
1950	445,071
Decrease	91,677

(4) Comparison of Number of Men and Wages:

Year	No. of Men	No. of Days	Amount	Rate per Day
1951	204	59,641	893,580.99	14.98
1950	219	58,108	751,238.74	12.93
Increase	-	1,533	142,342.25	2.05
Decrease	15	-	-	-

(5) Tons per Man per Day:

	1951	1950	Decrease
Surface	23.88	31.10	7.22
Underground	7.88	10.16	2.28
Total	5.93	7.66	1.73

(6) Cost of Production:

	1951	1950	Increase
Amount	1,252,788.83	1,115,616.72	137,172.11
Cost per Ton	3.545	2.507	1.038

Year	Labor	Percent	Supplies	Percent
1951	915,966.42	73.1	336,822.41	26.9
1950	787,389.23	71.0	328,227.49	29.0
Increase	128,577.19	2.1	8,594.92	-
Decrease	-	-	-	2.1

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

		1951		1950	
	Days per Week	6		5 to 8-28-50 6 Bal. of yr.	
	Shifts and Hours	1-8 1 2-8 292		1-8 3 2-8 265	
	Production, Tons	353,394		445,071	
	Average Daily Production, Tons	1,205		1,670	
	Number of Days Worked	293		268	
	UNDERGROUND COSTS:	Amount	Per Ton	Amount	Per Ton
1.	Exploring in Mine	53.46	-	28.71	-
2.	Estimated Wage Adjustment	39,470.74	.112	3,381.62	.008
3.	Development in Rock	18,560.43	.053	6,496.29	.015
4.	Development in Ore	33,712.64	.095	23,344.50	.052
5.	Stoping	296,798.43	.840	291,721.05	.655
6.	Timbering	189,961.69	.537	173,920.17	.391
7.	Tramming	176,133.80	.499	153,097.31	.344
8.	Ventilation	13,887.90	.039	6,273.34	.014
9.	Pumping	40,280.64	.114	37,443.92	.084
10.	Compressors and Air Pipes	43,680.80	.124	38,975.09	.088
12.	Underground Superintendence	28,409.35	.080	23,084.81	.052
14.	Maint.: Comp. & Power Drills	2,975.82	.008	3,039.81	.007
15.	Scrapers & Mech. Loaders	29,265.62	.083	26,849.17	.060
16.	Tramming Equipment	34,928.76	.099	21,175.91	.048
17.	Pumping Machinery	7,665.71	.022	2,070.28	.004
	Total Underground Costs	955,785.79	2.705	810,901.98	1.822
	SURFACE COSTS:				
18.	Hoisting	35,396.55	.100	34,937.19	.078
19.	Stocking Ore	17,508.30	.050	16,985.93	.038
21.	Dry House	10,289.89	.029	9,668.85	.022
22.	General Surface Expense	19,689.41	.056	20,590.56	.046
23.	Maint.: Hoisting Equipment	17,718.88	.050	15,452.35	.035
24.	Shaft	5,805.00	.016	12,590.40	.028
25.	Top Tram Equipment	3,036.14	.009	3,959.16	.009
26.	Docks, Trestles & Pockets	87.84	-	208.07	.001
27.	Mine Buildings	2,838.80	.008	5,158.63	.012
	Total Surface Costs	112,370.81	.318	119,551.14	.269
	GENERAL MINE EXPENSES:				
28.	Geological	1,302.76	.004	936.55	.002
29.	Mining Engineering	8,263.66	.023	7,169.58	.016
30.	Mechanical & Electrical Engineering	4,109.36	.012	5,444.09	.012
31.	Analysis and Grading	16,716.13	.047	14,690.31	.033
32.	Safety and Personnel Departments	2,498.78	.007	2,737.77	.006
33.	Telephones and Safety Devices	6,403.36	.018	5,252.61	.012
34.	Local and General Welfare	3,099.06	.009	3,132.54	.007
35.	Special Exp., Pensions & Allowances	5,103.77	.014	6,265.97	.014
36.	Ishpeming Office	24,758.86	.070	19,830.19	.045
37.	Mine Office	33,098.09	.093	26,356.74	.059
38.	Insurance	17,584.20	.050	19,720.31	.044
39.	Personal Injury	7,059.59	.020	22,049.81	.050
40.	Social Security Taxes	21,219.21	.060	19,717.13	.044
41.	Employees Vacation Pay	33,415.40	.095	31,860.00	.072
	Total General Mine Expenses	184,632.23	.522	188,545.22	.424
	COST OF PRODUCTION	1,252,788.83	3.545	1,115,616.72	2.507

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

In comparing the detail of costs for 1950 and 1951, all the 1951 figures are higher due to two main reasons: (1) The wage increase which became effective December 1st, 1950, and (2) The reduction in the production for the year. The explanation below is made in addition to the two above-mentioned causes for cost increases.

UNDERGROUND COSTS:

1. Exploring in Mine:

Charges to this account made up of 52.37 in April, and 1.09 in May, appearing on "direct charges" as Exploring in Mine, Geological Department and Exploring, Analysis, respectively.

2. Estimated Wage Adjustment:

Charges to this account made up of 8½¢ per hour wage adjustment for hourly employees, presently being negotiated.

3. Development in Rock:

Increase due to the large amount of this type of work during the year.

4. Development in Ore:

The increase in cost per ton is due to an increased amount of ore development.

5. Stoping:

The increase in the cost per ton is due to a general rise in supplies of all kinds, particularly powder and timber.

6. Timbering:

The increase in cost per ton is due to the rise in cost of all types of timber, as well as repairs carried on by miners during the period when additional mining areas were not available.

7. Tramming:

Increase is due to the need of equipping and manning the new 8th Level.

8. Ventilation:

The increase is the result of more auxiliary fans in operation during development period.

9. Pumping:

Increase due to the fact that there was considerably more water pumped.

Year	Total Gallons Pumped	Gallons per Minute
1951	242,744,183	461
1950	197,474,699	377

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

UNDERGROUND COSTS: (CONT'D)

10. Compressors and Air Pipes:

Increase due to the large amount of piping to accomodate development. There was less compressed air used because of reduced production and number of days worked.

Year	Cubic Feet of Air Compressed
1951	537,421,500
1950	545,206,500

12. Underground Superintendence:

The increase in cost per ton is due to additional supervisors being used, and the increase in salaries.

14. Compressors and Power Drills:

There was no substantial change in the cost per ton.

15. Scrapers and Mechanical Loaders:

Increase due to two mechanical loaders in operation during most of the year, because of development work.

16. Tramming Equipment:

Increase in cost per ton due to extensive repairs on locomotives used on the new 8th Level.

17. Pumping Machinery:

Increase due to additional maintenance, resulting from pumping more water.

SURFACE COSTS:

18. Hoisting:

The increase in cost is due to the large amount of rock hoisted.

19. Stocking Ore:

This item also includes the stocking of waste rock, and is high because of the great increase in rock development.

21. Dry House:

Increase in cost per ton due to rise in coal prices, and cost of labor.

22. General Surface Expense:

Increase due to 1950 advance in wages.

23. Hoisting Equipment:

Increase in cost per ton, due to general advance in cost of supplies.

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

SURFACE COSTS: (CONT'D)

24. Shaft:

Decrease in cost per ton was due to less repairs during the year.

25. Top Tram Equipment:

Charges to this account were the same as in 1950.

27. Mine Buildings:

Decrease due to less maintenance and repairs to mine structures.

GENERAL MINE EXPENSES:

28. Geological:

Charges to this account have increased due to more personnel in the geological department.

29. Mining Engineering:

The increase in the cost per ton is the result of a full-time mining engineer at the property to plan and carry out development work.

30. Mechanical and Electrical Engineering:

Charges to this account were the same as reported in 1950.

31. Analysis and Grading:

The cost to this account is made up as follows:

Year	Sampling at Mine	Central Laboratory	Shipping Dept. Expense	Trucking Samples, Etc.	Total
1951	1,626.06	10,768.44	2,525.40	1,796.23	16,716.13
1950	1,435.18	9,555.27	2,506.95	1,192.91	14,690.31
Increase	190.88	1,213.17	18.45	603.32	2,025.82

35. Special Expenses, Pensions and Allowances:

The cost to this account is made up as follows:

Year	Retirements	Employment Office	Legal	Pensions	Examinations	Total
1951	3,364.74	793.49	463.75	102.65	379.14	5,103.77
1950	4,482.31	837.46	407.33	203.75	335.12	6,265.97
Increase	-	-	56.42	-	44.02	-
Decrease	1,117.57	43.97	-	101.10	-	1,162.20

36. Ishpeming Office:

Year	Amount	Cost per Ton
1951	24,758.86	.070
1950	19,830.19	.045

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

GENERAL MINE EXPENSES: (CONT'D)

37. Mine Office:

The detail of charges to this account was as follows:

Year	Salaries Supt. & Clerks	Central Warehouse	Misc.	Total
1951	22,421.18	8,193.10	2,483.81	33,098.09
1950	20,324.40	4,353.57	1,678.77	26,356.74
Increase	2,096.78	3,839.53	805.04	6,741.35

38. Insurance:

This account is made up as follows:

Year	Property Ins.	Group Health & Life	Group Annuity	Catastrophe Ins.	Non-Ownership Liability Ins.	Total
1951	1,796.69	11,714.15	3,575.48	490.32	7.56	17,584.20
1950	1,814.91	15,260.70	2,309.77	334.93	0.00	19,720.31
Increase	-	-	1,265.71	155.39	7.56	-
Decrease	18.22	3,546.55	-	-	-	2,136.11

39. Personal Injury:

The detail of charges to this account was as follows:

Year	Compensation & Doctors	Compensation Department	Total
1951	6,088.67	970.92	7,059.59
1950	21,038.90	1,010.91	22,049.81
Decrease	14,950.23	39.99	14,990.22

40. Social Security Taxes:

Year	Unemployment Tax	Old Age Benefit Tax	Total
1951	9,199.95	12,019.26	21,219.21
1950	9,154.39	10,562.74	19,717.13
Increase	45.56	1,456.52	1,502.08

41. Employees' Vacation Pay:

Year	Amount	Cost per Ton
1951	33,415.40	.095
1950	31,860.00	.072

9. EXPLORATIONS AND FUTURE EXPLORATIONS:

There were no diamond drilling explorations in 1951. However, an extensive program is scheduled for 1952. Approximately nine holes are planned on the 7th and 8th Levels. The major part of the proposed program is underway on the 6th Level. It will involve 1,200 feet of rock drifting to the southeast, from the end of the crosscut southwest of the shaft. Three diamond drill stations will be located in this drift. From these stations areas on and below the 6th Level will be explored, as well as some Mather Mine "B" Shaft property, adjacent to the Jackson Strip on the south.

10. TAXES:

	1951		1950	
	Valuation	Taxes	Valuation	Taxes
Cambria Realty: S½ of SE¼ of Sec. 35, 48-27) Lots 7 & 8 of Sec. 35, 48-27) Lots 5, 6 & 7 of Sec. 36, 48-27) - 222.09 Acres)	200,000	9,090.00	200,000	9,490.00
Jackson Strip: N660' of N½ of NW¼ of Sec. 1, 47-27 - 40 Acres)	1,205,000	54,767.25	1,200,000	56,940.00
Personal Property:				
Stockpiles, Supplies & Equipment	395,000	17,952.75	355,000	16,844.75
Tot. by Mich. State Tax Com.	1,800,000	81,810.00	1,755,000	83,274.75
Collection Fee		818.10		832.75
Total Taxes, Negaunee	1,800,000	82,628.10	1,755,000	84,107.50
Division of Payments:				
Cambria-Jackson Taxes, Ishpeming*	100,000	3,760.56	100,000	3,783.24
Cambria-Jackson Taxes, Negaunee	1,800,000	82,628.10	1,755,000	84,107.50
TOTAL	1,900,000	86,388.66	1,855,000	87,890.74

*Cambria-Jackson Mine-Ishpeming: N660' of NE¼ of NE¼ of Sec. 2, 47-27 - 20 Acres)

Tax Rate per $100 of Valuation:	1951	1950
City of Negaunee	4.54500	4.74500
City of Ishpeming	3.76056	3.78324
Total Taxes, City of Negaunee:	696,031.85	667,585.43
Cambria-Jackson Percent of Taxes:		
City of Negaunee	11.75	12.47

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11. ACCIDENTS AND PERSONAL INJURY:

The accident and personal injury record was very good during the year 1951. The Cambria-Jackson Mine ranked first over the eleven underground mines on the Michigan and Minnesota ranges. The frequency rate amounted to 19.84, and the severity rate to .378. These figures are well below the ranking number one position for active underground mines in the past several years.

The following is a list of the number of compensable accidents classed as lost-time, where seven or more calendar days were lost through injury. The past four years have shown a continuing reduction in lost-time accidents.

	1951	1950	1949	1948
Fatal	0	1	0	1
Time lost - over 4 months	1	0	1	1
Time lost - 1 to 4 months	0	2	5	5
Time lost - less than 1 month	1	2	5	9
Total compensable accidents	2	5	11	16

On December 31, 1951 payments were being made on five cases which occurred prior to January 1, 1951. Three are death claims, one receives full compensation, and one occupational disease case is being paid.

Acc. No.	Date of Accident	Name		Days Lost
91	3-31-51	Louis Vallier	Lacerated thumb	19
92	4-21-51	Waino Kunnari	Fracture lower end of left femur, extending into knee joint	145
		Total		164

12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION:

There was no new construction carried on during the year, and, due to the limited life of the mine, no proposed new construction is anticipated.

13. EQUIPMENT AND PROPOSED EQUIPMENT:

b. 8th Level Development:

E. & A. No. CC-373 was authorized in September, 1950, to cover the cost of development and equipment for the new 8th Level.

STATEMENT SHOWING EXPENDITURES E.&A. NO. CC-373 DEVELOPMENT OF 8TH LEVEL

	Original Authorization	Supplement	Supplement	Amount Authorized	Expended	Unexpended
Equipment	4,000	-	-	4,000	4,987.18	987.18
Rock Drifting	96,000	31,400	3,450	130,850	136,508.71	5,658.71
Rock Raising	10,000	6,000	-	16,000	7,137.92	8,862.08
Soc.Sec.Taxes	-	-	-	-	2,211.08	2,211.08
Total	110,000	37,400	3,450	150,850	150,844.89	5.11

13. EQUIPMENT AND PROPOSED EQUIPMENT: (CONT'D)

b. 8th Level Development: (Cont'd)

As indicated in the 1950 report, it was predicted that this E. & A. would be overexpended. A supplement was granted prior to the completion of development, and late in the year a second supplement to cover a small remaining expenditure was authorized. Expenditures under this E. & A. were over the estimated figure because of wage and supply increases, which went into effect December 1st, 1950. In August, 1951, it was necessary to increase contract rates for the advancement of double-compartment cribbed raises. This was done to encourage more men to seek this type of work, which had not been practiced to any degree for the past four years.

c. Scraper Hoists:

There were no new scraper hoists purchased in 1951. The total cost of repairs decreased due to the fact that less mining contracts were active, and there was a reduced number of hoists used.

