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THE CLEVELAND CLIFFS IRON COMPANY
ORE MINING DEPARTMENT
MANAGER'S ANNUAL REPORT
YEAR 1941
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Ishpeming, Michigan
April 7, 1942

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 1941.

The inventories, maps, statements relative to the 1941 report will go forward under separate cover.

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

During the year many E&A's for new equipment have been approved. This has been necessary due to the full time operatim being carried on at all of our properties during 1941. We have tried to safe-guard ourselves against serious delay. On account of the full production program, it has been found that the drums on some of our hoists, for example, have shown enough wear to warrant replacement. It has also been necessary, in a number of instances, to put auxiliary power cables in our shafts. Inspections have become more rigid and we are doing everything in our power to continue to hoist without delay.

Our safety program has continued, and as a matter of fact, the precautions which we have taken to prevent accidents are even more rigid than they have ever been. We have had several general meetings with all Captains and bosses, and in addition, at regular intervals, at least once a month, the various Superintendents have gotten together with their bosses when problems of the individual mines were thoroughly discussed. It is our belief that frequent meetings of these small groups have been of great value.

The details of the activities of the Safety Department are all shown in Mr. Conibear's report and it is not necessary for me to give further details. I am, however, giving below a table showing the severity rates from 1935 to 1941 inclusive:

Severity Rates
All Compensable Accidents

Year	Non-Fatal Days Lost	Rate	Fatal Days Lost	All Accidents Days Lost	Rate
1935	3,225	7.93	3,600	6,825	17.70
1936	3,509	6.16	3,600	7,109	12.67
1937	7,881	10.29	1,800	9,681	12.64
1938	6,290	12.80	5,400	11,690	23.66
1939	3,264	5.79	1,800	5,064	8.97
1940	3,442	4.82	9,000	12,442	17.52
1941	5,403	5.81	9,000	14,403	15.75

Realizing that Mr. Conibear would retire on February 1st,1942, the Company made arrangements to fill his position by the employment of A. J. Stromquist, who reported on December 1st. We thought it wise to have Mr. Stromquist here for at least two months before Mr. Conibear left. Mr. Stromquist has been in the Bureau of Mines for a number of years so we are well acquainted with him. He has been here many times conducting first aid and mine rescue work. I am confident he will fill the position of Safety Director in a very competent and satisfactory manner.

The mines of the Company, with few exceptions are in first class physical condition. In 1940 it was assumed we had reached the peak of production. However, these figures were exceeded in 1941.

	1941				
		COST OF PRODUCTION		TOTAL COST	
	Production	Per Ton	Amount	Per Ton	Amount
Athens	648,750	1.827	1,185,475.84	2.258	1,464,862.44
Cliffs Shaft	658,747	2.277	1,499,994.37	2.607	1,717,221.56
Lloyd	558,253	1.621	904,680.46	1.788	997,973.08
Maas	827,369	1.917	1,586,005.77	2.323	1,921,712.92
Negaunee	1,033,220	1.418	1,465,002.32	1.992	2,058,064.13
	3,726,339	1.782	6,641,158.76	2.190	8,159,834.13
	1940				
Athens	515,725	1.680	866,599.60	2.162	1,115,246.60
Cliffs Shaft	552,598	1.949	1,077,048.43	2.275	1,256,936.98
Lloyd	476,934	1.299	619,569.12	1.494	712,336.85
Maas	699,977	1.669	1,168,642.34	2.118	1,482,562.83
Negaunee	865,689	1.262	1,092,527.63	1.941	1,679.975.24
	3,110,923	1.550	4,824,387.12	2.008	6,247,058.50
1941					
Increase in product	615,416				
Increase in cost		.232		.182	
% increase	19.8	15.0		9.1	

The cost, of course, is not directly comparable due to the fact that on April 1st, 1941 there was an increase of 10¢ per hour. Further, in September, 1941 we stepped up production from 16 shifts to 17 shifts per week at the soft ore mines.

On June 20th, fire was discovered on the 600' sub in the Athens Mine. The details are shown in Mr. Conibear's report and that of Mr. Graff'for the Athens Mine. It was not until July 18th that operations were again resumed. No one will ever know the cause of this fire but it is presumed that in all probability some individual violated the rules relative to smoking and threw a stub alongside of the drift, which started a fire in the mat.

On December 12th, contracts were signed with the Marquette Range Industrial Union for full bargaining rights for the Mather, Tilden, Cliffs Shaft, Lloyd, Athens and Cliffs Power & Light Company. This union has become very strong, probably due to increased activity of the CIO, and it is expected that other contracts will be signed with this union.

Ground was broken at the shaft site for the new mine on Section 2,47-27 on January 6th, and since that time we have continued to sink. On August 1st, with appropriate ceremonies, the mine was named "Mather". Details relative to this property are given in Mr. Allen's report.

A very careful study had previously been made by Messrs. Allen, Moore, and Stanford, who visited large operating mines in various parts of the United States and Canada. Before our plans were definitely made, we availed ourselves of the best practices which had been observed by those who made the investigation. We are confident that when this mine goes into commission, it will be modern in every respect, and it is my opinion, as far as equipment is concerned, it will be second to none.

The reopening of the Princeton Mine was authorized in October and on October 18th pumping started. A market has been found for this grade of ore and we were warranted in reopening this property.

During the year the Company has carried on an extensive program of diamond drilling at the Lloyd. This was necessary on account of the very unfavorable development in the lower part of the mine. It was found above the 7th Level, where ore had been assumed to exist in a uniform body, that large intrusions of rock had greatly reduced the tonnage. I am sorry to report that up to the end of the year, developments in the mine by diamond drill have been unfavorable. In order to safe-guard ourselves, and to be able to replace the Lloyd in case we do not find more ore in this property, we have also continued an extensive campaign of exploration on Section 5, immediately east. Preliminary work has indicated a crotch between the footwall and a dike. We are now drilling in this crotch to determine whether ore exists at depth.

No new ore has been found at the Spies Virgil and a very small tonnage is now in sight. Towards the end of the year the Company completed arrangements with the Spies Mineral Land Company for the purchase of twelve 40's to the east of this property. It is planned to do diamond drilling on this land to see if another deposit can be found.

As I stated last year, it is a matter of great pride and satisfaction to me to realize the splendid cooperation which I have had not only from the Superintendents but all others in responsible positions. If this had not been the case, results would not have been better in 1941 than in 1940.

Respectfully submitted

SRE:DP

Manager

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

YEAR	THE C.C.I.CO.	THE NEGAUNEE MINE CO.	THE ATHENS I. MG. CO.	THE C.P.& L.CO. & CLIFFS ELE	TOTAL FOUR COMPANIES		CHANGES FROM PREVIOUS YEAR
1929			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	12,815,645	4,185,700	2,266,500	1,447,936	20,715,781	D	1,863,543
1933	9,850,359	3,554,400	2,036,500	1,419,565	16,860,824	D	3,654,957
1934	10,002,373	3,196,400	2,077,800	1,418,887	16,695,460	D	165,364
1935	10,062,288	3,057,770	1,929,520	1,424,711	16,474,289	D	221,171
1936	10,263,100	3,107,500	1,929,520	1,424,281	16,724,401	I	250,112
1937	11,589,306	3,350,000	2,242,900	1,442,555	18,624,761	I	1,900,360
1938	12,959,542	3,124,100	2,532,900	1,447,843	20,064,385	I	1,439,624
1939	13,090,541	3,267,300	2,683,400	1,981,982	21,023,223	I	958,838
1940	12,185,132	3,692,700	2,683,400	2,003,335	20,564,567	D	458,656
1941	11,202,237	4,644,430	2,683,400	2,004,379	20,534,446	D	30,121
1942							
1943							
1944							
1945							
1946							
			TAXES PAID				
1929	$476,740.79	199,695.33	97,739.13	55,223.01	829,398.26		
1930	522,901.50	190,689.79	95,122.50	61,352.11	870,064.90	I	40,666.64
1931	507,175.34	183,218.38	100,251.06	65,344.18	855,988.96	D	14,075.95
1932	377,700.32	120,527.71	65,264.22	46,897.77	610,390.02	D	245,598.94
1933	261,765.08	99,599.60	57,065.71	36,067.26	454,497.65	D	155,892.37
1934	267,327.80	86,527.53	56,246.84	31,256.06	441,358.23	D	13,139.42
1935	279,734.41	95,226.14	60,089.81	29,817.75	464,868.11	I	23,509.88
1936	302,207.99	107,061.43	66,447.06	30,066.37	505,782.85	I	40,914.74
1937	345,790.20	120,097.50	80,366.44	30,024.80	576,278.94	I	70,496.09
1938	415,719.34	118,534.83	96,103.47	30,227.17	660,584.81	I	84,305.87
1939	415,979.65	120,806.75	99,217.45	37,997.17	674,001.02	I	13,416.21
1940	376,744.89	130,696.88	95,075.43	39,698.46	642,215.63	D	31,785.39
1941	340,282.83	156,845.98	90,003.76	39,846.19	626,978.76	D	15,236.87
1942							
1943							
1944							
1945							
1946							

NOTES: The Cliffs Power & Light Co. Beginning with 1939 the valuation represents a figure either determined or approved by The Michigan State Tax Commission.

The 15 mill amendment went into effect in year 1933.

The State Sales tax became effective July 1933.

Morris Mine taxes were paid by Inland Steel Co. beginning with 1933. The valuation and taxes for that year being $1,005,024 and $21,042.48 respectively.

The Negaunee Mine Co. Beginning with 1940 both valuation and taxes include new acquisions, and that part paid by The C. C. I. Co. is included in Negaunee Mine column and likewise deducted from the C. C. I. Co. valuation and taxes.

H. J. A.
1-28-42.

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

	1938	1939	1940	1941
PRODUCT - Tons	543,567	327,161	387,258	658,747
POWDER				
Pounds - Gelamite ...2X	301,100	346,600	478,750	581,050
50% L. F.	- -	- -	- -	- -
60% Gelatine	44,880	- -	- -	3,950
Total Pounds Powder	345,980	346,600	478,750	585,000
Total Cost	42,926.27	40,942.86	55,067.75	67,130.89
Fuse - Feet	534,800	609,200	771,800	1,012,600
Caps - Number	81,660	98,900	119,050	154,500
Duplex Shot Wire	4,130	5,800	6,550	21,550
Delay Fuses	3,432	illegible	illegible	illegible
Electric Caps	- -	1,500	4,973	8,044
Fuse Lighters	27,000	24,400	27,500	49,000
Fuse Containers	12	47	5	- -
Tamping Bags	26,350	40,000	34,600	54,800
Powder Bags	- -	20	- -	- -
Total Cost - Fuse, Caps, etc.	4,766.39	5,378.63	6,819.32	9,563.11
TOTAL - All Explosives	47,692.66	46,321.49	61,887.07	76,694.00
Average price per pound - Powder	.1241	.1181	.115	.1150
Cost per ton - Powder	.1312	.1057	.0997	.1019
Cost per ton - Fuse, etc.	.0146	.0139	.0123	.0145
Cost per ton - All Explosives	.1458	.1196	.1120	.1164
Pounds Powder per ton of ore	1.057	.8950	.8664	.8880

1941 Production increased 106,149 tons or 19.2 % compared with 1940
Average price for powder and Cost per ton for all explosives was practically the same for years 1941 and 1940

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

	1938	1939	1940	1941
PRODUCT - Tons	1,515,231	1,903,564	2,702,252	3,242,771
POWDER				
Pounds - 40%	2,000	- -	- -	- -
50%	157,549	44,515	9,500	5,600
60%	18,350	10,550	5,350	29,753
1X and 2X Gelamite	500,048	764,270	1,139,055	1,380,103
Total Pounds - Powder	677,947	819,335	1,153,905	1,415,456
Total Cost - Powder	82,844.59	96,623.23	132,720.38	162,750.17
Fuse - Feet	2,341,664	2,994,647	4,187,783	5,109,955
Caps - Number	325,171	426,426	591,115	726,208
Leading Wire - Feet	2,500	2,500	2,460	3,500
Connecting Wire - Pounds	48	120	82	106
Tamping Bags	71,500	83,000	99,150	133,800
Sealing Compound - Pints	40	44	72	
Powder Bags	101	125	133	177
Fuse Lighters	56,100	69,650	106,375	134,850
Electric Exploders	1,821	2,109	3,561	10,876
Blasting Machines	- -	- -	1	- -
Master Fuse Lighters	- -	8,650	400	3,416
TOTAL COST - Fuse, Caps, etc.	17,152.23	21,914.56	30,333.88	37,824.68
TOTAL COST - All Explosives	99,996.82	118,537.79	163,054.26	200,575.32
Average Price per pound - Powder	.1222	.1179	.1150	.1150
Cost per ton - Powder	.0547	.0518	.0491	.0502
Cost per ton - Fuse, etc	.0113	.0115	.0112	.0117
Cost per ton - All Explosives	.0660	.0623	.0603	.0619
Pounds of Powder per ton of ore	.4474	.4304	.4271	.4364

1941 Production increased 540,719 tons or 20% compared with 1940; average price per pound for powder and cost per ton for all explosives are practically the same for 1941 and 1940.
Mines included in above statement, Athens, Maas, Negaunee, Lloyd and Virgil.

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

	1938	1939	1940	1941
PRODUCT - TONS	1,515,231	1,903,564	2,702,052	3,242,771
TIMBER				
Feet 6-8	400,543	419,132	349,531	391,614
8-10	161,523	232,404	378,024	396,935
10-12	263,466	348,701	477,494	570,415
12-14	136,375	166,501	184,574	230,706
14-16	9,891	14,284	12,963	14,419
Treated Timber	6,554	6,937	4,756	526
Total Feet	978,352	1,187,959	1,407,342	1,604,615
Total Cost	73,697.16	89,080.48	110,124.43	127,923.50
LAGGING				
Feet 5	17,175	21,585	14,125	11,270
7	3,879,041	4,704,619	6,348,725	7,789,971
Total Feet	3,896,216	4,726,204	6,362,850	7,801,241
Total Cost	30,933.14	36,934.76	49,769.18	61,116.88
Poles - Feet	2,377,176	3,847,650	5,182,904	5,885,273
Poles - Cost	31,980.78	49,766.77	68,498.05	77,787.92
Wire Fencing - Rods	808	2,860	2,933	2,447
Wire Fencing - Cost	773.86	2,707.62	2,772.12	2,470.64
Total Cost for all Timber	137,384.94	178,489.63	231,163.78	269,298.94
Average Cost per foot - Timber	.0753	.0749	.0782	.0797
" " " 100' - Lagging	.7939	.7814	.7821	.7834
" " " " - Poles	1.345	1.293	1.322	1.322
" " " Rod - Fencing	.958	.946	.945	1.009
Feet of Timber per ton of ore	.646	.624	.521	.495
" " Lagging " " " "	2.571	2.482	2.355	2.406
" " Poles " " " "	1.569	2.021	1.918	1.815
" " Fencing " " " "	.0087	.025	.018	.012
Cost per ton for Timber	.0486	.0468	.0408	.0394
" " " " Lagging	.0204	.0194	.0184	.0188
" " " " Poles	.0211	.0261	.0254	.0240
" " " " Fencing	.0005	.0014	.0010	.0008
Total Cost per ton	.0906	.0937	.0856	.0830

1941 Production increased 540,719 ton or 20% compared with 1940
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 MINE"

SOFT ORE MINES

	1938		1939		1940		1941	
PRODUCT - Tons	1,515,231		1,903,564		2,702,052		3,242,771	
CLASSIFICATION	AMOUNT	PER TON	AMOUNT	PER TON	AMOUNT	PER TON	AMOUNT	PER TON
General Supplies	99,037.03	.0654	109,486.33	.0575	131,271.61	.0486	171,462.86	.0529
Iron and Steel	29,519.07	.0195	29,725.21	.0156	38,676.32	.0143	47,764.92	.0147
Machinery	51,994.21	.0343	58,523.72	.0308	71,942.91	.0267	122,755.28	.0378
Explosives	99,990.90	.0659	118,719.79	.0624	163,107.72	.0603	200,860.70	.0619
Lumber and Timber	162,249.04	.1071	195,651.50	.1028	245,940.96	.0910	296,315.16	.0914
Fuel	17,722.66	.0117	16,974.83	.0089	15,414.40	.0057	17,071.97	.0053
Electric Power	327,121.41	.2159	344,250.29	.1808	403,886.97	.1495	444,596.71	.1372
Miscellaneous	21,874.88	.0144	60,523.28	.0318	26,178.38	.0097	39,643.73	.0122
Total	809,509.20	.5342	933,954.95	.4906	1,096,419.27	.4058	1,340,471.33	.4134

HARD ORE MINES

	1938		1939		1940		1941	
PRODUCT - TONS	327,161		387,258		552,598		658,747	
CLASSIFICATION	AMOUNT	PER TON	AMOUNT	PER TON	AMOUNT	PER TON	AMOUNT	PER TON
General Supplies	29,768.82	.091	39,022.60	.101	44,025.34	.080	62,604.40	.095
Iron and Steel	18,852.90	.058	20,264.11	.052	32,250.25	.059	43,819.99	.066
Machinery	25,388.84	.077	22,640.32	.059	41,544.87	.075	55,561.35	.084
Explosives	47,677.83	.146	46,454.76	.120	61,887.07	.112	76,700.80	.117
Lumber and Timber	7,647.87	.023	7,863.57	.020	6,662.98	.012	11,543.83	.017
Fuel	4,561.12	.014	4,366.08	.011	5,157.58	.009	5,421.96	.008
Electric Power	77,269.00	.236	79,652,95	.206	91,349.36	.165	101,144.56	.154
Miscellaneous	3,790.74	.012	19,669.44	.051	2,489.46	.004	24,027.11	.037
Total	214,957.12	.657	239,933.83	.620	285,366.91	.516	380,824.00	.578

NOTES 1941 Soft ore Mines production increased 540,719 tons or 20% compared with 1940
Soft ore Mines included in statement - Athens, Lloyg, Maas, Negaunee and Virgil
Hard Ore Mine production increased 106,149 tons or 19.2 % compared with 1940

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THE CLEVELAND-CLIFFS IRON COMPANY
ORE MINING DEPARTMENT

LABOR SUMMARY - ALL COMPANIES

PRODUCT - TONS	1938	1939	1940	1941	
	2,705,862	3,699,285	5,419,185	7,172,418	
				Less Champion 106,928	Purchased Ore
				7,065,490	
	DAYS AMOUNT	DAYS AMOUNT	DAYS AMOUNT	DAYS AMOUNT	
Surface	173,941 3/4 978,568.71	197,836 1,131,048.39	250,446 3/4 1,441,760.22	308,725 2,040,091.32	
Cost per ton	.362	.306	.266	.289	
Underground	265,457 1/2 1,678,613.41	311,549 1/2 1,989,110.18	409,032. 3/4 2,616,755.26	548,847 3/4 4,083,080.09	
Cost per ton	.620	.538	.483	.578	
Superintendence and General Roll	51,903 3/4 371,712.80	55,047½ 388,021.13	54,911 3/4 393,790.45	56,652 444,289.71	
Cost per ton	.137	.105	.073	.063	
Grand Total	491,303 3,028,894.92	564,432 3/4 3,508,179.70	714,391 1/4 4,452,305.93	914,224 3/4 6,567,461.12	
Cost per ton	1.119	.948	.822	.930	
Average rate per day	6.17	6.22	6.23	7.18	
Tons per man per day (1)	5.51	6.55	7.59	7.72	
Production		3,699,285	5,419,185	7,172,418	
Prior year stockpile overrun		11,566	162,595	110,093	
Total		3,710,851	5,581,780	7,282,511	

NOTE: The above is the total of all wages and salaries for employee's of the Mining Department, including Cliffs Power and light Co. - excepting Champion Ore operations.

WAGES: Effective April 1st 1941 wages were increased by 10 cents per hour or 12½ %. Time and one-half allowed for over 8 hours in one day or 40 hours in one week. Vacation pay of 40 hours for three years service and 80 hours for 15 years service was paid in August but mines continued to operate - vacation time being deferred.

WORKING SCHEDULE - 1941 - MICHIGAN PROPERTIES

From Jan. 1st all mines. excepting Cliffs Shaft and Spies Virgil were on a 5 day per week basis working 3-8 hour shifts per day. Cliffs Shaft and the Spies Virgil were on a 5 day per week 2-8 hour shifts per day.

Effective Jan. 11th the Cliffs Shaft Mine went to a 6 days per week and Jan. 25th all other mines increased their working schedule by 1-8 hour shift on sixth day. On September 1st these mines increased their working schedule to 2-8 hour shifts on the sixth day excepting Spies Virgil which remained on the 5 day per week 2-8 hour shifts per day basis.

MINNESOTA PROPERTIES

The Canisteo ore operations began May 15th working 2-8 hour shifts per day 5 days per week and continued this schedule through October 8th when season closed.

The Holman Cliffs pit began ore operations April 21st working 3-8 hour shifts per day 5 days per week and continued this schedule through Oct. 31st when season closed.

The Hill-Trumbull pit began ore operations April 18th working 3-8 hour shifts per day 5 days per week and continued this schedule through Oct. 31st when season closed.

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COMPARISON OF TOTAL DAYS WORKED AND TONS OF ORE MINED FOR THE YEARS 1941 AND 1940

	1941 DAYS	1940 DAYS	1940 DAYS	1940 DAYS
NON-PRODUCTIVE UNITS				
Stephenson Mine	541	364½		
Princeton Mine	2,689¾	368½		
Gardner-Mackinaw Mine	1,220	1,811¼		
Mather Mine	20,098¾	2,404		
Miscellaneous payroll	1,945¾	1,872¼		
Shops and Storehouse	3,923	3,283¾		
CCICO-Miscellaneous & General	52,008¾	46,210¼		
Negaunee Mine Co. " "	7,155¼	4,033		
Athens Iron Mng Co. " "	1,810½	1,202		
Mesaba Cliffs Mining Co.	21,069¼	17,657¼		
Canisteo Mining Co.	13,668¾	16,891½		
The Cliffs Power and Light Co.	24,548¼	26,310¾		
General-Undistributed	37,194½	37,014¼		
TOTAL DEDUCTIONS	187,873½	159,423¼		
Champion Screen Plant	1,582¼	- -		
TOTAL DEDUCTIONS	186,291¼	159,423¼		
Grand Total - All operations	915,807	714,391¼		
Net - Operating Mines	729,515¾	554,968	729,515¾	554,968
Total Tons	7,172,418	5,419,185		
Less Champion ore	106,928	- -		
Total Tons	7,065,490	5,419,185		
Tons per man per day	9.69	9.76		
	TONS			
OPEN PIT PRODUCTION				
Tilden Mine	302,943	205,612	8,198¼	5,753¾
Canisteo Mine	585,679	478,339	22,479	18,731
Hill-Trumbull Mine	1,285,681	1,055,310	43,403	32,471¾
Holman-Cliffs Mine	989,669	425,274	42,014½	17,574
TOTAL	3,163,972	2,164,535	116,094¼	74,530½
Open Pit Tons per Man per Day	27.25	29.04		
Net Underground Days			613,421	480,437½
Net Underground Production	3,901,518	3,254,650		
Underground Tons per man per Day	6.360	6.774		
	PERCENTAGE OF TOTAL PRODUCTION			
	TONS	PERCENT	TONS	PERCENT
Underground Mines	3,901,518	54.39	3,254,650	60.00
Open Pits	3,163,972	44.11	2,164,535	40.00
Champion - purchased ore	106,928	1.50		
Total	7,172,418		5,419,185	

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STATEMENT SHOWING PENALTY COST OF OVERTIME WORKED BY EMPLOYEES
DURING YEAR 1941, AND EFFECT THE PENALTY COST HAD ON THE YEARS PRODUCTION

	MICHIGAN PROPERTIES	MESABA RANGE			TOTAL
		CANISTEO	HILL TRUMBULL	HOLMAN CLIFFS	
January	6,631.48	62.32	28.12	18.39	
February	14,184.99	55.10	- -	3.52	
March	14,960.29	.66	10.54	40.84	
April	17,476.60	62.99	1,223.90	1,187.53	
May	23,113.45	127.66	1,441.46	1,841.62	
June	23,212.49	88.29	1,366.24	1,284.00	
July	11,976.52	78.81	744.11	738.05	
August	25,844.72	216.73	1,290.59	1,480.34	
September	19,175.65	219.29	1,291.86	1,134.16	
October	29,421.83	203.78	1,719.54	1,373.71	
November	25,255.84	98.61	663.60	654.02	
December	19,488.11	58.78	466.44	344.10	
Total - 1941	230,741.97	1,273.02	10,246.40	10,100.28	252,361.67
Total - 1940	10,201.98	917.01	4,317.58	644.88	16,081.45
PRODUCTION					
Tons - Years 1941	4,311,389	585,679	1,285,681	989,669	7,172,418
Tons - Year 1940	3,460,262	478,339	1,055,310	425,274	5,419,185
Effect the Penalty Cost had on year's Production's Cost					
Cost per ton - 1941	.0535	.0022	.0008	.0010	.0352
Cost per ton - 1940	.0029	.0019	.0004	.0015	.0029

NOTE: Effective in January 1941, and extending through balance of the year, all Michigan Mines, excepting Spies-Virgil operated over 40 hours per week, and overtime was paid for over 8 hours in one day and 40 hours in one week.

