

**THE CLEVELAND-CLIFFS IRON CO.**

**Ore Mining Department**

**ANNUAL REPORT OF GENERAL MANAGER**

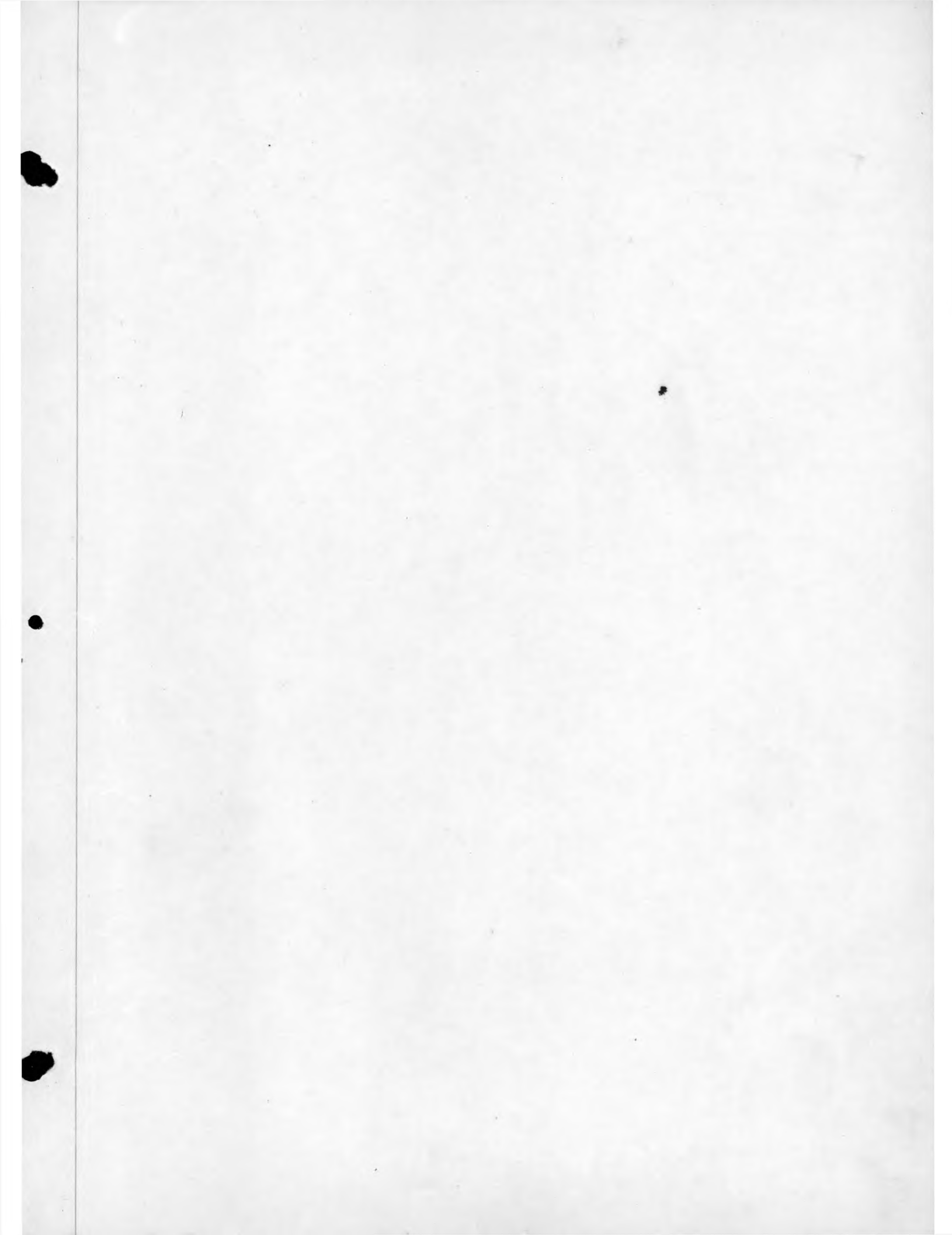
**For Year Ending December 31, 1940**

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THE CLEVELAND-CLIFFS IRON COMPANY  
ORE MINING DEPARTMENT  
MANAGER'S ANNUAL REPORT  
YEAR 1940  
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<b>ISHPEMING DISTRICT:</b>							
General .....		14	58-59	95	111	325	
Production, Shipments & Inventories		14-19	59-61	95-98	111-113	-	
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Continued -



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#2.

	FRANCIS	GARDNER- MACKINAW	GWINN DISTRICT	PRINCETON	STEPHENSON	SPIES VIRGIL
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Gwinn Crusher .....	-	-	345	-	-	-
				CANISTEO	HOLMAN- CLIFFS	HILL- TRUMBULL
<u>MESABA DISTRICT:</u>						
General .....				378-379	405-406	431-432
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Ishpeming, Michigan  
March 10th, 1941

Mr. E. B. Greene, President,  
Cleveland, Ohio

Dear Sir:-

I beg to submit the report of the operations of the Mining Department for the year 1940.

The inventories, maps, statements relative to the 1940 report will go forward under separate cover.

The colored portions of the map show the work for the year. The reports of the different mines of the Company were made by the Superintendents in charge, and the reports of the Engineering, Mechanical, Electrical, Geological, Safety and Welfare Departments by the Heads of these Departments.

During the year E&A's were approved for the enlarging and remodeling of the dries at the following mines: Maas, Athens, Negaunee and Cliffs Shaft, and for the remodeling of the dry at the Lloyd. This has been made necessary due to the large increase in the number of men being employed and the condition that our own investigation has proven - that the ventilation, heating and sanitation in these dries could be greatly improved. At a number of the properties complaints have been received from the men stating that necessary improvements should be made eliminating the necessity for having the dirty clothes and clean clothes in the same room. Naturally this condition made it impossible for our employees to keep their street clothes clean. I presume that the complaints were really the reflection of the wives of our men. From my viewpoint, in order to keep things on an even keel, it is just as important to keep the wives satisfied as the workers. When these dries were constructed twenty or more years ago, they were considered modern in every respect. This situation, however, has changed and with the remodeling, which was completed about the end of the year, conditions in these buildings have been vastly improved. More space has been provided and the serious crowding has been eliminated. Although the cost has been considerable, I am confident the expenditure is well worth while.

Mr. Conibear's report shows in detail what has been accomplished in the line of safety. I want to assure you that even though we have had five fatalities during the year, this increase is in no way due to any let-up in discipline or in the matter of detailed inspection of all working places. In fact, I believe the intensity and thoroughness of such inspections has increased. Some of these fatalities in the soft ore mines have been due to an unusual situation where the speed of mining has been at a faster rate than the downward movement of the gob. It is our opinion this is not true at mines where the working schedule is not three eight hour shifts five days per week. This is an unfortunate situation and every effort is being exerted to eliminate sudden settlement of the gob. I list below the severity rate for the past six years. This is the best guide of what is actually being accomplished.

-2-

	Severity Rate*	Severity Rate Inc. Fatalities
1935.....	7.93	17.70
1936.....	6.16	12.67
1937.....	10.29	12.64
1938.....	12.80	23.66
1939.....	5.93	8.97
1940.....	4.50	17.00

\*Severity rate based on days lost per 1,000 days worked.

If figures were available from other companies, I am sure that our record would compare favorably with results obtained elsewhere.

The mines of the Company are in first class physical condition and during 1940 a record production was obtained. I call your particular attention to the detailed reports of the Superintendents. The results at the Cliffs Shaft have been most encouraging and the ore put in sight about counterbalances the ore mined. I give below comparative figures for 1937 and 1940. I have selected 1937 for the reason that the wages and working time are comparable. As a matter of fact more days were worked in 1937 than in 1940, the mines being on a six day schedule for over six months:

#### 1937

	Production	Cost of Production		Total Cost	
		Per Ton	Amount	Per Ton	Amount
Athens.....	443,098	1.670	740,063.48	2.305	1,021,346.65
Cliffs Shaft.....	543,567	2.008	1,091,570.79	2.285	1,241,982.94
Lloyd.....	545,274	1.272	693,709.19	1.412	770,086.18
Maas.....	780,189	1.510	1,178,062.76	1.976	1,541,356.47
Negaunee.....	820,915	1.298	1,065,605.00	1.927	1,581,550.75
Total	3,133,043	1.522	4,769,011.22	1.965	6,156,322.99

#### 1940

Athens.....	515,725	1.680	866,599.60	2.162	1,115,246.60
Cliffs Shaft.....	552,598	1.949	1,077,048.43	2.275	1,256,942.71
Lloyd.....	476,934	1.299	619,569.12	1.494	712,336.85
Maas.....	699,977	1.669	1,168,642.34	2.118	1,482,562.83
Negaunee.....	865,689	1.262	1,092,527.63	1.941	1,679,975.24
Total	3,110,923	1.551	4,824,387.12	2.008	6,247,064.23

The figures given above are gratifying.

There is still some extravagance in the operation of the City of Negaunee. I am glad to report, however, that there is a steady improvement and the amount of money which has been necessary for the City government to borrow was considerably less than the previous year. Over a period of years a decided improvement has been made.



-3-

There is not much to report as to the activities of the Marquette Range Industrial Union. This organization continues to have its meetings at regular intervals and occasionally I have meetings with the officers. These meetings have been most friendly and I am pleased to report to you that matters which they have taken up with me, as representative of the Company, were promptly disposed of to the satisfaction of both parties. From information which I have obtained, this organization is stronger than it was in the previous year. A complaint was made to the National Labor Relations Board to the effect that the Marquette Range Industrial Union was influenced by the Company. The federal Board sent a representative to Ishpeming and made a complete investigation. In time a report from the investigator was received, which absolutely exonerated the Company. This was a feather in the cap of the local union and I presume has been one of the reasons why more interest in this organization is now being taken by employees of the Company. As far as my knowledge goes, there is no dissatisfaction with the wage schedule, working conditions or any other important thing. For a considerable part of the year, one or more organizers have been in Ishpeming. From all I can learn these men, as a rule CIO, have made practically no headway and I do not believe they have even made a dent in our organization. As you know, this Company has continued its operations for a period of forty-five years without any labor disturbance. It is not reasonable to assume that such a record can be continued indefinitely.

Effective October 1st, Mr. F. J. Haller was made Superintendent at the Lloyd and Spies Virgil. Early in February Mr. C. W. Allen was relieved of his duties at these two mines and started to devote the larger part of his time to details in connection with the development of Section 2 mine. In order to try out Mr. Haller, he was transferred to the Lloyd and Spies Virgil without title. Although he did not have the title, he assumed the responsibility and has handled the job very creditably.

It was our desire, when opening the Section 2 mine, to use the most modern practices to the end that when this property finally went into commission, it would be second to none. A vast amount of information was available at other large properties and before we could make up our minds as to the best practice and equipment to use, a large amount of detailed investigation was necessary. Messrs. Allen and Moore spent much time in making such investigation and I am confident that we will avail ourselves of the best practices of a large number of similar operations. The net result should be a property at Section 2 which is modern in every detail. You will find in Mr. Allen's report a description of what has been done up to the end of the year.

Due to the intensive operation at the Negaunee and Athens Mines too much of a load was being thrown on Mr. Graff. On February 28th Onnie Marjamaa was sent to the district as Mr. Graff's assistant, but without title. Here again it was our wish to try this young man out to determine definitely whether he had the proper qualifications for a superintendent. In the latter part of the year Mr. Graff had serious trouble with certain glands in his neck



and it was necessary for him to go to Ann Arbor for an operation. The Athens and Negaunee were without proper supervision, as Marjamaa had not been given any authority. When this situation arose I went to the Negaunee and had a meeting with the Captains and at that time told Marjamaa he would have to assume responsibility. I am glad to report that he did this in a very creditable manner and on December 1st was appointed Asst. Superintendent of the Athens and Negaunee.

Conditions at the Maas, due to the large amount of water coming into the property, have been unfavorable. On February 28th, I thought it advisable to appoint Mr. Graff as District Superintendent, thus giving Mr. Moulton the benefit of his years of practical experience. Due to Mr. Graff's illness and inability to get around the way he should, the Maas Mine has not obtained the full benefit of this appointment. We have expended a large sum of money in surface drainage, deep well pumps, at the Maas Mine. We were of the opinion we were warranted in doing this as the water in the working places adds probably 25¢ to 30¢ per ton to the cost of the ore. Although the results have not been as good as were expected, according to Mr. Moulton's detailed report conditions are now improving. It is hoped that during the coming year, this improvement will continue and will be reflected in the cost.

As reported last year, the water supply of the City of Negaunee from Teal Lake cannot be considered as potable. We are pumping sufficient water from Maas wells 1 and 2 to supply the City with potable water. Up to the present time they have not seen fit to sign the agreement which the Company submitted. On our part, strictly from a matter of policy, we have made no effort to induce the City to use the water from these wells. If this were done they would naturally believe the Company had some ulterior motive. In the course of time this undoubtedly will be done.

It is a matter of tremendous pride and satisfaction to me that the mines have operated so efficiently. The results which have been obtained could not have been realized unless I had received the full cooperation of all of my assistants.

Respectfully submitted

  
Manager

SRE:DP

**THE CLEVELAND-CLIFFS IRON COMPANY  
MINING DEPARTMENT**  
**A COMPARISON OF MINING DEPARTMENT MICHIGAN ASSESSED VALUATIONS AND  
TOTAL TAXES PAID FROM YEAR 1929**

YEAR	THE C.C.I.CO.	THE NEGAUNEE MINE CO.	THE ATHENS I. MG. CO.	THE C.P.& L.CO & CLIFFS EL	TOTAL FOUR COMPANIES	CHANGES FROM PREVIOUS YEAR
1929	\$13,291,521	5,284,600	2,586,500	1,318,198	22,480,819	
1930	14,169,590	4,884,400	2,436,500	1,370,445	22,860,935	I. 380,116
1931	13,867,696	4,635,700	2,536,500	1,539,428	22,579,324	I. 218,389
1932	12,826,545	4,185,700	2,266,500	1,447,726	20,726,471	D. 2,352,825
1933	9,867,714	3,544,400	2,036,500	1,419,565	16,010,987	D. 4,715,484
1934	10,013,575	3,196,400	2,077,800	1,418,887	16,706,662	D. 1,170,039
1935	10,117,036	3,056,770	1,929,520	1,424,711	16,529,037	D. 177,625
1936	10,498,659	2,927,500	1,929,520	1,424,281	16,778,960	I. 149,923
1937	11,671,806	3,350,000	2,242,900	1,442,555	18,707,261	I. 1,928,301
1938	13,064,542	3,124,100	2,542,900	1,447,843	20,169,385	I. 1,462,124
1939	13,180,541	3,267,300	2,683,400	1,981,982	21,113,223	I. 943,838
1940	12,312,618	3,692,700	2,683,400	1,993,336	20,682,053	D. 431,170
1941						
1942						
1943						
1944						

YEAR	THE C.C.I.CO.	THE NEGAUNEE MINE CO.	THE ATHENS I. MG. CO.	THE C.P.& L.CO & CLIFFS EL	TOTAL FOUR COMPANIES	CHANGES FROM PREVIOUS YEAR
1929	\$476,740.79	199,695.33	97,739.13	55,223.01	829,398.26	
1930	523,354.40	190,689.79	95,122.50	61,352.11	870,518.80	I. 41,120.54
1931	507,606.51	183,218.38	100,251.06	65,344.18	856,420.13	D. 14,098.67
1932	378,136.12	120,527.71	65,264.22	46,897.77	610,825.82	D. 245,596.31
1933	262,194.86	99,599.60	57,065.71	36,067.26	454,927.43	D. 155,898.39
1934	267,750.15	86,527.53	56,246.84	31,256.06	441,780.58	D. 34,112.56
1935	286,303.64	95,226.14	60,089.81	29,817.75	471,437.34	I. 29,656.76
1936	315,635.66	100,859.97	66,477.06	30,066.37	513,039.06	I. 41,601.72
1937	348,808.35	120,097.50	80,366.44	30,024.80	579,297.09	I. 66,258.05
1938	419,703.25	118,534.83	96,103.47	30,227.17	664,568.73	I. 85,271.64
1939	419,307.36	120,806.75	99,217.45	37,997.17	677,328.73	I. 12,760.00
1940	387,485.04	130,696.88	95,075.43	39,698.46	652,955.81	D. 24,372.92
1941						
1942						
1943						
1944						

NOTES: The Cliffs Power and Light Co. beginning with 1939 represents a valuation either determined or approved by the State Tax Commission

The 15 mill amendment went into effect in year 1933.

State Sales Tax became effective July 1933.

Morris Mine taxes were paid by Inland Steel Co. beginning 1933.

The Valuation and Taxes for the year being \$1,000,524 and \$20,965.81 respectively.

Negaunee Mine Co. 1940 both valuation and taxes include new acquisitions during year. Like amounts \$697,200 and \$24,563.58 respectively have been deducted from the C. C. I. Co. figures.



## STATEMENT SHOWING COMPARATIVE COST FOR ALL EXPLOSIVES USED AT HARD ORE MINES

	1937	1938	1939	1940
PRODUCT - Tons .....	543,567	327,161	387,258	552,598
POWDER				
Pounds - Gelamatie "2X" .....	- -	301,100	346,600	478,750
50% L. F. ....	164,650	- -	- -	- -
60% Gelatine .....	397,850	44,880	- -	- -
Total Pounds Powder .....	562,500	345,980	346,600	478,750
Total Cost .....	68,309.67	42,926.27	40,942.86	55,067.75
Fuse - Feet .....	802,600	534,800	609,200	771,800
Caps - Number .....	138,950	81,660	98,900	119,050
Duplex Shot Wire .....	18,180	4,130	5,800	6,550
Delay Fuses .....	5,875	3,432	- -	- -
Electric Caps .....	- -	- -	1,500	4,973
Fuse Lighters .....	24,400	27,000	24,400	27,500
Fuse Containers .....	6	12	47	5
Tamping Bags .....	36,000	26,350	40,000	34,600
Powder Bags .....	- -	- -	20	- -
TOTAL COST - Fuse, Caps, etc. ....	7,522.05	4,766.39	5,378.63	6,819.32
TOTAL - All Explosives .....	75,831.72	47,692.66	46,321.49	61,887.07
Average Price per pound - Powder .....	.1214	.1241	.1181	.115
Cost per ton - Powder .....	.1257	.1312	.1057	.0997
" " " - Fuse, etc. ....	.0138	.0146	.0139	.0123
" " " - All Explosives .....	.1395	.1458	.1196	.1120
Pounds Powder per ton of ore .....	1.035	1.057	.8950	.8664

1940 Production increased 165,340 tons or 42.7% compared with 1939.

Average price for Powder decreased 2.6% compared with 1939.

Cost per ton for all explosives decreased 6.3% compared with 1939.

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STATEMENT SHOWING COMPARATIVE COST OF ALL EXPLOSIVES USED AT SOFT ORE MINES

	1937	1938	1939	1940
PRODUCT - Tons .....	2,833,554	1,515,231	1,903,564	2,702,052
<u>POWDER</u>				
Pounds - 40% .....	- -	2,000	- -	- -
50% .....	799,770	157,549	44,515	9,500
60% .....	77,862	18,350	10,550	5,350
1X and 2X Gelamite .....	438,300	500,048	764,270	1,139,055
Total Pounds - Powder .....	1,315,932	677,947	819,335	1,153,905
Total Cost - Powder .....	156,720.63	82,844.59	96,623.23	132,720.38
Fuse - Feet .....	4,384,364	2,341,664	2,994,647	4,187,783
Caps - Number .....	622,421	325,171	426,426	591,115
Loading Wire - Feet .....	2,760	2,500	2,500	2,460
Connecting Wire - Pounds .....	96	48	120	82
Tamping Bags .....	67,350	71,500	83,000	99,150
Sealing Compound - Pints .....	35	40	44	72
Powder Bags .....	115	101	125	133
Fuse Lighters .....	91,487	56,100	69,650	106,375
Electric Exploders .....	5,733	1,821	2,109	3,561
Blasting Machines .....	- -	- -	- -	1
Master Fuse Lighters .....	- -	- -	8,650	400
TOTAL COST - Fuse, Caps, etc. ....	33,940.53	17,152.23	21,914.56	30,333.88
TOTAL COST - All Explosives .....	190,661.16	99,996.82	118,537.79	163,054.26
Average Price per pound - Powder .....	.1191	.1222	.1179	.1150
Cost per ton - Powder .....	.0553	.0547	.0508	.0491
" " " - Fuse, etc. ....	.0120	.0113	.0115	.0112
" " " - All Explosives .....	.0673	.0660	.0623	.0603
Pounds of Powder per ton of ore .....	.4644	.4474	.4304	.4271

1940 Production increased 798,488 tons or 41.9% compared with 1939.  
 Average price for powder decreased 2.5% compared with 1939.  
 Cost per ton for all explosives decreased 3.2% compared with 1939.  
 Mines included in above statement are Athens, Negaunee, Lloyd, Maas and Virgil.



STATEMENT SHOWING COMPARATIVE COST FOR ALL MINE TIMBER USED AT SOFT ORE MINES

	1937	1938	1939	1940
PRODUCT - Tons .....	2,833,554	1,515,231	1,903,564	2,702,052
<u>TIMBER</u>				
Feet 6-8 .....	380,876	400,543	419,132	349,531
8-10 .....	334,236	161,523	232,404	378,024
10-12 .....	470,071	263,466	348,701	477,494
12-14 .....	217,676	136,375	166,501	184,574
14-16 .....	8,225	9,891	14,284	12,963
Treated Timber .....	15,217	6,554	6,937	4,756
Total Feet .....	1,426,301	978,352	1,187,959	1,407,342
Total Cost .....	115,460.55	73,697.16	89,080.48	110,124.43
<u>LAGGING</u>				
Feet 5 .....	11,805	17,175	21,585	14,125
7 .....	6,091,424	3,879,041	4,704,619	6,348,725
Total Feet .....	6,103,229	3,896,216	4,726,204	6,362,850
Total Cost .....	49,245.57	30,933.14	36,934.76	49,769.18
Poles - Feet .....	4,556,540	2,377,176	3,847,650	5,182,904
Poles - Cost .....	61,938.50	31,980.78	49,766.77	68,498.05
WIRE FENCING - Rods .....	1,515	808	2,860	2,933
" " - Cost .....	1,407.60	773.86	2,707.62	2,772.12
Total Cost for all Timber .....	228,052.22	137,384.94	178,489.63	231,163.78
Average Cost per foot - Timber .....	.0809	.0753	.0749	.0782
" " " 100' - Lagging .....	.8068	.7939	.7814	.7821
" " " " - Poles .....	1.359	1.345	1.293	1.322
" " " Rod - Fencing .....	.929	.958	.946	.945
Feet of Timber per ton of ore .....	.503	.646	.624	.521
" " Lagging " " " " .....	2.154	2.571	2.482	2.355
" " Poles " " " " .....	1.608	1.569	2.021	1.918
" " Fencing " " " " .....	.0088	.0087	.025	.018
Cost per ton for Timber .....	.0407	.0486	.0468	.0408
" " " " Lagging .....	.0174	.0204	.0194	.0184
" " " " Poles .....	.0219	.0211	.0261	.0254
" " " " Wire Fencing .....	.0005	.0005	.0014	.0010
Total Cost per Ton .....	.0805	.0906	.0937	.0856

1940 production increased 798,488 tons or 41.9 % compared with 1939.  
 Mines included in above statement are - Athens, Maas, Negaunee, Lloyd and Virgil.

