THE CLEVELAND - CLIFFS IRON COMPANY

Ore Mining Department

ANNUAL REPORT OF GENERAL MANAGER

For Year Ending December 31, 1945

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THE CLEVELAND-CLIFFS IRON COMPANY
ORE MINING DEPARTMENT
MANAGER'S ANNUAL REPORT
YEAR 1945
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Ishpeming, Michigan
March 8, 1946

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

Dear Sir:-

I am herewith submitting a brief summary of the Mining Department operations for 1945. The Mine Superintendents of the various mines both in Michigan and Minnesota, the Heads of the Geological Department, Engineering Department, Safety Department, Welfare Department and Cliffs Power & Light Company have already submitted their detailed reports for 1945 and copies of these reports as received are being transmitted to the Cleveland office for assembling and binding.

Maps and estimates for the Michigan State Tax Commission have also been sent to Cleveland to be relayed to the Michigan State Appraiser of Mines.

ADMINISTRATIVE STAFF

There were few changes in the administrative staff. Hugh Leach was put in charge of the Hill Trumbull Mine on March 1st, 1945. John Foucault was transferred to the Holman Cliffs, replacing Myron Youngberg who resigned. Capt. Richard Cattron was appointed District Mining Captain of the Negaunee District on August 1st, 1945. Mine Foreman Wilfred Tippett was promoted to the captaincy of the Negaunee Mine. Capt. Jack Olds retired as Captain of the Cliffs Shaft Mine on December 31st, his position being filled by promoting Matt Renowden. Alex Ham replaced J. W. Whiting as head of the Shipping Department for the Michigan operations. At the close of the year we also appointed Folke Johnson Assistant Mechanical Engineer, with the intention of retiring Ernest Keast early in 1946.

There were several changes on the Ishpeming Hospital staff. Dr. R. G. Williams reported on August 1st, 1945 and Dr. S. J. Greene, responsible for the Gwinn District, took over on October 20, 1945. Dr. R. L. Paine returned to the staff at the end of the year. These three doctors, together with Drs. Erickson, Hartt and Mudge, give us a good working staff.

LABOR SUPPLY

The Michigan mines continue to suffer from labor shortages. After V-E and V-J days we hoped that conditions would improve. However, it was late in the year before there was any radical change for the better. The following tabulation shows this very clearly:

MONTH	Number of Men Hired	Number of Separations	Labor Gains or Losses
January	15	22	7
February	57	19	38
March	35	12	23
April	38	28	10
May	14	30	16
June	23	21	2
July	15	24	9
August	21	36	15
September	35	45	10
October	38	39	1
November	51	38	13
December	62	35	27
TOTAL	404	349	55

By the end of the year 120 World War No. 2 veterans were employed at our Michigan Mines.

The labor shortage on the Mesaba was not quite so acute but at times we did not have the normal number of truck drivers.

PRODUCTION

Late in January, 1945, the operating schedule of the soft ore properties was increased from 40 to 48 hours per week. This was done to comply with a request of the War Production Board and the United States Employment Service for maximum ore production, and to avoid a possible shifting of employees from the Lake Superior country to the rubber tire production centers. On February 5th the stripping schedule in Minnesota was increased from five days to six days per week. During the ore shipping season, the 48 hour week was maintained at the open pits until stripping was resumed late in the year, at which time we reverted back to 40 hours.

Production from our Michigan and Minnesota mines for the past three years has been as follows:

Year	Michigan Mines	Minnesota Mines	TOTAL
1943	3,953,526*	2,541,933	6,495,459
1944	3,496,534*	2,400,481	5,897,015
1945	3,542,802*	2,376,286	5,919,088

* These figures do not include previous years stockpile overrun. The overrun tonnage is included if the stocked ore is loaded out in the same year.

Whereas production has been declining since 1942, in which year the combined total tonnage of our Michigan and Minnesota mines was 7,666,369, 1945 shows an upward trend by a small tonnage compared with 1944.

I am also pleased to report an increase in efficiency. Every one of our underground mines shows improvement, and the same trend towards increased efficiency prevailed on the Mesaba Range, if you take into consideration the small percentage of direct shipping ore moved from the Holman compared with the larger tonnage of "merch." loaded out in 1944. Just for the sake of the record the figures follow:

UNDERGROUND MINES

	1945 Tons per Man Per Day	1944 Tons per Man Per Day
Athens	5.20	4.72
Cambria Jackson	6.72	5.44
Cliffs Shaft	4.96	4.64
Lloyd	5.92	5.52
Maas	5.60	5.04
Negaunee	8.24	7.92
Princeton	6.32	5.12

OPEN PIT MINES

	1945 Tons per Man Per Hour	1944 Tons per Man Per Hour
Canisteo	7.09	5.48
Hill Trumbull	6.15	4.47
Holman Cliffs	4.13	3.90

CONCENTRATING EXPERIMENTS

Experiments continue in order to try to improve the performance of the concentrating plants on the Mesaba Range. The Stearns-Rober media concentrates did not improve the Canisteo flow sheet but they do seem to work well with the Hill Trumbull ore. Parts of the main mill at the Hill and also portions of the high density plant are being rearranged to permit treatment of the entire pit output as either a wash or retreat ore. The plant capacity of both mills will be increased by the elimination of rehandling all of the high density plant feed. These changes were started before the end of the year.

At the Holman mill the experimental hydroseparator, hydrotator and Dorrco sizer were given limited test runs, which indicated further changes must be made before these machines will give the desired results in making a finished product from the mill tailings. Due to delays in

deliveries and labor shortage, it was not possible to give these machines enough feed for a long enough time to properly evaluate their efficiency. The performance of these machines in 1945, however, was convincing enough to warrant further experimenting.

The Minerals Separation North America Corporation continued to make tests on tailings from the Canisteo washing plant at no cost to us.

ORE RESERVES

Reserve tonnages as reported to the Michigan State Tax Commission

	Dec. 31st 1944	Dec. 31st 1945	Increase or Decrease
Standard Ores	19,958,471	21,955,914	1,997,443
High Sulphur Ores	5,399,467	5,983,798	584,331
Total	25,357,938	27,939,712	2,581,774

Year end figures for Mesaba Range Mines

Canisteo	6,195,550	5,535,714	659,836
Hill Trumbull	3,041,220	2,803,876	237,344
Holman Cliffs	9,584,503	8,686,911	897,592
Total	18,821,273	17,026,501	1,794,772

Although the Mesaba reserves show a large shrinkage, it must be kept in mind that the Minnesota State Tax Commission does not require annual tax estimates. The tonnage figures in Minnesota are subject to review at any time during the year and some of the tonnages for our open pit properties will be increased during 1946 because a review of some of the tonnages by the Minnesota State Tax Department is scheduled for May 1st, 1946.

The shipments from Minneosta mines for 1945 of 2,376,286 indicate that some new ore was developed, because the shrinkage for the year was only 1,794,772.

ACCIDENTS & SAFETY DEPARTMENT

The year 1945 gave the company one of the best, if not the best, accident severity rating since the Safety Department was first established. The fatality rate of 0.32 based on "per thousand employees" is the lowest of any year, with the exception of 1932 - a depression year when operations were at a low ebb and when only a few employees were working. The average

fatality rate of 0.86 for the five year period 1941-1945 inclusive, is the lowest in the history of the Company.

The 1945 severity rating for all compensable accidents, including fatalities, is the lowest of all time, except 1932.

Including all lost time accidents our frequency rating is considerably below the nation's average for metal mining. The following table illustrates the fine record accomplished in 1945:

FATAL ACCIDENT RECORD

Year	Number of men Employed	Number of Fatalities	Fatality Rate
1901-1905	7,729*	41	5.30
1906-1910	13,028	66	5.06
1911-1915	13,332	35	2.70
1916-1920	18,348	43	2.36
1921-1925	12,282	20	1.61
1926-1930	10,438	72	6.90
1931-1935	5,298	11	2.05
1936-1940	12,691	12	0.94
1941	3,570	5	1.40
1942	3,562	2	0.56
1943	3,609	4	1.11
1944	3,584	3	0.84
1945	3,078	1	0.32

* Total men employed in the five year period. Average per year 1,546. Figures for successive five year periods are all on similar basis.

An interesting tabulation shows the number of tons mined per fatality. 1945 gives us a new high:

NUMBER OF MAN SHIFTS WORKED & TONS OF ORE PRODUCED PER FATALITY

Year	Number of Fatalities	Number man days worked per fatality	Number tons of ore mined per fatality
1931	3	165,137	529,680
1932	-	189,000	486,750
1933	2	94,689	398,357
1934	4	80,477	451,046
1935	2	196,883	1,136,215
1936	2	283,945	1,850,898
1937	1	765,702	5,216,879
1938	3	163,434	1,385,954
1939	1	564,433	3,713,389
1940	5	142,878	1,156,387
1941	5	182,340	1,456,528
1942	2	512,356	3,808,258
1943	4	269,351	1,624,315
1944	3	331,090	1,995,787
1945	1	915,666	5,970,577
15 YEAR AVERAGE	2.53	253,025	1,573,033

It should be noted that we produced last year almost 6,000,000 tons of ore per fatality, which is an unusually fine record.

