THE CLEVELAND - CLIFFS IRON CO.

Ore Mining Department

ANNUAL REPORT OF GENERAL MANAGER

For Year Ending December 31, 1942

#2013

1944
131

THE CLEVELAND-CLIFFS IRON COMPANY
ORE MINING DEPARTMENT
MANAGER'S ANNUAL REPORT
YEAR 1942
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MV:BB
10-25-43

Ishpeming, Michigan
April 28, 1943

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 1942.

The inventories, maps, statements relative to the 1942 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, the Company has expended a large amount of money in the purchase of new equipment and the improvement of its various plants. It is unnecessary to go into these details as they are all reported by the various Superintendents.

Our Safety program, which has extended over a period of many years - or since 1911 - has continued the foremost activity in the minds of all of us. As you know, this Company has steadily progressed and it is our aim to continually improve our safety record. This safety idea is thoroughly instilled in the minds of the Superintendents and the Captains and shift bosses and it is most gratifying to realize that we are not standing still but are progressing. Mr. A. J. Stromquist, who succeeded Mr. William Conibear, has been most efficient and energetic in his duties, carrying on the work which has been established on such a sound basis by Mr. Conibear. The details of the Safety Department are shown in Mr. Stromquist's report. I, however, want to emphasize a few of the outstanding facts. I give below two statements, one showing the frequency and the other the severity, from 1935 to 1942 inclusive.

FREQUENCY RATES*
All Compensable Accidents

Year	Total Man Days Worked	Number Compensable Accidents Non-Fatal	Fatal	Frequency Rate
1935	393,967	35	2	.094
1936	567,891	33	2	.062
1937	765,701	58	1	.077
1938	491,303	46	3	.099
1939	564,542	44	1	.078
1940	714,391	59	5	.089
1941	918,300	79	5	.092
1942	1,024,713	75	2	.075

* Based on days lost by accidents per 1000 days of labor.

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	15.68
1942	4,103	4.00	3,600	7,703	7.52

* Based on days lost by accidents per 1000 days of labor.

I call your particular attention to the fact that there has been only one year - 1936 - when the frequency rate was lower than it was in 1942. Further, that the severity rate for 1942 is the lowest for this same period. This is a most creditable performance and shows the closest co-operation between the Safety Department and our various mines. In examining these figures, it should be borne in mind that in 1936, for example, the product is just about half of what it was in 1942. I also call your particular attention to the increase in man days worked between 1935 and 1942. Naturally your exposure, or chances for accidents, increases directly with the days worked. This is why our 1942 record is so outstanding.

The mines of the Company are all in first class condition and our constant aim is to keep them in such condition, making it possible to produce a maximum tonnage at the lowest cost, always keeping in mind that the ore must be produced with safety to our employees. The following statement gives the production and cost per ton for 1941 and 1942:

COMPARATIVE FIGURES FOR 1942 & 1941

MINE	PRODUCTION	COST OF PRODUCTION PER TON T	COST OF PRODUCTION AMOUNT	TOTAL COST PER TON	TOTAL COST AMOUNT
1942					
Athens	681,748	1.932	1,317,083.70	2.337	1,593,467.74
Cliffs Shaft	713,530	2.225	1,587,422.91	2.540	1,812,041.13
Lloyd	568,036	1.724	979,483.43	1.984	1,127,102.54
Maas	882,399	1,854	1,636,020.54	2.263	1,997,088.79
Negaunee	1,020,950	1.476	1,633,650.25	1.936	2,142,052.17
	3,866,663	1.850	7,153,660.83	2.243	8,671,752.37
1941					
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
1942					
Increase in product	140,324				
Increase in cost		.068		.053	
% Increase	3.8	3.8		2.4	

Wages - Effective April 1, 1941 wages were increased by 10¢ per hour. The penalty cost on overtime worked increased considerably during 1942 due to the mines operating on a 17 shift per week basis.

	Penalty Cost	Effect on cost of production
1942	325,581.90	.0723
1941	230,741.97	.0535
Increase	94,839.93	.0188

While the cost of supplies did not vary much in the two years - .4134 cost per ton in 1941 and .4242 cost per ton in 1942, the cost of lumber and mine timber increased 15%.

We thought in 1941 the maximum production was being obtained from all of our mines. This, however, was not true, as a larger tonnage was hoisted in 1942. When you take into consideration the large increase in the penalty cost, or for time and one half worked, and the other increases, it is surprising that the cost shows such a small increase over 1941. This is a matter of great satisfaction not only to me but to all of the Superintendents.

CIO elections have been held at the Canisteo, Hill Trumbull and Holman Cliffs Mines and this organization was declared the bargaining agency. Contracts were signed at these properties on May 13. During the year the CIO has been declared the bargaining agency at the Spies Virgil, Lloyd and Cliffs Shaft Mines. It is safe to assume that this organization will also represent, before they get through, the employees at all of our mines. We are in bed with these fellows, so to speak, and I have made up my mind, and have impressed my views on all of the Superintendents, and I am glad to say they are absolutely in accord with me, that we have to make it our business to get along with these fellows. I am sure this can be done and it is to the Company's advantage to cooperate. This does not mean we are going to stand for anything unreasonable. Nevertheless, the vast majority of our employees have been loyal in the past and there is not the slightest reason to assume they will not be loyal in the future, even though they are represented by the CIO.

As you know, the Marquette Range Industrial Union has had the bargaining rights at all of our mines but as time went on, this union slowly disintegrated. None of the officers were paid and the work which was carried on was done solely from the deep interests of a few for the welfare of the Company as a whole. Very early in the spring, when the CIO were claiming and fighting for the collar to collar principle, and other advantages which they had not only obtained but were promising to our employees, it was perfectly evident the CIO was bound to come in here and sign up our men. All they needed to accomplish this was a first class organizer. The Company on its part, had nothing special to offer its employees and it was in no position to combat this movement.

Effective March 1st, Mr. C. J. Stakel was appointed Assistant Manager. Since his appointment, there has been a mass of government regulations and complicated statements to fill out. He has been of the greatest assistance to me, not only in this work but in assisting me in the mass of detail which has to go through this office. I am sure that if he had not been available to

collect and prepare these statements, there would have been much delay in complying with the regulations. In December, 1941, Mr. S. W. Sundeen went to the Cliffs Shaft without title so he could later on assume Mr. Stakel's duties at that mine. He was appointed Superintendent on July 1, 1942. I am sure he will give a good account of himself.

On November 1, 1942, Mr. Grover J. Holt was employed as an engineer in a consulting capacity with Ishpeming as his headquarters. Most of his time has been spent away from Ishpeming, where he has been looking into various mines and on methods of concentration. He will be a valuable addition to our Company.

The Company carried on an extensive drilling program during the year and I am sorry to say that up to the end of 1942 had shown up practically no new ore. It must be borne in mind that in practically all cases, it is necessary to work out the geological structure before ore can be expected. The program is being continued and we naturally hope that new ore will be put into the picture.

During the year I have received the finest kind of cooperation not only from the Superintedents but from the bosses and our employees as a whole. This is a matter of great pride and satisfaction to me.

Respectfully submitted

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	10,628,886	5,461,800	2,759,000	2,016.245	20,865,931	I	331,485
1943							
1944							
1945							
1946							
			T A X E S P A I D				
1929	$476,740.79	199,695.33	97,739.13	55,223.01	829,398.26		
1930	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	321,091.31	182,845,08	91,057.97	37,686.66	632,681.02	I	5,702.26
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

	1939	1940	1941	1942
PRODUCT - Tons	387,258	552,598	658,747	713,530
POWDER				
Pounds - Gelamite "2X"	346,600	478,750	581,050	593,600
60% Gelatine			3,950	55,200
Total Pounds Powder	346,600	478,750	585,000	648,800
Total Cost	$40,94 2.86	55,067.75	67,130.89	74,716.90
Fuse - Feet	609,200	771,800	1,012,600	1,144,340
Caps - Number	98,900	119,050	154,500	172,820
Duplex Shot Wire	5,800	6,550	21,550	30,870
Electric Caps	1,500	4,973	8,044	8,611
Fuse Lighters	24,400	27,500	49,000	53,300
Fuse Containers	47	5		
Tamping Bags	40,000	34,600	54,800	53,500
Powder Bags	20	- -	- -	- -
TOTAL COST - Fuse, Caps etc.	$ 5,378.63	6,819.32	9,563.11	11,042.52
TOTAL COST - All Explosives	46,321.49	61,887.07	76,694.00	85,759.42
Average Price per pound - Powder	.1181	.115	.1150	.1150
Cost per ton - Powder	.1057	.0997	.1019	.1047
Cost per ton - Fuse, etc	.0139	.0123	.0145	.0155
COST PER TON - All Explosives	.1196	.1120	.1164	.1202
Pounds Powder per ton of ore	.8950	.8664	.8880	.9092

1942 Production increased 54,783 tons or 8.3% compared with 1941
Average price for Powder and cost per ton for all explosives was practically the same for years 1942 and 1941.

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

	1939	1940	1941	1942
PRODUCT - Tons	1,903,564	2,702,052	3,242,771	3,494,309
POWDER				
Pounds 50%	44,515	9,500	5,600	
60%	10,550	5,350	29,753	59,875
1 X and 2 X Gelamite	764,270	1,139,055	1,380,103	1,514,069
Total Pounds - Powder	819,335	1,153,905	1,415,456	1,573,944
Total Cost - Powder	$ 96,623.23	132,720.38	162,750.17	181,126.68
Fuse - Feet	2,994,647	4,187,783	5,109,955	5,428,099
Caps - Number	426,426	591,115	726,208	769,919
Leading Wire - Feet	2,500	2,460	3,500	3,000
Connecting Wire - Pounds	120	82	106	138
Tamping Bags - Number	83,000	99,150	133,800	150,400
Sealing Compound - Pints	44	72	- -	- -
Powder Bags	125	133	177	167
Fuse Lighters	69,650	106,375	134,850	140,250
Electric Exploders	2,109	3,561	10,876	11,895
Blasting Machines	- -	1	- -	- -
Master Fuse Lighters	8,650	400	3,416	9,450
Total Cost - Fuse, Caps, etc.,..	$ 21,914.56	30,333.88	37,824.68	41,175.44
Total Cost - All Explosives	$ 118,537.79	163,054.26	200,575.32	222,302.12
Average price per pound - Powder	.1179	.1150	.1150	.1150
Cost per ton - Powder	.0508	.0491	.0502	.0518
Cost per ton - Fuse, caps, etc., ...	.0115	.0112	.0117	.0118
Cost per ton - All Explosives	.0623	.0603	.0619	.0636
Pounds of Powder per ton of ore	.4304	.4271	.4364	.4504

1942 - Production increased 251,538 tons or 7.8% compared with 1941.
The average price per pound for powder and Cost per ton for all explosives are practically the same for the years 1942 and 1941.
Mines included in above statement are Athens, Maas, Negaunee, Lloyd, Virgil and Princeton added in 1942.

JSM:RN
2-2-43

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

	1939	1940	1941	1942
PRODUCT - Tons	1,903,564	2,702,052	3,242,771	3,494,309
TIMBER				
Feet 6-8	419,132	349,531	391,614	556,638
8-10	232,404	378,024	396,935	367,747
10-12	348,701	477,494	570,415	642,825
12-14	166,501	184,574	230,706	266,819
14-16	14,284	12,963	14,419	12,555
Treated Timber	6,937	4,756	526	4,785
Total Feet	1,187,959	1,407,342	1,604,615	1,851,369
Total Cost	$ 89,080.48	110,124.43	127,923.50	155,394.02
LAGGING				
Feet 5	21,585	14,125	11,270	2,800
7	4,704.619	6,348,785	7,789,971	8,857,020
Total Feet	4,726,204	6,362,850	7,801,241	8,859,820
Total Cost	$ 36,934.76	49,769.18	61,116.88	82,967.91
Poles - Feet	3,847,650	5,182,904	5,885,273	6,048,020
Poles - Cost	$ 49,766.77	68,498.05	77,787.92	101,577.72
Wire Fencing - Rods	2,860	2,933	2,447	1,555
Wire Fencing - Cost	$ 2,707.62	2,772.12	2,470.64	1,634.83
Total Cost of All Timber	$ 178,489.63	231,163.78	269,298.94	341,574.48
Average Cost per foot - Timber	.0749	.0782	.0797	.0839
" " " 100' - Lagging	.7814	.7821	.7834	.9364
" " " " - Poles	1.293	1.322	1.322	1.6795
" " " Rod - Fencing	.946	.945	1.009	1.051
Feet of Timber per ton of ore	.624	.521	.495	.530
" of Lagging per ton of ore	2.482	2.355	2.406	2.535
" of Poles per ton of ore	2.021	1.918	1.815	1.731
" of Fencing per ton of ore	.025	.018	.012	.0073
Cost per ton for Timber	.0468	.0408	.0394	.0445
Cost per ton for Lagging	.0194	.0184	.0188	.0237
Cost per ton for Poles	.0261	.0254	.0240	.0291
Cost per ton for Wire Fencing	.0014	.0010	.0008	.0005
Total Cost per ton	.0937	.0856	.0830	.0978

1942 - Production increased 251,538 tons or 7.8% compared with 1941.
The mines included in above statement are, Athens, Maas, Negaunee, Lloyd, Virgil and Princeton added 1942
The total cost per ton for all timber etc. in 1942 increased approximately 18% compared with 1941. This is accounted for in the increase in price of 7 ft. Lagging and 9½ ft. poles - Price of 7 ft. Lagging increased 20 % - Price of 9½ ft. Poles increased 27%.

JSM:RN
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STATEMENT SHOWING TOTAL COST OF SUPPLIES CHARGED TO "COST OF ORE AT MINE"

SOFT ORE MINES

	1939		1940		1941		1942	
PRODUCT - TONS	1,903,564		2,702,052		3,242,771		3,494,309	
CLASSIFICATION	AMOUNT	PER TON	AMOUNT	PER TON	Amount	PER TON	AMOUNT	PER TON
General Supplies	109,486.33	.0575	131,271.61	.0486	171,462.86	.0529	156,046.21	.0447
Iron and Steel	29,275.21	.0156	38,676.32	.0143	47,764.92	.0147	48,634.64	.0139
Machinery	58,523.72	.0308	71,942.91	.0267	122,755.28	.0378	88,089.44	.0253
Explosives	118,719.79	.0624	163,107.72	.0603	200,860.70	.0619	218,427.41	.0625
Lumber and Timber	195,651.50	.1028	245,940.96	.0910	296,315.16	.0914	371,563.75	.1063
Fuel	16,974.83	.0089	15,414.40	.0057	17,071.97	.0053	23,571.18	.0067
Electric Power	344,250.29	.1808	403,886.97	.1495	444,596.71	.1372	470,499.99	.1346
Miscellaneous	60,623.28	.0318	26,178.38	.0097	39,643.73	.0122	105,397.23	.0302
Total	933,954.95	.4906	1,096,419.27	.4058	1,340,471.33	.4134	1,482,229.85	.4242

HARD ORE MINES

	1939		1940		1941		1942	
PRODUCT - TONS	387,258		552,598		658,747		713,530	
CLASSIFICATION	AMOUNT	PER TON	AMOUNT	PER TON	AMOUNT	PER TON	AMOUNT	PER TON
General Supplies	39,022.60	.101	44,025.34	.080	62,604.40	.095	61,270.59	.086
Iron and Steel	20,264.11	.052	32,250.25	.059	43,819.99	.066	43,009.66	.061
Machinery	22,640.32	.059	41,544.87	.075	55,561.35	.084	35,466.73	.049
Explosives	46,454.76	.120	61,887.07	.112	76,700.80	.117	85,759.42	.120
Lumber and Timber	7,863.57	.020	6,662.98	.012	11,543.83	.017	11,518.56	.017
Fuel	4,366.08	.011	5,157.58	.009	5,421.96	.008	5,263.55	.007
Electric Power	79,652.95	.206	91,349.36	.165	101,144.56	.154	104,081.28	.146
Miscellaneous	19,669.44	.051	2,489.46	.004	24,027.11	.037	39,067.53	.054
Total	239,933.83	.620	285,366.91	.516	380,824.00	.578	385,437.32	.540

NOTES 1942 Soft Ore Mines production increased 251,538 tons or 7.8% compared with 1941.
Hard Ore Mines production increased 54,783 ton 8.3 % compared with 1941.
Soft Ore Mines included in statement above, Athens, Maas, Negaunee, Lloyd, Princeton and Virgil.

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THE CLEVELAND-CLIFFS IRON COMPANY
ORE MINING DEPARTMENT
LABOR SUMMARY - ALL COMPANIES

	1939		1940		1941		1942	
					Less Champion	7,172,418	Less Champion	7,602,068
PRODUCT - TONS	3,699,285		5,419,185		Purchased Ore	106,928	Purchased Ore	58,305
						7,065,928		7,543,763
	DAYS	AMOUNT	DAYS	AMOUNT	DAYS	AMOUNT	DAYS	AMOUNT
Surface	197,836	1,131,048.39	250,446-3/4	1,441,760.22	308,725	2,040,091.32	365,987	2,535,635.72
Cost Per Ton		.306		.266		.289		.336
Underground	311,549½	1,989,110.18	409,032-3/4	2,616,755.26	548,847-3/4	4,083,080.09	596,685½	4,655,973.87
Cost Per Ton		.538		.483		.578		.617
Superintendence and General Roll.	55,047¼	388,021.13	54,911-3/4	393,790.45	56,652	444,289.71	60,632½	490,346.66
Cost Per Ton		.105		.073		.063		.065
GRAND TOTAL	564,432-3/4	3,508,179.70	714,391-1/4	4,452,305.93	914,224-3/4	6,567,461.12	1,023,305	7,681,956.25
COST PER TON		.948		.822		.930		1.018
Average Rate Per Day		6.22		6.23		7.18		7.51
Tons Per Man Per Day (1)		6.55		7.69		7.72		7.37
(1) Production	3,699,285		5,419,185		7,172,418		7,602,068	
Prior Year Stockpile Overrun.	11,566		162,595		110,093		72,753	
Total	3,710,851		5,581,780		7,282,511		7,674,821	

NOTE:
The above is the total of all wages and salaries for employees of the Mining Department, including The Cliffs Power & Light Company - 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 one week for three years service amd twp weeks for 10 years service was paid in August 1942, but mines continued to operate - the vacation of employees being deferred.

WORKING SCHEDULE - 1942 - MICHIGAN PROPERTIES:
From January 1st, all mines, excepting Cliffs Shaft and Spies-Virgil, operated on a 6 day per week schedule:
3 - 8 hr. shifts 5 days
2 - 8 hr. shifts Saturdays
Cliffs Shaft operated 6 days per week, 2-8 hr. shifts per day. Spies-Virgil operated 2-8 hr. shifts 5 days per week until October 17th - when 1-8 hr. shift on Saturdays was added.

MINNESOTA PROPERTIES:
The Canisteo ore operations began May 4, 1942, and concluded September 14, 1942 - operations were on the basis of 5 days per week - 3-8 hr. shifts per day.
The Holman-Cliffs ore operations began April 14, 1942 on a 5 day a week schedule. Beginning May 23rd on a 6 day a week basis. Back to the 5 day a week basis beginning August 1st to close of season November 6, 1942, operations were on 3-8 hr. shifts per day basis.
The Hill-Trumbull ore operations started April 13, 1942, and continued until close of season November 6,1942, operations were on a 6 day per week basis 3-8 hr. shifts per day.