STATEMENT SHOWING TOTAL COST OF SUPPLIES CHARGED TO "COST OF ORE AT MINES"

SOFT ORE MINES

YEAR	1937		1938		1939		1940	
PRODUCT - Tons .....	2,833,554		1,515,231		1,903,564		2,702,052	
<u>CLASSIFICATION</u>	<u>AMOUNT</u>	<u>PER TON</u>	<u>AMOUNT</u>	<u>PER TON</u>	<u>AMOUNT</u>	<u>PER TON</u>	<u>AMOUNT</u>	<u>PER TON</u>
General Supplies .....	136,971.20	.048	99,037.03	.0654	109,486.33	.0575	131,271.61	.0486
Iron and Steel .....	55,157.59	.019	29,519.07	.0195	29,725.21	.0156	38,676.32	.0143
Machinery .....	106,030.76	.037	51,994.21	.0343	58,523.72	.0308	71,942.91	.0267
Explosives .....	188,141.92	.066	99,990.90	.0659	118,719.79	.0624	163,107.72	.0603
Lumber and Timber .....	261,372.47	.093	162,249.04	.1071	195,651.50	.1028	245,940.96	.0910
Fuel .....	19,321.20	.007	17,722.66	.0117	16,974.83	.0089	15,414.40	.0057
Electric Power .....	394,928.05	.140	327,121.41	.2159	344,250.29	.1808	403,886.97	.1495
Miscellaneous .....	31,468.42	.011	21,874.88	.0144	60,623.28	.0318	26,178.38	.0097
Total .....	1,193,391.61	.421	809,509.20	.5342	933,954.95	.4906	1,096,419.27	.4058

HARD ORE MINES

YEAR	1937		1938		1939		1940	
PRODUCT - Tons .....	543,567		327,161		387,258		552,598	
<u>CLASSIFICATION</u>	<u>AMOUNT</u>	<u>PER TON</u>	<u>AMOUNT</u>	<u>PER TON</u>	<u>AMOUNT</u>	<u>PER TON</u>	<u>AMOUNT</u>	<u>PER TON</u>
General Supplies .....	46,825.71	.086	29,768.82	.091	39,022.60	.101	44,025.34	.080
Iron and Steel .....	37,544.78	.070	18,852.90	.058	20,264.11	.052	32,250.25	.059
Machinery .....	42,554.99	.078	25,388.84	.077	22,640.32	.059	41,544.87	.075
Explosives .....	75,831.72	.141	47,677.83	.146	46,454.76	.120	61,887.07	.112
Lumber and Timber .....	9,473.77	.017	7,647.87	.023	7,863.57	.020	6,662.98	.012
Fuel .....	5,649.79	.010	4,561.12	.014	4,366.08	.011	5,157.58	.009
Electric Power .....	88,837.43	.163	77,269.00	.236	79,652.95	.206	91,349.36	.165
Miscellaneous .....	6,908.03	.012	3,790.74	.012	19,669.44	.051	2,489.46	.004
Total .....	313,625.22	.577	214,957.12	.657	239,933.83	.620	285,366.91	.516

NOTES: Soft Ore Mines production increased 798,488 tons or 41.9% compared with 1939.  
 Soft Ore Mines included in statement - Athens, Lloyd, Maas, Negaunee and Virgil.  
 Hard Ore Mine production increased 165,340 tons or 42.7% compared with 1939.

THE CLEVELAND-CLIFFS IRON COMPANY  
MINING DEPARTMENT

LABOR SUMMARY - ALL COMPANIES

PRODUCT - Tons .....	1937		1938		1939		1940	
	DAYS	AMOUNT	DAYS	AMOUNT	DAYS	AMOUNT	DAYS	AMOUNT
Surface .....	267,904 $\frac{1}{2}$	1,501,153.07	173,941 $\frac{3}{4}$	978,568.71	197,836	1,131,048.39	250,446 $\frac{3}{4}$	1,441,760.22
Cost per ton .....		.295		.362		.306		.266
Underground .....	444,946 $\frac{1}{2}$	2,814,705.65	265,457 $\frac{1}{2}$	1,678,613.41	311,549 $\frac{1}{2}$	1,989,110.18	409,032 $\frac{3}{4}$	2,616,755.26
Cost per ton .....		.552		.620		.538		.483
Superintendence and General Roll .....	52,940	371,604.87	51,903 $\frac{3}{4}$	371,712.80	55,047 $\frac{1}{2}$	388,021.13	54,911 $\frac{3}{4}$	393,790.45
Cost per ton .....		.073		.137		.105		.073
Grand Total .....	765,791	4,687,463.59	491,303	3,028,894.92	564,432 $\frac{3}{4}$	3,508,179.70	714,391 $\frac{1}{2}$	4,452,305.93
Cost per ton .....		.912		1.119		.948		.822
Average rate per day .....		6.12		6.17		6.22		6.23
Total per man per day .....		6.66		5.51	(1)	6.55	(1)	7.59

NOTE; The above is the total of all wages and salaries for employee's of the Mining Department, including Cliffs Power & Light Co.

WAGES: Effective March 16th, 1937 there was an increase in wages of 10¢ per hour and the minimum wage rate was increased from \$4.00 to \$5.00 per day. This increase amounted to approximately 15.75% and time an one half was allowed for over-time, - overtime being over 40 hours a week or over 8 hours a day. These same rates were in effect during year 1939.

WORKING SCHEDULE - 1940 - MICHIGAN PROPERTIES:

During year 1940 all mines, excepting Spies-Virgil, operated on a schedule of each employee receiving 5 days per week; Spies-Virgil men were on a 4 day per week schedule to Nov. 16th when they went to a 5 day per week schedule. The Mines operated 2 - 8 hour shifts per day 5 days per week, 4 days per week at Spies-Virgil to Nov. 16th.

Additional men were added to the crews at all mines filling the third shift crew, until by January 1st, 1941 all mines, excepting Cliffs Shaft and Spies-Virgil were working 5 days per week 3 - 8 hour shifts per day.

Beginning August 12th, the eligible employees received 5 days vacation with pay. The mines operated the vacation week one eight hour shift each day with a skeleton crew composed of employees not eligible for a vacation.

MINNESOTA PROPERTIES:

The Canisteo ore operations began 5-28-40 working one 8 - hour shift per day. This continued through 6-5-40 when the pit went to 2-8 hour shifts per day and continued to close of season which ended Oct. 17th 1940.

The Holman-Cliffs pit started ore operation June 4th 1940 on a 5 day a week basis 2-8 hour shifts per day. July 5th the pit went to 3-8 hour shifts per day 5 days per week and continued on this basis until the season closed Oct. 17th 1940.

The Hill-Trumbull pit began operating May 6th 1940 on a 3-8 hour shifts per day basis 5 days per week and continued until the season closed on Oct. 15th 1940.

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(1) 1939 Production - 3,699,285 Prior year stockpile overrun 11,566 Total 3,710,851. 1940 Production - 5,419,185 Prior year stockpile overrun 162,595 Total 5,581,780.



COMPARISON OF TOTAL DAYS WORKED AND TONS OF ORE MINED FOR THE YEARS 1940 AND 1939

	1940 DAYS	1939 DAYS	1940 DAYS	1939 DAYS
<u>NON-PRODUCTIVE UNITS</u>				
Stephenson Mine .....	364 $\frac{1}{2}$	340		
Princeton Mine .....	368 $\frac{3}{4}$	358 $\frac{3}{4}$		
Gardner-Mackinaw Mine .....	1,811 $\frac{1}{2}$	2,534 $\frac{1}{4}$		
Section Two Mine .....	2,404			
Miscellaneous Pay-Roll .....	1,872 $\frac{1}{2}$	1,752		
Shops and Storehouse .....	3,283 $\frac{1}{2}$	3,146 $\frac{3}{4}$		
CCICO.- Miscellaneous & General .....	46,210 $\frac{1}{4}$	46,176 $\frac{3}{4}$		
Negaunee Mine " " .....	4,033	3,108 $\frac{3}{4}$		
Athens Mine " " .....	1,202	1,366		
Cliffs Power & Light Co. ....	26,310 $\frac{3}{4}$	20,468 $\frac{1}{4}$		
Mesaba Range Properties .....	17,657 $\frac{1}{4}$	36,440		
General Roll-Undistributed .....	37,014 $\frac{1}{4}$	37,923 $\frac{1}{2}$		
Canisteo Mine- Miscellaneous & General	16,891 $\frac{1}{2}$			
<b>TOTAL DEDUCTIONS .....</b>	<b>159,423<math>\frac{1}{4}</math></b>	<b>153,616</b>		
<b>Grand Total - All Operations .....</b>	<b>714,391<math>\frac{1}{2}</math></b>	<b>564,432<math>\frac{3}{4}</math></b>		
<b>Net for operating Mines .....</b>	<b>554,968</b>	<b>410,816<math>\frac{3}{4}</math></b>	<b>554,968</b>	<b>410,816<math>\frac{3}{4}</math></b>
<b>Total Tons .....</b>	<b>5,419,185</b>	<b>3,699,285</b>		
<b>Tons per man per day .....</b>	<b>9.76</b>	<b>9.00</b>		
	<u>TONS</u>			
<u>OPEN PIT PRODUCTION</u>				
Tilden Mine .....	205,612	170,276	5,753 $\frac{3}{4}$	4,152 $\frac{1}{2}$
Canisteo Mine .....	478,339	218,514	18,731	12,158 $\frac{3}{4}$
Hill-Trumbull Mine .....	1,055,310	1,019,673	32,471 $\frac{3}{4}$	29,213 $\frac{3}{4}$
Holman-Cliffs Mine .....	425,274		17,574	
<b>TOTAL .....</b>	<b>2,164,535</b>	<b>1,408,463</b>	<b>74,530<math>\frac{1}{2}</math></b>	<b>45,524<math>\frac{1}{2}</math></b>
<b>Open Pit Tons per Man per Day .....</b>	<b>29.04</b>	<b>30.94</b>		
<b>Net Underground Days .....</b>			<b>480,437<math>\frac{1}{2}</math></b>	<b>365,292<math>\frac{1}{2}</math></b>
<b>Net Underground Production .....</b>	<b>3,254,650</b>	<b>2,290,822</b>		
<b>Underground Tons per man per day .....</b>	<b>6.774</b>	<b>6.271</b>		
	<u>PERCENTAGE OF TOTAL PRODUCTION</u>			
	<u>TONS</u>	<u>PERCENT</u>	<u>TONS</u>	<u>PERCENT</u>
Underground Mines .....	3,254,650	60.00	2,290,822	61.9
Open Pits .....	2,164,535	40.00	1,408,463	38.1
<b>Total .....</b>	<b>5,419,185</b>		<b>3,699,285</b>	



STATEMENT SHOWING OVERTIME FOR YEAR 1940 AND EFFECT  
THE PENALTY COST HAD ON THE YEAR'S PRODUCTION

	MICHIGAN PROPERTIES	MESABA RANGE			TOTAL
		AGANISTEO	HILL TRUMBULL	HOLMAN CLIFFS	
January .....	309.84	94.10	14.78	--	
February .....	269.09	18.87	--	--	
March .....	801.14	--	8.46	--	
April .....	1,032.50	32.62	27.56	--	
May .....	1,882.70	328.67	1,965.77	39.69	
June .....	1,225.59	525.63	2,273.32	402.05	
July .....	3,318.91	284.28	2,021.54	345.40	
August .....	3,030.16	727.87	2,423.66	441.49	
September .....	5,015.26	201.92	3,490.32	385.58	
October .....	3,857.72	247.96	698.74	256.31	
1- November .....	8,015.10	114.02	8.14	52.22	
December .....	1,847.92	175.09	20.46	11.90	
TOTAL .....	30,605.93	2,751.03	12,952.75	1,934.64	48,244.35
1- Michigan properties overtime high in November due to Cliffs Shaft Mine operated 48 hours the week of Nov. 23rd to accumulate Lump Ore for the last Cargo - Entire crew received 8 hours overtime pay for this week.					
Penalty Cost of Above =					
1/3 of Totals .....	10,201.98	917.01	4,317.58	644.88	16,081.45
Production -					
Tons, Year 1940 .....	3,460,262	478,339	1,055,310	425,274	5,419,185
Effect the Penalty Cost had on Year's Product -					
Cost per ton .....	.0029	.0019	.0041	.0015	.00297

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CENTRAL ANALYTICAL LABORATORY  
STATEMENT SHOWING COST OF OPERATING AND DISTRIBUTION BASED ON DETERMINATIONS WORKED  
FOR YEAR 1940

	1940	1939
<u>COSTS</u>		
<u>Labor</u>		
Chemists and Assistants .....	19,480.00	20,280.00
Helpers and Sample Buckers .....	28,307.96	15,113.54
Total Labor .....	47,787.96	35,393.54
<u>Supplies and Expenses</u>		
Chemical, etc .....	12,873.73	11,312.60
Property Insurance .....	20.73	34.49
Personal Injury Expense .....	952.49	707.88
Unemployment Insurance Tax .....	1,566.33	1,163.98
Old Age Benefit Tax .....	474.48	354.44
Depreciation .....	233.88	153.84
Total .....	16,121.64	13,727.23
Grand Total Cost .....	63,909.60	49,120.77
Total Number of Determinations .....	216,563	169,681
Cost per Determination .....	.29511	.28949

<u>DISTRIBUTION:</u>	<u>NO. OF</u> <u>DETERMINATIONS</u>	<u>COST</u>	<u>% OF TOTAL</u> <u>LABORATORY</u> <u>WORK</u>
Cliffs Shaft Mine .....	35,483	10,461.79	16.4
Maas Mine .....	65,744	19,527.17	30.4
Gardner-Mackinaw Mine .....	1,872	521.69	.9
Lloyd Mine .....	30,158	8,767.69	13.9
Tilden Mine .....	7,776	2,211.29	3.6
Stephenson Mine .....	807	222.43	.4
Princeton Mine .....	86	23.16	-
Spies-Virgil Mine .....	188	52.71	.1
Negaunee Mine .....	37,073	10,884.37	17.1
Athens Mine .....	25,567	7,435.99	11.8
Experiments and Investigations ....	5,482	1,669.66	2.5
Morris Ore .....	721	201.53	.3
St Paul Ore .....	133	38.25	.1
E&A 731 - Explorations .....	2,465	723.92	1.1
Total Company Operations .....	213,555	62,741.65	.29379
<u>Accounts Receivable:</u>			
Volunteer Pit .....	2,915	1,116.85	1.4
L. A. & I. Ry. Co. ....	7	17.50	-
Mary Charlotte Mine .....	86	33.60	-
GRAND TOTAL .....	216,563	63,909.60	.29511 100.0

NOTES: - Accounts Receivable - work done for outside companies is charged at a set rate which is higher than the actual cost. The profit from this work is absorbed in the cost to our mines.

Cost per Determination for company operations - \$.29379  
 Cost per Determination for outside parties - .38828

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CLIFFS SHAFT MINE

ANNUAL REPORT

YEAR 1940

1. GENERAL:

The Cliffs Shaft Mine worked five days per week throughout 1941 and produced more ore than ever before in any one year. The total of 552,598 tons varied only a few tons from the year's estimate of 552,550 tons and the quality of the lump shipments exceeded the guarantee by a substantial margin.

The average daily hoist and the tons per man per day reached new high figures.

Shipments exceeded production by about 10%, or 59,293 tons.

Development work was prosecuted vigorously with the result that the new tonnage developed was approximately 515,000 tons, or slightly less than the year's production, so that the total ore reserves in sight shrunk by about 2%.

New contracts were put to work and at the end of the year we had 100 separate mining gangs on rock and ore.

Our scraping equipment was increased by 12 new units. Twelve new stoping drills were purchased. The underground equipment was also increased by 10 new 76 cu. ft. rocker dump cars, 2 new locomotive storage batteries, and 3 portable main level scraper slides.

On the surface we built one new transfer car to take run-of-mine ore to the top of the crusher building.

In the engine house a new 250 k.w. generator was bought because our entire haulage system was dependent on two old 100 k.w. units moved from other mines.

Changes were also made in the main dry house and by the end of the year the new addition was complete and ready for occupancy.

New men were added to the payroll, the majority being sons of employees, although we did hire four Copper Country men.

The mine also operated over a year without a lost time accident, the record being broken on August 31st. The previous lost time accident occurred on August 7, 1939.

2. PRODUCTION  
SHIPMENTS &  
INVENTORIES:

a. Production by Grades

<u>Grade</u>	<u>Tons</u>	<u>% of Total</u>
Cliffs Shaft Lump	327,628	
"    "    Crushed	151,377	
"    "    Run-of-mine	55	
Total Cliffs Shaft Ore	479,060	86.69
Bancroft Lump	44,117	
"    Crushed	26,092	
"    Run-of-mine	3,329	
Total Bancroft Ore	73,538	13.31
GRAND TOTAL FEE & LEASE ORE	552,598	100.00



CLIFFS SHAFT MINE  
ANNUAL REPORT  
YEAR 1940

Production by grades for past ten years follows:

Year	Lump Ore	Crushed Ore	Run-of-Mine Ore	Total Tons
	Tons	Tons	Tons	
1931	153,717	65,113	72,227	291,057
1932	57,104	24,449	566	82,119
1933	39,101	16,838	-	55,939
1934	156,776	66,469	-	223,245
1935	189,883	79,038	-	268,921
1936	315,731	140,650	379	456,760
1937	368,768	171,562	3,237	543,567
1938	222,672	102,361	2,128	327,161
1939	259,517	123,883	3,858	387,258
1940	371,745	177,469	3,384	552,598

The percentage of lumps and fines since 1932 is shown by the following figures:

Year	Lump		Crushed	
	Tons	% of Total	Tons	% of Total
1932	57,500	69.97	24,619	30.03
1933	39,101	69.89	16,838	30.11
1934	156,776	70.23	66,469	29.77
1935	189,883	70.61	79,038	29.39
1936	315,996	69.18	140,764	30.82
1937	368,768	68.24	171,562	31.76
1938	222,672	68.51	102,361	31.49
1939	259,517	67.69	123,883	32.31
1940	371,745	67.68	177,469	32.32

The percentage of lump produced in 1940 is identical with 1939. We have during the year experimented with different grades of dynamite in order to try to increase the percentage of lump. At the same time we tried to eliminate as far as possible as much bulldozing and block-holing as possible during the day shift. It was finally decided that the best way to make more lump was to install a revolving screen with 2" diameter holes.

The amount of ore mined from the Bancroft Lease is shown by the following table:

Year	Cliffs Shaft	% of Total	Bancroft Ore	% of Total
	Ore (Fee)		(Lease)	
1932	71,155 tons	86.6	10,964 tons	13.4
1933	48,891 "	87.4	7,048 "	12.6
1934	195,258 "	87.5	27,987 "	12.5
1935	241,474 "	89.8	27,447 "	10.2
1936	383,014 "	83.9	73,746 "	16.1
1937	451,170 "	83.0	92,397 "	17.0
1938	277,602 "	84.8	49,559 "	15.2
1939	323,647 "	83.6	63,611 "	16.4
1940	479,060 "	86.7	73,538 "	13.3



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We submit the following figures to show how much ore has been mined from the Bancroft Lease since the property was taken over:

<u>Year</u>	<u>Bancroft Ore</u> <u>Tons</u>
1925	15,658
1926	37,529
1927	38,372
1928	34,730
1929	65,889
1930	61,385
1931	43,303
1932	10,964
1933	7,048
1934	27,987
1935	27,447
1936	73,746
1937	92,397
1938	49,559
1939	63,611
1940	73,538
Total	723,163

b. Shipments

<u>Grade</u>	<u>Pocket</u> <u>Tons</u>	<u>Stockpile</u> <u>Tons</u>	<u>Total</u> <u>Tons</u>	<u>Last Year</u> <u>Tons</u>
Cliffs Shaft Lump	201,084	157,015	358,099	310,673
"  "  Crushed	95,303	83,715	179,018	176,302
"  "  Mine Run	55	-	55	430
Bancroft Lump	31,275	13,638	44,913	54,927
"  Crushed	15,720	10,757	26,477	45,610
"  Mine Run	3,329	-	3,329	3,428
Total	346,766	265,125	611,891	591,370
Total Last Year	208,742	382,628	591,370	
Incr. in Shipments	138,024	-117,503	20,521	

The following tabulation shows the fluctuation in shipments for the past ten years:

<u>Year</u>	<u>Cliffs Shaft Grade</u>			<u>Bancroft Grade</u>			<u>Grand Total</u>
	<u>Lump</u>	<u>Crushed</u>	<u>Run-of-Mine</u>	<u>Lump</u>	<u>Crushed</u>	<u>Run-of-Mine</u>	
1931	17,999	12,099	70,541	10,210	285	1,686	112,820
1932	25,505	3,727	574	-	-	-	29,806
1933	135,303	45,162	-	10,105	-	-	190,570
1934	142,891	47,607	-	30,238	16,703	-	237,439
1935	251,246	91,596	-	35,137	20,523	-	398,502
1936	304,265	153,738	165	48,565	31,716	214	538,663
1937	301,654	125,953	-	59,153	25,843	3,237	515,840
1938	95,983	42,240	171	19,254	3,416	1,957	163,021
1939	310,673	176,302	430	54,927	45,610	3,428	591,370
1940	358,099	179,018	55	44,913	26,477	3,329	611,891

We shipped the largest tonnage in 1940, exceeding the 1929, the 1937, and 1939 figures. We were able to do this because there was a substantial overrun tonnage in both the lump and crushed ore stockpiles.



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c. Stockpile Balances

Ore in stock as of Dec. 31, 1940:

Cliffs Shaft Lump	28,230 tons
" " Crushed	14,393 "
Bancroft Lump	2,462 "
" Crushed	<u>2,123 "</u>
Total	47,208 "

The stockpile balances at the end of each of the following years follows:

Balance in Stock - Dec. 31, 1931	-		-	342,860 tons
"	-	1932	-	395,173 "
"	-	1933	-	299,585 "
"	-	1934	-	275,391 "
"	-	1935	-	145,810 "
"	-	1936	-	82,072 "
"	-	1937	-	109,799 "
"	-	1938	-	273,939 "
"	-	1939	-	76,540 "
"	-	1940	-	47,208 "

The above tabulation shows that we finished 1940 with the smallest stockpile carry-over since 1929.

d. Division of Product by Levels

<u>Level</u>	<u>"A" Shaft</u> <u>Tons</u>	<u>"B" Shaft</u> <u>Tons</u>	<u>Total</u> <u>Tons</u>
1st	-	20,738	20,738
2nd	7,793	9,780	15,573
3rd	8,391	11,002	19,393
4th	40,535	-	40,535
5th	21,211	15,111	36,322
6th	45,493	9,147	54,640
7th	57,968	34,080	92,048
8th	41,631	19,856	61,487
9th	71,516	3,049	74,565
10th	41,845	24,738	66,583
11th	36,045	-	36,045
12th	-	8,789	8,789
13th	-	4,722	4,722
14th	-	15,801	15,801
15th	-	<u>3,357</u>	<u>3,357</u>
Total	372,428	180,170	552,598
Rock			<u>27,630</u>
Total Ore & Rock			580,228

The following table is submitted to show where the ore is broken and the proportion for each shaft:

<u>Year</u>	<u>"A" Shaft</u>		<u>"B" Shaft</u>		<u>Total</u>
	<u>Tons</u>		<u>Tons</u>		<u>Tons</u>
1931	193,747	66.5%	97,310	33.5%	291,057
1932	56,533	68.7%	25,586	31.3%	82,219
1933	39,816	71.3%	16,123	28.7%	55,939
1934	157,835	70.8%	65,410	29.2%	223,245
1935	194,847	72.3%	74,074	27.7%	268,921
1936	309,555	67.6%	147,205	32.4%	456,760
1937	358,930	66.2%	184,637	33.8%	543,567
1938	228,370	69.9%	98,791	30.1%	327,161
1939	254,133	65.5%	133,125	34.5%	387,258
1940	372,428	67.4%	180,170	32.6%	552,598



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Production from the two shafts is approximately two-thirds and one-third respectively for "A" and "B" Shafts. That means that compared with 1939 a little more ore came from the "A" Shaft territory in 1940.

