THE CLEVELAND-CLIFFS IRON CO.

Ore Mining Department

ANNUAL REPORT OF GENERAL MANAGER

For Year Ending December 31, 1939

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THE CLEVELAND-CLIFFS IRON COMPANY

ORE MINING DEPARTMENT

MANAGER'S ANNUAL REPORT

YEAR 1939

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Continued -

THE CLEVELAND-CLIFFS IRON COMPANY
ORE MINING DEPARTMENT

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CPJ:MRP
4-18-40

Ishpeming, Michigan
February 13, 1940

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 1939.

The inventories, maps, statements relative to the 1939 report will go forward under separate cover.

The colored portions of the maps 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.

There was no new construction at the mines with the exception of general maintenance and the rebuilding of a large number of roofs which were greatly damaged by a sleet storm which occurred about the middle of April.

On March 21st, about 5:30 P.M., fire started in the third floor of the General Office. The cause is not definitely known but it is reasonable to assume it was due to electricity. In the afternoon, before five P.M., men had been working on the third floor directly under the eaves, trying to stop a leak. These workmen state they had not been smoking and had used no open lights. They, however, had used a long extension cord and a faulty connection could have started the fire after they left.

The roof was asbestos and above the ceiling on the third floor there was an insulation of several inches of rock wool. The fire started between the roof and the rock wool and spread rapidly in all directions. The third floor was almost immediately filled with smoke and could not be fought from this point. The sprinkling system worked but could only save what was below it. The part of the building above the third floor was destroyed. The next morning the entire force moved to the Engineering Building and the ordinary daily routine was continued without interruption.

We immediately started to put on a new roof, the work being continued on three eight hour shifts. In eight days this large job was completed and there was no further possibility of damage from either rains or heavy snow. Although the building could not be classed as livable, everything being saturated with water, nevertheless, we got along without serious inconvenience.

When the reconditioning was started, it was found many parts of the building, which was built in 1899, were in bad condition. The weight was not properly distributed and considerable settlement had taken place along the walls. Further, the walls were not strong enough to carry the load and it was necessary

to start in the basement and carry columns, with concrete footings, up to the third floor. Today the building is in better condition than it has ever been and should be serviceable for many years to come. The outside walls and the area directly below the roof were filled with rock wool and the sprinkling system was restored. Originally the sprinkling system and rock wool were not installed above the ceiling of the third floor in the Engineering Building. It was thought advisable, not only for the protection of the Engineering Building but also to safeguard the General Office, that rock wool be installed directly under the roof and that the sprinklers be carried into the garret. Both buildings have been painted and their appearance has been greatly improved.

It is a matter of great satisfaction to report that we worked for the year 1939 without a fatality. This has not occurred for a period of forty years, except in 1932 when the mines were idle for six months and for the other half only worked two days per week. I believe this has been largely brought about by the very intensive work which we have done in enforcing rules and regulations and the penalizing of Shift Bosses who fail to do so. Details of the actual figures will be found in Mr. Conibear's report but below I want to show the record for 1939 as compared with the four previous years:

	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	5.93

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

Although I have not the figures for other companies, I am quite confident there is no organization in the Lake Superior district, employing a similar number of men, which can show such results.

Our mines are all in first class physical shape and you will notice by the enclosed statements, that the cost is most gratifying. I call your particular attention to the detailed report of the Cliffs Shaft Mine, where developments during the year have been very encouraging.

It is still necessary to fight extravagance in the City of Negaunee where proposals to spend the taxpayers money are continually being advanced. I am glad to report that at least for the previous year we have been able to forestall such things as a community building and sewage disposal plant.

The Marquette Range Industrial Union has continued to function. I, as a representative of the Company, have had a number of satisfactory meetings with the officers. They have no serious complaint as to wages, sanitation of working conditions. Many small matters have been taken up directly with the Superintendents by various representatives. Almost invariably these were promptly adjusted to the full satisfaction of both parties.

The membership in the Marquette Range Industrial Union dwindled during the year. I, however, am unable to give you the figures. I am told that this is due to the fact, especially the feeling of our older employees, that they are satisfied and have no complaint and see no reason why they should join any union. The CIO has been active, principally on the west end of the Range. I understand the latter part of the year they worked quite hard in both Ishpeming and Negaunee. From all I can learn, and it comes from a very good authority, they have made little headway. Presumably this active solicitation on the part of the CIO is driving many of our employees back into the Marquette Range Industrial Union. I am informed that their membership is increasing quite rapidly.

Effective April 1st, Mr. O. D. McClure, General Manager of the Cliffs Power & Light Company and Chief Mechanical Engineer, who had been in the employ of the Company since 1905, retired and arrangements were made so that he would be continued on our rolls in a consulting capacity until April 1st, 1940. Mr. McClure has been a most valuable servant of The Cleveland-Cliffs Iron Company and The Cliffs Power & Light Company and his services are greatly missed.

Effective April 1st, Mr. J. D. Preston was appointed General Manager of the Cliffs Power & Light Company and effective the same date, Mr. L. C. Moore, who has been a member of the Mechanical Department since 1907, was appointed Chief Mechanical Engineer.

I am sorry to report that on December 18th, Dr. J. D. Crane, Chief of Staff of the Ishpeming Hospital, died. Dr. Crane was highly respected in this community and had a fine standing as a surgeon. His passing is greatly regretted. Dr. A. W. Erickson has been appointed as Chief of Staff in place of Dr. Crane. Dr. Erickson has been with the Company since 1923 and I am sure will carry on in the same way as Dr. Crane did.

Near the end of the year, surface wells at the Maas Mine had advanced to such a point that it could be stated with assurance that during 1940 there would be enough water pumped to supply the City of Negaunee with a potable water supply. You will recall that for many years the City has endeavored to get a new water supply in order to use Teal Lake for recreational purposes.

It has been a matter of great satisfaction to me to have continued to receive the fullcooperation of officials and employees of the Company. Without this cooperation, it naturally would have been impossible to have shown such fine results for the year 1939.

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 1 9 2 9

YEAR	THE C.C.I.CO.	THE NEGAUNEE MINE CO.	THE ATHENS I. MG. CO.	THE C.P.& L.CO. & CLIFFS EL	TOTAL F O U R COMPANIES		CHANGES FROM PREVIOUS YEAR
			ASSESSED VALUATION				
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	2,352,853
1933	9,867,714	3,544,400	2,036,500	1,419,563	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	2,927,520	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
Inc. or Dec. 1931 - 1939	D 687,155	D 1,368,400	I 146,900	I 442,554	D 1466,101		
			T A X E S P A I D				
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	419,703.26	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
Decrease 1931 - 1939	88,299.15	62,411.63	1,033.61	27,347.01	179,091.40		

Notes;

The Cliffs Power & Light Co for 1939 represents a valuation either determined or approved by the State Tax Commission amounting to an increase of $534,139.00 in valuation and an increase of $7,770.00 in taxes over the previous year.

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 that year being $1,000,524 and $20,965.81 respectively.

Current year comparison is made with 1931 for the reason that this was the peak year for the state as to taxes raised, although the Mining Department taxes showed a slight decrease from 1930 due to lower mine valuations.

HJA-RN
C-CA -4/2/40
12-27-39

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

	1936	1937	1938	1939
PRODUCT - Tons	456,760	543,567	327,161	387,258
POWDER				
Pounds - Gelamatie "2X"	--	--	301,100	346,600
50% L. F.	396,000	164,650	--	--
60% Gelatine	58,200	397,850	44,880	--
Total Pounds Powder	454,200	562,500	345,980	346,600
Total Cost	52,098.25	68,309.67	42,926.27	40,942.86
Fuse - Feet	702,000	802,600	534,800	609,200
Caps - Number	114,500	138,950	81,660	98,900
Duplex Shot Wire	1,785	18,180	4,130	5,800
Delay Fuses	3,400	5,875	3,432	--
Electric Caps	--	--	--	1,500
Fuse Lighters	29,500	24,400	27,000	24,400
Fuse Containers	30	6	12	47
Tamping Bags	31,000	36,000	26,350	40,000
Powder Bags	--	--	--	20
TOTAL COST - Fuse, Caps, etc.	6,087.44	7,522.05	4,766.39	5,378.63
TOTAL COST - All Explosives	58,185.69	75,831.72	47,692.66	46,321.49
Average Price per pound - Powder	.1147	.1214	.1241	.1181
Cost per ton - Powder	.1141	.1257	.1312	.1057
" " " - Fuse, etc.	.0133	.0138	.0146	.0139
" " " - All Explosives	.1274	.1395	.1458	.1196
Pounds Powder per ton of ore	.9943	1.035	1.057	.8950

1939 Production increased 60,097 tons or 18.4% compared with 1938.
Average Price for Powder decreased 4.6% compared with 1938.
Cost per ton for all explosives decreased 18% compared with 1938.

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

	1936	1937	1938	1939
PRODUCT - Tons	1,913,242	2,833,554	1,515,231	1,903,564
POWDER				
Pounds - 40%	--	--	2,000	--
50%	746,185	799,770	157,549	44,515
60%	78,995	77,862	18,350	10,550
1X and 2X Gelamite	121,345	438,300	500,048	764,270
Total Pounds - Powder	946,525	1,315,932	677,947	819,335
Total Cost - Powder	105,732.20	156,720.63	82,844.59	96,623.23
Fuse - Feet	2,976,430	4,384,364	2,341,664	2,994,647
Caps - Number	434,527	622,421	325,171	426,426
Leading Wire - Feet	6,000	2,760	2,500	2,500
Connecting Wire - Pounds	42	96	48	120
Tamping Bags	94,150	67,350	71,500	83,000
Sealing Compound - Pints	32	35	40	44
Powder Bags	74	115	101	125
Fuse Lighters	54,100	91,487	56,100	69,650
Electric Exploders	11,540	5,733	1,821	2,109
Blasting Machines	1	-	-	-
Master Fuse Lighters	-	-	-	8,650
TOTAL COST - Fuse, Caps, etc.	23,872.40	33,940.53	17,152.23	21,914.56
Total Cost - All Explosives	129,604.60	190,661.16	99,996.82	118,537.79
Average Price per pound - Powder ...	.1117	.1191	.1222	.1179
Cost per ton - Powder	.0553	.0553	.0547	.0508
" " " - Fuse, etc.	.0124	.0120	.0113	.0115
" " " - All Explosives	.0677	.0673	.0660	.0623
Pounds of Powder per ton of ore	.4947	.4644	.4474	.4304

1939 Production increased 388,333 tons or 25.6% compared with 1938.
Average price for powder decreased 3.5% compared with 1938.
Cost per ton for all explosives decreased 5.6% compared with 1938.
Mines included in above statement are - Athens, Maas, Negaunee, Lloyd and Virgil.

JSM-L
1-18-40
-3-

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

	1936	1937	1938	1939
PRODUCT - Tons	1,913,242	2,833,554	1,515,231	1,903,564
TIMBER				
Feet 6- 8	513,514	380,876	400,543	419,132
8-10	222,488	334,236	161,523	232,404
10-12	361,061	470,071	263,466	348,701
12-14	131,705	217,676	136,375	166,501
14-16	5,147	8,225	9,891	14,284
Treated Timber	20,175	15,217	6,554	6,937
Total Feet	1,254,090	1,426,301	978,352	1,187,959
Total Cost	79,567.42	115,460.55	73,697.16	89,080.48
LAGGING				
Feet 5	58,275	11,805	17,175	21,585
7	4,546,086	6,091,424	3,879,041	4,704,619
Total Feet	4,604,361	6,103,229	3,896,216	4,726,204
Total Cost	32,044.85	49,245.57	30,933.14	36,934.76
Poles - Feet	3,376,027	4,556,540	2,377,176	3,847,650
Poles - Cost	38,353.17	61,938.50	31,980.78	49,766.77
WIRE FENCING - Rods	1,322	1,515	808	2,860
" " - Cost	1,137.24	1,407.60	773.86	2,707.62
Total Cost for all Timber	151,102.68	228,052.22	137,384.94	178,489.63
Average Cost per foot - Timber	.0634	.0809	.0753	.0749
" " " 100' - Lagging	.6959	.8068	.7939	.7814
" " " " - Poles	1.136	1.359	1.345	1.293
" " " Rod - Fencing	.860	.929	.958	.946
Feet of Timber per ton of ore	.655	.503	.646	.624
" " Lagging " " " "	2.407	2.154	2.571	2.482
" " Poles " " " "	1.765	1.608	1.569	2.021
" " Fencing " " " "	.0114	.0088	.0087	.025
Cost per ton for Timber	.0416	.0407	.0486	.0468
" " " " Lagging	.0167	.0174	.0204	.0194
" " " " Poles	.0200	.0219	.0211	.0261
" " " " Wire Fencing	.0006	.0005	.0005	.0014
Total Cost per Ton	.0789	.0805	.0906	.0937

1939 production increased 388,333 tons or 25.6% compared with 1938.
Mines included in above statement are - Athens, Maas, Negaunee, Lloyd and Virgil.

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

SOFT ORE MINES

YEAR	1936		1937		1938		1939	
PRODUCT - Tons	1,913,242		2,833,554		1,515,231		1,903,564	
CLASSIFICATION	AMOUNT	PER TON	AMOUNT	PER TON	AMOUNT	PER TON	AMOUNT	PER TON
General Supplies	85,084.04	.0445	136,971.20	.048	99,037.03	.0654	109,486.33	.0575
Iron and Steel	33,498.59	.0175	55,157.59	.019	29,519.07	.0195	29,725.21	.0156
Machinery	74,403.36	.0389	106,030.76	.037	51,994.21	.0343	58,523.72	.0308
Explosives	129,741.00	.0678	188,141.92	.066	99,990.90	.0659	118,719.79	.0624
Lumber and Timber	174,127.19	.0910	261,372.47	.093	162,249.04	.1071	195,651.50	.1028
Fuel	16,653.38	.0087	19,321.20	.007	17,722.66	.0117	16,974.83	.0089
Electric Power	321,282.52	.1679	394,928.05	.140	327,121.41	.2159	344,250.29	.1808
Miscellaneous	24,629.41	.0129	31,468.42	.011	21,874.88	.0144	60,623.28	.0318
Total	859,419.44	.4492	1,193,391.61	.421	809,509.20	.5342	933,954.95	.4906

HARD ORE MINES

YEAR	1936		1937		1938		1939	
PRODUCT - Tons	456,760		543,567		327,161		387,258	
CLASSIFICATION	AMOUNT	PER TON	AMOUNT	PER TON	AMOUNT	PER TON	AMOUNT	PER TON
General Supplies	44,369.18	.097	46,825.71	.086	29,768.82	.091.	39,022.60	.101
Iron and Steel	28,094.99	.062	37,544.78	.070	18,852.90	.058	20,264.11	.052
Machinery	44,140.79	.096	42,554.99	.078	25,388.84	.077	22,640.32	.059
Explosives	57,638.41	.126	75,831.72	.141	47,677.83	.146	46,454.76	.120
Lumber and Timber	13,026.30	.029	9,473.77	.017	7,647.87	.023	7,863.57	.020
Fuel	5,571.74	.012	5,649.79	.010	4,561.12	.014	4,366.08	.011
Electric Power	75,662.87	.166	88,837.43	.163	77,269.00	.236	79,652.95	.206
Miscellaneous	1,645.40	.003	6,908.03	.012	3,790.74	.012	19,669.44	.051
Total	270,149.68	.591	313,626.22	.577	214,957.12	.657	239,933.83	.620

Soft Ore Mines production increased-- 388,333 tons or 25.6%, compared with 1938.

Mines included in above statement (Soft Ore Mines) are Athens, Maas, Negaunee, Lloyd and Virgil.

Hard Ore Mines production increased -- 660,097 tons or 18.4% compared with 1938.

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THE CLEVELAND-CLIFFS IRON COMPANY
MINING DEPARTMENT

LABOR SUMMARY - ALL COMPANIES

	1936		1937		1938		1939	
PRODUCT - Tons	3,671,223		5,096,706		2,705,862		3,699,285	
Surface	205,213¼	895,502.30	267,904½	1,501,153.07	173,941¾	978,568.71	197,836	1,131,048.39
Cost per ton		.244		.295		.362		.306
Underground	320,594¼	1,640,168.13	444,946½	2,814,705.65	265,457½	1,678,613.41	311,549½	1,989,110.18
Cost per ton		.447		.552		.620		.538
Superintendence and General Roll	42,071	269,557.92	52,940	371,604.87	51,903¾	371,712.80	55,047¼	388,021.13
Cost per ton		.073		.073		.137		.105
Grand Total	567,878½	2,805,228.35	765,791	4,687,463.59	491,303	3,028,894.92	564,432¾	3,508,179.70
Cost per Ton		.764		.920		1.119		.948
Average rate per day		4.94		6.12		6.17		6.22
Total per man per day		6.46		6.66		5.51		6.55

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 - 1939. - MICHIGAN PROPERTIES:

January 9th to June 12th. - All mines operated on a schedule giving each employee 4 days per week. All mines, excepting Athens, operated 2-8 hour shifts per day, 4 days per week. Athens Mine operated 3-8 hour shifts per day, 5 days per week, staggering the crew so each employee received 4 days per week.

June 12th. to September 11th. - All mines went on schedule giveing each employee 3 days per week. LLOYD-MAAS-NEGAUNEE-AND SPIES-VIRGIL; - These mines operated 1-8 hour shift per day 4 days per week and 2-8 hour shifts one day per week. ATHENS; - operated 2-8 hour shifts per day 4 days per week. CLIFFS SHAFT; operated 1-8 hour shift three days per week. The crews being staggered so each employee received 3 days per week.

September 11th. to Dec. 31st. - All Mines, excepting Spies-Virgil, went on a schedule giving each employee 5 days per week. Spies-Virgil remained on the former schedule of 3 days per week. All Mines, excepting Spies-Virgil operated 2-8 hour shifts per day 5 days per week. Spies-Virgil operated 1-8 hour shift per day, 4 days per week and 2-8 hour shifts 1 day per week.

November 1st. - Spies-Virgil went to a 4 day per week schedule, the Mine operating 2-8 hour shifts for the 4 days, and the crews staggered so each employee received 4 days per week.

MINNESOTA PROPERTIES:

The Canistee pit operation began June 20th on 1-8 hour shift per day and continued until October 13th when the season closed.

The Hill-Trumbull pit began operating May 8th on a 3-8 hour shifts basis 5 days per week and contined until October 23rd. when the season closed.

The Holman-Cliffs pit was idle during the year 1939.