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CENTRAL ANALYTICAL LABORATORY
STATEMENT SHOWING COST OF OPERATING AND DISTRIBUTION BASED ON DETERMINATIONS WORKED FOR YEAR 1941

	1941	1940
COSTS		
LABOR		
Chemists and Assistants	23,121.32	19,480.00
Helpers and Sample Buckers	46,627.27	28,307.96
Total Labor	69,748.59	47,787.96
SUPPLIES AND EXPENSES		
Chemical, etc.	17,737.11	12,873.73
Property Insurance	20.24	20.73
Personal Injury Expense	52.50	952.49
Unemployment Insurance Tax	2,295.25	1,566.33
Old Age Benefit Tax	695.52	474.48
Depreciation	962.64	233.88
Total	21,763.26	16,121.64
Grand Total	91,511.85	63,909.60
Total Number of Determinations	281,270	216,563
Cost of Determination	.32535	.29511

DISTRIBUTION	NO. OF DETERMINATIONS	COST		PERCENT OF TOTAL LABORATORY WORK
Cliffs Shaft	43,545	14,060.29		15.5
Cliffs Shaft Diamond Drills	1,972	639.50		.7
Maas Mine	77,431	25,013.89		27.5
Maas Diamond Drills	677	211.60		-.2
Gardner-Mackinaw	1,080	343.05		-.4
Lloyd Mine	31,104	10,005.02		11.1
Lloyd Diamond Drills	1,869	611.98		.7
Tilden Mine	14,600	4,716.44		5.2
Stephenson Mine	757	240.67		.3
Princeton Mine	262	84.69		.1
Spies-Virgil Mine	25	7.81		
Experiments and Investigations	8,490	2,759.50		3.0
Uncomp. Construct. Explorations	5,393	1,762.93		1.9
Loading & Shipping, Champion	11,666	3,684.41		4.1
St Paul Ore	25	7.81		
Negaunee Mines	44,839	14,450.56		15.9
Athens Mine	27,572	8,876.55		9.8
Miscellaneous Dilivery Ore				
Cambria	2,688	869.18		1.0
Mary Charlotte	1,935	625.43		.7
Morris	46	13.54		
Total Company Operations	275,976	88,984.85	.32245	
Accounts Receivable:				
L. S. & I. Railway Co.	2	42.00		
Volunteer	5,292	2,485.00		1.9
GRAND TOTAL	281,270	91,511.85	.32535	100.0

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THE CLEVELAND-CLIFFS IRON COMPANY
ORE MINING DEPARTMENT
SAFETY BONUSES PAID TO FOREMAN - YEAR 1941
RECAPITULATION

MINE OR PROPERTY	Feby. 28th	May 31st	Aug. 31st	Nov. 30th	TOTAL
Cliffs Shaft Mine	$ 280.97	307.68	296.40	320.70	1,205.75
Lloyd Mine	197.78	212.11	210.88	224.96	845.73
General Storehouse	44.68	45.58	46.49	44.32	181.07
Maas Mine	181.23	308.44	278.10	330.27	1,098.04
Spies-Virgil Mine	50.94	51.58	45.78	54.48	202.78
Gardner-Mackinaw Mine	None	None	None	None	- -
TOTAL C.C.I.CO.	755.60	925.39	877.65	974.73	3,533.37
THE NEGAUNEE MINE COMPANY					
Negaunee Mine	235.95	272.14	284.54	295.63	1,088.26
Section Two Mine	6.60	None	None	None	6.60
TOTAL NEGAUNEE MINE CO. ..	242.55	272.14	284.54	295.63	1,094.86
THE ATHENS IRON MINING COMPANY ..	236.99	250.51	243.38	274.03	1,004.91
THE CLIFFS POWER & LIGHT CO.	40.54	29.04	29.78	38.06	137.42
TOTAL OTHER COMPANIES	520.08	551.69	557.70	607.72	2,237.19
GRAND TOTAL	1,275.68	1,477.08	1,435.35	1,582.45	5,770.56

NOTE: Gardner-Mackinaw Mine no bonuses paid since May 31st, Period 1938.

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THE CLEVELAND-CLIFFS IRON COMPANY
ORE MINING DEPARTMENT
SAFETY BONUSES PAID TO FOREMAN - YEAR 1941

B.C. NO.	NAME	OCCUPATION	MARCH 15th	JUNE 15th	SEPT. 15th	DEC. 15th	TOTAL 1941
CLIFFS SHAFT MINE							
1	Emanuel Stephens	Machy. Foreman, ..	30.54	33.72	33.51	32.16	129.93
5	William Tobin	Elect. Foreman ...	5.00	6.08	5.87	5.80	22.75
18	ALBERT Decaire	Surface Foreman ..	29.79	35.24	34.99	34.71	134.73
79	John Garrett	Shift Boss	37.24	38.32	35.69	38.68	149.93
84	James Andrew	Shift Boss	7.85	- -	Dead	- -	7.85
92	Raymond Boase	Shift Boss	27.85	35.21	29.87	34.96	127.89
94	Jacob Kivisto	Shift Boss	30.26	35.21	29.87	34.96	130.30
113	John Tynismaa	Timber Foreman ...	5.00	5.00	5.00	5.00	20.00
186	Stanley Kelly	Shift Boss	27.01	26.99	24.64	24.77	103.41
232	Edwin Dawe	Shift Boss	22.91	11.63	23.21	26.60	84.35
252	Fred Keskey	Scraper Foreman ..	2.50	6.21	5.40	5.80	19.91
77	John Glanville	Shift Boss	27.01	26.53	24.56	27.40	105.50
146	Glen Roberts	Shift Boss	16.15	27.69	25.23	26.60	95.67
350	Edward Guy ...	Shift Boss	11.86	19.85	18.56	23.26	73.53
	TOTAL CLIFFS SHAFT MINE		280.97	307.68	296.40	320.70	1,205.75
LLOYD MINE							
1	Arthur Nault	Surface Foreman..	24.63	30.01	28.00	28.25	110.89
4	William Wicklund	Machry. Foreman..	10.49	11.18	14.56	14.60	50.83
13	Jalmer Gronberg	Elect. Formn	5.00	5.00	5.00	5.00	20.00
52	Matt Bjorae	Shift Boss	24.88	25.35	36.43	27.09	113.75
67	Gust Saari	Shift Boss	24.33	15.49	11.16	29.59	80.57
94	Walter Turino	Shift Boss	25.62	26.91	20.26	24.87	97.66
119	John Bjorne	Shift Boss		13.93	8.19	2.50	24.62
134	Frank Juidici	Timber Foreman ..	5.00	5.00	- -	5.00	15.00
135	Albert Hamailainen	Track Boss	5.00	- -	5.00	- -	10.00
148	Carl Carlson	Shift Boss	24.88	26.03	22.69	26.73	100.33
184	Marvin Swanson	Shift Boss	- -	- -	13.86	5.97	19.83
189	William Anderson	Shift Boss	24.33	26.30	23.12	28.45	102.20
192	James Lawson	Shift Boss	23.62	26.91	22.61	26.91	100.05
	TOTAL LLOYD MINE, ...		197.78	212.11	210.88	224.96	845.73
GENERAL STOREHOUSE							
1	George Gill	Machy. Foreman..	21.05	19.40	- -	Died	40.45
35	Thomas H. Guy	Blksmth Foreman.	13.63	14.66	16.07	15.43	59.79
70	Henry Mayrand	Elect. Foreman .	5.00	6.52	6.49	6.41	24.42
17	Samuel Nirva	Garage Foreman .	5.00	5.00	5.00	5.00	20.00
10	Frank Culbert	Machy. Foreman .			18.93	17.48	36.41
	TOTAL GENERAL STOREHOUSE		44.68	45.58	46.49	44.32	181.07
SPIES-VIRGIL MINE							
8	Edward Pid geon	Elect. Foreman.	11.43	13.88	11.70	16.72	53.73
32	Walter Dobeck	Shift Boss	5.00	- -	7.85	- -	12.85
33	Richard Roberts	Shift Boss	6.02	16.35	8.57	16.38	47.32
35	Eli Banovich	Tbr. Foreman ..	7.47	To Mather Mine			7.47
84	Carl Christensen	Shift Boss	16.02	16.35	12.60	16.38	61.35
97	Alex Bain	Shift Boss	5.00	5.00	5.06	5.00	20.06
	TOTAL SPIES-VIRGIL MINE		50.94	51.58	45.78	54.48	202.78

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THE CLEVELAND-CLIFFS IRON COMPANY
ORE MINING DEPARTMENT
SAFETY BONUSES PAID TO FOREMAN - YEAR 1941

B.C. NO.	NAME	OCCUPATION	FEBY. 29th	MAY 31st	AUG. 31st	NOV. 30th	TOTAL 1941
MAAS MINE							
1	George Winter	Surf. Foreman ..	14.00	35.29	35.39	36.78	121.46
2	Howard Maloney	Machy. Foreman .	21.56	21.43	24.38	24.03	91.40
3	Ray Borlace	Elect. Foreman .	5.00	5.00	5.00	5.00	20.00
33	Arne Wm. Parkkonen	Mach. Helper ...	--	4.16	5.79	3.88	13.83
67	Albert Larson	Shift Boss	11.16	27.32	27.34	22.10	87.92
68	William Richards	Shift Boss	24.92	25.90	21.54	28.30	100.66
69	Sidney Harvey	Shift Boss	24.32	13.54	Died	- -	37.86
70	William T. Nicholas	Shift Boss	13.81	31.65	15.91	36.08	97.45
72	Joseph Skewes	Shift Boss	19.48	40.30	22.43	31.97	114.18
73	William Goldsworthy	Shift Boss		39.77	21.12	24.13	85.02
92	Peter Bessola	Tbr. Foreman ...	14.33	16.83	10.38	9.92	51.46
166	Harold Granlund	Shift Boss	8.12	22.44	24.94	21.68	77.18
201	Hugo Maunula	Shift Boss			25.35	24.71	50.06
202	Gust Sundberg	Shift Boss	24.53	24.81	22.76	26.63	98.73
207	Arne Mantela	Shift Boss				2.20	2.20
324	Jethro Collins	Shift Boss			15.77	32.86	48.63
	TOTAL MAAS MINE		181.23	308.44	278.10	330.27	1,098.04

THE CLIFFS POWER & LIGHT COMPANY
ELECTRICAL DEPARTMENT
PLANT PAY-ROLL

26	Arthur Olson	District Foreman	5.00	5.00	5.00	5.00	20.00
30	William F. Martin	District Foreman	5.00	- -	5.00	5.00	15.00
35	Leo S. Voelker	District Foreman	17.79	12.80	- -	14.07	44.66
46	Frank F. Hosey	Mech'l Engineer	12.75	11.24	19.78	13.99	57.76
	TOTAL CLIFFS POWER & LIGHT COMPANY ...		40.54	29.04	29.78	38.06	137.42

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THE NEGAUNEE MINE COMPANY
ORE MINING DEPARTMENT
SAFETY BONUSES PAID TO FOREMAN - YEAR 1941

B.C. NO.	NAME	OCCUPATION	FEBY. 29th	MAY 31st	AUG. 31st	NOV. 30th	TOTAL 1941
NEGAUNEE MINE							
1	John Peel	Surface Foreman	26.54	31.30	33.97	35.59	127.40
3	Fred Staples	Ma chy. Foreman	17.02	18.96	19.71	18.46	74.15
6	Earl Rule	Elect. Foreman	4.60	5.00	5.00	5.00	19.60
62	Wilfred Tippett	Shift Boss	20.11	19.32	19.04	19.19	77.66
77	Noah Hares	Shift Boss	9.41	- -	- -	2.41	11.82
78	Abel Laitinen	Shift Boss	29.43	37.79	37.68	31.62	136.52
79	August Jokinen	Shift Boss	30.76	35.36	29.15	41.90	137.17
80	William Denney	Shift Boss	30.93	38.91	36.74	36.65	143.23
81	David Pynnonen	Tbr. Foreman	5.00	5.00	11.88	12.40	34.28
109	Reuben E. Carlson	Shift Boss			17.45	7.34	24.79
172	John Tregonning	Shift Boss	1.79	- -	- -	- -	1.79
182	John Pascoe	Shift Boss	3.52	19.85	19.41	18.79	61.57
202	William H. Hares	Shift Boss	14.58	22.61	16.94	20.00	74.13
224	Edward Anderson	Shift Boss	- -	- -	- -	7.36	7.36
229	Francis Tresedder	Shift Boss	10.42	18.03	18.24	18.18	64.87
315	William Treloar	Shift Boss	24.24	20.01	19.33	20.74	84.32
416	Charles Besola	Shift Boss	7.60	- -	- -	- -	7.60
	TOTAL NEGAUNEE MINE		235.95	272.14	284.54	295.63	1,088.26
SECTION TWO MINE							
51	Allen Hjelt	Shift Boss	3.30	- -	- -	- -	3.30
63	Charles Besola	Shift Boss	1.65	- -	- -	- -	1.65
65	Eli Bonovich	Shift Boss	1.65	- -	- -	- -	1.65
	TOTAL SECTION TWO MINE		6.60				6.60

THE ATHENS IRON MINING COMPANY
ORE MINING DEPARTMENT

ATHENS MINE							
2	William Forslund	Elect. Foreman	5.00	5.00	4.60	5.00	19.60
3	Edward Heij	Surf. Foreman	26.88	28.32	32.37	30.58	118.15
4	Edward Prideaux	Machy. Foreman	15.07	16.11	15.42	16.85	63.45
41	Peter J. Bogetto, Jr.	Shift Boss	- -	- -	9.09	16.32	25.41
47	Reuben Carlson	Shift Boss	17.91	20.56	12.29	- -	50.76
52	Joseph Spelgatti	Tbr. Foreman	10.30	14.68	13.30	14.00	52.28
65	James Maino	Shift Boss	24.22	23.51	23.27	26.04	97.04
74	Frank Niemi	Shift Boss	30.74	31.19	23.99	26.61	112.53
80	William J. Skewes	Shift Boss	26.60	32.11	29.00	28.33	116.04
83	Howard P. Langlois	Shift Boss	- -	- -	6.14	15.94	22.08
90	Mark Dixon	Shift Boss	32.60	30.18	28.37	29.63	120.78
170	Waino Heikkila	Shift Boss	- -	- -	8.27	16.86	25.13
173	William Ghischia	Shift Boss	29.81	31.56	25.08	28.63	115.08
312	Mike Lelko	SShift Boss	17.86	17.29	12.19	19.24	66.58
	TOTAL ATHENS MINE		236.99	250.51	243.38	274.03	1,004.91

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CLIFFS SHAFT MINE

ANNUAL REPORT

YEAR 1941

1. GENERAL:-

The Cliffs Shaft Mine was operated 6 days a week throughout 1941 with the exception of the first Saturday in January. For the first time in many years the mine operated on Washington's Birthday, on Good Friday, on the Spring Election Day, on Decoration Day, Midsummer Day, and the day after Christmas Day. The mine was shut down on New Year's Day, from July 3rd. to July 11th., Labor Day, Thanksgiving, and Christmas Day. The shut-down from July 3rd. to July 11th. was necessary to give us time to put on two new drums on the main hoist in the engine house and at the same time a new steel crusher bowl was installed on the Number 8 McCully crusher.

The production for the year reached 658,747 tons compared with a previous high figure in 1940 of 552,598 tons. The output overran the revised budget estimate by 6,747 tons. It might also be added that the production figure for 1941 does not include any stockpile overrun and estimates by the Engineering Department show that if all of the lump pile had been shipped that 13,013 tons of lump ore overrun was actually developed in 1941. That means that the actual production of the Cliffs Shaft Mine for the Year 1941 was approximately 672,000 tons.

Shipments totaled 638,246 and all of the ore at the mine was cleaned up except about 37,000 tons of lump ore. The reason that the Cliffs Shaft Mine was able to carry over this lump ore tonnage was due to the fact that the Champion Mine produced 64,777 tons of lump ore which eased just that much load from the Cliffs Shaft property.

Every effort was made to put new ore in sight and with that end in view 60% of the mining gangs were kept on development work during the entire year.

Considerable new equipment was installed both on the surface and underground. The shaft houses were completely rewired and modern floodlighting equipment installed. Overhead cranes with 5 ton chain blocks were installed over the main entrance doors. The new jackbit shop was equipped with 2 new J-5 jackbit grinders, a new Westinghouse electric furnace, and a band saw. To the new drill sharpening shop we added a rebuilt drill sharpener, a new bench grinder, and an order was placed for a new oil furnace. A spare electric hoist was purchased for the crusher building, the idea being to replace the air tugger used to lift chunks out of the crusher bowl. The crusher itself was equipped with a new steel bowl.

To the underground equipment we added seven new Ingersoll-Rand DA-35 air drills, 2 Cleveland RB-12 air drills, 5 jackhammers for block-holing, 3 scraper hoists, 3 scraper slides, and one rebuilt 6 ton trolley locomotive.

A new double truck top tram car for handling lump ore was also built at the Hard Ore shops.

Construction work on the main dry house was finished and a contract was also let for an addition to the blacksmith shop and the laboratory.

CLIFFS SHAFT MINE
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In order to make more lump ore available the Maas Mine screening plant was reconstructed. A vibrating screen was installed and all of the crushed ore from both pocket and stockpile, with the exception of the so-called "charge" ore, was rescreened by this plant and the oversize over 3/4 of an inch called "marbles" was added to the lump ore.

A new revolving screen with 2" diameter holes was installed early in February replacing the old screen with 2½" holes. As a result of this change, the percentage of lump was increased from 68% to 75%.

On April 16th., the mine was put on an 8 hour collar to collar basis. It is interesting to note that the daily mine production following this change increased. Prior to the change the average daily product was 2,111 tons and for the last 8 months of the year this figure was increased to 2,275 tons.

2. PRODUCTION SHIPMENTS & INVENTORIES:

a. Production by Grades

Grade	Tons	% of Total
Cliffs Shaft Lump	402,615	
Cliffs Shaft Crushed	138,529	
Cliffs Shaft Run-of-mine	14,381	
Total Cliffs Shaft Ore	555,525	84.33
Bancroft Lump	62,187	
Bancroft Crushed	23,603	
Bancroft Run-of-Mine	17,432	
Total Bancroft Ore	103,222	15.67
GRAND TOTAL FEE & LEASE ORE	658,747	100.00

Production by grades for past ten years follows:

Year	Lump Ore Tons	Crushed Ore Tons	Run-of-Mine Ore Tons	Total Tons
1932	57,104	24,449	566	82,119
1933	39,101	16,838	-	55,939
1934	156,776	66,469	-	223,245
1935	189,883	79,038	-	268,921
1936	315,731	140,650	379	456,760
1937	368,768	171,562	3,237	543,567
1938	222,672	102,361	2,128	327,161
1939	259,517	123,883	3,858	387,258
1940	371,745	177,469	3,384	552,598
1941	464,802	162,132	31,813	658,747

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

	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
1940	371,745	67.68	177,469	32.32
1941	464,802	74.14	162,132	25.86

It will be noted that the proportion of lump produced in 1941 is larger than for any previous year. The answer is the reduction in the size of the holes in the revolving screen from 2½" to 2".

The division of product between the fee ore and the ore produced from the Bancroft Lease for the past ten years is shown by the following table:

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
1940	479,060 "	86.7	73,538 "	13.3
1941	555,525 "	84.3	103,222 "	15.7

We submit the following table which indicates all of the ore that has been produced to date from the Bancroft Lease since that property was taken over by the Company.

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
1940	73,538
1941	103,222
Total	826,385

CLIFFS SHAFT MINE
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b. Shipments

Grade	Pocket Tons	Stockpile Tons	Total Tons	Last Year Tons
Cliffs Shaft Lump	238,299	135,652	373,951	358,099
Cliffs Shaft Crushed	3,545	95,490	99,035	179,018
Cliffs Shaft Cr. Sp.	549	51,146	51,695	
Cliffs Shaft Mine Run	14,321	60	14,381	55
Bancroft Lump	39,601	18,652	58,253	44,913
Bancroft Crushed	12,639	10,910	23,549	26,477
Bancroft Mine Run	17,352	30	17,382	3,329
Total	326,306	311,940	638,246	611,891
Total Last Year	346,766	265,125	611,891	
Incr. in Shipments	20,460	46,815	26,355	

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

	Cliffs Shaft Grade			Bancroft Grade			
Year	Lump	Crushed	Run-of-Mine	Lump	Crushed	Run-of-Mine	Grand Total
1932	25,505	3,727	574	-	-	-	29,806
1933	135,303	45,162	-	10,105	-	-	190,570
1934	142,891	47,607	-	30,238	16,703	-	237,439
1935	251,246	91,596	-	35,137	20,523	-	398,502
1936	304,265	153,738	165	48,565	31,716	214	538,663
1937	301,654	125,953	-	59,153	25,843	3,237	515,840
1938	95,983	42,240	171	19,254	3,416	1,957	163,021
1939	310,673	176,302	430	54,927	45,610	3,428	591,370
1940	358,099	179,018	55	44,913	26,477	3,329	611,891
1941	373,951	150,730	14,381	58,253	23,549	17,382	638,246

Shipments for 1941 exceeded 1940. 1940 in turn exceeded the shipments for 1939 by about the same tonnage as 1941 exceeds 1940.

c. Stockpile Balances

Ore in stock as of Dec. 31, 1941:

Cliffs Shaft Lump	56,894 tons
Cliffs Shaft Crushed	16,066 tons
Bancroft Lump	6,396 tons
Bancroft Crushed	2,177 tons
Total	81,533 tons

The stockpile balances at the end of each of the following ten years was:

Balance in Stock	-	Dec. 31, 1932	-	395,173 tons
"	-	1933	-	299,585 "
"	-	1934	-	275,391 "
"	-	1935	-	145,810 "
"	-	1936	-	82,072 "
"	-	1937	-	109,799 "
"	-	1938	-	273,939 "
"	-	1939	-	76,540 "
"	-	1940	-	47,208 "
"	-	1941	-	81,533 "

CLIFFS SHAFT MINE
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d. Division of Product by Levels

Level	"A" Shaft Tons	"B" Shaft Tons	Total Tons
1st	824	44,513	45,337
2nd	8,976	-	8,976
3rd	16,221	7,599	23,820
4th	25,121	22,729	47,850
5th	27,176	15,798	42,974
6th	36,886	6,133	43,019
7th	75,703	52,107	127,810
8th	33,202	17,637	50,839
9th	77,147	20,233	97,380
10th	75,356	23,467	98,823
11th	31,056	-	31,056
12th	-	-	-
13th	-	23,741	23,741
14th	-	10,529	10,529
15th	674	5,919	6,593
Total	408,342	250,405	658,747
Rock			21,830
Total Ore & Rock			680,577

The following figures indicate where the ore has been broken and the proportion for each shaft.

Year	"A" Shaft Tons		"B" Shaft		Total Tons
1932	56,533	68.7%	25,586	31.3%	82,219
1933	39,816	71.3%	16,123	28.7%	55,939
1934	157,835	70.8%	65,410	29.2%	223,245
1935	194,847	72.3%	74,074	27.7%	268,921
1936	309,555	67.6%	147,205	32.4%	456,760
1937	358,930	66.2%	184,637	33.8%	543,567
1938	228,370	69.9%	98,791	30.1%	327,161
1939	254,133	65.5%	133,125	34.5%	387,258
1940	372,428	67.4%	180,170	32.6%	552,598
1941	408,342	62.0%	250,405	38.0%	658,747

It is significant that more ore came from "B" Shaft in the Year 1941 than in any of the prceding 10 years.

The table on the following page is put into the report to show how the ore has been hoisted from both "A" and "B" Shafts. Because only 38.0% of the product for 1941 was actually broken in "B" Shaft, ore had to be transferred from "A" Shaft over to "B" Shaft in order to balance the hoisting cycle and the figures show that we divided the ore very evenly between the two shafts.