The following is a list of the scraper hoists at the mine, and costs of repairs:

		1951		1950	
Company	Total Machines	Total Machines Repaired	Avg. Cost of Ea. Mach. Repaired	Total Machines Repaired	Avg. Cost of Ea. Mach. Repaired
Ing.-Rand 15-H.P.Elec.	16	1	350.00	5	357.96
Ing.-Rand 20-H.P.Elec.	2	1	445.00	-	-
Ing.-Rand 25-H.P.Elec.	2	1	680.00	1	48.12
Ing.-Rand Air Hoists	2	2	57.50	-	-
Sullivan 15-H.P.Elec.	17	2	250.00	7	315.31
Sullivan 25-H.P.Elec.	7	2	230.00	1	262.02
Total	46	9	2,550.00	14	4,307.07

d. Underground Tram Cars:

There were no new additions or reductions with reference to the underground 65 cubic-foot rocker dump tram cars. During the year a number of car trucks were sent to surface for repairs.

e. Skips and Cages:

There were no major changes, repairs, or replacements to the skips and cages during the year.

f. Haulage Tracks:

The following is a comparison of costs of materials for haulage tracks for 1951 and 1950:

	1951	1950
60-lb. Rail	68.04	136.40
40-lb. Rail	436.89	570.38
Ties & Tie Plates	95.52	254.38
Total	600.45	961.16

g. Mine Trucks:

The 1947 Chevrolet 1½-ton truck and the 1943 Dodge truck operated very satisfactorily during the year. No changes are anticipated in this equipment during 1952.

14. MAINTENANCE AND REPAIRS:

The maintenance and repair costs listed under "Underground Costs" were as follows:

	1951		1950	
	Amount	Cost per Ton	Amount	Cost per Ton
Compressors & Power Drills	2,975.82	.008	3,039.81	.007
Scraper Equipment	29,265.62	.083	26,849.17	.060
Electric Tram Equipment	34,928.76	.099	21,175.91	.048
Pumping Machinery	7,665.71	.022	2,070.28	.004
Total	74,835.91	.212	53,135.17	.119

The following is a list of purchases and repair costs for 1951, as compared with 1950:

	1951	1950
Scraper rope	10,519.28	9,697.81
Jackhamers and parts	3,391.06	-
Naylor pipe	2,791.29	-
Hoisting rope	1,765.38	1,675.27
Conveyor parts	1,679.49	-
Locomotive parts	1,576.00	1,419.77
Scraper hoist parts	1,415.33	1,690.66
Hydrocrane parts and repairs	1,344.92	697.59
Diesel shovel parts and repairs	1,020.94	1,080.92
Jacklegs and parts	963.50	-
Moving rock from rock pile	956.65	256.25
Transfer house on top landing	882.30	-
Machines, desks and chairs for mine office	869.88	68.10
Tractor repairs	817.61	2,421.76
Fans and parts	772.71	564.68
Truck repairs	635.39	671.42
Tram cars and parts	627.62	159.30
Electric cable	620.00	759.02
Air saws	580.00	-
Pump parts	426.93	33.00
Compressor parts	413.40	810.20
Larry car parts	347.25	281.53
Repairs to skip-cage hoist	345.99	1,082.12
Trestle legs	338.07	296.12
Air cylinders	294.72	-
Equipment for blacksmith shop	178.95	391.26
Battery for engine house	168.36	-
Police uniforms	166.50	-
Flowers, seeds and fertilizer	163.95	-
Bench grinder	105.00	-
Pickhamers and parts	103.44	1,048.30
Hot water tank for engine house	89.80	-
Sheave liners and bolts	77.77	37.20
Sump pump for engine house	69.37	-
Tugit hoists	61.00	59.00
Teletalks for underground tramming	56.95	398.05
Transit and repairs for mining engineer	36.20	219.75
Shaft sets, portland cement, fir and hemlock	-	4,610.13
Equipment for machine shop	-	600.13
Equipment for dry house	-	262.66
Total purchases	36,673.00	31,292.00

14. MAINTENANCE AND REPAIRS: (CONT'D)

	1951	1950
Repairs to Conveyor	4,993.86	-
Repairs to Motor-Generators	414.76	505.21
Repairs to Compressors & Power Drills	1,077.42	1,919.61
Repairs to Scraper Hoists	17,331.01	15,460.70
Repairs to Locomotives	6,783.91	3,063.03
Repairs to Trolley Wire	3,143.15	3,112.83
Repairs to Tracks	8,712.61	7,261.44
Repairs to Cars	6,997.36	5,654.33
Repairs to Pumping Machinery	4,447.49	1,750.86
Total Repairs	53,901.57	38,728.01

The maintenance and repair costs under "Surface Costs" were as follows:

	1951		1950	
	Amount	Cost per Ton	Amount	Cost per Ton
Hoisting Equipment	17,718.88	.050	15,452.35	.035
Shaft	5,805.00	.016	12,590.40	.028
Top Tram Equipment	3,036.14	.009	3,959.16	.009
Docks, Trestles & Pockets	87.84	-	208.07	.001
Mine Buildings	2,838.80	.008	5,158.63	.012
Total	29,486.66	.083	37,368.61	.085

	1951	1950
Inspection of Hoisting Ropes	839.69	670.04
Repairs to Electric Hoists	1,426.22	3,257.92
Repairs to Skips, Cages, Etc.	12,917.62	8,668.74
Repairs to Sheaves & Pulley Stands	346.21	61.06
Repairs to Shaft	5,805.00	7,980.27
Repairs to Larry Cars & Tracks	2,401.77	3,641.34
Trestle Trolley Line	287.12	36.29
Repairs to Pockets, Chutes, Etc.	87.84	208.07
Repairs to Mine Buildings	1,887.13	5,158.63
Total	25,998.60	29,682.36

15. POWER:

The following is a detail of electric current purchased in 1951 and 1950, distribution of charges to various accounts, and other data:

	1951	Per Ton	1950	Per Ton
Stoping	1,990.41	.006	715.33	.002
Tramming	286.30	.001	386.67	.001
Ventilation	4,505.79	.013	3,480.01	.008
Pumping	20,524.55	.058	17,610.61	.040
Compressors	19,882.34	.056	20,553.36	.046
Hoisting	16,024.78	.045	17,695.22	.040
Stocking Ore	301.29	.001	217.17	-
Dry House	567.79	.002	557.89	.001
Telephones & Safety Devices	2,024.80	.006	1,740.02	.004
Mine Office	133.55	-	158.62	-
Electric Haulage	13,777.94	.039	12,299.49	.028
Shops	757.44	.002	773.34	.002
Tractor and Trucks	72.22	-	65.62	-
Loading at Pocket	151.81	-	56.49	-
E. & A. No. CC-373	1,106.03	.003	-	-
E. & A. No. CC-278	-	-	495.65	.001
Total	82,107.04	.232	76,805.49	.173
Power charged to Idle Expense	1,269.20*	-	-	-

* Included above.

15. POWER: (CONT'D)

	1951	1950
Main Line Meter - K. W.	5,214,400	4,772,800
Separate Meter Readings	5,214,400	4,772,800
Line Loss - K. W.	-0-	-0-
Product - Tons	353,394	445,071
K. W. per Ton - Inc. Line Loss	14.76	10.72
Cost per K. W. - Average	.01574621	.0161
15 Min. Demand - K. W. - Average	1,092	1,068

Listed below is an itemized invoice on annual basis for 1951:

Energy Charge: 1092 x 864 = 943,488 x .041 =	38,683.02
4,270,912 x .0096 =	41,000.74
	79,683.76
Fuel Adjustment: 5,214,400 x .2442204 = 1,273,463 x .0019029 =	2,423.28
Total	82,107.04

17. CONDITION OF GROUNDS:

The grounds surrounding the shaft, engine house and other buildings were maintained throughout the year. The general appearance of the premises has always been very good, and many compliments are paid to the company.

Due to the lack of greenhouse facilities, most of the flowers planted on the grounds were purchased locally. As a result of this expenditure, a small greenhouse was built adjoining the south side of the surface tool house. In the future, plants for the Negaunee district will be planted and raised in this location.

18. NATIONALITY OF EMPLOYEES:

As to Parentage:	1951	Percent	1950	Percent
Finnish	84	37.9	75	34.1
English	33	14.9	37	16.8
Italian	32	14.4	37	16.8
Swedish	26	11.7	27	12.3
French	25	11.3	25	11.4
German	5	2.3	4	1.8
Irish	5	2.3	3	1.4
Danish	4	1.8	6	2.7
Norwegian	3	1.4	3	1.4
Austrian	1	.4	2	.9
Slovanian	1	.4	1	.4
Croatian	1	.4	-	-
Albanian	1	.4	-	-
Belgian	1	.4	-	-
Total	222	100.0	220	100.0

	American Born		Foreign Born	
As to Birth:	1951	1950	1951	1950
Finnish	67	55	17	20
English	27	31	6	6
Swedish	25	26	1	1
French	25	25	-	-
Italian	15	19	17	18
German	5	4	-	-
Irish	5	3	-	-
Danish	4	6	-	-
Norwegian	2	2	1	1
Austrian	-	1	1	1
Slovanian	1	1	-	-
Croatian	1	-	-	-
Belgian	1	-	-	-
Albanian	-	-	1	-
Total	178	173	44	47
Percent	80.2%	78.6%	19.8%	21.4%

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

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1. GENERAL

The Maas Mine operated on a two 8-hour shift, six day per week schedule from January 1st to December 31st except during the two strike periods, one of which was in June and lasted for four days while the other in July was of ten days duration. A small tramming and hoisting crew was also employed on the night shift throughout the year.

There was a labor turnover of approximately 15% due mostly to men quitting, but replacements were available and the crew was held fairly constant at about 400. There was no increase in wages during 1951 and the mine was not shut down for a vacation period on account of the aforementioned strikes.

The total production for the year was 712,474 tons including approximately 25,000 tons of stockpile overrun. This was an increase of about 79,000 tons over the 1950 product and was due partly to more operating shifts in 1951 and also to better working conditions underground. The shipments for the year totaled 789,528 tons leaving a balance of 63,618 tons on stock on December 31st.

Development was confined mostly to the 7th Level where the pump house and sump were completed and approximately 1,400 feet of drifts and cross-cuts were advanced in the footwall during the year. The block cave above the 4th Level produced 70,000 tons and the ore in this pillar was almost exhaused by the end of the year. Retimbering main level drifts and raises occupied the time of a very large crew as the weight was very excessive, especially on the 6th Level. The mining areas are decreasing and there was a loss of four working places during 1951.

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2. PRODUCTION, SHIPMENTS & INVENTORIES

a. Production by Grades

	1951	1950
Maas	334,003	253,490
Maas Special	213,016	198,016
* Race Course	3,745	42,831
Race Course Special	161,710	139,107
Total	712,474	633,444
Rock	35,280	25,000
Total Hoist	747,754	658,444

* All Race Course stocked was mixed with the Race Course Special and shipped as such.

b. Shipments

Grade of Ore	Pocket Tons	Stockpile Tons	Total Tons	Total Last Year
Maas	178,549	167,794	346,343	251,530
Maas Special	111,307	162,034	273,341	166,467
Race Course	4,462		4,462	52,029
Race Course Special	81,645	83,737	165,382	150,294
Total	375,963	413,565	789,528	620,320
Total Last Year	342,754	277,566	620,320	
Increase	33,209	135,999	169,208	

c. Stockpile Inventories

Grade of Ore	12-31-51	12-31-50
Maas	30,998	43,338
Maas Special	22,794	83,119
Race Course		717
Race Course Special	9,826	13,498
Total	63,618	140,672

d. Division of Product by Levels

	1951	%	1950	%
Fourth Level	204,958	28.8	202,748	32.0
Fifth Level	164,504	23.1	102,814	16.2
Sixth Level	340,451	47.8	327,882	51.8
Seventh Level	2,561	.3		
Total	712,474	100.0	633,444	100.0

Ore mined on 4th. and 5th. Levels was all standard grade.
Ore mined on 6th. and 7th. Levels was all special grade.

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2. PRODUCTION, SHIPMENTS & INVENTORIES (Cont.)

e. Production by Months

Month	Maas	Maas Spcl.	Race Course	R.C. Spcl.	Total	Rock
January	25,000	18,054	423	11,961	55,438	3,930
February	22,109	11,687	1,689	15,373	50,858	2,560
March	28,659	12,618	2,106	15,369	58,752	3,165
April	30,029	17,945	1,570	12,528	62,072	3,900
May	28,555	22,752	1,053	15,215	67,575	2,645
June	29,024	20,001	155	11,384	60,564	2,660
July	16,962	16,251	627	7,323	41,163	2,125
August	28,503	18,269	1,937	16,663	65,372	4,060
September	29,458	13,782	1,677	14,639	59,556	3,180
October	31,007	22,867	1,366	10,289	65,529	3,200
November	27,036	17,865	180	7,204	52,285	1,830
December	26,276	13,081		9,002	48,359	2,025
Total	322,618	205,172	12,783	146,950	687,523	35,280
Trans. to & from			9,038	9,038		
Cur. Year's St. Overrun	11,385	7,844		5,722	24,951	
Grand Total	334,003	213,016	3,745	161,710	712,474	

The product was distributed by leases as follows:

	1951	1950
George Maas Lease	547,019	450,509
Race Course Lease	165,455	181,938
Baldwin Kiln Road Lease	---	997
Total	712,474	633,444

f. Ore Statement

	Maas	Race Course	Maas Spcl.	R.C. Spcl.	Total	Total Last Year
On Hand 1-1-51	43,338	717	83,119	13,498	140,672	127,548
Product for Year	322,618	12,783	205,172	146,950	687,523	632,467
Transfers		9,038		9,038		
Cr. Year's Overrun	11,385		7,844	5,722	24,951	977
Total	377,341	4,462	296,135	175,208	853,146	760,992
Shipments	346,343	4,462	273,341	165,382	789,528	620,320
Balance on Hand	30,998		22,794	9,826	63,618	140,672
Increase in Output					55,056	

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2. PRODUCTION, SHIPMENTS & INVENTORIES (Cont.)

h. Delays

February 23rd, 7 P.M. to February 25th, 11 P.M.		
Skip jammed in shaft, breaking set & runners	Loss	2,000 tons
March 1st, 6 A.M. to March 2nd, 7:30 A.M.		
Bail of North skip broke	"	2,000 tons
June 11th to June 14th, inclusive - strike	"	9,000 tons
July 2nd, 3:30 P.M. to July 12th inclusive - strike	"	25,000 tons
November 2nd, afternoon shift home - burnt out compressors	"	1,000 tons
Total Loss		39,000 tons

3. ANALYSIS

a. Average Mine Analysis on Output

	1951				1950			
	Iron	Phos.	Sil.	Sul.	Iron	Phos.	Sil.	Sul.
Maas	58.74	.113	9.11	.037	58.88	.109	9.90	.030
Maas Special	59.59	.096	8.53	.186	58.78	.094	9.03	.169
Race Course	58.03	.120	10.08	.035	58.89	.108	9.81	.030
Race Course Special	58.88	.092	8.56	.169	58.54	.096	8.96	.169

b. Average Mine Analysis on Ore Shipped

Grade	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
Maas & Race Course	58.50	.119	9.51	.27	2.99	.59	.31	.034	2.09	13.51
Maas & R. C. Special	58.70	.095	8.77	.30	3.26	.67	.20	.185	2.11	13.47

c. Average Natural Analysis of Ore in Stock - December 31, 1951

Grade	Tons	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
Maas	53,792	50.86	.090	8.01	.26	2.82	.58	.17	.099	1.83	13.49
Race Course	9,826	50.77	.079	7.83	.26	2.82	.58	.17	.182	1.83	13.47

Note: At the end of the shipping season an authorization was obtained to stock Maas Standard and Maas High Sulphur together and the Race Course high sulphur in another pile which will average higher in sulphur and from which paint ore or other high sulphur orders can be filled.