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COMPARISON OF TOTAL DAYS WORKED AND TONS OF ORE MINED FOR THE YEARS 1939 AND 1938

	1939 DAYS	1938 DAYS	1939 DAYS	1938 DAYS
NON-PRODUCTIVE UNITS				
Stephenson Mine	340	304		
Princeton Mine	358 3/4	299 1/2		
Gardner-Mackinaw Mine	2,534 1/4	943 3/4		
Miscellaneous Pay-Roll	1,752	2,143 1/2		
Shops and Storehouse	3,146 3/4	3,526 1/2		
C.C.I.Co. Miscellaneous & General	46,176 3/4	36,029		
Negaunee Mine " "	3,108 1/2	4,271 1/2		
Athens Mine " "	1,366 3/4	1,565		
Cliffs Power & Light Co.	20,468 3/4	19,530 3/4		
Mesaba Range Properties	36,440	20,599		
General Roll - Undistributed	37,923 1/2	35,654 1/2		
TOTAL DEDUCTIONS	153,616	124,867		
Grand Total - All Operations	564,432 3/4	491,303		
Net for Operating Mines	410,816 3/4	366,436	410,816 3/4	366,436
Total Tons	3,699,285	2,705,862		
Tons per Man per Day	9.00	7,384		
	TONS			
Open Pit Production:				
Tilden Mine	170,276	85,589	4,152 1/2	4,456
Canisteo Mine	218,514	777,881	12,158 1/2	39,558
Hill-Trumbull Mine	1,019,673	--	29,213 1/2	--
TOTAL	1,408,463	863,470	45,524 1/2	44,014
Open Pit Tons per Man per Day	30.94	19.62		
Net Underground Days			365,292 1/4	322,422
Net Underground Production	2,290,822	1,842,392		
Underground Tons per Man per Day	6.271	5.714		

STATEMENT SHOWING OVERTIME FOR YEAR 1939 AND EFFECT THE PENALTY COST HAD ON THE YEAR'S PRODUCTION

	MICHIGAN PROPERTIES	MESABA RANGE			TOTAL
		CANISTEO	HILL TRUMBULL	HOLMAN CLIFFS	
January	228.06	-	-	-	
February	183.48	-	-	-	
March	233.15	-	-	-	
April	353.50	13.05	31.24	-	
May	412.29	2.39	206.97	-	
June	216.32	249.19	3,569.78	-	
July	285.79	99.80	3,210.24	-	
August	640.20	274.89	4,909.66	-	
September	1,392.14	314.75	6,326.57	-	
October	1,745.42	642.89	4,746.40	-	
November	2,607.43	743.27	907.26	135.68	
December	688.51	66.34	4,230.83	13.90	
TOTAL	8,986.29	2,406.57	28,138.95	149.58	39,681.39
Penalty Cost of Above = 1/3 of Totals	2,995.43	802.19	9,379.65	49.86	13,227.13
Production - Tons, Year 1939	2,461,098	218,514	1,019,673	-	3,699,285
Effect the Penalty Cost had on Year's product- Cost Per ton -	.0012	.0037	.0092	-	.0036

CENTRAL ANALYTICAL LABORATORY
STATEMENT SHOWING COST OF OPERATING AND DISTRIBUTION BASED ON DETERMINATIONS WORKED FOR YEAR 1939

COSTS	
Labor:	
Chemists and Assistants	20,280.00
Helpers and Sample Buckers	15,113.54
Total Labor	35,393.54
Supplies and Expense:	
Chemical, etc.	11,312.60
Property Insurance	34.49
Personal Injury Expense	707.88
Unemployment Insurance Tax	1,163.98
Old Age Benefit Tax	354.44
Depreciation	153.84
Total	13,727.23
Grand Total Cost	49,120.77
Total Number of Determinations	169,681
Cost per Determinations	.28949

DISTRIBUTION:	NO. OF DETERMINATIONS	COST		% OF TOTAL LABORATORY WORK
Cliffs Shaft Mine	31,037	8,926.31		18.3
Maas Mine	48,332	14,034.40		28.5
Gardner-Mackinaw Mine	818	221.62		.5
Lloyd Mine	22,650	6,412.02		13.3
Tilden Mine	6,158	1,666.60		3.6
Stephenson Mine	110	31.54		.1
Francis Mine	661	175.65		.4
Princeton Mine	64	17.43		-
Spies-Virgil Mine	25	8.49		-
Negaunee Mine	28,115	8,026.29		16.6
Athens Mine	20,328	5,784.62		12.0
Experiments and Investigations	5,833	1,753.81		3.4
Morris Ore	304	82.43		.2
St. Paul Ore	25	8.49		-
E&A 731 - Explerations	1,153	359.72		.7
Total Company Operations	165,613	47,509.42	.28687	
Accounts Receivable:				
Volunteer Pit	4,047	1,584.00		2.4
L. S. & I. Ry. Co.	9	22.50		-
Mary Charlotte Mine	12	4.85		-
GRAND TOTAL	169,681	49,120.77		100.0

NOTE: - 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 - $.28687.

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CLIFFS SHAFT MINE

ANNUAL REPORT

YEAR 1939

1. GENERAL:

The Cliffs Shaft Mine operated at about two-thirds of capacity in 1939 because we worked only 210 days out of a possible 300. Production, however, was speeded up considerably the latter part of the year, averaging almost 2,000 tons per day.

Shipments exceeded production by a little more than 200,000 tons; in fact, shipments exceeded any year heretofore.

We managed again to keep the development work apace with the amount of ore taken from floors and backs by keeping over half the mining gangs looking for new ore bodies and lenses. Ore reserves actually increased about 12,500 tons. As a result, the reserves are the largest in the past eighteen years. Some of the increase came in the North Vein territory in "A" Shaft and a small tonnage came from the Section 9 development work. The year 1940 will probably show a healthy increase in the West deposit in "B" Shaft because at the time the 1939 estimate was made we had not proven the ore to be continuous from the 10th to the 9th level.

With the increased production demand late in the year we purchased a number of new drilling machines, new batteries for storage battery locomotives, and new scraper hoist equipment.

Also late in the Fall as new equipment was delivered we added to the mining crews and closed the year with three new gangs. We must, however, add at least six more contracts before we can hope to hoist an average of 2,000 tons per day mine tally.

With the delivery of the new equipment on order we will have only one real vulnerable spot and that is the two old repaired motor generator sets in the engine house which operate our haulage system. If either one breaks down, and they have a number of times failed us in the past years, we have to curtail operations. A new 250 k.w. unit should be ordered and installed to properly carry our present and prospective load. Furthermore, we could operate our 10th level "B" Shaft haulage system to better advantage if we purchased at least ten new 84 cu. ft. steel cars replacing the present eight old second-hand $2\frac{1}{2}$ ton 42 cu. ft. rocker dump cars.

The quality of the ore output in 1939 showed an improvement over the analysis in 1938 in both lump and crushed grades.

2. PRODUCTION SHIPMENTS & INVENTORIES:

a. Production by Grades

Grade	Tons	% of Total
Cliffs Shaft Lump	220,015	
" " Mine Run	430	
" " Crushed	103,202	
Total Cliffs Shaft Ore	323,647	83.6
Bancroft Lump	39,502	
" Mine Run	3,428	
" Crushed	20,681	
Total Bancroft Ore	63,611	16.4
GRAND TOTAL BOTH FEE & LEASE	387,258	100.0

CLIFFS SHAFT MINE
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Production by grades for the past ten years follows:

Year	Lump Ore Tons	Crushed Ore Tons	Run-of-Mine Ore Tons	Total Tons
1930	226,059	94,910	86,956	407,925
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

The percentage of lumps and fines as shown on our yearly ore statement since 1932 follows:

	Lump		Crushed	
Year	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

The percentage of lump produced shows a slight decrease over previous years but inasmuch as the lump is the grade that we should make every effort to produce as much as possible of, it has been decided to take a cut off the bottom edge of the crusher head to reduce the amount of crushing in the bottom of the bowl. The head is now as low as we can lower it and keep the nut tight at the top of the shaft or mandrel carrying the crushing head.

The proportion of ore mined from the fee and leased portions of the mine is shown by the figures that follow:

Year	Cliffs Shaft Ore (Fee)	% of Total	Bancroft Ore (Lease)	% of Total
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

It will be noted that the percentage of product coming from the leased lands shows a slight increase over 1938.

CLIFFS SHAFT MINE
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In order to keep the tonnage of Bancroft Ore produced since the lease was signed clearly in mind, the following figures are shown:

Year	Bancroft Ore Tons
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
Total	649,625

b. Shipments

Grade	Pocket Tons	Stockpile Tons	Total Tons	Last Year Tons
Cliffs Shaft Lump	108,634	202,039	310,673	95,983
" " Crushed	63,832	112,470	176,302	42,240
" " Mine Run	430	-	430	171
Bancroft Lump	20,842	34,085	54,927	19,254
" Crushed	11,576	34,034	45,610	3,416
" Mine Run	3,428	-	3,428	1,957
Total	208,742	382,628	591,370	163,021
Total Last Year	98,191	64,830	163,021	
Increase in Shipments	110,551	317,798	428,349	

The following table shows comparative shipments for the past ten years:

	CLIFFS SHAFT GRADE			BANCROFT GRADE			
Year	Lump	Crushed	Run-of-Mine	Lump	Crushed	Run-of-Mine	Grand Total
1930	126,231	30,460	73,881	27,178	4,436	13,075	275,261
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

The figures indicate that this property shipped the largest tonnage in its history, topping both 1929 and 1937 by a substantial tonnage. This was entirely due to the large amount of crushed ore moved from the stockpiles.

CLIFFS SHAFT MINE
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c. Stockpile Balances

Ore in Stock as of Dec. 31, 1939, viz:

Cliffs Shaft	Lump	37,270 tons
" "	Crushed	33,504 "
Bancroft	Lump	3,258 "
"	Crushed	2,508 "
Total		76,540 "

For comparison we show the balances on hand at the end of each year since 1931:

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 "

With the exception of the year 1929, not shown in the above tabulation, we have the least amount of ore left on hand in the last ten years.

d. Division of Product by Levels

Level	"A" Shaft Tons	"B" Shaft Tons	Total Tons
1st	3,679	14,155	17,834
2nd	3,802	10,112	13,914
3rd	17,881	4,287	22,168
4th	9,962	6,770	16,732
5th	5,514	6,170	11,684
6th	47,511	3,815	51,326
7th	26,992	11,079	38,071
8th	26,180	21,777	47,957
9th	34,793	15,788	50,581
10th	51,871	11,864	63,735
11th	25,948	-	25,948
12th	-	5,326	5,326
13th	-	13,497	13,497
14th	-	6,869	6,869
15th	-	1,616	1,616
Total	254,133	133,125	387,258
Rock			30,626
Total Ore & Rock			417,884

The figures that follow show the amount of ore actually broken and produced in each shaft since 1931:

Year	"A" Shaft Tons		"B" Shaft Tons		Total Tons
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

CLIFFS SHAFT MINE
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It will be noted that a slightly larger proportion of ore came from the "B" Shaft territory, so that actually "B" Shaft furnished more ore than any other year since 1930.

Because of the fact that both the "A" Shaft and "B" Shaft skips must be hoisted alternately, each time with a full load to get up a maximum product, more or less ore must be diverted to "B" Shaft to balance the load. The following table shows the ore as hoisted.

	1939 Product as Hoisted	
	"A" Shaft	"B" Shaft
Month	Tons	Tons
January	15,500	14,672
February	13,210	12,804
March	14,925	14,189
April	8,492	7,946
May	18,653	18,342
June	16,321	15,532
July	13,550	13,242
August	12,857	12,012
September	16,761	16,608
October	22,746	22,173
November	22,725	22,407
December	20,119	19,162
Total	195,859	189,089
	50.8%	49.2%

It is apparent that we balanced the hoisting cycle pretty well throughout 1939.

e. Production by Months

		Cliffs Shaft			Bancroft			
Month	Optg. Days	Lump	Crushed	Mine Run	Lump	Crushed	Mine Run	Total
January	18	17,432	7,636	-	3,547	1,557	-	30,172
February	16	14,697	6,450	-	3,238	1,433	196	26,014
March	18	16,737	7,344	-	3,287	1,426	320	29,114
April	10	9,523	4,179	-	1,903	833	-	16,438
May	22	21,342	9,894	-	3,596	1,959	204	36,995
June	17	17,681	9,293	-	2,977	1,782	120	31,853
July	14	14,943	7,696	-	2,623	1,309	221	26,792
August	12	14,215	6,666	-	2,476	1,200	312	24,869
September	18	19,433	9,338	303	2,510	1,509	276	33,369
October	22	25,845	11,572	111	4,310	2,615	466	44,919
November	22	25,860	12,634	16	3,974	2,266	382	45,132
December	21	22,307	10,500	-	3,737	1,806	931	39,281
Total	210	220,015	103,202	430	38,178	19,695	3,428	384,948
Stockpile Overruns accumulated during 1939					1,324	986		2,310
GRAND TOTAL	210	220,015	103,202	430	39,502	20,681	3,428	387,258

CLIFFS SHAFT MINE
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f. Ore Statement

	Cliffs Shaft			Bancroft				
	Lump	Crushed	Mine Run	Lump	Crushed	Mine Run	Total	Last Year
On Hand Jan. 1, 1939	127,928	106,604	-	19,614	19,793	-	273,939	109,799
Output for Year	220,015	103,202	430	38,178	19,695	3,428	384,948	327,161
Transfers	-	-	-	3,357	3,357	-	-	-
Overruns	-	-	-	3,750	5,273	-	9,023	
Total	347,943	209,806	430	58,185	48,118	3,428	667,910	436,960
Shipments	310,673	176,302	430	54,927	45,610	3,428	591,370	163,021
Balance on Hand	37,270	33,504	-	3,258	2,508	-	76,540	273,939
Increase in Output							57,787	

g. Delays

Date	Hours	Tons Lost	Cause
January 5	1 1/2	250	Electric current off intermittently
March 15	1 1/4	200	Blizzard
April 4	1	175	Pinion broken on picking belt
" 20	2	300	Repairing shaft gate "A" Shaft
" 21	1	175	Top tram motor out of order
May 1	3	350	Top tram car over dump
" 12	1 1/2	250	Drive shaft broken on picking belt
Sept. 7	1	150	No electric current
Oct. 9	4 1/2	500	"A" Shaft skip dumping axle broken
Dec. 21	1	150	Chunk dropped down "B" Shaft
" 23	1	150	Lump car off track
Total - Year	18 3/4	2650	

3. ANALYSIS

a. Average Analysis of 1939 Output

	Iron	Phos.	Silica
Cliffs Shaft Lump	59.10	.112	8.34
" " Crushed	53.91	.107	14.46
" " Run-of-Mine	60.79	.107	7.33
Bancroft Lump	60.74	.123	6.57
" Crushed	55.81	.132	11.91
" Run-of-Mine	60.83	.130	6.92

The 1939 output analysis compare favorably with the 1939 guarantees of 59.35 Iron for the lump grades and 54.55 for the crushed if you combine both Cliffs Shaft and Bancroft grades.

b. Average Analysis on Straight Cargoes

	Mine Analysis			Lake Erie Analysis	
Grade	Iron	Phos.	Silica	Iron	Moist.
Lump Cliffs Shaft Spec.	59.93	.111	7.60	60.39	.36
" " "	59.02	.112	8.54	59.35	.60
Crushed" "	56.47	.113	10.34	56.88	2.06

Note:
In every instance the Lower Lake analysis exceed our mine results.

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c. Complete Analysis of 1939 ores shipped from Mine

Grade	Iron	Phos	Sil.	Alum	Mang	Lime	Mag.	Sul.	Loss
Lump Ore	60.10	.112	7.60	2.20	.33	1.13	.82	.015	1.35
Crushed Ore	54.70	.112	13.28	2.80	.46	1.42	1.01	.015	1.96

Note:
The grade of the ores shipped are higher than the figures published in the Analysis Booklet.

d. Analysis of Ore in Stock Dec. 31, 1939

		Iron	Phos.	Sil.	Mang.	Alum	Lime	Mag.	Sul.	Loss	Moist.
Cliffs Shaft Lump	Dried	58.76	.113	8.34	.46	2.40	1.13	.67	.013	1.62	
" " "	Natural	58.47	.112	8.30	.46	2.39	1.12	.66	.013	1.61	.50
Cliffs Shaft Crushed	Dried	54.41	.108	13.30	.56	2.68	1.45	1.18	.014	2.30	
" " "	Natural	53.50	.106	13.08	.55	2.63	1.43	1.16	.014	2.26	1.68
Bancroft Lump	Dried	59.86	.150	6.25	.33	2.60	1.56	1.15	.015	1.35	
" "	Natural	59.56	.149	6.22	.33	2.59	1.55	1.14	.015	1.34	.50
Bancroft Crushed	Dried	55.43	.135	12.27	.43	2.80	1.42	1.01	.029	1.96	
" "	Natural	54.60	.133	12.09	.42	2.76	1.40	1.00	.028	1.93	1.50

e. Analysis of Ore Reserves
Run-of-Mine Ore

		Iron	Phos.	Sil.	Mang.	Alum	Lime	Mag.	Sul.	Loss	Moist.
Cliffs Shaft Ore	Dried	57.30	.110	10.10	.50	2.40	1.20	1.00	.019	1.90	
" " "	Natural	56.04	.109	9.87	.49	2.35	1.17	.98	.018	1.86	2.20
Bancroft Ore	Dried	57.75	.125	9.85	.50	2.35	1.15	.95	.019	1.85	
" "	Natural	56.48	.123	9.63	.49	2.30	1.12	.93	.018	1.81	2.20

4. ESTIMATE OF ORE RESERVES:

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

Ore in Sight Dec. 31, 1939

Available ore in Bancroft area "A" Shaft

	Developed		Prospective	
	Floors	Pillars	Breasts	Total
Level	Tons	Tons	Tons	Tons
2nd	1,300	-	-	1,300
3rd	3,300	800	-	4,100
4th	9,200	3,100	-	12,300
6th	3,600	-	-	3,600
7th	1,100	-	-	1,100
8th	-	7,700	4,000	11,700
9th	7,300	5,500	4,000	16,800
10th	24,000	147,100	2,000	173,100
11th	86,500	-	-	86,500
12th	-	-	2,000	2,000
Total	136,300	164,200	12,000	312,500

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Summary

Bancroft Ore Available	312,500 tons
Less 10% for rock and 10% for loss in mining	253,200 "
Less December production	6,474 "
Net Total Available Bancroft Ore	246,726 "

Available Cliffs Shaft Ore "A" Shaft

	Developed		Prospective	
	Floors	Pillars	Breasts	Total
Level	Tons	Tons	Tons	Tons
1st	-	7,500	-	7,500
2nd	11,700	-	-	11,700
3rd	3,000	-	2,000	5,000
4th	-	-	10,000	10,000
5th	13,800	13,400	2,000	29,200
6th	67,800	79,500	4,000	151,300
7th	162,600	22,500	6,000	191,100
8th	140,200	34,600	6,000	180,800
9th	196,900	6,100	8,000	211,000
10th	53,500	149,800	6,000	209,300
11th	57,200	181,000	-	238,200
12th	70,100	76,000	2,000	148,100
15th	40,400	-	-	40,400
Total	817,200	570,400	46,000	1,433,600

Available Cliffs Shaft Ore "B" Shaft

	Developed		Prospective	
	Floors	Pillars	Breasts	Total
Level	Tons	Tons	Tons	Tons
1st	9,700	-	4,000	13,700
2nd	34,500	-	-	34,500
3rd	11,500	23,500	2,000	37,000
4th	-	-	2,000	2,000
5th	-	7,000	-	7,000
6th	2,000	10,400	-	12,400
7th	12,100	2,900	2,000	17,000
8th	47,600	5,700	4,000	57,300
9th	24,600	-	-	24,600
10th	29,100	-	2,000	31,100
11th	20,300	3,000	-	23,300
12th	4,600	5,500	-	10,100
13th	15,900	-	2,000	17,900
14th	16,200	-	-	16,200
15th	25,800	15,300	-	41,100
Total	253,900	73,300	18,000	345,200

Section 9-47-27

	Developed		Prospective	
	Floors	Pillars	Breasts	Total
Level	Tons	Tons	Tons	Tons
9th	-	7,100	2,000	9,100
10th	4,000	3,400	2,000	9,400
Total	4,000	10,500	4,000	18,500

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Summary

Cliffs Shaft Available Ore "A" Shaft	1,433,600 tons
" " " "B" "	345,200 "
" " " Section 9	18,500 "
Total Available Cliffs Shaft & Sec. 9	1,797,300 "
Less 10% for rock and 10% for loss in mining	341,500 "
Difference	1,455,800 "
Less December production	32,807 "
Net Total	1,422,993 "

Recapitulation

Net Cliffs Shaft Ore Available	1,422,993 "
Net Bancroft " "	246,726 "
Grand Total " "	1,669,719 "

The following tabulation shows the increase in ore reserves for the past year. The increase was small but the main point to consider is that we did not eat into the reserves.