The figures that follow are made up to show how ore is diverted to "B" Shaft from the "A" Shaft mining areas. Because only about one-third of the broken ore is drawn from "B" Shaft working places, ore from the 3rd, 5th, 8th, 10th, and 15th levels "A" Shaft is transferred over to "B" Shaft to balance the hoisting cycle. Unfortunately, the extra handling has a tendency to produce more fines but increases the productive capacity of the mine.

Month	1940 Product as Hoisted	
	"A" Shaft	"B" Shaft
	Tons	Tons
January	21,938	21,266
February	21,042	20,444
March	22,146	21,167
April	22,185	20,602
May	24,569	23,170
June	21,647	21,371
July	23,787	21,978
August	20,671	22,264
September	19,838	20,745
October	22,980	22,563
November	23,111	21,588
December	22,939	21,106
Total	266,853	258,259
% of Total	50.8%	49.2%

e. Production by Months

Month	Optg. Days	Cliffs Shaft			Bancroft			Total
		Lump	Crushed	Mine Run	Lump	Crushed	Mine Run	
January	22	25,453	12,058	-	4,046	1,894	-	43,451
February	21	24,443	11,675	-	3,757	1,775	-	41,650
March	22	25,696	12,129	-	3,830	1,774	-	43,429
April	21	26,527	12,624	-	3,301	1,569	-	44,021
May	23	30,585	14,988	-	3,796	2,130	-	51,499
June	21	27,037	13,054	-	3,398	1,931	325	45,745
July	22	29,337	12,821	-	3,185	2,798	718	48,859
August	23	27,758	12,605	-	2,412	2,897	334	46,006
September	20	24,697	11,857	55	3,826	2,312	110	42,857
October	23	27,684	12,570	-	4,859	2,650	525	48,288
November	22	32,220	12,666	-	4,544	2,561	677	52,668
December	22	26,191	12,330	-	3,163	1,801	640	44,125
Total	262	327,628	151,377	55	44,117	26,092	3,329	552,598

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f. Ore Statement

	<u>Cliffs Shaft</u>			<u>Bancroft</u>			<u>Total</u>	<u>Last Year</u>
	<u>Lump</u>	<u>Crushed</u>	<u>Mine Run</u>	<u>Lump</u>	<u>Crushed</u>	<u>Mine Run</u>		
On Hand Jan.1,1940	37,270	33,504	-	3,258	2,508	-	76,540	273,939
Output for Year	322,369	151,377	55	44,832	23,885	3,329	545,847	384,948
Transfers				- 991	991			
Overruns	26,690	8,530	-	276	1,216	-	36,712	9,023
Total	386,329	193,411	55	47,375	28,600	3,329	659,099	667,910
Shipments	358,099	179,018	55	44,913	26,477	3,329	611,891	591,370
Balance on Hand	28,230	14,393	-	2,462	2,123	-	47,208	76,540
Increase in Output							160,899	

g. Delays

	<u>Date</u>	<u>Hours</u>		<u>Tons</u>		<u>Cause</u>
		<u>Lost</u>	<u>Lost</u>	<u>Lost</u>	<u>Lost</u>	
Jan. 16, 1940	"	1 $\frac{3}{4}$	300	300	300	Repairing skip gate
Feb. 6, "	"	1 $\frac{1}{2}$	225	225	225	Low voltage all day
" 13, "	"	1	150	150	150	Only one motor generator set operating
June 10, "	"	2	300	300	300	Low voltage
" 11, "	"	7	800	800	800	Low voltage & short circuit in haulage
" 12, "	"	1	100	100	100	Low voltage /cable
" 17, "	"	2	300	300	300	Top tram car derailed
July 23, "	"	1	100	100	100	Electrical storm
Oct. 17, "	"	2 $\frac{1}{2}$	400	400	400	Skip gate broken
Total		19 $\frac{3}{4}$	2675	2675	2675	

3. ANALYSISa. Average Analysis of 1940 Output

	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Cliffs Shaft Lump	61.17	.107	6.52
" " Crushed	53.60	.102	15.01
" " Run-of-Mine	59.55	.118	10.78
Bancroft Lump	60.13	.127	5.57
" Crushed	56.49	.128	11.56
" Run-of-Mine	60.44	.113	7.69

The 1940 Cliffs Shaft Lump iron content was higher than the figure for years back and is not indicative of what can be expected especially under abnormal demands for ore. The average iron content on the lump grade produced since 1929, exclusive of 1940, is 58.80 and for that reason a guarantee of 59.00 for 1941 is advisable.

b. Average Analysis on Straight Cargoes

<u>Grade</u>	<u>Mine Analysis</u>			<u>Lake Erie Analysis</u>	
	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Iron</u>	<u>Moisture</u>
Lump Cliffs Shaft	61.85	.109	6.30	61.66	.34
Crushed " "	55.78	.114	11.81	55.93	1.89

It will be noted that the cargo analysis exceed the 1940 guarantees. Lump Cliffs Shaft was published at 59.00 Iron Natural and the shipments averaged 61.65 Iron Natural. The crushed ores shipped straight averaged 54.73 Iron Natural compared with a 53.80 guarantee. We were very fortunate in being able to mine in enough high grade ore stopes to keep the lump analysis at a very high figure. One answer is that we had more contracts in steel ore in 1940 and none in conglomerate ore. However, in 1941 it is more than likely some gangs will be mining conglomerate and other lean ores as, for instance, the new ore discovered on the 15th level "A" Shaft Bancroft territory.

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c. Complete Analysis of 1940 ores as shipped from Mine

<u>Grade</u>	<u>Iron</u>	<u>Phos</u>	<u>Sil.</u>	<u>Alum</u>	<u>Mang</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>
Lump Ore	61.60	.108	6.15	1.90	.33	1.03	.74	.015	1.19
Crushed Ore	54.20	.108	14.09	2.76	.46	1.36	1.00	.015	2.13

d. Analysis of Ore in Stock Dec. 31, 1940

		<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moist.</u>
Cliffs Shaft Lump	Dried	61.59	.108	6.83	.33	1.90	1.03	.74	.013	1.19	
" " "	Natural	61.28	.107	6.80	.32	1.89	1.02	.73	.013	1.18	.50
Cliffs Shaft Crushed	Dried	53.78	.106	14.00	.47	2.76	1.36	1.00	.014	2.13	
" " "	Natural	52.92	.104	13.78	.46	2.72	1.34	.98	.014	2.10	1.60
Bancroft Lump	Dried	60.71	.131	6.92	.33	2.60	1.56	1.15	.012	1.35	
" " "	Natural	60.41	.130	6.89	.32	2.59	1.55	1.14	.012	1.34	.50
Bancroft Crushed	Dried	53.64	.105	15.35	.43	2.80	1.42	1.01	.015	1.96	
" " "	Natural	52.77	.104	15.10	.42	2.76	1.40	.99	.015	1.93	1.62

e. Analysis of Ore Reserves

Run-of-Mine Ore

		<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moist.</u>
Cliffs Shaft Ore	Dried	57.65	.108	10.00	.47	2.38	1.22	.98	.014	1.90	
" " "	Natural	57.16	.107	9.91	.47	2.36	1.21	.97	.014	1.88	.85
Bancroft Ore	Dried	58.00	.130	9.70	.45	2.35	1.15	.95	.019	1.75	
" " "	Natural	57.56	.130	9.63	.45	2.33	1.14	.94	.019	1.74	.75

4. ESTIMATE OF ORE RESERVES:

Assumptions: Factor used is 8, 9, and 10 cu. ft. per ton of ore in place.  
The factor 9 is most commonly used  
10% deduction for rock  
10% " " loss in mining

Ore in Sight Dec. 31, 1940

<u>Level</u>	<u>Available ore in Bancroft Area "A" Shaft</u>			
	<u>Developed</u>		<u>Prospective</u>	
	<u>Floors</u>	<u>Pillars</u>	<u>Breasts</u>	<u>Total</u>
	<u>Tons</u>	<u>Tons</u>	<u>Tons</u>	<u>Tons</u>
2nd	1,300	-	-	1,300
3rd	3,300	800	-	4,100
4th	9,200	3,100	-	12,300
6th	3,600	-	-	3,600
8th	-	7,700	-	7,700
9th	6,800	16,700	-	23,500
10th	35,800	112,600	2,000	150,400
11th	87,700	-	-	87,700
12th	-	-	2,000	2,000
15th	-	-	-	-
Total	147,700	140,900	4,000	292,600

Summary

Bancroft Ore Available	292,600 tons
Less December production	5,604 "
	286,996 "
Less 10% for Rock & 10% for loss in mining	54,530 "
Net Total Available Bancroft Ore	232,466 "



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Available Cliffs Shaft Ore "A" Shaft

<u>Level</u>	<u>Developed</u>		<u>Prospective</u>	<u>Total</u> Tons
	<u>Floors</u>	<u>Pillars</u>	<u>Breasts</u>	
	<u>Tons</u>	<u>Tons</u>	<u>Tons</u>	
1st	-	7,000	-	7,000
2nd	11,200	-	-	11,200
3rd	3,000	-	-	3,000
4th	-	-	8,000	8,000
5th	13,800	10,100	4,000	27,900
6th	54,700	70,800	4,000	129,500
7th	151,900	22,200	2,000	176,100
8th	135,900	43,800	4,000	183,700
9th	203,300	9,200	6,000	218,500
10th	58,000	138,200	12,000	208,200
11th	57,100	180,300	-	237,400
12th	67,000	76,000	2,000	145,000
15th	40,400	-	-	40,400
<b>Total</b>	<b>796,300</b>	<b>557,600</b>	<b>42,000</b>	<b>1,395,900</b>

Available Cliffs Shaft Ore "B" Shaft

<u>Level</u>	<u>Developed</u>		<u>Prospective</u>	<u>Total</u> Tons
	<u>Floors</u>	<u>Pillars</u>	<u>Breasts</u>	
	<u>Tons</u>	<u>Tons</u>	<u>Tons</u>	
1st	8,500	1,700	4,000	14,200
2nd	37,200	-	-	37,200
3rd	11,500	23,500	2,000	37,000
4th	-	-	4,000	4,000
5th	-	7,000	2,000	9,000
6th	2,000	-	-	2,000
7th	26,700	2,900	6,000	35,600
8th	37,100	5,700	-	42,800
9th	24,600	-	2,000	26,600
10th	31,200	-	4,000	35,200
11th	20,300	3,000	-	23,300
12th	4,600	2,700	-	7,300
13th	15,500	-	2,000	17,500
14th	16,000	-	2,000	18,000
15th	21,400	15,300	-	36,700
<b>Total</b>	<b>256,600</b>	<b>61,800</b>	<b>28,000</b>	<b>346,400</b>

Section 9-47-27

<u>Level</u>	<u>Developed</u>		<u>Prospective</u>	<u>Total</u> Tons
	<u>Floors</u>	<u>Pillars</u>	<u>Breasts</u>	
	<u>Tons</u>	<u>Tons</u>	<u>Tons</u>	
9th	-	9,000	-	9,000
10th	5,800	11,000	-	16,800
<b>Total</b>	<b>5,800</b>	<b>20,000</b>	<b>-</b>	<b>25,800</b>

Summary

Cliffs Shaft Available Ore "A" Shaft	1,395,900
"                    "      "B"      "	346,400
"                    "      Section 9	25,800
<b>Total</b>	<b>1,768,100</b>
Less Production for December	38,521
	<b>1,729,579</b>
Less 10% for Rock & 10% for loss in mining	328,620
<b>Net Total</b>	<b>1,400,959</b>

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Recapitulation

Net Cliffs Shaft Ore Available		1,400,959 tons
Net Bancroft	" "	232,466 "
Grand Total	" "	1,633,425 "

The following table compares ore reserves at the beginning and end of 1940 to show how much new ore was developed during the year.

	<u>Jan. 1, 1940</u>	<u>Dec. 31, 1940</u>
Cliffs Shaft Ore Available	1,422,993 tons	1,400,959 tons
Bancroft	246,726 "	232,466 "
Total	1,669,719 "	1,633,425 "
Decrease for year 1940		36,294 "
New ore developed in 1940 (552,598 - 36,294)		516,304 "

The following figures are given to show how the ore reserves have fluctuated from year to year beginning with 1929:

<u>Year</u>	<u>Net Available Ore in Sight</u>		
	<u>Bancroft Ore</u>	<u>Cliffs Shaft Ore</u>	
		<u>Tons</u>	<u>"A" Shaft</u>
		<u>Tons</u>	<u>Tons</u>
1929	100,764	1,029,413	258,139
1930	179,200	1,071,900	255,600
1931	182,600	1,099,778	255,922
1932	210,864	1,055,384	245,483
1933	198,916	995,211	227,565
1934	204,730	1,091,100	251,087
1935	210,429	1,090,540	232,345
1936	246,659	1,055,621	289,828
1937	252,050	1,099,090	303,762
1938	243,512	1,105,663	307,991
1939	246,726	1,139,349	283,644
1940	232,466	1,106,045	294,914

The foregoing indicates that the "B" Shaft reserves show a slight increase with small decreases in both the Bancroft territory and "A" Shaft.

The figures that follow give a picture of the available ore in the mine at the end of each year for the past 20 years:

Total Available Ore in Mine at end of each year

1940	1,633,425 tons
1939	1,669,719 "
1938	1,657,166 "
1937	1,654,902 "
1936	1,592,108 "
1935	1,533,314 "
1934	1,546,917 "
1931	1,541,050 "
1930	1,506,700 "
1929	1,388,216 "
1928	1,358,000 "
1927	1,392,000 "
1926	1,436,000 "
1925	1,444,000 "
1924	1,453,000 "
1923	1,361,000 "
1922	1,364,000 "
1921	1,386,000 "
1920	1,404,000 "

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5. LABOR & WAGESa. General

The number of men employed shows an increase compared with 1939. Reasons are twofold - new men were hired and more men were added than were taken off the payroll by retirements, deaths resulting from sickness, or other reasons. We also resumed the practice of putting all of the General Shop labor on the Cliffs Shaft Labor Statement instead of charging this outside labor against the supply account.

b. Comparative Statement of Wages & Product

	<u>1940</u>	<u>1939</u>	<u>Increase</u>	<u>Decrease</u>
PRODUCT	552,598	387,258	165,340	
No. of Shifts & Hours	2 8-hr	2 8-hr		
No. of Days Operated	262	210	52	
<u>Average Number of Men Employed</u>				
Surface	91	80	11	
Underground	312	298	14	
Total	403	378	25	
<u>Average Wages per Day</u>				
Surface	5.60	5.52	.08	
Underground	6.33	6.34		.01
Average	6.17	6.16	.01	
<u>Wages per Month of 25 Days</u>				
Surface	140.00	138.00	2.00	
Underground	158.25	158.50		.25
Average	154.25	154.00	.25	
<u>Wages per Month of 22 Days</u>				
Surface	123.20	121.44	1.76	
Underground	139.26	139.48		.22
Average	135.74	135.52	.23	
<u>Wages per Month of 17 Days</u>				
Surface	95.20	93.84	1.36	
Underground	107.61	107.78		.17
Average	104.89	104.72	.17	
<u>Wages per Month of 13 Days</u>				
Surface	72.80	71.76	1.04	
Underground	82.29	82.42		.13
Average	80.21	80.08	.13	
<u>Product per Man per Day</u>				
Surface	23.24	21.76	1.48	
Underground	6.76	6.14	.62	
Average	5.24	4.79	.45	



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For comparison the following data shows the product per man per day since 1926, or going back over a period of 15 years. It will be noted that for the first time the total tons per man per day for the year exceeded 5.00 and that despite the fact that no credit was given for the year's crushed ore stockpile overrun.

Product per Man per Day for 15 years back

<u>Year</u>	<u>Surface</u>	<u>Underground</u>	<u>Total</u>
1940	23.24	6.76	5.24
1939	21.76	6.14	4.79
1938	17.72	5.68	4.30
1937	20.72	6.54	4.97
1936	19.67	6.46	4.86
1935	17.42	6.08	4.51
1934	19.60	6.46	4.86
1933	8.65	4.57	2.99
1932	12.27	4.66	3.39
1931	18.75	5.52	4.26
1930	20.08	5.65	4.41
1929	20.67	5.86	4.56
1928	20.53	5.80	4.52
1927	22.00	6.19	4.85
1926	19.37	5.91	4.53

<u>Labor Cost per Ton</u>	<u>1940</u>	<u>1939</u>	<u>Increase</u>	<u>Decrease</u>
Surface	.241	.253		.012
Underground	.936	1.033		.097
Total	1.177	1.286		.109

Following are comparative figures for the past 10 years:

<u>Year</u>	<u>Surface Labor</u>	<u>Underground Labor</u>	<u>Total Labor</u>	<u>Wage Index *</u>
1940	.241	.936	1.177	190.17
1939	.253	1.033	1.286	190.17
1938	.310	1.110	1.420	190.17
1937	.267	.985	1.252	184.77
1936	.214	.791	1.005	164.29
1935	.232	.809	1.041	149.79
1934	.194	.728	.922	138.05
1933	.379	.861	1.240	129.78
1932	.303	.908	1.211	132.27
1931	.232	.888	1.120	157.44

\* Wage Index gives yearly basic wage rates compared with June 30, 1916, which is assumed as a base of 100%.

	<u>1940</u>	<u>1939</u>	<u>Increase</u>	<u>Decrease</u>
Average Product Stoping and Trammig (Tons per shift)	17.87	16.69	1.18	
Average Product Stoping and Trammig, including haulage crews (Tons per shift)	14.93	13.78	1.15	
Average Wages-Cont. Miners	6.75	6.69	.06	
" " -Trammers (Cont)	8.90	8.81	.09	
" " -Contract Labor	7.02	6.96	.06	

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<u>Total Number of Days</u>	<u>1940</u>	<u>1939</u>	<u>Increase</u>	<u>Decrease</u>
Surface	23,773 $\frac{1}{4}$	17,797 $\frac{1}{4}$	5,976	
Underground	81,663 $\frac{3}{4}$	63,062 $\frac{3}{4}$	18,601 $\frac{1}{4}$	
Total	105,437	80,859 $\frac{3}{4}$	24,577 $\frac{1}{4}$	

<u>Amount for Labor</u>				
Surface	\$ 133,299.09	98,195.92	35,103.17	
Underground	517,420.10	399,853.48	117,566.62	
Total	\$ 650,719.19	498,049.40	152,669.79	

<u>Proportion of Surface to Underground Men</u>	
1940	1 to 3.43
1939	1 to 3.73
1938	1 to 3.22
1937	1 to 3.15
1936	1 to 3.28
1935	1 to 3.72
1934	1 to 4.05
1933	1 to 4.00
1932	1 to 4.60
1931	1 to 3.66

## 6. SURFACE

### a. Buildings & Repairs

Repairs to mine buildings for the past 5 years are shown by following tabulation:

	<u>1940</u>	<u>1939</u>	<u>1938</u>	<u>1937</u>	<u>1936</u>
Office & Warehouse	637.58	247.85	153.00	375.24	411.83
Shops	111.18	219.84	116.31	50.15	743.92
Shaft Houses	777.48	373.85	274.74	952.41	857.16
Engine House	1119.47	105.71	184.33	823.26	1708.73
Dry Houses	4503.76	1554.29	839.88	2738.45	4956.23
Coal Dock & Trestle	307.30	855.66	1163.97	45.31	11.21
Crusher Building	522.03	157.84	327.04	864.60	677.10
Miscellaneous	271.41	56.46	110.60	338.38	1077.39
Total	8253.21	3571.50	3169.87	6187.80	10443.57

Cost of repairs to mine buildings is considerably in excess of the last two years and increases were due to improvements to the office warehouse, shaft houses, engine house, dry house and crusher building. In the case of the office and warehouse a new first aid room was provided and the warehouse enlarged by rebuilding the old office formerly occupied by the Chief of Police.

In the shaft houses we repaired the stairways and rebuilt the deck on a level with the skip dumps in both "A" and "B" shaft houses. Plans have been made and material is being ordered for rebuilding the lighting system.

The engine house roof began to give us trouble and so we completely reroofed the entire structure and put a strip of metal roofing 4 ft. wide along the eaves.

The dry house expense is high because of building the new addition and revamping the old dry house to provide separate rooms for clean and dirty clothes. By the end of the year the new addition was complete and part of the new lockers were installed. No work had been done in the old dry building except the laying of the new steam and water and return lines and hanging the new unit heaters.

The crusher building expense was increased over last year because we rebuilt the wood floors and put in new safety platforms and railings.

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7. UNDERGROUND

a. Development

The following tabulation gives the reader an idea as to the proportion of all the gangs in the mine kept on development work:

<u>Month</u>	<u>Total Number of Gangs</u>	<u>Gangs Developing</u>	<u>% Developing</u>
January	94	53	56.3
February	95	49	51.6
March	93	48	51.6
April	91	46	50.6
May	92	48	52.2
June	91	50	55.0
July	95	57	60.0
August	96	54	56.3
September	97	58	59.8
October	98	52	53.1
November	100	55	55.0
December	97	51	52.6
Monthly Average	94.9	51.7	54.5
Year 1939			53.6
" 1938			52.0
" 1937			56.5
" 1936			55.2

We did, as in years past, keep more than half of all the gangs in the mine on development work. It should be obvious that the Cliffs Shaft Mine cannot continue to produce over 550,000 tons a year with only three times that much ore in sight unless we continue to keep up an intensive development campaign. It should also be kept in mind that our future possible productive areas are becoming more limited each succeeding year as we approach the main hanging and footwalls on each level and explore these contacts. In 1929 we had exhausted the reserves as originally calculated by the Internal Revenue Department geologists. A revision of these figures, however, extended the life of the property a few additional years but we are now getting close to the total of the revised figures. The point we are trying to establish is that every effort should be made to take over or lease other lands close to or adjacent to the mine that may contain hard ore in order to conserve our own fee ore as long as possible.

"A" Shaft  
1st Level

Contract #34 directly North of "A" Shaft pushed the breast of their stope East along the South boundary of the Bancroft Lease until it holed into old #9 workings. In the opposite direction Contract #1 Southwest of the shaft in the Southeast Vein drove two breast stopes - one West over D. D. Hole #101, and the other East towards D. D. Hole #117. Directly South of #1's East stope we have developed ore along the Oliver Iron Mining Co's boundary for a distance of 250 ft. and raises are already up from the 3rd level which would make it possible to start mining this ore immediately if the property could be leased.



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3rd Level

In the Bancroft area 800 ft. Northeast of "A" Shaft Contract #29 followed the hanging contact until the hanging came down too low for a full size breast. The miner was then moved down his raise to put up a branch to the East and a new stope started directly over the ore shown in D. D. Hole #374. It is possible that the ore #29 is developing will be found to connect with the new ore #12 found on the 5th level.

In the North Vein near the 200 South coordinate line Contract #74 extended their stope West for 75 ft. and for a while it looked as if the ore would extend another 225 ft. West to the old North Vein workings. The hanging, however, flattened and the foot rose up to cut off the ore in the breast.