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4. ESTIMATE OF ORE RESERVES

a. Developed Ore

Standard Location	Race Course Lease	Maas Lease	B. K. Road City of Neg. Lease	Total Tons
3rd to 4th Levels		421,280		421,280
4th to 5th Levels		130,029		180,029
Gross Total 12-31-51		551,309		551,309
Less 10% for Mining & Rock (as of Sept. 1)		66,509		66,509
Net Total Standard Grade		484,800		484,800
Special				
4th to 5th Levels	76,244	183,165	34,375	293,784
5th to 6th Levels	341,843	1,674,508	667	2,017,018
Below 6th Level	18,563	1,071,030		1,089,593
Gross Total 12-31-51	436,650	2,928,703	35,042	3,400,395
Less 10% for Mining & Rock (9-1)	48,101	299,630	3,504	351,235
Net Total Special Grade	388,549	2,629,073	31,538	3,049,160
Total All Grades	388,549	3,113,873	31,538	3,533,960

There was a decrease of approximately 192,000 tons in the estimate for 1951 as compared with 1950 after mining for the year was deducted. This decrease was distributed as follows:

	Maas	Race Course	Total
Standard Grade	74,179 Tons	29,030 Tons	103,209 Tons
Sulphurous Grade	61,069 "	28,023 "	89,092 "
Total	135,248 Tons	57,053 Tons	192,301 Tons

The decrease in the Standard grade was occasioned mostly by water and caving rock forcing abandonment of areas in the block cave before all of the ore could be recovered. Jasper inclusions in the 4th to 5th Level pillars were larger than had been estimated and some Race Course Standard ore was immediately above the Sulphurous ore and could not be mined separately.

The decrease in the Sulphurous ore was almost entirely due to a reestimate of the ore below the 6th Level using information from the diamond drilling instead of using an arbitrary 100' in depth as was done previously.

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4. ESTIMATE OF ORE RESERVES

d. Estimated Production
January 1st to December 31st, 1952

Grade	Estimated Production 12 Shifts Per Week for 6 winter months 11 Shifts Per Week for 6 summer months
Maas	515,000
Race Course	100,000
Total	615,000

Grade	Iron	Phos.	Sil.	Sul.	Moist.
Maas	58.75	.108	9.15	.155	13.50
Race Course	59.00	.100	9.00	.250	13.50

5. LABOR & WAGES

a. Comments

There were 61 men hired as against a loss of 70 during the year. Practically all of the new men were without any previous mining experience and 40% of these were the ones who quit after a short period. Unexcused absenteeism, exclusive of time lost during deer season, was 3%, the same as for 1950.

There was no change in the wage schedule during 1951 and the average of $.085 per hour increase for inequities agreed upon in December, 1950 was still in negotiation at the end of the year.

A change in supervisory personnel went into effect on May 1st when William Oliver who had been Captain at the Maas since January 1, 1941 retired and William Nicholas, Foreman, was promoted to Captain. At the same time, Albert Larsen was promoted from Shift Boss to Foreman, and Russell Toms from temporary to regular Shift Boss.

The mine did not shut down for a vacation period on account of the loss of product during the strike and the following table shows the proportion of the men receiving vacation pay based on 48 hours per week:

45 Men, or 12% of the total, received one week's pay.
231 Men, or 60% of the total, received two week's pay.
86 Men, or 22% of the total, received three week's Pay.
25 Men, or 6% of the total, were ineligible, having worked less than 1 yr.

Although 3 men retired during 1951, at the end of the year there were still 15 more who were over 65 years of age. The average age of all employees was 43 and there were 13 men who had been in the Company's employ over 40 years.

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5. LABOR & WAGES

a. Comments (Cont.)

The following table shows a comparison in labor turnover for the last three years:

	1951	1950	1949
Died	3	3	3
Fatal Accident	0	1	1
Retired on Account of Age	3	6	12
Unable to Continue Work on Account of Ill Health	2	2	2
Transferred to other C.C.I. Co. Properties	15	21	23
Quit	40	15	4
Discharges & Lay-offs	1	0	1
Drafted & Enlisted	6	3	0
Total Loss	70	51	46
Hired or Transferred to Maas	61	62	60
Net Gain	9	11	14
Active Experienced Miners Encluded in Total Loss	12	8	4

Proportion of surface to underground men:

1951	1950	1949
1 - 4.8	1 - 5.0	1 - 4.9

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5. LABOR & WAGES

b. Comparative Statement of Wages & Product

	1951	1950	Increase	Decrease
Product	712,474	633,444	79,030	
Number of Shifts & Hours	291	268	23	
1 8-hour	2	1	1	
2 8-hour	289	267	22	
AVERAGE NO. MEN WORKING				
Surface	62	65		3
Underground	320	330		10
Total	382	395		13
AVERAGE WAGES PER DAY				
Surface	13.43	11.22	2.21	
Underground	15.32	12.85	2.47	
Total	15.01	12.56	2.45	
AVERAGE WAGES PER MONTH 25 Days per Month 12 Shifts per Week				
Surface	335.75	280.50	55.25	
Underground	383.00	321.25	61.75	
Total	375.25	314.00	61.25	
PRODUCT PER MAN PER DAY				
Surface	40.74	36.75	3.99	
Underground	7.60	7.16	.44	
Total	6.40	6.00	.40	
LABOR COST PER TON				
Surface	.320	.299	.021	
Underground	2.019	1.793	.226	
Total	2.339	2.092	.247	
AVERAGE PRODUCT MINING				
Stoping	28.04	24.75	3.29	
Ore Development	8.48	9.99		1.51
Total	27.20	24.66	2.54	
AVERAGE WAGES CONTRACT LABOR	16.30	13.94	2.36	
TOTAL NUMBER OF DAYS				
Surface	17,486 ½	17,237 ½	249	
Underground	93,802	88,409 ½	5,392 ½	
Total	111,288 ½	105,647	5,641 ½	
AMOUNT FOR LABOR				
Surface	228,095.69	189,325.11	38,770.58	
Underground	1,438,137.73	1,136,017.57	302,120.16	
Total	1,666,233.42	1,325,342.68	340,890.74	
AVERAGE WAGES PER MONTH BASED ON MEN CARRIED ON MINE PAYROLL				
Surface	335.75	280.50	55.25	
Underground	383.00	321.25	61.75	
Total	375.25	314.00	61.25	

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5. LABOR & WAGES

c. Nationality of Employees

	As to Parentage		As to Birth	
	No.	%	American Born	Foreign Born
Finnish	144	36.3	112	32
American	102	25.8	102	
English	60	15.2	42	18
Italian	35	8.8	19	16
Swedish	22	5.6	17	5
French (Canadian)	17	4.3	17	
Norwegian	7	1.7	6	1
German	3	.8	3	
Austrian	3	.8	2	1
Irish	2	.5	2	
Danish	1	.2	1	
Total	396	100.0	323	73

6. SURFACE

a. Buildings & Repairs

There was very little repair work required to buildings during 1951. A new rack and some repairs were made to the storage shed for iron and pipe and minor repairs to the shop roof.

b. Location Buildings & Repairs

There were major repairs to 9 of the rented buildings during 1951 and this together with monor repairs and interior decorating, occupied part of the time of the 3-man crew. They were also used on the Negaunee and Athens Mine houses. Repairs to the 9 houses, which included 2 new furnaces, 1 new roof and major repairs, cost approximately $8,000.00 while repairs to the other 36 houses averaged about $200.00 or slightly less than the revenue from their rent.

Four houses located over proposed mining areas were purchased and one moved to another location but there were none sold making a total of 49 rented buildings. Two of these houses will be dismantled or sold to be removed early next year as they are not worth the expense of moving by the Company and are adjacent to the caved area. The location of those purchased is as follows:

House #197 located on Lot 6, Block 23, Pioneer Iron Co. Plat - purchased 9/1/51

House #198 located on Lot 9, Block 2, Kirkwood & Kellan Plat - purchased 9/12/51

House #199 located on Lot 8, Block 31, Pioneer Iron Co. Plat - purchased 12/1/51

House #200 located on Lot 8, Block 31, Pioneer Iron Co. Plat - purchased 12/1/51

One house was moved from Lot 9, Block 2, Kirkwood & Kellan Plat to Lot 7, Block 7, Pioneer Iron Company's 2nd Addition and repaired as part of the deal in the purchase of House #197. This event was covered by E & A, CC-471.

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6. SURFACE

c. Stockpiles

All of the ore was stocked on the East and West steel trestles and with the exception of the very wet ore stocked in November was cleaned up during the season. Approximately 25,000 tons of overrun was developed, which was about 7% on the ore stocked. Most of the loading was accomplished with the Electric Shovel while the steam-powered Caterpillar shovel was used intermittently when it was required to load both grades.

d. Docks, trestles, & pockets

The Northwest ore pocket on the landing was rebuilt and some of the head-frame members were replaced or strengthened. The rock trestle was dismantled and re-erected further to the South to shorten the distance that the rock had to be spread with the bulldozer.

e. Timber Yard

The timber treating plant did not operate in 1951 as steel was used entirely for supporting slabby ground in rock drifts on main levels. The saw mill was used intermittently to take care of the requirements at the Maas and also from some of the other Company mines.

f. Drainage

A further change had to be made in the location of the Maas Mine discharge as it crossed through a new addition being built North of the C. C. I. Co. 2nd Addition. Considerable expense would have been entailed to make this change and there would still be the difficulty of settling out the iron ore to conform to State regulations. Therefore, a new pipe line was put in the East end of the property and an open ditch was excavated along the old South Shore Right of Way some 2,800 feet to the edge of the swamp, North and West of the Carp River. The swamp level is quite flat and the water so far has been practically clear when it enters the river. If it becomes necessary, a pond with a series of baffles can be excavated in the swamp at a later date.

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7. UNDERGROUND

b. Development

6th Level

The major development on 6th Level during 1951 was the completion in October of the #6800 Cross-cut. This drift, located 185 feet West of #6700 Cross-cut, was driven to the South 385 feet and with the exception of a 10' dike was entirely in first class sulphurous ore. Three raises, #6801, #6803, and #6805 from the 6800 Cross-cut were in progress during 1951. By the end of the year, #6801 and #6803 had been advanced approximately 100 feet to the hanging rock and had been cut out on the -25' Sub Level, while Raise #6805 had only reached a height of 20 feet above the level.

Cross-cut #6800 will be the limit of Western development as any extension of the ore in this direction will be mined from the 7th Level.

Additional development on 6th Level included the completion of two raises from the North footwall drift. Raise #6064, located along the 6000 drift between #6700 and #6800 Cross-cuts, and #6057, located to the West of #6400 Cross-cut, were cut at the -25' Sub Level.

7th Level

Drifting on the 7th Level advanced on a single shift only during the year, as this produced all the rock that could be hoisted and still maintain ore production as scheduled. A third contract was added during March, making a total of three gangs developing on this level throughout most of the year. A pumphouse, approximately 36' x 36' x 12" and a sump, 176' in length were completed, as well as a spur from the main drift running along the South end of the sump. This spur will serve as tramway for handling the mud when the sump is being cleaned. The average dimensions of the sump in cross-section measured 15' x 17' and a 2½' reinforced concrete divider was constructed along the center line of the sump. This divider will enable one compartment of the sump to be cleaned while the other can be used for water storage. A suction chamber, 20' x 10' x 10' was cut and concreted in the floor of the South end of the pump house and a concrete dam was built between the chamber and the sump proper. By the end of the year a Wheatly pump, capable of handling 480 gallons per minute, was installed but was not yet in operation. The two pumps at present on the 6th Level will be moved to the 7th Level and all the water will be pumped directly to 5th Level. The main discharge line for the pumps passes through a 4' dog drift in the West wall of the pump house and up the winze to the 5th Level.

The Southeast corner of the pumphouse proved troublesome in that large slabs of the slate continued to peel from the back. This situation was remedied by first roof bolting the back in place and then adding support with steel sets.

Also completed late in the year was the pipe line from 6th Level which will carry the 6th Level mine water down the winze. When the new pump station is placed into operation, this water will be discharged into a concreted ditch.

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7. UNDERGROUND

b. Development

7th Level (Cont.)

Total drifting on the 7th Level during the year ammounted to 1,480 feet. The footwall drift was advanced 695 feet in slate, #7100 Cross-cut was advanced 556 feet in lean sulphurous ore and ferruginous slate, and #7200 Cross-cut was extended 229 feet through sulphurous ore, lean sulphurous ore, and ferruginous slate. The total exposure of first class ore in the latter drift measured 25 feet. The #7100 Cross-cut had reached the mining limit adjacent to the Pioneer and Arctic Lease and during December started to curve Westerly to drift along the limit line. Cross-cut #7200 will join #7100 at the Western end of this curve and initial mining operations will commence in the area to the Northeast of this intersection.

Raise #7102, extending from #7100 Cross-cut to the East rib of #6400 Cross-cut was completed and the top of the raise opened to the 6th Level by the end of the year. This raise serves as an opening for a direct fresh air supply to the 7th Level.

No major breakdowns occurred on the new level during 1951. However, some difficulty was encountered while opening the #7100 Switch. The back broke very high and it became necessary to use concrete to seal and support this area.

Present plans anticipate the new pumping station to be in use by the end of January and regular ore production from the 7th Level block cave late in 1952.

c. Stoping

General

Actual mining operations during 1951 extended from the 200' Sub Level, 85 feet above 4th Level to the -100' Sub Level immediately above 6th Level. It is estimated that the actual caving of ore in the block cave reached the 260' Sub Level or approximately 145' above the 4th Level. Although sub level caving, sub level stoping, and block caving were employed as mining methods during the year, 90% of the ore produced was recovered by the sub level caving method.

Mining in the developed area of the block cave above 4th Level was completed during the year with the exception of a small tonnage produced during the first half of January, 1952. Although this method proved more successful at the West end of the block, the over-all results of this mining were not too favorable. Several other methods had been tried in this very wet area on the North footwall but had to be abandoned due to the men having to work in icy water with continuous repairing and very small production. At least from the block cave a total of 75,000 tons or approximately $\frac{3}{4}$ of the estimated ore was recovered during the year.

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7. UNDERGROUND

c. Stoping

General (Cont.)

Excessive repairing to maintain transfers, large volumes of water, and changes in the consistency of the ore, alternating hard and soft seams, caused mining costs to be high and ore recovery low. This experience indicates that future block caving in the Maas will require a modification of the method used in this area, with additional supporting of transfers by circular steel or concrete.

As previously mentioned, the far West end of the mine above 6th Level was opened during the year. It became necessary, as sub caving in other sections of the mine terminated, to move more contracts to this West area in order to keep production at the present level. This concentration of contracts in one area has produced tramming difficulties in that it is impossible to give adequate service to the miners when raises are so grouped in one vicinity. It will be possible to remedy this situation later in 1952 when the block cave on the 7th Level and the pillar above the 6100 Cross-cut on the 6th Level are in production. This latter had to be retarded as the 6100 turn-out was being used for an auxiliary pump station and also the extra rock obtained from driving the 6100 Cross-cut could not be handled at the shaft at an earlier date.

Detail

200' & 185' Sub Levels

The Northeast footwall pillar was mined on these subs by four contracts. Although water handicapped mining efforts in this area, production was considered very satisfactory throughout the year.

Mining to the West on the North footwall from the 150' to the 185' elevation was completed during the year exhausting all the standard ore in the Race Course Lease. This area was also extremely wet.