	Jan.1,1939	Dec.31,1939
Cliffs Shaft Ore Available	1,413,654 tons	1,422,993 tons
Bancroft " "	243,512 "	246,726 "
Total " "	1,657,166 "	1,669,719 "
Increase for year 1939		12,553 "

The following tabulation shows how the ore reserves have changed in the two shafts since 1929:

	Net Available Ore in Sight		
		Cliffs Shaft Ore	
Year	Bancroft Ore Tons	"A" Shaft Tons	"B" Shaft Tons
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

The foregoing data shows that both the Bancroft and "A" Shaft areas are on the upgrade, while "B" Shaft lost about 24,300 tons in 1939. This is almost entirely due to taking out the North Vein reserves between the 6th and 8th levels. The hanging is very treacherous here and rather than risk an accident and also have a lot of hanging rock contaminate the ore in No. 36 raise, which would in turn spoil the crushed ore in the main No. 1 storage raise between the 10th and 15th levels, we abandoned the area and took the ore left in place out of the reserve tonnage.

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The following table is of general interest because it shows what has happened to the ore reserves as reported to the State Tax Commission since 1920:

Available Ore in Mine at end of each year	
1939	1,669,719 tons
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 "

5. LABOR & WAGES

a. General

The number of men employed as shown on the labor statement shows a decrease for 1939 compared with 1938 despite the hiring of new employees late in 1939. The reason is two-fold - first, eighteen old employees were retired in March and not all of these were replaced with younger men. We also stopped the practice of showing the men in the General Shops working on jobs for the Cliffs Shaft Mine on the labor statement and instead made these charges against our supply account and distributed it to the various accounts.

b. Comparative Statement of Wages and Product

	1939	1938	Increase	Decrease
PRODUCT	387,258	327,161	60,097	
No. of Shifts & Hours	2 8-hr	2 8-hr		
No. of Days Operated	210	191	19	
Average Number of Men Employed				
Surface	80	92		12
Underground	298	296	2	
Total	378	388		10
Average Wages per Day				
Surface	5.52	5.48	.04	
Underground	6.34	6.31	.04	
Average	6.16	6.11	.05	
Wages per Month of 25 Days				
Surface	138.00	137.00	1.00	
Underground	158.50	157.75	.75	
Average	154.00	152.75	1.25	

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	1939	1938	Increase	Decrease
Wages per Month of 22 Days				
Surface	121.44	120.56	.88	
Underground	139.48	138.82	.66	
Average	135.52	134.42	1.10	
Wages per Month of 17 Days				
Surface	93.84	93.16	.68	
Underground	107.78	107.27	.51	
Average	104.72	103.87	.85	
Wages per Month of 13 Days				
Surface	71.76	71.24	.52	
Underground	82.42	82.03	.39	
Average	80.08	79.43	.65	
Product per Man per Day				
Surface	21.76	17.72	4.04	
Underground	6.14	5.68	.46	
Average	4.79	4.30	.49	

Product per Man per Day for 10 years back

Year	Surface	Underground	Total
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

	1939	1938	Increase	Decrease
Labor Cost per Ton				
Surface	.253	.310		.057
Underground	1.033	1.110		.077
Total	1.286	1.420		.134

Following are comparative figures for past 10 years:

Year	Surface Labor	Underground Labor	Total Labor	Wage Index *
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
1930	.222	.890	1.112	161.70

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

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	1939	1938	Increase	Decrease
Average Product Stoping and Tramming (Tons per shift)	16.69	11.16	5.53	
Average Product Stoping and Tramming, including haulage crews (Tons per shift)	13.78	9.73	4.05	
Average Wages - Cont. Miners	6.69	6.70		.01
" " - Trammers(Cont)	8.81	8.80	.01	
" " - Cont. Labor	6.96	6.96		
Total Number of Days				
Surface	17,797¼	18,479⅓		682¼
Underground	63,062½	57,558¼	5,504¼	
Total	80,859¾	76,037¾	4,822	
Amount for Labor				
Surface	$ 98,195.92	101,327.52		3,131.60
Underground	399,853.48	362,975.58	36,877.90	
Total	$ 498,049.40	464,303.10	33,746.30	

Proportion of Surface to Underground Men

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
1930	1 to 3.76

Above table indicates that we now have a larger proportion of our men underground, which is a step in the right direction as the producers should be in the majority.

6. SURFACE

a. Buildings & Repairs

The following table shows cost of repairs for the various mine buildings for the past five years:

	1939	1938	1937	1936	1935
Office & Warehouse	247.85	153.00	375.24	411.83	280.72
Shops	219.84	116.31	50.15	743.92	410.10
Shaft Houses	373.85	274.74	952.41	857.16	404.32
Engine House	105.71	184.33	823.26	1708.73	66.97
Dry Houses	1554.29	839.88	2738.45	4956.23	823.32
Coal Dock & Trestle	855.66	1163.97	45.31	11.21	146.79
Crusher Building	157.84	327.04	864.60	677.10	-
Miscellaneous	56.46	110.60	338.38	1077.39	506.90
Total	3571.50	3169.87	6187.80	10443.57	2639.12

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Shops

In order to brighten up and admit more light into the shops, we tore out all of the old overhead wooden passageways and then painted the walls and ceilings with white cold water paint.

Shaft Houses

Only minor repairs were made to the shaft houses. We did, however, finish installing all the stairways in "B" Shaft house, doing away with the use of ladders when greasing and oiling the main sheaves.

In "B" Shaft house we also moved the 8 ft. sheave that guides the rope into the counterweight pipe because we found the rope had cut a slot in eight sections on the West side of the 12" counterweight pipe between surface and the 1st level.

Dry Houses

Approximately 45% of the entire cost of repairs to mine buildings was spent on the underground Dry. The entire roof had to be repapered because of damage done by the sleet storm in the Fall of the year.

We purchased a new 1500 gallon hot water tank and also the heating element needed to heat the water in the tank. Instead of having the heating coils within the tank it is now standard practice to have the water heated by means of a multi-coil "Toco" heater fastened onto the side of the boiler of the dry heating plant.

We also installed a new bank of shower baths in the North end of the washroom after moving a whole tier of lockers.

The underground Dry at present is overcrowded and it is impossible for us to shut off the drafts the men complain about when dressing after bathing. The problem can easily be solved, however, by adding a new wing and separating the clean clothes room from the one in which the men hang up their working clothes.

Coal Dock

Although we spent $1163.97 in 1938 repairing our old coal dock we had to go ahead and put in an additional $855.66 this year before the railway inspectors would permit us to dump coal.

Now that we are using stoker coal more extensively it will not be necessary to continue to repair and maintain all of the dock now in use. We have already torn down about one-third of the old dock and if necessary can tear down additional bents.

Pulley Stands

Last year we rebuilt most of the pulley stands on the "A" Shaft side of the engine house. This year, 1939, several were rebuilt on the "B" Shaft side. We also constructed portable fences that can be lifted out of place when changing hoisting ropes.

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7. UNDERGROUND

a. Development

The following table gives a good idea as to the number of gangs we kept on development work for the past four years:

Month	Total Number of Gangs	Gangs Developing	% Developing
January	95	51	53.7
February	91	48	52.7
March	94	50	53.2
April	92	53	57.6
May	93	49	52.7
June	91	49	53.8
July	89	49	55.1
August	90	50	55.6
September	89	48	53.9
October	92	48	52.2
November	94	51	54.4
December	94	46	48.9
Monthly Average	92.0	49.3	53.6
Year 1938			52.0
" 1937			56.5
" 1936			55.2

It will be noted that a little more than half the mining gangs are kept consistently on the development program with the result that the ore reserves are being maintained in a healthy condition regardless of production.

"A" Shaft

1st Level

Contract #34 working along the boundary line in the Bancroft territory directly North of "A" Shaft pushed the breast of the stope East for 40 ft. The footwall of this lens is over the back of the old rock drift going into Contract #9 territory.

In the "B" Shaft territory, but shown on the "A" Shaft maps, Contract #1, 700 ft. Southwest of "A" Shaft in the Southeast Lens, continued the stope raise started in 1938 and by the end of 1939 the breast of their stope was vertically over Diamond Drill Hole #101. The breast was widening out late in the year indicating additional ore further West and we still have two runs of ore in Diamond Drill Hole #101 that we have not found in our mining operations.

3rd Level

Near the intersection 200 South and 1600 East #74 opened up a fine new stope in 1939. There is about 400 ft. of virgin territory West of #74's breast so that this portion of the North Vein will probably be very productive for years to come. In the early part of the year this stope did not look very promising but as the months went by conditions improved and by the end of the year this territory showed every indication of long life.

4th Level

Three gangs, a double #8 contract in the extreme East end of the North Lens and #83, 1000 ft. Northeast of "A" Shaft, all added to our ore reserves. The quality of the ore improved in #8 contract and both the North and South breasts were pushed farther East. The Northerly gang crossed the 200 South coordinate line following the ore to the Northeast.

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The Southerly #8 temporarily stopped the middle crosscut and pushed the South stope East along the 400 South meredian. By the end of the year we were only 160 ft. from the old #3 mine workings (long since unwatered) and the North breast was about 500 ft. from the Southwest corner of the old New York Mine owned by the Harlow Estate of Marquette. It might be said right here that negotiations have been going on with Mr. Harlow Clark since 1897 but to date the company has done no mining or exploring on the old New York Mine forty. If the ore continues East and North we will probably be close to the boundary line in another four or five years.

Contract #83 has been feeling around for a sizeable ore body most of the year. It was their work that lead us to the ore #74 found on the 3rd level but we believe there should be more ore between #83 and #8 - 1400 ft. to the East - and by following the leader we are in we hope to uncover another portion of the North Lens.

5th Level

In the Bancroft area #12 was started drifting Northeast from the intersection 200 North and 1300 East. We were looking for the upward extension of #76's ore coming up on the foot from the 10th level. The miner did find a seam of conglomerate ore running North and South but by the end of the year we had not intercepted #76's ore. The latter gang was only 20 ft. below the 5th level and presumably we would have to drift in rock about 75 ft. further to the Northeast to hole to #76 stope.

Contract #32 in the North Lens pushed their hanging wall stope further South and West between the 2600 and 2800 East coordinate lines.

6th Level

In the North Lens four separate gangs did development work. Over on the West side the two miners in the double #44 contract continued the raise stope Northwest over Diamond Drill Hole #55 with the result that the top of the stope is half way between the 4th and 5th levels near the main East-West Fault. This stope started at the 7th level and to improve ventilation and provide a better travelling road a crosscut was driven by #20 on the 6th level approximately parallel with the 1600 East coordinate line. This crosscut was also intended to explore the area between the Main Vein and the North Vein but no merchantable ore body was found in the first 175 ft. As we approached #44's stope 25 ft. of ore was cut in the crosscut.

In the Southeast corner of the North Vein #67 developed a new ore body back in the foot near the intersection 300 South and 2900 East but because most of the new ore seemed to lie in the floor a new branch raise was started from the main raise going to the 8th level and a new sub opened up Southwest of the 6th level ore area.

In the Main Vein 600 ft. due East of "A" Shaft #81 put up a new stope raise from the 6th to the 4th level, holing at the latter elevation South of any old known ore body. A thin seam of rock separated the new and old workings.

7th Level

Contract #60 extended the breast of their stope 60 ft. closer to the ore shown in Diamond Drill Hole #349 in the Northwest corner of the Southeast Vein. Because the hanging on the West side of the stope came down close to the floor it was necessary to drop down the raise and start a new bench to give #60 enough head room to advance West.

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8th Level

In the Bancroft territory the known width of the West end of the ore body was increased from 30 ft. to 115 ft. and the height was proven up to nearly the 5th level elevation. We do not know the East-West extent of the ore because we have merely put up a stope raise in the heart of the ore body and have encountered neither foot or hanging to date. Contract #76 raised from the 7th to nearly the 5th level during 1939. Contract #89 drove the connecting crosscut across from the old #62 stope close to the South boundary of the leased area for 190 ft. to connect with the South side of #76 stope. #89 then stoped straight North and proved the width of the ore to be 110 ft.

In the East end of the North Vein three gangs - #25, #62, and #64 - all increased the known ore area by breast stoping between the 2700 and 3200 East coordinate lines. Contract #25 drove their stope East and parallel with the 000 line for another 100 ft. and after skirting a dike broke through and found a fine strong ore lens that may lead us to the ore shown in Diamond Drill Hole #406 on the 6th level. Contract #62, a short distance Southwest of #25, also breasted along the 000 South line while #64 to the Northwest has found a wide strong ore lens to run West along the 200 North line. What we supposed to be a jasper foot along the South side of the stope turned out to be merely a seam of rock and we now find that we have not yet found any regular foot or hanging. In other words, the ore body is much larger than indicated on the maps.

9th Level

All five gangs employed on the 9th level in the Bancroft area enlarged the known ore areas. Up in the Northwest corner of the level #80 cut out at the top of their raise in ore a short distance North of the intersection 400 North and 1400 East. They followed the ore Southeast for 110 ft. and then hit rock. The drift was continued in rock during December headed for the contact in old #10's drift 150 ft. further Southeast. Contract #76 has continued to develop new ore as previously described under the 8th level caption. In the South Central part of the Vein #10 drove West along the hanging while #84 extended the known limits East. Over on the extreme East side #70 found the ore to run 40 ft. further under the hanging along the 2400 East coordinate line.

In the Southeast Vein #65 breasted Northwest behind the old hanging and we were hopeful that their breast might eventually strike the ore shown in Diamond Drill Hole #189. The foot and hanging came together and pinched out the ore so that we will have to make another try for the ore in the drill hole.

In the North Lens Contract #91 breasted Southwest after crossing the 2800 East meredian. This ore is the same as that discovered by #5 on the 10th and also the same as the 8th level ore being developed by #64. All in all this area looks favorable for opening up into a big vein.

Down in the extension of the Incline Shaft territory #35 and #68 both found considerable new ore. #35 looks more promising than #68 at the top of their stope raise but eventually the two stopes may join. In the East breast near the sill floor, however, #68 found a nice breast of ore going East and as we are out in unknown territory we are much encouraged with the possibility of finding something new.

Contract #55 in the Southeast Vein continued their raising stope from the 9th to the 8th level, finally holing it at the latter elevation. We are sure that we have not found the ultimate limits of the ore on either the 9th or 10th levels.

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10th Level

In the Bancroft area Contract #80 extended the main Northwest drift 105 ft. towards the ore shown in Diamond Drill Hole #456. The ore did not seem to go beyond the course of the diamond drill hole and so a raise was started for the 9th level and ore discovered as already described. We believe, however, that there is still more ore than we have now shown up and in 1940 will plan to test this area more fully. In the Southwest corner of the Bancroft ore body Contract #5 is stope raising along the 1400 East coordinate line. To date this part of the ore body is very narrow. This same gang also extended the breast of the sub East towards the 2600 East meredian parallel with the 200 North line. This working place has been stopped temporarily waiting for mechanical equipment to handle the ore.

In the North Vein East of the Bancroft Lease both #23 and #82 showed up some new ore. Contract #23 extended the main Northeast drift 225 ft. to the East in ore. We hit the foot 65 ft. East of Diamond Drill Hole #458. The back and sides of the drift were then stoped out but the broken ore cannot be trammed until we get another new scraper slide and scraper hoist, both of which are being built in our Hard Ore Shops. In order to keep the miner occupied while waiting for the scraping equipment, he started a new raise a short distance Southwest of the intersection 200 North and 3000 East which is planned to hole into #25's old stope on the 8th level. When this raise holes we can start up a new mining gang.

Contract #82, also in the North Vein, drove the Southeast drift Southeasterly towards the bottom of Diamond Drill Hole #460 proving up a new ore area about 220 ft. East and West and 80 ft. North and South. A new raise now nearly holed to the 8th level proves this to be the same ore body we have on the 8th level where #25 and #62 are now employed.

In the Main Vein over on the East side between 2700 and 2800 East three gangs - #11, #26, and #50 - all increased our developed ore area. Contract #11 breasted South along the West side of Diamond Drill Hole #208. Contract #26 breasted East towards the same diamond drill hole, while #50 drove North close to the 2800 East coordinate line.

11th Level

In the Northwest corner of the Main Vein Contract #62 extended the breast West along the 600 South coordinate line. There is still some new ore off to the Southwest found in Diamond Drill Holes #444 and #445 that we have not found to date.

Contract #21 in the Northeast end of the Main Vein has opened up some additional territory along the 600 South coordinate line. Earlier in the year a stope was opened up at the top of one of the three branches of the main East raise going to the 15th level near the intersection 600 South and 2700 East but the ore was lean.

15th Level

Contract #75 drove two crosscuts on the main level in the Bancroft territory. About 200 ft. of new drift was driven North 80° West from the North end of the Bancroft drift and 300 ft. of drift was driven along the 200 North coordinate line. Both of the drifts were in the foot and are intended for new raises going up to the 10th level territory. Our chances of finding additional new ore are better over on the East side where we put down some inclined diamond drill holes below the 10th level. We have proven ore to extend down at least 100 ft. below the 10th and the raises planned to come up from the 15th will have a lot of bearing on our future ore reserves. No ore to date has been put in sight below the 12th level in "A" Shaft but geologically there is no reason why we should not find some new ore closer to the 15th level.

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"B" Shaft

1st Level

Contract #17 on the 1165 ft. sub in the Main Vein continued to push the known limits of the ore West along the 800 South coordinate line. As we go to the Northwest a large pillar of ore is being left along the South side of the stope through which crosscuts can be driven.

On the sill floor during the latter part of the year Contract #58 started a crosscut Southwest, the objective point being the ore in Diamond Drill Hole #467. The crosscut will skirt the Northwest corner of the Lake Superior Iron Co's property and the ore that we hope to mine will be the Westerly extension of a nice run of ore that exists on the lands of our neighbor to the South.

4th Level

Contract #33 pushed their raising stope up to the 4th level elevation in 1939. The ore does not seem to want to run West and is heading for the intersection 600 South and 400 West. Apparently this portion of the Fault Vein has limited possibilities.

5th Level

Contract #71 at the close of the year was trying to find a worthwhile stope in the ore seams indicated in Diamond Drill Holes #145, 146, and 147, on the South side of the Main Vein. To date we have not been much encouraged.

6th Level

On the 6th level in the Southerly portion of the North Vein Contract #13 drove their breast stope Northwest towards Diamond Drill Hole #72. Then #87 holed a stope raise into the floor of #13's working place and the latter was moved to the 7th level to put up a new raise to tap the ore shown in Diamond Drill Hole #157. More than probable old #13's breast is in the same lens shown in the drill hole.

Contract #42 directly North of "B" Shaft breasted both East and West from the top of their branch raise put up by #88 Contract.. This ore lens can follow the contact East for 250 ft. before holing into the old workings.