4th Level

Every gang but one - #22 - added to the ore reserves by increasing the known ore areas on the 4th level. Up in the North Vein in the Northwest corner of the level 200 ft. South of the Southwest corner of the Bancroft Lease Contract #30 cut through the old footwall and is finding ore that may take us up to the old 2nd level workings. In the Northeast corner of the North Vein area close to "A" Shaft Contract #83 holed their stope to the old workings between D. D. Holes #12 and #159. They also started a new stope a little Southeast of the intersection 200 South and 1600 East. This area was stopped temporarily until we get a new raise up from the 5th level. In the extreme Northeast end of the North Vein near the old New York Mine a double gang - #8 - extended three breasts to the North and Northeast. There are good prospects for expecting this ore to extend Northeast towards the old No. 3 Mine workings.

Down in the Southeast Vein #45 after putting up a new raise extended the known area of the vein back West along the 1200 South coordinate line for another 80 ft. That may seem small footage for a year but it must be kept in mind that any gang producing 7500 tons of hard ore a year is doing good work. An advance in the face of an average size stope of from 8 to 10 ft. a month will produce that tonnage.

5th Level

In the Bancroft area four gangs opened up new areas. Contract #76 spent some time trying to find a connection between their ore developed from the 10th to the 5th and the ore on the 2nd and 3rd levels. After putting up two exploring raises near the 1400 East coordinate line we decided to stop the work temporarily and try and find a connection somewhere else. Contract #44 accordingly started to raise a short distance Northeast of the intersection 000 North and 1000 East and after three different attempts finally found a leader of ore going up to the 2nd level. By the end of the year the raise was up in ore to about the 3rd level elevation.

Contract #74 also started to drift South along the West boundary of the Southeast quarter of the Southwest quarter of Section 3 and found a nice lens of ore after crosscutting about 25 ft. Because all cars had to be back switched we decided to go back down the main drift and cut East to try and find the same ore. So a new crosscut was started near the 1200 East coordinate line and after a few cuts we did hit the ore we were looking for. About 200 ft. Southeast of this discovery, Contract #76 stope raised up on the foot along the 1400 East line and by the end of the year had developed a fine healthy looking stope. We believe that eventually all these ore lenses opened up by #44, #74, and #76, and also #29 on the 3rd level will join and form one ore body.

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6th Level

In the North Vein East of the Bancroft Lease Contract #51 took out all the available ore between the boundary line of the leased area and the old stope to the East. As is customary, all ore pillars are left on the leased area, making it possible to take out all the adjacent fee ore. In the Southwest corner of the same North Vein but close to the main fault #16 extended the South limits of the raising stope. There is still additional ore in this area that we have not as yet developed.

In the Main Vein at the intersection 400 South and 1600 East Contract #12 opened up a new ore area on the sill floor and then raised to the level above in ore to the floor of an old sub level above the 5th level.

7th Level

Seven mining gangs were employed on the 7th but only two of them - #6 and #60 - in the Southeast Vein increased our known ore areas. The former raised up over the back of his stope for 30 ft. and then stripped down the ore, but during this operation the broken ore was not available for hoisting for four months. Contract #60 extended their breast stope 140 ft. further to the Northwest crossing the ore shown in D. D. Hole #349. When the breast got 240 ft. from the raise we decided it was too great a distance to scrape and so planned a new drift and raise from the 8th level.

8th Level

We are now getting down into that portion of the mine where most of the new ore is being discovered. In the Bancroft Lease Contract #89 - one of the best producing gangs in the mine - stope raised from the 8th to the 5th level in the Northwest corner of the known ore area. Down in the Southeast corner #53 drove West and also put up two new raises from the sub above the 9th to the 8th level. The hanging here is treacherous and so strong ore braces must be left in place to support it.

In the North Vein East of the Bancroft Lease #64 extended their breast a short distance West towards the boundary and they also drove East in the opposite direction. In the Northeast corner of the level four other contracts increased our known ore areas. Contract #25 pushed the limits further East and closer to the ore in D. D. Hole #406 on the 6th level by stope raising. Contract #62 along the South side opened up a new area 80 ft. long. Contract #79 is finding the ore under the hanging along the North side to join with the ore shown in D. D. Hole #417. Contract #92 found both foot and hanging of their old stope to be very thin and the ore behind these walls will greatly increase the known width of the ore body.

At the close of the year we started another gang - #23 - drifting North along D. D. Hole #261 and by the end of the year the drift was in beyond the end of the drill hole in mixed ore and jasper. We are still hopeful of intercepting the ore #51 is mining on the 5th. This is in North Vein territory South of the Bancroft Lease. Over on the West side of the level two more gangs - #79 and #94 - were developing. No. 79 breasted West but did not reach the ore shown in D. D. Hole #260. We then dropped down under the hanging and tried to get through in ore to get under the ore in the drill hole. This scheme failed because the ore evidently does not go very far below the 8th level. Contract #94 drove Southwest for 185 ft. crossing near the intersection 400 South and 1600 East. A raise with three branches was then started to get under the ore found by #12 on the 6th and in D. D. Holes #54 and #55 also on the 6th level.



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9th Level

Four gangs did development work at widely scattered points on the 9th. Up in the Northwest corner #91 breasted East and just crossed the East line of the Bancroft area by the end of the year. #64, 250 ft. East of #91, extended two stope raises to the 8th level. Both of these gangs were in the North Vein.

In the Southeast Vein #65 found more ore in the back and on the foot near the 2200 East line than we figured on. 1,000 ft. further East Contract #68 put up a stope raise all the way from the 9th to the 7th level. The hanging rock is hard to keep safe and so we planned a new chute and travelling road for #68.

In the Bancroft area six gangs were kept busy most of 1940. Starting up in the Northwest corner #80 followed a leader until it nearly pinched out. Then the ore opened up like an hour glass and we decided it advisable to get a second outlet into this working place. Contract #5, therefore, crosscutted due North to hit the contact leading to #80. Going Southeast we have four gangs holed to each other - #10, #69, #70, and #84. Contract #10 pushed the known limits of the ore body further West but we had a lot of trouble keeping the hanging safe and so late in the year decided to give this place a rest. Further East #84 holed to #70 and #70 driving East holed to old #5's stope. The work done by #84 proved the ore body to be 200 ft. longer than developed a year ago. In fact, #10, #69, #70, and #84 are in the same ore body as #64 and #91 and as time goes on we will prove that this portion of the Bancroft ore body runs from the 1900 East coordinate line continuously to the 3000 East line.

Down in the Southeast corner #53 opened up a new sub 100 ft. long.

10th Level

There were only two places on the 10th in the Main Vein where we found new ore. Contract #39 raising up in the central area that we supposed was nothing but hanging rock found ore to extend 30 ft. above the 10th. This location is near the intersection 700 South and 2300 East. Over on the East side #26 and #50 are extending the ore areas further North and East between the 2700 and 2800 East lines. In the extreme East end #95, a new gang, drove East in rock to the 3200 coordinate line and then started raising for #68's breast on the 7th level.

On the Bancroft Lease #23 and #32 both opened up some new ore. The former drifted along the South boundary proving the ore to extend 140 ft. further to the West. Up in the Northwest corner #32 mining in the North Vein, which is merely the East end of the Bancroft ore body, crosscutted South until the hanging came down and cut off the ore. What we need here are raises from the levels below and that is the project #75 is working on.

11th Level

Two gangs on this level can be classed as developing gangs - #21 and #39. The first one breasted Northwest towards the intersection 600 South and 2800 East until the ore became too lean. The latter found ore 30 ft. above the 10th as mentioned before by raising up on the foot.

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15th Level

Contract #75 drove due East in footwall dike and siderite to the 2900 East coordinate line. We cut out two diamond drill stations and Hole #478 found enough fair grade ore North of the drift for us to crosscut and drift in and for putting up raises to the 10th level. Inclined holes from the 10th level prove high grade ore to exist down to the 12th level and we believe we can now put up raises all the way from the 15th in merchantable ore.

"B" Shaft

1st Level

All the contracts working on or above the 1st level did their part in maintaining the ore reserves. Above the level both #17 and #18 spent most of the year advancing their breasts. #18 in particular seems to have found an extension to the Main Vein that should go much farther to the South and West. On the sill floor #58 in the new South-west Vein found the ore lens to be at least 40 ft. wide. Unfortunately, we are sure that a great deal of this ore lies on the Oliver Iron Mining Co's property. To date we have not been able to prove by surface drill holes that this ore goes to the West and extends down below the 1st level.

In the North Vein both #63 and #72 extended the ore area further South but #72 ran into a lot of trouble with their back and barred steadily from May to the middle of October. As conditions didn't improve we decided to put up a new raise from the 5th so that #72 would not have to travel under the loose. The raise holed the last week in December.

4th Level

Contract #13 in the North Vein and #33 in the Fault Vein opened up new territory. The former put up two new raises from the 5th to open up the ore shown in D. D. Holes #65 and #77. The ore so far discovered is lean. In #33's working place we decided we were wasting too much time crosshauling and so #97 miner was moved from the 10th to the 4th to put up a new raise which was completed before the end of the year. There is still some ore to the East of the 400 West coordinate line that we have as yet not developed.

5th Level

The three contracts working on the 5th - #38, #71, and #93 - can all be classified as developing contracts even though two of them were mining backs because none of these ore areas were included in last year's ore estimate for the reason that we did not know that the ore was there. Contract #38 in the Fault Vein near the intersection 800 South and 1200 West found more ore on the foot that could be mined.

In the Main Vein #71 after trying three different spots to find the ore shown in D. D. Holes #147 and #468 finally discovered an opening wide enough between foot and hanging to start a raise stope. As a result the raise led us up to the old 3rd level between two old rock dumps. Neither the old 3rd or 4th level maps show any available ore in this area but we will undoubtedly keep #71 busy all of 1941 mining in these old floors.

Contract #93 in the North Vein 600 ft. Northwest of "B" Shaft repeated #71's experience by trying here and there in the back until we found a leader that took us up to the 4th level where we can mine for some months to come.



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6th Level

On this level Contract #42 extended their breast stope both East and West along the hanging in the North Vein 300 ft. directly North of the shaft. For a while it looked as if the East side would have to be stopped but the dike running through the ore pinched out. Down in the Fault Vein #38 was described with the 5th level gangs but by putting up two raises from the 6th found the ore behind the foot to extend down below the 6th level also.

7th Level

Up in the Northeast corner three developing gangs increased the formerly known ore areas.

On the East end #40 breasted Northwest leaving enough back to prevent rock from the 6th level rock dump mixing with the ore. Going West #31 opened up a good sized stope around the intersection 000 North and 200 East. A short distance to the Southwest #85 drove their stope raise East holing to the 6th level. This ore is quite badly seamed with layers of rock, resulting in a lot of rock picking. These gangs all worked in the North Vein.

Down in the Fault Vein we find another new raise in ore put up by #49 from the 8th level. The raise by the end of the year holed in ore to the 6th level which means that #49 after starting originally testing the back on the 10th level has now found the ore to go up four levels or 200 ft.

8th Level

In the Main Vein #69 drove two breast raising stopes North and East 700 ft. West of the shaft. This area has some pyrites in the ore and so we stopped working here after the middle of the year.

Down in the Fault Vein #49 opened up a new ore area behind the old footwall 1300 ft. Southwest of the shaft. Because this broken ore pile was needed to work on we put two miners here for a while to speed up the work. No ore was hoisted from #49 from January to October.

9th Level

Contract #77 started a new stope in the Main Vein 650 ft. Northwest of the shaft after discovering this ore in D. D. Hole #471. This area has possibilities both to the Northeast and Southwest.

In the Main Vein & Fault Vein two contracts - #19 and #49 - already described on upper levels, extended the previously known ore outlines.

In the Section 9 territory both #47 and #82 did a lot of exploring. #47 extended the ore limits West 190 ft. but found that there was little ore over the back of the level. On the East side #82 raised in ore until they reached the 3rd level elevation. What the extent of this ore is to the East or West we do not know and because of the difficulty of ventilating these workings from one raise it was decided to stop developing at the top and go back to the bottom. Accordingly, two new raises were started from the 10th - one on the 4100 West line and the other 50 ft. farther West. The first raise was so planned as to come up under ore found in surface holes #34, #35, and #39. This ore was up 230 ft. above the 10th but the first raise hit ore 86 ft. above the level. After continuing in this ore for 20 ft. we stopped to start another raise. The ore in the raise lines up with the ore in old 77's stope 200 ft. farther West and so we are quite confident that we have an ore body at least 350 ft. long East of the 4400 West coordinate line. That means at least 1200 tons per foot of vertical height. We do not presume to forecast ore from the 10th to the 3rd level, or 315 ft., but we should at least develop the tonnage of 225,000 tons estimated by the State Tax Commission.

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10th Level

About 900 ft. West of "B" Shaft we had three developing gangs - #14, #56, and #97. The first mentioned continued to increase the ore reserves by crosscutting both East and West. #56 to the South also extended a fine breast due East and eventually there will be some connection between these two stopes. Contract #14, however, ran into the old 9th level rock dump in the back of their stope and so we planned a new raise through which to draw off the rock. This raise put up by #97 went up in ore 50 ft. South and parallel with the 400 South coordinate line.

Out in the Section 9 territory Contract #88 started a crosscut Northwest to develop the ore found to the North in D. D. Hole #472. In the West end Contract #97 extended the stope West for another 160 ft. and then put up two new raises to the 9th level. The ore in the West end of the stope does not extend above the 9th. The footwall drift was then extended West along the hanging contact until it crossed the 5000 West coordinate line. We are planning to drill another hole or two to the South to find the ore discovered in D. D. Hole #473.

13th Level

Contract #43 continued to stope raise 1300 ft. West of "B" Shaft in the Fault Vein.

14th Level

#48 by driving a new breast stope straight North under the hanging shown in D. D. Hole #449 is apparently going to develop some new tonnage in an area supposedly all hanging jasper.

15th Level

Contract #37 put up a new raising stope 1600 ft. Northwest of "B" Shaft. The top of the stope finally holed to the 14th level. We have an opportunity here to drive due West for another 150 ft. back of the hanging of the old Main Vein stope.

General

In order to show the tonnage broken by the developing gangs and in order to check on the engineers' ore estimate, we submit the following table which shows the amount of new ore secured from the developing contracts. As mentioned before, we have found a rule-of-thumb by experience that the average developing gang driving a breast stope will develop as much new tonnage in the floor and back as they take out or produce. In other words, if we hoisted half our product from the contracts extending the old ore limits or finding new lenses, we should develop or offset the other half of the year's product with additional new reserves.



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Ore Broken (Mine Tally) by developing gangs

<u>"A" Shaft</u>				<u>Mine Tally</u>
2nd Level	-	Cont. #27	- Main Vein	8,004 Tons
3rd	"	"	29 - Bancroft Vein	3,302 "
4th	"	"	8 - North Vein	8,410 "
4th	"	"	83 - " "	3,919 "
5th	"	"	44 - Bancroft Vein	4,536 "
5th	"	"	76 - " "	5,686 "
5th	"	"	45 - Southeast "	5,510 "
6th	"	"	12 - Main "	136 "
6th	"	"	67 - North "	3,643 "
7th	"	"	60 - Southeast "	4,092 "
8th	"	"	25 - North "	5,439 "
8th	"	"	62 - " "	4,494 "
8th	"	"	64 - " "	4,882 "
8th	"	"	79 - " "	6,048 "
8th	"	"	89 - Bancroft "	9,762 "
8th	"	"	92 - North "	6,058 "
9th	"	"	5 - Bancroft "	6,245 "
9th	"	"	10 - " "	5,116 "
9th	"	"	26 - Main "	6,762 "
9th	"	"	68 - North "	6,862 "
9th	"	"	70 - Bancroft "	8,749 "
9th	"	"	80 - " "	2,231 "
9th	"	"	84 - " "	7,914 "
9th	"	"	91 - " "	7,444 "
10th	"	"	3 - South Lens	6,423 "
10th	"	"	21 - Main "	6,324 "
10th	"	"	23 - Bancroft "	3,250 "
10th	"	"	32 - North "	4,148 "
10th	"	"	50 - Main "	7,200 "
Total "A" Shaft - - - - -				162,589 "

<u>"B" Shaft</u>				
1st Level	-	Cont. # 1	- Southeast Vein	4,615 "
1st	"	"	17 - Main "	5,321 "
1st	"	"	18 - " "	6,817 "
1st	"	"	58 - Southwest "	3,029 "
4th	"	"	13 - Fault "	2,725 "
4th	"	"	33 - " "	3,489 "
5th	"	"	71 - " "	1,491 "
6th	"	"	42 - North "	5,134 "
7th	"	"	40 - " "	4,904 "
8th	"	"	31 - " "	5,547 "
8th	"	"	49 - Fault "	4,612 "
9th	"	"	77 - " "	4,546 "
9th	"	"	47 - Section 9	3,418 "
9th	"	"	82 - " 9	2,908 "
10th	"	"	14 - Fault "	7,318 "
10th	"	"	56 - " "	4,628 "
10th	"	"	88 - Section 9	3,095 "
10th	"	"	96 - Fault "	593 "
13th	"	"	43 - " "	4,504 "
14th	"	"	48 - Main "	7,723 "
15th	"	"	37 - " "	3,202 "
Total "B" Shaft - - - - -				89,619 "

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Summary

"A" Shaft	162,589 tons
"B" Shaft	89,619 "
Total "A" & "B" Shafts	252,208 "

Note:- The tally for 1940 mine tonnage, minus overruns, was 525,112 tons so that the 252,208 tons hoisted as shown above represents 48% or, as we reason it, our ore reserves should show a loss of 100% minus 2 x 48%, or 4%. 4% of 552,598 is 22,104 tons and the engineers estimate that the ore reserves shrunk by 33,294 tons.

The figures for the four-year period 1937-1940 inclusive are:

Ore produced-mine tally (no overrun) 1937-1940	1,738,001 tons
" " by developing gangs "	839,973 " or
	48.3 %

The factor of 48.3% would indicate that we should show a slight loss in ore reserves over the four-year period but as a matter of fact we show a slight gain of 1 $\frac{1}{2}$ %, indicating that the rule-of-thumb is fairly reliable.

The following comparative data is submitted to show how the efficiency of the developing gangs improved compared with previous years:

<u>Year</u>	<u>No. of Gangs on Ore Development</u>	<u>Tonnage Mine Tally</u>	<u>Shifts Worked</u>	<u>Tons per Gang per Shift</u>
1940	50	252,208	11,345	22.23
1939	48	167,936	9,098	18.46
1938	53	167,384	8,538	19.60
1937	45	252,445	12,755	19.79

b. Stoping  
"A" Shaft

1st Level

Contract #34 took out a portion of the 1st level floor back of the 2nd level North of "A" Shaft on the South side of the boundary. The broken ore was tied up from March until November because the miner needed the pile to work from to avoid building high stages.

2nd Level

In the extreme South side of the Bancroft area Contract #49 took out both back and floor close to the 1100 East coordinate line. In the central portion of the Main Vein Northwest of "A" Shaft #27 continues to take floors, first removing the rock dumped on the old 2nd level floor. For over two years we have taken out ore covered for years in the old rock dump. As near as we can estimate there is still enough ore left to keep #27 busy for another two years.

4th Level

Contract #22 continued to mine floors in the North Vein adjacent to the Bancroft Lease between the 1300 and 1400 East coordinate lines. The ore in this area occasionally carries pyrites and when that occurs we leave that ore in place.



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5th Level

All three gangs employed on the 5th level during the year mined floors. In the North Vein between "A" and "B" Shafts #57 mined floor from the 4th to a short distance below the 5th level floor. In the Southeast Vein #41 over on the West side took out floor between the 5th and 6th. This was equivalent to finding some new ore because this portion of the mine was supposed to be worked out. In the North Central part of the Southeast Vein Contract #2 took out floors between the 2100 and 2200 East coordinate lines.

6th Level

Most of the contracts on the 6th are depleting gangs taking floors and backs. In the Bancroft area #61 took out a bench 30' x 50' and then crossed over the boundary line to the South and mined out a "U" shaped floor along the 2500 East coordinate line.

In the North Vein Contract #66 mined the floor between the pillars in the Bancroft Lease near the Southeast corner and the foot to the South. In the South Central part of the North Vein between the 2200 and 2400 East lines #20 and #52 took floors. No production was secured from these gangs for long periods because ore had to be accumulated to provide a place to stand on to reach the back. By the end of the year we were scraping in #52 contract. In the West end of the North Vein #54 took out some back near the 1900 East coordinate line. This ore had seams of rock running through it and so had to be carefully picked over before scraping.

In the Southeast corner of the level two contracts - #15 and #67 - mined floors. The latter had a lot of trouble with the back of their stope and spent five and a half months barring.

In the West end of the Southeast Vein #41 took out some developed ore under the hanging. As mentioned before, they also took out the ore on the foot all the way up to the 5th level.

7th Level

In the North Vein every gang employed - #16, #78, #35, and #28 - taking them in rotation West to East, was a depleting gang. The first named mined mostly back on the 1700 East coordinate line. Contract #78 took floors near the 2100 East line until their back was endangered by #52 blasting on the 6th level. This contract was then moved to the East end of the 8th level. Both #28 and #35 working near the 3100 East coordinate line mined out floors, one in the footwall stope and the other close to the hanging.

10th Level

Six gangs mined developed reserves and all but one were in the Main Vein. Contract #24 in the Northwest end of the Main Vein took floors between the 10th and 11th levels. Contract #7, 400 ft. further East, mined a lot of ore on the foot from the 10th to the 11th level. 400 ft. still further East #4 also mined floors. Directly South of #4 Contract #11 took floors. In the East end Contract #21 mined out floor where the 2900 East coordinate line crosses the 600 South line.

In the Southeast Vein Contract #3 not only mined the floor down half way to the 11th level but they also developed new tonnage by breasting West along the 800 South coordinate line.

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11th Level

Directly South of the Southeast corner of the Bancroft Lease #83 after being moved from the 4th level started mining floors from the top of the Southwest branch of old #75's raise.

"B" Shaft

3rd Level

Contract #73 mined floors in the Main Vein a short distance Southwest of "B" Shaft. For the first half of the year the ore was lean but the quality improved as the months went by.

7th Level

In the North Vein Contracts #87 and #90 mined floors between the 100 West and 300 West coordinate lines.

In the Main Vein #19 took out floors close to the 1000 West line. This gang barred steadily up until September after which we got some production.

8th Level

In the North Vein 850 ft. Northwest of "B" Shaft Contract #36 took out floors in both the East and West ends of the stope. We explored in the West end trying to find some ore under the foot but the leaders quickly played out. In December we did succeed in finding some new ore under the hanging along the 700 West line and perhaps we may eventually find the ore to connect with a leader in the back of the 10th level crosscut.

12th Level

Contract #86 mined developed reserves in a number of different places between the 1200 and 1300 West coordinate lines. The reason for jumping around was that the ore at times was lean and streaked with bands of jasper and we only mined the merchantable seams.

13th Level

Contract #46 took out floors in the South Central part of the Main Vein 1500 ft. West of "B" Shaft.

The following tabulation gives the location, the contract number, and the tons hoisted from each of the stoping or depleting gangs. All of these contracts mined backs or floors.