Frequency and Severity rates for all compensable accidents for the past three years follow:

FREQUENTY RATE

Year	Number man Days Worked	Number non-fatal accidents	Fatalities	Frequency Rate
1943	1,077,402	171	4	20.30
1944	993,272	121	3	15.61
1945	915,666	107	1	14.74

SEVERITY RATE

Year	Non-fatal Days Lost	Days Lost Due to Fatalities	Severity Rate
1943	10,355	24,000*	3.986
1944	7,759	18,000	3.242
1945	7,624	6,000	1.860

* Since 1942 the National Safety Council and the U. S. Bureau of Mines methods for determining ratings, used 6,000 days lost for each fatality.

The 1944 national ratings for all mining and metal mining were as follows:

	Frequency	Severity
1944 National rating - all mining	50.53	8.46
1944 National rating - metal mining	25.39	5.91
C.C.I.Co. rate for 1945	14.74	1.86

Our company conducted a metal mine accident prevention course during the early part of 1945. Approximately 100 out of a total of 148 of our supervisory staff on the Marquette Range took a course in accident prevention from Max Peterson, instructor of the U. S. Bureau of Mines staff Duluth. 20 hours of instruction were given in ten periods of two hours each. Lantern slides and graphs were used to instruct the classes but the greatest benefit came from the straight-forward discussions drawn out of the men.

LABOR MATTERS

Following the War Labor Board Directive on shift differentials, vacation and holiday pay, several meetings were held with the union regarding a new contract. At the first meeting held in August, the union presented their contract proposal to us and at a later meeting we submitted our idea of a contract to the union. Finally on September 14th the local company and

and union representatives signed an agreement, the terms and conditions of which were supposed to be in effect until February 1st, 1947.

On November 28th, 1945, a strike vote was taken at all of our properties. 72% of the eligible employees voted in Michigan. In Minnesota 70% cast their ballots. 72½% of those voting in Michigan chose to strike. The figure for the Minnesota Range was 90%. On the average the Marquette Range vote showed the smallest percentage in favor of striking in the Lake Superior District.

While this is being written the strike is going into its fourth week because the union persists in following the national pattern in demanding a wage increase of 18-1/2¢ per hour.

BUILDING LOTS

Considerable time was spent surveying the possibility of platting new lots in the City of Ishpeming area or Ishpeming Township, to the north and east of the Mather Mine. Over the long range viewpoint areas for building lots might possibly be considered even though they might be at a considerable distance from the present boundaries of the cities of Ishpeming and Negaunee. However, from a practical standpoint the immediate need is for lots close to the present site of Ishpeming, because there are possible locations on the footwall and over the hard ore horizon where new homes can be built that will be undisturbed for many years in the future.

SPECIAL PROJECTS

Concentrating experiments on Republic jaspers are being continued. It is more than probable these jaspers in particular lend themselves to concentration more readily than the general run of Marquette Range jaspers. They probably can be concentrated into a finished project much easier and at less expense than the Mesaba Range taconite.

In the underground soft ore mines, we are trying out several changes in mining methods. For years the prevailing system in soft ore mines was top slicing. This method insures good extraction and little dilution to lower the iron value and increase the percentage of silica. It is also a very safe system of mining. Because we must maintain the grade of ore to sell on the open market, no new mining method that tends to dilute the grade can be considered. The average silica in Cliffs Group the past two years has been a little over 9%, which is about the maximum the trade will stand for.

At the Mather Mine all of the ore has been mined by the stoping or sub-caving system and as far as possible eliminating chute loading by the use of scraper loading subs.

At the Cambria Jackson Mine nearly half of the year's product was obtained by sub level caving, which helped to reduce the cost on cars from $2.964 in 1943 to $2.695 and $2.475 in 1944 and 1945 respectively. The Cambria thereby shows one of the best improvements in efficiency and lowering of costs of all of our operating mines.

At the Athens sub level caving has shown little improvement in cost over the top slicing system but the over-all efficiency due to an increase in manpower allocated to that property by our Employment Office, gave us a decided reduction in costs. For the first time in three years, despite the added burden of charging off a full two years of retroactive wage adjustments, the Athens Iron Mining Company completed 1945 practically in the black, the actual deficit being less than $500.00.

The Negaunee Mine cost on cars for the last three years has remained practically stationary, around $2.086, due partially to the change in ore extraction methods. We have successfully operated several new sub level stopes here for the first time in many years.

The Princeton Mine also adopted sub level caving and transfer loading drifts as far as practical, which resulted in the tons per man per day being increased about 30%, resulting in a large decrease in the cost of production for 1945.

SUMMARY

All of our active mines on both the old Ranges and Minnesota improved their operating records in 1945. Our Safety Department reported a remarkable record this past year. These performances were only possible by the fine cooperation and team work of our administrative staff working under severe handicaps. The mines have partially recovered from the slump due to shortage of manpower and general inefficiency which prevails everywhere when labor is scarce. Rationing restrictions and the increase in over-all age of our employees due to inductions and enlistments of the younger age group also had a tendency to destroy efficiency. Part of this trouble has been cured, much still remains to be done, and the entire supervisory force is aware of the fact that it is their duty and responsibility to increase efficiency in order to get lower costs. All of them are aware of the pressure brought on us by the CIO. They are cognizant of the OPA situation; of our competitive position. For that reason they realize that labor costs must be held and every effort must be made by improved mining methods, improved machinery, in an effort to keep our costs on a par or better than our competitors.

Yours very truly

CJS:DP

Manager

THE CLEVELAND-CLIFFS IRON COMPANY
MINING DEPARTMENT
COMPARATIVE FIGURES FOR 1945 AND 1944 OF THE SEVEN PRINCIPLE PRODUCING MINES

YEAR 1945

MINE	PRODUCTION	COST OF PRODUCTION PER TON	COST OF PRODUCTION AMOUNT	TOTAL COST PER TON	TOTAL COST AMOUNT
Athens	438,427	2.589	1,135,286.97	3.070	1,345,800.22
Cliffs Shaft	550,169	2.665	1,466,927.65	3.095	1,703,184.88
Cambria-Jackson	315,514	2.201	694,576.84	2.475	781,025.40
Lloyd	326,633	2.323	758,916.85	2.632	859,616.55
Maas	558,633	2.523	1,409,368.60	3.034	1,695,161.36
Negaunee	654,447	1.786	1,169,012.21	2.042	1,336,189.85
Princeton	269,041	2.116	569,429.10	3.917	1,053,935.60
Total	3,112,864	2.314	7,203,518.22	2.819	8,774,913.86

YEAR 1944

Athens	421,153	2.726	1,148,413.60	3.265	1,375,351.67
Cliffs Shaft	587,051	2.749	1,613,815.67	3.168	1,859,840.74
Cambria-Jackson	282,184	2.370	668,925.11	2.738	772,682.11
Lloyd	376,758	2.349	885,039.85	2.664	1,003,755.38
Maas	578,307	2.521	1,457,901.12	3.055	1,766,947.96
Negaunee	757,677	1.733	1,313,460.62	2.129	1,613,121.91
Princeton	216,512	2.503	541,932.52	3.968	859,207.11
Total	3,219,642	2.370	7,629,488.49	2.873	9,250,906.88

1945				
Decrease in Product ..	106,778			
Decrease in Cost		.056		.054
Percent	3.3%	2.4%		1.9%

NOTE: The retroactive wage adjustment, which included shift differential, vacations, etc. in accordance with W. L. B. directive dated March 23, 1945 amounted to $300,448.82. $151,506.06 applicable to 1944 operations and $148,942.76 to 1945. The above statement includes the wage adjustment allocated to the both years for the respective units.

The penalty cost on overtime increased in 1945 due to the soft Ore Mines going from a 10 shift per week-schedule to 12 shifts per week effective Feb. 1, 1945 throughout the balance of the year.