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COMPARISON OF TOTAL DAYS WORKED AND TONS OF ORE MINED FOR THE YEARS 1942 AND 1941

	1942 DAYS	1941 DAYS	1942 DAYS	1941 DAYS
NON-PRODUCTIVE UNITS:				
Stephenson Mine	-	541		
Princeton Mine	-	2,689¾		
Gardner-Mackinaw Mine	27¾	1,220		
Mather Mine	26,930¼	20,098¾		
Miscellaneous Payroll	1,849¼	1,945¾		
Shops and Storehouse	4,489½	3,923		
C.C.I.Co. Miscellaneous & General	76,607	52,008¾		
Negaunee Mine Co. " "	3,241¼	7,155¼		
Athens Iron Mining Co" "	2,013½	1,810½		
Mesaba-Cliffs Mining Co "	37,930	21,069¼		
Canisteo Minining Co. "	13,175½	13,668¾		
The Cliffs Power & Light Co. "	23,780¼	24,548¼		
General Roll - Undistributed	39,602	37,194½		
Champion Screen Plant	1,367¾	1,582¼		
TOTAL DEDUCTIONS	231,014	186,291¼		
GRAND TOTAL-ALL OPERATIONS	1,024,672¾	915,807		
NET OPERATING MINES	793,658¾	729,515¾	793,658¾	729,515¾
Total Tons	7,602,068	7,172,418		
Less: Champion Ore Shipped	58,305	106,928		
Total Tons	7,543,763	7,065,490		
Tons Per Man Per Day	9.51	9.69		
		T O N S		
OPEN PIT PRODUCTION:				
Tilden Mine	235,207	302,943	7,580¾	8,198¼
Canisteo Mine	772,659	585,679	24,135	22,479
Hill-Trumbull Mine	1,223,113	1,285,681	49,184½	43,403
Holman-Cliffs Mine	1,104,945	989,669	48,237½	42,014½
TOTAL	3,335,924	3,163,972	129,137¾	116,094¾
Open Pit - Tons Per Man Per Day	25.83	27.25		
Net Underground Days			664,521	613,421
Net Underground Tons	4,207,839	3,901,518		
Underground Tons Per Man Per Day	6.332	6.360		

PERCENTAGE OF TOTAL PRODUCTION

	1942		1941	
	TONS	PERCENT	TONS	PERCENT
Underground Mines	4,207,839	55.35	3,901,518	54.39
Open Pits	3,335,924	43.88	3,163,972	44.11
Champion - Purchased Ore	58,305	.77	106,928	1.50
TOTAL	7,602,068		7,065,490	

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STATEMENT SHOWING PENALTY COST OF OVERTIME WORKED BY EMPLOYEES
DURING YEAR 1942, AND EFFECT THE PENALTY COST HAD ON THE YEARS PRODUCTION

	MICHIGAN PROPERTIES	MESABA RANGE			TOTAL
		CANISTEO	HILL TRUMBULL	HOLMAN CLIFFS	
January	25,522.81	274.54	362.57	209.83	
February	24,359.75	166.33	224.09	191.73	
March	23,901.64	192.85	592.97	345.21	
April	22,416.85	350.43	1,427.10	1,830.65	
May	34,449.38	932.54	4,468.86	5,092.61	
June	28,565.93	879.79	4,264.47	4,165.45	
July	21,933.27	1,698.71	4,535.43	4,621.79	
August	36,262.73	1,487.12	4,476.54	2,891.65	
September	28,339.15	336.10	3,974.88	2,964.61	
October	35,008.88	351.76	3,294.99	1,432.22	
November	22,355.96	349.84	240.88	660.16	
December	22,465.55	500.99	241.22	940.35	
Total - 1942	325,581.90	7,521.00	28,104.00	25,346.26	386,553.16
Total - 1941	230,741.97	1,273.02	10,246.40	10,100.28	252,361.67
PRODICTION					
Tons - Year 1942	4,501,351	772,659	1,223.113	1,104,945	7,602.068
Tons - Year 1941	4,311,389	585,679	1,285,681	989,669	7,172,418
Effect the Penalty Cost had on Years Production cost.					
Cost per ton - 1942	.0723	.0097	.0230	.0229	.0508
Cost per ton - 1941	.0535	.0022	.0080	.0100	.0352

NOTE;
During the year 1942 all Michigan Mines, excepting Spies-Virgil operated over 40 hours per week, and time and one-half 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 1942

	1942	1941
COSTS		
LABOR		
Chemists and Assistants	24,594.30	23,121.32
Helpers and Sample Buckers	61,894.42	46,627.27
Total Labof	86,488.72	69,748.59
SUPPLIES AND EXPENSES		
Chemical, etc.	24,797.09	17,737.11
Property Insurance	34.98	20.24
Personal Injury Expense	58.00	52.50
Unemployment Insurance Tax	1,378.33	2,295.25
Old Age Benefit Tax	861.45	695.52
Depreciation	1,711.99	962.64
Sale of Equipment- Missouri Cliffs	455.00	
Total	28,386.84	21,763.26
Grand Total	114,875.56	91,511.85
Total Number of Determinations	309,737	281,270
Cost of Determination	.37088	.32535

DISTRIBUTION	NO. OF DETERMINATIONS	COST		PERCENT OF TOTAL LABORATORY WORK
Cliffs Shaft	49,559	18,335.17		16.0
Cliffs Shaft Diamond Drills	2,082	791.42		.7
Incline Pit	1,258	440.87		.4
Maas	83,603	31,095.64		27.1
Maas Diamond Drills	272	98.72		.1
Gardner Mackinaw	50	23.94		- -
Lloyd	40,586	14,937.53		13.0
Lloyd Diamond Drills	2,322	880.71		.8
Tilden	15,348	5,695.44		5.0
Stephenson	50	23.94		- -
Princeton	10,529	3,808.40		3.3
Loading Champion	3,683	1,338.73		1.2
Spies-Virgil	115	43.94		.05
Experiments and Investigations	9,045	3,462.87		3.0
Uncomp. Construct. Explorations				
E. & A's	1,862	696.84		.6
Land Offers	2,492	847.16		.7
Negaunee Mine Co.				
E. & A's , Mather	2,731	1,082.63		.9
E. & A's, Negaunee	314	117.85		.1
Negaunee Mine	47,745	17,645.32		15.4
Athens Mine	31,679	11,638.42		10.1
Miscellaneous Delivery				
Cambria	58	20.38		- -
Saint Paul	25	11.98		- -
Mary Charlotte	8	2.99		- -
Morris	1,079	387.83		.3
Archibald	424	149.96		.1
Total Company Operations	306,917	113,595.09	.37012	
Accounts Receivable:				
L. S. & I. Railway Co.	5	45.00		.05
Volunteer Pit	2,815	1,235.47		1.1
GRAND TOTAL	309,737	114,875.56	.37088	100.00

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CLIFFS SHAFT MINE

ANNUAL REPORT

YEAR 1942

1. GENERAL:-

The Cliffs Shaft Mine was operated 6 days a week throughout 1942. As in 1941, many days previously considered as no-work holidays were worked on regular schedules. The mine was closed down only on the following five days: New Year's Day, Fourth of July, Thanksgiving Day, Christmas Day, and the day after Christmas Day. In other words, the mine was operated a total of 308 days in 1942.

The production for the year amounted to 713,530 tons compared with the previous year's high of 658,747 tons. The budget estimate as revised in March of 1942 called for a production of 702,416 tons. The product for 1942 exceeded the estimate by 11,114 tons. The production figure for the year includes 3,318 tons of overrun developed in 1942 for which credit was given in the cost of production. The Engineering Department's stockpile estimates show that if all of the ore had been shipped from stockpile during the year, there would have been an additional 18,175 tons of lump ore overrun and 600 tons of crushed ore overrun or a total overrun of all grades of 18,775 tons. Therefore, actual production for the year 1942 approximated 732,000 tons.

Shipments from the mine totaled 747,564 tons. At the close of the boat shipping season on November 25th, there were, according to the Engineering Department's estimates, about 24,000 tons of ore left in the stockpiles. Of this total, 16,689 tons were Cliffs Shaft Lump, 1,486 tons Bancroft Lump, 89 tons Cliffs Shaft Crushed, and 6,107 tons Bancroft Crushed. As in 1941, the shipment of 34,787 tons of lump ore from the Champion Mine helped to fill the demand for hard lump ore.

In order to put new ore in sight, as many development crews were kept on that type of work as possible. Even with the great demand for ore and the highest production record in the history of the mine, there were 54% of the mining crews doing development work in 1942. In addition to this a second diamond drill was added during the year to explore for new ore.

Equipment purchased for the surface consisted of a number of items, some of which were new and some replacements of similar worn units. A new mantel was installed in the No. 8 McCully crusher and a spare one was purchased for emergency repair. A new apron conveyor was also purchased to replace the old one that was getting too worn. The revolving screen was practically rebuilt from spare parts on hand and new parts were purchased to replace those used. In the Engine House, a rebuilt intercooler was put on one of the compressors and a ventilating fan was installed in the north wall to improve summer temperatures in the building. A washing machine was added in the dry house to provide

facilities for the men to wash their dirty underground clothes. The dry house heating plant was improved by the addition of a new condensation pump and a flue blower. One new 8 foot and one new 12 foot sheave wheels were purchased to replace broken units of this description. For the blacksmith shop we purchased a new A C arc welder. A new oil furnace was installed in the bit sharpening shop for heating drill steel.

For underground we added the following new equipment: 5 Ingersoll-Rand DA-35 air drills, two of which were equipped for rock work with New York State approved back heads, 2 Cleveland RB-12 air drills, 2 Gardner-Denver D-89 air drills, 1 Ingersoll-Rand air powered tugger hoist, 1 scraper slide, 3 scraper motors, 1 new battery for battery locomotive, 18 Lake Shore Engineering Co. 76 cu. ft. steel mine cars. New Model K headpieces were put on all our Cliffs Shaft electric cap lamps. We also improved the underground current distribution system by putting in a new 2200 volt cable in "B" Shaft. Previous to this, all the scraper current was brought down in the mine through a cable in "A" Shaft and carried across to "B" Shaft on the 10th Level. Increasing current demand necessitated the new cable for "B" Shaft. In the event of cable failure in either shaft, the entire mine's scraper system can now operate at a slightly reduced pace by using the other cable. This change required a new transformer station on the 2nd Level "B" Shaft with 3 transformers, 5 circuit breakers, 2 cutouts, and some secondary cable.

An order was placed for a new centrifugal pump to replace the auxiliary centrifugal in the pump house, which was completely worn out. Construction work was completed in 1941 on the addition to the jackbit shop and the equipment was moved in early 1942. The basement of the laboratory was remodeled to make a storage room for acid carboys and chemicals. The former office of the Chief Chemist was redesigned to make a small laboratory work room. The shift bosses' room in the main dry building was doubled in size in 1942 by extending out the west wall 9 ft. To comply with Federal Bureau of Investigation recommendations, the Engine House windows were screened with metal guards and wire guards were installed at the entrances which are capable of being opened only from the inside by the operators. A new timber sheave stand was erected for the hold down sheave outside "B" Shaft house. The office was reroofed and small gables constructed over the doors to shed snow, thereby reducing ice hazards.

Steel construction work was completed on two jobs on the surface in 1942. The Worden-Allen Company, under contract, reinforced the top tram trestles so that they are now twice as strong. The permanent steel stocking trestle was erected and ready for use before the start of the stocking season. This work was done by our own steel workers. In addition to this, extensive work has been carried on into 1943 on repairs to our crusher building steel framework. This is intended to reduce the crusher vibration and transmission of same to top tram trestles.

The grounds were improved around the mine buildings by new lawns and some concrete curb. To eliminate dust that used to be particularly troublesome to the laboratory and to reduce road repairs,

the area in front of the laboratory, "A" Shaft house, and the roads leading up to these places, were hard surfaced during the year. A floodlighting system was installed for the surface to meet F.B.I. recommendations.

On January 1, 1942, the revolving screen in the Crusher Building was equipped with 2 sections having 2" holes and 1 section with 1 1/2" holes. On February 8, in order to increase the percentage of lump ore available, one of the 2" hole sections was replaced by another 1 1/2" hole section so that of the three sections, two had 1 1/2" holes and one had 2" holes. We estimated the division of the product as a result of this screening to be 80% lump ore and 20% fines. Shipments to the dock from pocket were started on April 17. On May 2 the pocket shipments were reduced to two grades - Cliffs Shaft Mine Run and Bancroft Mine Run, and the bulk of the product for the year was shipped as those grades. From May 10 until the start of the stocking season on November 27, the screen sections were blanked by plate and no separation was made of the ore.

Stocking of ore was resumed on November 27, with the ore again being screened and separated into 80% lump and 20% fines.

2. PRODUCTION SHIPMENTS & INVENTORIES

a. Production by Grades

Grade	Tons	% of Total
Cliffs Shaft Lump	197,116	
Cliffs Shaft Crushed	52,464	
Cliffs Shaft Run-of-Mine	375,540	
Incline Lump	4,541	
Total	629,661	88.25
Bancroft Lump	24,102	
Bancroft Crushed	4,046	
Bancroft Run-of-Mine	55,721	
Total	83,869	11.75
GRAND TOTAL FEE & LEASE ORE	713,530	100.00

Production by grades for the past ten years follows:-

Year	Lump Ore Tons	Crushed Ore Tons	Run-of-Mine Ore Tons	Total Tons
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
1942	225,759	56,510	431,261	713,530

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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
1942	225,759	79.98	56,510	20.02

The size of the holes in the revolving screen was reduced from 2" to 1 1/2" on one section of the three, in late 1941, and on a second screen section on February 8, 1942. This accounts for the higher proportion of lump ore in 1942. It must be borne in mind that the 1942 percentages given above are based on only 282,269 tons out of the total of 713,530 tons of production. The rest of the ore was not screened but shipped as run-of-mine ore.

The division of the product between fee ore and Bancroft Lease Ore for the past ten years is shown by the table below:-

Year	Cliffs Shaft Ore (Fee)	% of Total	Bancroft Ore (Lease)	% of Total
1933	48,891 tons	87.4	7,048 tons	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
1942	629,661 "	88.2	83,869 "	11.8

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All of the ore produced to date from the Bancroft Lease since that property was acquired by the Company is shown by years in the following table:-

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
1942	83,869
Total	910,254

b. Shipments

Grade	Pocket Tons	Stockpile Tons	Total Tons	Last Year Tons
Cliffs Shaft Lump	20,897	205,128	226,025	373,951
Cliffs Shaft Crushed	5,076	52,584	57,660	99,035
Cliff Shaft Cr. Sp.	325		325	51,695
Cliffs Shaft Mine Run	375,540		375,540	14,381
Bancroft Lump	4,108	22,978	27,086	58,253
Bancroft Crushed	616		616	23,549
Banc. Mine Run	55,721	50	55,771	17,382
Incline Lump	4,541		4,541	0
Total	466,824	280,740	747,564	638,246
Total Last Year	326,367	311,879	638,246	
Incr. or Decr.) in Ships.	140,457	31,139	109,318	

Shipments for the last ten years are tabulated below:-

Year	Cliffs Shaft Grade			Bancroft Grade			Grand Total
	Lump	Crushed	Run-of-Mine	Lump	Crushed	Run-of-Mine	
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
1942	230,566*	57,985	375,540	27,086	616	55,771	747,564

*Contains 4,541 tons of Incline Pit Lump.

The great increase in shipments in 1942 over 1941 was possible because less ore was left in stock at the end of 1942 shipping season and because more ore was produced at the mine.

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c. Stockpile Balances

Ore in Stock as of Dec. 31, 1942:

Cliffs Shaft Lump	40,998 tons
Cliffs Shaft Crushed	10,545 "
Bancroft Lump	3,412 "
Bancroft Crushed	5,607 "
Total	60,562 "

Stockpile balances at the end of the year are shown for the past ten years in the following table:-

Balance in Stock - Dec. 31,	1933	-	299,585 tons
" -	1934	-	275,391 "
" -	1935	-	145,810 "
" -	1936	-	82,072 "
" -	1937	-	109,799 "
" -	1938	-	273,939 "
" -	1939	-	76,540 "
" -	1940	-	47,208 "
" -	1941	-	81,533 "
" -	1942	-	60,562 "

d. Division of Product by Levels

Level	"A" Shaft Tons	"B" Shaft Tons	Total Tons
1st	8,723	42,516	51,239
2nd	13,066		13,066
3rd	10,249	22,094	32,343
4th	21,132	27,784	48,916
5th	20,666	5,235	25,901
6th	38,546	20,553	59,099
7th	54,876	37,729	92,605
8th	75,657	23,859	99,516
9th	84,239	39,339	123,578
10th	69,485	10,188	79,673
11th	45,811	10,058	55,869
12th	2,467	8,707	11,174
13th		4,837	4,837
14th		4,109	4,109
15th	543	11,062	11,605
Total	445,460	268,070	713,530
Rock			23,758
Total Ore & Rock			737,288

The ten year table below shows where the ore has been broken and the percentage from each shaft:-

Year	"A" Shaft Tons		"B" Shaft Tons		Total Tons
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
1942	445,460	62.43%	268,070	37.57%	713,530

In spite of the fact that there has been a greater proportion of development work - much of it in rock - in "B" Shaft during 1942, the percentage of ore broken in "B" Shaft dropped only 0.43% from 1941 which was a high for the preceding 10 years.

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Since the product is hoisted in two shafts with the quantity from each kept as nearly balanced as possible, it is necessary to transfer some of the ore broken in "A" Shaft to the "B" Shaft side for hoisting. The table below is put in to show how the ore has been hoisted each month from "A" and "B" Shafts:-

1942 Product as Hoisted

Month	"A" Shaft Tons	"B" Shaft Tons
January	28,395	27,683
February	26,523	26,421
March	29,469	28,158
April	28,750	27,731
May	30,662	29,445
June	31,141	30,896
July	27,818	27,788
August	29,395	29,718
September	29,675	29,892
October	31,496	31,037
November	26,839	27,295
December	26,510	27,005
Total	346,673	343,069
% of Total	50.3 %	49.7 %

Note: Above table does not include overruns

e. Production by Months

		Cliffs Shaft				Bancroft			
Month	Optg. Days	Lump	Crushed	Mine Run	Incl. Lump	Lump	Crushed	Mine Run	Total
January	26	37,053	12,342	-	-	4,070	1,320	1,496	56,281
February	24	35,169	10,837	-	-	4,148	1,198	1,671	53,023
March	26	39,454	9,934	-	-	5,036	1,225	2,089	57,738
April	26	39,480	8,664	102	-	5,440	1,148	2,414	57,248
May	26	1,711	426	51,880	-	215	-	8,529	62,761
June	26	-	-	56,598	-	-	-	6,659	63,257
July	26	-	-	52,743	-	-	-	5,268	58,011
August	26	-	-	54,112	1,559	-	-	7,551	63,222
September	26	-	-	55,451	1,424	-	-	6,592	63,467
October	27	-	-	59,058	1,558	-	-	5,705	66,321
November	24	4,204	1,050	44,804	-	504	68	4,654	55,284
December	25	36,794	9,231	705	-	3,069	707	3,093	53,599
	308	193,865	52,484	375,453	4,541	22,482	5,666	55,721	710,212
Trans.		67	20	87		1,620	1,620		
Stk. Pile Over.		3,318							3,318
Total		197,116	52,464	375,540	4,541	24,102	4,046	55,721	713,530

f. Ore Statement

	Cr. Spec.	Cliffs Shaft Lump	Crushed	Mine Run	Incl. Lump	Bancroft Lump	Crushed	Mine Run	Total	Total Last Year
On Hand Jan. 1,1942	-	56,894	16,066	-	-	6,396	2,177	50	81,583	47,208
Output for Year	-	197,183	52,484	375,453	4,541	22,482	5,666	55,721	713,530	658,747
Stk. Pile Over.	-	13,013	-	-	-	-	-	-	13,013	13,874
Transfers	-	67	20	87	-	1,620	1,620	-	-	-
Total	-	267,023	68,530	375,540	4,541	30,498	6,223	55,771	808,126	719,829
Shipments	-	226,025	57,985	375,540	4,541	27,086	616	55,771	747,564	638,246
Balance on Hand	-	40,998	10,545	-	-	3,412	5,607	-	60,562	81,583

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g. Delays

Date	Hours Lost	Tons Lost	Cause
January 5, 1942	1 ½	150	Large Chunks - "A" Shaft
" 29, "	12	"B"	
" 29, "	2	"A" 1400	"B" Shaft Pockets
February 16,"	2 ¼	200	"A" Shaft - Signal system out of order
" 17,"	1 ¼	100	"A" Shaft - Shaft Gate knocked out
March 17, "	1	100	"B" Shaft - Large chunk in crusher
" 25, "	1	100	"A" Shaft - Large chunk in shaft house
" 26, "	3 ½	500	Pulled top tram cars too far in cr. house
" 30, "	1 ¼	100	"B" Shaft 5th Level gate knocked out
April 2, "	1	100	Large chunks in crusher
April 3, "	1	100	Large chunks in crusher
April 7, "	4	500	Coil on "A" Shaft hoist motor burned off
April 10, "	2	200	"B" Shaft runner knocked out
April 14, "	7	750	"A" Shaft hoist motor burned out
April 28, "	1 ½	200	Large chunks in crusher
May 5, "	1	100	Top tram motor trouble
May 13, "	2 ¾	400	Lightning blew fuses. Scraper cable
June 19, "	2	400	Rope socket pulled out on high tram
July 7, "	¾	100	No current
July 11, "	5 ½	900	Scraper cable burned out. Top tram motor
July 15, "	2	200	T. Tram switch board burned out. burned
July 18, "	1	100	No current
July 29, "	5 ½	350	1 hr. in crusher, 4½ hrs. "B" hoist motor
July 30, "	¾	100	Large chunks in crusher shorted.
July 31, "	3	400	"B" Shaft car pulled through dummy block in
August10, "	5	600	"B" Shaft hoist motor burned out. crusher
Nov. 2, "	3 ½	450	"A" Shaft bearing in 8' sheave broke
Total	75	8600	
Last Year	132 ½	16400	

3. ANALYSIS

a. Average Analysis of 1942 Output

	Iron	Phos.	Silica	Sulphur
Cliffs Shaft Lump	60.88	.101	7.58	.012
Cliffs Shaft Crushed	51.27	.091	19.32	.016
Cliffs Shaft Mine Run	60.45	.103	8.25	.012
Bancroft Lump	60.84	.113	6.83	.012
Bancroft Crushed	53.23	.111	16.09	.014
Bancroft Mine Run	61.40	.114	6.47	.011
Incline Lump	54.22	.126	17.35	.011

Examination of the average analyses and comparison with previous years figures shows that the crushed ore has remained about the same as in 1941. The other noticeable difference in 1942 is that the Cliffs Shaft ore in general more closely approximates the analysis of the Bancroft ores. The iron content of lump and run-of-mine grades is lower than in 1941 but not so different from previous years. Underground practice was not appreciably different in 1942 than in 1941, but in the early part of 1942 the sampling technique at the mine was carefully reviewed. Due to the fact that a larger proportion of

the fines have been mixed with the lump since 1940 when the size of the holes in the revolving screen was reduced, the lump product could be expected to be lower in iron content. Average analyses for 1941 showed just the opposite result. It is possible that the sampling was responsible for this, because the examination conducted in 1942 indicated that not enough fines were being included in the sample. Inclusion of a little higher proportion of fine material in the lump ore sample in 1942 brought about a drop in the average analysis to a value below that for 1941, but still above the average of 58.80 for lump ore produced from 1929 to 1940.

c. Complete Analysis of 1942 ores as shipped from Mine

Grade	Iron	Phos.	Sil.	Alum	Mang	Lime	Mag.	Sul.	Loss
Lump Ore x-1	61.25	.094	7.72	1.90	0.27	0.77	0.65	.012	1.00
Crushed Ore x-2	51.55	.092	19.35	2.61	0.41	1.01	0.84	.015	1.50
Mine Run x-3	60.35	.103	8.35	1.90	0.31	0.86	0.80	.013	1.23
Mine Run x-4	61.50	.112	6.44	2.06	0.25	0.96	0.69	.012	1.17
Incline Lump	54.20	.124	17.50	2.90	0.09	0.45	0.75	.012	.55

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

Ford Lump at Mine	59.85	.109	9.02	2.15	0.25	0.90	0.73	.012	1.05
" " " Crush.	56.60	.102	12.60	2.50	0.28	1.09	0.80	.012	1.22

d. Analysis of Ore in Stock Dec. 31, 1942.