160' Sub Level

Two additional top timber transfers were driven at this elevation and all necessary mill raises opened to complete the development of the block cave previously mentioned in this report. By the end of 1951, all of the area above the transfer was undercut and mined.

130' & 100' Sub Levels

Five contracts were mining at these elevations just to the South of the block cave area. This ore is transferred on the 75' Sub Level and trammed from the 5200 Cross-cut. Production from this general area was increased during the year due to better ventilation. Connections were made in lean ore and rock to the 4th Level to obtain fresh air directly from the source of supply.

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7. UNDERGROUND

c. Stoping

Detail (Cont.)

75' Sub Level

One contract was mining in the small remaining footwall pillar above #5200 Cross-cut. This mining operation was hampered by the consistant hardness of the ore and intrusions of jasper pillars.

25' Sub Level

Two contracts completed mining operations in the territory known as the Maas Area. This ore has been mined through the Maas shaft since the closing of the Negaunee Mine in 1949. Water and mud, which has interferred with mining on the subs above in this area, also reduced production in 1951. The nearly horizontal footwall also made it necessary to develop considerable footage in lean ore to recover the first class ore lying above. Upon exhausting this area in September, it became possible to abandon #5300 Cross-cut which had been very costly to maintain.

All mining areas that have thus far been described under "Detail - Stoping " have been in the standard ore reserves of the Maas Mine, with the one exception of the 25' sub pillar which was sulphurous. These areas have all been in the Maas Lease with the exception of the Western footwall pillar which was noted as Race Course ore in the 185' and 150' Sub Level descriptions.

5th Level to -100' Sub Level

The mining included between these elevations was responsible for practically all of the sulphurous ore produced in the Maas and Race Course Leases.

The principal Race Course ore pillar was bounded by the Northeasterly trending dike and the East footwall; this structure causing the mining area to decrease in size as mining descended. During the year three contracts produced sulphurous ore from this area and by the end of December were sub caving on the -75' Sub Level. One other contract, located on the -25' Sub Level, spent the year entirely within the Race Course Lease mining North of the dike at the Eastern end of the North footwall pillar. Four other contracts also sub caved the footwall pillar in this immediate area, three of which remained in the Maas Lease, while the fourth mined along the Maas - Race Course Lease line. One of the contracts in the Maas Lease mined above the #6300 Cross-cut in the Race Course during the first quarter of the year. There was no other mining in the Race Course Lease below the 5th Level during 1951.

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7. UNDERGROUND

c. Stoping

Detail

5th Level to -100' Sub Level (Cont.)

At the far West end of the mine a large sub level stope, developed early in 1950, was finally exhausted after drawing ore for more than a year. Mining was continued along the North footwall to the East of the stope by sub caving. In this far West area, opened late in the year, the jasper hanging wall is trending toward a horizontal position with the contact approximately at an elevation of -15'. Unfortunately, this hanging structure is heavily folded causing the ore to appear in pockets. One other contract, mining on the -50' Sub Level just to the West of the #6700 Cross-cut also encountered this rolling hanging wall. Very often the ore found along this hanging contact is extremely hard and very high in sulphur, raising the mining costs in the area and necessitating cautiousness in absorbing the product in order to keep the general mine samples at the required level.

The majority of the contracts that started the production from the West end moved from exhausted protions of the mine where they were located during the first half of the year. One contract was moved from the Northeast footwall lean ore pillar at the -90' elevation and two others who were previously mining above the #6400 Cross-cut.

Mining along the Southern footwall progressed during the year with two contracts mining between the footwall and an intersection of dike West of the Southern end of #6400 Cross-cut.

The pillar of ore above #6400 Cross-cut and to the West of the Race Course Lease was being mined by only one contract at the end of the year. This contract was at top timber elevation above the 6th Level and employed a double scraping system in order to prevent a collapse of #6400 Cross-cut.

6th Level & 7th Level

The development work on the 6th and 7th Levels during 1951 has been described in previous paragraphs.

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YEAR 1951

7. UNDERGROUND

d. Timbering

TIMBER STATEMENT FOR THE YEAR 1951

Kind	Lineal Ft.	Avg. Price Per Ft.	Amount 1951	Amount 1950
6" x 8" Cribbing Timber	51,982	.0796	4,136.69	3,471.79
8' x 10" Stulls	41,758	.1370	5,722.26	5,397.63
10" x 12" Stulls	77,117	.1920	14,803.53	15,811.52
12" x 14" Stulls	47,476	.2884	13,693.56	11,835.97
9' Steel Sets	11,610	.2355	2,734.54	4,794.57
Total 1951	229,943	.1787	41,090.58	
Total 1950	232,418	.1777		41,311.48
		Per 100 Ft.		
7' Metal Lagging	3,633	3.69	1,341.55	
7' Lagging	1,581,780	1.775	28,080.01	18,562.43
9½' Poles	612,198	2.993	18,326.19	16,992.65
50" Fencing	14 R.		340.12	
10' Steel Spiling Poles	1,500	.728	1,092.00	1,406.58
Total 1951	2,199,111	2.236	49,179.87	
Total 1950	1,816,209	2.035		36,961.66
Grand Total 1951			90,270.45	
Grand Total 1950				78,273.14
Product, Tons			712,474	633,444
Feet of Timber per Ton of Ore - Stulls & Cribbing			.3227	.3669
Feet of Stull Timber Only per Ton of Ore			.2498	.2880
Feet of Lagging per Ton of Ore			2.225	1.955
Feet of Poles per Ton of Ore			.8614	.9118
Feet of Lagging per Foot of Timber			6.895	5.329
Feet of Poles per Foot of Timber			2.669	2.485
Cost per Ton for Timber			.0577	.0652
Cost per Ton for Lagging			.0418	.0293
Cost per Ton for Poles			.0272	.0291
Cost per Ton for All Timber			.1267	.1236

Total Cost for Timber, Lagging, Poles, etc. and Cost per Ton

Year	Amount	Cost per Ton
1951	90,270.45	.1267
1950	78,273.14	.1236
1949	82,105.02	.1361
1948	99,949.06	.1485
1947	81,240.99	.1125

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7. UNDERGROUND

f. Explosives, Drilling and Blasting

EXPLOSIVES STATEMENT FOR THE YEAR 1951

Stoping and Ore Development

Kind	Quantity	Average Price	Amount 1951	Amount 1950
1¼" Gelamite #1	259,700	.1674 lb.	43,468.76	44,716.37
1¼" 60% Gelatin	10,100	.2049 lb.	2,069.00	347.75
1¼" Hercomite 2X	500	.1600 lb.	80.00	79.75
1¼" Hercomite 5 x 5	2,300	.2200 lb.	506.00	
Total Powder 1951	272,600	.1692	46,123.76	
Total Powder 1950	288,120	.1567		45,143.87
Fuse	974,460	9.30 M'	9,062.58	8,212.19
#6 Blasting Caps	112,642	14.87 M	1,674.77	1,469.87
Electric Blasting Caps	1,566	20.23 C	316.87	430.63
Powder Bags	28	5.06 Ea.	141.54	105.30
Fuse Lighters	28,100	9.00 M	252.90	202.50
Primacord	63,000	34.00 M'	2,142.00	1,824.00
#20 Connecting Wire	62	9.00	55.80	70.20
Total Fuse, Caps, Etc.			13,646.46	12,314.69
Total All Explosives			59,770.22	57,458.56
Product, Tons			712,474	633,444
Pounds Powder per Ton of Ore			.3826	.4548
Cost per Ton for Powder			.0647	.0716
Cost per Ton for Fuse, Caps, Etc.			.0192	.0194
Cost per Ton for All Explosives			.0839	.0910

Rock Development

1¼" Gelamite 1X			70.15
Total Powder 1951			
Total Powder 1950	460	.1525	70.15
Fuse			27.22
#6 Blasting Caps			5.29
Total Fuse, Caps, Etc.			32.51
Total All Explosives			102.66

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7. UNDERGROUND

i. Ventilation

The two main airways in rock from the Negaunee Mine, #2 Shaft, again proved adequate for handling the fresh air supply to the Maas working places. However, within the mine several changes were made in the general ventilation plan. A new air course was driven between the 4th and 5th Levels on the 100' Sub Level causing a split at the 4200 Cross-cut on the 4th Level. The air moving along the new course flows to the 75' Transfer and exhausts down Raise #5214 to the 5th Level. This ventilation plan succeeded in cooling four contracts that previously were subjected to almost impossible working conditions as to heat and humidity.

The ventilation of the 7th Level, formerly accomplished by a fan system which forced air down the winze, was changed to a natural flow of air by completing a raise from #7100 Cross-cut to the #6400 Cross-cut. This has increased the movement of air on the level and cleared up the gassy condition which had prevailed there.

The ventilation plan for providing air for the contracts mining above the #6800 Cross-cut was in the process of being completed by the end of the year. The top timber drift between the 600 Drift and #6700 Cross-cut was being extended and will eventually hole through to the #6800 Cross-cut. It is anticipated that this drift, along with the proper placing of air doors, will effectively ventilate the West mining area. Completion of this plan is expected by February of 1952.

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8. COST OF OPERATING

a. Comparative Mining Cost

	1951	1950
Product	712,474	633,444
Underground Cost	2.732	2.449
Surface Cost	.223	.207
General Mine Expense	.495	.489
Cost of Production	3.450	3.145
Depletion - Original Cost	.024	.028
Depreciation - Plant & Equipment	.027	.020
Development	.005	.002
Movable Equipment	.015	.010
Taxes	.206	.244
Loading & Shipping	.066	.062
Total Cost at Mine	3.793	3.511
Budget, Estimated Cost per Ton	3.888	3.459
Number of Days Operated	291	268
1 8-hour	2	1
2 8-hour	289	267
Average Daily Product	2,448	2,364

MAAS MINE
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YEAR 1951

8. COST OF OPERATING

b. Detailed Cost Comparison

	1951		1950	
	Amount	Per Ton	Amount	Per Ton
Underground Costs				
Exploring in Mine	32.56	.000	50.17	.000
Wage Adjustment	73,639.12	.103	6,358.17	.010
Development in Rock			1,547.80	.002
Development in Ore	20,003.36	.028	3,168.74	.005
Stoping	618,739.21	.868	532,829.04	.841
Timbering	593,924.97	.834	485,365.06	.766
Tramming	195,993.19	.275	180,623.74	.286
Ventilation	32,129.92	.045	33,342.80	.053
Pumping	112,164.06	.157	75,614.27	.119
Compressors & Air Pipes	72,878.57	.102	69,257.73	.109
Underground Superintendence	61,247.58	.086	52,344.00	.084
Maintenance, Compr. & Drills	2,517.24	.004	4,014.43	.006
Scrapers	82,701.72	.116	59,986.14	.095
Electric Tram Equipment	43,939.19	.062	36,146.24	.057
Pumping Machinery	36,832.47	.052	10,403.23	.016
Total Underground Costs	1,946,743.16	2.732	1,551,051.36	2.449
Surface Costs				
Hoisting	53,458.72	.075	47,847.16	.076
Stocking Ore	30,190.64	.043	22,267.04	.035
Screening-Crushing at Mine			460.56	.001
Dry House	20,960.19	.029	17,266.91	.027
General Surface	14,991.87	.021	13,630.14	.022
Maintenance Hoisting Equipment	12,757.44	.018	3,731.44	.006
Shaft	14,138.74	.020	12,245.19	.019
Top Tram Equipment	2,532.78	.004	1,710.26	.003
Docks, Trestles, & Pockets	8,033.01	.011	1,517.77	.002
Mine Buildings	1,694.41	.002	10,297.68	.016
Total Surface Costs	158,757.80	.223	130,974.15	.207
General Mine Expense				
Geological	1,763.51	.002	828.67	.001
Mining Engineering	11,649.35	.016	8,676.51	.014
Mechanical & Electrical Engineering	6,328.50	.009	5,870.81	.009
Analysis & Grading	46,085.76	.065	36,926.54	.058
Safety Department	4,787.60	.007	4,395.53	.007
Telephones & Safety Devices	5,570.16	.008	4,755.30	.008
Local & General Welfare	5,615.14	.008	5,316.30	.008
Sp. Exp., Pensions & Allowances	9,248.48	.013	10,634.51	.017
Ishpeming Office	44,844.48	.063	33,655.49	.053
Mine Office	45,748.13	.064	34,429.28	.054
Insurance	29,668.66	.042	32,352.62	.051
Personal Injury	24,189.49	.034	39,898.26	.063
Social Security Taxes	37,725.79	.053	33,217.84	.052
Employees' Vacation Pay	78,957.80	.111	59,100.00	.094
Total General Mine Expense	352,182.85	.495	310,057.66	.489
Cost of Production	2,457.683.81	3.450	1,992,083.17	3.145

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8. COST OF OPERATING

b. Detailed Cost Comparison (Cont.)

Cost of Production

Year	Amount Labor	%	Supplies	%	Cost per Ton Labor	Supplies	Total
1951	1,750,566.49	71.2	707,117.32	28.8	2.460	.990	3.450
1950	1,383,152.10	69.4	608.931.07	30.6	2.183	.962	3.145

The increase in labor cost was due to the raise in wages effective December 1st, 1950, the wage adjustment to take care of the inequities, and a straight 6-day per week schedule requiring more overtime on repairs. There was also a gradual increase in the price of most of the supply items.

The tons per man per day increased from 6.00 to 6.40 due to more favorable mining condtions and also on account of the production from one small block cave.

A few of the separate accounts are listed below for special comment.

Detail of Accounts

UNDERGROUND COSTS

Timbering

	Labor	Cost Per Ton	Supplies	Cost Per Ton	Total Cost Per Ton
1951	473,149.22	.665	120,775.75	.169	.834
1950	384,649.82	.608	100,715.24	.158	.766
Increase	88,499.40	.057	20,060.51	.011	.068

There was considerable more repair work required on the 6th Level drifts due to mining close to the level and most of this work had to be performed on Sunday at overtime rates to avoid interferring with tramming. An unusual amount of retimbering was also necessary in the block cave and other transfer drifts. With labor costs becoming higher, it has been decided to support the 7th Level transfer drifts with circular steel sets in the hope of reducing maintenance.

Pumping Machinery

	Amount	Cost per Ton
1951	36,832.47	.052
1950	10,403.23	.016
Increase	26,429.24	.036

Approximately one-half of the increase in 1951 was due to changing the discharge line on surface. The former pipe line passed through a new addition being built North of the C.C.I. Co. 2nd Addition and had to be changed to avoid the new sewer system and basements. As there had been contemplated action by the State to avoid pollution, it was decided to construct an entirely new line where the water could be discharged into a swamp that would act as a settling basin. This work was done under an E & A at a cost of approximately $11,000.00 and then the amount was charged against this account. There was also more maintenance required to the present pumping equipment both at the mine and at the General Shops.

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8. COST OF OPERATING

b. Detailed Cost Comparison

Detail of Accounts (Cont.)

Pumping

	Amount	Cost per Ton
1951	112,164.06	.157
1950	75,614.27	.119
Increase	36,549.79	.038

When the Negaunee Mine completed mining operations, it was decided that the charge for pumping the water, except that in the shaft, should be a Maas Mine account. The water could have been diverted to the Maas Mine but then it would have had to been pumped against a much higher head and also some of the water might have got into the workings. This accounts for the increase in 1951.