	PENALTY COST OF OVERTIME	COST PER TON	RETROACTIVE WAGE ADJUSTMENT	COST PER TON	TOTAL
1945	262,594.72	.084	148,942.76	.048	.132
1944	190,525.44	.059	151,506.06	.047	.106
1945 over 1944 Increase	72,069.28	.025	2,563.30	.001	.026

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 IRON MINING	THE C.P.&L.CO.	TOTAL FOUR COMPANIES		CHANGES FROM PREVIOUS YEAR
			ASSESSED VALUATION				
1929 -	$ 13,291,521	5,284,600	2,586,500	1,318,198	22,480,819		
1930 -	14,169,590	4,884,400	2,436,500	1,370,445	22,860,935	I	380,116
1931 -	13,867,696	4,635,700	2,536,500	1,539,428	22,579,324	I	218,389
1932 -	12,815,645	4,185,700	2,226,500	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 -	11,936,427	5,418,800	2,785,300	2,134,715	22,275,242	I	1,409,311
1944 -	12,326,490	5,022,010	2,868,550	2,134,755	22,351,805	I	76,563
1945 -	11,949,265	4,809,060	2,446,740	2,135,750	21,340,815	D	1,010,990
			TAXES PAID				
1929 -	$476,740.79	199,695.33	97,739.13	55,233.01	829,398.26		
1930 -	552,901.50	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	674,901.02	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	90,003.70	39,846.19	626,978.76	D	15,236.87
1942 -	321,091.30	182,845.08	91,057.97	37,686.66	632,681.02	I	5,702.26
1943 -	380,652.40	202,371.63	107,251.69	40,623.07	730,898.79	I	98,217.77
1944 -	436,214.77	200,703.60	121,015.20	40,577.13	798,510.70	I	67,611.91
1945 -	425,599.58	191,565.47	104,255.07	40,964.14	762,384.26	D	36,126.44

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

The 15 Mill Tax Amendment went into effect in year 1933.

The State Sales Tax became effective July 1933.

Morris Mine taxes are 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 acquisitions and that part paid by The CCICo., is included in Negaunee Mine column and likewise deducted from The CCICo., valuation and taxes.

HJC:mvh
1-18-46

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

	1942	1943	1944	1945
PRODUCT - Tons	713,530	634,628	587,051	550,169
POWDER				
Pounds - Gelamite "2X"	593,600	625,100	585,750	523,450
60% Gelatine	55,200	11,000		350
Total Pounds Powder	648,800	636,100	585,750	523,800
Total Cost	74,716,90	73,151.25	67,367.00	60,549.00
Fuse - Feet	1,144,340	1,029,300	836,561	791,194
Caps - Number	172,820	154,000	136,500	124,160
Duplex Shot Wire	30,870	48,710	26,480	17,760
Electric Caps	8,611	14,224	15,498	12,358
Fuse Lighters	53,300	47,500	35,000	35,000
Connecting Wire			637	637
Powder Bags	53,500	15,000	35,000	11,700
Total Cost - Fuse, Caps, Etc. .	11,042.52	10,729.02	9,562.74	8,323.06
Total Cost - All Explosives	85,759.42	83,880.27	76,929.74	68,872.06
Average Price per pound - Powder ...	.1150	.1150	.1150	.1150
Cost per ton - Powder	.1047	.1152	.1148	.1100
Cost per ton - Fuse, etc.	.0155	.0169	.0163	.0151
Cost per Ton - All Explosives	.1202	.1321	.1311	.1251
Pounds Powder per ton of ore	.9092	1.0020	.9980	.952

1945 Production decreased 36,882 tons or 6.3% compared with 1944.
The average price per pound for Powder was the same during the two years.
The cost per ton for all explosives decreased 4.5% compared with 1944.

JSM:RN
2-25-46
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STATEMENT SHOWING COMPARATIVE COST OF ALL EXPLOSIVES USED AT SOFT ORE MINES

	1942	1943	1944	1945
PRODUCT - Tons	3,494,309	3,178,907	2,700,228	2,562,695
POWDER				
Pounds - 40%				150
50%			815	
60%	59,875	58,100	74,070	37,457
IX and 2X Gelamite	1,514,069	1,345,292	1,092,650	1,093,650
Total Pounds - Powder	1,573,944	1,403,392	1,168,535	1,094,659
Total Cost - Powder	181,126.68	161,384.48	134,423.51	125,861.91
Fuse - Feet	5,428,099	5,296,582	4,190,851	3,824,987
Caps - Number	769,919	726,184	599,138	541,726
Leading Wire - Feet	3,000	1,885	4,000	4,500
Connecting Wire - Pounds	138	65	172	72
Tamping Bags - Number	150,400	157,700	96,450	86,295
Sealing Compound - Pints				
Powder Bags	167	204	93	127
Fuse Lighters	140,250	137,200	121,084	105,700
Master Fuse Lighters	9,450	10,441	1,548	2,000
Electric Exploders	11,895	10,716	11,619	4,074
Total Cost-Fuse, Caps, etc.	41,175.44	39,381.05	31,530.09	28,557.13
Total Cost - All Explosives	222,302.12	200,765.53	165,953.60	154,419.04
Average Price Per Pound - Powder	.1150	.1150	.1150	.1150
Cost per Tons - Powder	.0518	.0508	.0498	.0491
Cost per Ton - Fuse, Caps, etc	.0118	.0124	.0117	.0112
Cost per Ton - All Explosives	.0636	.0632	.0615	.0603
Pounds of Powder per Ton of Ore	.4504	.4414	.4328	.4271

NOTE - The mines included in 1945 figures are, Athens, Maas, Negaunee, Lloyd, Princeton and Cambria-Jackson. Virgil ore reserves depleted in 1945.
The average price per pound for powder and the cost per ton for all explosives was practically the same for the two years.

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

		1942	1943	1944	1945
PRODUCT - Tons		3,494,309	3,178,907	2,700,228	2,562,695
TIMBER					
Feet - 6-8"		556,638	751,812	533,365	345,704
8-10"		367,747	311,432	266,988	179,170
10-12"		642,825	584,188	495,134	390,086
12-14"		266,819	347,562	274,828	233,952
14-16"		12,555	27,876	21,906	16,714
Treated Timber		4,785	741	250	8,389
Total Feet		1,851,369	2,023,611	1,592,471	1,174,015
Total Cost	$	155,394.02	199,569.46	174,030.56	136,629.67
LAGGING					
Feet - 5		2,800	9,933		
7		8,857,020	8,815,982	7,508,090	6,458,823
Total Feet		8,859,820	8,825,915	7,508,090	6,458,823
Cost	$	82,967.91	90,857.37	106,325.33	90,743.61
Poles - Feet		6,048,020	6,488,241	5,616,789	5,479,330
Poles - Cost	$	101,577.72	117,610.72	113,484.62	115,326.82
Wire Fencing - Rods		1,555	1,686	1,147	208
Wire Fencing - Cost	$	1,634.83	1,720.97	1,159.38	240.12
Grand Total Cost	$	341,574.48	409,758.52	394,999.89	342,940.22
Average Cost per Foot - Timber	$	.0839	.0986	.1093	.1164
" " " 100' - Lagging		.9364	1.065	1.416	1.405
" " " 100' - Poles		1.6795	1.812	2.020	2.104
" " " Rod - Fencing		1.051	1.021	1.011	1.150
Feet of Timber Per Ton of Ore		.530	.637	.590	.458
" " Lagging " " "		2.535	2.682	2.780	2.520
" " Poles " " "		1.731	2.041	2.080	2.138
" " Fencing " " "		.0073	.0087	.007	.0013
Cost Per Ton for Timber		.0445	.0628	.0644	.0533
" " " " Lagging		.0237	.0286	.0394	.0354
" " " " Poles		.0291	.0370	.0420	.0450
" " " " Fencing		.0005	.0005	.0005	.0001
Total Cost Per Tons		.0978	.1289	.1463	.1338

NOTE: The Mines included in 1945 figures are, Athens, Maas, Negaunee, Lloyd, Princeton and Cambria-Jackson. Virgil Mine ore reserves depleted in 1945.
The total cost per ton for all timber in 1945 decreased $.0125 or 8.5% compared with 1944

Comparative Statement of Prices

	1945	1944	Inc. or Dec.	Percent
All Stull Timber - Cost per Foot	.1164	.1093	.0071	6.5
Lagging - Per 100 Lin Feet	1.405	1.416	.011	.8
Poles - " " "	2.104	2.020	.084	4.2

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

SOFT ORE MINES

	1942		1943		1944		1945	
PRODUCT - Tons	3,494,309		3,178,907		2,700,228		2,562,695	
CLASSIFICATION	AMOUNT	PER TON	AMOUNT	PER TON	AMOUNT	PER TON	AMOUNT	PER TON
General Supplies	156,046.21	.0447	127,302.86	.0400	137,163.65	.0507	118,680.10	.046
Iron and Steel	48,634.64	.0139	49,137.31	.0155	52,197.63	.0198	38,150.87	.015
Machinery	88,089.44	.0253	71,498.54	.0225	61,542.27	.0228	56,165.00	.022
Explosives	218,427.41	.0625	202,625.24	.0637	167,982.88	.0622	155,417.06	.061
Lumber and Timber	371,563.75	.1063	447,172.36	.1407	432,768.85	.1601	373,091.09	.145
Fuel	23,571.18	.0067	29,523.80	.0093	34,429.02	.0127	30,192.55	.012
Electric Power	470,499.99	.1346	499,761.56	.1572	494,302.75	.1831	452,656.12	.177
Miscellaneous	105,397.23	.0302	192,730.29	.0606	185,608.31	.0686	163,071.12	.063
Total	1,482,229.85	.4242	1,619,751.96	.5095	1,565,995.36	.5800	1,387,423.91	.541

HARD ORE MINES

PRODUCT ....Tons	713,530		634,628		587,051		550,169	
CLASSIFICATION								
General Supplies	61,270.59	.086	39,810.89	.063	40,688.16	.069	37,900.25	.068
Iron & Steel	43,009.66	.061	37,083.42	.058	39,443.60	.068	33,933.08	.062
Machinery	35,466.73	.049	24,381.96	.039	23,556.93	.040	17,083.10	.031
Explosives	85,759.42	.120	83,880.27	.132	76,929.74	.131	68,872.06	.125
Lumber and Timber	11,518.56	.017	11,464.17	.018	15,980.43	.027	15,546.68	.028
Fuel	5,263.55	.007	5,921.98	.009	5,988.68	.010	6,111.06	.012
Electric Power	104,081.28	.146	107,603.42	.170	111,649.01	.190	102,385.23	.186
Miscellaneous	39,067.53	.054	64,266.13	.101	60,069.89	.103	69,252.06	.126
Total	385,437.32	.540	374,412.24	.590	374,306.44	.638	351,083.52	.638

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NOTES: Soft Ore Mines included in statementabove, Athens, Maas, Negaunee, Lloyd, Princeton and Cambria-Jackson. Virgil Ore reserves depleted in 1945.