CLIFFS SHAFT MINE
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1941 Product as Hoisted

Month	"A" Shaft Tons	"B" Shaft Tons
January	26,229	25,550
February	26,072	25,670
March	27,649	26,913
April	27,838	26,978
May	29,084	28,452
June	26,749	26,497
July	22,311	22,693
August	27,813	27,169
September	27,620	26,681
October	29,329	29,306
November	25,723	26,182
December	25,876	24,293
Total	322,293	316,384
e. % of Total	50.46 %	49.54 %

Production by Months

		Cliffs Shaft			Bancroft			
Month	Optg. Days	Lump	Crushed	Mine Run	Lump	Crushed	Mine Run	Total
January	25	29,474	13,869	-	5,297	3,073	-	51,713
February	24	30,600	13,708	-	4,850	2,696	-	51,854
March	26	32,941	13,791	-	4,999	2,488	563	54,782
April	26	26,694	10,740	8,820	5,520	2,494	1,740	56,008
May	27	33,596	10,775	5,286	6,507	2,063	1,385	59,612
June	25	36,186	11,453	-	4,663	1,739	1,736	55,777
July	21	29,720	9,495	-	3,613	1,339	2,463	46,630
August	26	36,289	11,644	161	4,537	1,662	2,568	56,861
September	25	33,881	12,701	-	5,833	2,365	1,915	56,695
October	27	37,679	12,708	-	6,264	2,471	1,767	60,889
November	24	35,391	11,263	-	3,826	1,375	2,111	53,966
December	26	34,928	11,678	54	4,621	1,525	1,154	53,960
	302	397,379	143,825	14,321	60,530	25,290	17,402	658,747
Transfers		5,236	5,296	60	1,657	1,687	30	
Total		402,615	138,529	14,381	62,187	23,603	17,432	658,747

f. Ore Statement

		Cliffs Shaft			Bancroft				Total Last Year
	Cr. Spec.	Lump	Crushed	Mine Run	Lump	Crushed	Mine Run	Total	
On Hand Jan.1,1941.		28,230	14,393	-	2,462	2,123	-	47,208	76,540
Output for Year		397,379	143,825	14,321	60,530	25,290	17,402	658,747	545,847
Transfers	51,695	5,236	56,991	60	1,657	1,687	30		
Overruns			13,874					13,874	36,712
Total	51,695	430,845	115,101	14,381	64,649	25,726	17,432	719,829	659,099
Shipments	51,695	373,951	99,035	14,381	58,253	23,549	17,382	638,246	611,891
Balance on Hand	-	56,894	16,066	-	6,396	2,177	50	81,583	47,208

CLIFFS SHAFT MINE
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g. Delays

Date	Hours Lost	Tons Lost	Cause
Jan. 8, 1941	1 ½	200	Switchboard trouble
" 28 "	2 ½	300	Picking belt trouble
" 30 "	2	200	Crushing plant dumping device out of order
April 18,"	2	250	Top tram motor leads burned off
" 25 "	1	125	Large chunk in crusher
May 1, "	2	300	Top tram motor leads burned off
" 15 "	5	450	Gate broke in "B" Shaft
" 21 "	9 ½	900	"A" Shaft skip motor out of commission
" 26 "	1	250	Lightning burned out transformers on top tram
" 29 "	2 ½	200	Crack in "B" Shaft drum shell
June17 "	2	300	Trouble with the top tram motor
July shut down	52	9000	To install new hoist drums and repair
Augs. 11 "	1 ½	300	Broken air lift /crusher bowl
" 29 "	½	50	Electrical Storm
Oct. 27 "	1 ½	250	Repairing "A" Shaft skip
Nov. 17 "	2	300	Picking belt broken down
" 28 "	3	450	Repairs on "A" Shaft skip
Dec. 10 "	8	625	Broken skip-gate on 8th level "A" Shaft
" 15 "			
16			
17	33	1950	Broken adjustment bolt on "B" Shaft hoist / brake
Total	132 ½	16400	

3. ANALYSIS

a. Average Analysis of 1941 Output

	Iron	Phos.	Silica
Cliffs Shaft Lump	62.07	.103	6.31
Cliffs Shaft Crushed	51.64	.092	18.73
Cliffs Shaft Mine Run	59.17	.107	9.90
Bancroft Lump	62.10	.118	5.97
Bancroft Crushed	53.24	.112	15.58
Bancroft Mine Run	62.86	.106	5.52

If the 1941 analyses are compared with those for the previous year, it will be noted that the Cliffs Shaft Lump and Bancroft Lump iron content was higher in 1941. In fact if the annual reports for the last eleven years are compared, the quality of the lump produced in 1941 was better than in any previous year. The analysis of the Crushed ore was lower because we are mining a larger percentage of ore from the lean ore stopes. The lean material produced in these stopes can be picked out from the Lump grade, but we have no means at the present time of discarding the lean material in the Crushed Ore.

CLIFFS SHAFT MINE
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c. Complete Analysis of 1941 ores as shipped from Mine

Grade	Iron	Phos	Sil.	Alum	Mang	Lime	Mag.	Sul.	Loss
Lump Ore x-1	61.40	.102	7.20	2.00	0.30	0.75	0.70	.012	1.04
Crushed Ore x-2	54.60	.109	14.10	2.88	0.40	1.00	0.81	.017	1.80
Mine Run x-3	58.45	.103	10.80	2.17	0.32	0.87	0.54	.016	1.12
Mine Run x-4	63.30	.104	5.25	1.87	0.22	0.73	0.40	.011	0.87
Crushed Spec. x-5	50.70	.087	20.50	2.62	0.42	1.00	.073	.013	1.60
Crushed x-6	52.40	.093	17.85	2.64	0.41	1.00	.073	.016	1.65

Note:-
x-1 is Cliffs Shaft and Bancroft Lump combined
x-2 is Cliffs Shaft and Bancroft Crushed combined
x-3 is Cliffs Shaft Mine Run only
x-4 is Bancroft Mine Run only
x-5 is Crushed Special (marbles) from Maas Crusher
x-6 is Crushed from Maas Crusher

d. Analysis of Ore in Stock Dec. 31, 1941.

		Iron	Phos.	Sil.	Mang	Alum	Lime	Mag.	Sul.	Loss	Moist.
Cliffs Shaft Lump	Dried	60.12	.102	8.92	0.33	1.90	1.03	0.74	.013	1.19	
Cliffs Shaft Lump	Natural	59.82	.101	8.88	0.33	1.89	1.02	0.74	.013	1.18	.50
Cliffs Shaft Crushed	Dried	51.07	.091	19.75	0.47	2.76	1.36	1.00	.014	2.13	
	Natural	50.25	.090	19.43	0.46	2.72	1.34	.98	.014	2.09	1.60
Bancroft Lump	Dried	61.00	.115	7.05	0.33	2.60	1.56	1.15	.012	1.35	
	Natural	60.70	.114	7.01	0.33	2.58	1.55	1.14	.012	1.34	.50
Bancroft Crushed	Dried	53.20	.103	17.01	0.43	2.80	1.42	1.01	.015	1.96	
	Natural	52.35	.101	16.74	0.43	2.76	1.40	1.00	.015	1.93	1.62

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

		Iron	Phos.	Sil.	Mang	Alum	Lime	Mag.	Sul.	Loss	Moist.
Cliffs Shaft Ore	Dried	57.31	.107	10.10	0.47	2.36	1.21	1.00	.019	1.89	
" " "	Natural	56.82	.106	10.01	0.47	2.34	1.20	.99	.019	1.87	.85
Bancroft Ore	Dried	57.68	.125	9.88	.50	2.35	1.15	.95	.019	1.85	
" "	Natural	57.25	.124	9.81	.50	2.33	1.14	.94	.019	1.83	.75

CLIFFS SHAFT MINE
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4. ESTIMATE OF ORE RESERVES:

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

Ore in Sight December 31, 1941

Available ore in Bancroft Area "A" Shaft

	Developed		Prospective	
	Floors	Pillars	Breasts	Total
Level	Tons	Tons	Tons	Tons
2nd	1100			1100
3rd	1900	800		2700
4th	9200	5800		15000
5th			6000	6000
6th	7800			7800
8th		7700		7700
9th	6800	9500		16300
10th	33600	113900	2000	149500
11th	87700			87700
12th			2000	2000
Total	148100	137700	10000	295800

Summary

Bancroft Ore Available	295800	tons
Less 10% for loss in mining	29580	"
	266220	"
Less 10% for Rock	26622	"
	239598	"
Less December Product	7300	"
Net Total Bancroft Ore Available	232298	"

Available Cliffs Shaft Ore "A" Shaft

	Developed		Prospective	
	Floors	Pillars	Breasts	Total
Level	Tons	Tons	Tons	Tons
1st		5,600	-	5,600
2nd	9,800	-	-	9,800
3rd	300	-	-	300
4th	2,700	-	10,000	12,700
5th	13,800	9,600	4,000	27,400
6th	49,400	70,800	6,000	126,200
7th	141,400	12,900	6,000	160,300
8th	118,300	29,100	8,000	155,400
9th	198,900	9,800	6,000	214,700
10th	59,100	143,600	10,000	212,700
11th	51,900	167,900	-	219,800
12th	66,300	76,000	-	142,300
15th	40,400	-	-	40,400
Total	752,300	525,300	50,000	1,327,600

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Available Cliffs Shaft Ore "B" Shaft

	Developed		Prospective	
	Floors	Pillars	Breasts	Total
Level	Tons	Tons	Tons	Tons
1st	1,900	12,800	4,000	18,700
2nd	41,900	-	-	41,900
3rd	11,500	23,500	2,000	37,000
4th	-	-	4,000	4,000
5th	-	7,000	-	7,000
6th	3,300	-	-	3,300
7th	29,200	2,900	6,000	38,100
8th	34,000	5,700	4,000	43,700
9th	21,200	-	4,000	25,200
10th	34,100	-	-	34,100
11th	25,900	3,000	-	28,900
12th	4,600	2,700	2,000	9,300
13th	11,000	-	2,000	13,000
14th	8,500	-	2,000	10,500
15th	21,800	15,200	-	37,000
Total	248,900	72,800	30,000	351,700

Section 9 Development

	Developed		Prospective	
	Floors	Pillars	Breasts	
Level	Tons	Tons	Tons	Total
9th	-	11,600	-	11,600
10th	2,900	13,200	-	16,100
Total	2,900	24,800	-	27,700

Summary

Cliffs Shaft Available Ore "A" Shaft	1,327,600
Cliffs Shaft Available Ore "B" Shaft	351,700
Cliffs Shaft Available Ore Section 9	27,700
Total	1,707,000
Less 10% for loss in mining	170,700
	1,536,300
Less 10% for rock	153,630
	1,382,670
Less December Production	46,660
Net Total Available Fee Ore	1,336,010

Recapitulation

Net Cliffs Shaft Available Ore	1,336,010	tons
Net Bancroft Available Ore	232,298	"
Grand Total	1,568,308	"

Ore reserves for the past two years are shown for comparison

	Dec. 31,1940	Dec. 31,1941
Cliffs Shaft Ore Available	1,393,640 tons	1,336,010 tons
Bancroft Ore Available	231,402 "	232,298 "
Total	1,625,042 tons	1,568,308 tons
Decrease for Year 1941		56,734 tons
New Ore developed in 1941 (658,747 - 56,734)		602,013 tons

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The following figures show how the ore reserves have fluctuated from year to year in each of "A" and "B" Shafts beginning with 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
1940	231,402	1,105,158	288,482
1941	232,298	1,047,360	288,650

The foregoing table shows that the drop in reserve tonnage is in the "A" Shaft workings as both the Bancroft Lease and "B" Shaft show slight increases.

The following tabulation gives a general idea of how the ore reserves have fluctuated since 1920. It will be noted that despite the heavy production the past two years that the ore in sight at the end of 1941 exceeds the figure of 21 years ago by a substantial margin.

Total ore available in mine at the end of each year:-

1941	1,568,308 tons
1940	1,625,042 "
1939	1,669,719 "
1938	1,657,166 "
1937	1,654,902 "
1936	1,592,108 "
1935	1,533,314 "
1934	1,546,917 "
1931	1,541,050 "
1930	1,506,700 "
1929	1,388,216 "
1928	1,358,000 "
1927	1,392,000 "
1926	1,436,000 "
1925	1,444,000 "
1924	1,453,000 "
1923	1,361,000 "
1922	1,364,000 "
1921	1,386,000 "
1920	1,404,000 "

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5. LABOR & WAGES

a. General

The number of men employed in 1941 shows an increase compared with 1940. The increase in the number of men on the surface in the labor statement is partially accounted for by the fact that all of the steam shovel pit crew were carried on the mine payroll instead of the General Storehouse payroll as heretofore. Additional men also had to be added to the surface crew when the overtime hoisting schedule was increased to 9 P.M. During December the hoisting period was extended to 10 P.M. The underground crew was increased by approximately 20 men. Some of these new employees were put on the night shift to scrape ore from accumulated piles in order to provide additional ore for the overtime hoisting shift.

b. Comparative Statement of Wages & Product

	1941	1940	Increase	Decrease
PRODUCT	658,747	552,598	106,149	
No. of Shifts & Hours		2 8-hr		
No. of days operated	302	262	40	
Average Number of Men Employed				
Surface	103	91	12	
Underground	342	312	30	
Total	445	403	42	
Average Wages Per Day				
Surface	6.57	5.60	.97	
Underground	7.45	6.33	1.12	
Average	7.26	6.17	1.09	
Wages Per Month of 25 Days				
Surface	164.25	140.00	24.25	
Underground	186.25	158.25	28.00	
Average	181.50	154.25	27.25	
Wages Per Month of 22 Days				
Surface	144.54	123.20	21.34	
Underground	163.90	139.26	24.64	
Average	159.72	135.74	23.98	
Wages Per Month of 17 Days				
Surface	111.69	95.20	16.49	
Underground	126.65	107.61	19.04	
Average	123.42	104.89	18.53	
Wages Per Month of 13 Days				
Surface	85.41	72.80	12.61	
Underground	96.85	82.29	14.56	
Average	94.38	80.21	14.17	
Product Per Man Per Day				
Surface	22.12	23.24		1.12
Underground	6.35	6.76		.41
Average	4.94	5.24		.30

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Labor Cost Per Ton	1941	1940	Increase	Decrease
Surface	.297	.241	.056	
Underground	1.173	.936	.237	
Total	1.470	1.177	.293	

The labor cost would naturally show an increase in 1941 for two reasons. One was the increase in wages of 10 cents an hour on April 1, 1941, and the other was the penalty paid for time and one-half when the operating schedule was changed from 5 to 6 days a week. We estimate that the additional cost from these two causes increased the labor costs by the following amounts:

Penalty paid for time and one-half	$ 66,055.01
Inc. Labor cost because of 10¢ per hour increase in wages	80,637.60
Total	$146,692.61

The penalty cost and raise in hourly wage rates noted above added 22¢ per ton to the labor cost.

The following figures show the comparative wage index for the past ten years. The table shows the basic average yearly wage rates compared with June 30, 1916 which is assumed as being 100.0%

Year	Surface Labor	Underground Labor	Total Labor	Wage Index
1941	.297	1.173	1.470	207.99
1940	.241	.936	1.177	190.17
1939	.253	1.033	1.286	190.17
1938	.310	1.110	1.420	190.17
1937	.267	.985	1.252	184.77
1936	.214	.791	1.005	164.29
1935	.232	.809	1.041	149.79
1934	.194	.728	.922	138.05
1933	.379	.861	1.240	129.78
1932	.303	.908	1.211	132.27

	1941	1940	Increase	Decrease
Average Product Stoping and Tramming (Tons per Shift)	17.09	17.87		0.78
Average Product Stoping and Tramming, including haulage crews (Tons per Shift)	14.33	14.93		0.60
Average Wages-Cont. Miners	7.91	6.75	1.16	
Average Wages-Trammers(Cont.)	10.33	8.90	1.43	
Average Wages-Contract Lab.	8.20	7.02	1.18	
Total Number of Days				
Surface	29,774¼	23,773¼	6,001	
Underground	103,653	81,663¾	21,989¼	
Total	133,427¼	105,437	27,990¼	
Amount for Labor				
Surface	$ 195,702.51	133,299.09	62,403.42	
Underground	772,571.22	517,420.10	255,151.12	
Total	$ 968,273.73	650,719.19	317,554.54	

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Proportion of Surface to Underground Men

1941	1 to 3.32
1940	1 to 3.43
1939	1 to 3.73
1938	1 to 3.22
1937	1 to 3.15
1936	1 to 3.28
1935	1 to 3.72
1934	1 to 4.05
1933	1 to 4.00
1932	1 to 4.60

6. SURFACE

a. Buildings & Repairs

Repairs to the mine buildings for the 1937 - 1941 period are shown by the following figures.

	1941	1940	1939	1938	1937
Office & Warehouse	515.63	637.58	247.85	153.00	375.24
Shops	1075.65	111.18	219.84	116.31	50.15
Shaft Houses	2399.63	777.48	373.85	274.74	952.41
Engine House	321.64	1119.47	105.71	184.33	823.26
Dry Houses	6381.12	4503.76	1554.29	839.88	2738.45
Coal Dock & Trestle	331.25	307.30	855.66	1163.97	45.31
Crusher Building	570.44	522.03	157.84	327.04	864.60
Miscellaneous	366.24	271.41	56.46	110.60	338.38
Total	11961.60	8250.21	3571.50	3169.87	6187.80

The toal cost for repairs in 1941 is in excess of the four previous years with heavy increases for the shop buildings, shaft houses, and dry house. The shops were provided with new roofs which included a metal strip along the eaves. All the mine buildings are now equipped with metal strips which prevent ice from accumulating and subsequently sliding off after each thaw.

Two needed improvements were made in the shaft houses. New wire glass windows were installed. Chunks frequently have to be blasted above the fingers in the storage bin and every blast invariably broke the plain glass windows. This was serious in the winter because we try to keep the shaft houses heated to prevent freezing of the ore in the storage bins particularily on the overtime hoisting shift. Lump ore will freeze worse and quicker than soft ore hematite because of the open spaces between the chunks. Since the wire glass windows were put in, we have had no breakage. The Cliffs Power and Light crew also installed flood lights both inside and outside the shaft houses. This improvement cost $1015.00.

The dry house cost increase is simply a transfer from capitol account to operating expense. One third the cost of remodeling the dry was charged to dry house expense in 1941.

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7. UNDERGROUND

a. Development

The following table shows the proportion of all the gangs in the mine doing development work:

Month	Total Number of Gangs	Gangs Developing	% Developing
January	100	63	63.0
February	99	64	64.6
March	101	67	66.2
April	102	67	65.8
May	102	65	63.7
June	100	64	64.0
July	102	66	64.6
August	102	66	64.6
September	101	48	47.5
October	100	53	53.0
November	101	55	54.4
December	100	59	59.0
Monthly Average	100.8	61.5	61.0
Year 1940			54.5
Year 1939			53.6
Year 1938			52.0
Year 1937			56.5
Year 1936			55.2

Even a larger percentage of gangs than usual were kept on the development program. Not all of these contracts actually discovered or were looking for new ore. Many of them were put into old abandoned areas where no ore reserves are reported to the Tax Commission and mined old backs and floors that could not be reached until raises were put up from the motor haulage levels.

We did not discover or open up any new territory that gives great promise in the future except in two instances. We are going to find the Bancroft ore body deeper than estimated below the 10th level. Raises from the 15th show ore down to the 13th level elevation. We are also going to mine more ore in the North East end of the mine between the 6th and 10th levels between our present workings and the west line of the old New York Mine 500 ft. to 800 ft. away from the East limits of our 6th, 8th, and 9th levels.

As has been said in previous annual reports, every effort should be exerted to get a lease on the two Oliver Iron Mining Company's forties south of the Cliffs Shaft Mine before it is too late. We could start developing these lands immediately. As time goes on and we mine floors on the 5th, 6th, 7th, and 8th levels along the boundary, we are gradually but surely cutting off communication on these levels between the Cliffs Shaft Mine and the Oliver forties, so that it is imperative that these lands be acquired at once if possible.

"A" Shaft

1st Level

Contract #1 on the "A" Shaft maps, although actually one of the "B" Shaft gangs, drove a short crosscut Southwest from the breast of the

footwall crosscut towards diamond drill hole #101 and did find a stringer of ore about eight to ten feet wide. At the end of the year a raise was started on the North side of the drift which might find ore extending further to the West. Possibly they may find a lens that will connect with the upper part of the ore found in diamond drill hole #466 and #467.

2nd Level

Contract #44 after raising up from the 5th level in ore by the end of the year was close to holing into the old second level workings. Just how far the ore will extend to the Southwest we do not know, but there are possibilities that this ore will connect with the workings in old #9 contract by swinging around toward the Southeast.

3rd Level

During the year diamond drill hole #482 located at approximately 1400 East and 360 South was drilled toward the North and encountered about 22 ft. of ore near the intersection of coordinates 1400 East and 200 South. To develop this ore a raise was started on the 5th level in the North Lens near the 1400 East and 200 South coordinates. This raise was driven toward the South until it encountered the hanging slate. The gang then dropped down a short way in the raise and cut out a drift to the South which delimits the width of the ore body. Work was suspended temporarily at this point in order to get a chute built on the 5th level in order to handle the product. Since then Contract 12 has been mining backs.

4th Level

In the Bancroft Vein, Contract #29 was developing and mining new ore reserves during the year by continuing to breast toward the Southwest under the slate-graywacke hanging wall which dips toward the Southeast. There is a strong possibility that the ore lens being mined by this gang will extend to the Southwest at least as far as the breast of the old stope driven by #29 up above. Further, it is at least possible that this ore is in the same general horizon as the ore lens through which #44 put up their raise from the 5th level to the elevation of the 2nd level. As remarked under the discussion of Contract 44 on the 2nd level, this ore may swing toward the Southeast and be connected eventually with the stopes of old #9 on the 4th level. It appears to be practically certain that the ore in the floor of Contract #29 will connect with the ore in the back of Contract #74 on the 5th level. There is approximately 22 ft. of ground left between the two stopes.

In the main vein between coordinates 1400 East and 1700 East, there are two gangs on development work—Contracts #12 and #81. Contract #12 has been accumulating ore and mining backs since about Oct. of 1941. Contract #81 has been mining backs and accumulating ore since April of 1941. Both of these gangs are operating in a territory where no ore has been shown on the estimate maps for a number of years.

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Over in the North Vein Contract #57 was moved in March, from mining floors, up to an old sub-level between the 4th and 5th levels. This sub-level stope extends East and West about 200 ft. along approximately the 150 South coordinate. A small part of the stope was on the "B" Shaft maps. This gang has been stripping the top and both sides of the old sub-level stopes toward the east. The ore found has extended high enough to bring this stope up onto the 4th level map. The work of this crew has been classed as development since the old sub-level was supposed to have been worked out years ago.

Contract #8 in the North Vein in the extreme East end of the mine is a double contract. One gang of this contract has been working in two places in the North Lens of ore. They drove a new stope raise toward the North from the rib opposite the narrow drift that connects this lens of ore with the south lens. Dike footwall and hanging wall converging up the dip toward the North seem to be limiting the thickness and Northward extent of this stope raise ore, but it is likely that this gently dipping sheet will extend toward the East and may connect with the 1st stope raise, inside toward the East. This gang also extended the breast of the middle stope toward the North and holed into the stope raise on the left side. Here too, the rock in the back is flatter to the north and limiting the heighth of the ore. The southernmost gang of Contract #8 enlarged the opening between their lower stope and their old stope raise. They also advanced their breast toward the East in a 12' to 14' seam of southward dipping ore that lies between slate hanging wall and dike footwall. The geological relations indicated by this and neighboring areas suggests that this ore may extend for another 130 ft. Southeast and connect with old Incline Mine workings on this elevation. Since the Incline Mine is a part of the circuit of natural ventilation for the Cliffs Shaft Mine, the ventilation in the East end of the North Vein will be considerably improved when and if Contract #8 holes through into these old workings.

5th Level

The Bancroft Vein has three development crews. Contract #89 at the end of the Northeast trending drift has been working in various places in their stope between the 8th and 5th levels, but at least a part of their work for the year resulted in the simultaneous enlargement of the stope and area of floor taken out on the 5th level. No ore was shown on the estimate maps in the area during the past year so all of the work of this gang falls in the class of development. The geology of this area indicates there are possibilities for extensions of ore both to the Southwest and toward the Northwest.

Contract #74 in 1940 drove a short drift Southeast from the Northeast Bancroft drift. This little stub is just opposite diamond drill hole #487. A full breast of ore in the end of this drift was deemed justification for moving back in the main drift 120 ft. toward the Southwest and drifting Southeast in order to provide an advantageous loading approach to this ore. Following that plan, this gang during 1941 went through 25 ft. of dike and encountered a 35 to 40 ft. seam of ore which they have opened up both toward the Southwest and Northeast. There is little doubt that this ore connects with that found in the breast of the short stub of drift toward the Northeast. There is also

every probability that the ore lens connects with that in which Contract #29 is mining on the 4th level.

Contract #76 mining in a sub-level above the 5th level just North of the Bancroft Line between coordinates 1300 East and 1500 East broke through into some old 4th level stopes on the West end of their stope. Since that work which was done in the early part of the year, they have been devoting most of their time to advancing the breast to the East and taking up bottom throughout the stope.

During 1941, Contract #96 drove 175 ft. of drift Southeast from the main haulage drift in the North Vein starting at coordinates 150' South and 580' East. This drift is intended to serve as a haulage for ore broken in #27 contract on the third level, thereby eliminating a difficult scraping and hand tramming operation in the removal of #27 contract ore. The drift penetrated about 155 ft. of siderite and jasper and then encountered 15 ft. of ore with jaspery material limiting the ore on the South again. A raise started in this ore has been planned to hole into the floor of #27 contract.

Between coordinates 1500 East and 1700 East there is a drift connecting the Main Vein and the North Vein. Old Contract #12, during the year, stripped this drift to a width that will accommodate our present haulage equipment. A new chute has been built in the raise that leads up into the territory where contract #12 has been accumulating ore. All of this work was done in order to provide a means for removing the ore from this accumulating pile.