Analysis of Supplies Used

	1951		1950	
	Amount	Per Ton	Amount	Per Ton
General Supplies	70,218.68	.098	61,400.80	.097
Iron & Steel	26,081.54	.037	23,335.37	.037
Oil & Grease	7,214.47	.010	5,700.66	.010
Machinery Supplies	47,705.25	.067	38,711.30	.061
Explosives	60,112.75	.084	58,362.01	.092
Lumber & Timber	102,432.37	.144	82,134.14	.129
Fuel	15,946.25	.022	16,636.46	.026
Electric Power	162,940.16	.229	157,829.05	.249
Total	492,651.47	.691	444,109.79	.701

The following table shows the expense, incurred during the strike in July, which is not included in the yearly costs:

	Labor	Supplies	Total
Total Underground Costs	3,432.55	1,715.19	5,147.74
Total Surface Costs	1,175.63	178.54	1,354.17
Total General Mine Expense	4,883.33	3,074.03	7,957.36
Depreciation & Taxes		4,719.00	4,719.00
Total Cost	9,491.51	9,686.76	19,178.27

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10. TAXES

	1951		1950	
	VALUATION	TAXES	VALUATION	TAXES
Maas Mine	$ 2,120,000	96,354.00	$ 2,200,000	104,390.00
Race Course	340,000	15,453.00	375,000	17,793.75
Stockpile & Equipment	830,000	37,723.50	640,000	30,368.00
Miscellaneous Parcels	15,200	690.89	11,470	544.30
Total Oprtg. Maas Mine	3,305,200	150,221.39	3,226,470	153,096.05
Collection Fees		1,502.21		1,530.96
Total		151,723.60		154,627.01
Tax Rate		4,545.00		4,745.00
Total City of Negaunee Tax		696,031.85		667,585.43
Maas Mine % of City Tax		21.8%		23.2%
Maas Mine Rented Houses	115,675	5,257.53	110,050	5,221.97
Mineral Lands, Etc.	11,350	524.07	11,530	547.09
Total Houses & Lands	127,025	5,781.60	121,580	5,769.06
Collection Fees		57.82		57.69
Total		5,839.42		5,826.75

11. ACCIDENTS AND PERSONAL INJURY

	1951	1950
Fatal	0	1
Time Lost, over 4 months	0	0
Time Lost, 1 to 4 months	6	8
Time Lost, less than 1 month	4	13
Total Compensable Accidents	10	22

On December 31, 1951 payments were being made on seven cases which occurred prior to January 1, 1951.

The total compensation for accidents occurring within the year was $883.99 as compared with $3,024.99 in 1950.

The Maas Mine rated second in the safety record for all Company underground mines for the year with a Frequency of 39.56 and a Severity of .379 as compared with the overall average of 47.85 and 2.975.

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11. ACCIDENTS AND PERSONAL INJURY (Cont.)

Only one of the accidents was of an unusual nature or had the possibility of more severe injury and therefore the others do not merit a detailed description in this report.

Date of Accident	Name of Injured Man	Description of Accident
8-16-51	Robert Snyder	Snyder, a fairly new employee and a member of a motor crew, was squeezed between the timber and a haulage car at the bottom of a chute. He was walking ahead of the train to warn others of its approach and upon reaching the chute where they were to load, for some unexplained reason, he crossed over onto the wrong side of the drift where there was insufficient room for him to stand and allow the train to pass. He severed the extensors of his left forearm and lost one and one-half months.

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

Causes	
Slipping	3
Falls of Ground	2
Squeezed between two objects	1
Struck by moving objects	1
Tools Slipped	1
Falling Material	1
Falling off a truck	1
Total	10

Responsibility	
Injured Person	7
Injured & Others	2
Trade Risk	1
Total	10

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

E & A CC-285

Total Estimate		$225,350.00
Expended to Dec. 31, 1950	$90,126.57	
Expended in 1951	96,583.80	
Total expended		186,710.37
Balance December 31, 1951		$ 38,639.63

The purpose of this E & A was to sink a winze from 6th to 7th Level and develop the 7th Level. Most of the expenses in 1951 were for the pump house and sump and drifting on the 7th Level. The total cost per foot including the supplies, such as water and air lines, trolley, rail, etc. was $45.00. The rock in the drifts would not stand without support and steel sets were installed. Drifting and rock raising will be continued in 1952.

E & A CC-353

Total Estimate		$4,400.00
Expended to Dec. 31, 1950	$3,621.36	
Expended in 1951	952.04	
Total expended		4,573.40
Balance December 31, 1951		$ 173.40

The purpose of this E & A was the purchase and installation of a pump on the 7th Level to discharge the water to the 5th Level as the 7th is not connected to the main shaft.

E & A CC-374

Total Estimate		$21,000.00
Expended to Dec. 31, 1950	$ 157.89	
Expended in 1951	27,078.00	
Total expended		27,235.89
Balance December 31, 1951		$ 6,235.89

The purpose of this E & A was the purchase and installation of a motor generator set underground on the 5th Level to take care of the increase in load for haulage and scraper hoists. The increase in cost was due to overhauling the equipment which was purchased from the War Surplus Supplies and to more work required in the excavation and supports of the underground station.

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

E & A CC-378

Total Estimate		$12,000.00
Expended to Dec. 31, 1950	$11,742.91	
Expended in 1951	176.74	
Total expended		11,919.65
Balance December 31, 1951		$ 80.35

The purpose of this E & A was the purchase of the Black-Johns and Sundberg houses and lots and the removal of the houses to other locations. These houses were located on ground which will be subsequently caved by mining operations at the Maas Mine. This E & A was closed in 1951.

E & A CC-386

Total Estimate		$11,370.00
Expended to Dec. 31, 1950	$10,818.96	
Expended in 1951	620.00	
Total expended		11,438.96
Balance December 31, 1951		$ 68.96

The purpose of this E & A was for the purchase of a Hydro-crane to be used mostly for unloading timber and also for other work around the mine. The E & A was closed in 1951.

E & A CC-461

Total Estimate	$11,200.00
Total Expended	11,133.40
Balance December 31, 1951	$ 66.60

This E & A was authorized to cover the installation of a new discharge line for the water being pumped from the Maas Mine and the E & A was closed in 1951.

E & A CC-471

Total Estimate	$20,500.00
Total Expended	20,265.40
Balance December 31, 1951	$ 234.60

The purpose of this E & A was the purchase of two houses from the Amonino estate and the removal of one to another location. These houses were also on ground that will be subsequently caved. The other house will be sold for removal in 1952.

MATHER MINE "B" SHAFT
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1. GENERAL:

Paving, landscaping, and the planting of flowers and shrubbery gave the mine plant the finishing touches which had been looked forward to since the fall of 1946 when the original lay-out and plan were drawn. Excepting for a few minor changes in elevations for the parking lot, the basic plan was followed very closely in arrangement of structures and grading in general.

Production for the year was 478,243 tons. The total production for the year would have been over 500,000 tons if the C.I.O. Union had not called out the men on the two strikes in June and July.

The steady increase in production during the year, from a few hundred tons per day to a high daily hoist of 3,156 tons in December, proved that the mine plant had been well designed to handle the large tonnages which will be forthcoming as maximum capacity is reached.

6th Level produced all of the year's product excepting 9,702 tons which was encountered in cross-cutting on 7th Level.

Exploration and development through the year proved that considerable tonnages of ore are available to 6th Level. Steeply inclined drill holes from the footwall on 6th Level proved that the ore on 6th Level extended up the dip making large tonnages of ore available for mining above 5th Level. Since Mather "B" Shaft had not cut a plat nor installed pockets on 5th Level, on July 20, 1951 "A" Shaft started to drive a main footwall drift towards the ore to be mined above 5th Level elevation. By the end of the year this heading had reached a point 399' east of the boundary line between Mather "A" and "B" Shafts.

Labor relations continued to be satisfactory. Although there were several grievences of a minor nature, no grievence was carried beyond Step 2 of the agreement between the Company and the Union.

Manpower was plentiful in the unskilled classification. Of the skilled employees hired a large majority quit after a short period of employment due to the lack of housing in the district. Most of these skilled men came from the former iron mining district around Vulcan, Michigan and the copper mining district around Hancock and Calumet, Michigan. It is hoped that completion of the 100 new houses in the Cliffs 8th Addition will relieve this housing shortage and encourage outside experienced miners to settle and obtain work at the mines in the locality.

MATHER MINE "B" SHAFT
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1. GENERAL: (Cont'd)

Ore development crews were added continuously on the 6th Level as the limits of the ore body became out-lined through exploratory drilling. Actual mining by the stoping method was started in March and mining by the block caving method in one section of the ore body was started in May.

Main level drifting and cross-cutting was carried out on 7th Level continuously throughout the year with two crews. By the end of the year exploratory drilling from locations along the main drift and in the cross-cuts had out-lined an ore body of considerable size in the area above the 7000 and 7100 Cross-cuts.

Drifting towards the ore body was started in April on 8th Level and by the end of the year the main drift heading had reached a point 55' west of the 8100 Cross-cut point of curve.

Development of the 10th Level pumphouse was carried on continuously throughout the year. By the end of the year both sumps had been driven and partially concreted and the pumphouse proper was about 50% complete.

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2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production by Grades:

	Product	1951 Stockpile Overrun	Total	1950 Total
Mather Special	418,002	6,527	424,529	47,052
Mather Standard	53,714	-	53,714	1,066
Total	471,716	6,527	478,243	48,118
Rock			160,880	88,154

b. Shipments:

	Pocket Tons	Stockpile Tons	Total Tons	Total 1950	Increase
Mather Special	83,492	258,368	341,860	35,378	306,482
Mather Standard	-	53,714	53,714	1,066	52,648
Total	83,492	312,082	395,574	36,444	359,130

Pocket shipment of ore which was accomplished by using the truck loading ramp built in 1950, was started Monday, April 23rd and continued until the headframe flow sheet and the north bound conveyor were handling the entire product.

c. Stockpile Inventories:

	1951	1950
Mather Special	94,343	11,674

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2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

d. & e. Division of Product by Levels and by Months:

Months	Sixth Level	Seventh Level	Total	Rock
January	12,936	-	12,936	16,512
February	16,368	-	16,368	13,508
March	22,608	-	22,608	15,216
April	33,057	-	33,057	14,484
May	49,619	1,128	50,747	17,664
June	41,461	534	41,995	11,312
July	34,139	666	34,805	9,204
August	54,738	2,826	57,564	12,144
September	47,004	2,328	49,332	11,096
October	54,378	66	54,444	14,100
November	47,874	978	48,852	11,576
December	47,832	1,176	49,008	14,064
Totals	462,014	9,702	471,716	160,880
Current Year Stockpile Overrun			6,527	
			478,243	

f. Ore Statement:

	1951	1950
On Hand January 1, 1951	11,674	-
Output for Year	471,716	48,118
Overrun	6,527	-
Total	489,917	48,118
Shipments	395,574	36,444
Balance on Hand	94,343	11,674
Increase in Output	430,125	48,118
Increase in Ore on Hand	82,669	11,674

Working Schedule

1951 - Five 3-8 hr. and one 2-8 hr. shifts per week from April 1, 1951 to December 31, 1951.

1950 - Five 3-8 hr. shifts per week from July 1, 1950 to August 20, 1950. Six 3-8 hr. shifts per week from August 21, 1950 to December 31, 1950.

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2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

g. Operating Delays:

Excluding 11 2/3 days lost during the strikes in June and July there were only several minor operating delays which did not effect production or underground development.

With the large storage capacity in the trenches at the shaft stations it is possible to absorb these delays in hoisting without effecting production. Absorbing these minor delays will be possible until the mine reaches maximum production.

3. ANALYSIS:

a. Average Mine Analysis on Output (Dried):

Grade	Iron	Phos.	Silica	Sulphur
Mather Special	58.99	.099	7.73	.535

b. Average Analysis on Straight Cargoes:

Grade	Iron	Phos.	Silica	Sulphur	Moist	Iron Nat'l
Mather Special	57.75	.100	8.82	.671	10.00	51.974

c. High Sulphur Ore:

All of the mine product was mixed and hoisted as a mine run grade. Five car lots were transferred to Mather Standard grade after sampling and analysis proved that the sulphur content was low enough to permit transferring from Mather Special. With the large reserves of high sulphur ore above 6th Level, sulphur content of the product from 6th Level will be a problem for several years.

Standard Ore:

Although some of the ore above 6th Level is of standard grade it is necessary to use most of the standard ore mineable to 6th Level to mix with the hi-sulphur ore to make the average sulphur content of the 6th Level product about .800 sulphur. Exploratory drilling between 6th and 7th Levels proves that most of the ore available to 7th Level will be of a standard grade. With completion of the proposed west extension stockpile conveyor it will be possible to separate some of the standard ore from the mine product.

d. Complete Analysis of Ores in Stock (Dried):

Grade	Tons	Iron	Phos.	Silica	Mang.	Alum.	Lime	Mag.	Sulph.	Loss	Moist.
Mather Special	94,343	58.67	.107	7.11	.46	2.28	1.26	.30	.790	2.24	-

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4. ESTIMATE AND ANALYSIS OF ORE RESERVES:

The total net estimate of ore reserves reported to the Tax Commission as of December 31, 1951 was 10,037,275 tons. A comparison with the 1950 estimate indicates an increase of 631,955 tons. The significant change in the estimate was the increase in high sulphur reserves indicated by diamond drilling above 6th Level. The development and exploration work on 7th Level did not materially change the previous estimate of either Standard or High Sulphur ore.

Of the 10,000,000 tons estimated, approximately 7,300,000 tons are available to the present underground development. The remaining 2,700,000 tons are estimated from surface diamond drilling information. However, of the 7,300,000 tons available to present development, approximately one-half must remain as pillars until the ore above 5th Level is mined. Thus, only 3,600,000 tons are actually available for mining for the next two or three years. Of the actual tonnage available, approximately 500,000 tons are High Sulphur grade and 3,000,000 tons are Standard grade.

The estimate of ore reserves as reported to the Tax Commission as of December 31, 1951 is as follows:

	Mather Standard	High Sulphur	Total Tons
Above 6th Level	1,599,126	3,626,146	5,225,272
Between 6th and 7th Levels	2,215,626	1,010,729	3,226,355
Between 7th and 8th Levels	177,083		177,083
Sec. 1 Diamond Drill Hole Estimate	3,055,199		3,055,199
Total Gross as of December 31, 1951			11,683,909
Less Total Production 1951			478,243
Total Gross Less Production			11,205,666
Less 10% for Mining and Rock			1,168,391
Net Total as of December 31, 1951			10,037,275

Expected Average Natural Analysis of Ore Reserves as of August 31, 1951:

Grade	Total Tons	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sulph.	Loss	Moist.
By Surface Diamond Drilling ...	2,749,679	54.40	.081	5.08	.10	2.62	.58	.60	.017	2.20	11.50
By Underground Development	7,287,596	52.00	.090	7.00	.45	2.50	2.50	.50	.625	2.00	10.50
	10,037,275										

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5. LABOR AND WAGES:

a. Comments:

By the end of the year 509 men were employed at the mine which was a net gain of 161 employees for the year. By the end of the year all of the men who had previously requested transfers to Mather "B" from Mather "A" had been transferred.

Number of Men 1/1/50	348
Added to Roll During the Year	271
Total	619
Separations	110
Total on Payroll 12/31/51	509
Net Gain	161

A large proportion of the new hires were men with mining experience from other mining districts in the Upper Peninsula. Of the separations nearly 50% left the employ of the company mainly because of the shortage of housing in the district. It is hoped that the new homes being constructed by the Cliffs Realty Company will relieve the housing shortage.