7th Level

Contract #40 over on the East side of the North Lens opened up a new stope in the ore found in Diamond Drill Hole #462. A new raise first had to go up from the 8th level before we could tackle this ore.

A short distance West of #40 Contract #85 raise stoped from the 7th level and as we kept going up the ore kept getting wider and better and finally we holed to old #40's workings a short distance below the 5th level.

8th Level

Contract #31 was one of the year's disappointments in that although in favorable territory along a hanging contact with ore on the level above we drifted over 200 ft. in dike and found no ore. This gang in the North Vein 300 ft. Northeast of "B" Shaft also started a new raise in the hope of cutting the ore found by #85 on the 7th level. Geologically there is a chance of #31's raise finding some new ore on the 7th level South of the old North Vein stopes. It will be noted as this report is read that we occasionally remark about some prospective ore lens in "B" Shaft not developing as we had hoped, the same being true of the diamond drill holes planned in "B" Shaft, and the explanation lies in the fact that we are making every effort to explore "B" Shaft thoroughly even though the chances for ore are remote.

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We could take the same gangs into "A" Shaft and be more certain of finding something new but because "B" Shaft has always lagged behind we believe it better for the ultimate future of the mine to explore the almost hopeless ore horizons left in "B" Shaft before giving up the search for new ore.

9th Level

In the Section 9 territory, three-quarters of a mile West of "B" Shaft, two gangs - #47 and #77 - although actually not developing much new tonnage, proved the 10th level ore body to have a height of at least 150 ft. above the 10th. Because #77 carried a raising stope 25 ft. wide and about 15 ft. high up through the ore body like a chimney and because we did not attempt to drift or crosscut on the 8th or 7th level elevations, we did not actually prove or put much new ore in sight. The main idea was to find the top of the ore and then provide another outlet from the main 10th level so that ventilation could be established and the miner can climb down into the stope and avoid the loose that must be barred from the bottom up to reach the breast. When you have an opening into the top of a raising stope and you start drilling and blasting at the bottom, working your way to the top, it is not necessary to bar the ground or back below the working place and the air and water lines do not have to be taken up and put back after each blast.

Contract #47 after drifting Northwest from the raise found a lens of ore about 20 ft. by 40 ft. in size. Then the drift entered mixed material but by the end of the year the breast was back into high grade ore. On the 9th level we are duplicating the conditions found on the 10th level. On the sill floor we found a lens about 20 ft. by 80 ft. in size. Then we followed a seam 2 or 3 ft. wide for 125 ft. to the Northwest and then hit another lens 150 ft. long, the width varying from 15 to 30 ft. In Contract #47, 64 ft. above the 10th level, we are encountering the same set of conditions.

10th Level

In the Fault Vein 900 ft. West of "B" Shaft Contract #14 and #56 both extended our known ore limits. #14 was a disappointment for months but by mid-summer we finally ran onto what promises to be a sizeable ore body, all high grade. Contract #56 has found some new ore but the breast does not compare with #14. The latter gang went into a territory abandoned years ago and we are still hopeful that 1940 will show more promise for Contract #56.

Contract #88, 4700 ft. West of "B" Shaft, opened up 245 ft. of new territory in 1939. After following a narrow seam of ore, as previously mentioned, for 125 ft., the ore body widened out and we were able to open up a good sized stope and put in a double track. We have followed the jasper on the North side and the hanging slate on the South side. Because we have found no true foot we can still have more ore to the North, a fact proven by Diamond Drill Hole #472. There is also a chance of finding more ore along the slate hanging to the South.

13th Level

Contract #43 continued their stope raise in the Southeast corner of the Fault Vein, 1400 ft. Southwest of the shaft. The ore seems to be getting wider.

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15th Level

Contract #37 is still finding new ore but not the ore discovered in Diamond Drill Holes #451 and 454 on the 14th level. We have to date found two lenses dipping to the South and they seem to parallel the ore found in the diamond drill holes. The ore discovered lies North of the 000 South coordinate line 1700 ft. Northwest of "B" Shaft. Neither lens is very wide but the quality of the ore is good.

The following tabulation shows the various developing gangs (rock excluded) and the tonnage they furnished in 1939. The purpose of putting this table in the report is to prove in a general way, aside from the engineer's ore estimate, that we got about half of our product from new ore areas or from new extensions in the old known ore bodies or leases.

"A" Shaft

1st	Level	- Cont.	#34	- Bancroft	Vein	3,478	Tons	Mine Tally
2nd	"	- "	9	- "	"	3,594	"	"
3rd	"	- "	74	- North	"	3,859	"	"
4th	"	- "	8	- "	"	6,662	"	"
4th	"	- "	83	- "	"	1,286	"	"
5th	"	- "	81	- Main	"	2,798	"	"
6th	"	- "	20	- North	"	2,546	"	"
6th	"	- "	32	- "	"	4,092	"	"
6th	"	- "	44	- "	"	5,229	"	"
6th	"	- "	67	- "	"	2,231	"	"
8th	"	- "	60	- Southeast	"	4,205	"	"
8th	"	- "	76	- Bancroft	"	5,302	"	"
8th	"	- "	89	- "	"	4,163	"	"
9th	"	- "	10	- "	"	4,652	"	"
9th	"	- "	25	- North	"	4,833	"	"
9th	"	- "	35	- "	"	2,263	"	"
9th	"	- "	55	- Southeast	"	4,027	"	"
9th	"	- "	64	- Bancroft	"	5,402	"	"
9th	"	- "	65	- Southeast	"	6,221	"	"
9th	"	- "	68	- North	"	2,583	"	"
9th	"	- "	80	- Bancroft	"	1,601	"	"
9th	"	- "	84	- "	"	7,229	"	"
9th	"	- "	91	- North	"	2,005	"	"
10th	"	- "	5	- Bancroft	"	955	"	"
10th	"	- "	11	- Main	"	8,132	"	"
10th	"	- "	12	- "	"	226	"	"
10th	"	- "	23	- North	"	1,507	"	"
10th	"	- "	26	- Main	"	4,552	"	"
10th	"	- "	50	- "	"	6,048	"	"
10th	"	- "	82	- North	"	2,943	"	"
10th	"	- "	21	- Main	"	4,890	"	"
11th	"	- "	62	- "	"	1,775	"	"
Total "A" Shaft - - - - - - - - - - - -						121,289	"	"

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"B" Shaft

1st Level	- Cont. # 1	- Southeast	Vein	3,339	Tons Mine Tally
1st "	- " 17	- Main	"	5,229	" "
4th "	- " 33	- Fault	"	3,074	" "
5th "	- " 13	- North	"	3,607	" "
6th "	- " 42	- "	"	2,342	" "
7th "	- " 40	- "	"	2,759	" "
7th "	- " 85	- "	"	2,297	" "
9th "	- " 47	- Section 9	"	1,334	" "
9th "	- " 77	- " 9	"	3,394	" "
10th "	- " 14	- Fault	"	4,197	" "
10th "	- " 56	- "	"	3,486	" "
10th "	- " 88	- Section 9	"	3,533	" "
13th "	- " 43	- Fault	"	4,326	" "
14th "	- " 31	- Main	"	2,200	" "
15th "	- " 37	- "	"	1,323	" "
15th "	- " 58	- "	"	207	" "
Total "B" Shaft	- - - - - - - - - - - - - - -			46,647	" "

Summary

"A" Shaft	121,289	tons
"B" Shaft	46,647	"
Total	167,936	" or 45.8% of the product hoisted as shown below.

Total product hoisted 1939 Mine Tally
(No pocket overrun included) --- 368,991 tons

The same figures for the three-year period 1937-1949 inclusive are:

Ore Produced - mine tally (no overruns) 1937-1939 - 1,212,889 tons
" " - by development - 587,765 " or 48.4 %

In that same period our ore reserves increased 4.2% which means although the figures are at variance by 5.8% that generally speaking keeping half the gangs finding new ore will maintain the reserves on an even basis. That means, of course, half our contracts on ore development not rock development. Usually six or seven gangs each month are on rock only and those must be eliminated when considering the 50-50 basis we refer to in this report.

For comparative date for the three years 1937-1939 refer to these figures:

Year	No. of Gangs on Ore Development	Tonnage Mine Tally	Shifts Worked	Tons per Gang per Shift
1939	48	167,936	9,098	18.46
1938	53	167,384	8,538	19.60
1937	45	252,445	12,755	19.79

As mentioned last year, comparisons do not actually mean that the developing miners were less efficient than they were last year or the year before because if a larger proportion of the new ore is obtained from drifts, raises, or narrow lenses, than in the regular 25 ft. heading in the breast or raising stopes, the tons per shift will show a decrease. However, the figures are included because they give us a basis for figuring the contract wages. We mean by that, that a developing miner must be paid at a higher rate per car than the miner mining floors or backs.

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b. Stoping

The table which follows shows the location, the contract number, and the tonnage hoisted or trammed from each gang. These gangs are called depleting contracts because all of them were barring, mining floors, or backs, or gouging out the sides or walls of the old or known stoping areas.

"A" Shaft

2nd	Level	- Cont.	#27	- Main Vein	6,358	Tons	Mine Tally
2nd	"	- "	30	- " "	8,017	"	"
3rd	"	- "	27	- Bancroft Vein	2,530	"	"
4th	"	- "	57	- North "	3,570	"	"
5th	"	- "	45	- Southeast "	2,415	"	"
6th	"	- "	2	- " "	5,150	"	"
6th	"	- "	16	- North "	2,391	"	"
6th	"	- "	51	- Bancroft "	5,746	"	"
6th	"	- "	54	- North "	1,701	"	"
7th	"	- "	15	- " "	4,546	"	"
7th	"	- "	28	- " "	4,652	"	"
7th	"	- "	41	- Southeast "	2,462	"	"
7th	"	- "	52	- Main "	6,568	"	"
7th	"	- "	61	- Bancroft "	7,064	"	"
7th	"	- "	66	- North "	5,696	"	"
8th	"	- "	6	- Southeast "	3,145	"	"
8th	"	- "	59	- Main "	5,980	"	"
8th	"	- "	78	- North "	7,229	"	"
9th	"	- "	22	- " "	1,599	"	"
9th	"	- "	53	- Bancroft "	5,478	"	"
9th	"	- "	70	- " "	8,500	"	"
9th	"	- "	79	- North "	6,111	"	"
10th	"	- "	7	- Main "	3,145	"	"
10th	"	- "	24	- " "	6,129	"	"
11th	"	- "	3	- South Lens	6,757	"	"
11th	"	- "	39	- Main "	4,502	"	"
Total "A" Shaft - - - - - - - - - - - - - -					127,441	"	"

"B" Shaft

1st	Level	- Cont.	#18	- Main Vein	4,814	"	"
2nd	"	- "	63	- North "	5,384	"	"
2nd	"	- "	72	- " "	4,176	"	"
3rd	"	- "	73	- Main "	4,053	"	"
4th	"	- "	71	- North "	2,830	"	"
6th	"	- "	38	- Main "	5,835	"	"
7th	"	- "	19	- " "	394	"	"
7th	"	- "	87	- North "	3,531	"	"
7th	"	- "	90	- " "	4,368	"	"
8th	"	- "	36	- " "	4,420	"	"
8th	"	- "	69	- Main "	5,675	"	"
9th	"	- "	49	- Fault "	7,198	"	"
12th	"	- "	86	- " "	5,035	"	"
13th	"	- "	46	- Main "	8,434	"	"
14th	"	- "	48	- " "	6,494	"	"
Total "B" Shaft - - - - - - - - - - - - - -					72,641	"	"

Recapitulation

"A" Shaft contracts produced	127,441	" "
"B" " " "	72,641	" "
Total -	200,082	" "

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The following data is submitted for general information only and is not intended to show the relative efficiency of the various stoping gangs in the three year period:

Year	No. of Gangs Stoping	Tonnage Mine Tally	Shifts Worked	Tons per Gang per Shift
1939	41	200,082	7,514	26.63
1938	37	153,321	5,494	27.91
1937	38	263,155	10,771	24.43

These figures, as well as those shown under Development, are taken from our contract statements from which we figure contract wages each pay day. They have nothing to do with figures shown on the labor statement and are not figures that ever get on any monthly statements sent to either the General or Cleveland Offices. They are strictly local mine office figures and are kept and tabulated to assist us in figuring monthly contracts.

It might also be added that we had ten gangs during the year doing an unusual amount of barring for a total of 712 man shifts.

Tons per man per day Stoping (Labor Statement)

Year	
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 foregoing figures actually include all miners on ore because of the difficulty of knowing just where to draw the line between stoping and developing contracts each month or actually for each two-week period. The problem is much easier when a whole year is taken for the interval of time in which to divide and separate contracts into these two groups as we consider them in this annual report because we have the engineer's regular maps available and also the annual estimate maps posted up to date.

Following is a detailed account of the work done by the contracts mining developed reserves:

"A" Shaft

2nd Level

Two gangs - #27 and #30 - ate into the developed ore but strictly speaking #27 could have been considered a developing gang. The latter spent November and December 1938 and January of 1939 removing and scraping back 1875 to 1900 tons of rock from off the top of a nice body of clean ore and in 1939 we mined over 6,000 tons of ore formerly buried under the old rock pile. This ore came from the Main Vein between the 500 and 650 East coordinates 400 ft. Northwest of "A" Shaft. About 200 ft. North of #27, Contract #30 also took out floors close to the 3rd level elevation in the Main Vein.

3rd Level

Contract #29 in the Bancroft area near the 200 North and 1200 East intersection took out all the available floor and then started to breast Northeast along the hanging towards the possible upward extension of #76's ore coming up from the 5th level. Most of #29's mining was in the floor of the old stope.

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4th Level

In the North Vein 200 ft. West of the Southwest corner of the Bancroft Lease #57 first extended both the Northwest and Southwest stopes over to the 400 East line and then mined floors out of that area. This contract actually did develop a limited amount of new ore but the most of his 3570 tons of product was taken from floors.

Down in the Southeast corner of the level Contract #45, like #57, first enlarged the ore area in the East end of the Southeast Vein near the intersection 1200 South and 2600 East and then took floors. Directly below #45 on the 5th level some day a drift should be started South to explore the ore found in Diamond Drill Hole #392. At a point 400 ft. South of the present workings in what is probably the downward extension of the old Moro Mine ore body there is probably some high grade ore. The only drawback is the close proximity of the East boundary line of the Oliver Iron Mining Co's Hard Ore reserve.

5th Level

Contracts #2 and #41, both in the Southeast Vein, took out floors and backs; #2 in the central part of the vein spent most of the year mining between the 5th and 6th levels. The other gang took out floors on the 6th up to a point 1150 East of the origin of the coordinate system and then raised up and holed to the 5th and actually made some new ore available at the end of the year.

6th Level

In the North Vein a short distance East of the Bancroft boundary #57 continued to take floors between the 5th and 6th levels.

In the Bancroft leased area down in the Southeast corner #61 and #66 mined out a lot of floor, the two gangs producing almost 13,000 tons. Part of #66's ore came from the North Lens South of the Bancroft Vein.

In the North Vein at the intersection 100 South and 1900 East #54 after barring from May 1938 to November 1939 finally succeeded in making the back safe. In that period it is estimated he barred and blasted down 3,500 tons of "loose" ore. The experience of #54, although not typical, still gives an idea of the situation that we sometimes run into in this property. The writer can well remember #46 barring over two years in "B" Shaft.

Contract #15 down in the Southeast end of the North Vein near the 3000 East coordinate line spent all the year mining floors and barring. They took down over 500 tons of rock before it was safe to proceed with the regular mining operations. At one time so much blasting was necessary that the miner was interfering with the other gangs nearby and when that condition arises we move the miner either onto the night shift or let him work on the days the mine is idle.

7th Level

The contracts mining known reserves between the 6th and 7th levels were #6, #28, #52, #59, and #78. Contract #6 took out floors in the West end of the Southeast Vein. #28, #52, and #78, all mined in the North Vein, with #78 the banner producer with a total of 7,229 tons. Contract #59, one of the best in the mine, had accumulated quite a tonnage by the end of the year.

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8th Level

In the Bancroft Vein #53 took out all the ore they could between the 8th and 9th levels between the 2000 and 2200 East coordinates but they had to be moved when they started interfering with #84. They were then moved 400 ft. further East and started to take the floor around the top of #82's raise coming up from the 10th level.

In the North Vein over on the West side #79 by swinging over to the South along the hanging were able to mine a fair quality of ore.

Over in the Northeast corner of the property #22, afterwards called #92, started mining the floor in old #12's working place.

9th Level

In the Bancroft area #70 although actually developing and enlarging the known limits of the East end of the Bancroft Vein spent most of the year taking out floors.

In the Main Vein #7 mined out a large floor East of the 2200 East coordinate line from the 9th to the 10th levels. At the end of the year we had over 5,000 tons of broken ore in this one contract.

10th Level

Contract #24 in the Northwest corner of the Main Vein took out all the available floors and backs tributary to their 10th level raise and then moved Northeast to #62's raise coming up from the 11th level and started to mine the 10th level floor.

In the South Lens #3 continued to mine halfway down to the 11th level. We continue to mine and find more ore here than was unknown to us a year ago. It now looks as if the ore would go back North under the main 10th level motor track.

11th Level

Only one gang - #39 - barred, sliced, and mined back in the central part of the Main Vein. The miner barred for three straight months before it was judged safe to proceed with regular mining operations.

"B" Shaft

1st Level

Contract #18 although classified here as a depleting gang actually can be considered a developing gang even though they mined floors all year. This area of the Main Vein on the 1204 ft. sub level 600 ft. Southwest of "B" Shaft was supposedly all mined out but the jasper foot was only a thin seam and 4,810 tons of some of the best ore in the mine came from #18. It is a little hard to get at and has to be rescraped three or four times with two separate scrapers but the ore is too high quality to leave behind.

In the North Vein 400 ft. Northwest of "B" Shaft Contract #63 and #72 continue to take floors when they are not barring. We have had a lot of trouble here with "loose". #63 spent one-third of the year barring and #72 spent all of 1938 and nine months of 1939 barring. However, we have ore in the floor going down to the 3rd level and so must keep barring until the back is absolutely safe.

3rd Level

#73 a short distance West of "B" Shaft in the Main Vein ran into a bad barring situation which was not cleaned up until the middle of December. However, they gave us at least half normal tonnage in 1939.

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4th Level

#71 finished the floors in the North Vein directly North of "B" Shaft and then moved to the 5th level Fault Vein. There is still some ore Northwest of "B" Shaft that should be looked for by putting up some new raises from the 5th level.

5th Level

In the North Vein 600 ft. Northwest of "B" Shaft #72 took down most of the available back, steadily accumulating ore all year. A new scraper hoist was installed here late in 1939 and we hope to be able to hoist some of this ore early in 1940.

6th Level

Contract #38 in the Fault Vein skimmed ore off the foot just North of the intersection 800 South and 1200 West and then found so much ore here that we decided to follow it up on the foot. Raises were put up to the 5th level and we believe that we have found enough ore to keep him busy for four or five years. Again, although this contract mined floors most of the year they have as far as old reserves are concerned not mined in any known ore area.

In the Main Vein #19 who started barring in September 1938 kept up barring and accumulating ore until December 15, 1939, but we did get a few tons of ore from this working place late in December.

7th Level

Two gangs in the North Vein - #87 and #90 - Northwest and North of "B" Shaft mined floors all year.