6th Level

Contract #51 worked one place in the Bancroft Vein 100' North and 50 ft. to 100 ft. West from the Southwest corner of the Bancroft property and another place about 100 ft. Northeast of this same corner on the Cliffs Shaft property - North Vein. The work on the Bancroft territory consisted of mining out to the elevation of the 6th level some narrow ore seams that had been left in the bottoms of the old 5th level stopes, but which have not been carried on the estimate maps as reserves. The mining by this gang on Cliffs Shaft property was essentially of the same nature as that indicated above for the Bancroft faces.

In the East end of the mine, Contract #15 has been working in the North Vein taking back and putting up short exploratory raises in the back and on the North side of their stope which is located at coordinates 250 ft. South and 3000 East. Some of their ore is conglomeritic and is being mined out from directly underneath hanging wall slate. From the development to date in this area, the geology suggests a possible continuity of ore on the 5th level between the main Bancroft Vein near the Southwest corner of that property and the ore lens mined by old #8 contract on the 4th level East.

Contract #67 in the North Vein, East end, between coordinates 2800 East and 3000 East mined some floor during the year but even this was not ore carried under reserves. In addition to the floors they extended a breast Westward from the North half of their stope, a breast West from the South half of their stope, and a breast toward the Southeast from the South rib. The latter two breasts are being currently worked. All of this work is being carried on below the elevation of the

6th level. There is still ore remaining in the 6th level floor of part of #67 contract's stope and the back of the stope which is now being extended toward the Southeast will eventually be broken down so as to hole into this floor. The ore in the breast of the stope which is being advanced toward the West may possibly continue westward 200 ft. or far enough to connect with the Main Vein ore lens.

In September Contract #80, which had been developing ore reserves between the 7th and 6th levels in the North Vein near the intersection of coordinates 000 and 3000 East, was moved up into an old drift on the 6th level. This drift dead-ends about 50 ft. Southwest of the intersection of the above mentioned coordinates. It was planned to extend this drift, if necessary on a down grade, and connect it with the workings that #80 had cut out during the first two-thirds of the year from the top of their raise that starts up in the back of old #25 stope on the 8th level. The aforementioned plan would provide a safe and well ventilated traveling road into the territory where #80 has developed certain ore reserves. Consummation of this project lies in the future because in starting the 6th level operations it was found that ore still remained in the floor and benches of the small stope at the mouth of this dead end drift and for the last four months of the year the miner has been breaking this ore.

There are two development gangs in the Main Vein on the 6th level. Contract #59 was engaged for a part of the year in mining on the 7th level but for the most part has been raising between the 7th and 6th levels or mining on the 6th level proper. All of this activity is in the territory between coordinates 1800 East and 2000 East. Most of the mining has been of old benches in an area that shows no ore reserves. The other contract working in the Main Vein, #94, started the year by extending for 57 ft. the Southwest trending drift located near coordinates 400 South and 1600 East on the 8th level. From a point about 110 ft. back from this extended breast, they put up a raise and branched it so as to hole one branch inthe 6th level floor of the drift that connects the Main Vein with old 44 deposit. This branch will serve eventually to carry ore from #81 contract on the 4th level down to the 8th level. The other branch of the raise was put up to the 6th level at coordinates 390 South and 1565 East. From the top of this branch a small exploratory drift was driven 50 ft. Southwest to pick up diamond drill hole #54, then turned abruptly Southeast along the course of the diamond drill hole for 60 ft. where it holed into the connecting drift 100 ft. South of the top of the other branch raise. Some small leaders of ore were found in this drift and need to be further explored. All of this exploratory drifting was carried on in an attempt to open up some ore that was indicated in old diamond drill hole #54. During the latter part of the year, Contract 94 put up another raise from the North side of the main haulage drift on the 8th level, which holed on the 6th level at coordinates 500 South and 1580 East.

Between coordinates 1900 East and 2200 East in the Southeast Vein there were two contracts on development work during 1941. Contract #6 coming up from the 7th level opened up a stope and mined out the floor in an area on the 6th level at about 1950 ft. East and 1175 ft. South. Since no ore reserves were shown in this area, the work is classed

as development. The other contract in the vein, #2, located 200 ft. East of #6, advanced a breast to the West and a crosscut stope to the South mining to the 6th level elevation, floors already partly taken from the 5th level, but which were not carried as reserves.

7th level

Contract #54 in the North Vein did mine some reserves during the year but for a considerable part of the year they advanced two breast stopes on the South side of their working place so as to hole into the old 7th level traveling way drift at coordinates 150 ft. South - 1800 ft. East; and 150 ft. South - 1860 ft. East respectively.

At the intersection of coordinates 1100 South and 1900 East in the Southeast vein, Contract #60 has also been both mining reserves and developing ore. Their development work was a breast stope advanced from the South center of their stope toward the Southwest. This stope broke into the drift at the approach to old #6 stope and now shows some ore yet remaining in both the back and the floor.

8th level

There were four contracts in the North Vein at the East end of the mine that did development work during the year. Contract #78 worked out some floor reserves during the year but also advanced a breast eastward into new ground. This breast is now located 115 ft. North and 3120 ft. East and is slightly above the 8th level drift leading to old #77 raise. Possibly this ore will make connection with the ore in #25 contract's stope raise.

From coordinate 000 South and 3075 East, contract #62 connected their old stope with the top of #25 contract's stope and also raised approximately 15 ft. into the back of this area in order to delimit the upward extent of this ore. Hanging wall slate was encountered in the back of the raise. The contract was moved from this area on the completion of the work outlined above.

As mentioned in the discussion of the 6th level contracts, #80 contract started the year by raising from the back of old 25 contract stope toward the southwest and developed by small drifts some ore reserves as high as the 6th level. These can be mined as soon as a safe traveling way is established into the place from the 6th level.

Starting from a breast located 150 ft. South - 3165 ft. East, Contract #61 is driving an extension of an old drift toward the Northwest. This drift will serve as a means to get under the territory on the 6th level-East end where ore was found in diamond drill holes 490, 491, and 492.

Between coordinates 600-800 South and 3000-3200 East, Contract #95 started a raise from the extreme East end of the 10th level. This raise was completed above the 8th level where it holed into the upper part of old #68 contract's stope. During 1940 great quantities of rock had peeled off the back of 68 stope making it impossible to continue mining the breast until some new means were made available for taking out the ore and a new, safe, traveling road could be provided. The raise completed by #95 contract was to serve this purpose, but was not entirely satisfactory because it holed into #68 stope too far from the breast. Since there was some ore in the raise slightly above the 8th

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level elevation, a small drift was carried Southeast in this ore and holed into 68 stope near the breast. This small drift will be utilized as a scraping drift to pull the ore into 95 raise. A safe traveling way into the breast was produced by blasting through the floor at the end of the 7th level drift near coordinates 745 ft South and 3200 ft. East.

Beginning nearest the shaft in the Main Vein at coordinates 700 South-1560 East, Contract 62, which had been mining in the North Vein at the East end of the mine during the early part of the year, was mining the back from stopes long since abandoned and partly filled with rock. Although this mining might ordinarily be classed as depleting, it is breaking and putting into sight ore that was not known to exist and hence it can be properly called development work. About 800 ft. East of the above contract or at 400 South - 2450 East in the Main Vein, Contract #99 has been raising and stope raising during the year in a narrow seam of ore that was first discovered by diamond drill hole #193. Dike in the back and irregular jasper limits for the footwall of this ore seam have so far not permitted much optimistic regard for the tonnage available. However, the development to date is small scale and the seam may widen out toward the East.

In the Main Vein at coordinates 300 South and 2670 East, Contract #23 drifted 100 ft. North from the North rib of the East-West stope in this area. This drift was almost entirely in jasper. From a point 30 ft. back from the breast on the West side of the drift, a raise was put up to the 6th level elevation, where it holed at coordinates 180 ft. South and 2675 East. This raise will be used as a chute for the ore to be mined from 6th level floors in the territory just South of where Contract #51 is now working.

On the 7th level in the Southeast Vein near coordinates 980 South and 1760 East there is a run of 14 ft. of first-class ore shown in Underground drill hole 125. From the maps it appeared as though Contract #60 on the 7th level would never be able to continue in ore and reach this indicated ore. Consequently Contract #98 drove a short drift East, from the traveling road drift on the 8th level, starting at coordinates 1030 S. and 1800 East. This gang then put up a raise which holed into the breast of #60 Contract on the 7th level. The upper part of this raise was in ore but it was obviously not the ore in diamond drill hole 125. Closer scrutiny of the north rib of the 8th level traveling road drift in this area showed some ore about 125 ft. Northwest of where #98 contract had started their drift. Contract #6 was brought in to this place and drove a 110 ft. drift slightly South of East. This drift was in ore lying between slate hanging wall on the North and dike footwall on the South side. From the geological relations, it seems apparent that this is the seam of ore shown in diamond drill hole 125. At the very end of this drift, a hole was made through into the top of an unused raise that comes from the 9th level. Furthur exploration of this seam of ore in the future is warranted.

In the Southeast Vein about 2250 East coordinate, Contract #65, during 1941, holed into the floor of the 8th level drift with a stope raise brought up from the 9th level. They have widened this hole to the East and West and continued up above the 8th level with a stope raise about 30 ft. wide. As is so often the case with the ore in the Southwest Vein, this is partly well sandwiched with jaspery material.

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9th Level

The Bancroft Vein was the locus for two developing gangs during 1941. Contract #84, while they did remove some floor reserves, for the most part were engaged in advancing their stope outline toward the Northwest. The center of this gang's activity is located at 135 ft. North and 2260 ft. East. The ore now showing in the breast of this stope seems to be under slate hanging wall that dips very gently to the South. Locally a dike forms a steeper hanging wall limit on the South side and indications are favorable that the ore may extend for a considerable distance to the West underneath this dike.

Contract #53 is the other developing crew in this territory. They are located in a stope just North of the 000 coordinate between 2400 East and 2600 East. The gang advanced their stope 65 ft. to the West as well as taking up one lift from the floor.

One other developing gang operated on the 9th level during 1941. This was Contract #68 found in the Main Vein in the extreme East end of the mine, about 200 ft. South and 3000 ft. East. Four small breasts or drifts were advanced in the area, following small ore leaders in anticipation of their widening to stoping widths. North of the raise the small stope was extended on both ends but the material proved too jaspery to be commercially mineable. Starting at the raise a drift was driven Southwest toward a run of ore shown in old diamond drill hole #253. A thin seam of conglomeritic ore was followed in this drift but doesn't look like anything big enough to be stoped. The fourth exploration drift was from the South rib of the small stope located about 50 ft. South of the raise. This encountered mixed-up ore and dike and finally was stopped in dike about 15 ft. South from the starting point.

10th Level

For the last four months of 1941, Contract #5 was raise stoping to the Northwest from the West end of the Northernmost drift in the Bancroft Vein. The ore seam they are developing is of excellent quality but limited so far to about 12 ft. in thickness. Slate forms the hanging wall on the North side and a dike occurs on the South side both dipping Northeast about 70 degrees.

Further East in the Bancroft Vein between 2400 East and 2600 East, Contract #70 connected their stope with old #5 stope to the East. In addition to this they breasted South until limited by slate or dike hanging wall that dips toward the South. Keeping well North of this rock limit this crew advanced a drift about 50 ft. to the East all in ore. Plans for the future entail the mining of floor and advance of a breast to the South from old #5 stope. This breast is expected to continue until holed into the drift about 40 ft. to the South. It is also planned to connect by a drift the East end of #70 ore drift with the West end of #23 Contract's sub-level drift which is located about 55 ft. to the Southeast.

In order that Contract #70 may remove the ore from the floor and breast of old #5 stope with efficiency, a new raise and chute were put up from the 10th level to hole into the floor of the sub-level stope. This work was performed by #80 contract.

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From a point 000 South and 2600 East, Contract #23 raised North from the 10th level Bancroft Vein to an elevation 45 ft. above the 10th level. At that point rock was encountered in the breast of the raise and a drift was then driven 120 ft. to the East. This drift was all in ore but stopped against a dike at the breast. Coming back 30 ft. from the breast, the gang put up another raise to the North from the sub-level. This reached an elevation about 40 plus ft. above the sub-level before it ran into rock and was discontinued. From the East end of this sub-level we anticipate putting through a connection to the West end of old #92 stope in the East end of the 8th level. A rotten back in that stope halted mining there until a new approach can be made to the place.

Contract #50 in the Main Vein 700 ft. South - 2800 East advanced three breasts in their place during the year. The breast to the West was holed into the drift leading into the working place. The breast to the North was all new during the year but was stopped when it ran into lean jaspery material. The last working breast developed to the East and is really a stope raise. The ore seam on this side seems to rise to the Northeast and is limited so far by jasper in both the back and floor.

The South Lens has one gang and that is a development crew--namely #3 contract located 750 ft. South - 1800 East. From the breast of a stope slightly below the 10th level floor elevation this crew continued to advance to the Northwest with a stope raise reaching an elevation in the back of plus 753 ft. or about 44 ft. above the 10th level floor before the hanging wall rock was encountered. They then dropped down about 30 ft. and once more started to breast to the West.

15th Level

Contract #75 in the Bancroft territory on the 15th level is a double developing gang. At the beginning of the year the two miners were working together and advanced for a distance of 40 ft. to the East the breast of their drift, which runs east along the 200 ft. North coordinate line. Two crosscuts were put in to the North from this East-West drift parallel to diamond drill holes 478 and 479 respectively. The first of these crosscuts was started on about the 2300 East coordinate and had 45 ft. of dike to go through at the outset. North of this dike a small seam of ore was encountered which checked with the ore shown in diamond drill hole #478. The crosscut was carried to a point 125 ft. North of the East-West drift and went through a mixture of dike and formation for the last 55 ft. From the end of the crosscut a raise has been in progress toward the Sathwest. It was up to an elevation of about plus 620 ft. at the end of the year having gone through rock all of this distance. The second crosscut started on the 2600 East coordinate but was driven only about 50 ft. to the North. Here, too, a raise is being put up by the other gang of the contract. One branch of this raise was tipped back toward the South. The other branch which is currently being worked heads Northwest. Some conglomerate ore was encountered in this branch at approximately the 600 ft. elevation.

Both of these raises are planned to reach the 10th level Bancroft territory in order to provide a means for removing the ore that will be mined at the 10th level elevation and below, in the area around

#70 contract. Further than that, it is anticipated that these raises will encounter and develop or be tributary to the development of ore indicated between the 10th and 15th levels by several old underground diamond drill holes put down to the North from the 10th level.

"B" Shaft

1st Level

Notwithstanding the fact that Contract #63 did mine some floor reserves during the year, they shall be described as a development gang because they extended the width of their stope and breasted a considerable distance to the South. This working place is located in the North Vein about 300 ft. West of "B" Shaft. The ore mined here was largely conglomeritic but of fair quality.

Over in the Southwest Vein, Contract #58, during 1941, resumed drifting in their ore seam. Starting from the West end of the small stope which they had already opened, this crew drifted about 230 ft. West. The ore seam is relatively narrow but of good quality. Slate forms the hanging wall on the South side and dips toward the Sath. Apparently dike will be the limiting rock on the North side of the drift although it is not exposed except in a few places. Although the ore still continues an unknown distance west from the breast of the drift, it was decided that it would be more expedient to raise to the North in this ore and open it up from a sub-level. This would permit faster and greater production and possibly save some unnecessary drifting on the Main level. To that end, two raises were put up, one at 45 ft. West coordinate, the other at 145 ft. West coordinate. The Westernmost raise went up under hanging wall slate in ore to an elevation of 1215 ft. The other raise was advanced to an elevation of 1178 ft. and at the present time is still in ore. Projected plans are to connect these raises on top and use one for a traveling road; the other for a dirt road while opening up the ore seam and mining it out to the West.

2nd Level

Approximately 700 ft. West of "B" Shaft in the Main Vein, Contract #71 started the year by raise stoping from the 3rd level up to the 2nd level. This gang had, previous to 1941, started raising from the 6th level and by following a leader of ore finally came out on the 2nd level in floors of merchantable ore that subsequent development during 1941 proved to be not only good quality but of considerable width. Although this territory was considered to be worked out many years ago, the performance of #71 contract is a repitition of similar occurrences throughout the history of the Cliffs Shaft Mine.

For the last three months of 1941, Contract #73 has been engaged in development work. Through mixed ore and jasper, they drove a raise Northeast from the North rib of the sub-level stope located above the 3rd level about 250 ft. Northwest of "B" Shaft. This raise holed into a small old stope raise on the 2nd level located at the intersection of coordinates 200 South and 200 West.

ace diamond drills above this territory suggest that the ore horizon cut by them is dipping gently to the North, consequently by tipping the raise to the North it is to be expected that we shall enter that ore horizon sooner than by continuing Southward.

Coming up with a breast stope along a gently rising floor from the 10th level, Contract #56 in the Fault Vein about 800 ft. West of "B" Shaft has pushed their breast through and above the 9th level floor. The stope is headed Northeast and may very probably connect in ore with Contract #77 about 150 ft. away. The latter contract is located 600 ft. West of "B" Shaft in the Main Vein. During the past year they have enlarged their stope, practically speaking, on all sides but the North, where they are limited by the necessity of leaving pillars or are cut off by rock.

10th Level

From the 1000 South and 4440 West coordinate, Contract #88 in the Section 9 Deposit continued during 1941 to advance their drift toward the Northwest. This drift, headed for the ore that was cut by diamond drill hole 472, encountered that seam of ore and by widening out the drift entirely delimited the ore on the 10th level elevation. At the breast of the drift approximately 780 ft. South and 4560 ft. West a raise was put up in ore toward the Northeast to an elevation of plus 797 ft. where rock was encountered in the breast. The crew then put up a parallel raise in ore starting 60 ft. back toward the shaft from the first raise. This raise was carried to an elevation of 788 ft. and stopped when rock cut across the breast. The last work of the year for this gang has been a drifting operation headed Southeast from the top of the first raise in an attempt to connect to the top of raise number two.

Eight hundred ft. West of "B" Shaft in the Main Vein, Contract #14 breasted West in their stope until it holed to their haulage drift. This operation formed a pillar in the middle of the West half of their place. Far better ore was encountered, however, in the breasting operation to the East. In view of the fact that diamond drill hole 215 shows 30 ft. of good ore on the 10th level elevation just North of Contract 14, it seems logical to expect that the ore in Contract 14 will connect with the old stopes to the North.

14th Level

Contract #48, which is in the Main Vein 1500 ft. West of "B" Shaft, did mine a small amount of floor reserves during the year. By and large, however, their main effort was applied to breast stoping North and West. A major proportion of this stoping has been somewhat below the 14th level floor elevation and going out under old diamond drill hole #449. This hole indicated no ore present at the time it was drilled, but evidently the hole had passed just over the ore that Contract #48 is mining.

15th Level

Contract #37 is the only one operating on the fifteenth level "B" Shaft and is a developing gang. They are located between 1500 West and 1600 West on the 000 coordinate line. Throughout the year this

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4th Level

Contract #13 spent the entire year working in their stope in the North Vein about 300 ft. Northwest of "B" Shaft. This stope was the result of exploratory work started by raising from the 5th level in an attempt to find the ore shown in diamond drill hole #65. According to the diamond drill hole, the ore should have been North of the dirt road raise in #13 stope. To test this possibility an 18 ft. breast stope was advanced 25 ft. to the North from the top of the raise. This stope was in good ore but was cut off by rock in the breast, and rock in the back allowed a height of only 10 or 12 ft. for the stope. Leaving a 20 ft. pillar another but smaller drift was driven 25 ft. North, also looking for the ore in the drill hole. This proved to be a disappointment too, although a little ore was found along the rib of the old stope. After this exploratory work, a 25 to 30 ft. wide breast stope was carried in for about 80 ft. to the South. Generally speaking, the product from this contract has been somewhat lean in quality.

In the so-called Fault Vein 600 South and 400 West, Contract #33 connected the top of their two stopes on the 4th level by stope raising and mining out some of the intervening ground. From the South stope of their territory they breasted both South and East. The ore in the South breast is the better quality and indications are favorable that it will be possible to develop ore toward the West again once the present breast has advanced far enough to the South to leave a supporting pillar.

7th Level

During 1941 Contract #49 was developing and mining new ore mainly in the area occupied by the Fault Vein between coordinates 1200 West and 1400 West. From a raise previously put up from the 7th level along approximately the 1300 West coordinate, this gang breasted West along a bench overhanging the 7th level. The latter part of the year they started raising in a pillar to come out in some floors at the extreme West end of the 5th level. Once again, all this ore comes from areas that have been thought to be depleted of all reserves for several years past.

9th Level

There were two developing gangs in the Section 9 deposit operating on the 9th level during 1941. Contract #47 stripped 10 to 15 ft. off the South side of their old stope and drove a drift East following a vertical rock wall on their South side. While they were drifting in this ore they were headed East with the intention of connecting their drift to the top of a new raise that Contract #82 had put up to the 9th from the 10th level along the 4165 West coordinate line. This objective was accomplished. In the meantime Contract #82, having finished their new raise to the 9th level elevation, drifted across to connect with their old raise 60 ft. to the East. During the latter part of the year, #82 has been raising in the ore from the back of the drift that #47 developed. Contract #47 finished the year extending the 1st. #82 raise along the 4100 West coordinate line. This raise was started from the 10th headed South but slightly above the 9th level elevation it was tipped back to the North and is going through jasper-ore material. Surf-

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crew has advanced their breast to the East. This is on the sub-level elevation between the 15th and 14th levels. Another hole was made through into the 14th level floor from this breast. Sometime in the future this gang will no doubt be able to develop considerable ore to the West of their present stope between the 15th and 14th levels. Diamond drill holes 451 and 454 indicate a seam of ore in this territory.

Ore Broken (Mine Tally) by developing gangs

"A" Shaft

				Mine Tally
2nd Level	- Cont.	#44	- Bancroft Vein	2,047 Tons
3rd "	- "	12	- North "	1,158 "
4th "	- "	8	- " "	10,474 "
4th "	- "	29	- Bancroft "	5,218 "
4th "	- "	57	- North "	9,487 "
5th "	- "	74	- Bancroft "	8,258 "
5th "	- "	76	- " "	8,290 "
5th "	- "	89	- " "	11,836 "
6th "	- "	2	- Southeast "	10,022 "
6th "	- "	6	- " "	4,662 "
6th "	- "	15	- North "	4,452 "
6th "	- "	51	- Bancroft "	11,267 "
6th "	- "	59	- Main "	8,109 "
6th "	- "	67	- North "	6,830 "
6th "	- "	80	- " "	1,470 "
6th "	- "	94	- " "	1,076 "
7th "	- "	54	- " "	5,864 "
7th "	- "	60	- Southeast "	5,707 "
8th "	- "	65	- Southeast "	8,274 "
8th "	- "	78	- North "	9,148 "
8th "	- "	98	- Southeast "	215 "
8th "	- "	99	- Main "	2,683 "
9th "	- "	53	- Bancroft "	6,956 "
9th "	- "	68	- North "	4,851 "
9th "	- "	84	- Bancroft "	12,301 "
10th "	- "	3	- South Lens	7,458 "
10th "	- "	5	- Bancroft "	4,995 "
10th "	- "	23	- " "	1,333 "
10th "	- "	50	" Main "	6,318 "
10th "	- "	70	- Bancroft "	8,823 "
Total "A" Shaft	- - - - - - - - - - -			189,582 "

"B" Shaft

1st Level	- Cont.	# 1	- Southeast Vein	3,995 Tons
1st "	- "	58	- Southwest "	2,895 "
1st "	- "	63	- North "	9,169 "
2nd "	- "	71	- Main "	7,400 "
4th "	- "	13	- North "	6,883 "
4th "	- "	33	- Main "	6,736 "
6th "	- "	49	- Fault "	10,180 "
9th "	- "	47	- Section 9	5,670 "
9th "	- "	56	- Fault "	4,105 "
9th "	- "	77	- Main "	6,578 "
9th "	- "	82	- Section 9 "	504 "
10th "	- "	14	- Fault "	10,295 "
10th "	- "	88	- Section 9	2,772 "
14th "	- "	48	- Main "	9,014 "
15th "	- "	37	- Main "	5,764 "
Total "B" Shaft	- - - - - - - - - - -			91,960 "

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Summary

"A" Shaft gangs mined	189,582 Tons
"B" Shaft gangs mined	91,960 "
Total "A" & "B" Shafts	281,542 "

The mine tally, no pocket overrun included, indicates that production totalled 638,677 tons which means that the development gangs by producing 281,542 tons furnished 43.9% of the total.