<u>"A" Shaft</u>		<u>Mine Tally</u>
1st Level -	Cont. #34 - North Vein	2,824 tons
2nd " - "	9 - Bancroft Vein	4,610 "
4th " - "	22 - North "	5,408 "
4th " - "	30 - " "	7,172 "
5th " - "	2 - Southeast "	8,363 "
5th " - "	74 - North "	4,945 "
5th " - "	81 - Main "	6,048 "
6th " - "	15 - North "	3,160 "
6th " - "	20 - " "	3,743 "
6th " - "	41 - Southeast "	4,795 "
6th " - "	51 - North "	10,196 "
6th " - "	52 - " "	6,977 "
6th " - "	54 - " "	6,122 "
6th " - "	61 - Bancroft "	7,292 "
6th " - "	66 - North "	7,082 "



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7th Level - Cont. # 6 - Southeast Vein	5,387 tons
7th " - " 16 - North "	6,337 "
7th " - " 28 - " "	9,054 "
7th " - " 35 - " "	6,607 "
7th " - " 59 - Main "	9,670 "
8th " - " 55 - Southeast "	6,478 "
8th " - " 78 - North "	8,001 "
9th " - " 53 - Bancroft "	5,505 "
9th " - " 65 - Southeast "	5,339 "
10th " - " 4 - Main "	5,888 "
10th " - " 7 - " "	8,584 "
10th " - " 11 - " "	4,011 "
10th " - " 24 - " "	8,865 "
11th " - " 39 - " "	6,599 "
Total "A" Shaft - - - - -	185,060 "

"B" Shaft

1st Level - Cont. #63 - North Vein	6,652 "
1st " - " 72 - " "	2,677 "
3rd " - " 73 - Main "	10,495 "
5th " - " 57 - North "	4,961 "
5th " - " 93 - " "	3,239 "
6th " - " 38 - Main "	7,234 "
7th " - " 19 - Fault "	7,898 "
7th " - " 87 - North "	4,796 "
7th " - " 90 - " "	8,479 "
8th " - " 36 - " "	6,431 "
8th " - " 85 - " "	3,649 "
8th " - " 69 - Main "	7,699 "
12th " - " 86 - Fault "	8,384 "
13th " - " 46 - Main "	7,350 "
Total "B" Shaft - - - - -	89,944 "

Summary:

"A" Shaft Contracts	185,060 tons
"B" " "	89,944 "
Total "A" & "B" Shafts	275,004 "

The following tabulation similar to the one submitted under the developing gangs gives an idea as to what each gang produces each day:

<u>Year</u>	<u>No. of Gangs Stopping</u>	<u>Tonnage Mine Tally</u>	<u>Shifts Worked</u>	<u>Tons per Gang per Shift</u>
1940	43	275,004	9,739	28.23
1939	41	200,082	7,514	26.63
1938	37	153,321	5,494	27.91
1937	38	263,155	10,771	24.43

As was true for the developing gangs, the stoping contracts also showed an improvement in 1940.

Another tabulation that may be of interest shows the tons per man per day stoping as indicated on the Labor Statement. These Labor Statement figures do not agree with the foregoing table because on the Labor Statement Stopping includes all miners in stopes whether they are mining floors, backs, breasting, raise stoping, etc. That means they are a composite of not only the depleting gangs but also all developing contracts except the raising and drifting gangs.

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Tons per man per day Stopping (Labor Statement)

Year 1940	24.23
1939	21.40
1938	21.55
1937	22.52
1936	22.61
1935	22.98
1934	23.25
1933	18.90
1932	21.80
1931	20.55

The table confirms the other previous tabulations in showing the largest tons per man per day for 10 years.

c. Drifting and Raising

<u>Year</u>	<u>Rock Drifts and Raises</u>	<u>Ore Drifts and Raises</u>	<u>Total</u>
1940	1,756 ft.	3,242 ft.	4,998 ft.
1939	2,130 "	2,270 "	4,400 "
1938	2,337 "	1,955 "	4,292 "
1937	4,292 "	2,895 "	7,187 "
1936	4,122 "	2,724 "	6,846 "
1935	3,043 "	2,646 "	5,689 "
1934	2,061 "	1,109 "	3,170 "
1933	615 "	372 "	987 "
1932	1,357 "	585 "	1,942 "
1931	3,577 "	3,212 "	6,789 "

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d. Explosives, Drilling and Blasting:  
Explosives Statement for Year 1940

Stoping and Development in Ore

	Quantity	Average Price	Cost 1940	Cost 1939
Gelamite #1 - lbs.	446,300	11.50	51,336.00	36,108.36
Fuse - feet	748,700	5.65	4,147.68	3,123.22
No. 6 Caps	115,300	12.20	1,406.61	1,171.09
Electric Caps	2,938	11.68	343.32	145.92
Fuse Lighters	26,200	6.38	173.27	159.92
Wire - #18 Shot Cord	3,450	12.04	41.55	47.02
Fuse Cans, etc.	5		5.01	64.44
Tamping Bags	32,100	3.12	104.05	133.27
Powder Bags & Miscel.			134.95	33.14
Total Fuse, Caps, etc.			6,356.44	4,878.02
Total - Stopping & Development in Ore			57,692.44	40,986.38

Product			552,598	387,258
Lbs. of Powder per ton of ore			.8077	.7890
Cost per ton for Powder			.0929	.0932
" " " Fuse, etc.			.0115	.0126
" " " all Explosives			.1044	.1058

Development in Rock

Gelamite #1 - lbs.	32,450	11.50	3,731.75	4,834.50
Fuse - feet	23,100	5.65	120.64	319.44
No. 6 Caps	3,750	12.20	45.75	92.82
Electric Caps	2,035	11.70	238.53	33.82
Fuse Lighters	1,300	6.75	8.82	12.63
Wire - #18 Shot Cord	3,100	12.04	36.05	19.86
Tamping Bags	2,500	3.25	8.00	11.13
Miscellaneous			5.09	10.91
Total Fuse, Caps, etc.			462.88	500.61
Total - Development in Rock			4,194.63	5,335.11

Feet - Development in Rock			1,653	2,130
Cost per ft. " " "			2.537	2.52

Grand Total - All Explosives			61,887.07	46,321.49
Average Cost per lb. for Powder			.115	.1181

Following are comparative figures for the past 10 years:

Year	Lbs. Powder per ton of Ore	Cost per Ton for Powder
1940	.8077	.0929
1939	.7890	.0932
1938	.9140	.1134
1937	.9050	.1095
1936	.8575	.0980
1935	.8387	.0982
1934	.7838	.0879
1933	.7561	.0927
1932	.7312	.0914
1931	.8512	.1080



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The amount of powder used per ton of ore is slightly higher but the cost per ton was lower in 1940 than in 1939. As mentioned once before in this report, we did some experimenting with other kinds of powder hoping to break a larger percentage of lump but we made no headway. During the past few years we have changed powder a number of times. At one time we used nothing but 50% low freezing dynamite. Then we gradually began using Gelatin to prevent formation of undesirable gases and in 1936 and 1937 were using nothing but 50% and 60% Extra Gelatin. When the bulk powders made their appearance we shifted for a while to Gelamite "A" and then changed to Gelamite #1. In 1938 we were using both Gelamite #1 and 60% Gelatin but along early in 1939 we standardized on Gelamite #1. That powder gives us the best average performance, has little disagreeable gases, and does not create excessive blockholing. In order to cut down on the dust hazard it is imperative that we do as little blockholing and bulldozing as possible on the day shift.

The character of the ore makes some difference as to the powder we use and as is customary a table showing the various kinds of ores the contracts were working in forms a part of this report.

	<u>Dec. 1937</u>	<u>Dec. 1938</u>	<u>Dec. 1939</u>	<u>Year 1940</u>
Specular Ore Contracts	41.1 %	50.5 %	52.2 %	52.2 %
Slate " "	17.5 %	17.4 %	19.3 %	17.0 %
Steel " "	29.1 %	24.2 %	20.5 %	24.5 %
Magnetite " "	11.2 %	7.9 %	8.0 %	6.3 %
Conglomerate "	1.1 %	0.0 %	0.0 %	0.0 %
	<u>100.0 %</u>	<u>100.0 %</u>	<u>100.0 %</u>	<u>100.0 %</u>

More contracts mined steel ore in 1940 than in 1939. The slate ore and magnetite ore contracts were fewer in number.

8. COST OF OPERATING

a. Comparative Mining Costs

	<u>1940</u>	<u>1939</u>	<u>Increase</u>	<u>Decrease</u>
PRODUCT (Tons)	552,598	387,258	165,340	
Underground Costs	1.426	1.572		.146
Surface Costs	.212	.260		.048
General Mine Expense	.311	.374		.063
Cost of Production	<u>1.949</u>	<u>2.206</u>		<u>.257</u>
Depreciation	.003	.004		.001
Taxes	.251	.365		.114
Loading & Shipping	.057	.082		.025
TOTAL COST AT MINE	<u>2.260</u>	<u>2.657</u>		<u>.397</u>
No. of Days Operating	262	210	52	
No. of Shifts & Hours	2 8-hr	2 8-hr		
Average Daily Product (Tons)	2,109	1,844	265	

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The average daily product since 1929 is tabulated to show how the figure has gone up year by year:

<u>Year</u>	<u>Average Daily Product</u>
1940	2,109
1939	1,844
1938	1,713
1937	1,830
1936	1,698
1935	1,610
1934	1,595
1933	1,331
1932	1,368
1931	1,448
1930	1,383
1929	1,400

The increase in production is due to hoisting overtime every operating day for the year with the exception of eleven days, most of these in August during the vacation week when we ran the mine for the men ineligible for a paid vacation from 8 A. M. to 4 P. M.

In May we also started to hoist one extra hour up until 9 o'clock in the evening instead of 8 o'clock.

Increase in product is also due to larger tonnage per day broken by both the developing and stoping gangs. This is in a measure due to installing two scraping units in some contracts which makes it possible to crosshaul and scrape into the chute simultaneously. Increased efficiency is also partially accounted for by the scraping we do in certain contracts on the night shift. For instance, a gang may have a large pile of broken ore, no blasting being done in the back so that the back will be safe to work under, and a night shift crew will be put into that stope to scrape ore into the chute. That makes it possible for the miner to get at his face or bench on the day shift to resume drilling and blasting. In fact, we believe that is the safest and most practical way to get more ore out of the mine and as a matter of fact that plan accounts for most of the increase of 265 tons per day. We did, of course, add three more producing gangs during the year. Late in 1940 three more gangs were put to work but these latter three were on rock work.

Exploring in Mine

<u>Year</u>	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>
1940	\$ 9,092.79	5,255.82	14,348.61
1939	8,382.45	4,179.33	12,561.78
Increase	710.34	1,076.49	1,786.83

Increase is due to operating a second drill on the surface the latter part of the year.

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The detail cost can be broken down as follows:

	<u>1940</u>	<u>1939</u>
Labor for drilling	\$ 5,945.28	3,470.89
Prop. of D.D.Supt's time	169.67	110.91
Carbon Loss	2,518.58	1,565.84
Pipe & Fittings	12.74	26.85
Drill Equipt. & Repairs	313.35	452.28
"    "    Rental	840.50	440.00
Miscellaneous Supplies	262.57	50.20
Compressor Expense	590.00	535.00
Total Drilling Cost	<u>10,652.69</u>	<u>6,651.97</u>
Miscl. & Direct Charges	2,228.00	533.49
Analysis Expense	335.12	363.16
Geological Dept. Expense	<u>1,132.80</u>	<u>5,013.16</u>
Grand Total	<u>14,348.61</u>	<u>12,561.78</u>
Feet drilled	2,429	1,792
Cost per foot	5.44	4.21

Development in Rock

To make it possible to compare rock drifting and raising costs, the figures for five years back are shown:

Year	Footage	Labor Cost		Supply Cost		Total Cost	
		Total	Per Foot	Total	Per Foot	Total	Per Foot
1940	1756	24,084.21	13.71	6,559.87	3.74	30,644.08	17.45
1939	2130	23,585.00	11.07	8,091.96	3.80	31,676.96	14.87
1938	2337	27,178.28	11.63	9,267.95	3.97	36,446.23	15.60
1937	4292	46,240.53	10.78	15,808.94	3.70	62,049.47	14.48
1936	4122	29,973.19	7.27	13,826.79	3.35	43,799.98	10.62

The cost per foot for 1940 is the highest in the five year period and in order to be able to give an intelligent reason more data will have to be shown.

	<u>1940</u>	<u>1939</u>	<u>1938</u>	<u>1937</u>	<u>1936</u>
Rock Raises	176'	318'	663'	1657'	1060'
10' x 10' Main Haulage Drifts	1303'	1104'	1389'	1906'	2105'
8' x 8' " " "	277'	708'	285'	729'	957'
Total	<u>1756'</u>	<u>2130'</u>	<u>2337'</u>	<u>4292'</u>	<u>4122'</u>

The following data will give an idea as to what kind of ground the rock drifts and raises cut through:

	<u>Jasper or Lean Ore</u>	<u>Siderite</u>	<u>Dike or Slate</u>	<u>Total</u>
Rock Raises	77'	-	99'	176'
10' x 10' Rock Drifts	89'	249'	965'	1303'
8' x 8' " " "	43'	-	234'	277'
Total	<u>209'</u>	<u>249'</u>	<u>1298'</u>	<u>1756'</u>

The reason for the increased unit cost is very apparent when the foregoing data is examined. In 1940 80% of the rock work was in main level drifts compared with only about 50% for the previous four years. It costs more money per foot to drive and equip a main trolley locomotive drift than it does a sub level connection or a level with a storage battery locomotive system.



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Development in Ore & Stopping

The two accounts - Development in Ore and Stopping - are combined because of the difficulty in segregating the various contracts in the mine into the two different classifications each month. A contract may be stopping that is carrying a breast 25 to 30 ft. wide and 16 to 18 ft. high out into new territory and in that case it is really a developing gang.

Following are costs for past four years:

Year	Labor Cost	Supply Cost	Total Cost
1940	\$ 233,615.23	94,534.32	328,149.55
1939	176,679.23	67,828.08	244,507.31
1938	158,962.48	62,792.63	221,755.11
1937	234,506.85	98,963.60	333,470.45

The detailed cost follows for the years 1939 and 1940:

	1940		1939	
	Total	Cost Per Ton	Total	Cost Per Ton
<u>Labor</u>				
Miners' Labor	\$ 153,863.82	.279	121,372.98	.313
Other "	79,751.41	.144	55,306.25	.143
Total "	233,615.23	.423	176,679.23	.456
<u>Supplies</u>				
General	1,413.72	.003	1,212.42	.003
Iron & Steel	16,702.14	.030	10,160.56	.026
Oils	805.13	.001	641.02	.002
Machinery	2,947.66	.005	1,493.20	.004
Explosives	57,692.44	.105	40,986.38	.106
Lumber	19.86	-	24.41	-
Sundries	2,385.34	.004	4,441.56	.012
Expense Accounts	12,568.03	.023	8,868.53	.023
Total Supplies	94,534.32	.171	67,828.08	.175
Total Labor & Supp.	328,149.55	.594	244,507.31	.631
Tons Hoisted	552,598		387,258	

The unit cost for 1940 shows a decrease over 1937, 1938, and 1939, due to increased efficiency of the mining gangs. We produced 42.5% more ore with only 3% more gangs working 25% more days.

Timbering

Year	Total Cost	Cost per Ton
1940	\$ 13,604.44	.025
1939	11,117.41	.029
Increase	2,487.03	
Decrease		.004

We had to add an extra timberman to keep the chutes in shape. We are producing at such a rate that many times the underground chutes are empty clean down to the fingers which means that the chutes get a terrific battering from the lump ore and so we rebuilt more of them than usual.

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Tramming

Year	Labor		Supplies		Total	
	Total	Per Ton	Total	Per Ton	Total	Per Ton
1940	\$ 200,493.28	.363	13,558.56	.025	214,051.84	.388
1939	142,284.89	.367	10,709.11	.028	152,994.00	.395
Increase	58,208.39		2,849.45		61,057.84	
Decrease		.004		.003		.007

The total cost naturally shows an increase due to more operating days in 1940. Unit cost for 1940 is decreased because of larger daily average hoist.

Ventilation

Year	Total Cost	Cost per Ton
1940	\$ 657.42	.001
1939	428.98	.001
Increase	228.44	No change

Cost shows an increase because of purchase of a new ventilating fan complete for use in rock drifts.

Pumping

	Total	Cost per Ton
Operating Cost as per 1940 Cost Sheet -	\$ 29,534.95	.053
Maintenance " " " " -	3,510.23	.006
Total	33,045.18	.059
Operating Cost as per 1939 Cost Sheet -	31,457.57	.081
Maintenance " " " " -	1,739.11	.004
Total	33,196.68	.085

The detailed cost for the two years follow:

	1940	1939
Maintenance	3,510.23	1,739.11
Pumpmen Labor	7,636.15	8,028.93
Other Labor	1,282.24	729.20
Total Labor	8,918.39	8,758.13
Compressor Expense	600.00	600.00
Oil, Waste, and Packing	102.03	223.32
Tools, etc.	99.08	82.99
Electric Light	300.00	328.71
" Power	19,515.45	21,464.42
Total Operating Expense	29,534.95	31,457.57
" Maintenance & Operating	33,045.18	33,196.68
Gallons of Water Pumped	363,090,686	363,540,036
" " " " per Minute	689	691

It will be noted that the changes in the cost for pumping are negligible but that in the detail the maintenance costs doubled in 1940. We had to purchase a new water cylinder for one of the Prescott pumps. We tried to repair and weld the job two or three times but it would not hold. Also had to get some 5" extra heavy check valves. The motor on the centrifugal pump also needed repairs. Those repair items were offset by lower power bills due to a lower rate per k.w.h. which in turn was due to a better power factor because of increased operations.

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The water pumped each month can be seen from the table which follows:

<u>Month</u>	<u>Gallons per Minute</u>		
	<u>1940</u>	<u>1939</u>	<u>1938</u>
January	637	627	624
February	637	620	654
March	630	615	621
April	621	677	741
May	692	786	750
June	742	809	733
July	739	799	729
August	741	751	694
September	720	732	694
October	721	668	677
November	673	621	697
December	673	613	658
Average for Year	689	691	690

The average for the year over the three year period shows little change.

Compressors, Air Pipes, & Power Drills

	<u>1940</u>		<u>1939</u>	
	<u>Total</u>	<u>Per Ton</u>	<u>Total</u>	<u>Per Ton</u>
Compr. & Air Pipes	\$ 42,616.77	.077	34,510.90	.089
" & Power Drills	6,616.53	.012	1,533.95	.004
Total	49,233.30	.089	36,044.85	.093

Breaking down these figures gives this picture, viz:

	<u>1940</u>	<u>1939</u>
Labor for Compressors & Air Pipes	\$ 4,763.00	4,121.83
" " " & Power Drills	475.78	804.94
Total Labor	5,238.78	4,926.77
Supplies for Compr. & Air Pipes	37,853.77	30,389.07
" " " & Power Drills	6,140.75	729.01
Total Supplies	43,994.52	31,118.08
Grand Total	49,233.30	36,044.85

Some of the items in detail that go to make up the cost for the year are indicated, viz:

<u>Size</u>	<u>Air &amp; Water Pipes</u>	
	<u>1940</u>	<u>1939</u>
1"	3789'	6812'
1 1/4"	206'	907'
1 1/2"	360'	462'
2"	4346'	5294'
3"	1305'	-
4"	1721'	-

We installed some 3" and 4" pipe to improve the air pressure on the 9th, 10th, 12th, 13th, and 14th levels in "B" Shaft. The same project also raised the pressure in the extreme West end of the 10th level in the Section 9 workings.



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New Drills Purchased in the last four years:

	<u>1940</u>	<u>1939</u>	<u>1938</u>	<u>1937</u>
N-75 Ingersoll-Rand Standard Drifters	-	1	9	14
DA-35 " "	10	15	0	0
D-12 Cleveland " "	4	2	0	7
Gardner-Denver African Dustless	-	1	0	0
J-45 Ingersoll-Rand Block Holers	-	0	0	5
S-49 " "	-	4	0	0
Total	<u>14</u>	<u>23</u>	<u>9</u>	<u>26</u>

Back Filling

<u>Year</u>	<u>Total</u>	<u>Cost Per Ton</u>
1940	\$ 4,192.44	.008
1939	4,385.93	.011
Decrease	<u>193.49</u>	<u>.003</u>

The reason for the decrease is because there was less rock drifting than the year before; there would, naturally, be less rock to be backfilled in the old stopes.

Underground Superintendence

<u>Year</u>	<u>Total</u>	<u>Cost Per Ton</u>
1940	\$ 26,043.45	.047
1939	21,066.63	.054
Increase	<u>4,976.82</u>	
Decrease		<u>.007</u>

Increase entirely due to more working days in 1940. The working schedule increased 24.8% and the supervisory cost increased 23.6%.

Scrapers & Mechanical Loaders

<u>Year</u>	<u>Labor Cost</u>		<u>Supply Cost</u>		<u>Total Cost</u>	
	<u>Total</u>	<u>Per Ton</u>	<u>Total</u>	<u>Per Ton</u>	<u>Total</u>	<u>Per Ton</u>
1940	\$ 15,993.34	.029	32,511.96	.059	48,505.30	.088
1939	10,476.58	.027	24,217.44	.063	34,694.02	.090
Increase	<u>5,516.76</u>	<u>.002</u>	<u>8,294.52</u>		<u>13,811.28</u>	
Decrease				<u>.004</u>		<u>.002</u>

	<u>1940</u>		<u>1939</u>	
	<u>Amount</u>	<u>Cost</u>	<u>Amount</u>	<u>Cost</u>
3/8" Wire Rope	1,525'	129.63	2,701'	227.27
1/2" "	10,270'	1029.94	6,750'	672.42
5/8" "	74,990'	12887.14	39,630'	6901.39
Electric Cable #6	5,030'	1468.44	2,450'	811.75
* " Motors	2 (New)	535.11	1 (New)	256.96
** New Scraper Units	-	-	5 (New)	2721.27
" " Slides	3 (New)	1127.56	-	-
General Electrical Repairs & Renewals	15334.14		-	12626.38
Total	<u>32511.96</u>		<u>24217.44</u>	

\* 8 25-h.p. A.C. motors and 1 15-h.p. D.C. motor charged to E & A's

\*\* 8 scraper units built at General Shops charged to E & A's.



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As has been our custom since 1938, nothing but "Trulay" rope is used for the 5/8" size for our large scraping units. The performance of this rope compared with other competitive types can be seen from this data, viz:

Year	Product	Type of 5/8"	Feet	Cost	Unit
		Rope Used	Purchased		Cost
1940	552,598 tons	"Trulay"	74,990	\$ 12,887.14	.0232
1939	387,258 "	"Trulay"	39,630	6,901.39	.0178
1938	327,161 "	"Trulay"	41,731	7,522.60	.0229
1936	456,760 "	"Standard"	66,961	9,120.90	.0195

Note: In order to protect ourselves against delays we keep 10,000 ft. of 5/8" rope on hand so that the number of feet shown as purchased in 1940 is actually excessive.

Electric Tram Equipment

	1940			1939		
	Labor	Supplies	Total	Labor	Supplies	Total
Generator & Motors	\$ 58.22	223.20	281.42	25.00	131.18	156.18
Locomotives	1874.61	3372.65	5247.26	1145.53	7939.52	9085.05
Wiring	797.24	1235.84	2033.08	577.93	2605.44	3183.37
Tracks	7049.58	3516.86	10566.44	4984.55	2311.78	7296.33
Cars	4094.81	3191.01	7285.82	1992.43	4367.57	6360.00
Spotting Engine	-	89.62	89.62	-	82.18	82.18
Total	13874.46	11629.18	25503.64	8725.44	17437.69	26163.11

The total expense of repairs and maintenance and the cost of the new extensions to the electric haulage system was less in 1940 than the previous year. In 1939 a number of extraordinary replacements were made. Five new storage batteries were put into use, two 25-cell units and three with 48 cells each. In 1940 we purchased only one new Edison 25-cell unit of an improved type which makes it possible to remove individual trays easier than heretofore.

The wear and tear on rectifier tubes was back to normal, only six being used compared with 32 in 1939, the heavy usage in 1939 being due to trying to charge old worn-out batteries with too many cells cut out.