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

	1942		1943		1944		1945	
Less Champion Purchased Ore		7,602,068 58,305						
PRODUCT - TONS		7,543,763		6,524,441		5,958,102		5,926,724
	DAYS	AMOUNT	DAYS	AMOUNT	DAYS	AMOUNT	DAYS	AMOUNT
Surface	365,987	$2,535,635.72	399,687	$2,993,417.97	384,372	$2,879,649.20	359,951	$2,874,020.12
Cost per Ton		.336		.459		.483		.485
Underground	596,685½	4,655,973.87	614,254¾	5,069,232.61	546,173	4,510,435.55	495,916	4,539,430.56
Cost per Tons		.617		.777		.757		.766
Superintendence & General Rolls	60,632½	490,346.66	61,983½	525,218.87	62,007	523,995.29	61,504½	585,781.08
Cost per Ton		.065		.080		.088		.099
GRAND TOTAL	1,023,305	7,681,956.25	1,075,925¼	8,587,869.45	992,552	7,814,080.04	917,371½	7,999,231.76
COST PER TON		1.018		1.316		1.328		1.350
Average Rate Per Day		7.51		7.98		7.97		8.72
Tons Per Man Per Day (1)		7.37		6.06		6.00		6.46

(1) Production	7,602,068	6,524,441	5,958,102	5,926,724
Prior Year Stockpile Overrun	72,753	None	29,260	43,853
Total	7,674,821	6,524,441	5,987,362	5,970,577

NOTES: The above is the total of all wages and salaries for employees of the Mining Department, including the Cliffs Power & Light Company.

WAGES:
Retroactive adjustments in accordance with War Labor Board Order dated March 23, 1945 was paid in 1945. This order included shift differential, overtime for 6th day account of Holiday, rate adjustment to minimum rate, and vacation pay adjustment.

WORKING SCHEDULE - 1946 - MICHIGAN PROPERTIES:
January 1st to January 21st the Athens, Maas, Cambria-Jackson, Negaunee, Mather Princeton and Spies Virgil operated 2-8 hour shifts 5 days per week. Effective January 21st these mines started operating 2-8 hour shifts 5 days and 1-8 hour shift on Saturday, and changed to 2-8 hour shifts 6 days per week on February 5th and continued on this basis throughout the year.
The Cliffs Shaft Mine continued to operate 2-8 hour shifts per day 6 days a week throughout the year.
The Lloyd Mine effective February 5th mined or 3-8 hour shifts 6 days per week and hoisted ore 6 days 2-8 hour shifts per week.

MINNESOTA PROPERTIES:
Canisteo Mine - Ore operations commenced May 7th working 2-8 hour shifts per day 6 days per week untill October 7th. From October 7th to October 13th the mine was on 1-8 hour shift 6 days per week. Operations suspended October 13, 1945.

Holman-Cliffs Mine - Operations began intermittent loading of Direct Ore on April 2nd. Crude Ore and Washing Plant operations began May 1st on a 2-8 hour shift 6 day per week operation. Ore operations completed on October 27th 1945.

Hill-Trumbull Mine - Operation commenced April 23, working 2-8 hour shifts per day 6 days per week. Operations suspended October 31st. 1945.

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COMPARISON OF TOTAL DAYS WORKED AND TONS OF ORE MINED FOR THE YEARS 1945 AND 1944.

	1945 DAYS	1944 DAYS	1945 DAYS	1944 DAYS
NON-PRODUCTIVE UNITS:				
Mather Mine	- -	47,249¼		
Miscellaneous Payroll	15,859½	3,500½		
Shops and Storehouse	4,685¾	4,643¾		
C. C. I. Co. Miscellaneous and General	54,846¾	62,262¼		
Negaunee Mine Co. Miscellaneous & General	2,181¾	2,692		
Athens Iron Mng. Co. Miscellaneous & General	2,323¼	1,144		
Mesaba- Cliffs Mining Co.	43,863½	50,504¼		
Canisteo Mining Company	16,517	16,501½		
The Cliffs Power & Light Company	15,879¾	18,176		
General Roll - Undistributed	38,606	38,613½		
Total Deductions	194,763¼	245,287		
Grand Total - All Operations	917,371½	992,552		
Net Operating Mines	722,608¼	747,265	722,608¼	747,265
Total Tons	5,926,724	5,903,381		
Tons per Man per Day	8.20	7.90		
OPEN PIT PRODUCTION	TONS			
Tilden Mine	197,476	214,824	6,587¾	6,861
Canisteo Mine	659,836	567,146	20,867	20,484
Hill Trumbull Mine	836,685	787,150	33,721¼	38,488
Holman Cliffs Mine	879,765	1,046,185	35,140	40,885
Total	2,573,962	2,615,305	96,316	106,718
Open Pit - Tons per Man per Day	26.72	24.50		
Net Days - Underground Mines			626,292¼	640,547
Net Tons - Underground Mines	3,352,762	3,288,076		
Underground Mines - Tons per man per Day	5.35	5.13		

PERCENTAGE OF TOTAL PRODUCTION	1945		1944	
Underground Mines	3,352,762	56.57%	3,342,797	56.10%
Open Pits	2,573,962	43.43	2,615,305	43.90
Total	5,926,724		5,958,102	

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STATEMENT SHOWING PENALTY COST OF OVERTIME WORKED BY EMPLOYEES DURING YEAR 1945 AND EFFECT THE PENALTY COST HAD ON THE YEAR'S PRODUCTION COST

	MICHIGAN PROPERTIES	MESABA RANGE			TOTAL
		CANISTEO	HILL TRUMBULL	HOLMAN CLIFFS	
YEAR 1945					
January	13,899.64	341.41	240.11	308.80	
February	27,686.48	1,193.91	1,546.86	1,578.97	
March	36,098.58	1,996.37	2,480.44	2,251.81	
April	28,397.68	1,619.93	2,667.39	2,424.35	
May	29,546.74	1,895.80	3,557.99	3,109.91	
June	29,192.44	1,820.21	3,014.31	3,192.49	
July	24,230.44	1,545.14	3,166.40	2,974.50	
August	26,537.88	1,756.74	3,205.08	3,578.29	
September	31,652.83	1,921.41	3,315.32	3,393.06	
October	31,070.16	1,610.29	3,466.39	3,293.11	
November	24,210.14	280.81	303.22	502.44	
December	32,203.05	707.11	705.06	622.12	
Total 1945	334,726.06	16,689.13	27,668.57	27,229.85	406,313.61
Total 1944	232,899.17	13,381.97	28,474.76	33,238.07	307,993.97
PRODUCTION					
Tons - Year 1945	3,542,802	659,836	836,685	879,765	5,919,088
Tons - Year 1944	3,496,534	567,146	787,150	1,046,185	5,897,015
EFFECT THE PENALTY COST HAD ON YEAR'S PRODUCTION COST					
Increased 1945 by	.0945	.0253	.0331	.0310	.0686
Increased 1944 by	.0666	.0236	.0362	.0318	.0522

NOTE: The penalty cost on overtime increased in 1945 due to the Michigan Soft Ore Mines going from a 10 shift per week- 5-2-8 hr shifts schedule to a 12 shift per week- 6-2-8 hr shift schedule, effective February 1, 1945 and continuing the balance of the year.