8th Level

Contract #36 in the North Vein gave up the idea of trying to get any more of the ore between the 6th and 8th levels because of a very bad hanging and so were forced to write off the North Vein tonnage as unavailable. The miner then dropped down the main raise going to the 10th level and started to take the floor.

Down in the Main Vein 600 ft. South of #36 Contract #69 continued to mine backs.

9th Level

Out in the Southwest corner of the level in the Fault Vein #49 spent all year mining backs. They also enlarged the known ore area by breasting Northeast.

12th Level

Contract #86 mined floors between the branch raises put up by #58 from the 15th level in the Fault Vein 1200 ft. West of "B" Shaft.

14th Level

Two of the best producing gangs in the mine - #46 and #48, giving us nearly 15,000 tons in 1939, mined floors in the South side of the Main Vein. The latter contract - #48 - also extended the known ore limits farther to the North along Diamond Drill Hole #449.

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c. Drifting and Raising

Year	Rock Drifts and Raises	Ore Drifts and Raises	Total
1939	2,130 ft.	2,270 ft.	4,400 ft.
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 "

We did a little more drifting and raising in 1939 than was done in 1938 but we also worked 19 more shifts in 1939 over the 191 operated in 1938.

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d. Explosives, Drilling and Blasting:
Explosive Statement for Year 1939

Stoping and Development in Ore

	Quantity	Average Price	Cost 1939	Cost 1938
60% L.F. Gelatin				5,060.60
Gelamite #1	305,500	11.82	36,108.36	32,026.05
Total Powder	305,500	11.82	36,108.36	37,086.65
Fuse - feet	551,200	5.67	3,123.22	2,658.51
#6 Caps	91,500	12.80	1,171.09	878.69
Electric Caps	1,225	11.91	145.92	253.79
Fuse Lighters	23,435	6.83	159.92	134.37
Wire (#18 Shot Cord)	4,300		47.02	34.79
Fuse Cans, etc.			64.44	18.87
Tamping Bags	36,250	3.67	133.27	74.52
Power Bags & Miscellaneous			33.14	42.12
Total Fuse, etc.			4,878.02	4,095.66
Total - Stoping & Development in Ore			40,986.38	41,182.31
Product			387,258	327,162
Lbs. of Powder per ton of ore			.7890	.9140
Cost per ton for powder			.0932	.1134
" " " fuse, etc.			.0126	.0125
" " " all explosives			.1058	.1259

Development in Rock

60% L.F. Gelatin				981.50
Gelamite #1	41,100	11.76	4,834.50	4,858.12
Total Powder	41,100	11.76	4,834.50	5,839.62
Fuse - feet	58,000	5.67	319.44	373.82
#6 Caps	7,400	12.50	92.82	115.63
Electric Caps	275	11.91	33.82	139.31
Fuse Lighters	965	6.83	12.63	20.31
Wire	1,500		19.86	10.08
Tamping Bags	3,750	3.67	11.13	10.55
Miscellaneous			10.91	1.03
Total Fuse, etc.			500.61	670.73
Total - Development in Rock			5,335.11	6,510.35
Feet - Rock Development			2,130	2,337
Cost per ft. - Rock Development			2.52	2.79
GRAND TOTAL - All Explosives			46,321.49	47,692.66
Average Cost per lb. for Powder			.1181	.1241

Following are comparative figures for past 9 years:

Year	Lbs. Powder per ton of Ore	Cost per Ton for Powder
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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It will be seen that the amount of powder used per ton of ore in 1939 was less than the average for the past 5 years. We believe one reason for this is due to trying to prevent the miners blasting during the working shift and compelling all of them as far as possible to confine all blasting to the end of the shift. That procedure has a tendency to reduce the bull-dozing and increases the amount of block holes drilled. It is obvious that the powder used when block holing is only a fraction of what is used when bull-dozing.

Sometimes the character of the ore changes in the working places and we find more gangs mining the specular slate and magnetite ores which require less powder than steel or conglomeritic ore.

For sake of comparison we show the various types of ores in the different contracts for a typical month:

	Dec. 1937	Dec. 1938	Dec. 1939
Specular Ore Contracts	41.1 %	50.5 %	52.2 %
Slate " "	17.5 %	17.4 %	19.3 %
Steel " "	29.1 %	24.2 %	20.5 %
Magnetite " "	11.2 %	7.9 %	8.0 %
Conglomerate "	1.1 %	0.0 %	0.0 %
	100.0 %	100.0 %	100.0 %

The above would indicate that we might expect some decrease in powder consumption but also some decrease in the amount of lump produced because of the change of the character of the ore from steel to slate or specular ore.

Another reason for less powder being used might be the more general use of tamping bags. We doubled the purchase of these in 1939

8. COST OF OPERATING

a. Comparative Mining Costs

	1939	1938	Increase	Decrease
PRODUCT (Tons)	387,258	327,161	60,097	
Underground Costs	1.572	1.735		.163
Surface Costs	.260	.279		.019
General Mine Expense	.374	.386		.012
Cost of Production	2.206	2.400		.194
Depreciation	.004	.003	.001	
Taxes	.365	.431		.066
Loading & Shipping	.082	.024	.058	
TOTAL COST AT MINE	2.657	2.858		.201
No. of Days Operating	210	191	19	
No. of Shifts & Hours	2 8-hr	2 8-hr		
Average Daily Product (Tons)	1,844	1,713	131	

The average daily product for the past eleven years follows. It will be noted that the figure for 1939 surpassed the 1937 daily output and that the big increase came in the last five months of the year when the mine was pushed to almost 2,000 tons per day.

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Year	Average Daily Product
1939	1,974 (August to December inclusive)
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 larger daily output maintained the latter part of 1939 was due to extra efforts made to meet sales of lump ore. An average of nearly 2,000 tons per day could not be maintained in December 1939 nor will we do so in January or February 1940 because as yet we only have about 20% of the new equipment ordered last Fall to increase production. We have two of the new ten scraper hoists but only portions of the balance have gone through the main shops which are the bottle neck at the present time holding up deliveries simply because the shops are overcrowded with repair work. Furthermore, even if we had the hoists built by the Lake Shore Engine Works some delay would ensue due to difficulty in getting over two 25 h.p. motors per month from the General Electric Company. In the meantime we have hired about 20 new young men who are being trained and broken in to be available to take their places when the new mining gangs are organized.

It must be remembered that in 1937 we increased production by operating six days per week with every man working the sixth day so that we were on a 48-hour-per-week schedule. That meant an extra 40 days product or about 55,000 tons, Saturday being a short shift, that could be secured yearly without increasing the number of gangs or buying any new equipment. Now we are attempting to increase production and still keep within the 40-hour week. That means crowding the mine all five days and means one less day per week in all our development drifts and raises.

Our present surface equipment is ample for the demands we are making with one exception and that is the motor generator sets for the electric haulage system. The two we have are both running simultaneously after synchronizing them with difficulty each morning and both are old sets moved from other properties. What we really need is a new 250 k.w. unit big enough to take the load alone. Purchase of that unit should be made early in 1940 to avoid a possible breakdown and serious delay.

Exploring in Mine

Year	Labor	Supplies	Total
1939	$ 8,382.45	4,179.33	12,561.78
1938	4,686.91	3,104.43	7,791.34
Increase	3,695.54	1,074.90	4,770.44

The above can be broken down as follows:

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	1939	1938
Labor for Diamond Drilling	$ 3,470.89	2,833.00
Proportion of D.D. Supt's time	110.91	155.48
Carbon Loss	1,565.84	1,961.89
Pipe & Fittings	26.85	59.70
Drill Equipment & Repairs	452.28	259.18
" " Rental	440.00	412.50
Miscellaneous Supplies	50.20	76.15
Compressor Expense	535.00	475.00
Total Drilling Cost	6,651.97	6,232.90
Miscellaneous & Direct Charges	533.49	515.97
Analysis Expense	363.16	320.76
Geological Dept. Expense	5,013.16	2,368.16
GRAND TOTAL	12,561.78	9,437.79
Feet drilled	1,792	1,848
Cost per foot	4.212	3.825

The increase in cost per foot is entirely due to labor charges both for the drill crew and the supervision and overhead from the Geological Department. Some of the latter charge could have been buried in the Ishpeming Office Expense but it was believed advisable to bring it out in the open and charge the cost of the Geological Department personnel where it properly belongs.

Furthermore, to show the various types of ground drilled in 1939 and 1938 the following data is given:

	1939		1938	
	Feet	%	Feet	%
Ore footage drilled	111	5.7	159	8.6
Lean Ore " "	186	10.5	124	6.7
Hard Ore Jasper ft. drilled	516	28.8	384	20.8
Soft " " " "	23	1.3	124	6.7
Dike " "	309	17.3	799	43.2
Chert " "	282	15.8	11	0.6
Siderite " "	84	4.8	155	8.4
Slate " "	281	15.8	92	5.0
Total	1792	100.0	1848	100.0

We drilled a larger footage in the harder materials in 1939 which would have a tendency to increase costs.

Development in Rock

So that proper comparisons can be made we submit the figures for the past five years.

		Labor Cost		Supply Cost		Total Cost	
Year	Footage	Total	Per Foot	Total	Per Foot	Total	Per Foot
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
1935	3043	19,725.90	6.48	11,486.68	3.77	31,212.58	10.25

So that a more intelligent comparison can be made, the following gives more detailed data for rock work:

	1939	1938	1937	1936
Rock Raises	318'	663'	1657'	1060'
10'x10' Main Haulage Drifts	1104'	1389'	1906'	2105'
8' x 8' " " "	708'	285'	729'	957'
Total	2130'	2337'	4292'	4122'

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In 1939 21%, or about one-third, of the development work was done in the harder material, while in 1938 31% of all the rock drifts and raises were driven in jasper or lean ore which is just about as hard to drill and blast as jasper. The unit cost for 1939 shows a decrease which we believe is largely accounted for by a lesser footage of hard rock.

Development in Ore & Stoping

The two accounts - Development in Ore and Stoping - are run together because it is very hard to differentiate between the two captions as previously mentioned in this report. We probably had 10 to 12 gangs each month that could properly be classified either way. That may seem a strange statement but not for one familar with underground conditions. The point is we always try to have two headings, breasts or places, for each miner to work so that while scraping from one place the miner is in the other drilling and getting ready to blast. One can readily see that any miner could be driving a breast stope ahead on one side of his raise, which we would call developing, and take floors, backs, or trim ore off foot or hanging on the other side of his raise, which means stoping or mining developed reserves. The two operations are difficult to separate, particularly the tram car tally from the one raise. Supplies could not be allocated properly without each miner becoming a bookkeeper

Following are the costs for the last three years:

Year	Labor Cost	Supply Cost	Total Cost
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 details for the last two years follow:

	1939		1938	
Labor	Total	Cost Per Ton	Total	Cost Per Ton
Miners' Labor	$ 121,372.98	.313	108,892.97	.333
Other "	55,306.25	.143	50,069.51	.153
Total "	176,679.23	.456	158,962.48	.486
Supplies				
General	1,212.42	.003	1,066.42	.003
Iron & Steel	10,160.56	.026	9,336.15	.029
Oils	641.02	.002	593.47	.002
Machinery	1,493.20	.004	2,872.43	.009
Explosives	40,986.38	.106	41,182.31	.126
Lumber	24.41		189.82	
Sundries	4,441.56	.012	1,367.19	.004
Expense Accounts	8,868.53	.023	6,184.84	.019
Total Supplies	67,828.08	.175	62,792.63	.192
TOTAL LABOR & SUPPLIES	244,507.31	.631	221,755.11	.678
Tons Hoisted	387,258		327,161	

It will be noted that 1939 shows a decreased unit cost in both supplies and labor. Part of this is due to the 1938 costs being high due to storing ore in stopes in order to reach the hanging. There is no doubt but what we broke more ore than we hoisted in 1938. In 1939 at the beginning of the year the bosses reported 16,540 cars of broken ore in the stopes and at the end of the year this had increased to 16,935 cars so that we also accumulated some broken ore tonnage underground during 1939, but not in the same degree as 1938.

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Timbering

Year	Total Cost	Cost per Ton
1939	$ 11,117.41	.029
1938	10,640.09	.033
Increase	477.32	
Decrease		.004

The unit cost for 1939 shows a drop due to fewer chutes built in the raises. Practically all the timbering cost in this mine is either building new or rebuilding old chutes.

Tramming

	Labor		Supplies		Total	
Year	Total	Per Ton	Total	Per Ton	Total	Per Ton
1939	$142,284.89	.367	10,709.11	.028	152,994.00	.395
1938	127,736.29	.390	10,648.82	.033	138,385.11	.423
Increase	14,548.60		60.29		14,608.89	
Decrease		.023		.005		.028

Unit cost shows a drop because of larger daily average hoist. With the exception of December, we had just about the same number of men on the tramming system for the two years.

Ventilation

Year	Cost
1939	$ 428.98
1938	1,127.87
Decrease	698.89

The principal expense in 1939 was the purchasing of another #2½ "B" Anaconda Type Fan 4,000 cu.ft. capacity, powered with a 5 h.p. 1750 RPM DC motor. That gives us four complete new units because we bought three in 1938. Now we should purchase at least two air driven blowers to be used on levels where no electric current is available.

Pumping

		Total	Cost per Ton
Operating Cost as per 1939 Cost Sheet	-	$ 31,457.57	.081
Maintenance " " " " "	-	1,739.11	.004
Total	-	33,196.68	.085
Operating Cost as per 1938 Cost Sheet	-	34,835.33	.107
Maintenance " " " " "	-	2,545.60	.008
Total	-	37,380.93	.115

The detailed cost for the two years follow:

	1939	1938
Maintenance	1,739.11	2,545.60
Pumpmen Labor	8,028.93	8,667.99
Other "	729.20	2,729.89
Total "	8,758.13	11,397.88
Compressor Expense	600.00	600.00
Oil, Waste, and Packing	223.32	165.11
Tools, etc.	82.99	61.07
Electric Light	328.71	381.34
" Power	21,464.42	22,229.93
Total Operating Expense	31,457.57	34,835.33
" Maintenance & Operating	33,196.68	37,380.93
Gallons of Water Pumped	363,540,036	362,484,824
" " " " per minute	691	690

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Costs for 1939 show a decrease both in maintenance and operating accounts. In 1938 costs were above normal due to cleaning all four sumps, one at the bottom of each shaft, one small sump South of the main sump, and the latter which is the big job. The big sump located under the pumphouse was cleaned in 1927, again in 1932, and again in 1938. It probably will not need further attention until 1943 or 1944. No calamity would result even if we got caught with the current off with the big sump full of mud and silt because we have storage capacity on our 15th level plat and drifts to take care of all incoming water for six or seven days.

The main pumps are elevated nearly 10 ft. above the 15th level floor. The main drifts running East and West are fairly flat and we can back water up for 3,000 ft. each side of the pumphouse before the water would reach the pumphouse floor. We have installed a special bridge and opening to the cage shaft to permit the pumpmen reaching the shaft when the level is flooded.

The real reason for cleaning the sump is to prevent mud and silt getting into the pumps and valves and perhaps causing the same distress the Inland Steel Company had at the Morris Mine when three pump motors burned out the same day.

The power costs show a decrease also which can best be explained by the following figures:

Year	K.W.Hours	Rate	Cost
1939	1,334,277	.0161	$ 21,464.42
1938	1,348,611	.0167	22,609.47
Decrease	14,334	.0006	1,145.05

The following tabulation shows the gallons per minute pumped each month for the past two years. The table gives evidence of a very rainy spell in the latter part of May, all of June, and the forepart of July. In June this year in Ishpeming rainfall was 8.63" compared with 3.70" in 1938. The year's average of 33.58" was a little below the total of 35.32" for 1938. The figures follow:

	Gallons per Minute	
Month	1939	1938
January	627	624
February	620	654
March	615	621
April	677	741
May	786	750
June	809	733
July	799	729
August	751	694
September	732	694
October	668	677
November	621	697
December	613	658
Average for Year	691	690

Compressors, Air Pipes, & Power Drills

	1939 Total	Per Ton	1938 Total	Per Ton
Compr. & Air Pipes	$ 34,510.90	.089	33,004.48	.101
" & Power Drills	1,533.95	.004	4,441.00	.014
Total	36,044.85	.093	37,445.48	.115

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Breaking down these figures gives this picture, viz:

	1939	1938
Labor for Compressors & Air Pipes	$ 4,121.83	3,557.25
" " " & Power Drills	804.94	334.31
Total Labor	4,926.77	3,891.56
Supplies for Comprs. & Air Pipes	30,389.07	29,447.23
" " " & Power Drills	729.01	4,106.69
Total Supplies	31,118.08	33,553.92
Grand Total	36,044.85	37,445.48

The foregoing indicates a lower cost per ton for 1939 and it will be seen that the decrease is in Compressors & Power Drills. Analyzing that account shows that although we purchased 19 new drifting drills, only one was charged to the operating accounts. These drills actually cost $7,980.00 and if all of them had been charged to operating our cost per ton would have shown an increase. The rest of the drills carry a monthly depreciating charge, the rate depending on the pre-determined life of the machine.

The following table shows the amounts of air and water pipes installed the past two years:

Size	1939	1938
1/4" Pipe	-	130'
1/2" "	708'	709'
3/4" "	1137'	6738'
1" "	6812'	5566'
1 1/4" "	907'	590'
1 1/2" "	462'	229'
2" "	5294'	3978'
3" "	-	100'
Total	15320'	18040'

As a matter of interest, in 1937 we installed 31,557 ft. of new pipe because we changed, revamped, and enlarged both air and water lines on the 6th, 7th, 8th, 9th, and 10th Levels "A" Shaft. In 1938 and 1939 we used only a normal amount of new pipe.

If, however, we find it possible to put more than five or six gangs of miners in the Section 9 ore body, we will probably have to change the "B" Shaft piping on the 9th and 10th levels before very long.

New Drills Purchased in the last three years:

	1939	1938	1937
N-75 Ingersoll-Rand Standard Drifters	1	9	14
DA-35 " " " "	15	0	0
D-12 Cleveland "	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	23	9	26

We stopped purchasing the Ingersoll-Rand N-75 machines which have been standard at this mine for twelve years and changed to the Ingersoll-Rand DA-35 type because it drills about 10% faster.

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Back Filling

Year	Total	Cost per Ton
1939	$ 4,385.93	.011
1938	3,913.24	.012
Increase	472.69	
Decrease		.001

Cost increase is just about the same as the increase in the number of working days.

Underground Superintendence

Year	Total	Cost per Ton
1939	$ 21,066.63	.054
1938	19,387.57	.059
Increase	1,679.06	
Decrease		.005

There were no changes in the underground bossing personnel and total cost increased 8.6%. The 1939 working schedule shows a 10% increase in the number of days operated. The discrepancy is due to the fact that the shift bosses in 1938 were allowed to work not less than four days per week doing repair work.