The expense for maintaining and extending tracks was high because of the cost of replacing 40,500 lbs. of old rail and fastenings, together with new ties, bonding, etc.

The car expense also went up due to replacing and repairing running gear on the 8th, 10th, and 15th level cars.

Ten new 76-cu.ft. cars were placed on the 10th level "B" Shaft.

Hoisting

Comparative data for 1940 and 1939 follows:

	1940	1939
Maintenance	\$ 5,493.43	6,285.80
Operating Expense:		
Engineers' Labor	10,522.78	8,794.95
Other	1,254.63	1,255.73
Total	11,777.41	10,050.68



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	<u>1940</u>	<u>1939</u>
<u>Supplies</u>		
Oil, Waste, and Packing	\$ 103.76	91.94
Tools & Miscellaneous	104.54	93.99
Electric Lights	212.46	202.68
Electric Power	17,217.77	13,457.48
Compressor Expense	375.00	330.00
Heating Expense	869.48	835.13
Total Supplies	18,883.01	15,011.22
Total Operating Expense	30,660.42	25,061.90
Total Maint. & Operating Expense	36,153.85	31,347.70
Cost per ton produced	.065	.081
Tons Ore & Rock Hoisted	580,228	417,884
Average depth hoisted	759'	741'

The maintenance cost in 1940 shows a decrease because two new skip and cage ropes and one second-hand counterweight rope were put on in 1939 whereas in 1940 we put on only two new skip and cage ropes. The operating cost went up because of the 52 extra hoisting days and also because we hoisted one extra hour each day during the last eight months of 1940. The operating cost increased 22.3% while the product hoisted increased 42.6%.

Stocking Ore

<u>Year</u>	<u>Total Cost</u>	<u>Cost per Ton</u>
1940	\$ 15,239.70	.028
1939	14,470.96	.037
Increase	768.74	
Decrease		.009

Slight increase of 5.3% in stocking cost due to 13% more ore stocked in 1940 because of heavier operating schedule in the winter months. In 1939 the mine stocked 176,083 tons compared with 199,081 tons in 1940.

Screening & Crushing at Mine

	<u>1940</u>		<u>1939</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
Labor	\$ 18,342.66		13,501.62	
Supplies	9,722.51		7,490.14	
Total	28,065.17	.050	20,991.76	.054

In 1940 we purchased and put into service three complete sets of 12 screen sections, each at a cost of \$490.00 for each complete installation. We also purchased a new picking belt at a cost of \$800.00.

Dry House

<u>Year</u>	<u>Total</u>	<u>Cost per Ton</u>
1940	\$ 8,936.15	.016
1939	6,046.22	.016
Increase	2,889.93	No change



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Part of the increase is accounted for by changing from steam coal to stoker coal. In 1939 we burned 500 tons of coal in the Main Dry heating plant. In 1940 this was increased to 514 tons but the cost of stoker coal is \$1.56 more per ton than steam coal and naturally the heating cost rose \$760.00. We have, however, eliminated a bad smoke nuisance by installing the new stoker late in 1939. The labor cost increases also when we increase the number of operating days because the floor man in the engine house acts as a dry man on the days the mine is shut down.

General Surface Expense

<u>Year</u>	<u>Total</u>	<u>Cost per Ton</u>
1940	\$ 10,215.89	.019
1939	7,355.54	.019
Increase	2,860.35	No change

Although the total cost shows an increase, the unit cost remained unchanged. Surface costs in 1939 were unusually low because in 1938 the expense reached a high of \$10,293.62 although in 1938 we operated only 191 days. In 1939 when demand for ore dropped off we curtailed on our surface improvement program. In 1940 we began to pick up the loose ends again.

Shaft

<u>Year</u>	<u>Total</u>	<u>Cost per Ton</u>
1940	\$ 2,787.52	.005
1939	9,650.40	.025
Decrease	6,862.88	.020

In 1939 the cost was high because we had two repair jobs that were out of the ordinary. We retimbered "B" Shaft from the 5th to the 6th level and also retimbered No. 3 shaft which is the third outlet from surface to 20 ft. below the ledge. No. 3 shaft is also the downcast shaft because both "A" and "B" Shafts are upcast. The shaft expense in 1940 was very low and with the present intensive hoisting schedule no doubt more repairs will be necessary in 1941.

Top Tram Equipment

<u>Year</u>	<u>Total</u>	<u>Cost per Ton</u>
1940	\$ 4,929.04	.009
1939	5,449.54	.014
Decrease	520.50	.005

Cost in 1939 higher than 1940 because in 1939 two new stocking cars were added to the top tram equipment. The unit cost for 1940 was below the normal based on the last five years experience. The only unusual item in the 1940 cost was the 50 lb. guard rail for both inclined steel trestles between "A" and "B" Shafts and the crusher building.

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<u>Docks, Trestles &amp; Pockets</u>		
<u>Year</u>	<u>Total</u>	<u>Cost per Ton</u>
1940	\$ 2,893.06	.005
1939	1,855.24	.005
Increase	1,037.82	No change

The cost for 1939 was unusually low as is evident from the following data:

Cost for year 1940 -	\$ 2,893.06
" " 1939 -	1,855.24
" " 1938 -	2,870.93
" " 1937 -	3,802.86
" " 1936 -	4,631.48

In 1940 we repaired a considerable portion of the lump ore stocking area by filling in depressions, grading, and laying new sollar plank. We also rebuilt and strengthened the rock trestle and built an extension to the old trestle in the old coal dock area.

General Mine Expenses

	<u>1940</u>	<u>1939</u>
Mining Engineering	\$ 3,883.65	3,947.48
Mechanical & Electrical Engr.	2,073.70	2,519.99
Analysis & Grading	16,332.47	15,407.46
Safety Department	2,286.27	2,163.50
Telephone & Safety Devices	4,876.61	5,804.41
Local & General Welfare	6,600.45	7,411.73
Special Expense, Pensions & Allow.	27,236.87	11,051.01
Ishpeming Office	22,581.75	22,398.74
Mine Office	21,912.14	21,824.36
Insurance	3,517.14	3,928.92
Personal Injury	22,520.95	19,187.00
Social Security Taxes	27,933.49	21,923.31
Employees Vacation Pay	9,725.35	7,308.43
Total General Mine Expenses	171,480.84	144,876.34
Cost per Ton	.311	.374

The mine office does not get a detail of the various items that go to make up the costs under the above thirteen items except such charges as we make for Telephones & Safety Devices. The bulk of the figures are charges distributed by the Cleveland and Ishpeming Offices.

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9. EXPLORATIONS

The drill holes put in underground for the year follow:

D. D. Hole	#	Total Depth	Feet of Ore
D. D. Hole	#472	815'	11' of 63% Ore
"	473	477'	No Ore
"	474	202'	"
"	475	298'	"
"	476	214'	"
"	477	255'	"
"	478	235'	23' of 57% Ore
"	479	170'	21' of 56% Ore

D. D. Holes #478 and #479 were drilled on the 15th level in "A" Shaft Bancroft Territory and #479 is only 50 ft. from our own fee lands East of the Bancroft area. Although the ore found in these holes is not high grade it is good enough to drift and raise in and can be mixed with the ores from the rest of the mine.

Two surface holes were also put down but neither one found the ore we were hoping to find, but that does not mean that the newly discovered Southwest Vein on the 1st level "B" Shaft is not to be found later below the 1st level. The first surface hole angled off to the East and the second hole dipped to the South, which means that neither hole hit the objective point. We will now have to bide our time and do the exploring underground.

10. TAXES

Comparative data for 1939 and 1940 follows:

	1940		1939	
	Valuation	Taxes	Valuation	Taxes
Realty	\$ 2,525,000	87,049.13	2,275,000	79,397.50
Minerals under NW $\frac{1}{4}$ Sec. 9-47-27	100,000	3,447.49	100,000	3,490.00
Personal	755,000	26,028.55	1,130,000	39,437.00
Lot 2, Sec. 3-47-27 (Bancroft)	550,000	18,961.20	450,000	15,705.00
SE $\frac{1}{4}$ of NE $\frac{1}{4}$ Sec. 9-47-27 (Barnum)	52,000	1,792.70	52,000	1,814.80
Lot 174, Nelson Addition	100	3.45	100	3.49
South 35.91 ft. of Lot 179	50	1.73	50	1.75
Total	3,982,150	137,284.25	4,007,150	139,849.54
Collection Fees		1,372.84		1,398.50
GRAND TOTAL		138,657.09		141,248.04
Taxes per ton produced		.2509		.3647
" " " shipped		.2266		.2388

Valuations and taxes for the past ten years are shown for comparison:

Year	Taxes	Valuation
1940	137,284.25	3,982,150
1939	141,248.04	4,007,150
1938	140,789.79	3,852,150
1937	127,643.22	3,712,150
1936	110,614.68	3,232,150
1935	101,853.17	3,202,110
1934	99,486.51	3,119,110
1933	99,072.28	3,160,110
1932	123,114.90	3,640,130
1931	159,547.60	4,000,150



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The taxes for 1940 show a reduction from the previous year because of a drop of \$25,000 in valuation but mostly due to a lower tax rate, the rate for 1940 being \$34.4748 compared with \$34.8999 in 1939.

City of Ishpeming Tax Levy

	1940		1939	
	Amount	Rate	Amount	Rate
Valuation	\$ 10,616,400.00		10,906,510.00	
<u>Funds</u>				
County Tax	63,698.40	6.0000	64,893.73	5.9500
County Road Tax	23,356.08	2.2000	22,358.35	2.0500
City Contingent Tax	43,000.00	4.0503	64,500.00	5.9139
City Debt Service Tax	7,840.00	0.7385	8,005.00	0.7340
Street & Highway Tax	79,000.00	7.4413	80,000.00	7.3350
Fire Fund Tax	18,000.00	1.6955	20,000.00	1.8338
Library Tax	19,600.00	1.8462	10,900.00	0.9994
Sewer Tax	10,000.00	0.9419	8,000.00	0.7335
Cemetery Tax	17,000.00	1.6013	9,200.00	0.8435
School Tax	71,129.88	6.7000	75,254.92	6.9000
School Debt Service Tax	13,375.00	1.2598	17,525.00	1.6068
Total Taxes	\$ 365,999.36	34.4748	380,637.00	34.8999

11. ACCIDENTS  
AND  
PERSONAL  
INJURIES

Comparative data is given on the accident record for a 5-year period:

	1940	1939	1938	1937	1936
Number of No-Time Lost Accidents	89	62	64	101	62
Compensable or Fatal Accidents	2	4	11	10	3
Number of Man Shifts Worked	105,437	80,860	26,038	109,412	93,437

We had two lost time accidents in 1940, both due to a fall of loose.

	1940	1939
Hurt about hands, body, feet, (not eyes) while barring "loose"	10	3
" " " " " " " drilling	7	3
" " " " " " " sledging	1	1
Eye Injuries	11	10
Hurt while shovelling or lifting chunks	5	4
Loading ore at chutes	12	14
Scraping Ore	2	2
Sprains & Strains	6	3
Slipped on tracks, planks, ore or rock piles, walks, etc.	7	10
Hurt moving equipment	10	1
Broken wires from scraper rope entering fingers or hands	3	5
Miscellaneous	15	6
Total	89	62

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12. NEW  
CONSTRUCTION  
OR EQUIPMENT

E. & A. #B50

The equipment authorized on this E. & A. was all purchased except one storage battery. We had 10 scraper hoists built in the Hard Ore Shops and purchased the 6 drills.

E. & A. #CC-2-A

This covered one J-3 Jackbit semi-automatic grinder which was put into service in the middle of the summer, replacing the first J-2 purchased in 1934.

E. & A. #CC-3

This E. & A. covers one stocking car and three portable scraper slides, all of which were built in the Hard Ore Shops. The stocking car is a new double truck saddle-back car for the lump ore trestle. The only spare car we had on hand was a wooden car with only five-ton capacity. The new car holds 10 tons of ore. The old wood car slowed up production from the mine because the lump ore chute would be filled to the top before the car could return and be spotted for another load.

The scraper slides were intended to replace the wood slides formerly used in our advancing breast stopes on the sill floors of the levels.

E. & A. #CC-8

This covers the cost of remodeling the change house and by the end of 1940 only part of this job was complete.

E. & A. #CC-14

Better fire protection for the laboratory by putting in a sprinkler system was provided for by this E. & A. This job was completed by the middle of the year.

E. & A. #CC-17

A new coupe for the Superintendent was delivered and put into use during the year. The Chief Sampler in turn got the Superintendent's old coupe.

E. & A. #CC-21

The 250 k.w. motor generator set provided for by E. & A. #CC-21 was a badly needed piece of equipment. In fact, one of the two old 100 k.w. units burned out two days before the new set was ready for service. Fortunately the burn-out occurred on Friday and by working an extra crew overtime on the new unit we suffered no serious delay.

E. & A. #CC-24

In order to speed up the 10th level "B" Shaft West development work in Section 9, it was decided to equip the 10th level with 10 standard 76-cu. ft. cars. These cars were all delivered in July. We also rebuilt #36, #49, and #77 chutes so that the new cars could be used for transferring ore from these gangs.

The eight small 40 cu. ft. cars are now used for #14, #19, #38, and #56 gangs.



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E. & A. #CC-27

This E. & A. authorized the Shop to build a spare 5-ton Granby type car for the inclined trestle between the shafts and the crusher building. Before this car was built we had only one spare car and that always had to go to the Hard Ore Shop for repairs. If anything had gone wrong with the two cars in service we would have had a delay.

E. & A. #CC-32

This covers 8 drilling machines - 4 Ingersoll-Rand DA-35's and 4 Cleveland D-12's. All were delivered and put into service.

E. & A. #CC-34

This covers 4 more 25 h.p. scraper hoist units and 2 spare 25 h.p. motors. This equipment was received in the latter part of the year.

E. & A. #CC-49

The three portable scraper slides and hoists authorized by this E. & A. were not built in 1940. We got delivery of one in December but the rest will come along early in 1941.

Summary of Expenditures as Authorized and made up to Dec. 31, 1940:

	<u>Expenditures</u>		<u>Unexpended</u>
	<u>Authorized</u>	<u>Expended</u>	
E. & A. #850	\$ 14,000.00	12,863.74	1,136.26
" #CC-2-A	505.00	489.76	15.24
" #CC-3	3,300.00	2,758.08	541.92
" #CC-8	14,678.06	7,767.27	6,910.79
" #CC-14	1,441.00	1,600.07	- 159.07
" #CC-17	629.50	618.35	11.15
" #CC-21	9,154.00	9,607.77	- 453.77
" #CC-24	5,950.00	6,035.31	- 85.31
" #CC-27	650.00	706.06	- 56.06
" #CC-32	3,376.00	2,526.86	849.14
" #CC-34	2,720.00	2,624.17	95.83
" #CC-49	4,175.00	1,367.21	2,807.79

E. & A. #CC-8 covering changes in Dry House is not complete because the work of remodeling this building will be carried over in 1941.

E. & A. #CC-32 is complete in that all the drills have been purchased but two of them apparently have not been charged out.

E. & A. #CC-49 is still incomplete in that we will not get delivery of all the portable slides until early in 1941.



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14. MAINTENANCE  
AND REPAIRS

<u>Dwellings</u>	<u>Rented Buildings</u>			<u>Loc. Expense</u> <u>Cleaning, etc.</u>	<u>Grand</u> <u>Total</u>
	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>		
Hard Ore Location	\$ 1275.89	1144.70	2420.59	14.56	2435.15
Barnum "	292.89	448.61	741.50	-	741.50
Angeline "	60.20	39.11	99.31	77.33	176.64
Salisbury "	-	3.74	3.74	58.33	62.07
Second "	154.74	187.48	342.22	209.00	551.22
Outhwaite Purchase	194.02	250.82	444.84	-	444.84
Hyde Purchase No. 1	366.56	132.45	499.01	-	499.01
" " " 2	339.04	143.75	482.79	-	482.79
Smith Purchase	91.85	27.51	119.36	-	119.36
Nelson Purchase	255.36	68.01	323.37	-	323.37
Berg Purchase	10.69	293.45	304.14	-	304.14
Total	3041.24	2739.63	5780.87	359.22	6140.09

Comparative figures for the past six years follow:

Total for Year 1940	-	\$ 6,140.09
" 1939	-	9,430.70
" 1938	-	6,990.77
" 1937	-	15,588.69
" 1936	-	13,305.82
" 1935	-	21,497.81

It will be noted that expenditures are off \$3300.00 from last year. That is due to selling houses to employees. The Hard Ore Location expense in 1939 was \$4,416.05. In 1940 this dropped to \$2,435.15. Likewise, the Barnum Location expense dropped off \$260 and the Angeline Location \$150. The Second Addition cost us \$551 in 1940 compared with \$1543 in 1939.

15. POWER

The Cliffs Shaft Mine purchased a total of 6,078,269 k.w.h. at an average cost of .0150529 per k.w.h.

<u>Year</u>	<u>K. W. H.</u>	<u>Cost</u>	<u>Rate per K.W.H.</u>
1940	6,078,269	91,349.36	.0150529
1939	4,876,747	79,652.95	.01633
1938	4,609,711	77,269.00	.01677
1937	6,104,385	88,837.43	.01455
1936	5,415,857	75,662.87	.01397

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Following is a detail of how the electric power was used:

	<u>K. W. H.</u>	<u>Cost</u>
Tramming	331,541	4,990.66
Pumping	1,316,387	19,815.45
Hoisting	1,157,931	17,430.23
Stocking Ore	12,231	184.12
Crushing Ore	207,519	3,123.76
Dry House Expense	20,468	308.11
Surface	14,792	222.67
Telephones & Safety Devices	63,212	951.53
Mine Office	9,458	142.37
Machine & Carpenter Shops	4,226	63.62
Drill & Jackbit Shops	59,258	892.00
Heating Plant	18,205	274.04
Compressors	2,390,559	35,838.57
Electric Haulage	466,636	7,024.23
Ventilation	5,846	88.00
Total	6,078,269	91,349.36

Comparative data for 1940 and 1939:

	<u>1940</u>	<u>1939</u>	<u>Difference</u>	<u>% Increase</u>
Production (Tons)	552,598	387,258	165,340	42.6
	<u>K.W.H.</u>	<u>K.W.H.</u>		
Tramming	331,541	230,392	101,149	43.9
Pumping	1,316,387	1,334,277	- 17,890	1.3 Decr.
Hoisting	1,157,931	836,348	321,583	38.5
Stocking Ore	12,231	10,972	1,259	11.5
Crushing Ore	207,519	149,474	58,045	38.8
Dry House	20,468	18,978	1,490	7.9
Surface	14,792	15,547	- 755	5.0 Decr.
Telephones & Safety Devices	63,212	56,538	6,674	11.8
Mine Office	9,458	7,774	1,684	21.7
Mach. Shop & Carpenter Shop	4,226	3,689	537	14.5
Drill & Jackbit Shop	59,258	50,118	9,140	18.2
Heating Plant	18,205	9,983	8,222	82.4
Compressors	2,390,559	1,790,175	590,384	33.0
Electric Haulage	466,636	362,482	104,154	28.7
Ventilation	5,846	-	5,846	-
Total	6,078,269	4,876,747	1,201,522	24.6

One would naturally expect increases in most of the accounts due to more days operated.

The pumping cost is independent of operations and should go down as operations are speeded up for two reasons. One is that we get a better power factor under full operations and the labor cost for pumpmen helpers is decreased, there being no need for the second man on each pumping shift except on week ends.

The average per cent increase in power consumption was 24.6% compared with a 24.8% increase in working schedule and a 42.6% increase in product.



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18. NATIONALITY  
OF  
EMPLOYEES

Following is a list of the men employed, by nationality,  
as of Dec. 31, 1940:

	American Born	Foreign Born	Total
English	79	28	107
Finnish	95	75	170
Swedish	41	15	56
Italian	18	16	34
French	32	3	35
Norwegian	16	3	19
Irish	7	1	8
German	2	-	2
Austrian	2	-	2
Total	292	141	433

Comparison for 1940, 1939, and 1938 follows:

	1940		1939		1938	
	Number	% of Total	Number	% of Total	Number	% of Total
English	107	24.7	96	24.6	92	23.8
Finnish	170	39.3	147	37.8	147	37.9
Swedish	56	12.9	52	13.3	57	14.7
Italian	34	7.9	28	7.2	26	6.7
French	35	8.1	39	10.0	37	9.5
Norwegian	19	4.4	15	3.8	18	4.6
Irish	8	1.9	9	2.3	9	2.3
German	2	.4	4	1.0	2	0.5
Austrian	2	.4	-	-	-	-
Total	433	100.0	390	100.0	388	100.0



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1. General

The production for the current year totaled 476,934 tons, including 2,147 tons of current year's stockpile over-run. This production compares with 317,055 tons in 1939 and shows an increase of 159,879 tons, or slightly greater than 50%. All indications point toward an even greater production during the coming year.

Shipments from pocket and stockpile were carried on throughout the year at such a rate that the Lloydale stockpile reserves were completely exhausted in November. The total for the year was 510,592 tons as compared with 477,848 in 1939, an increase of 32,744. Stockpile reserves as of the end of the year totaled 110,847 tons as compared with 109,054 in 1939.

The working schedule at the beginning of the year was 2-8 hr. shifts per day, 5 days per week. Beginning June 15, a small crew was added on the third shift to take up the slack in production occasioned by the disappointing results of the exploratory program in the stoping area above the 6th Level. The addition of the third shift had the effect of increasing the number of employees from 210 at the beginning of the year to 307 at the end of the year. In all probability it will be necessary to add a few more during the shaft sinking operations which are planned for 1941. This third shift was gradually increased during the latter part of the year, and by the end of December had been rounded out to almost full size.

The lease and management agreement with the Republic Steel Corporation continued in effect throughout the greater part of the year and was cancelled as of November 30, in accordance with the one year notice received in November, 1939. Under the provisions of the lease, production in 1940 was 139,565 tons for Republic's account and 373,369 tons for the Cliff's account. Shipments were divided as follows: 152,525 tons for Republic and 358,067 tons for Cliffs.

In general, mining operations were confined to the main East Lloyd deposit, from the 4th to the 6th Levels. In addition, one contract spent the first half of the year in the development of the bottom of the Lloyd Deposit, and the remainder of the year in mining on the 3rd Level elevation and immediately below. The bulk of production was obtained from top slicing operations above the 5th Level with a smaller amount than anticipated being obtained above the 6th Level where the development work in the stoping area was extremely disappointing. Toward the end of the year plans were going forward to complete the development of the 7th Level in an attempt to increase production by adding additional working places. The average analysis of the product was little changed from last year, the iron content of the Lloydale ore being 58.85% as compared with 58.90% in 1939.



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1. GENERAL (Cont.)

With the exception of the lack of enrichment in the stoping area above the 6th Level, operations were quite satisfactory throughout the year. The addition of almost 100 men had the effect of reducing efficiency somewhat, due to the fact that approximately half of them were without previous underground experience. The work of excavating the new sump on the 5th Level and installing the pump was carried on as rapidly as possible throughout the year and was practically completed. The installation of this pumping plant will make the Lloyd Mine independent of the Morris Mine pumps. A new motor generator set was purchased and installed to meet the electric power demands of the increased working schedule.