Union membership increased from 59.4% in January 1951 to 69.8% in January 1952. The Union Membership Committee worked hard throughout the year in an effort to sign up new members, although a large proportion of the older employees still refused to join the union. The number of grievances of a minor nature increased towards the end of the year. The greater proportion of these minor grievances involved promotions to contract mining. Each time a new hire or transfer with a great deal of mining experience was placed into a contract, the union objected because in all instances we did not follow seniority. In all cases the union's argument was weak as the employees involved in the grievance did not have mining experience and had only been employed at the mine for a short period, which in most cases was only six months. As new mining contracts were organized the basic plan was to pick one man with mining experience who may or may not have seniority and could act as a lead man in safety and method of mining. The high seniority employees were teamed up with these experienced miners.

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5. LABOR AND WAGES:

a. Comments: (Cont'd)

Six Mather "B" miners were promoted to the position of shift boss. In this group were Edward Mallett, Lawrence Delongchamp, Emmett Hoiem, Chester Prideaux and Michael Bussone. Walter Tuominen, who was employed as a shift boss at Mather "A", transferred to Mather "B" February 12, 1951. John Tregoning, who was employed as a mine foreman at the Negaunee Mine, transferred to Mather "B" as a shift boss October 1, 1951. Gilbert Dawe, who was employed at Mather "B" as geologist, transferred to Mather "A" as operating engineer on October 15, 1951. Dominic Polini was promoted to shift boss status in charge of underground mechanical work.

In an effort to make up production lost during the two short strikes, Mather "B" did not schedule a regular vacation week. The men eligible for vacations were permitted to take their vacation periods at any time during the year upon sufficient notice and replacement on his particular job. This method did not work out too well as a certain proportion of the employees were away on vacation from July month through the deer hunting season in November. It involved shifting employees around into different areas in the mine unfamiliar to the employees. This method also involved additional work for the supervisory group.

The high contract pay for a single period during the year was $24.08 per day.

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5. LABOR AND WAGES: (Cont'd)

b. Comparative Statement of Wages and Product: (Six months operating in 1950) (Operating Only - Not including E&A Work)

		1951	1950
Product		478,243	48,118
Number of Shifts & Hours:			
Equiv. to		272-2/3 3-8 hr.	138 3-8 hr.
Average No. of Men Working:	Idle	Operating	
Surface	21	64	33
Underground	20	206	75
Total	41	270	108
Average Wages Per Day:			
Surface		$ 14.36	$ 12.66
Underground		16.03	14.82
Total		$ 15.63	$ 14.16
Wages Per Mo. of 23 Days:			
Surface		$330.28	$291.18
Underground		368.69	340.86
Total		$359.49	$325.68
Tons Per Man Per Day:			
Surface		26.84	9.89
Underground		8.34	4.32
Total		6.36	3.01
Labor Cost Per Ton:			
Surface		$ .535	$ 1.280
Underground		1.923	3.427
Total		$ 2.458	$ 4.707
Average Product Stoping		64.21	-
Average Wages Contract Miner		$17.56	$15.92
Total No. of Days:			
Surface		17,818-1/2	4,863
Underground		57,357	11,129-1/4
Total		75,175-1/2	15,992-1/4
Amount for Labor:			
Surface		$ 255,890.27	$ 61,599.43
Underground		919,418.09	164,910.90
Total		$1,175,308.36	$226,510.33
Proportion Surface to Underground Men		1:3.2	1:2.3

MATHER MINE "B" SHAFT
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6. SURFACE:

a. Buildings:

The excellent new buildings at the property required very little maintenance during the year. Some minor changes and additions in plumbing fixtures were made such as installation of additional drinking fountains and additional water lines in the Dry basement to provide for fire fighting facilities.

b. Headframe:

All rock and ore hoisted from the first of the year until the third week in June was handled through the rock pocket. In the last half of June the north bound stocking conveyor was placed into operation along with all the other headframe crushing and screening equipment. Although the crushing and screening equipment in the headframe was installed and ready to go early in the year this equipment could not be put to work until the stocking conveyor began to operate.

Successful operation throughout the year of all the equipment in the flow sheet proved that the whole installation was well laid-out and designed. The only delay from failure of mechanical equipment in the crusher building took place on Saturday, November 3, 1951, when one of the eccentric bearings on the Simplicity screen failed. When this bearing failed the plant where the screen was manufactured was contacted immediately by telephone and a serviceman was at the mine on Sunday with a replacement bearing. The screen was again ready to work on Monday.

Some trouble was experienced with the rollers on the 21 foot pan feeder. A few of these rollers froze to the shafts due to too tight a fit. With more frequent greasing this condition was overcome and it is now hoped that these rollers are thoroughly worked in after six months of operation. A Farval lubrication system was installed on the Allis-Chalmers crusher on September 25, 1951.

The shaft air heating installation which was work under contract to the Walker-Jamar Company began operating the last week in January. This was timely as some difficulty was being experienced with ice forming in the shaft. The shaft air heating system thawed the ice which had formed in the shaft in about twelve hours.

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6. SURFACE: (Cont'd)

c. Stocking:

All of the ore hoisted from January 1st until April 23rd was stocked by means of Euclid truck. On April 23rd, pocket shipment of ore was started using the truck loading ramp which had been constructed in 1950 for this purpose. The truck loading ramp was used until the north bound stocking belt was placed into operation in June. The north bound belt is used to handle all of the mine product excepting the occasional wet skips of ore which are trucked to a separate pile on the stockpile grounds. The wet ore is passed through the rock pocket rather than attempting to handle it over the stockpiling belt.

The Bethlehem Steel Company completed steel erection of the north bound stockpiling conveyor the last week in January. Laying of the tongue and groove fir decking was started with mine carpenters as soon as the Bethlehem Steel Company had completed erection of the first span of the trestle. The carpenters completed their portion of the work the last week in February.

The sheeting enclosure work was under contract to the American Steel Band Company through their dealer the Worden-Allen Company. The first shipment of materials and insulation for the enclosure work arrived at the mine in February. The erection crew began work the following week. Mine mechanics followed closely behind the sheeting crew installing conveyor idlers and other conveyor equipment. Due to inclement weather on several days in March and April the sheeting contractor was only able to work 50% or 60% of the scheduled work week. The sheeting contract was completed May 14th.

Another month was required to complete installation of mechanical equipment and the belt was ready for continuous operation June 23rd, after several days of intermittent operation during training and adjustment of all the equipment in the flow sheet.

Although a portion of the stockpile sollar was completed with rock hoisted during shaft sinking and early development of plats and main level drifting, most of the waste rock hoisted during the year was used to complete this work. The stockpile sollar was laid about 18" thick over the sand on the previously graded stockpile area.

Upon completion of plans for the east extension stocking trestle which were prepared by our consulting engineer Mr. R. E. Boeck (Professor of civil engineering at Marquette University in Milwaukee) several steel fabricators and erectors were invited to bid on the structure. The Worden-Allen Company was awarded the contract for both the steel work and the sheeting. This firm was the low bidder on the work involved in these contracts.

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6. SURFACE: (Cont'd)

c. Stocking: (Cont'd)

The Worden-Allen Company began steel erection the first week in October and completed this phase of the work November 20th. The sheeting work was started immediately upon completion of steel erection. At the end of the year this work was about 30% complete. Concrete foundations for all the structures were formed and poured by mine crews.

d. Landscaping, Roads and Parking Area:

Rough grading adjacent to the shop and dry wing which was a part of the building contract was completed by Proksch Construction Company in May.

Onnie Lescelius a former road contractor's foreman was borrowed from the Ohio Mine to supervise fine grading, graveling and black top paving in the areas around the buildings, parking lot and the new mine entrance road. The fine grading was done by mine laborers supervised by Mr. Lescelius.

A contract for construction of curbing and a rockwall around an area between the parking lot and the office was awarded to the Straits Construction Company. This work was completed early in August.

A contract for black top paving was awarded to Paul Miller. Paving of the entrance road, parking lot and the area adjacent to the building was completed in one week from August 8th to 14th.

O.O. Snowden was awarded a contract to construct guard rail at the shoulder of the steep enbankments and also was awarded a contract to sod certain portions of the long steep enbankments. Snowden carried on his work with a small crew from May to August.

All of the work involved in the three contracts was coordinated and carried on in a workmanlike manner under the supervision of Mr. Lescelius and Julien Payen, who supervised the construction of the rock-wall and the final grading of the area enclosed by the rockwall and the curbing.

e. Timber Tunnels:

Approximately 200 linear feet of timber tunnel was formed and poured. Only a short portion of the lower timber tunnel remains to be built to complete all of this work. 810 linear feet of four foot high retaining wall was constructed parallel to one of the narrow guage tracks running the full length of the timber yard adjacent to the stull timber field. The retaining wall is used to roll stull timber onto timber trucks.

MATHER MINE "B" SHAFT
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7. UNDERGROUND:

a. Shaft Sinking:

Work in the shaft consisted of picking up odds and ends which were not completed during actual sinking. Included in this work was installation of the wire screen which is nailed to the runners on the cage side of the ladder road, bolting in place of sollars omitted during sinking, etc.

b. General:

Ore production increased steadily during the year from 12,936 tons in January to a high of 54,738 tons in August. All of the ore produced in the first four months of the year came from 6th Level. In May the first ore was hoisted from 7th Level as the 7000 Cross-cut was driven. Sixth Level produced 462,014 tons or 98%; Seventh Level produced 9,702 tons or 2%. All of the 7th Level product was development ore. One stope and one block cave produced the bulk of the ore hoisted.

6th Level:

Area Between the 6000 and 6100 Cross-cuts: Although development of two top timber slusher drifts was started north of No. 22 Dike, in 1950, further development of the area was not continued until the extent of the ore up the dip had been proven by exploration. Exploration in the area by drilling was started in September from a small drift in the footwall at the -525 elevation or 20' above the proposed 5th Level. By the end of the year drilling from the -525 elevation had proven that the ore in the area did not extend to any great height above the elevation from which the drilling was done.

The area south of and adjacent to No. 22 Dike was developed and mined. 38,592 tons were produced from the small cave south of the Dike.

Area Between the 6000 and 6100 South Cross-cuts: Development of the area was started in November to mine out a small isolated ore body adjacent to No. 25 Dike.

Area Between the 6100 and 6200 Cross-cuts: This area produced the bulk of the year's tonnage. The portion of the area north of and adjacent to No. 22 Dike was developed as a stope due to the extreme hardness of the ore. Development was completed and actual stoping started in March. The stope produced 107,430 tons.

The portion of the area south of and adjacent to No. 22 Dike was developed and mined as a block cave. This portion of the area produced 142,718 tons. All of this tonnage was produced by two mining contracts who began development of the block in February with actual mining beginning in May. The area was mined out by October.

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7. UNDERGROUND: (Cont'd)

b. General: (Cont'd)

Area Between the 6200 and 6300 Cross-cuts: Development of the portion of the area north of No. 22 Dike was carried on with several mining crews and stoping operations were started with opening up of the stope slot in September. The portion of the area north of No. 22 Dike produced 17,808 tons.

The portion of the area south of and adjacent to No. 22 Dike was developed as a block cave and mining began in October. The block cave produced 18,888 tons.

Area Between the 6300 and 6400 Cross-cuts: Although no great width of ore was proven by cross-cutting, exploratory drilling with steeply inclined holes above the level proved that considerable tonnages were available to this area. The first experimental concreted slusher drifts were formed and poured at top timber elevation. Further exploration and diamond drilling above the area of the concreted drifts proved that the ore extended to considerable heights above 5th Level elevation. Actual mining in this area can not be started until the ore available to 5th Level has been mined out.

Area Between the 6700 and 6800 Cross-cuts: The 6700 and 6800 Cross-cuts were driven from the main footwall drift into the jasper capping. With completion of the 6800 Cross-cut capital expenditures for 6th Level were completed excepting for some exploratory drilling and a raise connection to 5th Level which is to be used as a rock pass for Mather "A" crews drifting on 5th Level. Development of the area for mining was started in August and continued for the balance of the year.

7th Level:

Main level drifting and cross-cutting constituted the greater portion of the work on this level. One drift crew advanced the main drift heading while the second crew advanced cross-cuts. By the end of the year the 7th Level main drift heading was advanced to a point 120' beyond the 7600 Cross-cut point of curve.

Exploratory drilling with inclined holes from 7th Level and vertical holes from the end of the cross-cuts on 6th Level proved that an ore body of considerable size was available for mining in the area between the 7000 and 7100 Cross-cuts. Exploration and development on and above 7th Level has shown encouraging results for this level with great ore reserves available for mining.

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7. UNDERGROUND: (Cont'd)

b. General: (Cont'd)

8th Level:

Main level drifting towards the ore body was started on 8th Level in April after completion of the west skip plat facilities to handle development rock.

By the end of the year the 8000 Cross-cut was cut and the main drift heading had reached a point 55' beyond the 8100 Cross-cut point of curve.

10th Level:

One crew worked on 10th Level continuously developing sumps and a large pumphouse. Two sumps were driven at right angles from the end of the 10th Level west trench. A section of these sumps adjacent to the trench were concreted. Work on the sumps was completed and excavation of the pumphouse proper was started in December.

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7. UNDERGROUND: (Cont'd)

d. Timbering:

The cost per ton for timbering supplies used under the operating account "Timbering" was $0.1147 as compared with $0.3650 in 1950. In general, 8' hardwood stull timber was used in supporting slusher drifts and most of the drilling-sub drifts in the stoping areas although occasionally a larger drift was driven in which 9' timber was used. Concreting of the first slusher drift was started in September, 1951 with the use of the Blaw-Knox steel drift forms and pneumatic concrete placers. Concrete was batched and mixed at a point approximately 200 feet west of the shaft. From this location the mixed concrete was blown through a series of three placers before it arrived at the forms approximately 2,400 feet west of the shaft at the top timber elevation on 6th Level. It was later found that two placers could do this work and the placer on 6th Level, a short distance from the forms was eliminated. By the end of the year one slusher drift 250 feet long was completed and about 125 feet was completed in the second drift. The total cost of this underground slusher drift concreting is being carried in the operating account.

In most of the main level rock drifting the 4" W.F. 13# caps and legs were sufficient support. In the heavier ground the 8" W.F. 24# beams were used for caps along with 4" W.F. 13# legs. The Bethlehem hat shaped sections were used for back-poles in all of the main level drifting with steel sets. Minecrete back-poles were used for side lagging on the plats. The galbestos V-beam sheets were used to cover the back of the steel sets supporting the shaft station openings. The use of steel sets, galbestos sheets and minecrete back-poles in ground support at the shaft stations eliminates the possibility of fire at these important underground locations. Although the floor of the plat on 7th Level was covered with wood plank, from a standpoint of safety and the elimination of fire hazard, the 7th and 8th Level shaft station floors were finished with concrete.

Due to a rainy, wet summer which made hauling roads impassable the mine timber supply was practically exhausted by the time woods roads had frozen sufficiently to permit loggers to begin moving timber supplies to the mine. By the end of the year all types of timbering supplies were again moving into the mine plant in sufficient quantities.