The figures for the five year period 1937-1941 are:

Ore produced-mine tally (no overrun)	2,376,078 tons
Ore produced by developing gangs	1,121,515 "
Percentage produced by developing gangs	47.3 %

The statement has frequently been made that ore reserves in the mine can be maintained on a fairly even keel if at least half the total number of contracts are kept on development work. In 5 years there has been a gain of 35,000 tons and during that period 55.3% of all the gangs were looking for new ore. It may be of interest to state that 4,619,877 tons of new ore have been found in this property during the past 13 years

The following tabulation shows that the tons per developing gang per shift is only slightly larger than last year:

Year	No. of Gangs on Ore Development	Tonnage Mine Tally	Shifts Worked	Tons per Gang per Shift
1941	61	281,542	12,611	22.32
1940	50	252,208	11,345	22.23
1939	48	167,936	9,098	18.46
1938	53	167,384	8,538	19.60
1937	45	252,445	12,755	19.79

b. Stoping
"A" Shaft

No.	Level	Location by coordinates at Approx. Center of Operations	Character of Work
30	1st	180 S. - 540 E.	Breaking backs
34	2nd	30 S. - 800 E.	" " of 1st
9	3rd	10 N. - 1040 E.	Mining 2nd Level floors
27	3rd	65 S. - 550 E.	" " " "
30	4th	180 S. - 670 E.	Backs and Floors
22	5th	50 S. - 1330 E.	Mining 4th Level floors
41	6th	1070 S. - 1190 E.	" 6th " "
45	6th	1190 S. - 2580 E.	" 5th " "
20	7th	200 S. - 2200 E.	" 6th " "
52	7th	230 S. - 2220 E. to 2400	" 7th " Backs
55	7th	1150 S. - 2650 E.	" 7th " "
61	7th	60 S. - 2490 E.	" 6th " Floors
66	7th	50 S. - 2600 E.	" 6th " "
10	8th	180 S. - 1900 E.	" 7th " "
16	8th	180 S. - 1700 E.	" 7th " "
25	8th	40 N. - 3120 E.	" 8th " Backs

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No.	Level	Location by coordinates of Approx. Center of Operations	Character of Work
28	8th	490 S. - 3160 E.	Mining 7th Level floors
35	8th	520 S. - 2940 to 3030E.	" 7th " "
55	8th	1150 S. - 2650 E.	" 7th " "
79	8th	200 S. - 2090 E.	" 8th " backs
64	9th	210 N. - 2800 E.	" 8th " floors
69	9th	110 N. - 2100 to 2250 E.	" 9th "floors-Pillar
92	9th	170 N. - 2940 E.	" 9th " " "
4	10th	625 S. - 2500 E.	" 9th " " sub-level
7	10th	450 S. - 2250 E.	" 9th Level floors
24	10th	580 S. - 1680 E.	" 9th " "
26	10th	640 S. - 2770 E.	" Floors and backs of sub level
32	10th	300 N. - 3050 to 3200 E.	" 10th Level floors
91	10th	240 N. - 2750 E.	" 9th " "
7	11th	480 S. - 2230 E.	" 10th " "
11	11th	710 S. - 2650 E.	" 10th " "
21	11th	600 S. - 2950 E.	" 10th " "
39	11th	700 S. - 2180 to 2300 E.	" 11th " backs
83	11th	650 S. - 2640 E.	" 11th " floors
"B" Shaft			
17	1st	760 S. - 120 E.	Mining Floors
18	1st	980 S. - 125 W.	" "
72	2nd	330 S. - 380 W.	Mining 1st Level floors
73	3rd	530 S. - 75 W.	Mining floors
73	3rd	290 S. - 230 W.	Mining back and floor
93	5th	265 N. - 180 W.	Mining back & floors of sub
38	6th	770 S. - 1230 W.	Mining floors
42	6th	70 S. - 90 E.	" "
42	6th	170 S. - 95 W.	" "
19	7th	570 S. - 1040 W.	" "
31	7th	25 S. - 225 E.	" " of 6th
40	7th	25 S. - 330 E.	Mining backs and floors
87	7th	60 S. - 330 W.	Mining backs
90	7th	20 N. - 30 W.	Mining floors
100	7th	700 S. - 1000 W.	" "
36	8th	150 N. - 550 to 700 W.	" "
85	8th	390 S. - 640 W.	Mining backs & floors
97	10th	1060 S. - 4860 W.	Mining 10th Level backs
43	13th	500 S. - 1380 W.	Mining floor of sub-level
86	13th	340 S. - 1200 W.	Mining 12th level floors
46	14th	370 S. - 1490 W.	Mining 13th level floors

The table on the following page shows the ore broken (mine tally) by stoping gangs mining developed reserves:

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"A" Shaft				Mine Tally
1st Level	- Cont.	#30	- Main Vein	2,693 Tons
2nd "	- "	34	- North Vein	8,741 "
2nd "	- "	9	- Bancroft Vein	5,596 "
3rd "	- "	27	- Main "	8,153 "
4th "	- "	22	- Bancroft "	5,723 "
5th "	- "	45	- Southeast "	9,917 "
6th "	- "	20	- Main "	588 "
6th "	- "	41	- Southeast "	3,833 "
6th "	- "	59	- Main "	1,327 "
6th "	- "	61	- North-Bancroft Vein	7,990 "
6th "	- "	66	- North "	7,670 "
7th "	- "	10	- North "	1,633 "
7th "	- "	16	- North "	6,358 "
7th "	- "	28	- North "	10,222 "
7th "	- "	35	- North "	5,754 "
7th "	- "	52	- North "	9,161 "
8th "	- "	25	- North "	Barring
8th "	- "	55	- Southeast "	5,476 "
8th "	- "	64	- North "	7,492 "
8th "	- "	79	- North "	6,513 "
8th "	- "	92	- North "	6,652 "
9th "	- "	91	- North "	7,014 "
10th "	- "	4	- Main "	6,111 "
10th "	- "	7	- Main "	11,041 "
10th "	- "	11	- Main "	11,106 "
10th "	- "	24	- Main "	9,059 "
10th "	- "	26	- Main "	10,311 "
10th "	- "	32	- North "	6,468 "
10th "	- "	69	- Bancroft "	10,631 "
11th "	- "	21	- Main "	5,681 "
11th "	- "	39	- Main "	6,977 "
11th "	- "	83	- Main "	10,127 "
Total "A" Shaft - - - - - - - - -				216,018 "

"B" Shaft				
1st "	- "	17	- Main "	8,392 "
1st "	- "	18	- Main "	8,678 "
1st "	- "	72	- North "	10,219 "
3rd "	- "	73	- Main "	8,575 "
5th "	- "	93	- North "	5,898 "
6th "	- "	38	- Fault "	9,812 "
6th "	- "	42	- North "	5,316 "
7th "	- "	19	- Main "	11,461 "
7th "	- "	31	- North "	7,360 "
7th "	- "	40	- North "	4,890 "
7th "	- "	87	- North "	1,475 "
7th "	- "	90	- North "	8,704 "
7th "	- "	100	- Fault "	7,040 "
8th "	- "	36	- North "	7,455 "
8th "	- "	85	- Main "	6,996 "
10th "	- "	97	- Section 9	4,547 "
12th "	- "	86	- Fault "	8,363 "
13th "	- "	43	- Fault "	5,743 "
14th "	- "	46	- Main "	10,253 "
Total "B" Shaft - - - - - - - - -				141,117 "

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Recapitulation

"A" Shaft Contracts Mined	216,018	Tons
"B" Shaft Contracts Mined	141,117	"
Total "A" & "B" Shafts	357,135	"

The mine tally for the year totalled 638,677 tons and as the contracts mining floors or backs produced 357,135 tons, they furnished 56.1% of the total.

A comparative statement for the five year period 1937-1941 follows:

Year	No. of Gangs Stoping	Tonnage Mine Tally	Shifts Worked	Tons per Gang per Shift
1941	40	357,135	13,961	25.58
1940	43	275,004	9,739	28.23
1939	41	200,082	7,514	26.63
1938	37	153,321	5,494	27.91
1937	38	263,155	10,771	24.43

Apparently from the foregoing data, one could conclude that the efficiency of the stoping gangs had decreased for the worse in 1941, but let us examine the facts. We have included in the 1941 tabulation contracts that accumulated ore all year, but did not get any or very little of their production out to the shaft. That is true of #30 8th level "A"; particularily true of #20 sixth level "A"; #10 seventh level "A"; #25 eighth level and #87 seventh level "B". If we added 25,000 tons of product which these gangs would have produced, the tons per gang per shift is increased to 27.40.

c. Drifting and Raising

Year	Rock Drifts and Raises	Ore Drifts and Raises	Total
1941	2,196 ft.	3,411 ft.	5,607 ft.
1940	1,756 "	3,242 "	4,998 "
1939	2,130 "	2,270 "	4,400 "
1938	2,337 "	1,955 "	4,292 "
1937	4,292 "	2,895 "	7,187 "
1936	4,122 "	2,724 "	6,846 "
1935	3,043 "	2,646 "	5,689 "
1934	2,061 "	1,109 "	3,170 "
1933	615 "	372 "	987 "
1932	1,357 "	585 "	1,942 "

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d. Explosives, Drilling and Blasting:
Explosives Statement for Year 1941

Stoping and Development in Ore

	Quantity	Average Price	Cost 1941	Cost 1940
Gelamite #1 - lbs.	548,200	11.50	62,899.64	51,336.00
60% L. F. Gel	1,000	11.50	114.25	-
Total Powder	549,200	11.50	63,013.89	51,336.00
Fuse - ft.	971,100	5.72 M	5,551.08	4,147.68
#6 Caps	148,025	12.20	1,814.51	1,406.61
Electric Caps	4,394	12.09	531.05	343.32
Fuse Lighters & Master Ltrs.	45,500	7.65	348.11	173.27
Wire (#18 Shot Cord)	11,250	1.39	156.86	41.55
Tamping Bags	49,500	3.03	150.38	104.05
Miscellaneous			91.00	139.96
Total Fuse, etc.			8,642.99	6,356.44
Total for Stoping & Development in Ore			71,656.88	57,692.44
Product			658,747	552,598
Lbs of Powder per ton ore			.8338	.8077
Cost per ton for powder			.0957	.0929
Cost per ton for fuse, etc.			.0131	.0115
Cost per ton for all explosives			.1088	.1044

Development in Rock

Gelamite #1 - Lbs.	32,850	11.50	3,777.75	3,731.75
60% L. F. Gel.	2,950	11.50	339.25	
Total Powder	35,800	11.50	4,117.00	3,731.75
Fuse - ft.	41,500	5.72 M	237.56	120.64
No. 6 Caps	6,475	12.20	78.99	45.75
Electric Caps	3,650	12.09	433.98	238.53
Fuse Lighters & Master Ltrs.	3,500	7.65	24.94	8.82
Wire #18 - ft.	10,300	1.39	128.38	36.05
Tamping Bags	5,300	3.03	15.02	8.00
Miscellaneous			1.25	5.09
Total Fuse, etc.			920.12	462.88
Total for Rock Development			5,037.12	4,194.63
Feet Rock Development			2,109	1,653
Cost per ft. Rock Development			2.39	2.537
GRAND TOTAL ALL EXPLOSIVES			76,694.00	61,887.07
AVERAGE COST PER LB. FOR POWDER			.1147	.115

The amount of powder used for each ton of ore was slightly higher for 1941 but as has been already mentioned two or three times before in this report, the product for 1941 does not represent the full production from the mine. In 1940, not only did the mine get credit for all overrun on pocket shipments but in addition the production figure was credited with all of the lump ore overrun on the lump stocked during the 1939-40 stocking season.

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The following table shows the kind of ore mined for the Year 1940 and the Year 1941:

	1940	1941
Specular Ore Contracts	52.2 %	51.3 %
Slate " "	17.0	14.2
Steel " "	24.5	29.3
Magnetite " "	6.3	5.2
	100.0 %	100.0 %

8. COST OF OPERATING

a. Comparative Mining Costs

	1941	1940	Increase	Decrease
PRODUCT (Tons)	658,747	552,598	106,149	
Underground Costs	1.682	1.426	.256	
Surface Costs	.278	.212	.066	
General Mine Expense	.317	.311	.006	
Cost of Production	2.277	1.949	.328	
Depreciation	.029	.018	.011	
Taxes	.219	.251		.032
Loading & Shipping	.082	.057	.025	
TOTAL COST AT MINE	2.607	2.275	.332	
No. of Days Operating	302	262	40	
No. of Shifts & Hours	2 8-hr	2 8-hr		
Average Daily Product (Tons)	2,181	2,109	72	

The average daily product since 1929 is tabulated in order to show how the daily average hoist has increased:

Year	Average Daily Product
1941	2,181
1940	2,109
1939	1,844
1938	1,713
1937	1,830
1936	1,698
1935	1,610
1934	1,595
1933	1,331
1932	1,368
1931	1,448
1930	1,383
1929	1,400

It will be noted from the above tabulation that the average daily hoist increased 72 tons per day. This is accounted for by the fact that in 1941 we hoisted overtime every operating day. In 1940 there were 12 days when the mine hoisted day shift only. In 1940 the mine operated during the week of August the 12th with a skeleton crew of men that were not entitled to their vacation with pay. The average daily output for that week ran around 1300 tons per day.

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Exploring in Mine

Year	Labor	Supplies	Total
1941	$ 11,299.97	6,194.81	17,494,78
1940	9,092.79	5,255.82	14,348.61
Increase	2,207.18	938.99	3,146.17

The detail cost can be broken down as follows:

	1941	1940
Labor for Undg. drilling	$ 5,225.61	4,188.53
Prop. of D.D.Supt's time	218.33	169.67
Carbon Loss	1,967.48	2,111.12
Pipe & Fittings	121.64	8.78
Drill Equipt. & Repairs	434.98	209.45
" " Rental	682.38	612.50
Miscellaneous Supplies	100.54	110.97
Compressor Expense	590.00	590.00
Underground drilling cost	9,340.96	8,001.02
Miscl. & Direct Charges	613.38	835.94
Analysis Expense	506.66	269.83
Total Undg. drilling cost	10,461.00	9,106.79
Geological Dept. Expense	2,547.09	2,457.31
Surface Drilling Cost	4,486.69	2,784.51
Grand Total Expl. Cost	17,494.78	14,348.61
Feet drilled underground	3,762	2,429
Cost per ft. drilled undg.	2.783	3.750
Feet drilled on surface	1,196	745
Cost per foot drilled on surf.	3.751	3.738

In order to get a clearer picture of what the drills did in 1940-41, we are showing the kind of material encountered in the various underground holes:-

	1940		1941	
Ore	55 ft.	2.3%	182 ft.	4.8%
Lean Ore	178 "	7.4%	538 "	14.3%
Jasper	554 "	22.4%	186 "	4.9%
Dike	965 "	39.7%	1656 "	44.1%
Slate	398 "	16.5%	989 "	26.3%
Siderite	90 "	3.8%	211 "	5.6%
Quartzite	189 "	7.9%	-	-
Total	2429 "	100.0%	3762 "	100.0%

From the above table it can be readily seen that during 1941 a much greater percentage of the footage drilled was in the relatively softer rocks, namely dike and slate than during the Year 1940. Jasper siderite, and quartzite constitute a much harder medium through which to drill than do slate or dike. This analysis of the underground drilling operations explains why in 1941 the average cost per foot was .97 a foot less than during 1940 in spite of the fact that 1941 was a year of higher labor and supply costs.

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Development in Rock

Comparative costs for rock work for the past 5 years follows:

		Labor Cost		Supply Cost		Total Cost	
Year	Footage	Total	Per Foot	Total	Per Foot	Total	Per Foot
1941	2196	33,351.58	15.19	8,005.31	3.64	41,356.89	18.83
1940	1756	24,084.21	13.71	6,559.87	3.74	30,644.08	17.45
1939	2130	23,585.00	11.07	8,091.96	3.80	31,676.96	14.87
1938	2337	27,178.28	11.63	9,267.95	3.97	36,446.23	15.60
1937	4292	46,240.53	10.78	15,808.94	3.70	62,049.47	14.48

In order to be able to make a more intelligent explanation of the unit cost per foot, it is necessary to submit the following data:

	1941	1940	1939	1938	1937
Rock Raises	993'	176'	318'	663'	1657'
10' x 10' Main Haulage Drifts	631'	1303'	1104'	1389'	1906'
8' x 8' Main Haulage Drifts	572'	277'	708'	285'	729'
Total	2196'	1756'	2130'	2337'	4292'

The nature of the ground that the rock drifts and raises were driven in is shown by the following data:

	Jasper or Lean Ore	Siderite	Dike or Slate	Total
Rock Raises	397'		596'	993'
10' x 10' Rock Drifts	174'	163'	294'	631'
8' x 8' Rock Drifts	300'		272'	572'
Total	871'	163'	1162'	2196'

The unit cost per foot for 1941 shows an increase over the year before and all of the increase is in the labor changes. As a matter of fact the supply cost shows a slight decrease. The labor cost would naturally show an increase because of time and one-half paid for the sixth day and because of the ten cents per hours increase after April 1st, 1941. The unit cost will also vary, depending on the kind of development work done during the year, as it should be obvious that a 10' x 10' haulage drift costs more per foot than a rock raise. Again, the kind of material that the exploration work is in will vary the unit cost. In 1940 about 26% of all of the development work was in jasper or siderite. In 1941, nearly 50% of the rock raises and drifts were in jasper or siderite. One would expect a low unit cost when the bulk of the exploratory work is in dike or slate.

Development in Ore & Stoping

The two accounts are combined because of the difficulty in classifying developing and stoping gangs in the Cliffs Shaft Mine. Each month about 15 to 20% of the gangs in ore are shown on the cost sheet as developing. Each month in the superintendent's report invariably 50 to 60% of the contracts are classified as developing. The reason for the apparent discrepancy is that the ore developing gangs on the cost sheet are usually the raising and drifting gangs and do not include the raise stoping or breast stoping contracts that are carrying full breasts of ore out into new territory.

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Following are comparative costs for the past two years:

Year	Labor Cost	Supply Cost	Total Cost
1941	$ 353,861.16	122,065.02	475,926.18
1940	233,615.23	94,534.32	328,149.55

The detailed cost for the two years follows:

	1941		1940	
Labor	Total	Cost Per Ton	Total	Cost Per Ton
Miners' Labor	222,688.40	.339	153,863.82	.279
Other Labor	131,172.76	.199	79,751.41	.144
Total	353,861.16	.538	233,615.23	.423
Supplies				
General	2,140.37	.003	1,413.72	.003
Iron & Steel	24,765.73	.037	16,702.14	.030
Oils	966.60	.001	805.13	.001
Machinery	3,270.82	.005	2,947.66	.005
Explosives	71,656.88	.109	57,692.44	.105
Lumber	20.32	.000	19.86	-
Sundries	2,655.15	.005	2,385.34	.004
Expense Accounts	16,589.15	.025	12,568.03	.023
Total Supplies	122,065.02	.185	94,534.32	.171
Total Labor & Supp.	475,926.18	.723	328,149.55	.594
Tons Hoisted	658,747		552,598	

The increase in the unit cost per ton in 1941 over the year 1940 as seen from the table above amounts to 0.129 per ton. A consideration of the detail in the table and of the conditions during the operating year indicates a justifiable reason for this increase. Approximately one and one-half cents of the increase is due to higher supply costs chiefly in the cost of powder and iron and steel. The major portion of the 1941 unit cost increase is due to the increase in the cost of labor. As mentioned under other sections, of this report, during the last nine months of 1941 labor received 10 cents more per hour. In addition to this the mine operated six days throughout the year which involved a penalty cost in the form of time and one-half payment for the extra operating days. These two factors together increased the unit cost per ton approximately 8.5 cents. The remaining three cents of the 1941 increase would be practically wiped out had the mine received credit for all of the overrun which it produced during 1941

Timbering

Year	Total Cost	Cost per Ton
1941	$ 20,725.94	.032
1940	13,604.44	.025
Increase	7,121.50	.007

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The toal cost for the two years is split between labor and supplies as follows:

	1940		1941	
	Total	Per Ton	Total	Per Ton
Labor	$ 8,731.90	.016	12,584.62	.020
Supplies	4,872.54	.009	8,141.32	.012
Total	13,604.44	.025	20,725.94	.032

The supply cost proportionally increased more than the labor cost. Iron & steel supplies increased from a total of $416.33 in 1940 to $1,587.00 in 1941. Timber used went up from $3,541.39 to $4,619.40. Labor costs increased due to adding two new men to the timber gang. Because of increased product, more repairs had to be made to underground and shaft pockets and chutes.

Tramming

	Labor		Supplies		Total	
Year	Total	Per Ton	Total	Per Ton	Total	Per Ton
1941	$ 302,894.62	.460	17,205.65	.026	320,100.27	.486
1940	200,493.28	.363	13,558.56	.025	214,051.84	.388
Increase	102,401.34	.097	3,647.09	.001	106,048.43	.098

Increase in 1941 entirely in labor cost. The tramming labor cost includes not only all motormen, brakesmen and trammers, but the skip tenders and miners' helpers and scraper operators. The theory behind these charges is that the scrapers superceded most of the hand tramming and that the skip tenders and cage riders spend most of their time switching and dumping ore cars at the shaft stations.

As mentioned before in this report, labor costs increased because of wage increase and penalty paid for time and a half operation. Total cost would also increase because we operated forty more shifts in 1941.

Ventilation

Year	Total Cost	Cost per Ton
1941	$ 588.88	.001
1940	657.42	.001
Decrease	68.54	No change

Charges were nominal in 1941.

Pumping	Total	Cost per Ton
Operating Cost as per 1941 Cost Sheet -	$ 28,149.44	.042
Maintenance " " " " -	3,041.87	.005
Total -	31,191.31	.047
Operating Cost as per 1940 Cost Sheet -	29,534.95	.053
Maintenance " " " " -	3,510.23	.006
Total -	33,045.18	.059

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The detailed cost for the two years follow:-

	1941	1940
Maintenance	3,041.87	3,510.23
Pumpmen Labor	8,034.54	7,636.15
Other Labor	925.71	1,282.24
Total Labor	8,960.25	8,918.39
Compressor Expense	600.00	600.00
Oil, Waste, and Packing	230.59	102.03
Tools, etc.	57.02	99.08
Electric Light	412.20	300.00
" Power	17,889.38	19,515.45
Total Operating Expense	28,149.44	29,534.95
" Maintenance & Operating	31,191.31	33,045.18
Gallons of Water Pumped	343,850,964	363,090,686
" " " " per Minute	654	689

Pumping costs decreased in 1941 due to less water pumped and to a lower rate for electric power because the mine developed a better power factor due to increased operations.

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

	Gallons per Minute		
Month	1941	1940	1939
January	668	637	627
February	653	637	620
March	630	630	615
April	637	621	677
May	653	692	786
June	661	742	809
July	658	739	799
August	642	741	751
September	634	720	732
October	675	721	668
November	697	673	621
December	662	673	613
Average for Year	654	689	691

Compressors, Air Pipes, & Power Drills

	1941 Total	Per Tons	1940 Total	Per Ton
Compr. & Air Pipes	$ 47,216.17	.072	42,616.77	.077
Compr. & Power Drills	6,006.39	.009	6,616.53	.012
Total	53,222.56	.081	49,233.30	.089

The foregoing cost figures can be divided between labor and supplies which will result in the following:

	1941	1940
Labor Costs for Compressors & Air Pipes	$ 5,594.41	4,763.00
Labor Costs for Compressors & Power Drills	670.38	475.78
Total Labor	6,264.81	5,238.78
Supplies for Comprs. & Air Pipes	41,621.76	37,853.77
Supplies for Comprs. & Power Drills	5,336.01	6,140.75
Total Supplies	46,957.77	43,994.52
Grand Total Labor & Supplies	53,222.58	49,233.30

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Increase in Labor Costs for 1941	$ 1,026.03
Increase in Supply Costs for 1941	2,963.25
Total increase	3,989.28
Unit Cost Decrease	.008

New drills purchased in the last five years show that our purchases are predominately Ingersoll-Rand equipment.

	1941	1940	1939	1938	1937
N-75 Ingersoll-Rand Drifters	-	-	1	9	14
DA-35 " "	7	10	15	-	-
D-12 Cleveland Drifters	2	4	2	-	7
Gardner-Denver Drifters	-	-	1	-	-
J-45 Ingersoll-Rand Block Holers	2	-	-	-	5
S-49 " " "	-	-	4	-	-
JB-4 " " "	3	-	-	-	-
Total	14	14	23	9	26

Back Filling

Year	Total	Cost Per Ton
1941	$ 4,098.70	.006
1940	4,192.44	.008
Decrease	93.74	.002

There were only 21,830 tons of rock back filled in 1941 compared with 27,630 in 1940.

Underground Superintendence.

Year	Total	Cost Per Ton
1941	$ 32,378.24	.049
1940	26,043.45	.047
Increase	6,334.79	.002

One additional underground shift boss was assigned to "A" Shaft. On January 1, 1941, a new route comprising the contracts in the Bancroft territory between the 8th and 10th levels and all of the contracts in the North Vein and a portion of the Main Vein on the 8th, 9th, and 10th levels were assigned to the former head pipeman. Some of these gangs previously were supervised by the shiftboss looking after most of the territory between the 4th and 8th levels in the Bancroft, North and Main Veins, and some of the gangs were taken from another boss who had charge of the mining contracts on the 9th, 10th, and 11th levels.