		Iron	Phos.	Sil.	Mang.	Alum	Lime	Mag.	Sul.	Loss	Moist.
Cliffs Shaft Lump	Dried	60.39	.105	8.13	0.33	1.90	1.03	0.74	.013	1.19	
	Natural	60.09	.104	8.09	0.33	1.89	1.02	0.74	.013	1.18	.50
Cliffs S. Crushed	Dried	51.55	.097	19.30	0.47	2.76	1.36	1.00	.015	2.13	
	Natural	50.55	.095	18.93	0.46	2.71	1.33	0.98	.015	2.09	1.93
Bancroft Lump	Dried	60.26	.118	7.23	0.33	2.60	1.56	1.15	.013	1.35	
	Natural	59.96	.117	7.19	0.33	2.59	1.55	1.14	.013	1.34	.50
Bancroft Crushed	Dried	53.18	.112	16.35	0.43	2.80	1.42	1.01	.014	1.96	
	Natural	52.32	.110	16.08	0.42	2.76	1.40	.99	.014	1.93	1.62

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

		Iron	Phos.	Sil.	Mang.	Alum	Lime	Mag.	Sul.	Loss	Moist
Cliffs S. Ore	Dried	57.45	.107	9.88	0.46	2.34	1.21	1.04	.019	1.88	
	Natural	56.97	.106	9.80	0.46	2.32	1.20	1.03	.019	1.87	.85
Bancroft Ore	Dried	57.59	.127	10.00	0.51	2.39	1.16	0.98	.019	1.85	
	Natural	57.16	.126	9.93	0.51	2.37	1.15	0.97	.019	1.84	.75

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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, 1942

Available ore in Bancroft Area "A" Shaft

Level	Developed Floors Tons	Developed Pillars Tons	Prospective Breasts Tons	Total Tons
2nd			2000	2000
3rd	1900	800		2700
4th	8200		2000	10200
5th			6000	6000
6th	7800			7800
7th				-
8th		7700		7700
9th	6800	9500		16300
10th	35100	145900	2000	183000
11th	87000			87000
12th			4000	4000
Total	146800	163900	16000	326700

Summary

Bancroft Ore Available	326700	Tons
Less 10% for loss in mining	32670	"
	294030	"
Less 10% for rock	29403	"
	264627	"
Less December Production	6869	"
Net Total Bancroft Ore Available	257758	"

Available Cliffs Shaft Ore "A" Shaft

Level	Developed Floors Tons	Developed Pillars Tons	Prospective Breasts Tons	Total Tons
1st		3,200	2,000	5,200
2nd	7,400	-	-	7,400
3rd	-	-	2,000	2,000
4th	-	-	8,000	8,000
5th	13,800	8,100	4,000	25,900
6th	41,300	71,500	6,000	118,800
7th	130,900	12,000	4,000	146,900
8th	102,100	15,300	2,000	119,400
9th	192,900	7,900	8,000	208,800
10th	58,500	137,400	4,000	199,900
11th	58,800	156,300	-	215,100
12th	64,800	76,500	-	141,300
15th	40,400	-	-	40,400
Total	710,900	488,200	40,000	1,239,100

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Available Cliffs Shaft Ore "B" Shaft

Level	Developed Floors Tons	Developed Pillars Tons	Prospective Breasts Tons	Total Tons
1st	9,700	14,300	6,000	30,000
2nd	40,200	-	-	40,200
3rd	11,500	23,500	2,000	37,000
4th	-	2,600	4,000	6,600
5th	5,800	7,000	-	12,800
6th	3,300	-	-	3,300
7th	20,700	2,900	4,000	27,600
8th	31,100	5,700	2,000	38,800
9th	21,200	-	4,000	25,200
10th	33,000	-	-	33,000
11th	21,300	3,000	-	24,300
12th	4,600	-	-	4,600
13th	10,800	-	-	10,800
14th	7,900	-	2,000	9,900
15th	20,100	15,200	2,000	37,300
Total	241,200	74,200	26,000	341,400

Section 9 Development

Level	Developed Floors Tons	Developed Pillars Tons	Prospective Breasts 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	1,239,100
Cliffs Shaft Available Ore "B" Shaft	341,400
Cliffs Shaft Available Ore Section 9	27,700
Total	1,608,200
Less 10% for loss in mining	160,820
	1,447,380
Less 10% for rock	144,738
	1,302,642
Less December Production	46,730
Net Total Available Fee Ore	1,255,912

Recapitulation

Net Cliffs Shaft Available Ore	1,255,912 Tons
Net Bancroft Available Ore	257,758 "
Grand Total	1,513,670 "

Ore reserves for the past two years are shown for comparison.

	Dec. 31, 1941	Dec. 31, 1942
Cliffs Shaft Ore Available	1,336,010 Tons	1,255,912 Tons
Bancroft Ore Available	232,298 "	257,758 "
Total	1,568,308 "	1,513,670 "
Decrease for Year 1942		54,638 "
New Ore developed in 1942 (713,530 - 54,638)		658,892 "

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The following figures show how the ore reserves have varied 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
1942	257,758	977,345	278,567

Both the "A" and "B" Shaft workings show a drop in reserve tonnage in the fee ore property as can be seen from the table above. It is only partially offset by the increase in the Bancroft Lease reserves.

From the table below a rapid comparison can be made of the reserve tonnages during the years since 1920. It will be noted that the reserves at the end of 1942 were below those of 1941, but at the same time they exceed the reserves shown for any year between 1920 and 1930. This is noteworthy in light of the fact that production at the Cliffs Shaft reached an all-time peak in 1942 following on the heels of two high output years in succession.

Total Ore Available in Mine at the End of Each Year:-

1942	1,513,670 Tons
1941	1,568,308 "
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 slight increase in the number of men employed on the surface in 1942 as compared with 1941 is accounted for by the fact that we did much extra work on surface during the year. Three men were busy from June to the end of the year on steelwork, erecting the permanent steel stocking trestle and repairing the Crusher Building. The increase in underground men by a total of 14 men is practically entirely due to the increase in the number of mining gangs and the extra ore hoisted. To some extent the increased turnover of labor from Selective Service requirements resulted in a higher proportion of inexperienced men in the mine during 1942 than in 1941. To get the same or more work accomplished with these men required more of them.

b. Comparative Statement of Wages & Product

	1942	1941	Increase	Decrease
PRODUCT	713,530	658,747	54,783	
No. of Shifts & Hours	2 8-hr.	2 8-hr.		
No. of days operated	308	302	6	
Average Number of Men Employed				
Surface	106	103	3	
Underground	356	342	14	
Total	462	445	17	
Average Wages Per Day				
Surface	6.74	6.57	.17	
Underground	7.65	7.45	.20	
Average	7.45	7.26	.19	
Wages Per Month of 25 Days				
Surface	168.50	164.25	4.25	
Underground	191.25	186.25	5.00	
Average	186.25	181.50	4.75	
Wages Per Month of 22 Days				
Surface	148.28	144.54	3.74	
Underground	168.30	163.90	4.40	
Average	163.90	159.72	4.18	
Wages Per Month of 17 Days				
Surface	114.58	111.69	2.89	
Underground	130.05	126.65	3.40	
Average	126.65	123.42	3.23	
Wages Per Month of 13 Days				
Surface	87.62	85.41	2.21	
Underground	99.45	96.85	2.60	
Average	96.85	94.38	2.47	
Product Per Man Per Day				
Surface	22.39	22.12	.27	
Underground	6.54	6.35	.19	
Average	5.06	4.94	.12	

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Labor Cost Per Ton	1942	1941	Increase	Decrease
Surface	.301	.297	.004	
Underground	1.170	1.173		.003
Total	1.471	1.470	.001	.003

With no wage changes in the Year 1942, very little change in the cost per ton of labor would be expected. Surface labor costs increased in 1942 over 1941 by .004. This was due to the extra jobs during the summer, such as erecting the permanent steel stocking trestle, the "B" Shaft hold down sheave support, and an addition to the shift bosses' change room. Because of the urgency for all out production, any breakdown that occurred had to be repaired without much regard for overtime penalty costs. Consequently, that figure, also, is slightly higher in 1942 than in 1941 as indicated in the following estimate:-

	1942	1941
Penalty paid for time and one-Half	$72,184.00	$66,055.01

Increased tonnage, however, lowered the underground labor cost per ton in 1942 and this in spite of more inexperienced labor.. The net total increase in cost per ton, therefore, amounted to only 1/10 of a cent.

The following table shows the labor costs per ton of ore for the past ten years. The wage index shows the basic average yearly wage rates compared with June 30, 1916 which is assumed to be 100%.

Year	Surface Labor	Underground Labor	Total Labor	Wage Index
1942	.301	1.170	1.471	213.94
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

	1942	1941	Increase	Decrease
Avg. Product Stoping and Tramming (Tons per Shift)	19.21	17.09	2.12	
Avg. Product Stoping and Tramming, including haulage crews (Tons per Shift)	15.99	14.33	1.66	
Avg. Wages-Cont. Miners	8.13	7.91	.22	
Avg. Wages-Cont. Trammers	10.73	10.33	.40	
Avg. Wages-Cont. Labor	8.36	8.20	.16	
Total Number of Days				
Surface	31,868	29,774¼	2,093¾	
Underground	109,093½	103,653	5,440½	
Total	140,961½	133,427¼	7,534¼	

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Amount for Labor	1942	1941	Increase	Decrease
Surface	214,958.43	195,702.51	19255.92	
Underground	834,681.71	772,571.22	62110.49	
Total	1,049,640.14	968,273.73	81366.41	

Proportion of Surface to Underground Men

1942	1 to 3.36
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

6. SURFACE

a. Buildings & Repairs

The following figures show cost of repairs to mine buildings for the 1938 - 1942 years:-

	1942	1941	1940	1939	1938
Office & Warehouse	1759.49	515.63	637.58	247.85	153.00
Shops	1519.98	1075.65	111.18	219.84	116.31
Shaft Houses	384.67	2399.63	777.48	373.85	274.74
Engine House	860.22	321.64	1119.47	105.71	184.33
Dry House	3713.75	6381.12	4503.76	1554.29	839.88
Coal Dock & Trestle	96.67	331.25	307.30	855.66	1163.97
Crusher Building	2903.35	570.44	522.03	157.84	327.04
Miscellaneous	614.12	366.24	271.41	56.46	110.60
Total	11852.25	11961.60	8250.21	3571.50	3169.87

The total cost of repairs in 1942 is only slightly under that for 1941. The major portion of the heavy cost of repairs is due to work on the mine office, shops, engine house, dry house, crusher building and miscellaneous buildings.

The mine office roof had been leaking so new shingles were put on in 1942. Gables to shed the drip of rain or ice water were constructed over each entrance and metal flashing was put on over the eaves section to prevent ice water from pushing back under the shingles. We also sealed the cracks between window and door casings and the brickwork.

The shop expense was mainly incurred in the jackbit shop, completing the job of fitting that place for grinding of the bits. The machine shop interior was cleared and rearranged after the jackbit grinding equipment was moved to its new quarters.

A new ventilating fan was installed in the engine house and some concrete was broken from the old compressor foundation in the room that houses the spare compressor. A new double door was also put in this end of the building. In order to be in compliance with the Federal Bureau of Investigation recommendations, heavy wire screen guards were placed as cages inside the doors of the engine house. Push button latches on these permit the hoisting men to open the doors, but he has a chance to investigate any one desiring admittance before they are actually in the building. Screen guards were also put on all windows easily accessible from the ground.

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To accomodate the greater number of shift bosses and provide adequate change room facilities for them, their quarters were doubled in size, accounting for a large portion of the expense to the dry house.

The crusher building was extensively repaired in 1942 and this work is continuing into 1943. When the top tram trestle was reinforced, it was deemed advisable to free it as far as possible from the constant vibration imparted to it through the crusher building framework from the crusher. In order to accomplish this, it was necessary to cut the crusher building free from contact with the crusher foundation. This entailed considerable reinforcement and replacement of structural members in the crusher building in order to provide the needed support for revolving screen and other heavy equipment.

The relatively high proportion of cost in the miscellaneous category was incurred because new shanties or shelters had to be made for the stocking car controller, the hoist used for pulling cars down from the pocket, and the top tram motor. When the new steel stocking strestle was erected, the old shanties had to be dismantled and they were in such poor condition they were replaced by new structures.

7. UNDERGROUND

a. Development

The following tabulation shows the total number of mining gangs and the proportion engaged in development work during 1942:-

Month	Total Number of Gangs	Gangs Developing	% Developing
January	102	54	52.9
February	102	53	52.0
March	102	51	50.0
April	104	56	53.8
May	104	60	57.7
June	104	56	53.8
July	104	59	56.7
August	104	51	49.0
September	104	54	51.9
October	104	55	52.9
November	104	57	54.8
December	104	59	56.7
Monthly Average	103.5	55.4	53.5
Year 1941			61.0
Year 1940			54.5
Year 1939			53.6
Year 1938			52.0
Year 1937			56.5
Year 1936			55.2

Although 1942 was a record year for production and the demand for ore was great, the number of development crews in the mine w as kept well over half those employed.

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The prediction made in 1941 that we would eventually mine more ore between the 6th and 10th Levels in the area between our present workings and the west line of the Old New York Mine is being borne out by the disclosure of ore in a raise into the south side of this area from the 8th Level. Work done by #64 Contract just north of the 200 north coordinate indicates very strongly that ore will be found to extend to the east a considerable distance beyond our present workings on the 9th Level elevation. This is a part of the same general territory as that discovered above. Diamond Drill Hole 505 discovered two separate ore seams on the 10th Level east of the Bancroft territory near coordinates 3400 east and 400 north. This appreciably extends the eastern possibilities for ore development on the 10th Level and above. One contract has opened up a stope on the 12th Level in the Bancroft territory and this gives promise of extending a long way both east and west as well as upward to the 10th Level.

In the "B" Shaft area there is one new territory that holds forth some promise of extending the bounds of the mine. This is a body of ore discovered by Contract #49 by raising from the west end of the 3rd Level "B" Shaft workings up to the 1st Level elevation. Ore 25 to 30' thick occurs here under northwest dipping slate and extends an unknown distance to the west. At the present time a 500' connecting drift is being driven to the east to make the area more accessible and allow travel from the 1st Level "B" Shaft. This drift is all in ore so far.

The need to acquire a lease on the Oliver Iron Mining Company's forties to the south of the Cliffs Shaft has been pointed out before. A geological viewpoint and a clear understanding of the structural elements of the Cliffs Shaft Mine bring out with the strongest emphasis the urgency of the above necessity. We can only reiterate that action must be recognized as imperative.

"A" Shaft

1st Level

Contract #1 on the "A" Shaft maps, but one of the "B" Shaft gangs, completed a short raise from the north side of the southwest crosscut by holing into the rib of their raise stope at the breast. Opposite this point on the north rib of their raise stope, they drifted 20' into the old 1165' sub-level workings shown on that "B" Shaft map. Since then they have alternately breast stoped to the south starting from the south rib of the old 1165' stopes, and mined bench from the 1205' sub-level at coordinates 1075 south and 400 east. The breast stope was cut in a vein of ore that dips gently south under slate hanging wall. This ore will probably extend west to join the old workings shown on the 1205' sub-level at approximately 1200 south and 300 east. It may also connect east with the narrow vein in the breast of #1's old raise stope at coordinates 1200 south and 500 east.

In the early part of the year #30 Contract was moved to the 1st Level in the Main Vein. After mining a bench between two pillars, to the elevation of the 1st Level, they started a breast stope east through the pillar on that side. This pillar is 170' long east and west and 100' wide north and south. Formerly mapped as jasper, it now looks as though it will prove to be largely ore. The breast stope had by the

end of 1942 been extended 70' following a vertical dike that runs through the length of the pillar near its south side. Flat-lying slate occurs in the back.

2nd Level

Contract #44 in the Bancroft Vein holed their raise to the 2nd Level early in the year. They dropped down in the raise to about the 3rd Level and cut out on the west side, developing a raise stope to the northwest. At the close of the year this was up about 15' above the 2nd Level, but the vein was getting thin because dike in foot and back converge upward. To the west there are undeveloped and unknown possibilities which will be explored by development in 1943.

3rd Level

Not until the latter part of 1942 did #27 Contract begin development work, which consisted of breast stoping northwest at an elevation 10' below the 3rd Level in the Main Vein at coordinates 300 south and 600 east. This stope is under an area on the 2nd Level where the floors had been partly mined and the space filled with waste rock. An arch or floor pillar is left over the back of #27 in order to hold up this rock. The ore mined is the variety steel ore.

4th Level

In the Bancroft Vein at coordinates 210 north-1230 east, Contract #29 did a small amount of development work during the year when they raise stoped from their sub just above the 4th Level and connected to the sub above the 3rd Level elevation. No new ore was put in sight by this work but it was done in ore that was unestimated.

There were three gangs that operated on development work in the North Vein during 1942. Contract #57 extended the 4th Level outline of their stope over a hundred feet to the east at coordinates 150 south and 500 east by back stoping an old 5th Level stope. They also cross cut to the south with a breast stope at coordinates 200 south and 500 east. The ore in this latter place seems likely to extend to the run of ore shown in old Diamond Drill Hole #30 and may even be continuous with the ore vein in which #27 Contract is mining on the 3rd Level.

The double Contract #8 is located in the extreme east end of the mine. One gang of this contract completed a raise stope at coordinates 200 south - 3280 east when they mined all of the ore from this vein which pinched out up the dip to the north between converging dike foot and slate hanging wall. After completing the raise stope, this crew resumed breast stoping to the east at coordinates 200 south - 3500 east. About 75' back from the breast in this stope the floor was dike. Toward the close of 1942 the crew discovered with test holes that this dike floor either disappears to the east or dips down steeply. Naturally this will increase the tonnage prospects to the east because the ore vein becomes thicker. There is good reason to believe ore veins will be found to connect to the workings of the old Number 3 Mine just south and west of the southwest corner of the New York Mine property.

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The other crew of the #8 Contract spent all year stope raising and extending the east rib of their stope raise at coordinates 350 south and 3500 east. The vein they mined is only 10 to 15' thick and lies between two dikes that seem to converge slightly upward. Good ore remains exposed for development on the east side of their stope.

5th Level

In the Bancroft Vein Contract #76 did some development work when they breast stoped north at coordinates 00 south and 1420 east. This stope advanced 30' north and encountered northward dipping slate hanging wall. The gang turned west along the hanging and developed a crosscut stope 35' long in that direction. From the geology in this area we can assume that there is a good possibility the ore vein will extend around to the northwest because the hanging slate makes a curve in that direction around a local syncline pitching to the east. The area under the slate in this syncline contains ore deposits on the 8th Level that are being developed. Possibly ore will occur continuously between the 8th and 5th Levels.

Contract #74 increased the area of their Bancroft stope and the area of reserves in the back at coordinates 60 north and 1170 east. There is about 22' of ore in the back of 74 stope, with Contract 29 directly above this area. In order to continue Contract 29 in their stope, we moved #74 into the North Vein at coordinates 180 south and 780 east. From this point the gang drifted east through ore for 50' and through jasper and dike for another 50'. The drift is following a contact between dike on the north and iron formation on the south. It will be driven approximately another 170' to reach a point where a raise can be put up for the ore in Diamond Drill Hole #502 and in the floors of the 3rd and 2nd Levels above this area.

Contract #96 is usually a "B" Shaft gang but during the first part of 1942 they completed fifty ft. of tail track in the end of the North Vein footwall drift under #27 area. They also completed a raise up to the floor of Contract #27 stope on the 3rd Level which makes it much easier to remove the ore from that contract.

Between coordinates 1500 east and 1700 east in the Main Vein east of "A" Shaft, two gangs were developing during 1942 on a sub between the 5th and 4th Levels. Contract #12 increased the area of their stope by stripping the south rib to a vertical dike contact and by breasting to the northeast at coordinates 370 south and 1630 east. The latter work was in a vein that may extend northeast to old workings at coordinates 250 south and 1800 east. Contract #81 advanced a breast stope 30' southwest and cross cut through a long pillar at coordinates 400 south and 1530 east. The ore in the floor of this area probably extends at least to the 5th Level.