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CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1945

1. GENERAL:

The Cliffs Shaft Mine produced 550,169 tons of ore in 303 operating days in 1945. We did not quite reach the budget estimate of 561,270 tons of production because our available manpower dropped to a lower point than in any of the other war years. This condition was most acute in the shipping season with the reversal in the trend of decreasing manpower starting in November and December. Because of lack of manpower and due to the demand for lump ore, we kept all the crews that we could on stoping operations during the months of May through October. As a consequence direct, development work suffered a serious cutback during the year. During 1943 we employed 22% of the total crews in the mine on direct development, that is, raising and drifting. In 1944 we used 22.6% of the crews on direct development and in 1945 we had only 11.9 crews or 14.16% of the total engaged in this work. There was an average of 84 gangs working in the mine throughout the year. As manpower becomes available it should be our policy to increase the total number of mining crews. The bulk of this increase will have to be applied to development work. From this course of action ore production can be expected to be somewhat less than in 1945 but we will be able to once more have a favorable balance in the ratio of developed working places to the number of active gangs.

The Cliffs Shaft Mine shipped a total of 606,144 tons during the year. Of this amount 8,667 tons was overrun estimated by the engineers in the previous years stockpile of crushed ore. Inasmuch as all of the ore was shipped out of the stockpiles by October 25th, 1945 we were able to establish the overrun accurately for 1945 production at 14,715 tons or 2.67%. Current year overrun was 4,334 tons on stockpiled ore and 10,381 tons on pocket shipments. The skip weight factor remained constant at 5.10 tons per skip throughout the year 1945.

Several changes were made in the size of screen sections on the revolving screen during the year. The average screening ratio for the year was 78.19% lump and 21.81% crushed ore.

During 1945 a number of major items of new and used equipment were purchased or ordered for the surface plant. In the engine house a used, 100 K.V.A. converter with transformer and control panel was purchased and installed as a spare unit for the production of direct current for the underground haulage. Two new auxiliary hoist brakes for the hoisting engines were purchased but have not been installed. A set of stator coils for the hoist motor was purchased and stored in the engine house for replacement of the "A" Shaft motor's coil when that unit finally fails. For the pumping system that supplies cooling water to the compressors, we bought and repaired a used Triplex pump. One of the compressors had a low pressure piston replaced and we completed the piping of this compressor with copper pipe. We also purchased a set of new light fixtures for the engine house which will be installed in 1946.

A new boiler, stoker and condensate pump was ordered for the main dry heating plant. Pending the arrival of this equipment we laid new steam lines from the main dry to the engine house, oil house, mine office, surface dry and "B" Shaft house.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1945

1. GENERAL: (Cont'd)

In the crusher building the equipment purchased during 1945 consisted of replacements. There were 8 complete screen sections bought in 1945. For the crusher we got a crusher gear, bevel pinion and one new belt.

Other surface equipment consisted of 11 rubber-lined idler sheaves, a portable electric hand drill and an A.C. welder. We also repaired one skip and cage unit at the Hard Ore Shops.

For the underground system we purchased in 1945, one 9' Aerodyne Junior ventilating fan not yet installed, one Worthington Horizontal Duplex pump not yet installed, a transformer and 2300 Volt cable for the extension of the scraper cable system to Section 10. To speed development drifting we bought a Cleveland Mine Rig and an Eimco Model 40 shovel. We also purchased one D-89 drifter, one D-12 drifter, 6 DA-35 drifters, two D-12 Automatic drifters and one DA-35 Automatic drifter. In the pump house we installed a new impeller shaft in the Gould centrifugal which serves as our spare pump until we get the new pump installed. Two new batteries replaced old ones on battery locomotives. One of these was a 25 cell and the other a 48 cell battery. We also obtained the necessary square fir timber to retimber one level between 9th and 10th levels in "A" Shaft and two levels between 8th and 10th levels in "B" Shaft.

In the last three years the Oliver Iron Mining Company established a connection between the 1st level (+490 elev.) of the Holmes Mine via a drift and raise to the bottom or 920' level (+540 elev.) of the No. 7 Hard Ore Mine. The old hard ore mine was pumped out in this period and thoroughly sampled. During 1945 we were appraised of the fact that the Holmes Mine would be closed and allowed to fill with water. Although the possibility might be remote, we considered it advisable to seal the connecting drift between the Holmes and the No. 7 Hard Ore Mine in the event that the Cliffs Shaft workings should ever be extended to the point where it would be necessary to drain the No. 7 Hard Ore Mine. Should such a situation arise, we would certainly not want to pump the Holmes and Lake Angeline Basin down to the level of the bottom elevation of the No. 7 Hard Ore Mine. This seal was constructed by our timber crew in the drift at the point where the Holmes mine had their steel door dam. The steel door opened toward the No. 7 Hard Ore side of the dam and was not, therefore, designed to withstand pressure from the Holmes mine side. The whole dam was filled with a concrete plug making a permanent seal. The cost of making this concrete seal was $743.00.

The Bureau of Mines started a microseismic investigation in the Cliffs Shaft Mine in April of 1945. Co-operating with the Bureau of Mines, we selected an area in "B" Shaft between the 11th and 12th levels bounded by coordinates 1000' - 1300' W and 000 - 300 S. This area was mined out over 20 years ago, with the exception of pillars left for back support. The back in this stope area consists of interbedded conglomerate and slate immediately overlying the ore with a dip of 10 to 15° to the south. From surface drill hole data we know that the roof rock rapidly changes from slate to quartzite which persists practically without inter-

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1945

1. GENERAL: (Cont'd)

ruption to ledge surface, a distance of about 700'. From this area we mined three pillars out of a total of eleven, while the Bureau's physicists kept recordings of the microseismims (subaudible noises produced by minute rock movements) through their geophone equipment. We expect to remove at least one more pillar from this area after the ore produced from the three pillars mined has been scraped out of the place. From the data collected to date, Dr. Leonard Obert of the U. S. Bureau of Mines can find no evidence that the remaining pillars or expanded roof arch has been put under additional stress that even remotely approaches the point where rupture strain would appear. It seems apparent in this area that local spalling of rock which causes product dilution will cause the halt of pillar removal rather than major rock strains.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1945

2. PRODUCTION, SHIPMENTS, & INVENTORIES:

a. Production by Grades:

Grade	Tons	% of Total
Cliffs Shaft Lump	363,563	
Cliffs Shaft Crushed	100,334	
Total	463,897	84.3
Bancroft Lump	49,803	
Bancroft Crushed	14,861	
Total	64,664	11.8
Section 10 Lump	16,827	
Section 10 Crushed	4,781	
Total	21,608	3.9
GRAND TOTAL FEE & LEASE ORE	550,169	100.0

Production by grades for the past ten years follows:

Year	Lump Ore Tons	Crushed Ore Tons	Run-of-Mine Ore - Tons	Total Tons
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
1943	200,616	50,732	383,280	634,628
1944	443,123	137,701	6,227	587,051
1945	430,193	119,976	-	550,169

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
1943	200,616	79.82	50,732	20.18
1944	443,123	76.29	137,701	23.71
1945	430,193	78.19	119,976	21.81

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1945

2. PRODUCTION, ETC.: (Cont'd)

Several changes were made in the size of holes in the revolving trommel during 1945. From July 1st to December 1st we had one section of the three, blanked, in order to increase the proportion of lump. The average net result of all changes produced 1.90% more lump in 1945 than in 1944.

The division of the product between fee ore and Bancroft and Section 10 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	Sec. 10 Ore (Lease)	% of Total
1936	383,014 tons	83.9	73,746 tons	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		
1943	563,006 "	88.7	69,943 "	11.0	1,679 tons	0.3
1944	506,520 "	86.3	64,742 "	11.0	15,789 "	2.7
1945	463,897 "	84.3	64,664 "	11.8	21,608 "	3.9

The Bancroft Lease continued to produce a nearly constant percentage of the total output of the mine as it has for the past four years. The Section 10 Lease production is gradually increasing but can be expected to make a rather sharp increase after 1946 when development drifts and raises will be more nearly completed.