Scrapers & Mechanical Loaders

	Labor Cost		Supply Cost		Total Cost	
Year	Total	Per Ton	Total	Per Ton	Total	Per Ton
1941	$ 25,668.67	.039	45,055.27	.068	70,723.94	.107
1940	15,993.34	.029	32,511.96	.059	48,505.30	.088
Increase	9,675.33	.010	12,543.31	.009	22,218.64	.019

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The following data gives a detail of the major portion of the supply costs for the past 2 years:

	1941		1940	
	Amount	Cost	Amount	Cost
3/8" Wire Rope	3,090'	262.75	1,525'	129.63
1/2" "	11,697'	1218.02	10,270'	1029.94
5/8" "	108,698'	18582.14	74,990'	12887.14
Electric Cable #6	4,800'	1580.81	530'	1468.44
Electric Motors	5	1284.80	2	535.11
New Scraper Slides	3	1528.11	3	1127.56
Scraper Hoists	3	1570.26	*	-
Utility Air Hoists	2	2455.00		-
General Elect. Repairs & Renewals		16573.36		15334.14
Total		45055.27		32511.96

*8 scraper units charged to E & A's.

The figures below also show how the major portion of the supplies used on our scraping equipment are segregated between the three captions as indicated:

	1941	1940
General Supplies	$ 25,739.69	19,383.44
Iron & Steel	5,786.13	4,945.19
Machinery Supplies	5,408.63	3,526.38
Total	36,934.45	27,855.01

As has been the custom in the Cliffs Shaft Mine, all of the 5/8" scraper rope purchased in 1941 has been "Trulay" rope. The tonnage and unit cost for the past year compared with the previous four years is shown in the following tabulation:

Year	Product	Type of 5/8" Rope Used	Feet Purchased	Cost	Unit Cost	Feet per Ton Ore
1941	658,747 tons	"Trulay"	108,698	$ 18,582.14	.0282	.165
1940	552,598 "	"Trulay"	74,990	12,887.14	.0232	.136
1939	387,258 "	"Trulay"	39,630	6,901.39	.0178	.102
1938	327,161 "	"Trulay"	41,731	7,522.60	.0229	.127
1936	456,760 "	"Standard"	66,961	9,120.90	.0195	.146

There is a growing tendency for miners to be moved further back from their raises and into old places in the mine. This often creates a condition where the ore broken must be handled twice by two separate scraping units. Particularily is this true in the case where mining is started up in old areas where it is not practical to provide new raises. The extra handling of such ore obviously increases the feet of rope used per ton of ore and also the unit cost per ton.

Electric Tram Equipment

	1941			1940		
	Labor	Supplies	Total	Labor	Supplies	Total
Generators	$ 13.72	42.44	56.16	58.22	223.20	281.42
Locomotives	4538.38	7897.27	12435.65	1874.61	3372.65	5247.26
Wiring	1068.19	2293.89	3362.08	797.24	1235.84	2033.08
Tracks	8876.16	2744.81	11620.97	7049.58	3516.86	10566.44
Cars	6518.48	5729.49	12247.97	4094.81	3191.01	7285.82
Spotting Engine	-	118.54	118.54	-	89.62	89.62
Total	21014.93	18826.44	39841.37	13874.46	11629.18	25503.64

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The main increases in 1941 are confined to two items—locomotives and cars. A second-hand locomotive from the Mesabi Range rebuilt at a cost of $2913.85 was sent underground in "B" Shaft for the 5th level. Seven locomotive armatures were rebuilt at a cost of $2148.16. In addition a new Edisen battery was purchased for the "A" Shaft 11th level battery locomotive at a cost of $672.99.

In addition to repairs made at the Hard Ore Shops, most of the small repairs to the trolley and battery locomotives are made by the mine electricians. Of this type of expense there was at least 1/3 more during 1941 than 1940.

Up until 1941, invariably each year, new cars were purchased for the haulage system. In 1941 instead of buying new cars, extensive repairs were made to the cars in use. The Hard Ore Shops built four complete new trucks or running gear for the 76 cubic foot cars. The new trucks were sent underground replacing others that were in turn sent over to the Shops for repairs. The Shop rebuilt 8 trucks during the year at an average cost of about $365.00 each. The same general idea worked out with car wheels. Six complete sets of new wheels were purchased and as these were sent underground, twenty two sets of old wheels were repaired. Also for a short time blacksmiths from the Hard Ore Shops went underground in both "A" and "B" Shafts to make repairs on motor cars. In other words, whereas in previous years a great deal of car expense was avoided by buying new equipment, we found it necessary in 1941 to start an extensive repair campaign largely because of the difficulty in getting deliveries on new equipment as a consequence of the National Defense Program.

Hoisting

Comparative data for 1941 and 1940 follows:

	1941	1940
Maintenance	$ 17,747.42	5,493.43
Operating Expense:		
Engineers' Labor	15,154.85	10,522.78
Other "	1,844.30	1,254.63
Total "	16,999.15	11,777.41
Supplies		
Oil, Waste, and Packing	144.47	103.76
Tools & Misc. Supplies	124.46	104.54
Electric Light	491.64	212.46
Electric Power	19989.00	17217.77
Compressor Expense	465.00	375.00
Heating Expense	859.10	869.48
Total Supplies	22073.67	18883.01
Total Operating Expense	39072.82	30660.42
Total Maint. & Operating Exp.	56820.24	36153.85
Cost Per Ton Produced	.085	.065
Tons Ore & Rock Hoisted	680,577	580,228
Average depth hoisted	735'	759'

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Maintenance cost on the hoisting equipment for 1941 was the largest for years. The increase is principally due to installing 2 new drums on both "A" and "B" Shaft hoists. Cracks developed in these drums 8 or 10 years ago and late in 1940 the mechanical department advised the purchase of new drums. These were delivered early in 1941 and stored at the Cliffs Shaft Mine. In May 1941 the "B" Shaft drum showed further evidence of weakness and additional stay bolts and steel props were placed under the inside surface of the drum to keep it in a reasonably safe condition. It was then decided, although the "A" Shaft drum was apparently in better shape than the one on the "B" Shaft hoist, to shut down the mine in order to change the drums. Operations were suspended from July 4th to July 11th, 1941. The expense involved in making this change was almost exactly $9500.00.

In order to avoid possible delays, late in 1940 aluminum was ordered for a spare skip and cage. After considerable difficulty in securing priority, this aluminum was delivered early in the summer and work started on the new combination skip and cage.

As in the previous year, a new 1640' rope and a new 1950' rope were put into commission in October. These ropes cost $1328.23.

Naturally because of a 21% increase in production there would be an increase in the electric power consumption. Electric power costs increased $2772.00 which is an increase of 15.9% over the 1940 cost. The reason that the increased tonnage is not directly comparable to the increase in electric current costs is due to the fact that increased operations have given us a more favorable power factor with consequent lower unit cost per K.W.H.

The operating expense for engineers labor increased because of hoisting on Saturdays of each week, because wages were increased 10% on April 1st, 1941 and the floormen's time in the engine house could no longer be divided between Engine House and Dry House expense on idle days.

Stocking Ore

Year	Total Cost	Cost per Ton
1941	$ 24,076.64	.037
1940	15,239.70	.028
Increase	8,836.94	.009

From the increase in wages instituted in April 1941 and from the increased operating schedule necessitating time and one-half wages one day a week, an increase of something over 45% can be expected in the cost of stocking ore for 1941 as compared to 1940. In other words the increased general labor costs in 1941 should raise the stocking cost about $6700.00 in 1941 over 1940. The rest of the increase in the 1941 stocking cost is due to two factors. Firstly, an unusual amount of timber for stocking trestle legs and stringers was purchased in 1941 in anticipation of future difficulty getting delivery. Secondly, because of the increased demand for ore in 1941 the product broken underground was somewhat leaner and two more men were employed as rock pickers on the stockpile during the 1941 stocking season in order to cull some of this lean material.

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Screening & Crushing at Mine

	1941		1940	
	Amount	Per Ton	Amount	Per Ton
Labor	$ 27,793.11	.042	18,342.66	.034
Supplies	18,080.05	.028	9,722.51	.016
Total	45,873.16	.070	28,065.17	.050
Increase	17,807.99	.020		

The cost under this account increased because we made a number of major changes in the crusher building equipment. A new steel crusher bowl replaced one of cast iron. In the last four years two of the cast iron bowls have been cracked despite the fact that a heavy steel ring had been placed around the cast iron bowl. It was evident that something stronger than cast iron would be needed to keep the crusher in proper operating condition so the Allis-Chalmers Company was instructed to cast a steel bowl. The bowl cost $4400.00 and was installed during the week that the mine was shut down in July.

Another piece of equipment that gave us frequent trouble was the electric hoist used to pull large chunks out of the crusher. In order to avoid delays a spare electric hoist was purchased at a cost of $471.60.

We also added a new picking belt which cost $960.57.

Three complete sets of manganese screen sections were purchased in 1941 at a cost of $2350.10 which is a large increase over the cost of three complete sections purchased in 1940 for $1470.00.

We also stocked a spare gear reducer for the picking belt and another drive pulley. These two items have a value of $464.67.

Because of increased production, more manganese straps were needed for lining the pockets. The cost of these in 1941 was $1521.65 compared with $1115.78 in 1940.

Dry House

	1941		1940	
	Amount	Per Ton	Amount	Per Ton
Labor	$ 7,772.10		5,408.23	
Supplies	4,078.45		3,527.92	
Total	11,850.55	.018	8,936.15	.016
Incr.	2,914.40	.002		

The increase in labor cost is practically entirely due to the general increase in labor costs during 1941 as compared to 1940. The increased supply cost in 1941 is accounted for by the fact that fifty additional tons of stoker coal were burned in 1941 as compared with 1940.

General Surface Expense

Year	Total	Cost Per Ton
1941	$ 16,611.62	.025
1940	10,215.89	.019
Increase	6,395.73	.006

General surface expense is largely labor. There was, however, one large supply charge made in November 1941 amounting to $2850.24 which was the cost of paving the road around the West shore of Lake Bancroft. There was also another charge for grading the area between the laboratory and the office and moving shrubbery.

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Shaft

Year	Total	Cost per Ton
1941	$ 4,034.13	.006
1940	2,787.52	.005
Increase	1,246.61	.001

Shaft costs in 1940 were unusually low. In 1939 the total reached $9650.40. Because of the increased production schedule in 1941, more repairs to runners and shaft pockets were necessary.

Top Tram Equipment

Year	Total	Cost Per Ton
1941	$ 6,804.68	.010
1940	4,929.04	.009
Increase	1,875.64	.001

Costs for 1941 were higher than 1940, but the unit cost for 1940 was below the normal based on the previous five years' experience. There were no unusual expenditures in 1941.

Docks, Trestles & Pockets

Year	Total	Cost Per Ton
1941	$ 5,251.07	.008
1940	2,893.06	.005
Increase	2,358.01	.003

Increased cost due to laying new stockpile soller over an extensive area on the lump ore area. Also shaft house pocket in "A" Shaft was entirely rebuilt during the shut-down period from July 3rd to July 11th.

General Mine Expenses

	1941	1940
Mining Engineering	$ 4,221.06	3,883.65
Mechanical & Electrical Engr.	2,537.23	2,073.70
Analysis & Grading	20,474.67	16,332.47
Safety Department	2,303.94	2,286.27
Telephone & Safety Devices	6,104.97	4,876.61
Local & General Welfare	6,940.17	6,600.45
Spec. Expense, Pensions & Allows.	12,431.13	27,236.87
Ishpeming Office	25,052.22	22,581.75
Mine Office	24,333.42	21,912.14
Insurance	6,353.37	3,517.14
Personal Injury	31,216.88	22,520.95
Social Security Taxes	41,365.90	27,933.49
Employees Vacation Pay	25,726.86	9,725.35
Total General Mine Expenses	209,061.82	171,480.84
Cost per Ton	.317	.311

With the exception of the item Telephones and Safety Devices, no detail is furnished the mine office with respect to the costs involved in this list. The Ishpeming Central Office and Cleveland Office furnish the total charges with that one exception.

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9. EXPLORATIONS

Diamond drill holes drilled underground during the year are as follows:-

	Total Depth	Feet of Ore
D. D. Hole #479	86'	13' of 55% Ore
" 480	60'	No Ore
" 481	97'	"
" 482	210'	25' of 58% Ore
" 483	89'	No Ore
" 484	117'	10' of 65% Ore
" 485	107'	17' of 59% Ore
" 486	575'	No Ore
" 487	353'	23' of 57% Ore
" 488	75'	8' of 60% Ore
" 489	400'	10' of 58% Ore
" 490	206'	8' of 61% Ore
" 491	171'	49' of 57% Ore
" 492	316'	6' of 61% Ore
" 493	398'	No Ore
" 494	278'	No Ore
" 495	138'	16' of 62% Ore
" 496	105'	21' of 61% Ore

In August of 1941 the Underground Diamond Drill was moved up on the 6th Level into the extreme Northeast end of the mine. A series of four holes starting with 490 and running through 493 was drilled toward the East, Northeast, and North. The old exploration drifts in this territory were largely in hanging wall slate which was near the East end of a Westward pitching syncline. This syncline was partly cut off on the South side by an East-West fault. From the table above it will be noted that some good ore runs were found in three of the holes drilled out toward the East and Northeast. The area in which this ore was discovered is new ground and looks promising enough to warrant exploration by mining methods. A drift is being driven out under the area at the present time on the 8th level so that raises can be put up and mining started in the ore seams cut by the drill.

The last two holes drilled during the year, 495 and 496, cut ore of good quality in a territory south and west of Contract #89 stope on the West end of the 8th level Bancroft Deposit. Structural evidence suggests the possibility that this ore may continue both up to the West and down to the East. Upward it may extend high enough to be a part of #74 Contract ore on the 5th level.

An examination of the "B" Shaft maps of the Cliffs Shaft Mine reveals the fact that on the South limb of the ore bearing syncline, the productive ore seams extend progressively furthur West with successively lower levels. It may also be noted that along this same south limb where development is nearly complete, the productive ore zone is not of continuous width but pinches and swells in thickness. On the theory that this might happen out to the West in the hard ore horizon beyond the limits of present development, it was decided to explore that territory. The upper levels of the mine are not accessible for drifting or handling the rock involved in drifting so the only alternative was by surface diamond drilling. Two drill holes were put down and did enter the hard ore horizon at 330 ft. and 375 ft below the surface. No commercial ore was encountered and the drilling was stopped. This does not necessarily preclude the possibility that the theory motivating the drilling campaign was incorrect, because hard ore lenses offer a very small target that two holes could easily miss.

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10. TAXES

Comparative data for 1941 and 1940 follows:-

	1941		1940	
	Valuation	Taxes	Valuation	Taxes
Realty	$ 2,570,000	90,771.89	2,525,000	87,049.13
Minerals under NW¼ of Sec. 9-47-27	100,000	3,531.98	100,000	3,447.49
Personal	770,000	27,196.23	755,000	26,028.55
Lot 2, Sec. 3-47-27 (Bancroft)	550,000	19,425.89	550,000	18,961.20
SE¼ of NE¼ of Sec. 9-47-27 (Barnum)	52,000	1,836.63	52,000	1,792.70
Lot 174 Nelson Addition	100	3.53	100	3.45
South 35.91 ft. of Lot 179 -	50	1.77	50	1.73
Total	4,042,150	142,767.92	3,982,150	137,284.25
Collection Fees		1,427.68		1,372.84
GRAND TOTAL		144,195.60		138,657.09
Taxes per ton produced		.2189		.2509
Taxes per ton Shipped		.2259		.2266

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

Year	Taxes	Valuation
1941	144,195.60	4,042,150
1940	137,284.25	3,982,150
1939	141,248.04	4,007.150
1938	140,789.79	3,852.150
1937	127,643.22	3,712.150
1936	110,614.68	3,232,150
1935	101,853.17	3,202,110
1934	99,486.51	3,119,110
1933	99,072.28	3,160,110
1932	123,114.90	3,640.130

Taxes in 1941 shown an increase because of larger valuation and because the rate increased from $34.4748 to #35.3198

City of Ishpeming Tax Levy

	1941		1940	
	Amount	Rate	Amount	Rate
Valuation	10,707,135.00		10,616,400.00	
Tax Levy by Funds				
County Tax	53,535.67	5.0000	63,698.40	6.0000
County Road Tax	25,697.12	2.4000	23,356.08	2.2000
City Contingent Tax	58,000.00	5.4169	43,000.00	4.0503
City Debt & Service Tax	7,675.00	0.7168	7,840.00	0.7385
Street & Highway Tax	80,000.00	7.4717	79,000.00	7.4413
Fire Fund Tax	27,000.00	2.5217	18,000.00	1.6955
Library Tax	10,700.00	0.9993	19,600.00	1.8462
Sewer Tax	7,000.00	0.6538	10,000.00	.9419
Water Tax	5,000.00	0.4670	-	-
Cemetery Tax	10,000.00	0.9340	17,000.00	1.6013
School Tax	80,303.51	7.5000	71,129.88	6.7000
School Debt Service Tax	13,262.50	1.2387	13,375.00	1.2598
Total Taxes	378,173.80	35.3198	365,999.36	34.4748

City of Ishpeming tax levy shows a decrease in the county taxes but the increases in the contingent fund tax, the fire fund tax, and the water tax more than offset the decrease in country taxes.

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11. ACCIDENTS AND PERSONAL INJURIES

The accident record for the past 5 years follows:-

	1941	1940	1939	1938	1937
Number of No-Time Lost Accidents	93	89	62	64	101
Compensable or Fatal Accidents	9	2	4	11	10
Number of Man Shifts Worked	133,427	105,437	80,860	76,038	109,412

12. NEW CONSTRUCTION OR EQUIPMENT

E. & A. #CC-8

This E & A covers the expense involved in remodeling the change house or dry. Work on this project was started in October 1940 and the major portion of the job finished late in the spring of 1941. The cost overran the estimate for a number of reasons but confined principally to two causes. The original estimate was made in November 1939 and by the time the E. & A. was approved and contract let, prices started to rise. Secondly, the old plans did not provide for the new men needed when the pressure came on for additional ore. In other words, the original plans were based on the assumption that the Cliffs Shaft Mine would never employ over 425 men. At the present time there are 452 men on the mine payroll but the highest brass check number is 492. On the Cliffs Shaft payroll we carry all of the Central Laboratory employees. Most of these men have to be provided with locker space in the dry. Because of the increase in employment the original plans had to be entirely revamped and expanded. As a matter of fact the space provided for the shift bosses at the present moment is entirely too small and an addition to the dry will have to be built in 1942.

The original plans called for the rebuilding of 1/3 of the old floor surface and when that portion of the old floor was taken out, we discovered that the entire floor in the dry was only thin concrete shell laid on top of loose rock. Further investigation revealed the fact that the old sewer line was broken and cracked. The only sensible thing to do was to tear out and rebuild the entire sewage system from end to end and put in a new concrete floor.

The increase in the number of men meant increasing the number of showers which required the revamping of the entire hot and cold water system.

E. & A. #CC-56

This E. & A. authorized the building of an addition to the laboratory building. The cost on this project overran the estimate about 10% and this was entirely due to the expenditure on the brick building itself and for the wiring and sewer and water lines. When the building was planned with the Chief Chemist, the facilities laid out were ample to take care of the work with the crew that were on the staff in a year like 1937. All of the original drawings and estimates were based on that assumption. In the early part of 1941 it was thought advisable to allow for a possible increase in operations and for that reason the size of the new building was increased in the revised plans and provisions made for another work room in the old laboratory building.

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E. & A. #CC-57

The addition to the drill sharpening shop which meant an extension to the East of the shop building near "A" Shaft was covered by E. & A. #CC-57. At the end of the year, although this job was not entirely complete, it would appear that the unexpended balance would be ample to clear up all of the accounts under this E. & A.

E. & A. #CC-55

Although the work done under this E. & A. was at the Maas Mine, nevertheless the new screening plant built on the sight of the Maas District crusher is a part of the Cliffs Shaft operation. Work on the plant under this E. & A. was started in April and finished in June. Nearly every item on the E. & A. overran due to unforeseen changes. Because a large amount of water was deemed necessary in the screening operation, the original plans for the pocket had to be revamped to take care of the problems incident to the situation brought on by the large amount of water used in the operation of the plant.

The screen cost 50% more than estimated and the L. S. & I. Rwy. was required to make quite an extensive change in their track layout.

E. & A. #CC-68

This E. & A. covers the purchase and erection of a permanent steel structure to take the place of the present wood permanent trestle to the South of and attached to the main crushing plant. The steel for this job was delivered late in the year.

14. MAINTENANCE AND REPAIRS

Dwellings

	Rented Buildings			Loc. Expense	Grand
	Labor	Supplies	Total	Cleaning, etc.	Total
Hard Ore Location	1687.13	861.74	2548.87	-	2548.87
Barnum "	747.04	835.81	1582.85	-	1582.85
Angeline "	34.68	44.09	78.77	151.52	230.29
Salisbury "	-	-	-	184.86	184.86
Second Addition	20.81	24.19	45.00	-	45.00
Outhwaite Purchase	289.52	125.60	415.12	-	415.12
Hyde Purchase No. 1	141.20	163.52	304.72	-	304.72
Hyde Purchase No. 2	314.26	642.05	956.31	-	956.31
Smith Purchase	314.68	52.24	366.92	-	366.92
Nelson Purchase	368.48	103.68	472.16	-	472.16
Berg Purchase	50.22	51.43	101.65	-	101.65
Total	3968.02	2904.35	6872.37	336.38	7208.75

Comparative figures for the past six years follow:-

Total for Year	1941 -	$ 7,208.75
"	1940 -	6,140.09
"	1939 -	9,430.70
"	1938 -	6,990.77
"	1937 -	15,588.69
"	1936 -	13,305.82

The cost of maintenance and repairs on dwellings is approximately 17% greater than last year. Again, increased supply and labor costs could be expected to raise the total cost of maintaining and repairing these dwellings.

Late in the year, deeds were being prepared to turn over three more houses to employees. Two of these were in the second addition and one in the Barnum Location.

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15. POWER

The Cliffs Shaft Mine purchased a total of 6,981,570 k.w.h. at an average cost of .0144874 per k.w.h.

Year	K. W. H.	Cost	Rate per K.W.H.
1941	6,981,570	101,144.56	.0144874
1940	6,078,269	91,349.36	.0150529
1939	4,876,747	79,652.95	.01633
1938	4,609,711	77,269.00	.01677
1937	6,104,385	88,837.43	.01455

A detailed statement of the distribution of electric power at the mine during 1941 follows:

	K. W. H.	Cost
Tramming	581,143	8,419.25
Pumping	1,263,275	18,301.58
Hoisting	1,413,686	20,480.64
Stocking Ore	12,323	178.54
Crushing Ore	249,061	3,608.25
Dry House Expense	46,343	671.39
Surface	17,705	256.50
Telephones & Safety Devices	76,191	1,103.81
Mine Office	9,070	131.40
Machine & Carpenter Shops	5,473	79.30
Drill and Jackbit Shops	68,293	989.39
Heating Plant	13,454	194.92
Compressors	2,733,895	39,606.73
Electric Haulage	480,146	6,956.08
Ventilation	11,512	166.78
Total	6,981,570	101,144.56

Comparative data for 1941 and 1940:

	1941	1940	Difference	% Increase
Production (Tons)	658,747	552,598	106,149	19.2
	K.W.H.	K.W.H.		
Tramming	581,143	331,541	249,602	75.1
Pumping	1,263,275	1,316,387	53,112	4.0 Decr.
Hoisting	1,413,686	1,157,931	255,755	22.1
Stocking Ore	12,323	12,231	92	-
Crushing Ore	249,061	207,519	41,542	20.0
Dry House	46,343	20,468	25,875	12.6
Surface	17,705	14,792	2,913	19.7
Telephones & Safety Devices	76,191	63,212	12,979	20.5
Mine Office	9,070	9,458	388	4.0 Decr.
Mach. Shop & Carpenter Shop	5,473	4,226	1,247	29.5
Drill & Jackbit Shop	68,293	59,258	9,035	15.2
Heating Plant	13,454	18,205	4,751	26.1 Decr.
Compressors	2,733,895	2,390,559	343,336	14.4
Electric Haulage	480,146	466,636	13,510	2.9
Ventilation	11,512	5,846	5,666	96.9
Total	6,981,570	6,078,269	903,301	14.9

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With forty more operating days in 1941 than 1940 the increase in most of the electric power accounts is readily understood. The increased cost is however not directly proportional to the increased number of k.w.h's. since the mine gets a better power factor when under nearly continuous operation.

Pumping costs at the mine are independent of operations and decreased with increased operations because of the more favorable power factor and the decrease in labor costs as a result of the elimination of pumpman's helpers except for the week-end shifts. In 1941 there was approximately 53,000 less k.w.h's. of power consumed by pumping which is probably due to the fact that there was 20,000 gallons less water pumped in 1941 than 1940.

The power consuption at the mine increased 14.9% during 1941. At the same time the operating schedule increased 15.2% and the production increased 19.2%.