6th Level

At coordinates 200 south and 2680 east Contract 51 in the North Vein opened up a stope south, east, and west of the top of the raise which holed from 8th Level in the southwest corner of an old crosscut stope. The stopes to the south and to the east connected with old crosscuts that extend north from the Main Vein. The stope to the west, however, is headed into an unmined area that is large enough to contain

thousands of tons of reserves. This area looks, on the map, like a huge pillar 300' long by 200' wide north and south.

One hundred fifty feet north of #51, Contract #66 spent the last part of the year breast stoping south in a crosscut due south of the southeast corner of the Bancroft Lease. Doubtless this stope will connect with #51 stope sometime in 1943.

The work of Contract #80 is shown on the 6th Level "A" Shaft East map at coordinates 150 south and 2930 east. This gang continued to mine unestimated reserves from the floor of their stope and they also increased the size of this old stope. In September of 1941 this crew was moved into this territory in order to drive a drift to the north that would connect the 6th Level with the top of the raise which they had put up to this elevation from the back of #25 stope on the 8th Level. The discovery that ore occurred in this floor of the little stope at the mouth of the drift which they were to extend, called a halt to any rock breaking plans and they have been mining ore ever since that time.

In the Main Vein the four developing gangs during 1942 were, in order of their nearness to "A" Shaft, #94, #98, #59, #67. Contract #94 opened up an east-west stope parallel to the 6th Level traveling road and just north of it at coordinates 540 south and 1500 east. This stope encountered jasper to the west and was stopped during the summer. Test holes that had been drilled into the vertical dike which limited the stope along its north rib had indicated the presence of ore on the other side of a 10' dike seam. To explore this, Contract #94 drifted north from the top of their raise through the rock and found an ore vein in which they have been stoping to the end of the year. Just east of this area Contract #98 enlarged the outlines of an old raise stope that connects the 6th with the 5th Level. Part of their mining was of floors but none of this had been included in estimated reserves of the mine.

At coordinates 370 south-1850 east, Contract #59 mined floor during the first three months of 1942. This was another case of where the ore mined had not been included in the estimated reserves.

In the east end of the mine at coordinates 350 south - 2850 east, Contract #67 breast stoped to the west a distance of 50' and started a crosscut stope to the north in high quality specular ore. This ore vein should extend another 150' to the west and connect with the Main Vein workings shown on the 6th Level "A" Shaft map south of Contract #51.

Contract #41 in the southeast vein drove a narrow stope east along a 15' thick vein of ore that extends between two slate seams from 1330 east to 1470 east along the 1040 south coordinate line. The ore vein pinched out at the east end, but the mining crew raised in the upward extension of the ore at this point. The vein persists upward to the 5th Level but is too narrow to produce any large tonnage.

At 1200 south and 1970 east Contract #6 spent the last part of 1942 developing new ore reserves by stoping south at an elevation 25' below the 6th Level. Their old stope from which they had been mining floor was bounded on the south rib by a steep dike which was about 2' thick. As soon as the gang had lowered the floor enough to have a sufficient head room, they cut through the dike into ore on the south side of it. It seems probable that this is in part of the footwall vein and it may extend to the 5th Level elevation.

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8th Level

In the first part of 1942, Contract #89 mined ore from the back of the stope which connects the 9th Level with the 5th Level at coordinates 300 north - 1500 east in the Bancroft Vein. Since this ore was unestimated reserves, the work was classed as development. The only other work done in the Bancroft Vein was by #102 which raised from the 10th Level to an elevation about 40' above the 8th at coordinates 180 north and 1420 east. This raise encountered ore below the 8th Level and was stopped in ore. The vein is no doubt the same as the one cut by Diamond Drill Hole #495. During the last part of October this gang was moved to the 8th Level and started a drift in dike along the course of Diamond Drill Hole 495. The drift is headed for the raise put up from the 10th Level and will provide a good traveling road as well as ventilation while the ore is being developed. The ore should extend to the 5th Level in the territory where Contracts #74 and #76 stoped during the year.

In the North Vein at the east end of the mine three contracts did some development work during the year. Contract 61 continued drifting northeast through jasper, some dike, and a small amount of ore to coordinates 80 north and 3330 east. From that point the drift was extended due east 140'. Near coordinates 80 north and 3420 east the drift crossed ore [illegible] which we plan to develop by raising. The drift was planned to get under the territory on the 6th Level east and where ore was found in Diamond Drill Holes 490,491, and 492.

Contract #78 at an elevation 30' below the 8th Level drove a short drift from coordinates 130 north and 2980 east to connect their stope with #92 stope at the top of the latter contract's raise. The drift was all in ore of high quality.

During the major part of 1942, Contract #92 mined floor but to some extent, however, this turned out to be development because along the north rib of their stope at coordinates 200 north - 2940 east, the lowering of the floor revealed that the slate wall which had limited the ore to the north was a fault plane and at the lower elevation ore extends out north under the slate. The last two months of 1942, Contract 92 drifted west through ore from the west side of their ore raise at the 9th Level elevation.

In the Main Vein 700' east of "A" Shaft, Contract #4 continued to mine ore from the back of old stopes where no reserves were estimated.

At coordinates 500 south-1840 east, Contract 89 put up a raise through ore to the floor of the 7th Level which Contract 59 can use to remove the ore they mine from 7th Level floors.

At coordinates 400 south - 2425 east on the 7th Level old Diamond Drill Hole 222 crossed a seam of high grade ore. Contract 99 developed some of this ore in late 1941 and continued development in this area between the 8th and 7th Levels until the end of July. Results of this work, part of which was in rock, were disappointing, but there still is reason to believe more ore will be obtained from the territory, especially on the 7th Level.

Contract #95 spent a good share of 1942 exploring above the 8th Level for the upward extension of old #68 stope which came up to the 8th Level from the 9th Level and had to be abandoned because of a serious rock fall and a dangerous condition in the back. A drift to the

southeast and a raise south from the end of the drift made connections with old #68 stope but revealed the fact that the ore which had been left in the breast of the stope pinched out a few feet beyond the stope breast. Ore was encountered on the level, however, and Contract 95 spent the latter part of 1942 opening up a stope in this ore at coordinates 675 south - 3100 east.

For the first part of 1942, Contract #65, at coordinates 1080 south - 2320 east in the Southeast Vein, was raise stoping from the 8th to the 7th Level. A large part of the ore they developed in the floor of this raise stope was mined in the latter months of 1942.

9th Level

Only a small part of the year was devoted to development by Contract 69 in the Bancroft Vein. At coordinates 165 north and 2010 east, they cut through the southward dipping dike just north of the top of their raise and opened up a stope in good ore on the north side of this dike. This may be the westward extension of the ore vein in which Contract #84 is mining.

In the North Vein, Contract 91 started developing the last two months of the year when they began to drift west along the hanging wall slate contact at coordinates 240 north - 2685 east. This drift should before long connect with Contract #70 stope. Two hundred-fifty feet east of #91, Contract 64 spent a good share of 1942 developing new ore by breast stoping to the south and to the east. The stope to the east looks the most promising, and the area in that direction for 400' should be productive of ore.

One gang did development work in the Main Vein on the 9th Level during the year. That gang was Contract #68 in the east end of the mine. Most of their work consisted of breast stoping to the west at an elevation 30' below the 9th Level floor. The vein of ore is similar in character and probably will prove to be continuous with the vein being mined by Contract #50 to the west. At the close of the year, the best possibility for future development by #68 was to the southwest at coordinates 730 south - 2965 east.

10th Level

The eight development crews in the Bancroft Vein during the year were #5, #10, #23, #53, #70, #84, #89, and #102. The first of these, in the extreme northwest corner of the Bancroft Vein, put up a raise stope to about the 9th Level elevation. This was driven in a narrow vein of ore that occurred between dike on the south and slate on the north side. Both rocks dip steeply to the north. At the top of the raise stope the fact was disclosed that the ore was cut out by the dike changing strike so as to join the slate. The second one opened up a stope and crosscuts at coordinates 25 north - 1970 east in a big body of ore that occurs partly under their old stopes on the 9th Level. The third gang connected their sub-level drift by a northwest drift to the workings of Contract #70 and then proceeded to stope on both sides of their east-west exploration drift and extend their stope to the west toward #53 Contract at coordinates 30 north and 2600 east. This gang is working in a big body of ore too, the limits of which are not entirely known, although there seems to be dike or slate bounding the south side of the territory.

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Contract #53 at coordinates 30 north - 2350 east advanced their breast stope to the west about 85' during the year. They are approaching their old stope which was mined from the 8th Level. Both #53 and #23 are mining ore that occurs in an east-west vein associated with a vertical fault of that strike.

One hundred-thirty ft. north of #23, Contract #70 breast stoped to the east during the year. There seems some possibility that they will be able to connect with Contract #91 shown on the 9th Level, although the ore #70 is mining may be a separate vein that passes south of #91 stope.

At coordinates 150 north - 2200 east, Contract 84 continued to breast stope to the west on a sub-level above the 10th Level. They carried a 40' stope 25' to 30' high that is limited in the north by slate dipping north and on the south by a dike that dips south. This vein should have good chances of continuing 400' farther west.

Directly under the breast of #84 stope is the north-south drift driven during 1942 by Contract 89 to connect the Main Haulage Drift on the 10th Level Bancroft with the top of the raise put up by Contract #75 from the 15th Level. Diamond Drill Hole #415 shows about 40' of ore thirty feet below the 10th Level just south of #75 raise. This ore will be developed in the future and the connecting drift was driven to facilitate that development.

In the description of development work by Contract 102 on the 8th Level, mention was made of the raise this gang put up from the 10th Level Bancroft Vein to above the 8th Level elevation. This raise is shown at coordinates 130 north - 1500 east.

Following a vein of ore bounded on the north and on the south by nearly vertical dikes and limited also in the floor and back by dikes, Contract #3 in the South Lens drove a breast stope west to connect their last year's stope with old workings above the 10th Level at coordinates 720 south and 1670 east. No thorough test has been made to determine what occurs north of the north dike of #3 stope. Geologically, there is reason to believe ore will occur in that territory but since the 10th Level Haulage Drift passes through it, development and mining cannot for some years come too close to the 10th Level elevation and destroy the drift.

One gang, #32, developed ore reserves in the North Vein of the 10th Level during 1942. At coordinates 270 north - 3200 east this gang drove a crosscut stope south to encounter southward dipping slate and then stoped east along this slate for fifty feet. The slate strikes northeast to converge with jasper that exists at the east end of #32 drift. Three runs of good ore 100 to 150' east and northeast of this point in Diamond Drill Hole 505 indicate that there is good sense in planning to continue drifting east from the end of #32 drift. In fact the decision to continue the drift was made before Diamond Drill Hole 505 was drilled, but execution had to wait for the time when #32 had broken enough new ore to fill the hole to the west where the floor had been stoped in previous years. The track will be laid over the ore fill which was nearly completed by the end of 1942. The territory east and northeast of #32 is virgin ground except for the drill hole and should, on the basis of the information in the hole, prove productive of considerable tonnage.

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In the Main Vein Contract #11 at coordinates 650 south - 2570 east put up a small raise stope to the bottom side of the dike that makes the floor in old #4 sub-level stope. They also did some stoping at coordinates 750 south - 2625 east where they connected two south crosscuts by an east-west stope along the south dike boundary of the area.

On the 10th Level East Map the work of #50 Contract in the Main Vein is shown at coordinates 675 south - 2830 east. Raise stoping from the east end of their 10th Level stope, they holed to the 9th Level traveling road drift at coordinates 670 south - 2860 east. They also put up a branch raise connection to the floor of this new stope from their raise through which they remove their ore. Connection was also made between their raise stope and the east end of Contract #26 sub-level stope.

Diamond Drill Hole 498 drilled on the 9th Level crossed a vein of high grade ore at coordinates 350 south-2480 east. In order to get at this ore, Contract #5 started a drift on the 10th Level in the Main Vein at coordinates 570 south-2320 east. At the end of the year this drift had been advanced approximately 270' to the northeast through jasper, some ore, and a good deal of siderite. Early in 1943, we expect to raise for the ore shown in the diamond drill hole.

11th Level

Contract #21 made a small increase in the size of their stope outside the limits of estimated reserves on the north and east sides of their stope. At coordinates 650 south - 2910 east, they drove a small crosscut south which will eventually connect with the east end of the short drift from which the traveling road raise leads up to the 10th Level. This raise is in ore and Contract #21 will stope the ore along this raise as soon as their connecting stope is completed.

At the other end of the 11th Level, Contract #24 started in October to drift west from coordinates 670 south - 1965 east. At the end of the year the drift was in approximately 80' and showed ore on all sides. Old Diamond Drill Hole #44 drilled from the 10th Level shows some ore above the 11th Level elevation in the territory into which #24 drift is headed.

12th Level

For the last three months of 1942 Contract #89 drifted north from coordinates 315 north - 1960 east in the Bancroft Vein on the 12th Level. The drift cut 50' of dike and this gang opened up a small stope in a vein of ore formerly cut only by Diamond Drill Hole 428 drilled from the 10th Level. From a geologic standpoint there is a strong possibility that this development will progress far, both east and west and upward to the 10th Level.

In the Main Vein a new development was started in the last quarter of 1942 when Contract #99 opened up a narrow stope that advanced along the course of Diamond Drill Hole 334. Several runs of ore in the hole, coupled with the fact that Contract #99 has already proven up considerable tonnage, has resulted in the formulation of plans to put up a new raise into this territory from the 15th Level.

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15th Level

Two raises started in 1941 in the Bancroft Vein were completed to the 10th Level in 1942. Contract #75 raised through dike all the way to the 10th Level at coordinates 220 north - 2185 east. Contract 101 holed their raise to the 10th Level Haulage Drift at coordinates 235 north - 2615 east. The last 90' of this raise was in ore. Both of these raises will facilitate the development of ore below the 10th Level.

In the last half of 1942, Contract 101, after completing their raise to the 10th Level, started to drift through jasper toward the northeast from the east end of the Bancroft drift. The extension of this drift is designed to explore the possibility of ore occurrence on the 15th Level and above, but more specifically to reach a point from which a raise can be put up into the territory where Contract #32 has proven reserves and fine possibilities for developing more reserves.

"B" Shaft

1st Level

Although Contract #72 mined some floor in 1942, they will be described as a development gang because they extended their stope to the south and cross cut both to the east and west from this extension. The working place of this crew is located in the North Vein at coordinates 400 south - 350 west. The upper part of the ore mined by this gang was conglomeritic but the lower half of the stope was specular ore.

In the Main Vein three contracts did development work in 1942. Two of these, #17 and #18, worked on the 1205' and 1220' sub-levels respectively. Part of the work done by #17 was mining of backs and floors which were not included in the estimated reserves of the mine. In addition to that, #17 extended the outline of their 1205' sub-level stope by opening up two crosscuts to the north at coordinates 740 south-130 east and 760 south-240 east, respectively. The ore mined by this gang was conglomeritic and occurs in a vein dipping north under slate. The other gang, #18 on the 1220' sub-level, also mined some unestimated floor, but they, too, cross cut north from coordinates 940 south-170 west and holed into old workings on the sub-level. This crosscut shows good ore in the west rib which lends encouragement to the hope that ore will extend west for some distance.

The last developing Main Vein Contract was #49. This crew started the year raising from the 3rd Level at coordinates 870 south-1440 west. They raised south to the 1st Level elevation in ore of high quality and drifted through ore to the south on the 1st Level. This drift crossed the strike of the ore and developed a vein 35' thick in territory which is the westward extension of the Main south Limb of the "B" Shaft syncline. In order to facilitate further development and eliminate an almost impossibly difficult route of supply, it was decided that this development must be connected to the Main "B" Shaft workings on the 1st Level by a drift. This drift as planned had to be 530' long but would serve to explore the intervening ground as well as provide a traveling road. At the close of the year, Contract 49 had drifted approximately 200' northeast through ore toward the old 1st Level workings and Contract 97 had started to drift, during the last month of the year, from the old 1st Level drift headed toward #49. The latter work was also in ore. Discovery of ore in this area renews hope that the south limb of "B" Shaft syncline may be productive still farther to the west.

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The Southwest Vein first cut by Diamond Drill Holes 466 and 467 and opend up in 1940 was, in 1942, the scene of a great deal of development activity. Four gangs worked in this area during the year, although not all at one time. Contract #58 completed their raise at coordinates 1120 south - 30 west by holing into the old 1220' sub-level stope at that point. At a slightly lower elevation on the 1205' sub-level they drifted west to connect the tops of both their raises and started to drift west in ore from the westernmost raise. All of this work was in ore that constitutes an east-west vein which dips south about 50°. In July, Contract #75 was moved up to the 1205' sub-level and took over the drifting to the west from #58, who then started to stope the ore vein from both sides of their east raise on the 1165' sub-level. At the end of the year Contract #75 had encountered jasper in the drift on the 1205' sub-level and they started stoping the ore around the top of the westernmost raise.

Contract #96, in late summer, put up a raise entirely in ore from the 1st Level to an old stope on the 1205' sub at coordinates 1140 south-60 east. This raise is 100' east of the raise put up by Contract 58, but it is in the same vein of ore.

For a short time Contract #97 worked on the 1st Level in the Southwest Vein where they extended the drift west to coordinates 1200 south-220 west. The old breast of the drift was ore and the drift had been stopped only to permit the raise development program to be carried out. Resumption of drifting by Contract #97 was cut short when that gang encountered rock all around after progress of only 30 to 40'

2nd Level

Contract #71 continued throughout 1942 to mine floors from an area at coordinates 550 south - 700 west. This work was classed as development because none of this territory showed any estimated ore reserves.

3rd Level

At coordinates 275 south-275 west, Contract #73 stoped west and south from the side of an old sub-level slightly above the elevation of the 3rd Level. Part of the material mined was lean but enough good ore was found to warrant the work. No doubt this ore is part of the same vein that Contracts 63 and 72 are mining from the floors of 1st Level stopes west of #73.

4th Level

In the North Vein at coordinates 350 south-350 west, Contract #13 developed a new stope off the west side of teir previous workings and extended their old stope to the south. They also drifted from the south breast out to the 4th Level traveling road in order to improve the ventilation. The quality of the ore mined by this gang was somewhat lean but it is surprising that any mineable ore was found in this area since drill holes in the vicinity show jasper.

Three hundred feet south of #13, Contract #33 in the Main Vein stoped the finest steel ore in the mine during 1942. The major part of the work was carried out on the east side of the old workings where north and south crosscuts were opened up. In the southeast corner of

the south crosscut the mining crew broke a hole through into the floor of a 3rd Level stope near the toe of an old rock fill. Much of the back of #33 stope is ore, but the rock fills on the 3rd Level complicate the removal of some of the back.

5th Level

In the latter part of 1942, Contract #93 on a sub-level above the 5th Level, stoped east at coordinates 180 north and 000. This work was in ore that constituted the upward extension to the north of 5th Level stopes, but nonetheless it was ore not known to exist. A fair sized breast of ore still encourages advance to the east and the stope may progress a hundred feet or more. At least the geologic relations are favorable for ore occurrence on the 4th Level in the territory ahead of 93 Contract.

After completing the raise on the 1st Level, Contract #96 moved down to the 5th Level and started a drift south from coordinates 340 south-420 west. At the end of the year the drift had progressed about 40'. It is headed for a point about 540 south-400 west under the ore in the floor of Contract #33 on the 4th Level. A drill hole in this area shows ore at the 5th Level elevation. Primarily, however, the drift was planned to provide a means of eliminating the hoisting of ore from the 1st Level. This is desirable because the ore brought out to the shaft on the 1st Level is carried in 2 1/2 ton cars and two of these must be dumped, one after the other, to fill the skip which necessarily is a slow progress. After 96 drift is completed, it is planned to raise from the end of the drift all the way to the 1st Level and provide thereby a storage space for 1st Level ore which can be drawn off on the 5th Level.

6th Level

The North Vein was the locus of one development gang during 1942. This was #87 which mined backs of 7th Level stopes up to and above the 6th Level elevation at coordinates 50 south - 350 west. None of the ore mined was included in previous reserve estimates.

Contract 96 worked on the 6th Level in the Main Vein during May and June where they completed a new raise to the 4th Level under a pile of ore broken by them on the latter level during 1941. The coordinates of this raise are 500 south-550 west.

In the early part of 1942 plans were made to connect the old 1st Level workings with Contract #49 in their new vein of ore 530' southwest of the end of the 1st Level drift. Contract #49 could drift back northeast to accomplish this, only so long as they found ore. No rock could be mined by them because their accumulated ore pile would be contaminated. It was, therefore, necessary to have a gang that could drift from the old 1st Level heading and this crew had to have a way to handle either ore or rock. A raise was, therefore, put up by Contract 103 from the 6th Level to the 3rd Level at coordinates 550 south-870 west. The top of this raise is at the bottom of an old stope raise which connects the 3rd and 1st Levels and admirably serves the purpose outlined. In addition, we expect to develop some small tonnage of ore tributary to this raise on the 3rd Level.

7th Level

Most of the work of Contract #31 during the year was depleting in

character, but they did advance a new stope west from their North Vein stope at coordinates 40 north-170 east. By the end of the year this stope was almost completed due to the fact that an old rock filled raise occurs ahead of the breast. The raise connects with rock filled stope on the 7th Level and cannot be broken.

During June and July of 1942, Contract #97 was taken from the Section 9 Development to put up a raise from the 7th Level at coordinates 820 south-1290 west to the 5th Level at coordinates 850 south 1325 west. This raise was in ore all the way. It serves to remove the ore broken by Contract #49 on the 1st Level.