Scrapers & Mechanical Loaders

	Labor Cost		Supply Cost		Total Cost	
Year	Total	Per Ton	Total	Per Ton	Total	Per Ton
1939	$ 10,476.58	.027	24,217.44	.063	34,694.02	.090
1938	11,874.08	.036	22,347.97	.069	34,222.05	.105
Increase			1,869.47			
Decrease	1,397.50	.009		.006	471.97	.015

	1939		1938	
	Amount	Cost	Amount	Cost
3/8" Wire Rope	2,701'	227.27	1940'	164.02
1/2" "	6,750'	672.42	5418'	582.50
5/8" "	39,630'	6901.39	41731'	7522.60
Electric Cables - No. 6	2,450'	811.75	2180'	759.86
* " Motors	1 (New)	256.96	3 (New)	821.04
** New Scraper Units	5 (new)	2721.27	3 (New)	1650.00
General electrical Repairs & Renewals		12626.38		10847.95
Total		24217.44		22347.97

* Four other new motors costing $1027.84 charged to E & A's
** Other new units - four - built at General Shops charged to E & A's

We have continued to use "Trulay" 5/8" rope for all our 25 h.p. scraper hoists, of which we now have 87, and we show a gratifying decrease in the consumption of rope.

Year	Product	Type of 5/8" Rope Used	Feet Purchased	Cost	Unit Cost
1939	387,258 tons	"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

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The year 1937 is omitted because we made the change from "Standard" to "Trulay" in that year and the figures for 1938 are probably not indicative of the truth because it takes months to use up all the old rope underground. Furthermore, the use of "Trulay" was justified because we suffered no lost time accidents in 1939 from infections resulting from pieces of wire rope getting into hands or fingers. In past years we have had some bad infection cases. Furthermore, we were fortunate in having only five one-day reports turned in for men getting slight hand injuries from that cause. In four cases the bosses reported the men were wearing gloves.

Electric Tram Equipment

	1939					
	Labor	Supplies	Total	Labor	Supplies	Total
Generator & Motors $	25.00	131.18	156.18	55.11	10.51	65.62
Locomotives	1145.53	7939.52	9085.05	2021.43	2248.36	4269.79
Wiring	577.93	2605.44	3183.37	497.62	595.03	1092.65
Main Line Tracks	4984.55	2311.78	7296.33	5196.45	3512.60	8709.05
" " Cars	1992.43	4367.57	6360.00	3130.26	1577.42	4707.68
Spotting Engines	-	82.18	82.18	-	16.96	16.96
Total	8725.44	17437.69	26163.11	10900.87	7960.88	18861.75

Five new batteries were charged in 1939 costing $3857.56
New Cable in "B" Shaft " " " " 1296.71

Only two 25-cell Exide batteries were originally charged to operating accounts. The other three, of which one was a 48-cell unit, and two other 25-cell batteries, were first taken up on E & A's and later charged back into the operating account. Every new battery was of the Ironclad Exide type replacing the old Edison batteries used here for years. The latter is a very fine battery and very dependable but has one serious defect and that is the difficulty of making cell replacements due to swelling of old cells and trays. We find when we have trouble with the Exide batteries we can take out the spent cell and repair it. The Edison batteries had to be removed as one single unit but we now have a new Edison battery here on trial for a year that the management claims will not give us the trouble as outlined.

Further, the Exide batteries cost less and as near as we can ascertain give us just about as long a life so that the ton-mile cost is less for the Exide units.

We had a bad run on rectifier tubes used for charging batteries - 32 were purchased in 1939, but only 3 were used in the last three months. As the usage of these tubes was excessive, the matter was taken up with the General Electric Company engineers and they agreed that the charging rate was excessive. However, we did not believe that to be the trouble because we have not changed our switchboards for years. We found instead that just as soon as the new batteries were installed the trouble vanished and so it was obvious that the real crux of the bad situation lay in trying to use the old batteries too long beyond their intended life.

It will also be noted that we had a heavy expenditure for supplies for the main line cars due to employing a blacksmith and helper underground from March to the end of the year repairing cars on the 5th, 8th, 10th, and 15th levels. We have to, about once in every two or three years, give the cars a general overhauling and because of the small compartments in the shaft making it necessary to take the cars up and down in sections, we repair underground.

The cost for wiring also shows a large increase largely due to bonding rails.

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Hoisting

Comparative date for 1939 and 1938 follows:

	1939	1938
Maintenance	$ 6,285.80	4,210.44
Operating Expense:		
Engineers' Labor	8,794.95	8,203.99
Other "	1,255.73	1,338.99
Total "	10,050.68	9,542.98
Supplies		
Oil, Waste & Packing	91.94	89.67
Tools & Miscellaneous	93.99	67.11
Electric Lights	202.68	191.46
Electric Power	13,457.48	12,457.97
Compressor Expense	330.00	300.00
Heating Expense	835.13	796.73
Total Supplies	15,011.22	13,902.94
Total Operating Expense	25,061.90	23,445.92
Total Maint. & Operating Expense	31,347.70	27,656.36
Cost per ton produced	.081	.085
Tons Ore & Rock Hoisted	417,884	352,983
Average depth hoisted	759'	741'

The maintenance cost exceeded that of the year before by 50%. That cost was unusually low in 1938 as will be noted, viz:

1936	Hoisting	Maintenance	Cost	$ 5,321.99
1937	"	"	"	6,808.47
1938	"	"	"	4,210.44
1939	"	"	"	6,285.80

What has happened is simple - No new hoisting ropes were put into service in 1938. In 1937 a new cage rope went onto both "A" Shaft and "B" Shaft cages - one in March and the other in May 1937. In 1939 we put two new ropes on in March at a cost of $1410.00. We also put a second hand rope on the "B" Shaft counterweight in August 1939. Those items account for the difference in cost.

The operating expense naturally shows an increase of 7% in total cost because of more days in the hoisting cycle. Unit cost shows a decrease because of larger daily average hoist.

Stocking Ore

Total for 1939	$ 14,470.96	Cost per Ton	.037
" " 1938	17,586.66	" " "	.053
Decrease	3,115.70		.016

Cost for 1938 higher because of small shipments from pockets. Ore was stocked at least part of every single month in 1938. Shipments from pocket were started to the dock in late April 1939 and by July the dock was taking all of our product which continued to late in November.

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Screening & Crushing at Mine

	1939		1938	
	Amount	Per Ton	Amount	Per Ton
Labor	$ 13,501.62		11,452.26	
Supplies	7,490.14		6,301.52	
Total	20,991.76	.054	17,753.78	.053

The mine was closed down from April 6th to April 20th for crusher repairs. About five years ago a crack started to form in the bowl of the large crusher and in order to prevent a complete failure, with consequent shut down, a heavy steel ring 8" wide and 4" thick, made in two sections, was bolted outside the bowl. After this was drawn up tight, molten zinc was poured in between the ring and the outside of the bowl to take up all air spaces. This repair job lasted until February 1939 when we noticed the crack opening up and the zinc being gradually squeezed out. By March the crack was open 3/4" and it was then apparent that we were in for a shut down period.

Some years ago when the old South Jackson crusher building was dismantled, we salvaged all the parts of the crusher in that plant as it was a duplicate of the Cliffs Shaft equipment. In the meantime we had moved the Jackson crusher to the Cliffs Shaft and late in March we started making repairs, principally welding, on the old Jackson crusher to make it serviceable for our use. It took us two weeks to make the change and our crusher at the Cliffs Shaft is now as good as new.

Dry House

Year	Total	Cost per Ton
1939	$ 6,046.22	.016
1938	5,675.85	.017
Increase	370.37	
Decrease		.001

As mentioned before, the dry house roof was completely repaired late in 1939 by putting on another layer of roofing paper.

We also installed a new stoker for the dry heating plant but as this was not done until late in December it is impossible in this report to record any advantage. It has accomplished one thing and that is the elimination of the smoke nuisance. We still have to correct, however, the blowing out of the soot when cleaning flues which by the way is not as frequent since we installed the stoker due to better combustion.

General Surface Expense

Year	Total	Cost per Ton
1939	$ 7,355.54	.019
1938	10,293.62	.032
Decrease	2,938.00	.013

The general surface expense in 1937 was still higher at $10,596.66 but that can be explained by the fact that we were working six days a week paying time and a half for Saturdays. In 1939, however, we operated more days than in 1938 and the only explanation for the decrease is the laying off of a number of old employees in March 1939. Most of these men did little useful work. If we had not decreased costs in 1939, all our arguments for retiring these men would have been false.

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Shaft

Year	Total	Cost per Ton
1939	$ 9,650.40	.025
1938	1,676.84	.005
Increase	7,973.56	.020

Cost for 1939 above normal due to two unusual repair jobs. We retimbered "B" Shaft from the 5th to the 6th levels and also retimbered No. 3 Shaft from surface to the ledge. A few years ago we retimbered "A" Shaft from the 7th to the 8th levels. The 5th to 6th level lift in "B" Shaft has been gradually getting worse and finally early in 1939 we could no longer keep the storage or dumping pocket on the 5th level lined up to prevent ore falling down the shaft. When we found that the mine would have to be closed to repair the crusher we decided to take the opportunity to repair the shaft.

The No. 3 Shaft is the air shaft located East of 7th Street North of the main warehouse. An inspection trip through this shaft showed the ladder road to be dangerous as the wall and end shaft timbers were so rotten that the ladder sollars were not safe. We use this shaft not only for the downcast or incoming air but also as another outlet for the men in case of an emergency. We found it necessary to start at the top and put in close sets all the way down to a point about five feet below ledge. A temporary derrick was erected and a timber hoist borrowed from the Maas Mine. A crew of five men worked on this job for six weeks.

Top Tram Equipment

Year	Total	Cost per Ton
1939	$ 5,449.54	.014
1938	4,761.30	.015
Increase	688.24	
Decrease		.001

Total cost increased due to building another new side dumping car for the Bancroft crushed pile. We also had to install the spare 100 h.p. motor for the unit that pulls the cars up the incline from the shaft houses to the crusher building and repair the old motor that burned out early in April 1939.

We are now building a new side dump 10-ton, two-truck, eight-wheel, steel car as a spare for the lump stockpile. If we had trouble or should have our present car go over the dump, the only spare we have is the old 5-ton wood car that is now too small to keep the skip going.

Docks, Trestles & Pockets

Year	Total	Cost per Ton
1939	$ 1,855.24	.005
1938	2,870.93	.009
Decrease	1,015.69	.004

As a matter of information, note costs for the past four years:

Year	1939	- $ 1,855.24
"	1938	- 2,870.93
"	1937	- 3,802.86
"	1936	- 4,631.48

Most of the expense for previous years has been involved in rebuilding the pockets in both shaft houses and also the loading pockets and permanent trestle at the crusher building.

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General Mine Expenses

	1939	1938
Mining Engineering	$ 3,947.48	3,769.93
Mechanical & Electrical Engr.	2,519.99	2,138.64
Analysis and Grading	15,407.46	11,396.69
Safety Department	2,163.50	2,276.50
Telephone & Safety Devices	5,804.41	3,941.06
Local & General Welfare	7,411.73	7,459.07
Special Expense, Pensions & Allows.	11,051.01	9,924.89
Ishpeming Office	22,398.74	20,868.83
Mine Office	21,824.36	20,761.74
Insurance	3,928.92	309.21
Personal Injury	19,187.00	18,854.99
Social Security Taxes	21,923.31	20,201.56
Employees' Vacation Pay	7,308.43	5,183.12
Total General Mine Expenses	144,876.34	126,467.81
Cost per Ton	.374	.386

Practically all the above charges are made by the Ishpeming or Cleveland offices but there are some accounts where the major portion of the costs are charged out by the Mine Office. For instance, the account Telephone & Safety Devices, shows the largest proportionate increase due to buying new mine telephones, safety goggles, transformers for lighting circuits, gloves, etc. We tried to improve the telephone system and found we had two kinds of phones of different resistances and were advised to standardize on one type of phone. Safety goggles or glasses were furnished to every employee and the hard toe boot rule enforced for all surface employees.

Safety goggles have decreased eye accidents as is evident from following tabulation:

Year	1936	- 269 days operated	-	26	eye accidents	
"	1937	- 297 " "	-	38	"	"
"	1938	- 191 " "	-	16	"	"
"	1939	- 210 " "	-	10	"	"

Only one of the 10 accidents for 1939 was classified as lost time, the other 9 being reported on the one-day forms.

9. EXPLORATIONS

Following are the diamond drill holes drilled for the year:

	Total Depth	Feet of Ore
D. D. Hole #463	154'	None
" 464	123'	"
" 465	214'	"
" 466	178'	26'
" 467	426'	29'
" 468	137'	8'
" 469	155'	8'
" 470	75'	None
" 471	106'	26'
" 472	224'	14'
	1792'	111'

The diamond drilling campaign gave us some new leads for prospective ore lenses.

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Directly South of "B" Shaft and to the West of the Lake Superior Iron Co's boundary we found some ore that we are now drifting for. What the ore will amount to only the future will show, but at all events we have found a lead in an area where no ore has ever been mined.

On the 9th Level "B" Shaft we found by drilling what is probably the Easterly extension of the Fault Vein. This was an exceptionally good find because we cut 26 ft. of high grade ore, but almost 80 ft. of mineable ore.

On the 10th level in the Section 9 territory another lens of ore was discovered to the North of our present known ore areas discovered either by drifting, raising, or surface drilling.

10. TAXES

Comparative data for 1939 and 1938 for the area called the Cliffs Shaft Mine follows:

	1939		1938	
	Valuation	Taxes	Valuation	Taxes
Realty	$ 2,275,000	79,397.50	2,560,000	92,637.44
Minerals under NW¼ Sec. 9-47-27	100,000	3,490.00	100,000	3,618.65
Personal	1,130,000	39,437.00	690,000	24,968.68
Lot 2, Sec. 3-47-27 (Bancroft)	450,000	15,705.00	450,000	16,283.93
SE¼ of NE¼ Sec. 9-47-27 (Barnum)	52,000	1,814.80	52,000	1,881.70
Lot 174, Nelson Addition	100	3.49	100	3.62
South 35.91 ft. of Lot 179	50	1.75	50	1.81
Total	4,007,150	139,849.54	3,852,150	139,395.83
Collection Fees		1,398.50		1,393.96
GRAND TOTAL		141,248.04		140,789.79
Taxes per ton produced		.3647		.4303
" " " shipped		.2388		.8636

Valuations for the past few years are shown for comparison:

Year	Taxes	Valuation
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
1930	146,588.82	3,725,150

The valuation for 1939 is the highest in the past ten years but the amount of taxes paid were greater in 1930 and 1931.

The tax rate for 1939 was $34.8999 compared with $36.1865 in 1938. The following table will show where the reduction took place.

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City of Ishpeming Tax Levy

	1939		1938	
	Amount	Rate	Amount	Rate
Valuation	$ 10,906,510.00		10,541,910.00	
Funds				
County Tax	$ 64,893.73	5.9500	65,886.94	6.2500
County Road Tax	22,358.35	2.0500	20,029.63	1.9000
County Debt Service Tax	-	-	1,080.31	0.1025
City Contingent Tax	64,500.00	5.9139	55,400.00	5.2552
City Debt Service Tax	8,005.00	0.7340	8,170.00	0.7750
Street & Highway Tax	80,000.00	7.3350	79,000.00	7.4939
Fire Fund Tax	20,000.00	1.8338	34,400.00	3.2632
Library Tax	10,900.00	0.9994	10,200.00	0.9676
Water Tax	-	-	700.00	0.0663
Sewer Tax	8,000.00	0.7335	3,500.00	0.3320
Cemetery Tax	9,200.00	0.8435	9,200.00	0.8727
School Tax	75,254.92	6.9000	71,157.89	6.7500
School Debt Service Tax	17,525.00	1.6068	22,750.00	2.1581
Total Taxes	$ 380,637.00	34.8999	381,474.77	36.1865
Rejected County Tax			56.32	
Rejected City & School Tax			180.83	
TOTAL	$ 380,637.00		381,711.92	

The above indicates that there was a reduction in both County and City tax rates.

11. ACCIDENTS AND PERSONAL INJURIES

The figures that follow give the number of accidents occurring at this property over the last five years:

	1939	1938	1937	1936	1935
Number of No-Time Lost Accidents	62	64	101	62	49
Compensable or Fatal Accidents	4	11	10	3	7
Number of Man Shifts Worked	80,860	76,038	109,412	93,437	59,597

We suffered four compensable accidents but only one was preventable and that was due to not having goggles available for all the surface men.

The 62 accidents as classified on the one-day reports follow:

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

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12. NEW CONSTRUCTION OR EQUIPMENT

E. & A. #708

Authorized in 1936 among other items replacement of cells in storage battery locomotives. In 1938 we purchased a new battery for the 1st level "B" Shaft motor and in 1939 we followed up by buying additional batteries. The 48-cell Exide battery purchased in January 1939 and the 42-cell Exide battery purchased in February were purchased under authority granted by this E. & A.

E. & A. #804

This E. & A. authorized in May 1937 gave us the right to buy 6 N-75 drills. Four of these came in in 1938 and the other two in January 1939.

E. & A. #825

Covered the cost of buying and installing a new shaft haulage cable for "B" Shaft to relieve the overloaded cable (only one) in "A" Shaft. This cable was installed and put into use during the year. Both cables now feed to the 15th level and we have also run a connecting feeder across on the 10th level between the two shafts.

E. & A. #827

Was completed in 1939 and under its authority we purchased two Cleveland D-12 drills, one Gardner-Denver D-89 dustless machine, and twelve Ingersoll-Rand DA-35 drills.

E. & A. #842

This E. & A. covers the cost of a 1½ ton Ford Dump Body Truck. This truck was delivered late in the Fall and replaced a Chevrolet truck used since 1934.

E. & A. #843

A mechanical stoker for the present heating plant at the Cliffs Shaft Mine was installed in December 1939 to secure better economy on coal burned and to eliminate the soot nuisance. The stoker was installed too late in the year to determine its economy but the soot evil has been abolished.

E. & A. #850

All the items on this E. & A. had not been delivered in 1939. The first item is 10 25-h.p. scraper hoists. We received three of these hoists.

The E. & A. calls for six drills and three DA-35's were charged out in December. The other item of two small 25-cell storage batteries was purchased and charged to this E. & A.

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14. MAINTENANCE AND REPAIRS:

Dwellings

Following is the detailed cost of all repairs to rented houses in Ishpeming in 1939:

	Rented Buildings			Loc.Expense	Grand
	Labor	Supplies	Total	Cleaning, etc.	Total
Hard Ore Location	2206.20	2198.24	4404.44	11.61	4416.05
Barnum "	391.29	617.26	1008.55	-	1008.55
Angeline "	178.60	82.94	261.54	64.59	326.13
Salisbury "	42.20	7.42	49.62	137.81	187.43
Second Addition	590.86	871.45	1462.31	81.35	1543.66
Outhwaite Purchase	149.94	189.78	339.72	-	339.72
Hyde Purchase No.1	586.74	305.24	891.98	-	891.98
" " " 2	218.06	182.51	400.57	-	400.57
Smith Purchase	138.95	61.39	200.34	-	200.34
Nelson "	55.79	60.48	116.27	-	116.27
Total	4558.63	4576.71	9135.34	295.36	9430.70

The comparative figures for the past five years are as shown:

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

We had one unusual expense item in 1939 that we rarely have to contend with. A very severe hail storm early in the Fall did a lot of damage in Ishpeming. In the area to the North of Lake Bancroft the severe wind acted like a cyclone because trees were twisted off and broken, window glasses smashed, fences torn down, and roofs damaged. A great deal of the cost shown for the Hard Ore Location, the Barnum Location, and the Second Addition was repairs to roofs.

15. POWER

The Cliffs Shaft Mine purchased a total of 4,876,747 k.w.h. at an average cost of .01633.