2. PRODUCTION  
SHIPMENTS &  
INVENTORIES

a. Production by grades

<u>Grade</u>	<u>Tons</u>
Lloyddale	349,277
Lloyd Silica	127,657
Total	476,934

This production compares with 317,055 tons in 1939. The high month was December, when 49,796 tons were produced and the low month was June with 34,752 tons. The percentage of Silica grade produced decreased slightly from 27.6 in 1939 to 26.8 during the current year.

b. Shipments

<u>Grade</u>	<u>Pocket</u> <u>Tons</u>	<u>Stockpile</u> <u>Tons</u>	<u>Total</u> <u>Tons</u>	<u>Total</u> <u>Last Year</u>
Lloyddale	200,661	189,900	390,561	362,000
Lloyd Silica	64,964	55,067	120,031	115,848
Total	265,625	244,967	510,592	477,848
Total Last Year	162,051	315,797	477,848	
Increase	103,574	70,830	32,744	

The 1940 shipments are second only to 1937 during the last 5 year period, and exceeded production by 33,658 tons. Last year the shipments also exceeded the production, but by a much larger amount. The shipments for the last 5 years are shown in the following table:

Year - 1936	353,106
1937	644,395
1938	112,191
1939	477,848
1940	510,592



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2. PRODUCTION  
SHIPMENTS &  
INVENTORIES Cont.

c. Stockpile Inventories

<u>Grade</u>	<u>Tons</u>
Lloyddale	47,156
Lloyd Silica	63,691
Total	110,847

This stockpile balance is 1,793 tons greater than last year.

d. Division of Product by Levels

The ore produced above various levels was as follows:

	<u>Lloyddale</u> <u>Tons</u>	<u>Lloyd Silica</u> <u>Tons</u>	<u>Total</u> <u>Tons</u>
Fourth Level	59,044	13,217	72,261
Fifth Level	215,161	31,821	246,982
Sixth Level	75,072	82,619	157,691
Total	349,277	127,657	476,934

The proportion of the production from the 3 operating levels changed considerably as compared with the last 3 years. The increase in the 4th Level production was due largely to the reopening of the remainder of the Lloyd Deposit. The large increase on the 6th Level was due to the extensive stoping program. The increase in both these levels had the effect of decreasing the 5th Level production proportionately.

e. Production by Months

<u>Month</u>	<u>Days</u>	<u>Lloyddale</u> <u>Ore</u> <u>Tons</u>	<u>Lloyd</u> <u>Silica</u> <u>Tons</u>	<u>Total</u> <u>Ore</u> <u>Tons</u>	<u>Rock</u> <u>Tons</u>	<u>Tons per</u> <u>Man per</u> <u>Day</u>
January	22	23,387	12,627	36,014	772	7.72
February	21	23,072	12,511	35,583	896	8.03
March	22	25,825	12,375	38,200	1612	8.44
April	21	25,702	11,620	37,322	1572	8.61
May	23	25,279	10,545	35,824	1308	7.53
June	21	25,015	9,737	34,752	528	7.80
July	22	28,899	11,242	40,141	1196	8.14
August	23	28,336	9,331	37,667	812	7.95
September	20	33,756	6,729	40,485	1128	8.57
October	23	34,894	10,485	45,379	1096	7.74
November	21	35,955	7,669	43,624	892	7.91
December	22	37,010	12,786	49,796	688	7.94
Total	261	347,130	127,657	474,787	12500	8.06
Current Year Over-run		2,147		2,147		
		349,277		476,934		



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2. PRODUCTION  
SHIPMENTS &  
INVENTORIES

f. Ore Statement

	<u>Lloyd</u> <u>Lloyddale</u> <u>Tons</u>	<u>Lloyd</u> <u>Silica</u> <u>Tons</u>	<u>Total</u> <u>Tons</u>	<u>Total</u> <u>Last</u> <u>Year</u>
On Hand January 1, 1940	52,989	56,065	109,054	269,847
Output for year	344,382	130,405	474,787	317,055
Transfers	2,748	2,748		
Over-runs	37,598		37,598	
Total	437,717	183,722	621,439	586,902
Shipments	390,561	120,031	510,592	477,848
Balance on Hand	47,156	63,691	110,847	109,054
Increase in Output			157,732	
Increase in Shipments			32,744	
Increase in Ore on Hand			1,793	

The operating schedule for the past five years follows:

- 1936 - 1-8 hr. shift 6 days per week Jan. 1 to Feb. 1, 2 crews  
 2-8 hr. shifts 4 days per week Feb. 1 to May 1, 2 crews  
 2-8 hr. shifts 5½ days per week May 1 to Dec. 7, 2 crews  
 3-8 hr. shifts 5 days per week Dec. 7 to Dec. 31, 3 crews
- 1937 - 3-8 hr. shifts 5 days per week Jan. 1 to Apr. 17, 3 crews  
 3-8 hr. shifts 5-1/3 days per week Apr. 17 to Oct. 2, 3 crews  
 3-8 hr. shifts 5 days per week Oct. 2 to Dec. 6, 3 crews  
 2-8 hr. shifts 6 days per week Dec. 6 to Dec. 31, 3 crews
- 1938 - 2-8 hr. shifts 6 days per week Jan. 1 to Apr. 16, 3 crews  
 2-8 hr. shifts 4½ days per week Apr. 16 to June 1, 3 crews  
 1-8 hr. shift 4 days per week June 1 to Oct. 31, 2 crews  
 1-8 hr. shift 5½ days per week Oct. 31 to Dec. 31, 2 crews
- 1939 - 1-8 hr. shift 5½ days per week Jan. 1 to Jan. 9, 2 crews  
 2-8 hr. shifts 4 days per week Jan. 9 to June 12, 2 crews  
 1-8 hr. shift 5½ days per week June 12 to Sept. 11, 2 crews  
 2-8 hr. shifts 5 days per week Sept. 11 to Dec. 31, 2 crews
- 1940 - 2-8 hr. shifts 5 days per week Jan. 1 to July 15, 2 crews  
 Since July 15, gradually increased to 3-8 hr. shifts  
 5 days per week, 3 crews  
 This 3rd. shift brought to full strength by Dec. 31.

g. Delays

There were no reported production delays in 1940, as compared with 2 in 1939 and 3 in 1938. There were several minor interruptions in power service, none of which lasted in excess of an hour. These were not reported as delays since there was no loss of production.

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3. ANALYSIS

a. Average Mine Analysis on Output

<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Lloyddale	344,382	58.85	.185	6.82
Lloyd Silica	130,405	52.11	.123	16.70

The complete iron analysis of the 2 grades was 58.70 and 52.15 respectively. The phosphorous content of the Lloyddale ore was .160, as compared with .185 in the above average.

There were no straight cargoes forwarded from the mine during 1940 so the output, and the composite shipment analysis are the only ones reported.

b. Composite Analysis of Ores Shipped

<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moist.</u>
Lloyddale	390,561	58.70	.160	6.89	.24	2.59	.67	.39	.010	4.90	
Lloyd Silica	120,031	52.15	.125	16.47	.25	2.95	.59	.47	.010	4.40	

c. Analysis of Ore in Stock Jan. 1, 1941

Lloyddale Dried		58.62	.169	7.31	.24	2.59	.67	.39	.010	4.90	
Lloyddale Nat.		52.25	.151	6.52	.21	2.31	.60	.35	.009	4.37	10.87
Lloyd Sil. Dried		51.94	.129	16.83	.24	2.95	.59	.47	.010	4.40	
Lloyd Sil. Nat.		46.62	.116	15.10	.22	2.65	.53	.42	.009	3.95	10.25

d. Estimated Analysis of Ore Reserve

No distinction is made between the Lloyd and Lloyddale grades in the 2 deposits. The estimate is based on the mixing and production of the medium phos. Lloyddale grade during the past several years.

Lloyddale Dried		58.50	.158	7.00	.22	2.65	.65	.45	.010	4.80	
Lloyddale Nat.		51.95	.140	6.22	.20	2.35	.58	.40	.009	4.26	11.20

4. ESTIMATE OF  
ORE RESERVES

a. Developed Ore

Estimate made Nov. 30, 1940 using a factor of 12 cu. ft. per ton.



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4. ESTIMATE OF  
ORE RESERVES (Cont.)

	<u>Lloyd</u> <u>Deposit</u>	<u>Lloyd East</u> <u>Deposit</u>	<u>Total</u> <u>Tons</u>
Above 3rd Level	2,200		2,200
Between 3rd and 4th Levels	19,628	50,205	69,833
Between 4th and 5th Levels		132,512	132,512
Between 5th and 6th Levels		569,020	569,020
Between 6th and 7th Levels		826,913	826,913
Below 7th Level		348,333	348,333
Gross Tons Nov. 30, 1940	21,828	1,926,983	1,948,811
Less December Production	1,524	35,486	37,010
Total Reserves as of Dec. 31	20,304	1,891,497	1,911,801
Less 10% for Mining Loss	2,030	189,150	191,180
Total	18,274	1,702,347	1,720,621
Less 10% for Rock	1,827	170,235	172,062
Total Developed Reserve			
December 31, 1940	16,447	1,532,112	1,548,559

The following table shows the development, or the decrease, of standard ore reserves during the past three years.

	<u>1938</u>	<u>1939</u>	<u>1940</u>
Ore in Mine Jan. 1st.	2,308,802	2,118,390	1,841,233
Production	210,829	229,446	349,277
Balance	2,097,973	1,888,944	1,491,956
Ore in Mine Dec. 31st.	2,118,390	1,841,233	1,548,559
New Ore Developed	20,417	47,711	56,603

The small amount of new developed ore in the above table was due to new information above the 4th and 5th Levels, which increased the estimate by approximately 90,000 tons. This increase was offset to some extent by a decrease in the 6th Level area and the reserves above and below that Level.

5. LABOR &  
WAGES

a. General

Labor conditions and relations continued satisfactory throughout the year. The continuation of the 5 day work-week apparently had the effect of reducing the number of petty complaints and grievances to a minimum. Interest in the Marquette Range Industrial Union, has now declined to the point where only one employee at the property is still paying his dues and retaining his membership. An occasional meeting was held with one or two men who had been delegated by their fellow employees to request minor changes. In all cases these requests were complied with, as they were very reasonable and fair. As far as can be determined there was little or no activity on the part of organizers from outside unions.



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5. LABOR &  
WAGES (Cont.)

a. General (Cont.)

One major change in labor conditions, that became apparent during 1940, was the relative scarcity of local experienced miners; while the supply of inexperienced common labor remained more than ample for present requirements. The addition of a full 3rd. shift during 1940 completely exhausted the supply of experienced miners, and made it necessary to bring in a few from other districts. These outside men in all cases were chosen because of their skill and experience in mining and have proved very satisfactory workmen. In all cases they came with the highest type of recommendation both as to their mining ability and personal habits. Approximately half of the 100 new men employed during 1940 were without previous underground experience. A large number of these young men were obtained from the North Lake location.

The wage schedule of March 16, 1937 remained unchanged. In a few cases it was necessary to work a man more than 8 hours a day or 40 hours per week. In these cases, which were all occasioned by emergencies, rate and a half was paid for the excess time worked.

b. Comparative Statement of Wages & Product

	<u>1940</u>	<u>1939</u>	<u>Incr.</u>	<u>Decr.</u>
PRODUCT	476,934	317,055		
No. of Shifts & Hours				
Jan. 1 to Jan. 9		1-8 Hr.		
Jan. 9 to June 12		2-8		
June 12 to Sept. 11		1-8		
Sept. 11 to Dec. 31		2-8		
Jan. 1 to July 15	2-8 Hr.			
July 15 to Nov. 30	2-8 Hr.	(Small crew added to third shift)		
Dec. 1 to Dec. 31	3-8 Hr.	(Third shift brought to full strength)		
<u>AVG. NO. OF MEN WORKING</u>				
Surface	49	41		
Underground	<u>177</u>	<u>150</u>		
Total	226	191		
<u>AVG. WAGES PER DAY</u>				
Surface	5.72	5.64	.08	
Underground	<u>6.54</u>	<u>6.50</u>	<u>.04</u>	
Total	6.36	6.31	.05	

Average wages per day Surface and Underground respectively were  
1934 - 4.18 and 5.00: 1935 - 4.19 and 4.98: 1936 - 4.30 and 5.25:  
1937 - 5.44 and 6.30: 1938 - 5.59 and 6.42.

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5. LABOR &  
WAGES (Cont.)

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

<u>WAGES PER MONTH OF 22 DAYS</u>	<u>1940</u>	<u>1939</u>	<u>Incr.</u>	<u>Decr.</u>
Surface	125.84	124.08	1.76	
Underground	143.88	143.00	.88	
Total	139.92	138.82	1.10	
<u>WAGES PER MONTH OF 18 DAYS</u>				
Surface	102.96	101.52	1.44	
Underground	117.72	117.00	.72	
Total	114.48	113.58	.90	
<u>WAGES PER MONTH OF 12 DAYS</u>				
Surface	68.64	67.68	.96	
Underground	78.48	78.00	.48	
Total	76.32	75.72	.60	
<u>PRODUCT PER MAN PER DAY</u>				
Surface	36.37	35.21	1.16	
Underground	10.35	9.92	.43	
Total	8.06	7.74	.32	
<u>LABOR COST PER TON</u>				
Surface	.157	.160		.003
Underground	.632	.655		.023
Total	.789	.815		.026
<u>AVG. PRODUCT STOPING</u>	25.65	26.71		1.06
<u>AVG. WAGES CONTRACT MINERS</u>	7.19	7.22		.03
<u>TOTAL NO. OF DAYS</u>				
Surface	13,112 $\frac{1}{2}$	9,004 $\frac{1}{2}$	4,108	
Underground	46,090 $\frac{1}{4}$	31,496 $\frac{1}{4}$	14,594	
Total	59,202 $\frac{3}{4}$	40,950 $\frac{3}{4}$	18,252	
<u>AMOUNT FOR LABOR</u>				
Surface	75003.12	50743.64	24259.48	
Underground	301272.42	207570.53	93701.89	
Total	376275.54	258314.17	117961.37	

PROPORTION SURFACE TO UNDERGROUND MEN

1936 - 1 to 3.33  
 1937 - 1 to 4.06  
 1938 - 1 to 3.13  
 1939 - 1 to 3.66  
 1940 - 1 to 3.61



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6. SURFACE

A. Buildings

The only new construction during 1940 was the erection of a storage shed for iron and steel stock, immediately east of the east door of the blacksmith shop. This building, which is 14' wide and 24' long was put up to facilitate the storage and handling of material and supplies for the shop. Further, it releases the old storage shed in the main garage building which can now be used for car storage. The building was of plain frame construction and corrugated sheet metal.

Extensive alterations were made to the dry and change rooms, under E&A CC-9, in order to provide one room where the men's street clothes could be kept reasonably clean, and another for the drying of the underground clothes. This was accomplished by running a dustproof partition the long way of the building, dividing the main dry room into two separate rooms. All of the underground clothes are now kept in the east room which opens directly into the lamp room, fuse house, and shops. The men's street clothes are kept in the west room which is provided with lockers and wall hooks. One medium sized unit heater was purchased and installed in the mining clothes side and in addition the large heater formerly used at the shaft house was put into use for this purpose. The hiring of a large number of new men made it necessary to enlarge the mining clothes side in December. This was done by partitioning off a portion of the carpenter shop and including it in the main room.

Extensive repairs to the shaft house and headframe were made during the latter months of the year. This work is being continued into 1941, and consists of replacing a considerable number of the structural members which had corroded badly; and replacing with steel plate a large amount of old wooden casing and sheathing. This work will complete another major step in the fireproofing of the headframe.

All of the surface equipment at the Section 6 shaft, including the hoist and electrical apparatus, was removed and transferred for use in sinking the new shaft at Section 2.

b. Stocking Grounds

Shipments from stockpile totaled 244,967 tons as compared with 315,797 in 1939, a decrease of 70,830 tons. These shipments completely exhausted the Lloydale reserves and left a considerable amount of Silica still on hand, most of which was lying in two piles immediately east of the shaft. A small amount also remained in the long pile to the west. Three new trestles were erected in the fall, east of the shaft, for stocking both grades; and it is planned to extend the west trestle for Silica grade only. In building the new trestles in the fall of 1939, it was planned to load the ore from both sides and leave the trestles in place, thereby saving the cost of reerecting them. However, the demand for Lloydale ore was so great that it was necessary to dismantle them in order to obtain the few remaining tons between the bents.



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6. SURFACE (Cont.)

c. Roads

One ton of calcium chloride was again used to keep down the dust on the mine roads, and with the exception of a small amount of mud early in the spring, the roads were kept in fairly good shape. Next year it is planned to place a thin layer of gravel to alleviate the muddy condition during wet weather.

7. UNDERGROUND

a. Shaft Sinking

There was no shaft sinking during 1940, but plans are going forward to start this work early in 1941. The proposed deepening of the shaft, which has been authorized under E&A CC-44, consists of sinking approximately 90' for a skip pit beneath the 7th Level and a considerable amount of additional work necessary to bring the Level into production. This work is rather urgent since additional working places are needed if the estimated budget production is to be obtained.

b. Development

The bulk of the development work during 1940 was done on and above the 6th Level, with smaller amounts above the 5th and 4th. The work on the 6th consisted of extensions to the 630, 640 and 680 crosscuts, the main drift to the east and a short drift to provide tail-track beyond raise No. 606. In addition, 5 new cribbed raises were put up to the slicing area above the 5th Level and 4 raises in the stoping area from the 630 and 640 crosscuts. Development work in this stoping area was extremely disappointing, in that the Lloydale reserves did not reach any appreciable height above the Level. Contrasted with 125 to 150' above the 5th Level, the main stope above the 6th reaches a total height of considerably less than 100' in Lloydale ore. It was this lack of available stoping ore that made it necessary to add a 3rd shift in the slicing areas in order to maintain production. The ore outline on the 6th Level, as now developed, is very much smaller than that on the 5th Level above and the 7th Level below.

The first sub stope above the 6th Level, in which considerable mining was done in 1939, developed very little Lloydale grade and was worked intermittently throughout the year. This narrow lense along the north footwall was very spotty and contained more Silica ore than Lloydale. The second and third stopes in the central portion of the orebody were somewhat more satisfactory, in that Lloydale ore was present to a height of 2 subs above the transfer drift on the 500' sub Level.

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7. UNDERGROUND (Cont.)

b. Development (Cont.)

As mining and development work progressed to the east the height of the Lloydale ore has gradually been increasing. During December there was good evidence that the Lloydale ore would reach a considerable height in the last stages of these 2 stopes, as mining progresses to the east.

A considerable amount of exploration diamond drilling was done on the 6th Level in an attempt to discover ore south of the main deposit. This ore, if it had been found in any amount, would have postponed the sinking of the shaft for the development of the 7th Level. Three holes were drilled, Nos. 111, 112, and 113 and a 4th, No. 114, was started. With the exception of the first, these holes disclosed no Lloydale ore. A further discussion of this diamond drilling will be found under heading #9 - EXPLORATION. This first hole No. 111, was drilled southwesterly from the end of the 680 crosscut and disclosed a 25' seam of high grade ore lying some 90' beyond the end of the drift. Accordingly the drift was extended through this ore and an attempt was made to develop it for immediate mining. This attempt was very discouraging since the information obtained to date has not disclosed any appreciable amount above the level.

The development of the lower portion of the Lloyd Deposit was completed during the year by a pair of raises which were put up from the 4th Level. These raises were connected at intervals and a small amount of exploration work was done on the 860, 885, and 910' subs. Mining was carried on during the latter part of the year and progressed to the elevation of the 910' sub level.

The average number of contracts during 1940 was 20 with 5 on development work and the remainder on mining. All of these crews were on a 2 shift per day basis until July 15, when a 3rd shift was added. This 3rd shift was gradually increased to full strength in December. At the end of the year only 2 of the 5 development contracts were still on a 2 shift basis. The total development footage completed during 1940 was 10,043 as compared with 6,292 in 1939. The classification of this development work will be found in a subsequent portion of this report.



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7. UNDERGROUND (Cont.)

c. Stoping

With the exception of a single crew engaged in top-slicing in the Lloyd Deposit, stoping operations were carried on in three territories in the Lloyd East orebody. Three contracts worked throughout the year in the top-slicing territory above the east end of the 4th Level. By December one of these crews had been discontinued and the work was being carried on by the other two.

At the beginning of the year there were 11 crews top-slicing in the main area above the 5th Level. By December this number had been reduced to eight, the others having been moved to new working places. The center of mining operations in this main area moved downward from the 665' Sub level to the 615' sub by the end of the year.

Top-slicing operations were continued from the two 6th Level raises in the 630 crosscut in the west end of the top-slicing territory, having progressed from the 615' sub to the 575 in December.

Three Sub level stopes were operated above the 6th Level from transfer drifts on the 500' sub. None of these stopes was particularly productive as compared with similar operations in previous years. This was due to the very disappointing lack of enrichment in the stoping area. Of the three, No. 5, lying along the south footwall, was the most productive. This stope produced approximately 50% Lloyddale ore and 50% ore of Silicious grade.

The following is a detailed review of the year's mining operations:

3RD LEVEL

Contract No. 7 spent the first half of the year putting up 2 raises from the 4th Level to the 3rd Level elevation in the old Lloyd Deposit southeast of the shaft. This development work was completed in time to start top-slicing operations in May. A number of small pillars were recovered on the 3rd Level elevation, after which operations were moved to the Sub level below.

SUBS ABOVE THE 4TH LEVEL

Lloyd Deposit

925' and 910' Sub Levels

Top-slicing operations were continued at these elevations by Contract No. 7 throughout the latter part of the year. Efficient operations and complete recovery were not possible due to very wet conditions and the fact that the deposit is cut through by a number of small dikes.



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7. UNDERGROUND (Cont.)

Subs above the 4th Level (Cont.)

925' and 910' Sub Levels (Cont.)

Several long slices were completed on the higher of these two subs, and in addition a small stope was operated in the west end for a short period of time. By December, the crew had moved down to the 910' sub and was slicing to the southwest of raise No. 402.

885' and 860' Sub Levels

During the development work in raises 401 and 402, a small amount of exploration was done on these two Sub levels in an attempt to outline the orebody. Several small development drifts were driven in both ore and rock.

850', 840', 830', 820' and 810' Sub Levels

Top-slicing operations were continued throughout the major portion of the year in this small area at the east end of the Lloyd East Deposit. Mining was completed on the above Sub levels by contracts 1, 2 and 8, working from raises 487, 486 and 485.

800' Sub Level

By December operations had progressed to this elevation and contract No. 1 had been discontinued, due to the fact that the dip of the north footwall had had the effect of leaving the top of raise No. 487 entirely in rock. Contracts 2 and 8 were working from raises 485 and 486 respectively. Work in December consisted of joining these two raises by a full size mining drift and starting drifts to the west of No. 485 and east of No. 486.

SUBS ABOVE THE 5TH LEVEL

675', 665', 650', and 640' Sub Levels

Work in this main mining area consisted of the continuation of top-slicing from the 520, 530 and 540 series of raises. Eleven crews were at work during the early part of the year and by December this number had been reduced to eight due to the loss of working area caused by the westerly pitch of the orebody. Throughout the year the territory adjacent to the 640 series tended to lag behind since the area available to these raises was growing constantly larger, while the areas adjacent to the other two series continued to grow smaller. Mining conditions were very satisfactory since there is no water in this territory. Constant supervision was responsible for maintaining adequate ventilation with the exception of short periods of time when new Sub levels were being opened. During these periods individual ventilation was furnished by blower-fans from the Level.

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7. UNDERGROUND (Cont.)

Subs above the 5th Level (Cont.)

625' Sub Level

One small pillar was recovered at this elevation early in the year southwest of raise No. 632 above the 6th Level. By December operations in the main area had progressed to the point where the only ore remaining was lying in several pillars adjacent to the 540 series, some of which was being mined from the new raises above the 6th Level. Contract No. 14 was slicing to the northeast of raise No. 604 in the pillars left from previous stoping operations. Contract No. 9 was slicing to the southwest of raise No. 545. Contract No. 17 completed two slices to the east of raise No. 544 and then drove a drift and a slice to the west. Contract No. 19 completed a long drift and several slices to the northeast of raise No. 545 and at the end of the year was slicing to the southwest along the footwall.