8th Level

Exactly 600' due west of "B" Shaft in the Main Vein Contract #85 breast stoped east in magnetite ore during the year. Along the south side of this stope the footwall dike is exposed but good ore remains to be mined in the northeast corner.

At coordinates 650 south-1000 west in the Fault Vein, Contract #19 stoped along the side of an old stope from which floors had been mined. No ore reserves are indicated in this area, but much ore can be mined from backs and ribs in these old workings that were not thoroughly mined out in previous years.

9th Level

In a vein of ore bounded on the north and south by east-west dikes, Contract #36 stoped about 80' to the east in the North Vein at coordinates 170 north-500 west. Near the end of the year they started a raise to the north in this ore. We expect it will extend up to the 6th Level.

Contract #56, in the Main Vein, stope raised the first five months of 1942 and holed through to the floor of the 8th Level at coordinates 430 south-730 west. The work was considered development while the gang was stope raising, but classed as depletion after the connection was made to the 8th Level and they started to mine the 8th Level floor.

Contract #77 in the Main Vein at coordinates 300 south-700 west increased the outline of their stope and connected the northwest corner of it to the 9th Level drift by stoping out the intervening ground. Prospects are excellent that this ore vein will connect to the southwest with the stope where Contract #56 was mining early in 1942.

In the latter part of 1942 Contract #14 was moved to the 9th Level in the Fault Vein at coordinates 760 south-1420 west where they breast stoped west and then raise stoped southwest into an old 8th Level bottom. The area west of this development should produce much more ore and no doubt will when developed. The place was stopped at the close of the year, however, when Contract 14's former working place on the 10th Level could once more be worked.

Development work in the Section 9 Exploration was disappointingly unproductive of new finds in 1942. At least two gangs and most of the time four, worked in this area during the year. From the 9th Level, Contract #47 continued their raise to the north through jasper. Near the end of the year the raise was stopped after it had penetrated about 30' of slate at the top. The elevation of the breast of the raise when stopped was +1074' or about the 2nd Level elevation. The gang was brought down to the 1050' elevation where they drifted 70' south by the close of the year. The drift cut jasper and some slate. It is headed for the run of ore shown in Surface Diamond Drill Hole #39.

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Contract #82 raised in an 8' wide seam of ore over the back of the drift that connects old 47 stope with the new 47 raise. The ore vein is bounded on the south by dike and on the north by jasper. During the last half of 1942 this raise was also stopped due to the fact that the ore pinched to a thickness of only 3 to 4'. For the remainder of the time that #82 spent in this area, they stoped ore from the back of the drift at coordinates 1140 south-4290 west.

The best ore runs shown up by surface diamond drilling in the Section 9 area are high up around the 1st, 2nd, and 3rd Level elevations in holes #34, 39, etc. Contract #47 reached this elevation in late 1942 but not near any drill hole showing ore. In order to get up to the better ore runs shown by drilling, Contract #103 started, in 1942, to continue the south extension of 47 raise. At the end of the year this gang had progressed about 50'-60' above the old breast of this raise. The raise will also be used as a means of ventilation for the west end, because present plans are to drill a 36" or 48" hole from surface along the old Diamond Drill Hole #34. Contract 103 is headed for the ore shown in Diamond Drill Hole #34.

10th Level

The last month of 1942, Contract #82 was moved to the 10th Level Main Vein where they prepared to drift northeast from Coordinates 50 south-710 west. This drift will reach the area under the present working place of #36 Contract and aside from possibly crossing the downward continuation of #36, it will cut down the distance that ore in 36 Contract must be scraped.

Contract #14 in the Main Vein at coordinates 370 south-780 west stoped northeast to connect with old workings in the so-called "No. 1 stope area". The ore seems to occur on the footwall side of the deposit and dips to the northwest.

Out in the Section 9 Deposit on the 10th Level, Contract #88 drifted 70' south from the top of their northernmost raise in an ore vein bounded on the east by dike near the raise. They struck slate hanging in the breast of the drift and turned due east for another 70' where they encountered dike across the breast. Another turn to the south for still another 70' brought them into a southwest-striking ore vein with slate hanging on the west side of the drift and dike on the east side. From the map it is apparent that this ore is the same as that stoped on the 10th Level elevation directly below. The ultimate upward limit, of course, is unknown as yet.

Contract #97 in the Section 9 Deposit holed a raise from the 10th Level to the 9th Level near the west end of the workings. An attempt to follow this ore up above the 9th Level failed because the ore seam was too narrow at that point. At coordinates 1015 south-4480 east, however, a raise was put up for about 70' in ore with some jasper seams. This, too, pinched out and the raise was stopped in the last quarter of the year.

12th Level

Contract #86 made a small increase in the outline of the stope at coordinates 500 south-1170 west and extended a new stope north at coordinates 275 south-1260 west. Neither of these stopes are in new areas or areas expected to show any great development in the future.

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14th Level

At an elevation that brings the back of their stope just above the 14th Level, Contract #48 advanced a breast stope 50' wide for a distance of 80' to the north during 1942. They also opened up one short crosscut to the west. The most astonishing thing about this development is the fact that the stope extends along the course of Diamond Drill Hole #499 which shows nothing but jasper. The explanation is that the drill hole penetrated and paralleled the jasper hanging of 48 ore body.

The following table lists a number of contracts that were engaged in development work only part of the year 1942. The tonnage listed after these gangs is an estimate based on bi-monthly car reports for the period in which they were doing development work.

Ore Broken (Mine Tally) by developing gangs

"A" Shaft	Mine Tally
1st Level - Cont. 1	3,591 Tons
1st " - " 30	8,437 "
2nd " - " 44	4,473 "
3rd " - " 27	4,473 "
4th " - " 8	8,468 "
4th " - " 29	1,764 "
4th " - " 57	3,612 "
5th " - " 12	5,266 "
5th " - " 74	2,972 "
5th " - " 76	3,643 "
5th " - " 81	3,554 "
6th " - " 98	5,581 "
6th " - " 6	2,373 "
6th " - " 41	4,258 "
6th " - " 51	2,636 "
6th " - " 59	1,239 "
6th " - " 66	835 "
6th " - " 67	7,901 "
6th " - " 80	6,101 "
6th " - " 94	6,326 "
8th " - " 4	9,846 "
8th " - " 61	1,412 "
8th " - " 65	2,452 "
8th " - " 78	1,575 "
8th " - " 89	3,097 "
8th " - " 92	1,922 "
8th " - " 95	3,539 "
8th " - " 99	2,501 "
8th " - " 102	362 "
9th " - " 64	5,103 "
9th " - " 68	5,675 "
9th " - " 69	1,586 "
9th " - " 91	252 "

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Ore Broken (Mine Tally) by developing gangs

"A" Shaft		Mine Tally
10th Level	- Cont. 3	5,444 Tons
10th "	- " 5	2,468 "
10th "	- " 10	6,342 "
10th "	- " 11	2,950 "
10th "	- " 23	7,607 "
10th "	- " 32	1,129 "
10th "	- " 50	5,011 "
10th "	- " 53	5,197 "
10th "	- " 70	6,772 "
10th "	- " 84	11,954 "
10th "	- " 89	Rock
10th "	- " 102	Rock
11th "	- " 21	3,720 "
11th "	- " 24	1,050 "
12th "	- " 89	1,475 "
15th "	- " 99	990 "
15th "	- " 75	Rock
15th "	- 101	462 "
Total "A" Shaft	- - - - - - - - - -	189,396 "

"B" Shaft		
1st Level	- Cont. 17	1,517 Tons
1st "	- " 18	1,050 "
1st "	- " 49	6,156 "
1st "	- " 58	5,095 "
1st "	- " 72	4,134 "
1st "	- " 75	1,696 "
2nd "	- " 71	8,109 "
3rd "	- " 73	13,259 "
4th "	- " 13	6,804 "
4th "	- " 33	5,376 "
5th "	- " 93	2,216 "
6th "	- " 87	5,623 "
6th "	- " 96	5,169 "
6th "	- " 103	113 "
7th "	- " 31	1,176 "
8th "	- " 19	4,604 "
8th "	- " 85	4,887 "
9th "	- " 36	5,906 "
9th "	- " 47	210 "
9th "	- " 56	2,761 "
9th "	- " 77	1,885 "
9th "	- " 82	472 "
9th "	- " 88	2,782 "
9th "	- " 97	3,420 "
9th "	- " 103	Rock
10th "	- " 14	9,177 "
12th "	- " 86	8,421 "
14th "	- " 48	8,951 "
Total "B" Shaft		120,969 "

Summary

"A" Shaft gangs mined	189,396 Tons
"B" Shaft gangs mined	120,969 "
Total mined by development	310,365 "

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The mine tally as recorded on the contract sheets which includes no overrun, indicates that production totalled 690,166 tons. The 310,365 tons mined by developing constitutes, therefore, 44.97% of the total product as shown on the contract sheets. The mine tally as reported monthly to the shipping department totals 694,807 tons, but this figure includes 4,541 tons of ore from the Incline Pit which was included in the Cliffs Shaft product. Subtracting the 4,541 tons of Incline Pit ore, we have 690,266 tons as the official mine tally production of the Cliffs Shaft for 1942. The 100 ton discrepancy between contract sheet total and the official tally is possibly an error in contract sheet totals but does not effect the percentage above, because that was calculated on contract sheet totals.

The figures below are the mine tally production totals without any overrun for the past six years:-

1937	-	515,032 tons
1938	-	320,705 "
1939	-	369,018 "
1940	-	525,133 "
1941	-	642,327 "
1942	-	690,266* "
Total		3,062,481 "

*Actual tally is 694,807 which includes 4,541 tons of Incline Lump.

In the past six years developing gangs mined the following tonnages:

1937	-	252,445 tons
1938	-	167,384 "
1939	-	167,936 "
1940	-	252,208 "
1941	-	281,542 "
1942	-	310,365 "
Total		1,431,880 "

In the same six years, contract sheets show that depleting gangs mined 1,628,498 tons for a combined total of 3,060,378 tons. Again, there is a total of 2,103 tons less ore shown in the six year total taken from the contract sheets as compared to the official mine tally. For calculating the percentage, the contract sheet tally will be used.

In the past six years developing gangs have mined 46.79% of the ore produced by the Cliffs Shaft Mine. There has been a decrease in the total ore available at the close of the year, during that period, of only 78,438 tons. To date, there is no serious fallacy in the rule of thumb principle that by keeping half or more of the contracts on ore development, the reserves of the mine will be kept up. Eventually, the principle will be impossible to adhere to as the time comes that all of the limiting rock contacts are reached and outlined.

The table below shows a reduction in the tons per man per shift for developing crews. The figures for 1942 are not strictly comparable to those for preceding years because a much more detailed division of the work of each gang was made in 1942. Barring, which is depleting in

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character, was included in the development shifts if it was performed in the course of development mining. Strictly speaking, not all of the gangs listed below are on ore development in the sense that they are breaking ore. The shifts of the rock gangs are includedin the table for 1942:-

Year	Average No. of Gangs on Ore Development	Tonnage Mine Tally	Shifts Worked	Tons per Gang per Shift
1942	55.4	310,365	16,946½	18.31
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

b. Stoping
"A" Shaft

No.	Level	Location by coordinates at Approx. Center of Operations	Character of Work
34	2nd	50 S. - 750 E.	Mining floors
9	3rd	00 - 1180 E.	" "
27	3rd	270 S. - 550 E.	" "
22	4th	70 S. - 1310 E.	" "
29	4th	90 N. - 1150 E.	" "
57	4th	150 S. - 490 E.	" backs
2	5th	1150 S. - 2080 E.	" floors
45	5th	1200 S. - 2650 E.	" " & backs
76	5th	00 - 1400 E.	" floors
6	6th	1060 S. - 1970 E.	" "
15	6th	275 S. - 3000 E.	" "
20	6th	200 S. - 2200 E.	" "
51	6th	150 S. - 2700 E.	" back
52	6th	250 S. - 2260 E.	" " & floor
66	6th	50 S. - 2650 E.	" floor
10	7th	170 S. - 1920 E.	" "
16	7th	175 S. - 1720 E.	" "
28	7th	530 S. - 3220 E.	" "
35	7th	550 S. - 3120 E.	" "
54	7th	140 S. - 1920 E.	" "
59	7th	500 S. - 1840 E.	" "
60	7th	1100 S. - 1900 E.	" "
98	7th	530 S. - 1620 E.	" "
25	8th	20 N. - 3000 E.	" back
64	8th	250 N. - 2910 E.	" floor
65	8th	1150 S. - 2230 E.	" "
78	8th	130 N. - 3025 E.	" "
79	8th	200 S. - 2080 E.	" "
89	8th	290 N. - 1575 E.	" back
92	8th	150 N. - 2950 E.	" floor
55	9th	1050 S. - 2610 E.	" "
69	9th	80 N. - 2075 E.	" "
70	9th	160 N. - 2550 E.	" "
91	9th	270 N. - 2815 E.	" "

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No.	Level	Location by coordinates at Approx. Center of Operations	Character of Work
7	10th	480 S. - 2275 E.	Mining floor
11	10th	675 S. - 2550 E.	" "
23	10th	35 N. - 2625 E.	" "
24	10th	600 S. - 1780 E.	" pillar and floor
26	10th	640 S. - 2710 E.	" floor and back
62	10th	610 S. - 2430 E.	" floor
21	11th	600 S. - 2930 E.	" "
39	11th	660 S. - 2300 E.	" "
83	11th	650 S. - 2600 E.	" "
"B" Shaft			
17	1st	760 S. - 130 E.	Mining floor and back
18	1st	960 S. - 130 W.	" "
63	1st	300 S. - 310 W.	" "
72	1st	370 S. - 350 W.	" "
93	5th	250 N. - 75 W.	" back
38	6th	750 S. - 1160 W.	" floor
42	6th	140 S. - 50 W.	" "
100	6th	690 S. - 1080 W.	" "
19	7th	590 S. - 1040 W.	" "
31	7th	90 S. - 150 W.	" pillar
40	7th	70 S. - 440 E.	" floor
90	7th	00 - 100 W.	" "
85	8th	350 S. - 630 W.	" "
56	9th	430 S. - 760 W.	" "
77	9th	300 S. - 650 W.	" back
82	9th	1150 S. - 4300 W.	" "
46	10th	620 S. - 1350 W.	" floor
43	13th	500 S. - 1350 W.	" "
37	15th	00 - 1500 W.	" "

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

"A" Shaft				Mine Tally
1st	Level			-
2nd	"	- Contract	34	8,715 Tons
3rd	"	- "	9	4,625 "
3rd	"	- "	27	2,804 "
4th	"	- "	22	4,741 "
4th	"	- "	29	2,924 "
4th	"	- "	57	3,218 "
5th	"	- "	2	10,962 "
5th	"	- "	45	8,001 "
5th	"	- "	76	4,552 "
6th	"	- "	6	5,812 "
6th	"	- "	15	4,421 "
6th	"	- "	20	8,600 "
6th	"	- "	51	5,286 "
6th	"	- "	52	2,331 "
6th	"	- "	66	5,554 "

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"A" Shaft				Mine Tally
7th	Level	- Contract	10	961 Tons
7th	"	- "	16	4,883 "
7th	"	- "	28	5,859 "
7th	"	- "	35	5,528 "
7th	"	- "	54	5,791 "
7th	"	- "	59	7,088 "
7th	"	- "	60	5,166 "
7th	"	- "	98	1,108 "
8th	"	- "	25	998 "
8th	"	- "	64	4,032 "
8th	"	- "	65	5,344 "
8th	"	- "	78	7,586 "
8th	"	- "	79	11,792 "
8th	"	- "	89	452 "
8th	"	- "	92	4,121 "
9th	"	- "	55	8,193 "
9th	"	- "	69	10,421 "
9th	"	- "	70	3,182 "
9th	"	- "	91	11,046 "
10th	"	- "	7	13,487 "
10th	"	- "	11	3,736 "
10th	"	- "	23	2,016 "
10th	"	- "	24	6,203 "
10th	"	- "	26	7,098 "
10th	"	- "	62	6,888 "
11th	"	- "	21	3,948 "
11th	"	- "	39	11,812 "
11th	"	- "	83	10,508 "
Total "A" Shaft - - - - - - -				251,793 "

"B" Shaft				
1st	Level	- Contract	17	7,298 Tons
1st	"	- "	18	3,137 "
1st	"	- "	63	8,177 "
1st	"	- "	72	2,082 "
5th	"	- "	93	2,464 "
6th	"	- "	38	19,564 "
6th	"	- "	42	10,062 "
6th	"	- "	100	11,151 "
7th	"	- "	19	6,830 "
7th	"	- "	31	8,221 "
7th	"	- "	40	5,121 "
7th	"	- "	90	8,311 "
8th	"	- "	85	1,633 "
9th	"	- "	56	8,180 "
9th	"	- "	77	5,150 "
9th	"	- "	82	499 "
10th	"	- "	46	9,728 "
13th	"	- "	43	4,678 "
14th	"	- "	37	5,722 "
Total "B" Shaft - - - - - - -				128,008 "

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Recapitulation

"A" Shaft Contracts Mined	251,793 Tons
"B" Shaft Contracts Mined	128,008 "
Total "A" and "B" Shafts	379,801 "

The mine tally total from the contract sheets where the above breakdown is made equals 690,166 tons. Therefore, the stoping gangs produced 55.03% of the ore in 1942.

For a five year period the table below gives the comparison:-

Year	No. of Gangs Stoping	Tonnage Mine Tally	Shifts Worked	Tons per Gang per Shift
1942	48	379,801	14,250	26.65
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

It can be assumed that 25,000 tons were mined by certain gangs in the mine that accumulated some or all of their ore during the year. If that tonnage is added to the stoping tally, the tons per man per shift will be 28.41, which is higher than any of the four previous years.

c. Drifting and Raising

Year	Rock Drifts and Raises	Ore Drifts and Raises	Total
1942	2,855 ft.	3,166 ft.	6,021 ft.
1941	2,196 "	3,411 "	5,607 "
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 "

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d. Explosives, Drilling and Blasting:
Explosives Statement for Year 1942

Stoping and Development in Ore

	Quantity	Average Price	Cost 1942	Cost 1941
Gelamite #1 - lbs.	563,050	11.50	64,835.65	62,899.64
60% L.F. Gel	28,900	11.50	3,323.50	114.25
Total Powder	591,950	11.50	68,159.15	63,013.89
Fuse - ft.	1,064,040	5.79 M	6,166.09	5,551.08
#6 Caps	163,420	12.25	2,004.71	1,814.51
Electric Caps	5,225	11.13 C	581.20	531.05
Fuse Ltrs. & Master Ltrs.	50,000	7.00 M	350.72	348.11
Wire (#18 Shot Cord)	18,550	16.41	304.51	156.86
Tamping Bags	48,150	4.79	230.60	150.38
Miscellaneous			194.73	91.00
Total Fuse, etc.			9,832.56	8,642.99
Total for Stoping & Development in Ore			77,991.71	71,656.88
Product			713,530	658,747
Lbs. of Powder per ton of ore			.8296	.8338
Cost per ton for powder			.0955	.0957
Cost per ton for fuse, etc.			.0138	.0131
Cost per ton for all explosives			.1093	.1088

Development in Rock

Gelamite #1 - lbs.	30,550	11.50	3,533.25	3,777.75
60% L.F. Gel.	26,300	11.50	3,024.50	339.25
Total Powder	56,850	11.50	6,557.75	4,117.00
Fuse - ft.	80,300	5.79 M	461.71	237.56
No. 6 Caps	9,400	12.25	155.68	78.99
Electric Caps	3,386	11.13 C	369.36	433.98
Fuse Lighters	3,300	7.00 M	23.02	24.94
Wire (#18 Shot Cord)	12,320	16.41	174.57	128.38
Tamping Bags	5,350	4.79	25.62	15.02
Miscellaneous				1.25
Total Fuse, etc.			1,209.96	920.12
Total for Rock Development			7,767.71	5,037.12
Feet Rock Development			2,695	2,109
Cost per ft. Rock Development			2.883	2.39
GRAND TOTAL ALL EXPLOSIVES			85,759.42	76,694.00
AVERAGE COST PER LB. FOR POWDER			.115	.1147

The amount of powder used per tons of ore decreasedslightly in 1942, but cost per ton for all explosives was slightly higher due to increases in cost of items as #6 caps, #18 Shot Cord, and fuse.

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The biggest change in costs is shown by the increase in 1942 explosives costs per foot of rock development over those for 1941. The explosives statement above does not show all of the rock development footage obtained in 1942, however, and this would reduce the per foot cost considerably. Actually there were 2855' of rock development in the mine in 1942. Dividing the total cost by this figure, the per foot cost comes to $2.7208. This is still higher than normal and an examination of the statement shows that it all occurs in the item of powder. In 1942 we used 19.91 lbs. per foot of development as compared to 16.97 lbs. in 1941. In 1941 only 2950 lbs. of 60% L.F. Gelatine were used out of a total of 35,800 lbs., while in 1942 26,300 lbs. of this type of powder were used or nearly half of the total. The Gelatine powder is more compressible in a hole and it may be this factor that is responsible for our development crews using almost three lbs. more per foot of development. The development crews have requested this type of powder not because of any differences in strength, but because they think it produces less noxious gas. It must also be remembered that many new development miners and several new shift bosses were added in 1942. It is possible that the combination of less experienced miners, less experienced supervision, and the usage of a higher proportion of the Gelatine powder is responsible for more powder being used per foot of development.