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7. UNDERGROUND: (Cont'd)

d. Timbering: (Cont'd)

Statement of Timber Used Under Operating Account "Timbering"

	LINEAL FEET	AVG. PRICE PER FOOT	AMOUNT 1951	AMOUNT 1950
5'4" Cribbing	62,856	.08613	$ 5,414.24	$ 589.30
8' Stulls	58,240	.40355	23,503.27	4,525.13
Total	121,096	.23879	$ 28,917.51	
Total 1950				$ 5,114.43
7' Lagging	888,237	.01892	$ 16,809.25	$ 3,061.68
9½' Poles	242,480	.03506	8,502.54	1,032.82
Total	1,130,717	.02239	$ 25,311.79	
Total 1950				$ 4,094.50
4" x 4" 13# W.F. Beams				$ 4,522.36
4" x 8" 23# "I" Beams	58	.96362	$ 55.89	292.91
6½" x 8" 24# W.F. Beams	82	1.10280	90.43	1,869.14
4" x 4" x 12' Steel Legs	264	.76216	201.21	
4" x 4" x 9' Steel Legs	72	.99055	71.32	
Arch Steel Sets	12 Pcs.	16.42	197.04	
3/8" x 2" x 2" Angle Iron				959.38
Misc. (Bolts, Plates, Etc.)				709.33
Cement	5,413 Bags	1.06587	5,769.53	
Sand	356 Yds.	2.62213	933.48	
Gravel	537 Yds.	3.92382	2,107.09	
Pozzolith			225.34	
1" Reinforcing Rod	2,000 Feet	.13033	260.65	
Total			$ 9,911.98	
Total 1950				$ 8,353.12
GRAND TOTAL INCLUDING STEEL AND CONCRETE MATERIALS			$ 64,141.28	$17,562.05

Product For Year	1951	1950
	478,243	48,118
Foot Timber per Ton of Ore	.2532	.2215
Foot Lagging per Ton of Ore	1.8573	3.1336
Foot Poles per Ton of Ore	.5070	.6081
Foot Lagging per Foot of Timber	15.2513	14.1464
Cost Per Ton for Timber	.06046	.1063
Cost Per Ton for Lagging	.0351	.0940
Cost Per Ton for Poles	.0177	.0215
Cost Per Ton for Steel	.0013	.1736
Cost Per Ton for all Timbering Supplies, Including Steel	.1341	.3650

MATHER MINE "B" SHAFT
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YEAR 1951

7. UNDERGROUND: (Cont'd)

d. Timbering: (Cont'd)

Statement of Timber Used - All Operations

	LINEAL FEET	AVG. PRICE PER FOOT	AMOUNT 1951
5'4" Cribbing	99,359	.09859	$ 9,796.19
Timber	58,240	.40356	23,503.27
Total	157,599	.21129	$ 33,299.46
		PER 100'	
7' Lagging	2,052,865	1.8859	$ 38,715.37
9½' Poles	478,558	3.4628	16,571.62
Total	2,531,423	2.1840	$ 55,286.99
		PER FOOT	
4" x 4" 13# W.F. Beams	105,993	.86939	$ 92,149.49
4" x 8" 23# "I" Beams	2,986	1.03567	3,092.54
6½" x 8" 24# W.F. Beams	10,958	1.14547	12,552.08
8" x 12" 50# "I" Beams	214	2.25285	482.11
Total			$108,276.22
		PER UNIT	
Galbestos	2,463 Pcs.	5.63964	$ 13,890.44
Hat Sections	12,054 Pcs.	2.30560	27,791.80
Minecrete Back Poles	3,121 Pcs.	1.86037	5,806.23
Minecrete Blocks	6,761 Pcs.	.15608	1,055.26
Cement	5,413 Bags	1.06587	5,769.53
Sand	356 Yds.	2.62213	933.48
Gravel	537 Yds.	3.92382	2,107.09
Pozzolith			225.34
1" Reinforcing Rod	2,000 Feet	.13033	260.65
Total			$ 57,839.82

GRAND TOTAL INCLUDING STEEL AND CONCRETE MATERIALS $254,702.49

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7. UNDERGROUND: (Cont'd)

e. Drifting and Raising:

The following table includes all of the miscellaneous development work on all operations throughout the year.

	Drifting		Raising		
	Ore	Rock	Ore	Rock	Total
Large Size	12,134'*	13,523'**	635'***	520'****	26,812'
Small Size	7,205'	1,374'	5,425'‡	554'‡‡	14,558'
	19,339'	14,897'	6,060'	1,074'	41,370'

* Timbered
** 11,194' Timbered
*** 40' Cribbed
**** 514' Cribbed
‡ 2,135' Cribbed
‡‡ 241' Cribbed

f. Explosives:

The following table includes the type, quantity and price of blasting supplies used on all operations.

	Quantity	Average Price	Amount
Hercomite 2" x 24"	86,650#	15.999 CWT	$ 13,863.00
60% Gelatin 5" x 5"	56,570#	21.922 CWT	12,401.40
Gelamite 1¼" x 8"	493,101#	16.741 CWT	82,547.65
Total Powder	636,321	17.100 CWT	$108,812.05
Ignitacord Connectors	4,000	2.000 C	$ 80.00
Ignitacord	3,000'	.755 C	22.65
Electric Blasting Caps	97,807	23.404 C	22,891.17
#6 Blasting Caps	138,000	1.563 C	2,156.60
Lead Wire	105,320'	26.899 M	2,833.04
Primacord	303,500'	3.402 C	10,324.00
Dry Fuse	930,000'	9.445 M	8,783.70
Fuse Lighters	25,000	9.000 M	225.00
Tamptite Shells	21,607	6.450 M	139.31
Powder Bags	169	5.158	871.63
Total Fuse, Caps, Wire, etc			$ 48,327.10
GRAND TOTAL EXPLOSIVES & BLASTING SUPPLIES			$157,139.15

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7. UNDERGROUND: (Cont'd)

f. Explosives: (Cont'd)

As compared with 1950, explosives per ton of ore showed a very definite decrease which is directly due to the beginning of actual mining early in the year. All of the ore produced in 1950 was development ore which made the powder cost per ton very high.

Explosives Used in Breaking 478,243 Tons of Ore in Stoping and Development in Ore

	Quantity	Average Price	Amount 1951	Amount 1950
Gelamite 1-x, 1¼" x 8"	244,085#	16.777 CWT	$40,951.57	$11,367.97
Hercomite 2-2" x 24"	85,345#	15.917 CWT	13,685.02	13.95
Gelatin-60% high pressure	56,500#	21.922 CWT	12,386.00	-
Total Powder	385,930#	17.366 CWT	$67,022.59	
Total Powder 1950	66,565#	16.300 CWT		$11,381.92
No. 6 Blasting Caps	138,124	1.581 C	$ 2,185.09	$ 346.77
Dry Fuse	900,000	9.446 M	8,501.80	2,898.62
Electric Caps	16,233	24.051 C	3,904.36	1,148.26
Ignitacord	3,000	.755 C	22.65	7.55
Lead Wire	29,410	32.491 M	903.22	97.38
Powder Bags	115	5.203 ea.	598.43	212.25
Fuse Lighters	25,000	9.000 M	225.00	112.50
Tamping Shells	21,607	6.447 M	139.31	13.93
Primacord	303,500	3.401 C	10,324.00	-
Ignitacord Connectors	4,000	2.000 C	80.00	10.00
Total Caps, Wire, Fuse, etc.....			$26,883.86	$ 4,847.26
GRAND TOTAL EXPLOSIVES & BLASTING SUPPLIES.....			$93,906.45	$16,229.18

	1951	1950
Product	478,243	48,118
Pounds of Powder per Ton of Ore	.807	1.383
Tons of Ore per Pound of Powder	1.239	.723
Cost per Ton for Powder	.140	.237
Cost per Ton for Fuse, Caps, etc.	.056	.101
Cost per Ton for All Explosives	.196	.337

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7. UNDERGROUND: (Cont'd)

f. Explosives: (Cont'd)

The following table is a record of explosives used in driving 11,194 feet of rock drift.

	Quantity	Amount	Pounds of Powder Per Foot of Drift	Cost Per Foot
Germite 1x	160,420#	$26,908.71		
60% Gelatin	70#	15.40		
Hercomite 2" x 24"	733#	117.28		
Total Powder	161,223#	$27,041.39	14.40	$2.42
Miscellaneous Blasting Supplies		13,674.32	-	1.22
Grand Total		$40,715.71	14.40	$3.64

Most of the rock drift for the year was in the softer footwall slates through and near the footwall ore contact.

7. UNDERGROUND: (Cont'd)

g. Loading and Tramming:

Most of the loading in the drifting projects was done by the three Model 120 Conway Goodman electric loaders. The air operated Eimco Model 40 borrowed from Mather "A" Shaft was used in cross-cutting on 6th Level. The Joy Model HR-17 loader on trial at the mine was used in driving approximately 2,000 feet of drift. Late in the year the Joy Manufacturing Company requested return of the loader to the factory as it was the only loader of its type to be built and they did not wish to have in the field one experimental model for which they would have to carry replacement parts.

Vulcanizing of loader belts improved belt life and reduced maintenance on the loaders. One vulcanized belt on the loader on 8th Level operated continuously for eight months without failure. With the old type of steel belt lacing it was necessary to replace the lacing after two or three weeks of operating due to the bending of the lacing around the small diameter head and tail pulley.

The Jeffrey and Goodman combination locomotives have operated satisfactorily although some features on one type are better than the other.

The new all steel timber trucks equipped with Willison couplers have proven to be an excellent improvement over the old type wooden timber trucks. The all steel timber trucks can be pushed or pulled or mixed in a train of ore cars which helps to eliminate switching problems encountered with the old wooden type of truck. A sufficient supply of these trucks are now in use at the mine to carry on the present operations although the Central Shops still have an unfilled order of these trucks for Mather "B".

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7. UNDERGROUND: (Cont'd)

h. Ventilation:

With installation of the Joy 100,000 C.F.M. fan in July, ventilation for both Mather "B" and Mather "A" Shafts was greatly improved. Fresh air is drawn down "B" Shaft and after passing through the "B" Shaft working areas the air is exhausted to Mather "A". On the exhaust side of the fan the air is thoroughly cleaned with air and water sprays. With the 100,000 C.F.M. of air split into the mining areas in Mather "B" it is possible to blast in any mining contract at any time during the shift and have the working place completely cleared of smoke within a few minutes.

An air raise connection from 7th Level to 6th Level improved ventilation on 7th Level and also reduced the volume of air passing through the 6th Level main drift. About 40,000 C.F.M. of fresh air passes through 7th Level up through the ventilation raise into the 6000 Cross-cut on 6th Level. A similar ventilation connection was started on 8th Level to connect through to 7th Level.

i. Pumping:

All of the shaft water is collected and stored behind the 4th Level dam and used as drilling water. This supply is supplemented by city water which passes through the crusher cooling system. All of the mine water at "B" Shaft flows to "A" Shaft along the 6th Level footwall drift. The "B" Shaft water is all pumped from the Mather "A" Shaft pump station on 6th Level.

MATHER MINE "B" SHAFT
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YEAR 1951

8. COST OF OPENING, EQUIPPING, DEVELOPING AND OPERATING:

a. Comparative Mining Costs:

The increased production for 1951 reduced mining costs as compared with 1950. In making the budget estimated cost per ton the large allowance under Section 309 was not considered, which makes the cost per ton for the year considerably higher than the budget cost.

	1951	1950
Product	478,243	48,118
Underground Costs	3.065	6.115
Surface Costs	.352	.484
General Mine Expense	.794	2.702
Cost of Production	4.211	9.301
Allowance Under Section 309	1.985	-
Amortization of Defense Facilities	.432	-
Depreciation: Plant and Equipment	.183	.148
Development after 12/31/44	.188	.164
Pre-Production Development	.023	.023
Movable Equipment	.024	.120
Taxes	.180	-
Loading and Shipping	.044	.155
Total Cost at Mine	7.270	9.911
Budget - Estimated Cost Per Ton	5.427	-
Number of Shifts and Hours	2 1-8 hr. 42 2-8 hr. 249 3-8 hr.	3 1-8 hr. 5 2-8 hr. 134 3-8 hr.
Total 8 hr. Operating Shifts	833	415
Number of Operating Days	277 2/3	138 1/3
Average Daily Product	1,722	341

Proportion of Labor and Supplies

	Amount	Per Ton	Per Cent
Labor	$1,319,024.84	2.758	38%
Supplies	2,157,904.85	4.512	62%
Total Cost at Mine	$3,476,929.69	7.270	100%

MATHER MINE "B" SHAFT
ANNUAL REPORT
YEAR 1951

8. COST OF OPENING, EQUIPPING, DEVELOPING AND OPERATING: (Cont'd)

b. Detailed Cost Comparison (Operating):

	1951		1950	
	Amount	Per Ton	Amount	Per Ton
Estimated Wage Adjustment	75,118.57	.157	5,089.01	.105
Exploring in Mine	28,808.53	.061	7,586.39	.158
Development in Rock	14,030.55	.029	8,074.35	.168
Development in Ore	556,622.61	1.164	201,946.48	4.197
Stoping	223,910.51	.468	-	-
Timbering	245,442.86	.513	36,831.96	.765
Tramming	159,930.39	.334	22,938.52	.477
Ventilation	5,544.45	.012	-	-
Pumping	4,535.84	.010	2,187.01	.045
Compressors and Air Pipes	29,992.19	.063	4,189.60	.087
Underground Superintendence	53,681.94	.112	4,746.76	.099
Maint. Comp. & Power Drills	574.23	.001	-	-
Scrapers & Mechanical Loaders	50,587.23	.106	-	-
Tramming Equipment	14,685.17	.031	672.66	.014
Pumping Machinery	2,076.55	.004	-	-
Total Underground Costs	1,465,541.62	3.065	294,262.74	6.115
Hoisting	41,592.33	.087	5,961.93	.124
Stocking Ore	34,418.79	.072	1,648.82	.034
Screening - Crushing at Mine	8,575.92	.018	-	-
Dry House	26,000.00	.054	1,695.09	.035
General Surface Expense	28,975.84	.061	13,911.06	.289
Maint. Hoisting Equipment	18,833.54	.039	70.73	.002
Shaft	5,162.99	.011	-	-
Top Tram Equipment	3,319.35	.007	-	-
Docks, Trestles & Pockets	762.85	.001	-	-
Mine Buildings	904.89	.002	-	-
Total Surface Costs	168,546.50	.352	23,287.63	.484
Geological	8,944.27	.019	3,318.48	.069
Mining Engineering	32,045.80	.067	11,733.51	.244
Mechanical & Elect. Engrg.	12,160.39	.025	4,948.53	.103
Analysis and Grading	7,621.72	.016	1,705.87	.035
Safety Department	4,714.06	.011	2,494.69	.052
Telephones & Safety Devices	17,656.95	.037	966.84	.020
Local & General Welfare	5,909.74	.012	2,094.54	.044
Spec. Exp. Pensions & Allow.	9,750.37	.020	3,746.74	.078
Ishpeming Office	40,818.68	.085	13,846.19	.288
Mine Office	81,274.64	.171	24,357.90	.506
Insurance	30,425.99	.064	10,833.12	.225
Personal Injury	25,063.24	.052	20,045.01	.417
Social Security Taxes	38,925.77	.081	12,137.33	.252
Employees Vacation Pay	64,288.24	.134	17,760.00	.369
Total General Mine Expenses	379,599.86	.794	129,988.75	2.762
COST OF PRODUCTION	2,013,687.98	4.211	447,539.12	9.301

MATHER MINE "B" SHAFT
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8. COST OF OPENING, EQUIPPING, DEVELOPING AND OPERATING: (Cont'd)

Capital account expenditures for the year amounted to $2,274,655.59 of which $2,269,733.10 were expenditures under E&A NM-44. A mine payroll machine was purchased on E&A 79 at a cost of $4,922.49. Of the capital account expenditures, 52% were in Main Level Development, of which the largest proportion was for drifting on Sixth, Seventh and Eighth Levels. Approximately 10% or $231,975.74 was spent for mining equipment.