18. NATIONALITY OF EMPLOYEES

Following is a list of the men employed, by nationality, as of Dec. 31, 1941:

	American Born	Foreign Born	Total
English	88	25	113
Finnish	108	75	183
Swedish	49	12	61
Italian	22	16	38
French	35	2	37
Norwegian	21	-	21
Irish	6	-	6
German	4	-	4
Austrian	2	-	2
Total	335	130	465

Comparison for 1941, 1940, and 1939 follows:

	1941		1940		1939	
	Number	% of Total	Number	% of Total	Number	% of Total
English	113	24.3	107	24.7	96	24.6
Finnish	183	39.4	170	39.3	147	37.8
Swedish	61	13.1	56	12.9	52	13.3
Italian	38	8.2	34	7.9	28	7.2
French	37	7.9	35	8.1	39	10.0
Norwegian	21	4.5	19	4.4	15	3.8
Irish	6	1.3	8	1.9	9	2.3
German	4	.9	2	.4	4	1.0
Austrian	2	.4	2	.4	-	-
Total	465	100.0	433	100.0	390	100.0

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1. General

The year 1941 was very disappointing both as to the total production obtained and as to the future life of the property. Production, which was on a three shift per day basis, ranged from an all time high of 2,704 tons for a single day in February to lows of fourteen and fifteen hundred tons per day in the latter part of the year.

In an attempt to discover new reserves, diamond drilling was carried on throughout the year on a two shift per day basis. Discoveries of additional ore were negligible. In addition, other exploratory work was carried on at top speed.

Production for the year totaled 558,253 tons including 2,131 tons of current year's stockpile over-run. This is an increase of 81,319 tons over the previous year or 17%. With the steadily decreasing size of the orebody and the number of available working places the outlook for an increase in production during the coming year is very poor.

Shipments from both pocket and stockpile were confined largely to ore of Lloyddale grade, most of the Silica production being stocked even during the shipping season. Lloyddale stockpile reserves were completely exhausted by November. Shipments for the year totaled 457,923 tons as compared with 510,592 in 1940, a decrease of approximately 10%. Stockpile reserves at the end of the year were 211,177 tons of which only 28,700 tons were of Lloyddale grade.

The working schedule at the beginning of the year was 3-8 hour shifts per day five days per week. On January 25th this schedule was increased by one eight hour shift on the sixth day. On September 1st the schedule was again increased to 2-8 hour shifts on the sixth day, making a total of 17 shifts per week.

On April 1st a general wage increase of 10¢ per hour or 12½% went into effect. Throughout the entire year rate and one-half was paid for all work in excess of eight hours per day or 40 hours per week. Effective April 16, all underground men were put on a collar-to-collar basis.

The bulk of mining operations were confined to the main Lloyd East Deposit from the 4th to the 7th Levels. In addition, the single contract working in the old Lloyd Deposit above the 4th Level completed the mining of all remaining ore in that orebody. By the end of the year recovery of all known reserves was also completed in the Lloyd East orebody both above the 4th and 5th Levels, leaving operations confined to the 6th and 7th. The bulk of production was obtained from top slicing operations in the steadily diminishing Lloyd East Deposit. There was very little opportunity for successful stoping due to a persistent lack of enrichment in the capping at the east end. Such small stopes as were developed were mined out very rapidly. The 7th Level was brought into production on a small scale in September with operations increasing throughout the remainder of the year. Before mining could be started on this level it was necessary to sink the shaft an additional 75', excavate and prepare a new skip pit and build new pockets. In addition, a large amount of repair work was necessary in the drift which had caved and crushed badly.

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1. General (Cont.)

The work of preparing a new sump and installing a pump on the 5th Level was completed early in the year. This pump is now handling approximately half of the water in the mine, the remainder being pumped at the Morris Mine of the Inland Steel Company.

2. PRODUCTION SHIPMENTS & INVENTORIES

a. Production by Grades

Grade	Tons
Lloyddale	388,111
Lloyd Silica	170,142
Total	558,253

This production compares with 476,934 tons in 1940. The high month was March with 51,320 tons and the low was December with 41,140. The percentage of Silica grade production was increased from 26.8 in 1940 to 30.5 for the current year and is estimated at 34% for 1942.

b. Shipments

Grade	Pocket Tons	Stockpile Tons	Total Tons	Total Last Year
Lloyddale	247,112	159,414	406,526	390,561
Lloyd Silica	39,027	12,370	51,397	120,031
Total	286,139	171,784	457,923	510,592
Total Last Year	265,625	244,967	510,592	
Increase	20,514	73,183	52,669	

The 1941 shipments were considerably less than for the two previous years. This was due to the fact that most of the Silica grade was stocked, only 51,397 tons being shipped for the entire year. These low Silica shipments were due to the inclusion of lean material from the Cliffs Shaft and Champion piles. Shipments for the last five years are shown in the following table:

Year - 1937	644,395
1938	112,191
1939	477,848
1940	510,592
1941	457,923

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2. PRODUCTION SHIPMENTS & INVENTORIES (Cont.)

c. Stockpile Inventories

Grade	Tons
Lloyddale	28,704
Lloyd Silica	182,473
Total	211,177

This stockpile balance is 100,335 tons greater than last year due to the small shipments of Silica grade.

d. Division of Product by Levels

The ore produced above various levels was as follows:

	Lloyddale Tons	Lloyd Silica Tons	Total Tons
Fourth Level*	47,393	27,739	75,132
Fifth Level*	96,430	20,457	116,887
Sixth Level	238,264	119,374	357,638
Seventh Level	5,987	2,609	8,596
Total	388,074	170,179	558,253

*Production completed on and above these levels during 1941.

By far the largest proportion of the product was obtained from above the 6th Level due to the fact that practically all of the mining operations were concentrated in that area. Production from the 7th Level was very small since it was not open for mining until near the end of the year.

e. Production by Months

Month	Days	Lloyddale Ore Tons	Lloyd Silica Tons	Total Ore Tons	Rock Tons	Tons per Man per Day
January	22-1/3	31,424	18,248	49,672	1,920	7.48
February	21-1/3	35,952	10,224	46,176	792	7.36
March	22-2/3	38,256	13,064	51,320	1,376	7.82
April	23-1/3	40,388	8,725	49,113	936	7.33
May	23-2/3	30,218	14,892	45,110	1,904	6.32
June	24	29,638	12,350	41,988	1,664	5.83
July	22-2/3	31,968	10,056	42,024	2,144	6.17
August	23-1/3	35,443	13,729	49,172	1,600	6.97
September	23-2/3	25,818	22,456	48,274	1,692	6.54
October	25-2/3	31,895	17,280	49,175	912	6.22
November	22-1/3	25,435	17,523	42,958	1,916	6.19
December	23-1/3	29,508	11,632	41,140	984	5.61
Total	278-1/3	385,943	170,179	556,122	17,840	6.653
Current Year Over-run		2,131		2,131		
		388,074		558,253		

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2. PRODUCTION SHIPMENTS & INVENTORIES

f. Ore Statement

	Lloyddale Tons	Lloyd Silica Tons	Total Tons	Total Last Year
On Hand January 1, 1941	47,156	63,691	110,847	109,054
Output for year	386,811	169,311	556,122	474,787
Transfers	868	868		
Over-runs	2,131		2,131	37,598
Total	435,230	233,870	669,100	621,439
Shipments	406,526	51,397	457,923	510,592
Balance on Hand	28,704	182,473	211,177	110,847

Increase in Output	81,335
Decrease in Shipments	52,669
Increase in Ore on Hand	100,330

The operating schedule for the past five years follows:

1937 - 3-8 hr. shifts 5 days per week Jan. 1 to Apr. 17, 3 crews
3-8 hr. shifts 5-1/3 days per week Apr. 17 to Oct. 2, 3 crews
3-8 hr. shifts 5 days per week Oct. 2 to Dec. 6, 3 crews
2-8 hr. shifts 6 days per week Dec. 6 to Dec. 31, 3 crews

1938 - 2-8 hr. shifts 6 days per week Jan. 1 to Apr. 16, 3 crews
2-8 hr. shifts 4½ days per week Apr. 16 to June 1, 3 crews
1-8 hr. shift 4 days per week June 1 to Oct. 31, 2 crews
1-8 hr. shift 5½ days per week Oct. 31 to Dec. 31, 2 crews

1939 - 1-8 hr. shift 5½ days per week Jan. 1 to Jan. 9, 2 crews
2-8 hr. shifts 4 days per week Jan. 9 to June 12, 2 crews
1-8 hr. shift 5½ days per week June 12 to Sept. 11, 2 crews
2-8 hr. shifts 5 days per week Sept. 11 to Dec. 31, 2 crews

1940 - 2-8 hr. shifts 5 days per week Jan. 1 to July 15, 2 crews
Since July 15, gradually increased to 3-8 hr. shifts
5 days per week, 3 crews
This 3rd. shift brought to full strength by Dec. 31.

1941 - 3-8 hr. shifts 5 days per week Jan. 1 to Jan. 24, 3 crews
3-8 hr. shifts 5-1/3 days per week Jan. 25th to Aug. 31, 3 crews
3-8 hr. shifts 5-2/3 days per week Sept. 1 to Dec. 31, 3 crews

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2. PRODUCTION SHIPMENTS & INVENTORIES

g. Delays

There were a number of minor operating delays in 1941, none of which were either serious or extensive. The total estimated loss of product is in the neighborhood of 1,000 tons since, in most cases, it was possible to make up for lost time on the following shift.

Date	Time Lost	Reason
April 10th.	3½ Hrs.	Skip Repairs
May 8th.	4 Hrs.	Underground Haulage
May 26th.	2½ Hrs.	Lack of Power - Electrical Storm
June 5th.	1 Hr.	Underground Haulage
June 10th.	1 Hr.	" "
June 17th.	3 Hrs.	" "
June 26th.	1 Hr.	Skip Signals Out of Order
October 20th.	5 Hrs.	Changing Ropes for New Level
November 22nd.	3 Hrs.	Underground Haulage
December 8th.	4 Hrs.	Top Tram Car Off Track
December 8th.	2 Hrs.	Changing South Skip Rope
December 23rd.	3 Hrs.	Changing North Skip Rope
Total	33 Hrs.	

3. ANALYSIS

a. Average Mine Analysis on Output

Grade	Tons	Iron	Phos.	Silica
Lloyddale	386,811	58.42	.171	7.48
Lloyd Silica	169,311	52.91	.125	16.14

The complete iron analysis of the two grades was 58.35 and 52.60 respectively. The Phosphorous content of both grades was the same as in the above table.

There were no straight cargoes forwarded from the mine during 1941, so the output and the composite shipment analyses are the only ones reported.

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

Grade	Tons	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
Lloyddale Dried	28,704	58.51	.136	8.53	.24	2.59	.67	.39	.010	4.90	
Lloyddale Nat.		52.22	.121	7.61	.21	2.53	.60	.35	.009	4.37	10.75
Lloyd Sil. Dried	182,473	52.73	.128	16.15	.25	2.95	.59	.47	.010	4.40	
Lloyd Sil. Nat.		47.20	.114	14.43	.22	2.63	.53	.42	.009	3.93	10.65

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3. ANALYSIS (Cont.)

c. Complete Analysis of Ores Shipped

Grade	Tons	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
Lloyddale	406,526	58.35	.171	7.50	.30	2.48	.70	.50	.010	4.50	
Lloyd Silica	51,397	52.60	.125	16.61	.22	2.50	.65	.35	.009	3.90	

4. ESTIMATE OF ORE RESERVES

a. Developed Ore

Estimate made Nov. 30, 1941 using a factor of 12 cu. ft. per ton.

	Lloyd East Deposit	Lloyd South Deposit	Total Tons
Between 5th and 6th Levels	336,511	33,654	370,165
Between 6th and 7th Levels	806,314	38,333	844,647
Below 7th Level	355,667		355,667
Gross Tons Nov. 30, 1941	1,498,492	71,987	1,570,479
Less 10% for Loss in Mining	149,849	7,199	157,048
Total	1,348,643	64,788	1,413,431
Less 10% for Rock	134,864	6,479	141,343
Total	1,213,779	58,309	1,272,088
Less December Production	24,412	5,096	29,508
Total Developed Reserves	1,189,367	53,213	1,242,580

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

	1939	1940	1941
Ore in Mine Jan. 1st.	2,118,390	1,841,233	1,548,559
Production	229,446	349,277	388,111
Balance	1,888,944	1,491,956	1,160,448
Ore in Mine Dec. 31st.	1,841,233	1,548,559	1,242,580
New Ore Developed	47,711	56,603	82,132

The small amount of new ore developed during 1941 was found in the new South Deposit after extensive diamond drilling and exploratory raising and drifting. It was first thought that this orebody would be quite extensive but subsequent information proves that it is merely a local area of concentration.

At the end of the year, drifting on the 7th Level disclosed the fact that the main Lloyd East Deposit is not nearly as extensive as outlined by diamond drilling. A large mass of lean jasper was encountered in what was previously assumed to be high grade ore. This information will have the effect of materially decreasing the reserves in this area during the coming year.

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4. ESTIMATE OF ORE RESERVES

b. Estimated Analysis of Ore Reserves

Grade	Tons	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
Lloyddale Dried		58.50	.158	7.00	.22	2.65	.65	.45	.010	4.80	
Lloyddale Nat.		51.95	.140	6.22	.20	2.35	.58	.40	.009	4.26	11.20

The above analyses apply to Lloyddale ore only since the Old Lloyd Deposit was completely mined out during 1941.

5. LABOR & WAGES

a. General

Labor relations continued satisfactory throughout the year but the supply of skilled, competent men was practically exhausted. At the present time there are few, if any, experienced miners with the proper physical qualifications for employment at this property. As a result, it has been necessary to hire a large number of young inexperienced men, a good many of whom have already been called up for army duty. The labor turnover for the year was approximately 60 men, with the total force remaining practically the same as at the end of 1940.

As a result of the shortage of skilled miners, it has been necessary to train young inexperienced men much more rapidly than usual. The effects of this are quite apparent in the efficiency of the total operation.

Most of the experienced contract miners were deferred from draft duty but a large number of partially skilled men have been lost.

Interest in the Marquette Range Industrial Union was revived very strongly during the year with the result that the Union was able to show a majority of the workers at this property. Accordingly, a contract was requested and granted as of December 12, 1941, granting this Union the bargaining rights at the property. There has been some revival of activity on the part of the C.I.O. in this district but it is impossible to estimate what strength, if any, that organization has in the North Lake district.

Effective April 1st, all wages were increased by 10¢ per hour or approximately 12½%. In all cases, rate and one-half was paid for any work which exceeded eight hours per day or 40 hours per week.

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5. LABOR & WAGES (Cont.)

b. Comparative Statement of Wages & Product

	1941	1940	Incr.	Decr.
PRODUCT	558,253	476,934		
No. of Shifts & Hours				
Jan. 1 to July 15		2-8 hr.		
July 15 to Nov. 30		2-8 (Small crew added to third shift)		
Dec. 1 to Dec. 31		3-8 (Third shift brought to full strength)		
Jan. 1 to Jan. 25	3-8 hr. (			
Jan. 25 to Sept. 1	3-8 hr. (5-1/3 Days per week)			
Sept. 1 to Dec. 31	3-8 hr. (5-2/3 Days per week)			
AVG. NO. OF MEN WORKING				
Surface	59	49	10	
Underground	251	177	74	
Total	310	226	84	
AVG. WAGES PER DAY				
Surface	6.51	5.72	.79	
Underground	7.42	6.54	.88	
Total	7.24	6.36	.88	

Average wages per day Surface and Underground respectively were 1935 - 4.19 and 4.98; 1936 - 4.30 and 5.25; 1937 - 5.44 and 6.30; 1938 - 5.59 and 6.42: 1939 - 5.64 and 6.50.

WAGES PER MONTH OF 24 DAYS	1941	1940	Incr.	Decr.
Surface	156.24	137.28	18.96	
Underground	178.08	156.96	21.12	
Total	173.76	152.64	21.12	
WAGES PER MONTH OF 22 DAYS				
Surface	143.22	125.84	17.38	
Underground	163.24	143.88	19.36	
Total	159.28	139.92	19.36	
WAGES PER MONTH OF 18 DAYS				
Surface	117.18	102.96	14.22	
Underground	133.56	117.72	15.84	
Total	130.32	114.48	15.84	

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5. LABOR & WAGES (Cont.)

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

WAGES PER MONTH OF 12 DAYS	1941	1940	Incr.	Decr.
Surface	78.12	68.64	9.48	
Underground	89.04	78.48	10.56	
Total	86.88	76.32	10.56	
PRODUCT PER MAN PER DAY				
Surface	33.40	36.37		2.97
Underground	8.30	10.35		2.05
Total	6.65	8.06		1.41
LABOR COST PER TON				
Surface	.195	.157	.038	
Underground	.894	.632	.262	
Total	1.089	.789	.300	
AVG. PRODUCT STOPING	21.62	25.63		4.01
AVG. WAGES CONTRACT MINERS	8.01	7.19	.82	
TOTAL NUMBER OF DAYS				
Surface	16,713¾	13,112½	3,601¼	
Underground	67,230¼	46,090¼	21,140¼	
Total	83,944¼	59,202¾	24,741½	
AMOUNT FOR LABOR				
Surface	108,779.42	75,003.12	33,776.30	
Underground	498,916.95	301,272.42	197,644.53	
Total	607,696.37	376,275.54	231,420.83	

PROPORTION SURFACE TO UNDERGROUND MEN

1937 - 1 to 4.06
1938 - 1 to 3.13
1939 - 1 to 3.66
1940 - 1 to 3.61
1941 - 1 to 4.25

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6. SURFACE

a. Buildings

One new building was constructed during 1941 under E & A, CC-73 at a cost of approximately $2,000. This building was constructed for use as a combination waiting room, check-room and fuse-cutting room and was built to facilitate the new collar to collar checking system which was put into effect in April. The building is situated a few feet south of the shaft and cuts down the amount of travel time which was necessary under the old system with the check-room on the east side of the dry. The building has an 8" concrete foundation, a concrete floor and is of frame construction with galvanized metal on the outside and insulating board on the inside. Heat is obtained by means of an independent oil burning stove.

The extensive program of repairs and replacements to the shaft-house and head-frame were continued during the early months of the year and completed just before the opening of the shipping season. A large number of important structural members were either repaired or replaced. The shaft-house is now practically fire-proof, all unnecessary wood having been removed. In addition, an extension to the main discharge column has been piped up to the elevation of the top landing and branches run to the several compartments. It is now possible to divert the entire capacity of the 5th Level pump, which is 800 G.P.M., into the four shaft compartments.

With the exception of the old wooden head-frame, all of the buildings at Section 6 have now been dismantled. The hoisting equipment was moved to the Mather Mine late in 1940 after which the old buildings were torn down. Early in 1942 the old head-frame will be removed and replaced with a suitable fire-proof structure which will more properly protect the Second Outlet.

b. Stocking Grounds

Stockpile shipments totaled 171,784 tons as compared with 244,967 in the previous year. Only 12,370 tons of Siliceous ore were shipped due to the substitution of Champion and Cliffs-Shaft screenings for this grade. All of the available Lloyddale stockpile reserves were shipped. The extremely small tonnage of Siliceous grade removed from the stockpile created an abnormal situation which made it necessary to construct a new trestle for the stocking of this grade. This trestle was constructed north of the shaft, across the timber yard and L. S. & I. tracks into a field beyond. The stocking of a considerable quantity of Silica ore in this new pile will permit the cleaning up of the piles around the shaft and the rebuilding of the old Silica trestles which will be completely filled by the beginning of the shipping season. Lloyddale ore was again stocked in 3 piles east of the shaft and in one small pile between two Silica piles west of the shaft. At the end of the shipping season, it was necessary to engage Lindberg & Sons, General Contractors, to load out the small pile to the west. This would have been unnecessary if the Siliceous shipments had been normal, but was considerably cheaper than attempting to get into the small pile with the railroad shovel.

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6. SURFACE (Cont)

c. Roads

With the exception of a small amount of mud during very wet weather, the mine roads were generally in good condition. Hardly any plowing was necessary up to the end of the year due to an unusually mild winter and a very small amount of snow. Small amounts of calcium chloride were used during the summer to keep down the dust.

7. UNDERGROUND

a. Shaft Sinking

Shaft sinking under E & A, CC-44 was started in February with a small winze in the ladder compartment below the 7th Level. This winze was put down to a depth of 30' after which the full-size shaft was excavated under a 16' pentice which was left beneath the cage and skip compartments. Bearers were installed immediately under the pentice after which the shaft was continued full-size to a total depth of 74' by the middle of June. As soon as the bottom was reached, a new skip pit drift was driven and a skip pit pocket installed after which work on the loading pockets immediately below the Level was started. The excavation of the skip pit and loading pockets and the building of the loading pockets were completed before the pentice was removed in August after which production on the 7th Level was started. All of this work was completed under the full protection of the pentice while the mine operated 24 hours per day. Approximately one month was required to remove the pentice and complete the timbering since this work could be done only on Sunday when the mine was idle. The above operation was carried on during the afternoon and night shifts only, due to the necessity of handling the rock on the cage by means of which it was taken to one of the upper levels for loading into the skip. The sinking of the shaft to the 8th Level, which will be started early next year, should be somewhat faster since the crew is now well organized and the work can be done on a 3 shift per day basis, the excavated rock being loaded into the skips on the 7th Level without using the cage.

b. Development

Development work during 1941 was almost evenly divided between the areas on and above the 6th and 7th Levels. Work on the 6th Level consisted of approximately 400' of drift which was driven as an extension to the 680 cross-cut. This drift, which for the most part was driven in rock and jasper, was put in for the purpose of mining the reserves in the newly discovered South deposit which was originally outlined by diamond drilling in Hole No. 117. This deposit, which lies several hundred feet to the south of the main Lloyd East structure, is not very extensive and the concentration is very mixed and spotty. Large masses of lean ore and jasper are found throughout the concentrated area, a condition which makes mining very inefficient and unsatisfactory. Two raises were put up on the west side of the cross-cut to the 515' Sub-Level on which elevation transfer drifts were driven. A small stope was developed and mining was well under way by the end of the year.

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7. UNDERGROUND (Cont.)

b. Development (Cont.)

The 7th Level was ready for operations in the latter part of October after which a considerable amount of development work was done on the main level and on the sub-levels above. Before this work could be started, it was necessary to carry out extensive repairs to the main level drift which had broken down in several places east of the main fault. After the repairs had been completed, the first cross-cut was extended through the ore to the main fault. Two raises were put up on the east side of this cross-cut, and stope development drifts were driven on the 360' Sub-Level which is only 25' above the 7th Level. This development was extremely disappointing in that the concentration did not rise to any appreciable height above the 360' Sub-Level. The small stope above this elevation, which was partially developed by the end of the year will produce very little Lloyddale grade and limited amounts of Siliceous grade.

The second development project on the 7th Level was the 720 cross-cut which was driven to the south, 180' east of and parallel to, the first cross-cut. The ore body, as outlined by Diamond Drill Hole No. 108, should have been approximately 140' wide at this point. By the end of the year the cross-cut had been advanced some 50' into this area in mixed lean ore and jasper with one 10' seam of ore. The material in the breast of this cross-cut and in the breast of the 700 drift which had been turned off to the east, showed no sign of enrichment at the end of the year.

All of the information obtained to date on and above the 7th Level is extremely disappointing and has the effect of materially decreasing the estimate of reserves both above and below.

A large amount of exploration diamond drilling was done during 1941 in an attempt to augment the known reserves which are being depleted very rapidly. This work was done on a 2 shift per day basis with Company men and equipment. The drilling totaled 3,756' at a cost in excess of $15,000 which was absorbed into operating costs at the rate of $.027 per ton.

Hole No. 114, which was started on the 6th Level in December of 1940, was completed at a depth of 239'. Holes 115 to 119 inclusive and Hole No. 124 were also drilled from the 6th Level elevation, the latter being down 214' by the end of the year. Holes 120 to 123 were drilled on the 7th Level. Several of these holes were drilled to complete the outlining of known reserves, and of the others, which were drilled in an effort to discover new ore, only one showed ore of commercial value. This was Hole No. 117 which discovered the new South deposit. A more complete discussion of this drilling will be found under heading No. 9 - EXPLORATION.

The total development footage for the year again reflects the numerous attempts made to discover and develop new reserves. This footage which amounted to 10,873', compares with 10,043' in 1940, and 6,292' in 1939. The classification of this development work will be found in paragraph 7-e.

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7. UNDERGROUND (Cont.)

c. Stoping

A single crew continued slicing operations in the bottom of the old Lloyd deposit above the 4th Level. This work was completed by the end of the year.

At the beginning of the year, there were two contracts slicing in the extreme east end of the Lloyd East Deposit above the 4th Level. This working area, which was in the trough between the north and south footwalls, soon became too small to accommodate both crews. The work was continued with one crew throughout the latter part of the year and was completed in November. This operation brought to a close all work above the 3rd, 4th, and 5th Levels, leaving the crews crowded in the small remaining area above the 6th Level with a few development crews working on and above the 7th.

Slicing operations in the main area in the Lloyd East Deposit were continued on the three sub-levels immediately above the 6th Level. This territory, at the beginning of the year, accommodated an average of 13 crews, each working from an individual raise. By the end of the year this large area had become so small that only 8 mining raises could be crowded into the area. In order to continue production at the maximum, two crews were put at each of these slicing raises whenever possible. This attempt to continue production at top speed materially affected the recovery per man due to the inherent inefficiency of working two mining crews from one raise.