The table below shows the kind and percentage of ore mined for the year 1942 and 1941:-

	1941	1942
Specular Ore Contracts	51.3 %	50.91 %
Slate " "	14.2	15.19
Steel " "	29.3	27.04
Magnetite " "	5.2	6.86
	100.0 %	100.0 %

8. COST OF OPERATING

a. Comparative Mining Costs

	1942	1941	Increase	Decrease
PRODUCT (Tons)	713,530	658,747	54,783	
Underground Costs	1.671	1.682		.011
Surface Costs	.274	.278		.004
General Mine Expense	.280	.317		.037
Cost of Production	2.225	2.277		.052
Depreciation	.041	.029	.012	
Taxes	.201	.219		.018
Loading and Shipping	.073	.082		.009
TOTAL COST AT MINE	2.540	2.607		.067
No. of Days operating	308	302	6	
No. of Shifts and Hours	2 8- hr	2 8-hr		
Average Daily Product (Tons)	2,360	2,181	179	

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

Year	Average Daily Product
1942	2,360
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

The average daily hoist rose 179 tons in 1942 over 1941 as noted by the figures above. Lack of many serious delays is partly responsible for this increase and when delays did occur, we tried to make up lost product by extra hoisting.

Exploring in Mine

Year	Labor	Supplies	Total
1942	$ 9,652.56	9,069.01	18,721.57
1941	11,299.97	6,194.81	17,494.78
Increase		2,874.20	1,226.79
Decrease	1,647.41		

A light weight one man drill using mechanical set bortz bits was tried in the mine during September, October, and November. This proved impractical for the type of material in the Cliffs Shaft and it was transferred to the Lloyd Mine. The detail of costs shows a separate sheet for this drill.

	1942	1941
Labor for Undg. drilling	$ 6,725.82	5,225.61
Prop. of D.D. Supt's. Time	296.34	218.33
Carbon Loss	2,699.48	1,967.48
Pipe and Fittings	248.94	121.64
Drill Equip. and Repairs	84.06	434.98
" " " Rental	671.25	682.38
Miscellaneous Supplies	262.05	100.54
Compressor Expense	650.00	590.00
Fuel and Teaming	3.63	0.00
Adjust. of selling price of Carbon	1,633.16	0.00
Total	13,274.73	9,340.96
Misc. and Direct Charges	427.83	613.38
Analysis Expense	673.25	506.66
Total Undg. Drilling Cost	14,375.81	10,461.00
Geological Dept. Expense	1,429.09	2,547.09
Surface Drilling Cost	3,886.85	4,486.69
Total Cost of Undg. and Surf. Carbon Drilling	$ 19,691.75	17,494.78

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	1942	1941
Feet drilled undg. with carbon	3333	3762
Cost per ft. " " "	4.310	2.783
Feet drilled on surface	595	1196
Cost per ft. " "	6.532	3.751

The cost sheet detail for the one man "Gopher" drill is given below to show the excessive cost of mechanical set bits in Cliffs Shaft ground.

Labor for Underground Drilling	$ 549.56
Prop. of D.D. Supt's. Time	23.36
Carbon Loss	46.04
Cost of Mechanical set bortz bits	1,815.47
Pipe and Fittings	0.00
Drill equipment and repairs	77.57
Prop. of cost of drill on E. & A. 92	200.00
Compressor expense	50.00
Total	2,762.00
Analysis expense	82.92
Drifting	71.75
Total "Gopher Drill" Expl. Cost	$ 2,916.67
Feet drilled underground with bortz	373
Cost per foot drilled " " "	7.81

The total cost of all drilling exploration both surface and underground with bortz and carbon was:-

Surface and Underground Carbon Drilling	$ 19,691.75
Underground Bortz Drilling	2,916.67
Grand Total Exploration Cost	$ 22,608.42

To E. & A. CC-93 was charged in 1942 the sum of $11,706.43 for 2,080' of carbon drilling and 163' of standpiping in connection with surface drilling in Section 9.

A better ida of what the underground drills accomplished during the year can be gained from the comparison breakdown shown below:-

	1941		1942	
Ore	182 ft.	4.8%	247 ft.	6.7%
Dike	1656 "	44.1%	1447 "	39.0%
Slate	989 "	26.3%	46 "	1.2%
Lean Ore	538 "	14.3%	304 "	8.2%
Quartzite	-	-	165 "	4.5%
Siderite	211 "	5.6%	446 "	12.0%
Jasper	186 "	4.9%	1051 "	28.4%
Total	3762 "	100.0%	3706 "	100.0%

Disregarding the high cost of bortz drilling for comparison purposes, the 1942 cost of carbon drilling per foot was $1.53 more per foot. Almost a third of this is accounted for by the adjustment in selling price of carbon. The other $1.02 of difference is due to the higher proportion of hard ground drilled in 1942 compared to 1941.

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The table on the foregoing page shows that in 1941 only 10.5% of the hard materials - quartzite, jasper, and siderite - were included in the footage drilled. In 1942, these materials constituted 44.9% or an increase of over 34% over 1941 conditions.

Development in Rock

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

		Labor Cost		Supply Cost		Total Cost	
Year	Footage	Total	Per Foot	Total	Per Foot	Total	Per Foot
1942	2855	44,755.36	15.68	11,351.66	3.97	56,107.02	19.65
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

The unit cost per foot is more intelligible when the size of the development openings in rock is shown as in the following table:-

	1942	1941	1940	1939	1938
Rock Raises	1152'	993'	176'	318'	663'
10' x 10' Main Haulage Drifts	1140'	631'	1303'	1104'	1389'
8' x 8' Main Haulage Drifts	563'	572'	277'	708'	285'
Total	2855'	2196'	1756'	2130'	2337'

The type of rock through which the development heading is driven also influences the unit cost. For the Year 1942 the data is shown below:-

	Jasper or Lean Ore	Siderite	Dike or Slate	Total
Rock Raises	546'	8'	598'	1152'
10' x 10' Rock Drifts	357'	416'	367'	1140'
8' x 8' Rock Drifts	104'		459'	563'
	1007'	424'	1424'	2855'

The unit cost per foot shows a slight increase over the year before in both the labor and supply items. This is understandable from a consideration of the tables above which show that there is a higher proportion of 10' x 10' drifts and the material cut by them is more frequently jasper or siderite, the hard materials, than in 1941. Another factor, less easily pinned down but influential nonethe-less, is the proportion of high raises. During 1942, three very high raises were completed. The efficiency of the workman in terms of footage results is materially reduced where he must spend much of his effort climbing a long raise. As mentioned under the section on Explosives, there was an increase of approximately $0.33 a foot in cost of powder for rock development.

Development in Ore and Stoping

The two accounts are combined because of the difficulty of classifying developing and stoping gangs in the Cliffs Shaft Mine. A breast stope may be a developing gang if it is advancing out into new territory.

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Cost sheet developing gangs are mainly raising and drifting crews and do not include all of the gangs that are developing new ore reserves.

Comparative costs for last two years follow:-

Year	Labor Cost	Supply Cost	Total Cost
1942	$ 377,773.15	128,565.26	506,338.41
1941	353,861.16	122,065.02	475,926.18

The detailed cost for the two years follows:-

	1942		1941	
Labor	Total	Cost Per Ton	Total	Cost Per Ton
Miners' Labor	239,858.31	.336	222,688.40	.339
Other Labor	137,914.84	.193	131,172.76	.199
Total	377,773.15	.530	353,861.16	.538
Supplies				
General	2,899.30	.004	2,140.37	.003
Iron & Steel	24,891.66	.035	24,765.73	.037
Oils	969.43	.001	966.60	.001
Machinery	2,556.57	.004	3,270.82	.005
Explosives	77,991.71	.109	71,656.88	.109
Lumber	51.42	-	20.32	.000
Sundries or Cl. Acct.	19,205.17	.027	19,244.30	.030
Total Supplies	128,565.26	.180	122,065.02	.185
Total Labor & Suppl.	506,338.41	.710	475,926.18	.723
Tons hoisted	713,530		658,747	

The total cost in 1942 was slightly over $30,000.00 higher than in 1941, but the unit cost dropped $0.013 per ton indicating that general conditions were comparable in 1942 with 1941. The year 1942 to some extent could be expected to have a higher unit cost per ton since the higher wage level was in effect for a full 12 months of that year, whereas it prevailed only the last 8 1/2 months of 1941.

Timbering

Year	Total Cost	Cost per Ton
1942	$ 17,765.14	.025
1941	20,725.94	.032
Decrease	2,960.80	.007

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

	1941		1942	
	Total	Per Ton	Total	Per Ton
Labor	$ 12,584.62	.020	9,709.54	.014
Supplies	8,141.32	.012	8,055.60	.011
Total	20,725.94	.032	17,765.14	.025

We had nearly one more timberman in the Cliffs Shaft Mine during 1942 than in 1941, and the crew earned $1,509.30 more in the last year than the year before. The lower cost for timbering on the cost sheet is due to a different distribution of timbermen's time in 1942. In other words the two sets of figures are not comparable because they do not include the same charges.

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Tramming

	Labor		Supplies		Total	
Year	Total	Per Ton	Total	Per Ton	Total	Per Ton
1942	$ 323,050.72	.453	17,730.08	.025	340,780,80	.478
1941	302,894.62	.460	17,205.65	.026	320,100.27	.486
Increase	20,156.10		524.43		20,680.53	
Decrease		.007		.001		.008

Decrease in per ton cost of tramming is largely in the labor cost. Tramming labor includes motormen, brakesmen, and trammers, skip tenders, miners' helpers, and scraper operators. The skip tenders are included because they spend the larger part of their time switching and dumping cars at the shaft stations. The scraper men are included because they really took the place of trammers with the advent of scrapers.

The decrease in cost per ton is the result of larger product which permits motor crews and skip tenders to be used more efficiently. To some small extent it is also the result of gradual elimination of high cost contract tramming.

Ventilation

Year	Total Cost	Cost per Ton
1942	$ 811.76	.001
1941	588.88	.001
Increase	222.88	No change

Charges in 1942 increased slightly from the purchase of 325' of ventube used in ventilating some of our long drifts. Some work was also done on the 8th Level east end of "A" Shaft where a rock filled raise was emptied in order to provide a better course for the air to lower levels.

Pumping

	Total	Cost per Ton
Operating Cost as per 1942 Cost Sheet -	$ 28,897.53	.041
Maintenance " " " " " " -	2,119.17	.003
Total	31,016.70	.044
Operating Cost as per 1941 Cost Sheet -	$ 28,149.44	.042
Maintenance " " " " " " -	3,041.87	.005
Total	31,191.31	.047

The detailed cost for the two years follows:-

	1942	1941
Maintenance	2,119.17	3,041.87
Pumpmen Labor	9,015.83	8,034.54
Other Labor	647.32	925.71
Total Labor	9,663.15	8,960.25
Compressor Expense	600.00	600.00
Oil, Waste, & Packing	305.20	230.59
Tools, etc.	103.49	57.02
Electric Light	380.90	412.20
Electric Power	17,844.79	17,889.38
Total Operating Expense	28,897.53	28,149.44
Total Maintenance and Operating	31,016.70	31,191.31
Gallons of Water Pumped	339,185,356	343,850,964
Gallons of Water Pumped per Minute	642	654

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Pumping costs decreased slightly in 1942 due to less water pumped.

The water pumped each month can be seen from the table below:-

	Gallons per Minute			
Month	1942	1941	1940	1939
January	624	668	637	627
February	612	653	637	620
March	613	630	630	615
April	652	637	621	677
May	662	653	692	786
June	663	661	742	809
July	657	658	739	799
August	642	642	741	751
September	633	634	720	732
October	676	675	721	668
November	653	697	673	621
December	631	662	673	613
Average for Year	642	654	689	691

Compressors, Air Pipes, & Powder Drills

	1942 Total	Per Tons	1941 Total	Per Tons
Compr. & Air Pipes	$ 47,306.54	.066	47,216.17	.072
Compr. & Power Drills	5,340.37	.008	6,006.39	.009
Total	52,646.91	.074	53,222.56	.081

The cost figures shown above can be divided between labor and supplies as follows:-

		1942	1941
Labor Costs for Compressors & Air Pipes		$ 5,290.68	5,594.41
Labor Costs for Compressors & Power Drills		851.80	670.38
Total Labor		6,142.48	6,264.79
Supplies for Comprs. & Air Pipes		42,015.86	41,621.76
Supplies for Comprs. & Power Drills		4,488.57	5,336.01
Total Supplies		46,504.43	46,957.77
Grand Total Labor & Supplies		52,646.91	53,222.56
Decrease in Labor Costs for 1942	$ 122.33		
Decrease in Supply " " "	453.34		
Total Decrease	$ 575.67		
Unit Cost "	.007		

Theunit cost decrease is due principally to the increased tonnage since the total money decrease would account for only a fractional unit cost decrease.

New drills purchased in the last five years indicate a predominance of Ingersoll-Rand equipment.

	1942	1941	1940	1939	1938
N-75 Ingersoll-Rand Drifters	-	-	-	1	9
"					
DA-35 " " "	5	7	10	15	-
D-12 Cleveland Drifters	2	2	4	2	-
Gardner-Denver Drifters	2	-	-	1	-
J-45 Ingersoll-Rand Blockholers	-	2	-	-	-
S-49 " " "	-	0	-	4	-
JB-4 " " "	-	3	-	-	-
Total	9	14	14	23	9

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Back Filling

Year	Total	Cost Per Ton
1942	$ 3,012.89	.004
1941	4,098.70	.006
Decrease	1,085.81	.002

There were 23,758 tons of rock back filled in 1942 compared to 21,830 tons in 1941. The total cost for handling more tonnage in 1942 was less because of two circumstances. Less rock came from the 15th Level in 1942 since #75 Contract completed their raise in mid-year. This meant less rock to be hoisted to the 2nd Level "A" Shaft. Furthermore, a new rock dump was made on the 2nd Level that permitted the rock brought to that level to be dumped only once. Previous to that the rock was dumped on the 2nd Level and transferred on the 5th Level into old #57 stope on the "B" Shaft side.

Underground Superintendence

Year	Total	Cost Per Ton
1942	$ 35,765.97	.050
1941	32,378.24	.049
Increase	3,387.73	.001

A great many changes were made in the personell of the underground supervisory force during 1942. Mr. John Freethy, foreman in "B" Shaft, was retired and his place was filled by Stanley Kelly, formerly a shift boss. Two new shift bosses were picked from the mine personell and one boss left the employ of the company at the end of the year. The net result of all these changes, however, was that on an average we had 0.84 more bosses during 1942 than in 1941.

The increase in total cost of underground superintendence in 1942 is partly due to the increase in amount of supervision but primarily to an increase in salaries of the supervisors which went into effect on September 16, 1941.

Scrapers & Mechanical Loaders

	Labor Cost		Supply Cost		Total Cost	
Year	Total	Per Ton	Total	Per Ton	Total	Per Ton
1942	$ 25,544.46	.036	48,502.92	.068	74,047.38	.103
1941	25,668.67	.039	45,055.27	.068	70,723.94	.107

The following data gives a detail of the major items in the last two years:-

	1942		1941	
	Amount	Cost	Amount	Cost
3/8" Wire Rope	4,175'	440.51	3,090'	262.75
1/2" "	10,050'	1215.64	11,697'	1218.02
5/8" "	102,819'	17928.55	108,698'	18582.14
Electric Cable #6	4,940'	1814.29	4,800'	1580.81
Electric Motors-25 H.P.	4	1029.08	5	1284.80
New Scraper Slides(Not compl.)	3	841.79	3	1528.11
Scraper Hoists	6	3322.33	3	1570.26
Utility Air Hoists	-	-	2	2455.00
General Elect. Repairs & Renew.		47455.19		42242.02
Total		74047.38		70723.91

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All of the 5/8 " rope purchased in 1942 was "Trulay" rope. The tonnage and unit cost for the past six years are compared below:-

Year	Product	Type of 5/8" Rope Used	Purchased	Cost	Unit Cost	Feet per Ton Ore
1942	713,530 tons	"Trulay"	102,819	$ 17,928.55	.0251	.144
1941	658,747 "	"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

Longer life was extracted from the 5/8" scraper rope in 1942 than in the preceding year. We used less footage to get out more ore and naturally improved the unit cost. As much as possible we have tried to provide raises for crews where ore reserves are large enough to warrant this action. This reduces the amount of rope required. Difficulty encountered in getting rope at times, reduced the amount on hand to a point where the miners had to get along by tying more knots in their old ropes and using them longer.

Electric Tram Equipment

	1942			1941		
	Labor	Supplies	Total	Labor	Supplies	Total
Generators				13.72	42.44	56.16
Locomotives	6346.00	6780.95	13126.95	4538.38	7897.27	12435.65
Wiring	1069.61	1853.56	2923.17	1068.19	2293.89	3362.08
Tracks	7827.43	3231.43	11058.86	8876.16	2744.81	11620.97
Cars	6377.80	4052.46	10430.26	6518.48	5729.49	12247.97
Spotting Engine		91.77	91.77		118.54	118.54
Total	21620.84	16010.17	37631.01	21014.93	18826.44	39841.37

The total costs of electric tram equipment was $2,210.36 less in 1942 than in 1941. As in 1941, we had one 6 ton trolley locomotive rebuilt at a cost of $2,466.69. This was one of our earliest locomotives, having been bought in 1912. After rebuilding it was sent down to the 10th Level in "B" Shaft. Five armatures were repaired at a cost of $1,222.33. One new Exide battery was purchased and installed in the 6th Level "A" Shaft battery locomotive at a cost of $487.28. Thirteen rectifier tubes for charging stations that service battery locomotives were purchased at a cost of $350.74.

Because of increased production there was a greater burden placed on main line locomotives, both battery and trolley types and minor repairs made by the mine electricians increased as would be expected.

The reduction in the cost of trolley wiring in 1942 is all attributable to the supply item and most of this is the result of less trolley wire and less messenger wire used in 1942 as compared to 1941.

Track costs were practically the same in 1942 and 1941.

Cost of cars decreased $1817.71 in 1942 compared to 1941. Eighteen new 76 cu. ft. capacity cars were purchased in 1942 and we started to charge them off in August. The principal reason for lower costs in 1942 was the fact that very extensive repairs were made to rolling stock in 1941 and much less work of this nature was required in 1942.

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Hoisting

Comparative data for 1942 and 1941 is shown below:-

	1942	1941
Maintenance	$ 12,823.93	17,747.42
Operating Expense:		
Engineers' Labor	16,372.58	15,154.85
Other	1,772.87	1,844.30
Total	18,145.45	16,999.15
Supplies		
Oil, Waste, and Packing	164.63	144.47
Tools and Misc. Supplies	195.20	124.46
Electric Light	643.15	491.64
Electric Power	21,184.96	19,989.00
Compressor Expense	480.00	465.00
Heating Expense	766.30	859.10
Total Supplies	23,434.24	22,073.67
Total Operating Expense	41,579.69	39,072.82
Total Maint. & Operating Exp.	54,403.62	56,820.24
Cost per ton produced	.076	.085
Tons Ore and rock Hoisted	737,288	680,577
Average depth hoisted	730'	735'

Maintenance cost of hoisting equipment was nearly $5,000.00 less in 1942 than in 1941. The high cost of 1941 was the result of new hoist drums. Several important items were necessary in 1942, however, that kept the cost above the year 1940. A new 8' sheave wheel and a new 12' sheave wheel were needed in "B" Shaft house. These cost $1,433.45 without installation charges. A new timber stand for the hold-down sheave outside "B" Shaft was erected at a cost of $460.95, and repairs were made to the similar unit at "A" Shaft.

As in former years two ropes - one 1950' long and one 1720' long - were put into use in October. Cost of the ropes was $1,361.91.

The new "A" Shaft skip and cage unit was put into service in November. Part of the cost of this was charged in 1941, but total cost was $2,653.68.

Minor repairs on skip and cages, hoisting machinery, and sheaves were higher throughout the year because of intensified use of the equipment.

The increase in production naturally resulted in an increase in the use of operating supplies. Production increase over 1941 was about 8.3% and this is reflected in an increase of 6% in power cost for hoisting.

Operating expense was higher in 1942 than in 1941 due to the fact that the increase of 10% in wages instituted in April of 1941 was carried for a full 12 months in 1942.

Stocking Ore

Year	Total Cost	Cost per Ton
1942	$ 22,405.31	.031
1941	24,076.64	.037
Decrease	1,671.33	.006

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Because 1942 was uniform in wage rates throughout the entire year while 1941 had the higher rate only the last 8 1/2 months, the cost of stocking ore could be expected to be higher in 1942. Instead it was $1,671.33 less. Actually, the labor cost in 1942 was $542.74 more than in 1941, but supply costs in 1942 were $2,214.07 less than in 1941. Heavy purchases of timber in 1941 accounted for the high supply cost in that year.

Screening & Crushing at Mine

	1942		1941	
	Amount	Per Ton	Amount	Per Ton
Labor	$ 29,443.50	.041	27,793.11	.042
Supplies	13,846.48	.020	18,080.05	.028
Total	43,289.98	.061	45,873.16	.070
Decrease	2,583.18	.009		

The cost in this account dropped $2,583.18 under 1941. This is largely due to the fact that $4,400.00 was spent in 1941 for a new steel crusher bowl. Several big items were purchased in 1942, however, that kept the cost relatively high in this year. Some of these were one new picking belt at a cost of $1,071.00, four sections of screens at a cost of $1,056.84, one discharge head for the screen at a cost of $443.60, two mantels for the crusher costing $878.48.