All of the ore produced to date from the Bancroft Lease and Section 10 Lease since they were acquired by the Company is shown by years in the following table:

Year	Bancroft Ore Tons	Section 10 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	
1943	69,943	1,679
1944	64,742	15,789
1945	64,664	21,608
Total	1,109,603	39,076

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1945

2. PRODUCTION, ETC.: (Cont'd)

b. Shipments:

Grade	Pocket Tons	Stockpile Tons	Total Tons	Total Last Year
Cliffs Shaft Lump	252,033	112,926	364,959	417,769
Cliffs Shaft Crushed	58,977	96,016	154,993	89,043
Cliffs Shaft Mine Run				137
Bancroft Lump	39,093	10,226	49,319	46,349
Bancroft Crushed	8,973	5,681	14,654	24,084
Bancroft Mine Run				4,246
Section 10 Lump	13,523	3,684	17,207	9,542
Section 10 Crushed	3,275	1,737	5,012	3,134
Section 10 Mine Run				1,844
Total 1945	375,874	230,270	606,144	596,148
Total 1944	350,684	245,464	596,148	
Increase	25,190		9,996	
Decrease		15,194		

Shipments for the last ten years are tabulated below:

	CLIFFS SHAFT GRADE			BANCROFT GRADE			SEC. 10 GRADE			Grand
Year	Lump	Crushed	Mine Run	Lump	Crushed	Mine Run	Lump	Crushed	Mine Run	Total
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
1943	177,951	30,182	328,139	12,829	380	53,640			1,501	604,622
1944	417,769	89,043	137	46,349	24,084	4,246	9,542	3,134	1,844	596,148
1945	364,959	154,993		49,319	14,654		17,207	5,012		606,144

(°) Contains 4,541 tons of Incline Pit Lump.

c. Stockpile Balances:

Ore in stock as of December 31, 1945:

Cliffs Shaft Lump	31,292
Cliffs Shaft Crushed	11,681
Bancroft Lump	3,086
Bancroft Crushed	1,460
Section 10 Lump	592
Section 10 Crushed	244
Total	48,355

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2. PRODUCTION, ETC.: (Cont'd)

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

Balance in stock - Dec. 31,	1936	82,072 tons
	1937	109,799 "
	1938	273,939 "
	1939	76,540 "
	1940	47,208 "
	1941	81,533 "
	1942	60,562 "
	1943	90,568 "
	1944	95,663 "
	1945	48,355 "

d. Division of Product by Levels:

Level	"A" Shaft Tons	"B" Shaft Tons	Total Tons
1st	18,433	26,172	44,605
2nd	11,510	8,352	19,862
3rd	19,742	401	20,143
4th	10,844	12,867	23,711
5th	18,966	30,668	49,634
6th	13,090	6,243	19,333
7th	62,993	16,495	79,488
8th	53,188	18,939	72,127
9th	43,498	17,373	60,871
10th	81,649	13,203	94,852
11th	25,343	5,981	31,324
12th	15,608	3,242	18,850
13th	-	-	-
14th	-	8,420	8,420
15th	-	6,949	6,949
Total	374,864	175,305	550,169
Rock			21,856
Total Ore & Rock			572,025

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
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	62.4	268,070	37.6	713,530
1943	391,455	61.6	243,173	38.4	634,628
1944	382,934	65.2	204,117	34.8	587,051
1945	374,864	68.1	175,305	31.9	550,169

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2. PRODUCTION, ETC.: (Cont'd)

From the table it can be seen that "B" Shaft ore production has remained remarkably constant for the past 10 years. Unless the Section 9 deposit shall prove to be commercially stopeable, the "B" Shaft production is going to drop more or less steadily in the ensuing years. This prediction is based on geologic information which nearly completely defines the possible stoping areas in the "B" Shaft territory. The one major exception is the Section 9 Exploration. Diamond drilling carried on out in that area, during the year, shows some deposits of very high grade ore at the elevation of the 1st level. They are, in most cases, interbanded with dike seams to such an extent that we are not yet sure that the ore can be mined commercially clean.

The table below shows how the product was hoisted from "A" and "B" Shafts during 1945. Much of the 68% of ore mined in "A" Shaft was transferred for hoisting to "B" Shaft. During 1946 we expect to strip the connecting drift on the 10th level thereby making it easier to carry out these transfers of ore.

1945 Product as Hoisted

Month	"A" Shaft Tons	"B" Shaft Tons	Total Tons
January	22,457	22,428	44,885
February	22,311	21,332	43,643
March	26,198	25,781	51,979
April	24,414	23,498	47,912
May	25,691	24,259	49,950
June	25,400	23,855	49,255
July	23,677	23,029	46,706
August	18,228	19,962	38,190
September	20,760	20,232	40,992
October	22,940	23,250	46,190
November	19,798	20,283	40,081
December	17,781	17,890	35,671
Total without Overrun	269,655	265,799	535,454
Pocket Overrun	5,381	5,000	10,381
Stockpile "	2,334	2,000	4,334
Grand Total Tons	277,370	272,799	550,169
% of Total	54.00	46.00	100.00

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2. PRODUCTION, ETC.: (Cont'd)

e. Production by Months:

Month	Optg. Days	CLIFFS SHAFT Lump	CLIFFS SHAFT Crushed	BANCROFT Lump	BANCROFT Crushed	SECTION 10 Lump	SECTION 10 Crushed	Total
Jan.	26	27,386	9,662	4,644	1,629	1,208	405	44,934
Feb.	24	27,293	9,580	3,895	1,384	1,081	376	43,609
March	27	33,929	11,190	4,008	1,411	1,146	381	52,065
April	25	32,623	9,269	3,564	1,072	2,178	638	49,344
May	26	32,708	8,990	4,975	1,577	2,341	704	51,295
June	26	33,819	8,331	3,667	732	2,928	699	50,176
July	25	33,616	6,692	3,751	755	1,888	359	47,061
Aug.	25	28,542	5,261	4,116	879	860	182	39,840
Sept.	24	30,343	6,636	3,701	996	786	198	42,660
Oct.	27	32,253	8,174	4,848	1,432	1,285	343	48,335
Nov.	25	26,640	6,322	5,761	1,422	540	141	40,826
Dec.	23	23,136	8,544	2,508	900	455	147	35,690
Current Years Stkpl. Overrun		1,275	1,683	365	672	131	208	4,334
Total	303	363,563	100,334	49,803	14,861	16,827	4,781	550,169

f. Ore Statement:

Grade	On Hand Jan. 1, 1945	Output for Year	Prior Years Stockpile Overrun	Total	Shipments	Balance On Hand	Inc. or Dec. in Output
C. S. Lump	32,688	363,563		396,251	364,959	31,292	
C. S. Crushed	57,673	100,334	8,667	166,674	154,993	11,681	
Bancroft Lump	2,602	49,803		52,405	49,319	3,086	
Banc. Crushed	1,253	14,861		16,114	14,654	1,460	
Sec. 10 Lump	972	16,827		17,799	17,207	592	
Sec. 10 Crushed	475	4,781		5,256	5,012	244	
Total 1945	95,663	550,169	8,667	654,499	606,144	48,355	34,971
Total 1944	90,568	585,140	16,103°	691,811	596,148	95,663	49,488

(°) Contains 14,192 tons of prior years' stockpile overrun and 1,911 tons of current or 1944 stockpile overrun.

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2. PRODUCTION, ETC.: (Cont'd)

g. Delays:

Date	Hours Lost	Tons Lost	Remarks
Jan. 10	2	400	Picking Belt broke.
11	1½	300	Picking Belt out of commission.
12	1	100	Chunks - Undg. and Surface.
20	1	150	Chunks in Crusher.
23	¾	100	Chunks in Crusher.
Feb. 1	2	175	Chunks in Crusher.
21	¾	100	Crusher trouble.
22	4	600	Bell System in "A" Shaft out of order.
Mar. 8	½	50	Chunks in "B" Shaft.
13	½	50	Chunks in "B" Shaft.
15	1	200	Crusher repairs.
23	3½	300	Rep. contacts on Switch Board for "A" Shaft Hoist.
Apr. 4	3	500	Lightning struck Power Lines.
June 14	3	250	"B" Shaft Hoist Brakeband broke.
20	2	400	Rep. Top Tram Counterweight pick-up.
July 2	2	200	Chunks in pockets.
3	1	100	Broken air lift.
10	¾	100	Chunks
13	1	100	Crusher repairs.
19	1	100	"B" Shaft swithh panel burned.
21	5	400	"B" Shaft hoist motor burned out.
Aug. 14	5	600	No overtime hoist acct. of V.J. DAY.
Oct. 30	1½	150	Crusher repairs.
31	4	400	"B" Shaft Hoist Motor & Top Tram Car pulled through Crusher Building.
Nov. 14	3½	150	Underground Car off Track - "B" Shaft.
15-16	-	1500	Manpower shortage due to deer season.
20	1½	150	Chunks in "A" Shaft pocket.
21	1½	150	Chunks in "A" Shaft pocket.
Dec. 6	1½	150	"A" Shaft Skip broken.
19	2	500	Picking Belt Transmission broke down.
20	2½	500	Crushed car Motor on Top Tram burned out.
Total 1945	60¼	8925	
Total 1944	78¼	11325	

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3. ANALYSIS:

a. Average Analysis of 1945 Output:

	Iron	Phos.	Silica
Cliffs Shaft Lump	60.93	.105	7.21
Cliffs Shaft Crushed	52.47	.112	16.46
Bancroft Lump	61.66	.116	6.31
Bancroft Crushed	53.69	.118	14.50
Section 10 Lump	59.50	.102	8.70
Section 10 Crushed	53.46	.119	14.67

Most of the grades remained equally as good or were better in quality in 1945 as compared to 1944 ores with the exception of the Section 10 Lump ore which dropped 1/2% in iron units and went up over 1% in silica. This is probably the result of a higher proportion of development work in the Section 10 area in 1945 as compared to 1944 with the result that some questionable material gets included with the ore as the drift and raises are being advanced.

c. Complete Analysis of 1945 Ores as Shipped From Mine:

Grade		Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss
Lump Ore	(x)	61.20	.105	7.16	.27	1.90	.84	.72	.011	1.08
Crushed Ore	(x)	52.70	.108	16.87	.37	2.81	1.06	.90	.013	1.79

(x) Cliffs Shaft, Bancroft & Section 10 ores combined

d. Analysis of Ore in Stock Dec. 31, 1945:

		Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
Cliffs Shaft Lump	Dried	58.98	.119	9.05	.27	2.40	.84	.72	.011	1.28	-
	Natural	58.68	.118	9.00	.27	2.39	.84	.72	.011	1.27	.51
Cliffs S. Crushed	Dried	51.63	.119	18.06	.37	2.81	1.26	.90	.013	1.79	-
	Natural	50.48	.116	17.66	.36	2.75	1.23	.88	.013	1.75	2.23
Banc.&Sec.10 Lump	Dried	60.00	.125	7.83	.34	2.59	1.45	1.06	.012	1.35	-
	Natural	59.63	.124	7.78	.34	2.57	1.44	1.05	.012	1.34	.61
Banc. & Sec. 10 Crushed	Dried	52.02	.124	16.96	.43	2.90	1.42	1.01	.015	1.96	-
	Natural	50.91	.121	16.60	.42	2.84	1.39	.99	.015	1.92	2.14

e. Analysis of Ore Reserves: (Run-of-Mine Ore)

		Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
Cliffs Shaft Ore	Dried	57.51	.108	10.86	.48	2.36	1.21	1.00	.019	1.89	-
	Natural	56.82	.106	10.01	.47	2.34	1.20	.99	.019	1.87	.85
Bancroft & Sec. 10 Ore	Dried	57.86	.126	10.55	.51	2.35	1.15	.95	.019	1.84	-
	Natural	57.25	.124	9.81	.50	2.33	1.14	.94	.019	1.83	.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 and loss in mining.

Ore in Sight December 31, 1945:

Available Ore in Bancroft Area "A" Shaft

	Developed		Prospective	
	Floors	Pillars	Breasts	Total
Level	Tons	Tons	Tons	Tons
2nd			2,000	2,000
3rd		800		800
4th	7,100			7,100
8th	9,300		2,000	11,300
9th	9,800	6,400		16,200
10th	35,100	124,700	2,000	161,800
11th	112,200	4,600		116,800
12th	2,200	2,900	2,000	7,100
Total	175,700	139,400	8,000	323,100

Summary:

Bancroft Ore Available	323,100
Less December Production	3,408
Gross Tonnage as of Dec. 31, 1945	319,692
Less 10% for Mining & Rock	32,310
Net Total Bancroft Ore Available	287,382

Section 10 Lease

	Developed		Prospective	
	Floors	Pillars	Breasts	Total
Level	Tons	Tons	Tons	Tons
1st	1,000	10,600	2,000	13,600
2nd	4,200			4,200
3rd			4,000	4,000
5th			8,000	8,000
6th			2,000	2,000
7th			2,000	2,000
8th		89,800		89,800
9th	89,800			89,800
Total	95,000	100,400	18,000	213,400

Summary:

Section 10 Ore Available	213,400
Less December Production	602
Gross Tonnage as of Dec. 31, 1945	212,798
Less 10% for Mining & Rock	21,340
Net Total Section 10 Ore Available	191,458
Net Total Bancroft & Section 10 Lease	478,840

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4. ESTIMATE OF ORE RESERVES: (Cont'd)

Available Cliffs Shaft Ore "A" Shaft

	Developed		Prospective	
	Floors	Pillars	Breasts	Total
Level	Tons	Tons	Tons	Tons
1st		6,600		6,600
2nd	4,200			4,200
3rd	1,300		4,000	5,300
4th	800		8,000	8,800
5th	13,800	3,700	8,000	25,500
6th	39,700	70,700	6,000	116,400
7th	86,100	10,300	10,000	106,400
8th	64,800	3,200	4,000	72,000
9th	143,800	8,900	2,000	154,700
10th	48,400	119,700	2,000	170,100
11th	67,900	108,000	2,000	177,900
12th	39,100	82,900		122,000
15th	31,800			31,800
Total	537,700	414,000	46,000	1,001,700

Available Cliffs Shaft Ore "B" Shaft

	Developed		Prospective	
	Floors	Pillars	Breasts	Total
Level	Tons	Tons	Tons	Tons
1st	31,100	14,900	4,000	50,000
2nd	43,400			43,400
3rd	2,200	23,500	2,000	27,700
4th			6,000	6,000
5th	25,300		2,000	27,300
6th	2,000		2,000	4,000
7th	14,600	2,900		17,500
8th	28,700	5,700	4,000	38,400
9th	20,800	1,300	4,000	26,100
10th	27,900			27,900
11th	21,300	3,000		24,300
12th	4,600		2,000	6,600
13th	5,500			5,500
14th	5,900		2,000	7,900
15th	16,800	15,200		32,000
Total	250,100	66,500	28,000	344,600

Section 9 Development

	Developed		Prospective	
	Floors	Pillars	Breasts	Total
Level	Tons	Tons	Tons	Tons
9th		11,600	2,000	13,600
10th	2,900	13,200		16,100
Total	2,900	24,800	2,000	29,700

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4. ESTIMATE OF ORE RESERVES: (Cont'd)

Summary:

Cliffs Shaft Ore Available "A" Shaft	1,001,700
Cliffs Shaft Ore Available "B" Shaft	344,600
Cliffs Shaft Ore Available Section 9	29,700
Total	1,376,000
Less December Production	31,680
Gross Tonnage as of Dec. 31, 1945	1,344,320
Less 10% for Mining & Rock	137,600
Net Total Fee Ore Available	1,206,720

Recaptitulation:

Net Cliffs Shaft Ore Available	1,206,720
Net Bancroft Ore Available	287,382
Net Section 10 Ore Available	191,458
Grand Total	1,685,560

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

	Dec. 31, 1945	Dec. 31, 1944
Cliffs Shaft Ore Available	1,206,720 tons	1,140,331 tons
Banc. & Section 10 Ore Available	478,840 "	380,255 "
Total	1,685,560 "	1,520,586 "
Increase for year 1945	164,974 "	

New Ore Developed in 1945 550,169 & 164,974 = 715,143 tons

The following table shows the variations in ore reserves in "A" and "B" Shafts since 1929:

Net Available Ore in Sight

Year	Sec. 10 Ore Tons	Bancroft Ore Tons	Cliffs Shaft Ore "A" Shaft Tons	Cliffs Shaft Ore "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
1943	17,043	267,301	898,787	297,362
1944	107,904	272,351	834,801	305,530
1945	191,458	287,382	879,956	326,764

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4. ESTIMATE OF ORE RESERVES: (Cont'd)

From the foregoing tables it appears that our reserves have made increases everywhere except in "B" Shaft. This is only an apparent increase in all cases except the Section 10 Lease. The method of figuring the estimate was changed this year and instead of a deduction of 10% for mining and 10% for rock, there is but a single deduction made of 10% for loss in mining and rock combined. This produced an increase in the estimate of 156,890 tons that would have been taken off under last years method. Therefore, the true increase is only 8,084 tons in 1945 over 1944 and this is all in the Section 10 Lease. All the other areas were reduced in reserves.

From the following table it may be seen that the acquisition of the Section 10 Lease has brought reserves up, starting with 1944. It must be remembered, however, that the sharp increase shown in 1945 is fictitious as pointed out above.

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

1945	1,685,560 Tons
1944	1,520,586 "
1943	1,480,493 "
1942	1,513,670 "
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 "
1933	1,421,692 "
1932	1,511,731 "
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 AND WAGES:

a. General:

The average number of m en employed on surface decreased only slightly in 1945 as compared to 1944. Men qualified to work on surface were available as replacements of losses from this category. For the underground the story was different and we had to operate with an average of 60 less men than we had in 1944. The reversal of this trend started in November when veterans began to return in appreciable numbers.

b. Comparative Statement of Wages and Product:

	1945	1944	Increase	Decrease
PRODUCT	550,169	587,051		36,882
No. of Shifts & Hours	2 8-hr.	2 8-hr.		
No. of Days Operated	303	305		2
Average Number of Men Employed				
Surface	107	110		3
Underground	293	353		60
Total	400	463		63
Average Wages Per Day				
Surface	7.59	7.24	.35	
Underground	8.37	7.96	.41	
Total	8.16	7.76	.40	
Product Per Man Per Day				
Surface	17.16	17.62		.46
Underground	6.19	5.67	.52	—
Total	4.55	4.29	.26	
Labor Cost Per Ton				
Surface	.442	.405	.037	
Underg round	1.353	1.404	—	.051
Total	1.795	1.809		.014

The total decrease in labor cost in 1945 under 1944 was $.014 per ton. This, in spite of the addition of so-called fringe payments that raised costs in the neighborhood of .02 to .03 a ton. The increased tons per man was responsible for the lower cost per ton and this was the result of concentrating the efforts of our reduced underground personnel on the one essential, product. Naturally the development program and much of the maintenance work was subordinated during 1945. We will have to face increased costs in the future to catch up on this type of work.