Year	K. W. H.	Cost	Rate per K.W.H.
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
1935	3,710,853	59,791.67	.01611

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

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	K. W. H.	Cost
Tramming	230,392	$ 3,763.01
Pumping	1,334,277	21,793.13
Hoisting	836,348	13,660.15
Stocking Ore	10,972	179.22
Crushing Ore	149,474	2,441.38
Dry House Expense	18,978	309.98
Surface	15,547	253.94
Telephones & Safety Devices	56,538	923.44
Mine Office	7,774	126.98
Machine Shop & Carpenter Shop	3,689	60.25
Drill & Jackbit Shop	50,118	818.59
Heating Plant	9,983	163.05
Compressors	1,790,175	29,239.37
Electric Haulage	362,482	5,920.46
Total	4,876,747	79,652.95

Comparative data for 1939 and 1938 will naturally show mostly increases because of the larger number of days worked.

	1939	1938	% Increase	
Production (Tons)	387,258	327,161	15.6	
	K.W.H.	K.W.H.		
Tramming	230,392	257,385	10.5	Decrease
Pumping	1,334,277	1,348,611	1.1	"
Hoisting	836,348	754,799	10.8	
Stocking Ore	10,972	14,814	25.9	Decrease
Crushing Ore	149,474	123,812	20.7	
Dry House	18,978	16,489	15.1	
Surface	15,547	16,206	4.1	Decrease
Telephones & Safety Devices	56,538	50,098	12.8	
Mine Office	7,774	6,348	22.5	
Machine Shop & Carpenter Shop	3,689	3,464	6.5	
Drill & Jackbit Shop	50,118	28,181	77.8	
Heating Plant	9,983	7,596	31.4	
Compressors	1,790,175	1,663,969	7.6	
Electric Haulage	362,482	317,939	14.0	
Total	4,876,747	4,609,711	5.8	

The decreased consumption for Stocking Ore and Surface was because in 1938 we scraped for a number of weeks on the surface lump pile both day and night in order to take care of the lump product in February, March, April, and May 1938. By that we mean that ordinarily we have room for three parallel stocking trestles on the lump area and when the trestles are filled we install a 25 h.p. scraper hoist ontop the North trestle and fill in the valley between the piles. In that way we increase our stocking capacity probably at least 60%. This scraping or moving of the ore can best be done after the end of the hoisting shift. Although we have never tried it, it might be possible to use a bull-dozer for spreading the ore. Whether or not the heavy tractor running over the lumps would crush them and produce too many fines we do not know, but at least the new scheme would work on soft or crushed ore stockpiles.

The decrease in Tramming current consumption may be due to our rail bonding campaign. The purpose of bonding is to maintain proper voltage clean out to the end of the track and also to provide an efficient return.

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18. NATIONALITY OF EMPLOYEES:

	American Born	Foreign Born	Total
English	66	30	96
Finnish	75	72	147
Swedish	36	16	52
Italian	14	14	28
French	37	2	39
Norwegian	12	3	15
Irish	7	2	9
German	4	-	4
Total	251	139	390

Comparison for 1939, 1938, and 1937 follows:

	1939		1938		1937	
	Number	% of Total	Number	% of Total	Number	% of Total
English	96	24.6	92	23.8	104	26.3
Finnish	147	37.8	147	37.9	148	37.5
Swedish	52	13.3	57	14.7	59	14.9
Italian	28	7.2	26	6.7	22	5.6
French	39	10.0	37	9.5	30	7.6
Norwegian	15	3.8	18	4.6	18	4.5
Irish	9	2.3	9	2.3	10	2.5
German	4	1.0	2	0.5	3	0.7
Scotch	-	-	-	-	1	0.4
Total	390	100.0	388	100.0	395	100.0

The largest number of employees are Finns, but the percentage remains the same. The Scandinavians show a falling off with increases in the Italian and French percentages.

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1. GENERAL

The production of 317,055 tons was 44,063 tons above that of 1938, and all indications at the year end point to a continuation of this upward trend in 1940. The sudden increase in shipments which occurred coincident with the rise in steel production placed the total at 477,848, and left only 109,054 tons in stock at the mine compared to 269,847 a year ago. The 1939 shipments represented an increase of more than 400% over the 112,191 tons forwarded in 1938.

The average working schedule of about 4 days was more satisfactory than that of 1938 which reduced to a minimum of 2 days per week during the summer months. The period from Jan. 9 to June 12 was 4 days, from June 12 to Sept. 11 three days, and this was increased to 5 days thereafter. The working force of 2 shifts numbered about 190 men, and this total was also raised to 210 at the year end in order to secure maximum production under the 2 shift schedule.

The lease and management agreement with the Republic Steel Corporation continued in effect, although the required one year notice of cancellation was made by Republic to be effective Nov. 30, 1940. Under the provisions of the lease production in 1939 was 203,000 tons for Republic's account, and 114,055 tons for the Cliffs account. Shipments were divided 403,515 tons for Republic and 74,333 tons for Cliffs, while in the year previous Republic had elected to ship no ore.

Mining operations were confined to the main East Lloyd deposit from the 4th to 6th Levels. Development at the end of the year, however, was underway to reopen the Lloyd deposit southeast of the main shaft above the 4th Level. The center of production was the top slicing territory above the 5th Level, although an increasing proportion came from the newly developed 6th Level. The analysis of the product was little changed from last year, the average iron content of the Lloyddale grade being raised from 58.74 to 58.90.

The general operation was satisfactory throughout the year. The installation of a new ventilating fan is believed to have contributed toward improved underground efficiency. Preliminary work was started in December for the construction and installation of a separate pumping plant to make the Lloyd independent of the Morris Mine pumps. The remainder of the plant and equipment is in good shape for the heavier demand in effect at the year end.

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2. PRODUCTION SHIPMENTS & INVENTORIES

a. Production by Grades

Grade	Tons
Lloyddale	229,446
Lloyd Silica	87,609
Total	317,055

This product compared with 272,992 tons in 1938. The high month was 37,257 tons in November, and the low 17,158 tons during the vacation month of August. The opening of the 6th Level stopes in leaner material at the west end increased the Silica grade proportion from 22.8% in 1938 to 27.6%.

b. Shipments

Grade	Pocket Tons	Stockpile Tons	Total Tons	Total Last Year
Lloyddale	116,715	245,285	362,000	84,279
Lloyd Silica	45,336	70,512	115,848	27,912
Total	162,051	315,797	477,848	112,191
Total Last Year	69,840	42,351	112,191	
Increase	92,211	273,446	365,657	

The 1939 shipments were second only to 1937 during this 5 year period, and exceeded production by 160,793 tons. Last year the reverse was true, production exceeding shipments by 160,801 tons. These shipments are shown in the following table:

Year - 1935	180,208
1936	353,106
1937	644,395
1938	112,191
1939	477,848

c. Stockpile Inventories

Grade	Tons
Lloyddale	52,989
Lloyd Silica	56,065
Total	109,054

This stockpile balance is 160,793 tons below that of last year.

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2. PRODUCTION
SHIPMENTS &
INVENTORIES (Cont.)

d. Division of Product by Levels

The ore produced above various levels was as follows:

	Lloyddale Tons	Lloyd Silica Tons	Total Tons
Fourth Level	39,916	11,051	50,967
Fifth Level	169,631	48,519	218,150
Sixth Level	19,899	28,039	47,938
Total	229,446	87,609	317,055

Production from the 4th and 5th Levels was in about the same proportion as the last 2 years. The large increase from the 6th Level was due to the continuation of development plus the start of mining operations at the west end.

e. Production by Months

Month	Days	Lloyddale Ore Tons	Lloyd Silica Tons	Total Ore Tons	Rock Tons	Tons per Man per Day
January	17	18,480	8,996	27,476	660	7.98
February	16	18,209	6,209	24,425	768	7.77
March	18	19,188	5,900	25,088	612	7.48
April	16	20,086	4,739	24,825	231	7.96
May	19	18,160	8,233	26,393	609	7.32
June	20	13,668	5,836	19,504	516	7.02
July	19	12,958	5,669	18,627	468	7.01
August	17	12,022	5,136	17,158	231	7.25
September	19	19,884	9,106	28,990	603	7.89
October	22	26,370	9,407	35,777	501	8.36
November	22	27,717	9,540	37,257	510	8.68
December	21	22,704	8,831	31,535	864	7.44
Total	226	229,446	87,609	317,055	6,573	7.74

f. Ore Statement

	Lloyddale Tons	Lloyd Silica Tons	Total Tons	Total Last Year
On Hand January 1, 1939	185,543	84,304	269,847	109,046
Output for Year	229,446	87,609	317,055	272,992
Total	414,989	171,913	586,902	382,038
Shipments	362,000	115,848	477,848	112,191
Balance on Hand	52,989	56,065	109,054	269,847
Increase in Output			44,063	
Decrease in Ore on Hand			160,793	

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2. PRODUCTION
SHIPMENTS &
INVENTORIES (Cont.)

f. Ore Statement (Cont.)

The operating schedule for the past five years follows:

1935 - 1-8 hr. shift 4 days per week Jan. 1, to Feb. 11, 2 crews
1-8 hr. shift 6 days per week Feb. 11 to Dec. 31, 2 crews

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. 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 June12., 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

g. Delays

There were 2 production delays in 1939 compared to 3 in 1938. A sleet storm interrupted power service on April 17th. causing a delay of 2 hours and a production loss of 200 tons. The next 3 shifts were postponed and mining resumed on the 19th without further delay of operating time.

The second delay was the result of a severe electrical storm on June 13th. The power was off for 1 hour and the production loss amounted to 80 tons.

The surface cave at the Morris Mine caused no delay at the Lloyd, but there was a postponement of the working schedule from March 13th to the 15. to observe and await settlement of pumping capacity. The postponed days, as in April, were made up without loss of working time.

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3. ANALYSIS

a. Average Mine Analysis on Output

Grade	Tons	Iron	PHos	Silica
Lloyddale	229,446	58.90	.158	6.82
Lloyd Silica	87,609	52,97	.133	15.49

317,055

The comparative iron analysis of the 2 grades in 1939 was 58.74 and 52.93 respectively. The phosphorous content of the Lloyddale ore was maintained below .160 by inclusion of the Lloyd grade material from the west end stopes.

There were no straight cargoes forwarded from the mine in 1939 so the output, and composite shipment analyses are the only ones given.

b. Composite Analysis of Ores Shipped

Grade	Tons	Iron	Phos.	Sil	Mang.	Alum	Lime	Mag.	Sul.	Loss	Moist
Lloyddale	362,000	58.60	.158	7.10	.22	2.63	.70	.46	.011	4.74	
Lloyd Silica	115,848	52.85	.130	15.48	.21	2.81	.68	.48	.010	4.44	

c. Analysis of Ore in Stock Dec. 31, 1939

Lloyddale Dried	52,989	58.31	.154	7.30	.24	2.51	.80	.46	.010	4.71	
Lloyddale Nat'l		51.78	.137	6.48	.21	2.23	.71	.41	.009	4.18	11.20
Lloyd Sil.Dried	56,065	52.71	.125	15.58	.22	3.23	.75	.48	.010	4.00	
Lloyd Sil.Nat'l		47.21	.112	13.95	.20	2.89	.67	.43	.009	3.58	10.44

d. Estimated Analysis of Ore Reserves

No distinction is made for the first time 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'l	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, 1930 using a factor of 12 cu.ft. per ton.

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4. ESTIMATE OF ORE RESERVES (Cont.)

	Lloyd Deposit	Lloyd East Deposit	Total Tons
Above 3rd Level	10,310		10,310
Between 3rd and 4th Levels	9,323	85,821	95,144
Between 4th and 5th Levels		324,150	324,150
Between 5th and 6th Levels		675,061	675,061
Between 6th and 7th Levels		859,056	859,056
Below 7th Level		348,333	348,333
Gross Tons Nov. 30, 1939	19,633	2,292,421	2,312,054
Less 10% Loss in Mining	1,963	229,242	231,205
Total	17,670	2,063,179	2,080,849
Less 10% for Rock	1,767	206,318	208,085
Total	15,903,	1,856,861	1,872,764
Less December Production	0	31,531	31,531
Total Developed Reserve Dec. 31, 1939	15,903	1,825,330	1,841,233

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

	1937	1938	1939
Ore in Mine Jan. 1st.	2,676,686	2,308,802	2,118,390
Production	400,394	210,829	229,446
Balance	2,276,292	2,097,973	1,888,944
Ore in Stock Dec. 31st.	2,308,802	2,118,390	1,841,233
New Ore Developed	32,510	20,417	47,711

The reduction in the 1939 estimate was occasioned largely by the inclusion of the new ore outline at the 6th Level elevation. While this area approximates that of the 5th Level, it is smaller than the 7th, thereby reducing the former average between these levels.

5. LABOR AND WAGES

a. General

Labor conditions and relations were again satisfactory throughout the year. The three day working schedule during the summer months reduced incomes at a time when the effect was best withstood, and the 4 and 5 day schedules brought average earnings considerably above those of 1938. Membership in the Marquette Range Industrial Union was continued by a reduced proportion of the employees, but all meetings and adjustments of small complaints were pleasant in every respect.

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5. LABOR AND WAGES (Cont.)

a. General (Cont.)

Organizers of the S W O C canvassed the North Lake Location and were more active than in previous years, but evidently made little headway in 1939.

The over-supply of labor was as marked as during the latter part of 1938. The few men that were added in November and December were without exception from the third shift that was laid off in June 1938. The young men which made up the shovel crews during the summer months were from the larger families in the Location, and they also had former service records with the Company.

The wage schedule of March 16, 1937 remained unchanged. There were few emergencies in which rate and a half was paid for the time over 8 hours per day or 40 hours per week, the shovel crews near the end of the shipping season accounting for practically all of the amount.

b. Comparative Statement of Wages & Product

	1939	1938	Incr.	Decr.
PRODUCT	317,055	272,992		
No. of Shifts & Hours				
Jan. 1 to June 1		2-8 Hr.		
June 1 to Dec. 31		1-8		
Jan. 1 to Jan. 9	1-8 Hr.			
Jan. 9 to June 12	2-8 Hr.			
June 12 to Sept. 11	1-8			
Sept. 11 to Dec. 31	2-8			
Avg. NO. OF MEN WORKING				
Surface	41	48		7
Underground	150	150		
Total	191	198		
AVG. WAGES PER DAY				
Surface	5.64	5.59	.05	
Underground	6.50	6.42	.08	
Total	6.31	6.21	.10	

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

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5. LABOR AND WAGES (Cont.)

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

	1939	1938	Incr.	Decr.
WAGES PER MONTH OF 22 DAYS				
Surface	124.08	122.98	1.10	
Underground	143.00	141.24	1.76	
Total	138.82	136.62	2.20	
WAGES PER MONTH OF 18 DAYS				
Surface	101.52	100.62	.90	
Underground	117.00	115.56	1.44	
Total	113.58	111.78	1.80	
WAGES PER MONTH OF 12 DAYS				
Surface	67.68	67.08	.60	
Underground	78.00	77.04	.96	
Total	75.72	74.52	1.20	
PRODUCT PER MAN PER DAY				
Surface	35.21	29.53	5.68	
Underground	9.92	9.84	.08	
Total	7.74	7.38	.36	
LABOR COST PER TON				
Surface	.160	.189		.029
Underground	.655	.652	.003	
Total	.815	.841		.026
AVG. PRODUCT STOPING	26.71	29.76		3.05
AVG. WAGES CONTRACT MINERS	7.22	7.22		
TOTAL NO. OF DAYS				
Surface	9004½	9243¾		239¼
Underground	31946¼	27735¾	4212½	
Total	40950¾	36977½	3973¼	
AMOUNT FOR LABOR				
Surface	50,743.64	51,667.46		923.82
Underground	207,570.53	177,974.70	29,595.83	
Total	258,314.17	229,642.16	28,672.01	

PROPORTION SURFACE TO UNDERGROUND MEN

1935 - 1 to 3.29
1936 - 1 to 3.33
1937 - 1 to 4.06
1938 - 1 to 3.13
1939 - 1 to 3.66

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6. SURFACE

a. Buildings

There was no new construction, but several improvements to structures were made. The most noticeable was the fireproofing of the cage road entrance room in the headframe. Concrete walls lined with transite board replaced the rotted timbers of the old structure and improved the appearance in keeping with the other surface buildings. At the same time the permanent heating connection to the headframe stoker plant was made, and rotted timber sets in the timber tunnel beneath were replaced with concrete.

A second improvement in the headframe was the extension of the grizzly and enlargement of the by-pass chute to remove fines from the ore stream before entering the crusher. This reduced wear of the crusher considerably, and the unit was made of the loose bar type to be self-cleaning. The size of the compressor cooling pond was also increased to cut down the amount of water which had to be added to the circuit with both compressors running. The addition was to the south side of the old pond, and consisted of a concrete floor and walls with pipe inside for additional sprays.

A steel bin for the blacksmith's coal was built on the north side of the main building, and a temporary frame storage shed on the east side then dismantled. The bonded roof of the main building was damaged by a sleet and windstorm in October. The contractor responsible under the guarantee completed repairs in November, and fortunately was able to do the work in very mild weather.

b. Stocking Grounds

Shipments from stockpile were 315,797 tons compared to 42,351 tons in 1938. The removal of this tonnage allowed rearrangement of stockpiles west of the shaft, and provided ample space for new trestles on both sides. Construction of a new trestle of 24 bents on the west side was completed in October. As on the east side, the Silica grade is being stocked nearest the shaft with only one break in the pile between the 2 grades. Formerly the Silica grade was between 2 Lloyddale piles with double the wasted space between.

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6. SURFACE (Cont.)

b. Stocking Grounds (Cont.)

About one-half the ore under the trestle on the new southeast stockpile ground was loaded out, leaving this space available for use in the future. It will not be needed this season for the available capacity under the 2 new trestles is estimated at 50,000 tons in excess of requirements. The east trestle, also of 24 bents, was completed early in December aided by exceptionally mild weather conditions.

Loading from the sides of these 2 new trestles next summer will retain two-thirds of their capacity for the following season. This was the case with the northeast trestle, which is the only one to be replaced next summer unless all stockpile ore is shipped. Under this system of annual replacement of only one or two of the 4 trestles, the cost of providing stocking space is reduced from that of former years.

c. Roads

The use of the grader every week or two kept the mine roads in excellent shape. Dust was allayed by spreading one ton of calcium chloride on the section near the main building and the shafthouse, and this acted also as a binder to harden and pack the gravel.

7. UNDERGROUND

a. Shaft Sinking

There was no shaft sinking in 1939.

b. Development

The most important heading was again the development of the 6th Level. The work accomplished in 1939 was at first disappointing in regard to finding ore, but this situation was reversed and it now appears that the ore area will be slightly larger than the 5th Level. Three drifts were still underway and the completed ore outline will be known early in 1940.

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7. UNDERGROUND (Cont.)

b. Development (Cont.)

Development of the first sub level stope above this level in a separate lense near the north footwall was advanced far enough to start mining operations early in June. Production will soon begin from the second stope which is adjacent to the south footwall, and these 2 accounted for a large proportion of the small drift and raise development in 1939. Five raises were put up from the 6th Level, four double compartment and one single compartment. Two were for stopes, two were long raises for the start of top slicing operations under the old stopes just above the 5th Level, and the fifth was a semi-permanent single compartment raise in lean ore for a ventilation and traveling road between the 2 levels.