Increased production resulted in more wear on wearing plates of crusher and manganese straps lining the chutes. A total of $1,424.70 was spent for these parts.

The revolving screen was completely rebuilt in 1942 and was operated throughout the year even though we screened no ore during the shipping season. It was not practical to remove the revolving screen while we shipped mine run product so the screen was covered with blank plate and used merely as a revolving chute during the shipping season.

Dry House

	1942		1941	
	Amount	Per Ton	Amount	Per Ton
Labor	$ 7,565.43		7,772.10	
Supplies	4,443.03		4,078.45	
Total	12,008.46	.017	11,850.55	.018

The dryhouse expense was very little different in 1942 than in 1941. Labor cost dropped slightly and supply costs rose. Part of the supply cost increase is attributable to the purchase of a washing machine at a cost of $139.95. This machine was provided for the convenience of the men so that they might wash their mining clothes at the mine.

General Surface Expense

Year	Total	Cost Per Ton
1942	$ 18,594.67	.026
1941	16,611.62	.025
Increase	1,983.05	.001

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The fact that 1942 had 12 months in which the higher wage level prevailed while 1941 had 8 1/2 months of that condition would account for an increase in cost of the labor in 1942. The supply charges include $385.09 for grading parking space for the employees' cars; $852.76 for paving and curbing roads between office and "A" Shaft; $540.25 for installation of floodlight system in interest of national defense. The grading and planting of lawn east of the office continued through much of the year and work of this character was carried on in several spots around the mine during the summer.

Shaft

Year	Total	Cost per Ton
1942	$ 4,536.78	.006
1941	4,034.13	.006
Increase	502.65	-

Shaft costs increased because of the increased schedule of production that required more repairs to pockets and runners.

Top Tram Equipment

Year	Total	Cost per Ton
1942	$ 5,833.31	.008
1941	6,804.68	.010
Decrease	971.37	.002

No unusual expenditures were sustained in 1942 by the top tram equipment. In fact costs were below 1941 by $971.37.

Docks, Trestles, and Pockets

Year	Total	Cost per Ton
1942	$ 22,710.03	.032
1941	5,251.07	.008
Increase	17,458.96	.024

Almost all of the increase in cost of this category is due to the extensive repairs made to the top tram trestle. Partial collapse of this trestle on the "B" Shaft side of the crusher building required costly emergency repairs and this was followed later in the summer by a complete steel stiffening job. The work was done by the Worden-Allen Company under contract and cost $16,764.07. The trestle now meets the safety factor requirements for the loads carried.

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General Mine Expenses

	1942	1941
Mining Engineering	$ 5,452.30	4,221.06
Mechanical & Electrical Eng.	2,705.55	2,537.23
Analysis and Grading	27,914.54	20,474.67
Safety Department	2,898.05	2,303.94
Telephone and Safety Devices	5,675.53	6,104.97
Local and General Welfare	6,623.97	6,940.17
Spec. Expense, Pen. & Allow.	19,090.18	12,431.13
Ishpeming Office	25,616.47	25,052.22
Mine Office	25,719.12	24,333.42
Insurance	6,383.57	6,353.37
Personal Injury	16,828.79	31,216.88
Social Security Taxes	26,979.56	41,365.90
Employees' Vacation Pay	27,575.92	25,726.86
Total Gen. Mine Expenses	199,463.55	209,061.82
Cost per Ton	.280	.317

Total charges in the detail above are furnished by the Ishpeming Central Office and the Cleveland Office with the exception of the item Telephone and Safety Devices. The Mine Office furnishes cost data for this item.

9. EXPLORATIONS

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

	Total Depth	Feet of Ore
D. D. Hole #496	139'	8' of 58% Ore
" #497	206'	24' of 60% Ore
" #498	280'	55' of 61% Ore
" #499	138'	No Ore
" #500	268'	16' of 61% Ore
" #501	199'	No Ore
" #502	159'	12' of 58% Ore
" #503	151'	8' of 61% Ore
" #504	87'	54 1/2' of 59% Ore
" #505	381'	45' of 57% Ore
" #506	197'	No Ore
" #507	117'	15' of 61% Ore
" #508	322'	No Ore
" #509	118'	8' of 59% Ore
" #510	56'	18' of 65% Ore
" #511	82'	18' of 62% Ore
" #512	195'	No Ore
" #513	222'	No Ore
" #514	135'	8 1/2' of 61% Ore
" #515	89'	1' of 58% Ore
" #299 Deepened Old Hole	165'	No Ore
Total	3706'	291'

Drilling was conducted during the year mainly by one drill, but we did start a second machine in the latter part of August. Since that time two drills have been working steadily testing for ore possibilities.

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On the 4th Level "A" Shaft in the North Vein, Hole Number 502 was drilled to the north in order to explore the area west of #22 Contract. A small seam of ore was encountered that we believe will extend up to the 3rd and 2nd Levels. Contract #74 is drifting to get under this ore.

Three holes were drilled on the 5th Level A Shaft. Two of these, #503 and #504, located about 500 feet East of the shaft, test the ground on both sides of the traveling road drift in the Main Vein. Eight feet of ore near the collar was cut by #503 on the north side of the drift. The other hole to the south, #504, shows a total of 54 1/2' of 59% ore that occurs in a vein beneath the slate hanging wall. This should prove to be a good stoping area. The third hole, #508, on the 5th Level was an extension of a very old hole. It was drilled to explore the chances of ore extending down to the 5th Level from the 4th Level stopes east of "B" Shaft.

One short hole, #506, drilled on the 7th Level "A" Shaft encountered formation but no ore.

Holes #496 and #497 were drilled on the 8th Level Bancroft territory at its west end. Some ore was cut by both of these holes near the collars. This territory is relatively new and unexplored. It shows promise of developing ore between the 8th and 5th Levels. Hole #514 was drilled in the Main Vein on the 8th Level to search for ore possibilities east of #99 Contract. The last hole drilled on the 8th Level was #515 which was looking for a possible extension of Contract #55's ore, east along the footwall. This is in the southeast end of the level. No ore was found in either of the last two holes.

The 9th Level in "A" Shaft was pretty thoroughly explored for ore possibilites. Eight holes were drilled of which six were on the west end or south side of the "A" Shaft syncline. Two of these six found small runs of ore near the east end of the mine. Hole No. 498 encountered the best run of ore showing a total of 55' of 61% ore. This occurs in two mineable seams approximately 400 south and 2500 east.

At the extreme east end of the North Vein on the 10th Level Diamond Drill Hole #505 crossed 45' of 57% ore. It is toward this ore that Contract #32 is drifting on the 10th Level and for which we expect to raise from the 15th Level as soon as Contract 101 gets far enough east with their drift. This is one of the few territories in the mine where the structure is not delimited and where there may be good possibilities for future ore development.

In "B" Shaft three holes were drilled during the year. Hole #512 explored the possibility for eastward extension on the 8th Level of Contract 36's ore body. Holes 513 and 299 tested the North Vein on the 10th Level. The first of these was drilled into the footwall because of the possibility of discovering a vein or ore similar to that in Contract #36. No ore was found. The last hole was unfinished at the end of the year. This is being drilled northwest to explore another of the few areas where no structure has been definitely outlined. At the end of the year the hole was still in quartzite.

Under E. & A. CC-93 diamond drilling was started in April on surface in the N.W. 1/4 of the S.W. 1/4 Sec. 9-47-27. Hole #56 was drilled to a depth of 1410' through quartzite and slate. The hole deviated so far from the vertical that it passed over the boundary into Oliver Iron Mining Company property to the south. Because of this deviation, the hole was stopped. The drill was moved approximately 800' due north and at the close of the year Hole #57 had been drilled to a depth of 865' in quartzite.

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This campaign of surface drilling is being carried on to explore for hard ore occurrences beneath the Goodrich quartzite and slate formation in an area nearly one-half mile southwest of the Cliffs Shaft Mine workings in "B" Shaft. The Section 9 Development on the 10th Level is about a quarter of a mile north of Drill Hole #57. In view of the fact that the structure of the Cliffs Shaft Mine proper has by this time been quite completely outlined through mining and exploration drilling, it is very important that the westward pitching contact plane between Goodrich formation and Negaunee formation be explored in new areas for hard ore reserves.

10. TAXES

Comparative data for 1942 and 1941 follows:-

	1942		1941	
	Valuation	Taxes	Valuation	Taxes
Realty	2,200,000	76,217.46	2,570,000	90,771.89
Minerals under NW¼ of Sec. 9-47-27	320,000	11,086.18	100,000	3,531.98
Personal	881,100	30,525.09	770,000	27,196.23
Lot 2, Sec. 3-47-27 (Bancroft)	640,000	22,172.35	550,000	19,425.89
SE¼ of NE¼ of Sec. 9-47-27 (Barnum)	52,000	1,801.50	52,000	1,836.63
Lot 174 Nelson Addition	100	3.46	100	3.53
South 35.91 ft. of Lot 179	50	1.73	50	1.77
Total	4,093,250	141,807.77	4,042,150	142,767.92
Collection fees		1,418.08		1,427.68
GRAND TOTAL		143,225.85		144,195.60
Taxes per ton produced		.2007		.2189
Taxes per ton shipped		.1916		.2259

Valuations and taxes for the past ten years are shown below:-

Year	Taxes	Valuation
1942	143,225.85	4,093.250
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

Taxes in 1942 show a decrease even though valuation was greater, because the rate was decreased from $35.3198 to $34.6443.

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City of Ishpeming Tax Levy

	1942		1941	
	Amount	Rate	Amount	Rate
Valuation	11,495,051.00		10,707,135.00	
Tax Levy by Funds				
County Tax	64,372.29	5.0000	53,535.67	5.0000
County Road Tax	22,990.10	2.4000	25,697.12	2.4000
City Contingent Tax	69,000.00	6.0470	58,000.00	5.4169
City Debt & Service Tax	7,510.00	0.6582	7,675.00	0.7168
Street & Highway Tax	86,000.00	7.5368	80,000.00	7.4717
Fire Fund Tax	22,000.00	1.9280	27,000.00	2.5217
Library Tax	11,490.00	1.0069	10,700.00	0.9993
Sewer Tax	-	-	7,000.00	0.6538
Water Tax	-	-	5,000.00	0.4670
Cemetery Tax	17,000.00	1.4898	10,000.00	0.9340
School Tax	85,063.38	7.4547	80,303.51	7.5000
School Debt Service Tax	12,812.50	1.1229	13,262.50	1.2387
Total Taxes	398,238.27	34.6443	378,173.80	35.3198

11. ACCIDENTS AND PERSONAL INJURIES

The accident record for the past 5 years follows:-

	1942	1941	1940	1939	1938
Number of No-Time Lost Accidents	103	93	89	62	64
Compensable or Fatal Accidents	5	9	2	4	11
Number of Man Shifts Worked	140,962	133,427	105,437	80,860	76,038

12. NEW CONSTRUCTION ORE EQUIPMENT

E. & A. #CC-57

The work covered by this E. & A. was for an addition to the drill sharpening shop. Most of the work was completed in 1941 but some charges were made to the E. & A. as late as May 1942 for racks, benches, wiring, and moving equipment. The cost exceeded the estimate by over $500.00 due to the fact that the cost of piping and wiring both were higher than anticipated.

E. & A. #CC-68

This E. & A. covers the purchase of materials for the erection of a permanent steel trestle attached to the south side of the crusher building. The work was finished in September. Cost exceeded estimate for two reasons. Some additional second hand steel was purchased to construct a framework for the support of the ore chute and air cylinders above the permanent trestle floor. All wood is eliminated from the old tresle now except the pocket itself. The second reason for the cost overruning the estimate was that much larger concrete piers had to be made to support the structure than was originally thought necessary.

E. & A. #CC-89

This E. & A. covers the purchase of 18 new 76 ft. (cubic) steel cars for the underground haulage system which were put into use in the fall of 1942.

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E. & A. #CC-92

The necessity for a second diamond drill in the Cliffs Shaft was recognized in view of the high production rate and a new one man type was purchased under E. & A. CC-92 to fill this need. Two months of use proved the drill inadequate for the hard ground in the Cliffs Shaft and the drill was transferred to the Lloyd Mine. Cliffs Shaft bore $200.00 of the cost which is approximately equivalent to the rental charge for time used.

E. & A. CC-93

In March of 1942 diamond drilling was started in the NW¼ of the SW¼ of Sec. 9-47-27 to explore the horizon below the Goodrich formation south and west of the Cliffs Shaft Mine. This work is covered by E. & A. CC-93. Approximately 1/3 of the original amount estimated had been expended by the end of 1942.

E. & A. CC-95

Weakness of the top tram trestle as evidenced by a partial collapse early in 1942 was corrected in the fall when the Worden-Allen Company completed under contract a reinforcing job of the whole trestle. The cost of this was borne under E. & A. CC-95.

14. MAINTENANCE AND REPAIRS

Dwellings

	Rented Buildings			Loc. Expense	Grand
	Labor	Supplies	Total	Cleaning, etc.	Total
Hard Ore Location	1663.38	1059.15	2722.53	-	2722.53
Barnum Location	864.64	289.38	1154.02	-	1154.02
Angeline Location	-	3.94	3.94	32.42	36.36
Salisbury Location	-	8.82	8.82	1218.52	1227.34
Second Addition	27.33	43.66	70.99	-	70.99
Outhwaite Purchase	393.45	169.21	562.66	-	562.66
Hyde Purchase No. 1	102.44	116.73	219.17	-	219.17
Hyde Purchase No. 2	234.36	125.51	359.87	-	359.87
Smith Purchase	589.59	348.55	938.14	-	938.14
Nelson Purchase	70.02	23.57	93.59	-	93.59
Berg Purchase	170.22	73.88	244.10	-	244.10
Ramsdell Purchase	44.52	35.26	79.78	-	79.78
Total	4159.95	2297.66	6457.61	1250.94	7708.55

Comparative figures for the past six years follow:-

Total for Year	1942	-	$ 7,708.55
"	1941	-	7,208.75
"	1940	-	6,140.09
"	1939	-	9,430.70
"	1938	-	6,990.77
"	1937	-	15,588.69

The cost of repairs and maintenance of dwellings in 1942 was almost exactly $500.00 more than in 1941. Labor at the increased rate for 12 months in 1942 compared to 8 1/2 months in 1941 is part of the answer for the increase in cost. Increases in materials cost were pronounced in 1942 accounting for higher cost of maintenance in that year

One house was purchased in 1942 and one house in the Second Addition was sold.

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15. POWER

The Cliffs Shaft Mine purchased 7,084,467 k.w.h. plus 9,160 k.w.h. for the Incline Pit to make a total of 7,093,627 k.w.h. at and average cost of .0146725 per k.w.h.

Year	K. W. H.	Cost	Rate per K. W. H.
1942	7,093,627	104,081.28	.0146725
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

The detail of distribution of power at the mine follows:-

	K. W. H.	Cost
Tramming	560,560	8,224.82
Pumping	1,242,167	18,225.69
Hoisting	1,487,689	21,828.11
Stocking Ore	11,973	175.67
Crushing Ore	269,034	3,947.41
Dry House Expense	62,532	917.50
Surface	29,503	432,89
Telephone and Safety Devices	65,237	957.19
Mine Office	9,629	141.28
Machine & Carpenter Shops	5,587.	81.98
Drill and Jackbit Shops	73,874.	1,083.93
Heating Plant	9,442	138.54
Compressors	2,725,501	39,989.92
Electric Haulage	516,711	7,581.45
Ventilation	15,028	220.50
Total	7,084,467	103,946.88
Incline Pit	9,160	134.40
GRAND TOTAL	7,093,627	104,081.28

Comparative data for 1942 and 1941:-

	1942	1941	Difference	Inc.%	Dec. %
Production (Tons)	713,530	658,747	54,783	8.3	
	K.W.H.	K.W.H.			
Tramming	560,560	581,143	20,583		3.54
Pumping	1,242,169	1,263,275	21,106		1.67
Hoisting	1,487,689	1,413,686	74,003	5.23	
Stocking Ore	11,973	12,323	350		2.84
Crushing Ore	269,034	249,061	19,973	8.02	
Dry House	62,532	46,343	16,189	34.93	
Surface	29,503	17,705	11,798	66.64	
Telephone and Saf. Devices	65,237	76,191	10,954		14.37
Mine Office	9,629	9,070	559	6.16	
Machine & Carpenter Shops	5,587	5,473	114	2.08	
Drill & Jackbit Shops	73,874	68,293	5,581	8.17	
Heating Plant	9,442	13,454	4,012		29.82
Compressors	2,725,501	2,733,895	8,394		.31
Electric Haulage	516,711	480,146	36,565	7.61	
Ventilation	15,028	11,512	3,516	30.54	
Incline Pit	9,160	-	9,160	100.00	
Total	7,093,627	6,981,570	112,057	1.60	

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The increase in power consumption in 1942 is explained by the fact that we operated six more days in 1942 than in 1941. In 1941 the average power consumption per operating day was 23,117 k.w.h. For six days extra at the same rate the increase in 1942 should be 138,702 k.w.h. Actually, as shown in the comparison, the increase was only 112,057 k.w.h.

The power consumption increased 1.6% during 1942. The operating schedule increased 0.95% and production increased 8.3%.

18. NATIONALITY OF EMPLOYEES

The following table shows the various nationality groups employed at the mine as of December 31, 1942:-

	American Born	Foreign Born	Total
English	100	24	124
Finnish	105	73	178
Swedish	54	9	63
Italian	24	14	38
French	44	2	46
Norwegian	19	3	22
Irish	4	-	4
German	5	-	5
Austrian	1	-	1
Polish	1	-	1
Total	357	125	482

Comparison for 1942, 1941, and 1940 follows:-

	1942		1941		1940	
	Number	% of Total	Number	% of Total	Number	% of Total
English	124	25.73	113	24.3	107	24.7
Finnish	178	36.93	183	39.4	170	39.3
Swedish	63	13.07	61	13.1	56	12.9
Italian	38	7.88	38	8.2	34	7.9
French	46	9.54	37	7.9	35	8.1
Norwegian	22	4.56	21	4.5	19	4.4
Irish	4	.83	6	1.3	8	1.9
German	5	1.04	4	.9	2	.4
Austrian	1	.21	2	.4	2	.4
Polish	1	.21	-	-	-	-
Total	482	100.00	465	100.0	433	100.00

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1. General

All things considered, operations during 1942 were quite satisfactory. In spite of a badly depleted ore body, a very high rate of production was maintained, although indications at the end of the year were not at all favorable as regards the future life of the property. Production totaled 568,036 tons, an all-time high. The rate of production varied from a low of 40,869 tons in April to all-time high records in August, September, and October. Production for October was 56,069 tons.

A large scale program of exploration work was carried on throughout the entire year in an effort to discover and develop additional reserves. With the exception of several insignificant runs of high-grade ore, this program was not successful although it was being continued at the end of the year. The development of the 7th Level was started in the early months of the year after the completion of the tail track north of the shaft. The information obtained by drifting on the 7th Level was extremely disappointing in that a large portion of the area was very lean jasper instead of high-grade ore which was expected. In addition, this same mass of jasper was discovered in the main slicing area above the 6th Level. Both of these developments, plus the fact that the Silica content of the whole ore body has been steadily increasing, added materially to the difficulty of properly mining and grading the product; and decreased the reserves to a very great extent.

Shaft sinking under E & A, CC-86 was started in February with a winze beneath the new 7th Level skip pit and continued to a finished depth of 150' by the middle of August after which the pentice was removed and the skip pit excavated. By the end of the year drifting south of the shaft was well under way. As far as can be determined from available geological information, the new 8th Level will be at the bottom of the ore body.

Shipments of Lloyddale grade were somewhat smaller than for the previous year due to the fact that all the stocked ore of this grade had been cleaned up during the previous shipping season and the production of this grade for the current year was some 20,000 tons less than for the previous year. Shipments of Siliceous grade, however, were greatly increased from 51,397 in 1941 to 214,352 for the current year, the bulk of which was loaded from the stockpiles. At the end of the shipping season the Lloyddale reserves were completely exhausted and at the end of the year there was a stockpile inventory of 30,249 tons of this grade and 168,107 tons of Siliceous grade.

The operating schedule was held at 5-2/3 days per week, 3 shifts per day throughout the entire year. There was no change in the wage scale. On the 15th of December the employees at this property, by a large majority, chose the U.S.A. - C.I.O. as their exclusive bargaining agent. The collar to collar basis for underground men was continued throughout the year. Rate and one half was paid for all hours worked in excess of 8 in any one work day, or 40 hours in any work-week. Effective October 1, in accordance with the "President's Directive Order" and subsequent numerous interpretations, rate and one half was paid for work on designated holidays and double time was paid for any work done on a 7th consecutive day.

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1. General (Cont.)

In line with a general attempt to prevent attempts at sabotage, a fourth man was added to the police force in order to have the property guarded at all times. A burgular-proof fence was installed at the Section 6 air shaft, and the mine surface was fenced in as completely as practical. Identification cards were issued to the employees all of whom were also fingerprinted. Visitors' passes were issued to all persons having legitimate business on the property and admittance was refused to all others.