Small amounts of ore of both grades were recovered by sub-level stoping in the several stringers of ore that were found above the 6th Level. None of these operations were particularly satisfactory, but they did add to the total product. A considerable amount of this work was carried on in the recovery of the pillars which were left between the mills of several stopes above the west end of the 6th Level territory. The one fairly large stope which was worked during the early part of the year was No. 5 which was finished in March. Since that time, no area has been discovered which is suitable for a stope of any appreciable size.

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

3RD LEVEL

The only operation on this elevation was the mining of several small pillars lying along the north footwall in the old Lloyd deposit. Recovery was accomplished by a combination of slicing and stoping from Raises No. 401 and 402.

SUBS ABOVE THE 4TH LEVEL

Lloyd Deposit

925', 910', 900', 885', and 875' Sub-Levels

A single crew spent the greater part of the year completing the recovery of the ore lying in the bottom of the crotch of the old Lloyd deposit. For the

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7. UNDERGROUND (Cont.)

SUBS ABOVE THE 4TH LEVEL (Cont.)

Lloyd Deposit (Cont.)

925', 910', 900', 885', and 875' Sub-Levels (Cont.)

most part, the mining method was top slicing which was augmented, when possible, by small sub-level stopes. The deposit was cut through by numerous dikes and all of the water in the area tended to concentrate in the working place with the result that the last few months of this operation were very unsatisfactory. This mining was done from Raises No. 401 and 402 and was completed in November.

Lloyd East Deposit

800', 790', 775', 765', and 755' Sub-Levels

Top slicing in this area, which was at the extreme east end of the deposit in the crotch between the north footwall Slate and the South Dike, was continued by 2 crews throughout the earlier months of the year. These crews were working from Raises No. 485 and 486 on the 2 upper sub-levels. By the time operations had progressed to the 775' Sub, No. 486 had been cut off by the north footwall. From this elevation to the Level, the work was continued by a single contract. Operations in this area were quite satisfactory down to the point where the ore body was greatly diminished in size immediately above the Level.

4th Level

The completion of mining operations in this end of the deposit was accomplished by means of a scraper slide which was used to load the cars while mining the ore lying on the main level elevation and immediately below. The ore below the Level was recovered by a single drift driven on an incline between the north and south footwalls.

SUBS ABOVE THE 5TH LEVEL

625' Sub-Level

Operations on this elevation were confined to the recovery of several small pillars which were mined by 3 crews from the raises in the 540 series.

615' Sub-Level

Top slicing operations on this elevation, which were started late in 1940, were completed early in the year by 10 crews most of whom were working in the 520, 530, and 540 series of raises. The ore from these raises was loaded and trammed on the 5th Level. Smaller amounts of ore in this territory were mined from the new 600 raises which were put up from the 6th Level.

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7. UNDERGROUND (Cont.)

Subs above the 5th Level (Cont.)

615' Sub-Level (Cont.)

A small amount of mining was done in the open stope at the west end of the deposit on this elevation.

605' Sub-Level

Starting with this Sub-Level, all of the ore recovered in the main slicing area was handled by means of the new raises from the 6th Level, 4 of which were put up to this elevation in ore. A small amount of mining was done in the east end of the deposit by means of a stope which was developed in the crotch under a small portion of the top slicing area.

5TH LEVEL

Mining operations on the 5th Level were carried on throughout the greater part of the year. Slicing in the main area in the vicinity of the 600 raises was completed, and in addition, there was a small amount of stoping on both the east and west ends of the deposit. Open stoping on the east end completed the mining of the small area lying in the crotch of the footwalls under the east portion of the old top slicing territory. On the west end of the deposit, stoping operations in No. 5 reached this elevation from the transfer drift on the 500' Sub-Level. A considerable portion of the recovery from No. 5 stope was ore of Siliceous grade.

Exploratory raising in No. 1 stope above the 680 cross-cut reached this elevation in mixed lean ore and jasper.

SUBS ABOVE THE 6TH LEVEL

585' Sub-Level

Work in the main slicing area from the 600 series of raises was completed in the early part of the year as was the stoping in both the east and west ends.

Mining in the small sub-level stope above the 680 cross-cut at Raise No. 681 reached this elevation. The recovery was for the most part ore of Siliceous grade.

South Deposit

Two exploratory raises in advance of stoping operations in the new South Deposit reached this elevation in the latter part of the year. The material encountered by these raises was very lean at this height.

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7. UNDERGROUND (Cont.)

Subs above the 6th Level (Cont.)

575' Sub-Level

Mining in the open stopes at the east and west ends of the main deposit was completed early in the year as were operations in the west end of the slicing area at Raises No. 631 and No. 632. In the main slicing territory there were still a few unmined pillars at the end of December.

A considerable amount of exploring and a small amount of mining was done in the small stope above Raise No. 681. This work, which had been completed by the end of the year, produced a small amount of ore of both grades.

Operations in December were as follows:

Contract No. 16 spent most of the month drifting to the west of Raise No. 610.

Contract No. 14 completed timbering over Raise No. 604, and drove a connecting drift west to Raise No. 610. This crew also drove a drift and a slice north to the footwall and put up a small traveling and ventilation raise in the rock to the 540 cross-cut on the 5th Level above. Contract No. 2 drove a short drift and a slice south of the same raise.

Contract No. 9, working from Raise No. 606, completed a slice northeast of the raise and drove a second slice to the southwest along the traveling drift. Contract No. 2 worked for some time at this raise before moving to No. 604. This crew drove 2 short slices; one to the southeast and the other to the south. The latter slice was completed by Contract No. 9.

Contract No. 10 completed a slice to the north of Raise No. 605 which served as a connection with No. 604. This crew also drove a short slice to the southwest. Contract No. 19, also working from Raise No. 605, completed two slices to the southwest.

Contract No. 12 drove a long slice to the northwest of Raise No. 607 and a shorter slice to the west completing operations on this elevation. This crew then moved down to the sub-level below. Contract No. 17, also working from Raise No. 607, recovered a small pillar southwest of the raise before being transferred to the 7th Level stoping area.

South Deposit

Two raises reached this elevation in the new South Deposit during exploration work in advance of stoping operations. The one to the south above Raise No. 685 was in fairly good ore and was completed in December. The other raise above No. 683 was in lean ore and jasper and followed a small over-hanging Dike.

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7. UNDERGROUND (Cont.)

Subs above the 6th Level (Cont.)

565' Sub-Level

Operations in the 2 sub-level stopes on the east and west ends of the main deposit were completed prior to the end of the year as was the mining in the slicing territory adjacent to Raises No. 631 and 632.

Mining in the small stope above No. 681 recovered a fair proportion of Lloyddale grade at this elevation.

A small amount of ore of both grades was recovered from a sub-level stope east of old No. 15 stope above Raise No. 603. This work completed operations in the small seam of ore along the north footwall at this elevation.

During December operations in the main slicing area were as follows:

Contract No. 13 drove a small ventilation drift north of Raise No. 608 and connected with the ventilation raise to the 5th Level. This crew then drove a mining drift to the southwest connecting with Raise No. 607. This latter drift was in ore for the first 40' after which it was driven an additional 45' in very lean ore and jasper, some of which was too lean to be used in the Silica grade. This large mass of unenriched material is rather extensive, having been encountered in several spots on the sub-level above. It has the effect of materially decreasing the available amount of standard grade ore in the main slicing area which is already too small to accommodate a sufficient number of mining crews. On completion of the connecting drift, Contract No. 13 started a slice to the south and had encountered the same mass of jasper by the end of the month.

Contract No. 12 moved down to this elevation in the latter part of December, cut out and timbered over Raise No. 607 in jasper, and started a drift to the southwest. This drift re-entered the ore some 10' from the raise.

South Deposit

Development operations reached this elevation late in November above Raise No. 683 and above Raise No. 685 early in December. Sub-level connecting drifts were driven from both raises to the east, and a small stope was started in ore of Lloyddale grade. Operations were fairly successful during December although considerable amounts of Siliceous ore were produced due to the very spotty nature of the deposit. By the end of the year the stope was opened and was producing very well but the large amount of water flowing from the back had already started caving in the east end, indicating that it would probably be necessary to top-slice a considerable portion of the area.

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7. UNDERGROUND (Cont.)

Subs above the 6th Level (Cont.)

550' and 540' Sub-Levels

Sub-level stoping operations on these two elevations were finished in the east end of the main deposit under the old slicing area and in the west end where the last large stope was completed. Smaller stoping operations were also completed in the small seam along the north footwall east of old No. 15 stope and in the area above the 680 cross-cut at Raise No. 631.

Top slicing operations were also completed on these two elevations in the territory served by Raises No. 631 and 632.

South Deposit

Development work in this new area reached the 550 elevation by means of a single raise late in November. This work was continued through December and by the end of the month a fairly large opening had been mined out. The spotty nature of the deposit made it necessary to mine considerable quantities of Siliceous ore in addition to the standard grade.

525' Sub-Level

A small amount of sub-level stoping was done at this elevation in the east end of the main deposit under the old top slicing territory. This sub-level was the first or mill-sub above the transfer on the 515' Sub-Level below. The operation was completed early in the year.

A small amount of exploration work was done on this elevation along the north footwall in the vicinity of Raise No. 610. From the information thus obtained, it was decided to top slice the ore in this area since it was not the proper structure for sub-level stoping.

The mill-sub for the large open stope on the west end of the main deposit, was also at this elevation. Caving in this stope made it necessary to leave a pillar and re-open the stope beyond. By the time this re-opening was well under way, additional caving made it necessary to stop the operation. The small amount of ore remaining on and above this elevation will eventually be re-covered by top slicing.

Top slicing operations from Raises No. 631 and 632 were begun on this elevation in November and continued up to the end of the year. Whenever possible, two crews were employed at each of these raises in an effort to keep production at a maximum. This territory which is immediately under the jasper capping at the west end of the deposit, was very wet throughout the entire year. Operations for December were as follows:

Contract No. 18, a double crew working from Raise No. 631, completed 5 slices to the east and the southeast up to the mining limit.

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7. UNDERGROUND (Cont.)

Subs above the 6th Level (Cont.)

525' Sub-Level (Cont.)

Contract No. 6, also working as a double crew for part of the month, drove slices to the southeast and southwest of the raise. Slicing operations to the west will re-cover the small pillars between the mills of the old stope.

Operations in the small stope at Raise No. 681 were completed before the end of the year. This seam of ore, which was too narrow for top slicing, shows a tendency to become a little wider at this elevation. As nearly as can be determined, this small deposit is a riser from the main ore body along the transverse fault.

South Deposit

A double row of mills was opened up at this elevation and connected by small drifts in December. Stoping operations were well under way by the end of the year at the east end where the stope was started adjacent to the jasper.

515' Sub-Level

Operations at this elevation in the main slicing area were confined to the driving of an intermediate sub-level drift connecting the 600 series of raises. This drift was driven west from Raise No. 608 and connected with 607, 606, 605, and 604 after which it was continued to the west to No. 630. A new raise, No. 610, was put up from the 6th Level and connected with this drift west of Raise No. 604 and then advanced to the north to the 585' Sub-Level where an extension of the ore body to the west made room for an additional slicing raise. A drift was then driven north from Raise No. 610 and a raise put up in rock to the 540 cross-cut on the 5th Level. This rock raise, combined with the intermediate connecting drift, was put in to facilitate the handling of timber and supplies from the 5th Level on which no other tramming is being done. Subsequent to completing the connection with Raise No. 630, which is one of the main ventilation raises between the 5th and 6th Levels, a considerable amount of exploration drifting was done to the west and southwest. All of the material encountered in the vicinity of No. 630 and beyond was in mixed lean ore and jasper. The same mass of unenriched material which was encountered in the slicing area above was found in the connecting drift in the area adjacent to Raise No. 605. Apparently this mass of jasper will continue to the south footwall.

Mining operations in No. 1 stope in the vicinity of Raise No. 681 were completed in the latter part of the year. From the information obtained at this elevation, it is probable that this small deposit is becoming somewhat larger to the northwest.

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7. UNDERGROUND (Cont.)

Subs above the 6th Level (Cont.)

515' Sub-Level (Cont.)

South Deposit

Exploration and development work in the South Deposit reached this elevation late in October. During November a transfer drift was driven east and west of Raise No. 683. In December Contract No. 5 put up 9 mill raises to the sub-level above in advance of stoping operations.

Contract No. 8 put up Raise No. 685 to this elevation late in November, and during December did a considerable amount of exploratory drifting. A full-size timber drift was driven to the northwest and connected with Raise No. 683. A second drift was driven to the southeast encountering first lean ore and then the south Slate footwall. A third large drift was driven to the southwest in mixed material and a short distance into the jasper which was encountered 60' from the raise. The information obtained on this elevation was not particularly encouraging since the deposit is very spotty and contains large masses of very lean jasper within the area of concentration.

500' Sub-Level

The pillars of ore lying between the mills and the transfer drifts of stopes Nos. 4, 5, and 15 were recovered on this elevation by a combination of open stoping and top slicing from the sub-level below. In December a small amount of this work was being continued by Contract No. 21 east of Raise No. 603.

A transfer drift was driven to the southeast of Raise No. 681 in the small seam of ore above the 680 cross-cut. Mill raises were put up on the south side of the drift in advance of stoping operations on the sub-level above. In the latter months of the year it was necessary to do a considerable amount of blasting in very lean ore and jasper to provide filling for future top slicing operations which are planned for the sub-levels below.

490' Sub-Level

A considerable amount of top slicing was done in the main area from Raises 641 and 652 beneath the old stoping area. Whenever possible, mills were put up from the slices and the ore lying between the mills on the sub-levels above was stoped down. This work was being continued in December by Contract No. 15 which completed several slices to the southeast of Raise No. 652. The above operations were not at all satisfactory since the sub-level is too close to the main haulage drifts to provide sufficient chute capacity. In addition, it was frequently necessary to stop and blast filling material on top of the old slices. During a normal operation, this work would have been postponed until the opening of new raises from the 7th Level; but additional working places were too badly needed.

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7. UNDERGROUND (Cont.)

Subs above the 6th Level (Cont.)

490' Sub-Level (Cont.)

A long connecting drift was driven between Raises 602 and 603 and to the east of No. 603 from which the ore in the pillars above was recovered.

Contract No. 1 cut out at Raise No. 681 early in December and started a drift to the northwest under the small stope in which mining had been completed. Another small stope will be opened above this drift from which recovery of the ore in the mill pillars will be effected.

6TH LEVEL

The only operation in the main slicing territory was the completion of one new raise, No. 610, which was put up on the north side of the main haulage drift between Raise 604 and 630. This raise was connected with the 515' Sub-Level drift and continued to the 585' Sub-Level above where slicing was started.

A small-size ventilation and traveling raise, No. 701, was put up to this elevation in jasper and connected with the main haulage drift some 50' west of the 680 cross-cut. A second ventilation raise for connection with the 670 cross-cut had not been completed by the end of the year.

South Deposit

In order to develop and mine the ore in the new South Deposit, a long extension to the 680 cross-cut was driven. This drift was driven some 360' to the southeast and encountered approximately 100' of ore which was considerably mixed with masses of jasper. A cross-cut which was turned off to the east, was driven in ore some 55' where solid jasper was encountered. Two raises, No. 683 and 685, were put up on the west side of the cross-cut to the 515' Sub-Level above. The material encountered by these raises was also very mixed.

Diamond Drill Hole No. 124 was started in the east cross-cut and drilled on an incline to the northwest in an attempt to determine the location of this small ore body on the 7th Level below. At the end of the year, this hole had been completed at a depth of 124' with the dip of -38°. The information obtained shows that the enrichment stops some 40' vertically below the Level.

Six other diamond drill holes, Nos. 114 to 119 inclusive, were drilled from various locations on the Level during 1941. With the exception of No. 117, by means of which the South Deposit was discovered, no ore of commercial importance was found. The details of this drilling will be found in Paragraph No. 9.

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7. UNDERGROUND (Cont.)

SUBS ABOVE THE 7TH LEVEL

440' Sub-Level

A small exploration raise above the transfer drift on the 390' Sub-Level reached this elevation in December. Drifting to the south and west showed nothing but lean ore and jasper.

415' Sub-Level

Two mill raises from the transfer drift on the 360' Sub-Level reached this elevation in December. Small connecting drifts were completed and an exploratory drift was driven to the south. Most of the material encountered was very lean and mixed.

390' Sub-Level

Raise No. 734 above the 730 cross-cut on the 7th Level was put up to this elevation in November by Contract No. 4. The crew drove a small connecting drift to the north to Raise No. 632 and then started a full-size transfer drift to the east. This transfer drift, which was continued and completed in December, encountered mixed material with occasional seams of rich Lloyddale ore. Exploratory work on the two sub-levels above encountered nothing but lean ore and jasper. Accordingly, it was necessary to abandon plans for a stope above this elevation and move down to the 360' Sub-Level. The large drift at this elevation will be used as a sub-level drift in the stope which will produce very little Lloyddale ore.

375' Sub-Level

Development work above the transfer drift on the 360' Sub-Level reached this elevation in December. Ten mill raises were put up by Contract No. 22, 8 on the south side of the drift and 2 on the north side. The south mills were connected at this elevation by means of a small drift. The material was lean and mixed with a few areas of fairly rich Lloyddale ore. The two mills on the north side were stopped in lean ore and jasper and were not connected.

360' Sub-Level

After abandoning the transfer drift on the 390' Sub-Level, Contract No. 4 moved down to this elevation at Raise No. 734 and drove a full-size drift due east to the stope limit. The material encountered at this elevation was somewhat better but was still quite mixed and lean in spots.

Contract No. 22 reached this elevation at Raise No.732 early in November and started a transfer drift to the east. This crew also continued the raise small-size to the 390' Sub-Level in lean ore. During December Contract No. 22 continued the drift to the east beyond the stoping limit where the material encountered was of good grade. Ten mill raises were put up to the sub-level above.

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7. UNDERGROUND (Cont.)

7TH LEVEL

Throughout the greater part of the year a crew was engaged in repairing and re-timbering the main 7th Level drift in the vicinity of the fault where a bad break-down had occurred some years previously. This major break-down at the fault and several smaller ones to the east, made it necessary to re-timber a considerable portion of the drift. Due to the fact that there were no pockets below the 7th Level, it was necessary to handle all excavated material in small cars which were hoisted on the cage. Early in September the shaft sinking operation and the building of a new skip pit and pockets were completed. It was then possible to start operations on the Level on a larger scale. Work in the continuation of the 730 cross-cut was started immediately as was a ventilation raise to the 6th Level. The 730 cross-cut was advanced 45' through Lloyddale ore and stopped at the fault after which two raises, Nos. 732 and 734, were put up to the sub-level above. As was previously noted, the information obtained above the Level was very disappointing since the high-grade reserves do not extend upward to any appreciable height. The transfer drifts were driven on the 360' Sub-Level which is only 25' above the floor of the Level. The stopes above the 360' Sub-Level will produce very little Lloyddale ore.

The ventilation raise, No. 701, was put up double compartment, full-size in Lloyddale ore to elevation +374 which is 40' above the floor of the Level. From this point it was continued small-size, uncribbed in lean ore and jasper to the 6th Level elevation where it was connected to the south side of the main drift by means of a small drift west of the 680 cross-cut.

The driving of the 720 cross-cut was started in November and continued throughout December by Contract No. 3. The 700 drift was turned off to the east in what was presumed to be the center of the ore body. As was previously explained in the paragraph on development, the expected concentration did not materialize and both headings were in very lean jasper at the end of the year. This large mass of jasper which is lying in the center of the deposit close to the north footwall, greatly diminishes the reserves both above and below the Level.

Four diamond drill holes were put in during the year, the first, No. 120, vertically from the east side of the 730 cross-cut. This hole was drilled to determine the ultimate depth of the Lloyd East Deposit and encountered the Slate at a point 135' below the Level having passed through 35' of jasper and 100' of ore. Three other holes were drilled to the south at 1720, 1400, and 1,000 east, respectively. This latter drilling was done in an attempt to determine the location of the new South Deposit at the 7th Level elevation. No ore was encountered in any of the holes which proves almost conclusively that this deposit does not extend to the Level.

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7. UNDERGROUND (Cont.)

7th Level (Cont.)

Plat and Pocket

Early in January work was begun on the 7th Level plat preparatory to shaft sinking operations which were started in February. It was necessary to do a large amount of stripping directly south of the ladder and cage compartments to make room for the sinking hoist. In addition, the east side was stripped to permit the installation of a head sheave over the ladder compartment and spotting room for the two-ton cars east of the compartment. Shaft sinking operations, which were begun late in February, were completed at the new skip elevation 74' below the Level by the end of June. It was then necessary to put up a raise west of the pentice, excavate and build new skip pockets immediately below the Level, strip the west side of the plat to accommodate the ore cars, and excavate the new skip pit. All of this work was done before the removal of the pentice in order to permit it to be carried on during the operating shifts. For the most part this work was done on the afternoon and midnight shifts only, since the cage could not be spared to handle the rock on the day shift. Most of the above work was completed and the pentice removed by the end of September after which the Level was put into production on a small scale. After the first blast in the removal of the pentice, it was necessary to do the remainder during the idle shifts on Sunday. In order to get the 7th Level into production as rapidly as possible, some of the necessary stripping and drifting was postponed and was being continued at the end of the year.

d. Timbering

The decrease in the amount of timber used per ton of ore was due to several factors. There was a substantial decrease in the amount of cribbing used, since the large raising program between the 5th and 6th Levels was completed in 1940. The amount of covering poles used was also decreased considerably during experiments which were carried out during the latter part of the year. These experiments were necessitated by the fact that the supply of this material is rapidly becoming very limited. The third factor tending to decrease the amount of timber used, was the increase in the proportion of Siliceous ore produced. Most of this grade is obtained from open stopes where timber is not used.

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7. UNDERGROUND (Cont.)

d. Timbering (Cont.)

Statement showing timber used for 1941

	Lineal Feet	Avg. Price Per Foot	Amount 1941	Amount 1940
6" to 8" Cribbing Timber	29,319	.037	1083.20	2481.54
8" to 10" Stull "	85,962	.0683	5872.79	4653.35
10" to 12" " "	56,387	.095	5351.15	4772.83
12" to 14" " "	10,137	.1311	1329.08	1828.54
Total Timber 1941	181,805	.075	13636.22	
" " 1940	204,551	.067		13736.26
	Per 100 Feet			
7 Ft. Lagging	1,121,036	.782	8771.69	7987.96
3½" Poles	474,769	1.33	6324.60	6908.82
Wire Fencing	7,260	6.27	455.40	218.60
Total Poles & Fencing	482,029	1.41	6780.00	7127.42
Total Lagging, Poles and Fencing 1941	1,603,065	.97	15551.69	
Total Lagging, Poles and Fencing 1940	1,530,453	.99		15115.38
Product - Tons			558,253	476,934
Feet of Timber per Ton of Ore			.326	.429
" " Lagging " " " "			2.008	2.098
Feet of Lagging per Foot of Timber			6.166	4.891
Cost per Ton for Timber			.0244	.0288
" " " " Lagging			.0157	.0167
" " " " Poles & Fencing			.0121	.0149
Cost per Ton for All Timber			.0523	.0605
Equivalent Stull Timber to Board Measure			372,867	358,772
Feet of Board Measure per Ton of Ore			.668	.752

	Year	Cost Per Ton	Amount
Cost of Timber, Lagging, Poles, Fencing	1941	.0523	29,187.91
	1940	.0605	28,851.64
	1939	.0626	19,899.00
	1938	.0579	15,801.49
	1937	.0528	28,804.97

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7. UNDERGROUND (Cont.)

e. Drifting and Raising

Drifting and raising operations kept pace with the increase in production and were slightly greater than for the previous year. The figures for both these years were in excess of 10,000' as compared with 6,300' in 1939, and 7,900' in 1938, reflecting the numerous attempts to discover and develop additional reserves. A large proportion of the rock drifting shown in the following tables was done in the development of the 7th Level.

The following table gives a two year comparison:

	Ore Drift	Rock Drift	Total Drift	Ore Raise	Rock Raise	Total Raise	Grand Total
1941	6682	713	7395	3298	180	3478	10873
1940	4868	938	5806	3876	361	4237	10043
Increase			1589			759	830

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:

1941	2228	597	2825	481	92	573	3398
1940	1068	775	1843	1033	84	1117	2960
Increase			982			544	438

f. Explosives, Drilling and Blasting

The pounds of powder used per ton of ore recovered was considerably increased during 1941 due to the increase in Silica production which requires heavier blasting. Further, it was necessary to produce most of the Lloyddale grade by top slicing operations since it was not possible to develop any extensive stopes in this material.

The use of fuse cartridges or Master Fuse Lighters, was continued throughout the year and in addition, a new type of primer was used in the shaft sinking operation. This was the Hercules Powder Company's Primatube which was developed for use in making up the primers for electric blasting. The primatubes worked very satisfactorily.