The permanent ventilation raise between the 4th and 5th Levels was completed in February. The raise is located in the slate footwall at the east end of the 5th Level, and is of ample size to take care of the ventilation needs of the future. A second rock raise was also put up from the 640' sub level to the 4th Level at the west end of the orebody to serve as an auxiliary traveling and ventilation raise for the main top slicing territory above the 5th Level. The remaining 5th Level development was concentrated mostly in the northwest portion where several small sub level stopes were opened.

Mining operations were completed above the 3rd Level in the Lloyd orebody in 1937. The reopening of this deposit to mine the lower section was started from the 4th Level in November. Two raises were advanced to a height of 100' in rock and joined by a sub drift at this elevation. Softer material indicated that the bottom of the ore trough was close at hand, so the raises will be cribbed above this sub for the remaining distance of 100' to the 3rd Level. The reopening of this deposit will provide several additional working places which are needed under the present production schedule.

The average number of contracts in 1939 was about nineteen. Five of these were usually on development work and the total footage driven by these contracts amounted to 6292'. The classification and comparison with last year will be found under heading "e", Drifting and Raising.

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7. UNDERGROUND (Cont.)

c. Stoping

Stoping operations were conducted in three separate territories in the East Lloyd deposit. Three contracts continued top slice mining above the east end of the 4th Level, and in December, there were 13 contracts using this system above the 5th Level. The center of mining operations in this main area moved downward from the 700 to 665' sub levels during the year, leaving 4 subs available for mining above the 5th Level crosscuts in 1940.

Mining was completed in the highly productive No. 14 stope in May. The same contract mined several small pillars in the northwest corner of the orebody using this method, but No. 14 marked the end of major stoping operations above the 5th Level. The start of sub level stoping above the 6th Level in June made only partial replacement because of the difficulty in breaking the harder siliceous ore in the transition zone under the jasper hanging wall. The new subs opened in this third territory extended from the 565 to the 500, all above the 6th Level.

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

Subs Above the 4th Level

890' Sub Level
No. 8 contract in January mined from No. 486 raise in a small pillar remaining on the west side of the mining area near No. 2 old workings. This work was completed early in February and the contract dropped to the 870' sub level.

870' Sub Level
After cutting out the raise, No. 8 contract made a ventilation connection to the east with No. 1 working on the sub below. In March No's. 2 and 8 contracts combined operations at No. 486 raise in an effort to speed up the mining of this particular area, and this sub was completely mined in June.

860' Sub Level
In January No. 1 contract had just begun mining operations at No. 487 raise. This was continued, slicing from the east to the west, and the work was completed early in May. During 1939 No. 1 territory has shown a marked reduction in area due to the narrowing of the orebody between the footwall dikes on the north and south sides.

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7. UNDERGROUND (Cont.)

Subs Above the 4th Level (Cont.)

860' Sub Level (Cont.)

No. 2 contract dropped to this sub level in June, drifting to the east to make the ventilation connection before No. 8 contract completed slicing on the sub above. Little difficulty was experienced in this double contract despite the fact that the area was rather small. The usual procedure, after the preliminary cutting of the raise, was to have No. 2 contract drift to the south footwall dike and slice to the west toward their formerly mined out territory at No. 485 raise. No. 8 contract, after drifting to the east, thereafter mined the area south of this opening.

850' Sub Level

No. 1 contract dropped to this sub level in May and, as usual, made a connection with No's. 2 and 8 contracts for ventilation. Mining was then continued along the north footwall and fanned to the south and west. In September mining operations were completed on the 860' sub level and contracts 2 and 8 dropped to this sub. No. 2 contract drifted south of the raise a distance of approximately 70' to determine the character of the ground lying south of the small dike which bounded the subs above. The south end of the drift showed lean ore and caved material, and after mining a small amount the work was given up and No. 2 continued slicing to the west. No. 2 contract completed slicing operations on this sub level in December and also completed a small independent raise from the 820' sub level to the 830' sub preparatory to the start of mining at the lower elevation.

No. 8 contract, mining east of 848 raise, experienced difficulty in driving through the old 840' transfer, but in December completed one slice to the south and approached the limit on a second. It is evident that this territory will be somewhat enlarged on subsequent sub levels due to the enrichment of the area lying between the main footwall dike and the small east-west dike which has previously served as the south boundary.

830' Sub Level

No. 1 contract dropped to this sub level late in November, drifted to the west and then started slicing toward the south footwall. Late in December a timber breakdown under the old transfer was being repaired preparatory to extending a slice to join with No. 8 workings on the sub above.

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7. UNDERGROUND (Cont.)

Sub Levels above the 4th Level (Cont.)

820' Sub Level

In January mining operations were underway on this sub level by No. 2 contract at No. 485 raise. A "V" shaped pillar was left adjacent to No. 8 territory to prevent caving the drift between 485 and 486 raises. This work was completed in March and No. 2 contract joined No. 8 contract on the 870' sub. Later it was necessary for this contract to return to this area and drift to the east along the south side of the traveling and ventilation road to open a new connection. After this drift was completed, No. 2 contract again joined No. 8 on the 850' sub level.

4th Level

With the exception of a small amount of ore mined by stoping operations at the west end by No. 14, the 4th Level had been entirely mined previous to 1939. As mentioned under the development heading, No. 7 contract commenced the development of the Lloyd orebody below the 3rd Level in November. Two single compartment un-cribbed raises were started from the 4th Level approximately 500' east of the shaft to tap the orebody at its lowest point. The estimated tonnage remaining in this orebody is approximately 19,000 tons, and mining should be underway early in 1940

Sub Levels above the 5th Level

700' Sub Level

No's. 11 and 12 contracts were mining on this sub from raises Nos. 521 and 522 at the beginning of the year. No. 12 contract, after completing several slices in the southwest corner of their territory dropped to the 690' sub late in January. No. 11, after completing mining operations on the west side, mined the last small pillar on the east and joined No. 12 on the 690' sub late in February.

Nos. 9, 17 and 19 contracts, mining at the west end of the slicing territory, had just completed the raise connecting drifts at the end of 1938. On the west side of this area mining operations were either stopped in the jasper pillar between the stopes to the west, or in the caved material in the stopes themselves. On subsequent sub levels the area enlarged as enrichment extended to the west. Nos. 9, 17 and 19 contracts completed mining operations on this sub level in March.

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7. UNDERGROUND (Cont.)

Sub Levels above the 5th Level (Cont.)

690' Sub Level

No. 11 and 12 contracts at the east end of the orebody continued mining operations west of No's. 521 and 522 raises. For the most part, the east side consisted of a small pillar between the connecting drift and the caved No. 7 stope. Added difficulty was experienced in separating the numerous small stringers of dike, many of which join the north footwall in the vicinity of No. 521 raise.

Mining operations were underway along the central series of raises by Nos. 13, 16, and 10 contracts in January. The area mined by No. 13 contract was bounded on the west by the caved No. 14 stope, and on the east by No. 11 workings. This reduction in area allowed No. 13 contract to drop down to the next sub and complete the preliminary drift connecting with No's. 532 and 533 raises. No. 16 and 10 contracts were bounded on the west by an arbitrary mining limit which prevented them from undercutting contracts 9, 17, and 19, working in most cases on the sub above. Slicing operations were completed in this central portion of the orebody in April.

Contracts Nos. 9, 17 and 19 reached this sub level early in the same month. No. 9 contract stoped a small area on the south edge of the caved No. 14 stope. No. 19 contract mined under the jasper hanging wall on the west side of No. 544 raise, extending their territory once more into the leaner material bordering the east side of old No. 3 stope.

675' Sub Level

During the greater part of the time mining operations were underway on this sub level, the 8 contracts in this territory were in contact with one another. This arrangement improved mining conditions during most of the period since ventilation could be arranged in such a way that each contract had an ample supply of fresh air at all times. No. 11 and 12 contracts' mining area enlarged on the east side as the raises inclined in the opposite direction. All available ore was mined on this sub level, and No. 11 and 12 contracts dropped to the 665' sub in October. No. 13, 16 and 10 contracts likewise completed mining operations and dropped to the sub below as the contracts on the west raises cut out on this sub. No. 9 contract mined to the north, ending all slices in the cave of No. 14 stope. The combination of stoping followed by slicing resulted in at least 100% extraction in this northwest area. No. 17 was again able to keep in contact with the contracts to the east so that ventilation was good at all times.

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7. UNDERGROUND (Cont.)

Subs above the 5th Level (Cont.)

675' Sub Level (Cont.)

This sub level was fast being mined out in December with No. 19 having completed slicing to the west, and starting the removal of the remaining pillar to the east of No. 545 raise. No. 17 likewise had almost completed mining at this elevation by slicing to the northwest into the old No. 5 stope cave while No. 9 finished two long slices northeast of No. 543 raise.

665' Sub Level

No. 11 and 12 contracts were somewhat restricted at this elevation by the old sub level connecting drift which had been driven several years ago. However, this more or less blocked out the mining areas and a connection was maintained with the contracts to the west during the entire progress of this sub level. The dip of the north slate footwall reduced No. 11 mining area, and on the east side of raise No. 521, the ore was also banded with dike stringers which again interfered with clean extraction.

In December No. 11 contract completed mining on this sub level with three short slices southeast of the raise. The 650' sub level was then cut out to mark the lowest advance of top slicing operations in this territory. No. 12 contract will follow shortly when the mining of a small triangular pillar is completed south of No. 522 raise.

Along the 530 series of raises mining on the 665' sub was also nearing completion at the end of the year. No. 13 contract proceded the others in cutting out and drifting north to the auxiliary ventilation raise in the slate footwall. Mining then started from the west side of the raise rotating to the north and east. In December, No. 13 contract completed three slices northeast and to the north footwall, the latter a distance of 75' to No. 11 workings.

No. 16 contract, after cutting out on this sub level, drifted to the east making contact for ventilation and traveling with No. 12 contract. Slicing continued from this drift to the south. During December No. 16 completed two slices to the east and were making preparations to mine the remaining area between the last slice and No. 10 workings.

No. 10 contract mined west of No. 533 raise, connecting each slice with No. 17 workings. In December mining operations were completed southwest of the raise preparatory to mining the small remaining pillar on the east side.

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7. UNDERGROUND (Cont.)

Sub Levels above the 5th Level (Cont.)

650', 640' and 625' Sub Levels

Mining operations in No. 14 stope lying north of the 540 series of raises was near completion at the end of last year. A small amount of ore was mined on the upper subs as high as the 4th Level in the area just west of No. 13 contract. Soon after the completion of this stope the jasper hanging wall commenced to cave, and in a short time the entire stope filled. This marked the end of major stoping operations above the 5th Level. In July, however, a small stope was started from a transfer on the 625' sub level running east and below the original transfer of No. 14 stope. Development was continued from the 625' sub to the 650' sub and a small section was mined between the footwall and the north side of No. 14 stope.

In August a transfer drift was completed west of No. 547 raise by No. 3 contract on the 625' sub level. Development was then started on the north side of the transfer preparatory to stoping the area lying between old No. 18 stope on the north and No. 5 stope on the south. The major part of the ore between the old transfers of the above mentioned stopes was mined plus considerable transition material under the jasper hanging wall in an area somewhat above the 640' sub. Later in the year, No. 14 contract stoped the ore remaining between old No. 18 transfer and the above mentioned No. 3 transfer. In December this area was almost entirely mined out, and No. 14 at the time was stoping a small area north of No. 3 transfer.

No's. 3 and 18 contracts started top slicing in 1939 at the west end of the orebody on the 625' sub level under the caved No. 3 and 5 stopes. No. 18 contract early in the year continued slicing to the west of their raise No. 550, and from time to time were able to stope small areas lying between No. 3 and 5 stope transfers. No. 3 contract likewise continued slicing from the south to the east eventually working into the area mined by No. 18.

615' Sub Level

After completing two raises, Nos. 631 and 632 originating on the 6th Level, mining was resumed in September on this sub level directly under the above area. No. 18 contract mined east to a limit a distance of approximately 75' from the raise. During November, in order to speed up production, two additional men were added to the contract and mining was started to the west of the raise toward the jasper hanging wall. By December mining was almost completed on the west side of the raise, and two slices were likewise finished at a distance of approximately 75' on the east side. No. 3 contract was also replaced in November by No. 6, a four man gang, and after mining the territory west of the raise, slicing continued to the south and east. During December to slices were driven to the south footwall while a third drift was underway to the southeast a distance of approximately 60'. At the end of the

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7. UNDERGROUND (Cont.)

Sub Levels above the 5th Level (Cont.)

615' Sub Level (Cont.)

year mining had reached the 5th Level with the cutting out of the raise at the floor elevation.

Sub Levels above the 6th Level

590', 565, 540', 525' and 500' Sub Levels

During the latter part of 1938, work progressed in developing a long narrow orebody lying north of the 6th Level drift and northwest of the main Lloyd-East orebody. This work was done by No. 7 contract. A ventilation connection was made on the 500' sub to the transfer drift with a small single compartment raise No. 601 from the 6th Level. The transfer was also extended 200' east at approximately the same course as the 6th Level and connected with double compartment raise No. 603. Small drift development was then necessary on all of the four sub levels. The main traveling raise was advanced to a point just below the 5th Level elevation, but the ore proved to be too lean to be mined with the result that actual stoping operations were to a height of only 3 subs by No. 15 contract. The ore from this stope proved somewhat disappointing in that almost the entire product was silica grade despite the fact that a narrow enriched area was found on the second and third subs. At the end of the year stoping had progressed to the east a distance of 130' with an average stoping width of approximately 50'. East of No. 15 stope development was in progress by No. 20 contract. During December a small drift was being driven on the 3rd sub to connect with the stope, but the material encountered proved to be lean ore, and gave an indication of what might be expected at this elevation with further stoping operations to the east.

No. 5 contract in September started development of the second stope above this level by completing a double compartment cribbed raise from 650 crosscut to the 500' Sub Level. A transfer drift was then started from No. 632 raise toward the west. After driving the transfer a distance of 100' lean ore and jasper were encountered although mixed with seams of ore. The ultimate length of this transfer amounted to 160' where a definite jasper contact was encountered. Development was then begun by No's. 5 and 20 contracts to determine the extent of the ore laterally as well as vertically. Eight mill raises were started and connected to the first sub at the elevation 527'. Subsequent development was centered in the east raise which was driven nearly to the elevation of the 5th Level. Here again the upper portion of the raise was in lean material, indicating that a comparatively small vertical height could be mined. In December, after completing preliminary development on the first and second subs, stoping was started at the west end and carried through to the second sub. Considerable water was encountered under the hanging wall as the stope was opened, and it is hoped that this will soon drain the area and reduce in quantity.

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7. UNDERGROUND (Cont.)

6th Level

Development drifting was in progress during the entire year on the 6th Level. The main 6th Level drift was advanced approximately 555', and will be completed at the east end of the orebody early in 1940. Five crosscuts were turned off, and in December No. 3 contract advanced No. 610 crosscut and the main heading a distance of 46' in ore.

No. 640 crosscut was extended by No. 4 contract in December through the footwall dike to test the formation on the south side. Jasper, and the narrow enriched seam of ore indicated by drilling on the 7th Level were disclosed in the same relative positions, so this area willbe further explored in 1940.

d. Timbering

The reduced proportion of ore from sub level stoping operations in 1939 increased the consumption of timber, and the cost, to a level higher than any of the past 5 years. The increased weight in the top slicing area in the center of the orebody above the 5th Level also necessitated the use of heavier stulls, so that the amount for the 10" size, or over, was about $500 above the 1938 figure. The start of the raising program above the 6th Level nearly doubled the amount for cribbing,which had been exceptionally low in 1938 at $554.53. The cost per ton for lagging was lower, but the increased use of 3½" poles more than made up the difference. The comparative statement follows:

Statement Showing Timber Used for Year 1939

	Lineal Feet	Avg. Price per Foot	Amount 1939	Amount 1938
6" to 8" Cribbing Timber	29,808	.036	1072.17	554.53
8" to 10" Stull Timber	56,947	.067	3822.78	3178.72
10" to 12" " "	37,556	.094	3525.74	2637.90
12" to 14" " "	9,823	.129	1268.87	1658.79
Total Timber 1939	134,134	.072	9689.56	
" " 1938	101,774	.079		8029.94

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7. UNDERGROUND (Cont.)

d. Timbering (Cont.)

Statement Showing Timber Used for Year 1939 (Cont.)

	Lineal Feet	Per 100' Avg. Price Per Foot	Amount 1939	Amount 1938
7 Ft. Lagging	676,678	.784	5303.63	4714.31
3½" Poles	373,909	1.29	4811.21	2887.60
Wire Fencing	1,650	5.73	94.60	169.64
Total Poles Etc.	375,559	1.31	4905.81	3057.24
Total Lagging, Poles and Fencing 1939	1,052,237	.97	10,209.44	
Total Lagging, Poles and Fencing 1938.....	832,677	.93		7771.55
Product, Tons			317,055	272,992
Feet of Timber per ton of Ore			.423	.373
Feet of Lagging per ton of Ore			2.134	2.202
Feet of Lagging per foot of Timber			5.043	5.905
Cost per Ton for Timber			.0305	.029
Cost per Ton for Lagging			.0167	.0173
Cost per Ton for Poles & Fencing, Etc.			.0154	.0112
Cost per Ton for All Timber			.0626	.0579
Equivalent Stull Timber to Board Measure			240,100	200,652
Feet of Board Measure per Ton of Ore			.757	.735

	Year	Cost Per Ton	Amount
Cost of Timber, Lagging, Poles, Fencing	1939	.0626	19,899.00
	1938	.0579	15,801.49
	1937	.0528	28,804.97
	1936	.0596	21,719.68
	1935	.0515	11,432.19

e. Drifting and Raising

The progress of the 6th Level development played a large part in the footage classification in 1938 and 1939. Last year work was concentrated in advancing the main drift, while this year the opening of the orebody with raises, and the development of 2 sub level stopes above the level, increased the raise work and decreased the drift footage. The total amount of drifting and raising was a little less than in 1938 because development for stoping operations above the 5th Level had been completed that year.

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7. UNDERGROUND (Cont.)

e. Drifting and Raising (Cont.)

The following table gives the 2 year comparison:

	Ore Drift	Rock Drift	Total Drift	Ore Raise	Rock Raise	Total Raise	Grand Total
1939	3466	472	3938	1968	386	2354	6292
1938	4105	1513	5618	2154	164	2318	7936
Decrease			1680			36	1644

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:

1939	1209	367	1576	418	70	488	2064
1938	934	1453	2387	97	118	215	2602
Increase						273	
Decrease			811				538

f. Explosives, Drilling and Blasting

The reduction in powder consumption and cost per ton in 1939 is rather difficult to explain. The softer ore in the center of the orebody above the 5th Level no doubt needed less powder to break, but this was offset by development and the start of stoping operations in the very much harder siliceous ore at the west end of the 6th Level. The reduction of the development footage per ton of ore mined apparently was the controlling factor in lowering the overall cost for powder from .076 to .068 per ton in 1939.

The standard established in 1938 on the use of only the Gelamite No. 1 powder was continued, and the complete familiarity with the breaking strength of this powder is believed to have brought more efficient use. Over 4000 of the master fuse cartridges were used in working places where a large number of holes were detonated at one time in order to reduce the hazard of overstaying the allotted time.

The explosives statements are shown under the following headings:

BREAKING ORE	Quantity Lbs.	Average Price	Amount 1939	Amount 1938
Gelamite Powder #1	147,289	.1181	17,388.14	16,533.08
Gelamite Powder #2				526.75
Total Powder	147,289	.1181	17,388.14	17,059.83