615' Sub Level

Complete recovery of the ore adjacent to the 630 series of raises was effected early in the year by contracts 18 and 6 working from raises 631 and 632.

Exploratory work in No. 5 stoping area progressed to this elevation early in the year by means of a raise which was cut out at this elevation. A small drift was driven to the southeast in lean ore and Jasper.

Work in the main slicing area was begun on this Sub level in October in the 520 and 530 series and continued to the end of the year. The work in December is as follows:

Contract No. 12 completed one slice east of raise 522 and then drove a connecting drift and several slices to the west of the same raise. By the end of the year there was very little remaining ore available to this raise. In the 530 series, contract No. 13 completed one drift to the east and another to the west of raise No. 531. Contract No. 16 drove a long slice to the east and two to the west of No. 532. Contract No. 10 recovered all of the remaining ore lying southwest of No. 533 and then drove a drift and three short slices to the east along the south footwall.

5TH LEVEL

Actual mining operations at this elevation consisted of top-slicing by contracts 18 and 6, working in the 630 series of raises. Complete recovery of all the ore was effected in this small area which lies west of the main slicing territory and east of the stoping area.



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7. UNDERGROUND (Cont.)

5th Level (Cont.)

Exploratory work in advance of No. 5 stope reached this elevation early in the year by means of a small raise in lean ore and Jasper. Short drifts were driven to the southwest and northeast in an attempt to develop additional Lloydale reserves. This attempt was not successful at that time. Subsequently, in December, a second exploration raise was put up considerably to the north and east of the first. This raise reached the 5th Level elevation in Lloydale ore. A small drift was driven to the southwest, a distance of 40', also in ore of Lloydale grade. The discovery of this additional Lloydale ore was extremely fortunate in that it will materially increase the productive life of No. 5 stope and will aid materially in maintaining peak production.

A small amount of development work was done on this 5th Level elevation and consisted entirely of connecting new raises with the main level crosscuts. Previous to December, raises 604, 605, 606 and 608 were put up to this elevation and connected with the crosscuts by full size ore drifts of varying lengths. All of these raises were then extended above the Level and are now in readiness for top-slicing operations. These raises will take the place of the 5th Level raises which are rapidly becoming to short for adequate storage. In December contract No. 22 extended raise 607 to this elevation and made connection with the 530 crosscut by means of 60' of small size ore drift.

SUMP AND PUMP HOUSE

Work was carried on throughout the greater portion of the year on a new pumping plant under E&A 857. This work consisted of excavating a sump and pump house, building a concrete dam and installing the pump. By the end of the year the major portion of the work was completed and the pump nearly ready to run. The pump and motor were transferred to this property from the Stephenson Mine and the major portion of new parts were purchased from William Constable Company, Duluth.

The calculated capacity of the main sump is 96,750 gallons and that of the suction sump 14,740 gallons, for a total of 111,490 gallons. As soon as the main sump is started, the small sump now in use with the small motor pump will be connected, increasing the total capacity to 127,600 gallons. This small sump will also be used as a settling or auxiliary sump when it is necessary to clean out accumulated mud in the main sump. All of the mining work was done by contract No. 3, which by December had been moved to the 7th Level where work was started in stripping the plat in advance of shaft sinking operations. The main sump is approximately 80' long, 20' wide and 12' deep, and the suction sump is 6' long, 20' wide and 14' deep. The pump house itself is 20' x 24' x 20' high.



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7. UNDERGROUND (Cont.)

Sump and Pump House (Cont.)

In connection with the new pumping plant, which will handle the water formerly pumped by the Inland Steel Company at the Morris Mine, it was necessary to install an 8" discharge column 940' in length from the 5th Level to surface and several hundred feet of 10" spiral pipe to serve as a surface drain from the shaft to the present surface drainage system. The pumped water will be conducted beyond the surface cave southwest of the shaft in the surface drain-tile, now in use, and from there will flow along an open ditch westerly to the main drainage ditch south of the Morris Mine. A considerable amount of work was done by the County Road Commission in placing a new culvert under the Morris Mine road to conduct this water into the main ditch.

When finally completed, this pumping system will be so designed that it can be used for fire protection in the shaft. A series of pipes leading into the several compartments of the shaft at the elevation of the top landing will be installed so that the full 800 gallons a minute can be turned into the shaft by means of a valve in the surface discharge line.

SUBS ABOVE THE 6TH LEVEL

585' Sub Level

The only work done on this elevation during the year was the top-slicing operations in the 630 raises by contracts 18 and 6. These crews completed the mining of the ore in the small territory lying between the main slicing and stoping areas.

575' Sub Level

Top-slicing operations from the 630 raises were started on this elevation in the latter part of the year and continued through December. A connecting drift was driven between the two raises and a second connecting drift west from raise No. 632 to the stoping territory. This latter drift is being used for ventilation and traveling between the two mining areas. During December contract No. 18 was drifting and slicing northeast of raise No. 631 while contract No. 6 was slicing to the east and southeast of raise No. 632.

A considerable amount of stoping was done at this elevation by contract No. 5 in the largest of the 3 stopes above the 6th Level. This work, which was continued during December, had the effect of producing an opening 180' long by 40' wide at this elevation. The bulk of the product obtained at this height was ore of Silicious grade, although the material is growing gradually richer as mining progresses to the east. This stope is the first one at the Lloyd



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7. UNDERGROUND (Cont.)

Subs above the 6th Level (Cont.)

575' Sub Level (Cont.)

to be worked with Sub levels at 25' intervals instead of the former 20' intervals. This was made possible by the introduction of wet machines which permit more efficient drilling of down holes.

A small amount of work was done at this elevation by contract No. 11 in the development of the new stope under the old top-slicing territory at the extreme easterly end of the orebody. This work, which was done in December, consisted of a small development drift and one mill raise.

565', 550', 540', 525' and 515' Sub Levels

Stoping operations were continued on these Sub levels in stopes Nos. 4, 5, and 15, the last two of which were considerable higher than No. 4. In addition there was a considerable amount of work done in the development of the new stope at the east end of the orebody by contract No. 11. This work consisted of driving an inclined transfer drift on the 515' Sub level east of raise No. 608 and the necessary mill raises and sub level connecting drifts. Work during December consisted of 6 mill raises which were put up to the 540' sub and a connecting drift on that elevation. In addition an inclined mill raise was put up from the 540' Sub level to the elevation of the 5th Level above.

Operations in No. 15 stope along the north footwall were not very extensive due to an almost complete absence of ore of Lloyddale grade. This stope was worked intermittently throughout the early portion of the year, was then stopped for a time and reopened in the latter part. Operations in the last several months were confined to the recovery of all available Lloyddale ore and the mining of some Silicious ore necessary to the recovery of the higher grade product. Mining was done on the 565, 540 and 525' Sub levels above the transfer drift on the 500' Sub level, and was continued through December.

Operations in No. 5 stope were considerable more extensive, particularly on the 550' Sub level where a fair proportion of Lloyddale ore was obtained, the production growing richer as mining progressed to the east. This mining had the effect of producing an opening some 300' long by 80' wide at the 550' elevation and was continued through December.

Operations in No. 4 stope, lying immediately north of, and connected with, No. 5 stope, were much less extensive due to a scarcity of Lloyddale ore. This stope was limited in height to an elevation slightly higher than the 525' Sub level, though development work to the east indicated a possibility of finding Lloyddale ore at greater heights.



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7. UNDERGROUND (Cont.)

Subs above the 6th Level (Cont.)

500' Sub Level

Work on this elevation consisted of Sub level stope development for stopes Nos. 4, 5 and 15. The transfer drift under No. 15 stope was extended to the east of raise No. 503 in mixed Lloydale and Silicious ore. The mining of this stope in the east end was accomplished by the shrinkage system while the central portion was a continuation of the original Sub level stope.

Toward the middle of the year, raise No. 641 was put up to this elevation from the 6th Level and a transfer drift driven to the west under what was to become No. 4 stope. This work was also done in ore of mixed grades. Subsequently, this transfer drift was extended to the east of the raise and joined with No. 632 from the 6th Level.

The development in advance of stoping operations in No. 5 was accomplished by putting up raise No. 642 and drifting to the west where a connection was made with the original raise No. 652. Later this transfer system was extended easterly and connected with 633.

A small amount of work was done at this elevation in the seam of ore discovered by diamond drill hole No. 111, which was driven south-westerly on the 6th Level from the end of the 680 crosscut. Very little was accomplished since the material was lean and mixed. This work was stopped toward the middle of the year in order to move the crew to a more productive working area. Present plans call for further exploration work in this area some time during 1941.

6TH LEVEL

Development work on this Level was considerably less than in previous years and consisted of the extension of several of the crosscuts and the putting up of a number of new raises. The 680 crosscut was extended to the southwest a distance of 150' to permit exploration work in the ore seam originally discovered by diamond drill hole No. 111. With the exception of the 25' ore seam, this drift was driven in Jasper and rock. One double compartment raise was put up to the elevation of the 500' Sub level. Additional work in this crosscut consisted of a small amount of excavating to permit the building of a powder storage room. This was done on the west side of the crosscut 30' south of the main drift. A single compartment raise, No. 603A, was put up on the north side of the main level drift between the 650 and 640 crosscuts. This raise was used in the development of No. 15 stope and was stopped at the elevation of the 500' Sub.

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7. UNDERGROUND (Cont.)

6th Level (Cont.)

The 640 crosscut was extended 65' to the south through Jasper and lean ore. This extension was made as an exploration in order to test the area lying south of the main dike. Subsequently this crosscut was used as a diamond drill station for drilling holes Nos. 112 and 114 to the south. Two new double-compartment cribbed raises were put up on the east side of this crosscut to the stoping area on the 500' Sub level.

Two new raises, Nos. 633 and 634 were put up on the west side of the 640 crosscut to the stoping area on the 500' Sub. In addition, the crosscut was extended 30' into the main dike for tail-track. Four new double-compartment cribbed raises and a 5th of three compartments were put up from the easterly portion of the main level drift. These raises, which are numbered 604 to 608 inclusive, were needed in the slicing area to replace the 5th Level raises that were becoming too short for adequate storage capacity. The first four raises were completed by the end of the year and the 5th nearly so. The 3rd compartment in raise No. 608 was put up to the elevation of the 515' Sub level from which a transfer drift was driven to the east in advance of stoping operations in that territory. The east end of the main level drift was extended 110' easterly and 20' northeasterly to accommodate these new raises.

The small exploration drift south of raise No. 606 was widened to permit the drilling of diamond drill hole No. 113 to the southeast.

A small amount of work was done on the 6th Level in excavating a small sump on the east side of the plat, 70' south of the shaft. This small sump will be used for storage when the motor pump is moved down from the 5th Level.

d. Timbering

A slight increase in the proportion of ore obtained from the Sub level stopes had the effect of decreasing slightly the amount of timber used and the cost per ton for timber. This figure though smaller than in 1939, is still somewhat greater than previous years, due to the fact that Sub level stoping operations are still somewhat smaller than normal. Once again there was an increase in the proportion of the larger size timber used, due to the increased weight in the slicing areas. The amount of cribbing used was more than twice that for the previous year, due to the extensive raising program above the 5th and 6th Levels.



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7. UNDERGROUND (Cont.)

d. Timbering (Cont.)

Statement showing timber used for 1940

	Lineal Feet	Avg. Price Per Foot	Amount 1940	Amount 1939
6" to 8" Cribbing Timber	69,652	.036	2481.54	1072.17
8" to 10" Stull "	69,441	.067	4653.35	3822.78
10" to 12" " "	51,240	.093	4772.83	3525.74
12" to 14" " "	14,218	.129	1828.54	1268.87
Total Timber 1940	204,551	.067	13736.26	
" " 1939	134,134	.072		9689.56

Per 100 Feet

7 Ft. Lagging	1,000,488	.798	7987.96	5303.63
3 1/8" Poles	526,170	1.31	6908.82	4811.21
Wire Fencing	3,795	5.76	218.60	94.60
Total Poles Etc.	529,965	1.34	7127.42	4905.81

Total Lagging, Poles and Fencing 1940	1,530,453	.99	15115.38	
Total Lagging, Poles and Fencing 1939	1,052,237	.97		10209.44

Product Tons			476,934	317,055
Feet of Timber per Ton of Ore			.429	.423
" " Lagging " " " "			2.098	2.134
Feet of Lagging per Foot of Timber			4.891	5.043
Cost per Ton for Timber			.0288	.0305
Cost per Ton for Lagging			.0167	.0167
Cost per Ton for Poles and Lagging, Etc.			.0149	.0154
Cost per Ton for all Timber			.0605	.0626
Equivalent Stull Timber to Board Measure			358,772	240,100
Feet of Board Measure per Ton of Ore			.752	.757

	Cost		
	Year	Per Ton	Amount
Cost of Timber, Lagging, Poles, Fencing	1940	.0605	28,851.64
	1939	.0626	19,899.00
	1938	.0579	15,801.49
	1937	.0528	28,804.97
	1936	.0596	21,719.68

e. Drifting and Raising

The general increase in operations had the effect of increasing the amount of development work almost in direct proportion to the increased tonnage. Exploration and development on and above the 6th Level accounted for the bulk of the current year's footage, and in addition the work done in excavating the sump and pump house was very extensive. This accounted for the bulk of the rock drifting.

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7. UNDERGROUND (Cont.)

e. Drifting and Raising (Cont.)

The following table gives the 2 year comparison:

	<u>Ore</u> <u>Drift</u>	<u>Rock</u> <u>Drift</u>	<u>Total</u> <u>Drift</u>	<u>Ore</u> <u>Raise</u>	<u>Rock</u> <u>Raise</u>	<u>Total</u> <u>Raise</u>	<u>Grand</u> <u>Total</u>
1940	4868	938	5806	3876	361	4237	10043
1939	3466	472	3938	1968	386	2354	6292
Increase			1868			1883	3751

If the small untimbered raise and drift development in advance of Sub level stoping operations is eliminated from the above table, the full size development may be shown as follows:

1940	1068	775	1843	1033	84	1117	2960
1939	1209	367	1576	418	70	488	2064
Increase			267			629	896

f. Explosives, Drilling and Blasting

The slight increase in powder consumed per ton of ore in 1940 was more than offset by the decrease in price from \$11.81 per hundred to \$11.50. The use of Gelamite No. 1 was continued to the exclusion of all other types of powder with excellent results.

The use of the fuse cartridges, or Master Fuse Lighters, was also continued throughout the whole year. These have proved very satisfactory under the conditions for which their use is indicated. The number used increased from 4,150 to 5,300, which was the normal result of an increase in the amount of work done.

In comparing rock development, which excludes all of the work done under E&A's, the cost per foot went up considerably. This was due to an increase in the proportion of large size drift to small as compared with the previous year.



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7. UNDERGROUND (Cont.)

f. Explosives, Drilling and Blasting (Cont.)

The explosives statements are shown under the following headings:

<u>BREAKING ORE</u>	<u>Quantity</u> <u>Lbs.</u>	<u>Average</u> <u>Price</u>	<u>Amount</u> <u>1940</u>	<u>Amount</u> <u>1939</u>
Gelamite Powder #1	223,514	11.50	25,704.14	17,388.14
Fuse, Feet	733,695	5.05	3,702.22	2,561.53
#6 Blasting Caps	103,468	12.20	1,262.09	877.01
Tamping Bags	11,650	2.00	23.30	15.00
Fuse Lighters	16,425	6.72	110.37	67.17
Fuse Cartridges	5,300	19.86	105.26	83.97
Total Fuse, Caps, etc.			5,203.24	3,604.68
Total Explo. Breaking Ore			30,907.38	20,992.82
Product, Tons			476,934	317,055
Lbs Powder per Ton of Ore			.469	.465
Cost per Ton for Powder			.054	.055
Cost per Ton for Fuse, Caps, etc.			.011	.011
Cost per Ton all Explosives			.065	.066
 <u>DEVELOPMENT IN ROCK</u>				
Gelamite Powder #1	3,786	11.50	435.43	336.42
Fuse, Feet	14,898	5.05	75.19	65.35
#6 Blasting Caps	2,028	12.20	24.73	21.67
Tamping Bags	500	2.00	1.00	1.00
Fuse Lighters	1,500	6.69	10.03	5.41
Fuse Cartridges	150	19.93	2.99	2.00
Total Fuse, Caps, etc.			113.94	95.43
Total All Explosives			549.37	431.85
Rock Drifting, Feet			528'	525'
Cost per Foot for Powder			.825	.641
Cost per Foot for Fuse, Caps, etc.			.216	.182
Cost per Foot all Explosives			1.041	.823
Grand Total all Explosives Used in Mine			31,456.75	21,424.67
Cost per Ton all Explosives Used			.066	.068
Average Price per Pound for Powder			.1150	.1180

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7. UNDERGROUND (Cont.)

g. Ventilation

Ventilation conditions throughout 1940 continued to be very satisfactory. The new ventilating fan which was installed on the 4th Level at the bottom of the Section 6 shaft in June of 1939, continued to operate very successfully. This fan delivered approximately 20,000 cubic feet of fresh air per minute, and under the new system was reversed at approximately two hour intervals. This system has not only worked out very well as regards the removal of smoke and dust from the mine, but it also serves to keep both shafts entirely free of ice. This permitted the moving of the large heater fan from the shaft for use in the change house.

There were no new ventilation raises in rock since the new mining raises between the 6th and 5th Levels premitted the postponing of the rock work until a later date. The three crews above the 4th Level were provided with fresh air delivered by blower-fans, and in practically all other cases forced-ventilation was accomplished by utilizing the normal mining drifts and air-doors on the main levels. These air-ways were difficult to maintain at times in the main slicing area above the 5th Level, due to the extreme speed at which mining operations were being carried on. Occasionally it was necessary to serve these working places with blower-fans from the Level.

The ventilation of the stoping area above the 6th Level was rather difficult in the early part of the year, due to insufficient connections between the stopes. This condition was remedied as rapidly as possible and the ventilation was excellent during the last nine or ten months.

8. COST OF OPERATING

a. Comparative Mining Costs

	<u>1940</u>	<u>1939</u>	<u>Incr.</u>	<u>Decr.</u>
Product, Tons	476,934	317,055	159,879	
Underground Costs	.953	.979		.026
Surface Costs	.128	.146		.018
General Mine Expense	.218	.250		.032
Cost of Production	1.299	1.375		.076
Depreciation	.038	.047		.009
Taxes	.099	.143		.044
Loading and Shipping	.047	.079		.032
Total Cost at Mine	1.483	1.644		.161
Budget Estimated at Mine	1.440	1.642		.202
Number of Operating Days	261	227	34	
Number of Shifts & Hours	5, 1-8 Hr. 236, 2-8 Hr. 20, 3-8 Hr.	37, 1-8 Hr. 190, 2-8 Hr.		
Average Daily Product	1830	1397	433	



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8. COST OF  
OPERATING (Cont.)

	1940		1939	
	Amount	Per Ton	Amount	Per Ton
1. Exploring in Mine	6968.33	.015	302.71	.001
3. Development in Rock	5153.87	.011	3595.94	.011
4. Development in Ore	37485.90	.078	26798.33	.085
5. Stopping	186649.92	.391	117990.08	.372
6. Timbering	108089.31	.227	78221.44	.247
7. Traming	45975.85	.096	33857.22	.107
8. Ventilation	930.75	.002	811.99	.003
9. Pumping	8333.85	.017	10518.71	.033
10. Compressors and Air Pipes	18930.91	.040	15136.58	.047
12. Underground Superintendence	13675.51	.029	10949.86	.035
14. Maint. Comp. & Air Drills	4765.92	.010	756.48	.002
15. Scrapers & Mech. Loaders	9137.47	.019	5439.00	.017
16. Electric Tram Equipment	8410.58	.018	5704.41	.018
17. Pumping Machinery	207.53	.000	254.37	.001
Total Underground Costs	454715.70	.953	310337.12	.979
18. Hoisting	21620.59	.045	17546.06	.055
19. Stocking Ore	10955.74	.023	8369.19	.026
20. Crushing at Mine	1874.18	.004	883.73	.003
21. Dry House	7035.82	.015	5870.80	.019
22. General Surface Expense	5424.43	.011	5418.89	.018
23. Maint. Hoisting Equipment	4329.52	.009	2631.06	.008
24. Shaft	1391.17	.003	1608.91	.005
25. Top Tram Equipment	3416.88	.007	1982.56	.006
26. Docks, Trestles & Pocket	461.57	.001	621.84	.002
27. Mine Buildings	4520.49	.010	1144.23	.004
Total Surface Costs	61030.39	.128	46077.27	.146
Vacation Expense	5102.89	.011	3793.15	.012
28. Insurance	2050.94	.004	2230.30	.007
29. Mining Engineering	3960.93	.008	2651.92	.008
30. Mech. & Elect. Engineering	1753.84	.004	1996.38	.006
31. Analysis & Grading	11650.81	.025	8913.46	.028
32. Personal Injury	12979.90	.027	9999.00	.031
33. Safety Department	1300.26	.003	1192.66	.004
34. Telephones & Safety Devices	1901.16	.004	1226.01	.004
35. Local & Gen. Welfare	5670.41	.012	5917.56	.019
36. Spec. Exp. Pensions & Allow.	15359.65	.032	5586.82	.018
37. Ishpeming Office	12823.41	.027	11600.97	.037
38. Social Security Taxes	16345.42	.034	11545.49	.036
39. Mine Office	12858.25	.027	12756.54	.040
Total General Mine Expenses	103757.87	.218	79410.26	.250
Cost of Production	619503.96	1.299	435824.65	1.375
40. Taxes	47246.11	.099	45389.57	.143
Total Cost	666750.07	1.398	481214.22	1.518
Budget Estimated Cost		1.343		1.524

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8. COST OF OPERATING (Cont.)

b. Detailed Cost Comparison (Cont.)

	<u>1940</u>		<u>1939</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
41. General Supplies	26295.11	.055	22293.98	.070
42. Iron and Steel	7581.05	.016	4148.91	.013
43. Oil and Grease	1675.74	.003	1297.69	.004
44. Machinery Supplies	12237.28	.026	6660.93	.021
45. Explosives	31456.75	.066	21424.67	.068
46. Lumber and Timber	32363.94	.068	22366.79	.071
47. Fuel	1718.85	.004	1725.16	.005
48. Electric Power	35504.82	.074	28956.18	.091
49. Sundries	2824.91	.006	6905.06	.022
50. Other Mines and Accounts	182.91	.000	152.22	.000
Total Per Cost Sheet	151475.54	.318	115609.15	.365

In the following discussion of comparative costs, no explanation is made unless the difference is large enough to be significant.

1. Exploring in Mine

This increase is due to the large diamond drilling program, the cost of which was absorbed in operating.

5. Stoping

This increase of almost two cents a ton was due to a larger proportion of the production being obtained from top-slicing operations. The detail of this account, excluding ore from development, follows:

	<u>1940</u>		<u>1939</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
General Supplies	7,786.18	.018	6,331.49	.022
Iron and Steel	2,876.79	.006	1,283.86	.004
Oils & Greases	336.31	.001	272.97	.001
Machy. Supplies	3,279.45	.007	1,592.92	.005
Explosives	24,743.54	.056	16,395.64	.056
Lumber & Timber	13.87	.000	13.06	.000
Electric Power	2,718.71	.006	574.86	.002
Sundries	408.27	.001	1,000.39	.003
Expense Accounts	396.80	.001	293.68	.001
Total Supplies	42,559.92	.096	27,758.87	.094