Expenditures for stocking and loading amounted to $313,259.76 or 14%. Included in this was purchase of a 120 B Electric Shovel and installation of the east extension stockpile conveyor.

AUTHORIZATIONS AND EXPENDITURES MATHER MINE "B" SHAFT DEVELOPMENT:	TOTAL AUTHORIZED	EXPENDITURES TO DEC. 31, 1951	UNEXPENDED BALANCE	1951 EXPENDITURES
44-A GENERAL EXPENSE:				
a. Insurance		17,562.14		
b. Engineering		71,134.33		
c. Analysis		6,794.35		
d. Mine Office		62,315.02		
e. Ishpeming Office		29,169.57		
f. Superintendence		51,406.92		
g. Legal		635.30		
h. Personal Injury		12,886.13		
j. Taxes - Social Security		49,360.28		14,583.27
k. Vacation Expense		20,861.52		
m. Safety Department		5,174.52		
n. Geological		6,959.32		
o. Policing		30,531.18		
p. Compensation		1,541.87		
q. General Surface and Misc.		28,683.37		
r. General and District Welfare		5,019.24		
s. Special Expense		1,298.92		
t. Pensions and Retirements		8,339.95		
u. Hospital Loss		9,383.22		
v. Examinations		540.00		
TOTALS	480,000.00	419,597.15	60,402.85	14,583.27
44-B PREPARING SITE:				
a. Building Roads		52,360.86		37,361.03
b. Grading For Site		55,294.79		3,618.99
c. Purchase and Moving Dwellings		22,273.72		75.00
d. Landscaping		17,483.43		16,978.42
e. Drainage		13,794.20		824.83
f. Water Meter		1,818.75		165.37
p. Prop. of Distribution Exp.		2,122.21		-
TOTALS	161,000.00	165,147.96	4,147.96	59,023.64
44-C TEMP. BUILDINGS AND TEMP. EQUIPMENT:				
a. Tool Shed		413.64		-
b. Office and Dry		19,591.30		-
d. Engine House		12,735.46		-
e. Headframe		4,876.01		-
f. Shop Buildings		3,146.57		-
g. Heating Plant		3,418.70		-
h. Rotary Dump and Cars		3,631.75		-
i. Ventilating Fans		1,093.31		-
j. Sinking Hoists and Accessories		22,843.75		-
k. Compressors and Accessories		14,863.38		-
l. Air Lines		2,915.96		-
m. Power Lines		2,460.47		-
n. Water Lines		1,623.47		-
o. Sewer Lines		1,460.70		-
p. Electricians Shed		137.01		-
r. Machine Shop		1,054.47		-
s. Lamp Room		1,025.32		-
t. Rock Trestle		258.38		-
TOTALS	$97,575.00	$97,540.65	$34.35	-

AUTHORIZATIONS AND EXPENDITURES MATHER MINE "B" SHAFT DEVELOPMENT:	TOTAL AUTHORIZED	EXPENDITURES TO DEC. 31, 1951	UNEXPENDED BALANCE	1951 EXPENDITURES
44-D INITIAL EQUIPMENT:				
a. Tractor, Trailbuilder and Athey Wagon		13,449.28		-
b. ½ Yd. Comb. Crane and Clamshell		12,960.89		-
c. 5 Ton Truck		6,091.58		-
d. ½ Ton Pickup Truck		2,689.96		-
e. Shop Equipment		17,489.30		-
f. Fuel Tanks		123.15		-
h. Water Mains		327.49		-
j. Hopper		1,817.14		-
k. Concrete Mixer		3,676.93		-
l. Pumpcrete		9,512.00		-
m. Ford Dump Truck		2,604.55		-
TOTALS	70,747.27	70,747.27		-
44-E SINKING SHAFT:				
a. Equipment		31,478.31		-
b.-1 Shaft Sinking		660,450.05		68.07
b.-2 Stocking Rock		1,136.07		-
b.-3 Temp. Air Lines		1,786.80		-
c. Steel Sets, sheathing and Skip Guides		270,026.72		2,418.28
d. Installing Sets, sheathing and Skip Guides		104,114.37		185.42
e. Concreting and Guniting		93,484.59		-
f. Ventilating Seal		52,466.23		-
g. Discharge Line		27,794.71		-
h. Counterweight Pipe		32,878.21		-
i. Air Lines		19,246.27		-
j. Power Cables		37,688.80		129.03
k. Water Lines		747.79		-
l. Cage Guides		21,259.70		-
m. Signal Cables		7,908.74		-
TOTALS	1,379,000.00	1,362,467.36	16,532.64	2,800.80
44-F ENGINE HOUSE:				
a. Foundations		41,114.96		-
b. Main Buildings		193,677.55		-
c. Heating, Plumbing and wiring		32,994.12		-
d. Traveling Cranes		29,576.93		-
e. Skip Hoist - Foundations		10,675.73		-
f. Skip Hoist - Mechanical		149,701.73		-
g. Skip Hoist - Electrical		56,969.84		-
h. Cage Hoist - Foundations		9,148.54		-
i. Cage Hoist - Mechanical		137,071.47		-
j. Cage Hoist - Electrical		26,641.49		-
k. Compressors - Foundations		11,923.03		-
l. Compressors - Mechanical		65,984.90		332.41
m. Compressors - Electrical		5,782.52		-
n. Compressors - Air Lines		1,917.83		-
o. Main Switchboards and Power Cables		33,275.67		858.39
q/ Bell Lines and Signals		2,903.31		250.98
r. Motor Generator Sets		169,770.34		1,594.26
TOTALS	$999,425.00	$979,129.96	$20,295.04	$3,036.04

AUTHORIZATIONS AND EXPENDITURES MATHER MINE "B" SHAFT DEVELOPMENT:	TOTAL AUTHORIZED	EXPENDITURES TO DEC. 31, 1951	UNEXPENDED BALANCE	1951 EXPENDITURES
44-G SHOPS, OFFICE AND DRY BUILDINGS:				
a. Shop Wing		355,160.90		34,066.78
b. Dry Wing		408,745.47		13,018.11
c. Office Wing		168,907.07		17,373.08
d. Heating Plant Wing		221,917.58		4,435.07
TOTALS	1,188,000.00	1,154,731.02	33,268.98	68,893.04
44-H HEADFRAME:				
a. Headframe Foundations		11,086.02		352.56
b. Main Structure		161,781.82		5,235.92
c. Shaft House Foundations		13,052.37		-
d. Shaft House		82,983.32		1,512.99
e. Shaft House Ore Handling Machinery		121,993.05		6,790.46
f. Hold Down and Idler Sheaves		40,123.69		-
g. Shaft Air Heating Equipment		14,927.82		6,144.60
TOTALS	449,000.00	445,948.09	3,051.91	20,036.53
44-I SERVICE TUNNELS:				
a. Shops to Shaft		23,312.43		265.41
b. Shaft to Timber Yard		87,702.97		7,728.15
c. Shaft to Engine House		29,675.65		-
d. Ore Conveyor Tunnel		514.21		-
e. Heating Tunnel		1,520.79		-
TOTALS	148,500.00	142,726.05	5,773.95	7,993.56
44-J PUMPING PLANT:				
a. Pump House and Sump		71,201.76		55,987.61
b. Pumps and Erecting		14,563.33		-
TOTALS	75,000.00	85,765.09	10,765.09	55,987.61
44-K ELECTRIC HAULAGE:				
a. Locomotives		201,498.74		46,667.91
b. Cars		142,124.97		23,587.82
c. Timber Trucks		34,952.57		5,203.60
d. Signals		2,149.28		1,862.81
e. Motor Generator Set		3,525.31		2,183.14
f. Trolley Line		7,399.39		4,701.88
TOTALS	435,000.00	391,650.26	43,349.74	84,207.16
44-L MAIN LEVEL DEVELOPMENT:				
b. Pockets, Trenches and Equipment		771,458.89		169,407.54
c. Timbering		249,482.83		182,070.22
d. Drifting		698,346.09		434,065.61
e, Drifting Equipment		138,709.72		25,023.21
f. Installed Drift Equipment		188,919.35		119,787.08
g. Sub Station		15,103.33		10,298.55
h. Battery Station		7,934.76		7,902.56
j. Exploration		147,011.44		101,772.29
k. Raising Above Level		48,386.13		48,386.13
l. Drifting Above Level		12,294.49		12,294.49
m. Pumping Station		58,873.04		52,346.06
n. Pumping Equipment		3,310.78		70.78
q. Fan Station		5,044.88		5,044.88
r. Fan and Construction Equipment		12,531.00		12,531.00
s. Skip Pit		43,676.38		-
t. Pumping		17,183.59		-
u. Communication System		1,622.02		780.97
w. Social Security Taxes		87.30		87.30
TOTALS	$2,585,000.00	$2,419,976.02	$165,023.98	$1,181,868.67

AUTHORIZATIONS AND EXPENDITURES MATHER MINE "B" SHAFT DEVELOPMENT:	TOTAL AUTHORIZED	EXPENDITURES TO DEC. 31, 1951	UNEXPENDED BALANCE	1951 EXPENDITURES
44-M MOVABLE EQUIPMENT:				
a. Tractor and Bulldozer		20,443.81		20,443.81
b. Sno-Go		10,872.79		10,872.79
c. Pickup Truck		1,105.00		1,105.00
TOTALS	34,105.00	32,421.60	1,683.40	32,421.60
44-Q SEWERS:				
a. Sanitary		5,403.82		-
b. Storm		8,712.45		119.23
TOTAL	25,000.00	14,116.27	10,883.73	119.23
44-R CONVEYOR AND POCKETS:				
a. Trestle		163,331.27		132,441.22
b. Conveyor		60,626.23		16,189.63
c. Conveyor Control Equipment		772.89		764.04
e. Heating Equipment		2,746.30		1,641.76
TOTALS	242,000.00	227,476.69	14,523.31	151,036.65
44-S TIMBER YARD:				
a. Tunnel		21,005.78		16,994.28
b. Tracks		11,756.23		6,821.97
c. Haulage Equipment		8,533.94		3,194.66
d. Timber Handling Equipment		26,824.25		3,661.41
e. Lighting		158.49		158.49
TOTALS	85,000.00	68,278.69	16,721.31	30,830.81
44-T STOCKING AND LOADING:				
a. Haulage Equipment		35,612.20		-
b. Power Shovel		137,608.00		137,608.00
c. Weightometer		3,075.44		127.92
d. 30" Conveyor Belt		175,523.84		175,523.84
TOTALS	345,000.00	351,819.48	6,819.48	313,259.76
44-U MINING EQUIPMENT:				
a. Drill Machines and Accessories		77,312.96		50,099.05
b. Scrapers, Hoists and Accessories		279,899.72		134,047.41
c. Exploratory Drill Equipment		37,554.22		25,280.62
d. Miscellaneous Equipment		26,054.34		22,548.66
TOTALS	444,000.00	420,821.24	23,178.76	231,975.74
44-V FIRE PROTECTION EQUIPMENT:				
a. Surface Hydrants, Mains and Hoses		1,992.31		667.17
b. Portable Fire Extinguishers		2,841.24		929.90
c. Undg. Fire Protection Equip.		375.06		-
TOTALS	13,000.00	5,208.61	7,791.39	1,597.07
44-W SKIPS, CAGES AND HOISTING ROPES:				
a. Skips		28,529.03		9,819.84
b. Cages		13,044.83		-
c. Hoisting Ropes		29,579.02		242.08
TOTALS	119,000.00	71,152.88	47,847.12	10,061.92
GRAND TOTAL E&A NM-44	$9,375,352.27	$8,926,722.34	$448,629.93	$2,269,733.10

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9. EXPLORATIONS AND FUTURE EXPLORATIONS:

An extensive diamond drilling campaign was carried out during the year. The holes were planned to cover three major objectives. These were:

1. The outlining of ore available to a 5th Level.
2. Detailing the ore outlined for 6th Level mining.
3. Outlining the 7th Level ore bodies.

Just prior to the end of the year one diamond drill hole was started to explore for 8th Level.

Exploration in 1952 will be concentrated largely on 7th and 8th Levels. A few holes will be drilled from 6th Level and the 5th Level exploration will be carried out by Mather "A" Shaft from the 5th Level footwall drift.

5th Level:

Holes No. 20, 25, 29, 35, 36, 47, 51, 52, 55, 60, 65 and 69 were drilled from the 6th Level and sub-levels above 6th to explore for a continuation up the footwall of the high sulphur ore body found on 6th Level.

Holes No. 20, 25, 29, 35, 36, and 39 encountered sizeable runs of high sulphur ore at or above 5th Level elevation. Holes No. 47, 51, 52, 55, 60 and 65 found little or no ore but did establish the north-easterly and north-westerly limits of the ore body. The information from these holes assisted in establishing mining limits for 6th Level so that the ore above 5th Level can be mined safely.

6th Level:

Twenty-two holes were drilled from 6th Level and the sub-levels above to detail the outlines of ore bodies which might be available for 6th Level mining. The extensive use of diamond drilling allowed greater use of the limited number of mining crews for development and production work rather than exploration by small drift and small raise.

Holes No. 2, 32 and 58 were drilled in the area of the 6700 and 6800 Cross-cuts to outline the ore indicated by drill hole No. 3. This drilling increased slightly the total ore reserves indicated in the area.

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

6th Level: (Cont'd)

Holes No. 26, 28, 49, 53, 56, 59, 61 and 64 were drilled to further outline the ore first indicated by hole No. 16. This area is being developed immediately south of No. 25 Dike from the 6000 and 6100 Cross-cuts.

Holes No. 11, 19, 21, 22, 24, 27, 31, 33, 41, 45 and 70 were drilled to obtain detailed information on the ore outlines of the high sulphur and standard ore areas adjacent to No. 22 Dike between the 6000 and 6400 Cross-cuts.

7th Level:

The 7th Level exploration program included seven holes drilled down from 6th Level and eight holes from 7th Level workings. The results of this drilling indicate that (1) large tonnages will be available to 7th Level (2) the ore will be standard grade (3) the geologic structure is complex and further exploration will be necessary.

Hole No. 43 was drilled down from the south end of the 6000 Cross-cut (6th Level). It showed very little ore. Hole No. 68 which was drilled down about 200' north and 80' west of Hole No. 43 encountered 110' of ore above 7th Level.

From the 6200 Cross-cut, three holes were drilled to test the height of ore and locate the footwall for 7th Level. These holes encountered a large thickness of jasper separating the ore on 6th Level from that on the footwall above 7th Level. Hole No. 67, drilled up from 7th Level, about 65' east of the 6th Level holes gave further evidence of this condition.

Hole No. 34 was drilled vertically down from the end of the 6400 Cross-cut; about 60' of standard ore was encountered. This hole is north of No. 22 Dike in the area which was high sulphur grade above 6th Level.

Hole No. 63 which was drilled vertically down from the end of the 6700 Cross-cut encountered 160' of standard ore above 7th Level, indicating that this ore body is larger below 6th Level.

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

7th Level: (Cont'd)

Holes No. 46, 50, 57, 62 and 67 were drilled up from 7th Level in the 7000 and the 7100 Cross-cuts to test the height of ore.

Holes No. 44, 54 and 71 were drilled flat from the ends of the 7000, 7100 and 7200 Cross-cuts to determine whether it was necessary to drive these cross-cuts ahead.

8th Level:

Hole No. 72 was started down from the 7000 Cross-cut to explore for 8th Level. Information from the 7000 Cross-cut and surface drill hole No. 136 indicates only a limited amount of height to the ore body above 8th Level.