The bulk of mining operations was confined to the Lloyd East Deposit above the 6th and 7th Levels. By the end of the year operations above the 6th had been completed down to the 515' Sub-Level, and the bulk of the production was being obtained from the stoping and slicing areas above the 7th. Every attempt will be made during the early months of 1943 to speed up the driving of the new 8th Level since production will suffer materially if working places above the new level are not ready by the time mining is completed above the 6th.

2. PRODUCTION
SHIPMENTS &
INVENTORIES

a. Production by Grades

Grade	Tons
Lloyddale	368,050
Lloyd Silica	199,986
Total	568,036

This production compares with 558,253 tons in 1941, an increase of 9,783 tons. The high month was October with 56,069 and the low was April with 40,869. The percentage of Silica grade production was increased from 30.5% in 1941 to 35.2% for 1942. This compares with a production estimate for the year of 34%.

b. Shipments

Grade	Pocket Tons	Stockpile Tons	Total Tons	Total Last Year
Lloyddale	269,168	97,337	366,505	406,526
Lloyd Silica	58,790	155,562	214,352	51,397
Total	327,958	252,899	580,857	457,923
Total Last Year	286,139	171,784	457,923	
Increase	41,819	81,115	122,934	

Lloyddale grade shipments for 1942 were some 40,000 tons lower than in 1941 due to a shortage of this grade of ore. All of the stockpile reserves were completely cleaned up at the end of the shipping season. The shipments of Siliceous grade were more than four times as great as for the previous year and permitted the cleaning up of old piles east of the shaft which had been accumulated over the past several years. Even larger Siliceous grade shipments are predicted for 1943. Shipments for the past six years are shown in the following table:

Year -	
1937	644,395
1938	112,191
1939	477,848
1940	510,592
1941	457,923
1942	580,857

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2. PRODUCTION SHIPMENTS & INVENTORIES (Cont.)

c. Stockpile Inventories

Grade	Tons
Lloyddale	30,249
Lloyd Silica	168,107
Total	198,356

This stockpile balance is 12,821 tons lower than last year, although the balance of Lloyddale grade is slightly greater.

d. Division of Product by Levels

The ore produced above various levels was as follows:

	Lloyddale Tons	Lloyd Silica Tons	Total Tons
Sixth Level	211,023	108,869	319,892
Seventh Level	157,027	91,117	248,144
Total	368,050	199,986	568,036

Once again the area above the 6th Level was the larger producer. By the end of the year, however, the production from the area above the 7th Level had increased to the point where it constituted approximately half of the total hoist. During 1943 by far the greater portion of the mining will be in the area between the 6th and the 7th Levels.

e. Production by Months

Month	Days	Lloyddale Ore Tons	Lloyd Silica Tons	Total Ore Tons	Rock Tons	Tons Per Man Per Day
January	24-1/3	27,559	20,046	47,605	564	6.25
February	22-2/3	24,274	17,168	41,442	1,135	6.23
March	24-2/3	30,030	18,467	48,497	2,170	6.79
April	24-2/3	22,669	18,200	40,869	3,335	5.91
May	24-1/3	26,769	18,309	45,078	2,567	6.37
June	25	30,255	14,958	45,213	2,350	6.18
July	24-2/3	33,017	15,179	48,196	2,206	6.51
August	24-1/3	38,496	13,369	51,865	2,038	7.03
September	24-2/3	36,862	16,260	53,122	851	6.86
October	25-1/3	39,069	17,000	56,069 #	1,593	6.84
November	22-2/3	28,634	16,846	45,480	884	6.22
December	22-2/3	28,716	14,184	42,900	2,720	5.86
Total	290	366,350	199,986	566,336	22,413	6.421
Current Yr. Stockpile Over-run		1,700		1,700		
		368,050		568,036		

All-time high monthly production

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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, 1942	28,704	182,473	211,177	110,847
Output for year	368,262	198,074	566,336	556,122
Transfers	1,912	1,912		
Over-runs	1,700		1,700	2,131
Total	396,754	382,459	779,213	669,100
Shipments	366,505	214,352	580,857	457,923
Balance on Hand	30,249	168,107	198,356	211,177

Increase in Output	10,214
Increase in Shipments	122,934
Decrease in Ore on Hand	12,821

The operating schedule for the past five years follows:

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

1942 - 3-8 hr. shifts 5-2/3 days per week Jan. 1 to Dec. 31, 3 crews

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2. PRODUCTION SHIPMENTS & INVENTORIES

g. Delays

There were surprisingly few operating delays during 1942, when the uninterupted operating schedule is considered. The total time lost was nine hours and the estimated loss of product would not exceed 500 tons since in almost every case it was possible to make up for lost-time on the following shift.

Date	Time Lost	Reason
February 11	3 hrs.	Kink in North Skip Rope
February 26	1½ hrs.	Changing Skips
April 6	1 hr.	" "
June 20	3½ hrs.	Skip Hanging in Dump
Total	9 hrs.	

3. ANALYSIS

a. Average Mine Analysis on Output

Grade	Tons	Iron	Phos.	Silica
Lloyddale	368,050	58.85	.152	9.04
Lloyd Silica	199,986	53.14	.116	16.75

There were no straight cargoes forwarded from the mine during 1942.

b. Analysis of Ore in Stock Dec. 31, 1942

Grade	Tons	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
Lloyddale Dried	30,249	58.48	.135	9.92	.22	2.59	.67	.39	.010	4.90	
Lloyddale Nat.		51.609	.119	8.754	.194	2.286	.591	.344	.009	4.324	11.75
Lloyd Sil. Dried	168,107	53.16	.114	16.60	.25	2.95	.59	.47	.010	4.40	
Lloyd Sil. Nat.		47.004	.101	14.678	.221	2.608	.522	.415	.009	3.89	11.58

c. Complete Analysis of Ores Shipped

Grade	Tons	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
Lloyddale	366,505	58.75	.151	9.00	.27	2.15	.56	.40	.011	3.26	
Lloyd Silica	214,352	52.75	.120	17.27	.21	2.45	.59	.35	.010	3.24	

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4. ESTIMATE OF ORE RESERVES

a. Developed Ore

Estimate made Nov. 30, 1942 using a factor of 12 cu. ft. per ton.

	Lloyd East Deposit
Between 5th and 6th Levels	96,397
Between 6th and 7th Levels	507,651
Below 7th Level	249,479
Gross Tons Nov. 30, 1942	853,527
Less 10% for Loss in Mining	85,353
Total	768,174
Less 10% for Rock	76,817
Total	691,357
Less December Production	28,716
Total Developed Reserves	662,641

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

	1940	1941	1942
Ore in Mine Jan. 1st.	1,841,233	1,548,559	1,242,580
Production	349,277	388,111	368,050
Balance	1,491,956	1,160,448	874,530
Ore in Mine Dec. 31st.	1,548,559	1,242,580	662,641
New Ore Developed	56,603	82,132	211,889

As was previously stated in this report, a large mass of lean ore and jasper has greatly diminished the expected reserves in the main slicing area above the 6th Level and between the 6th and 7th Levels. Also, drifting operations on the 7th were very disappointing in that a large portion of the area is very lean and not mineable as standard grade ore. A third factor which tended to reduce the estimate of ore reserves was the unsatisfactory conditions found in the South Deposit; a considerable portion of which was mined during 1942. The remainder of this deposit lying above the 6th Level and the small amount of reserves which were last year estimated between the 6th and 7th Levels have now been abandoned. The remainder of the reserves above the 6th Level were too lean and spotty for further mining and the amount lying below the level is not sufficient to warrant development on the 7th.

All of the above factors had the effect of reducing the reserves at this property by 211,889 tons in excess of actual production.

b. Estimated Analyses of Ore Reserves

Grade	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
Lloyddale Dried	58.50	.150	9.00	.23	2.66	.65	.45	.010	4.80	
Lloyddale Nat.	51.77	.133	8.00	.20	2.35	.58	.40	.009	4.26	11.50

The above analyses apply to Lloyddale ore only since the old Lloyd Deposit was completely mined out during 1941 and the Lloyd South Deposit has been abandoned. Lloyd Silica reserves are not estimated.

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5. LABOR & WAGES

a. General

Labor relations were not nearly as satisfactory during 1942 as they were during the past several years. The supply of skilled competent men was entirely exhausted long before the end of the year, and it was necessary to assign young, inexperienced men to the more important jobs far too rapidly. All too frequently these young men were drafted into the service by the time they had become even reasonably well trained. The lowering of the draft age from 20 to 18 further complicated an already serious situation. The local draft board was quite fair and understanding in the deferment of older men in the more important job classifications, but the percentage of young men drafted from semi-skilled jobs was very high. Altogether there was a labor turnover of 74 men, with 331 carried on the roll at the end of the year as compared with 318 at the beginning. Thirty men entered the armed forces, and 21 quit to accept other employment. Of the remaining 23, 14 were transferred to other properties of the Company to facilitate transportation. Some of the men who left our employ to work elsewhere were aided by the U. S. Employment Service in spite of the national importance of our operation. It is expected that a rather large group of young men who recently registered when the draft age limit was lowered, will be called within the next few months. Due to their youth and the fact that their experience is limited, deferment is not being asked for most of this group.

Interest in the Marquette Industrial Range Union dropped to practically zero during 1942 due largely to the concentrated efforts of outside organizers for the C. I. O. By the middle of December, when a consent election was held at the property, the C.I.O. majority was overwhelming. Throughout the latter part of the year there was growing unrest amoung the employees, particularly the younger men who have had no experience elsewhere and who are quite easily stirred up by talk of "big money" in the defense plants. There is an increasing demand for double time penalty payments for Sunday repair work, and a fairly large number of the employees quit to seek better jobs in the defense centers.

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5. LABOR & WAGES (Cont.)

b. Comparative Statement of Wages & Product

	1942	1941	Incr.	Decr.
PRODUCT	568,036	558,253	9,783	
No. of Shifts & Hours				
Jan. 1 to Jan. 25		3-8 hr. (5 Days per week)		
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)		
Jan. 1 to Dec. 31	3-8 hr. (5-2/3 Days per week)			
AVG. NO. OF MEN WORKING				
Surface	62	59	3	
Underground	242	251		9
Total	304	310		6
AVG. WAGES PER DAY				
Surface	6.74	6.51	.23	
Underground	7.85	7.42	.43	
Total	7.62	7.24	.38	

Average wages per day Surface and Underground respectively were 1936 - 4.30 and 5.25; 1937 - 5.44 and 6.30; 1938 - 5.59 and 6.42; 1939 - 5.64 and 6.50; 1940 - 5.72 and 6.54.

WAGES PER MONTH OF 24 DAYS	1942	1941	Incr.	Decr.
Surface	161.76	156.24	5.52	
Underground	188.40	178.08	10.32	
Total	182.88	173.76	9.12	
WAGES PER MONTH OF 22 DAYS				
Surface	148.28	143.22	5.06	
Underground	172.70	163.24	9.46	
Total	167.64	159.28	8.36	
WAGES PER MONTH OF 18 DAYS				
Surface	121.32	117.18	4.14	
Underground	141.30	133.56	7.74	
Total	137.16	130.32	6.84	

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5. LABOR & WAGES (Cont.)

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

WAGES PER MONTH OF 12 DAYS	1942	1941	Incr.	Decr.
Surface	80.88	78.12	2.76	
Underground	94.20	89.04	5.16	
Total	91.44	86.88	4.56	
PRODUCT PER MAN PER DAY				
Surface	31.21	33.40		2.19
Underground	8.39	8.30	.09	
Total	6.45	6.65		.20
LABOR COST PER TON				
Surface	.226	.195	.031	
Underground	1.032	.894	.138	
Total	1.258	1.089	.169	
AVG. PRODUCT STOPING	23.86	21.62	2.24	
AVG. WAGES CONTRACT MINERS	8.46	8.01	.45	
TOTAL NUMBER OF DAYS				
Surface	18,198¾	16,713¾	1,485	
Underground	69,857¾	67,230½	2,627¼	
Total	88,056½	83,944¼	4,112¼	
AMOUNT FOR LABOR				
Surface	122,668.93	108,779.42	13,889.51	
Underground	548,457.50	498,916.95	49,540.55	
Total	671,126.43	607,696.37	63,430.06	

PROPORTION SURFACE TO UNDERGROUND MEN

1938 - 1 to 3.13
1939 - 1 to 3.66
1940 - 1 to 3.61
1941 - 1 to 4.25
1942 - 1 to 3.90

The increase in average wages per day and per month and the increase in the labor cost per ton was due almost entirely to the larger number of overtime shifts worked during 1942. Throughout the entire year, practically all of the employees worked two overtime shifts at rate and one half every three weeks. Certain types of necessary employees worked overtime shifts practically every week.

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6. SURFACE

a. Buildings

The only new building constructed during the year was a small watchmen's booth located at the main gate. This building was necessary to protect the officers during extremely cold weather.

Due to the very heavy mining program and to a marked decline in the quality of drill steel obtainable, it was necessary to build an addition to the blacksmith shop to house a second forge and drill shanking machine. All broken auger steel is now welded by the shop crew and put back into service instead of being scrapped. A small addition was also built to the steel storage shed east of the shop to provide additional room for storing miscellaneous machines and equipment.

In line with the plant protection program, the old head frame at the Section 6 air shaft was torn down and replaced with a small frame structure sheathed with corrugated iron. The shaft opening was covered with heavy, galvanized mesh at two different elevations to stop any attempt at throwing material into the shaft. As an additional precaution, a 10' burgular-proof fence was installed around this air shaft. Both the door in the shaft house and the gate in the fence are kept locked at all times, but can be opened from within by anyone coming up from underground.

The windows of the engine house were covered with iron mesh as a precaution against material being thrown through them.

The major repair program at the Lloyd shaft house was completed in 1941. The only work on this structure during 1942 was the dismantling and rebuilding of the permanent trestle on the east side of the shaft. A similar project for the west side is planned for 1943.

b. Stocking Grounds

For the first time in a good many years all the ore of both grades was completely removed from the east side of the shaft, permitting the rebuilding of the permanent and temporary stocking trestles which were in very poor condition. The piles of Siliceous ore immediately east of the shaft constituted an accumulation of a great many years. In order to accomplish this, a new stocking trestle was erected north of the shaft across the timber yard and L. S. & I. tracks into the large field north of the property. By stocking most of the currently hoisted ore in this new stocking grounds and loading most of the shipments from the stockpiles, it was possible to affect the clean-up which was badly needed. At the end of the shipping season, the new trestle was entirely filled with some 80,000 tons of this grade and two new trestles, ample for this season's stocking of both grades, had been built in the cleaned-up area. Next year's shovel loading of Siliceous grade will be concentrated west of the shaft with the same aim in view.

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6. SURFACE (Cont.)

b. Stocking Grounds (Cont.)

With the exception of a few thousand tons of wet ore between the two large Silica piles west of the shaft, all of the Lloyddale grade was stocked on the east side in three piles. These stocked reserves were cleaned up very early in the shipping season, the small pile to the west of the shaft being held until later when a portion of the Silica ore was also shipped. It is hoped that next year's shipments of Silica grade will permit cleaning up the west stocking area and rebuilding the trestles on that side.

In anticipation of handling large quantities of rock from the shaft sinking and 8th Level drifting operations, the large bulldozer from the Tilden was employed to remove one of the old rock piles, the material from which was pushed into the surface cave immediately south of the shaft. A new rock trestle was then erected which should suffice for the expected remaining life of the property.

c. Roads

The amount of work done on roads during 1942 was considerably greater than for the past several years. In line with the plant defense program, the so-called upper road to the property was fenced off and blocked with a gate which is kept locked at all times. This was done in order to limit the number of entrances to one main road. This main road was then widened and graded to provide ample room for passing cars and winter plowing. A parking lot was constructed inside the main gate to provide room to accommodate the cars for any two shifts. This arrangement enables the watchmen to keep an accurate check on anyone entering and leaving the property and to properly supervise the parking of employees' cars. During the winter it is now possible to plow half of the parking area while the cars occupy the other half. This has greatly facilitated the handling of the unusually large quantities of snow which fell during the latter months of the year.

A considerable portion of the old road which leads to the Section 6 air shaft was abandoned and re-located early in the year due to surface subsidence. This work was done very cheaply and effectively by means of the tractor and trail builder. The new location of this road is now permanent since it is back on the footwall where no further subsidence is expected.

7. UNDERGROUND

a. Shaft Sinking

Shaft sinking under E & A, CC-86 was started in February as soon as the condition of the 7th Level plat would permit. Work was started with a small crew in a winze at the 7th Level skip pit elevation in the ladder compartment. By the end of the month the winze had been completed and drifting under the pentice was well under way. Sinking was continued full-size under the pentice during the months of March, April, and May when the bearing pieces were installed and the excavation of the

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7. UNDERGROUND (Cont.)

a. Shaft Sinking (Cont.)

8th Level pockets begun. Work was continued during June, July, and August in the shaft, pockets, and on the 8th Level plat. Shaft sinking proper was completed early in August to the skip pit elevation at a depth of 220' below the 7th Level with a 150' interval between levels. During the remainder of August and the greater part of September, the excavation of the new skip pit and sump and the timbering of the shaft was completed. The new skip pit pockets were also constructed in September. The pentice was blasted late in September and cleaned up during the idle shifts on the week-ends in October after which the new cage rope was installed and the cage put through to the new elevation. During November the timbering in the skip roads was completed and the two new skip ropes installed by the 8th of the month after which the timbering of the pockets and the installation of the doors and the air cylinders were completed. Stripping operations on the new level were started late that month and continued throughout December.

All of the above work was carried on during a full, 3 shift operation with a crew of 5 men working 3 shifts per day. At no time was there any production delay due to the shaft sinking operation. The work extended from the first of February to the end of October and was completed without an accident of any kind.

b. Development

Development work during 1942 was carried on at a very rapid rate in order to keep abreast of stoping operations. The diminishing size of the deposit and the masses of unenriched material in the ore body made necessary a large amount of this work which under normal conditions would not have been needed. In order to maintain production it was necessary to crowd the slicing raises close together to provide a sufficient number of working places. Every small seam of enrichment was thoroughly explored and developed, also in an attempt to provide additional working places. By virtue of a development program which was almost twice as great as for any previous year in the life of this property, it was possible to maintain peak production and establish several new hoisting records.

In order to attain the above results, an average of 7, 3 shift contracts was kept on development work throughout the entire year. This does not include the shaft sinking crew of 5 men which was also working on a 3 shift per day schedule. The total number of contracts averaged 19, only 12 of which, or 63%, were engaged in stoping operations.

With the exception of comparatively small amounts of work on and above the 6th Level, development operations were concentrated on the 7th Level and sub-levels above. The 720 Cross-cut was completed early in the year after which the 700 Drift was driven practically the entire length of the ore body. The 740 Cross-cut was also driven in the extreme west portion of the deposit. Fifteen new double-compartment, cribbed raises, some of which went through to subs above the 6th Level, were put up during the year.

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7. UNDERGROUND (Cont.)

b. Development (Cont.)

From a standpoint of ore reserves, results obtained from this work were very disappointing. The 700 Drift was driven 200' in lean jasper instead of Lloyddale grade ore as was expected from previous diamond drilling. Results in the 720 Cross-cut were equally disappointing with less than 60' of high-grade ore as compared with approximately 130' as outlined by the drilling. The first raises put up on the south side of the 700 Drift went through 30 or 40 feet of jasper before encountering the ore. Later, several of these went back into jasper long before the 6th Level elevation was reached. The next several raises to the east were started in high-grade ore but encountered a large, vertical roll in the south foot. This roll not only increased the hazard of the work, but greatly decreased the estimate of available reserves above the level.

A large portion of the development work was done in advance of stoping operations on subs above the 7th Level. A long, intermediate drift was driven on the 375' Sub-Level connecting the slicing raises. This drift was put in for the purpose of ventilation, traveling, storage, and handling of timber and supplies. Three separate stope transfer drifts were also driven on this elevation in the west end of the ore body adjacent to the transverse fault. This latter drifting totaled approximately 750' of large ore drift. The mill raises and small-size sub-level drifts above these transfers, constituted a large portion of the total footage. The information obtained in the crotch between the north foot and transverse fault in the extreme west end of the ore body was very gratifying. The large stope which was developed in this area contributed greatly to the total production for the year. A second intermediate sub-level drift was driven on the 415' elevation connecting Raises Nos. 720, and 703 to 715 inclusive. This drift, which was approximately 425' in length, was also used for ventilation and the handling of supplies. The portion lying to the west of Raise No. 707 was eventually used as a stope transfer drift. During December the development of a small stope in the extreme east end of the ore body under the old top slicing territory was being carried on east of Raise No. 706 at this elevation.

Development work on the 6th Level was not very extensive. A short cross-cut, some 80' in length, was driven to the southeast of Raise No. 610 and a raise put up to the southwest to the 540' Sub-Level. A short drift, connecting the two cross-cuts in the South Deposit was also driven on the 6th Level elevation. The only additional development work on or above this level were the new Raises, Nos. 709, 710, 711, 715, 717, and 719, which were put up from the 7th Level below. Most of these raises were continued to the 480' and 490' Sub-Levels and connected with the cross-cuts on the level.

The total development footage for the year again reflects the effort that is being made to explore and develop with sufficient speed to keep pace with mining operations. This work, which totaled 19,476' exclusive of shaft sinking and 8th Level work, compares with 10,873' last year and 10,043' in 1940. The classification of the footage will be found in paragraph 7-e.