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5. LABOR AND WAGES: (Cont'd)

Again penalty costs decreased as may be seen from the following table. There were 126,789 penalty hours worked in 1945 compared to 149,628 hours of such time in 1944 or a decrease of 22,839 hours. Continued efforts to schedule repair jobs on non-penalty time helped to reduce the penalty hours. Probably one of the most important factors, however, was the high proportion of absenteeism in 1945 which amounted to 8,710 days from all causes compared to 5,991 days in 1944. Another influencing factor was the abolishment of double time in late August with the cancellation of the Presidential directive order.

	Surface	Underground	Total
1945	$ 13,802.09	$ 43,192.01	$ 56,994.10
1944	15,392.77	53,041.99	68,434.76
Decrease	1,590.68	9,849.98	11,440.66

Surface and underground labor costs per ton for the past ten years are as follows:

Year	Surface Labor	Underground Labor	Total Labor
1945	.442	1.353	1.795
1944	.405	1.404	1.809
1943	.396	1.399	1.795
1942	.301	1.170	1.471
1941	.297	1.173	1.470
1940	.241	.936	1.177
1939	.253	1.033	1.286
1938	.310	1.110	1.420
1937	.267	.985	1.252
1936	.214	.791	1.005

	Shifts	Earnings	Avg. Wages 1945	Avg. Wages 1944
Contract Miners				
Dev. in Rock	1,318½	13,006.63	9.86	
Dev. in Ore	2,103½	18,436.67	8.76	
Stoping	21,951	190,417.91	8.67	
Total Contract Miners	25,373	221,861.21	8.74	8.68
Contract Trammers	609½	7,926.36	13.00	12.53
Total Contract Labor	25,982½	229,787.57	8.84	8.87
Scraper Optrs. & Miners Hlprs.	35,879½	265,860.37	7.41	
Co. Acc't Trammers	2,469¾	17,674.22	7.16	
Motormen	3,485¼	25,014.56	7.18	
Brakemen	2,905¾	20,181.57	6.95	
Total Co. Acc't Labor Directly handling Ore & Rock	44,740¼	328,730.72	7.35	
Total all Labor directly handling the Ore & Rock	70,722¾	558,518.29	7.897	

Total Ore & Rock = 572,025 tons ÷ 70,722¾ shifts = 8.088 Tons Per Shift

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5. LABOR AND WAGES: (Cont'd)

	1945	1944	Increase	Decrease
Total Number of Days				
Surface	32,059	33,306¼		1,247¼
Underground	88,839	103,541		14,702
Total	120,898	136,847¼		15,949¼
Amount For Labor				
Surface	243,395.32	238,097.00	5,298.32	
Underground	744,094.41	824,157.02		80,062.61
Total	987,489.73	1,062,254.02		

Proportion of Surface to Underground Men	
1945	1 to 2.74
1944	1 to 3.20
1943	1 to 3.19
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

6. SURFACE:

a. Buildings and Repairs:

The following figures show cost of repairs to mine buildings for the years 1941 - 1945:

	1945	1944	1943	1942	1941
Office & Warehouse	537.42	1200.83	1611.05	1759.49	515.63
Shops	1679.64	719.73	1786.50	1519.98	1075.65
Shaft House	567.28	822.60	956.90	384.67	2399.63
Engine House	1052.36	553.86	1078.09	860.22	321.64
Dry House	1569.07	2597.53	1125.87	3713.75	6381.12
Coal Dock & Trestle	419.37	258.24	821.71	96.67	331.25
Crusher Building	878.57	628.19	4390.68	2903.35	570.44
Miscellaneous	967.27	3997.94	1086.06	614.12	366.24
Total	7670.98	10778.92	12856.86	11852.25	11961.60

Total cost for buildings and their repairs decreased $3,107.94 as compared with 1944.

Office & Warehouse expense decreased to less than half of 1944 expense. New steam lines were laid to the office building preparatory to connecting with new heating boiler to be installed. We also installed a thermostatic control and pressure reduction valve on the heating system in the office.

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6. SURFACE: (Cont'd)

a. Buildings and Repairs: (Cont'd)

A new concrete floor, started in the previous December in the Blacksmith Shop, was finished. A gyplap ceiling was also put in to facilitate the heating of the building. The walls were pointed with cement plaster and the room was given a general cleaning.

The increase in the engine house expense was due to the purchase of new dome reflectors for improving the lighting system and the labor and material charges for a new steam supply line to the engine house.

7. UNDERGROUND:

a. Development:

1. Section 10 Lease:

The emphasis was primarily on development rather than exploration with regards to the mining activities carried on in the Section 10 Lease during 1945. There was an average of 4 to 5 mining contracts working in the Section 10 Lease during the year and about 3 of these were engaged in drifting and raising in order to open up the main ore body which occurs in the north limb of the Section 10 syncline. We perhaps would have had additonal exploration work carried on by mining crews had we been able to install our new pump and start the drainage of the old Moro Mine but since this pump was not delivered to us until late in the Fall, we were unable to do any exploratory mining that would bring us closer than 300 feet of the old Moro workings. We hope to be able to start the drainage of the Moro in the ensuing year thereby relieving the water pressure and danger of flooding from that source as we open up the ore body on the Section 10 Lease in the vicinity of the old Moro Mine.

We had one drill rig operating in the Section 10 Lease throughout the entire year. Again, however, it may be said that much of this drilling was done to confirm our predictions and expectations as to the extensions of the ore body originally opened up on the 8th level. This drill crew completed Hole No. 551 from 298 ft. in depth to a total depth of 517 ft. This hole was located on the 5th level and the footage drilled during 1945 was made up primarily of dike followed by hanging wall material. Hole No. 551 established the fact that there was ore on the 5th level elevation near the 2000 E coordinate. They also completed Hole No. 552 on the 6th level by extending it from 238 ft. to 258 ft. This hole also encountered slate hanging wall but no ore was discovered in either the 1944 footage or the 1945 footage. Because Hole 552, drilled near the 1300 E coordinate on the 6th level elevation, discovered no ore it seems to establish the fact that the ore body does not extend that far west. In order to further prove the vertical extent of the main Section 10 ore body, Hole 553 was drilled on the 2nd level approximately along the 2250 East coordinate. This hole encountered nothing but hanging wall slate and quartzite, proving that at this particular location the ore body lies below the 2nd level elevation. In an attempt to find the top of the ore, Hole 555 was drilled on the 3rd level along the same general coordinate location and 64 ft. of first class ore was cut by this drill hole followed

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7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

1. Section 10 Lease: (Cont'd)

by slate and quartzite as the hole progressed to the south. In order to try to locate the ultimate depth of the ore vein along this meridian, Hole No. 558 was drilled on the 10th level from the end of the Section 10 drift. This hole extended a total of 600 ft. to the south without encountering any first class ore. Nearly all of the material cut by this hole was footwall jasper, siderite and dike. From this series of holes we conclude that the ore body extends from an elevation somewhere between the 10th and 8th levels to an elevation somewhere between the 3rd and 2nd levels. We also used the drill crew to test for the eastward extension of the ore body on the 6th level elevation by drilling Hole No. 556 which encountered 61 ft. of first class ore along the 2400 E coordinate. They also drilled Holes 562 and 563 on the 6th level at a location approximately 300 ft. west of Hole 552 which was blank, in order to thoroughly check for the westward extension of the ore vein. Both of these holes failed to encounter ore.

For the purpose of discussion, the known ore occurrences in the Section 10 Lease were divided into three general categories mentioned in the 1943 and 1944 annual reports. These are repeated here for the same purpose. No. 1: The syncline between the 1st and 3rd levels in the area 300 ft. south from the north boundary of the Section 10 Lease between coordinates 0 and 600 E. No. 2: The anticlinal structure between 1600 E and 3000 E lying adjacent to the Cliffs Shaft fee property along its south boundary. No. 3: The main ore bearing syncline which constitutes the westward extension of the Moro Mine syncline. During the year 1945, two crews worked part of the time in the No. 1 area namely, Contract No. 1 and Contract No. 58. Contract No. 1, operating on the 1165' sub-level, stoped floor from the east-west striking southward dipping ore body and Contract No. 58 completed two new cross cuts to the south in this same ore vein at coordinates 675 E and 700 E. We have reason to expect that Contract No. 1 will be able to follow ore down to an elevation below the 1st level. We had also believed that Contract 58 would be able to find ore extending well below the 1st level elevation but from the 1945 activities of this crew we have been forced to change our opinion regarding this latter expectation. The reason for this change in opinion was that Contract 58 encountered dike footwall dipping to the north in both of the cross cuts which they extended onto the Section 10 Lease. This dike encounters southward dipping slate hanging wall thereby pinching out the ore vein. There may be ore in a horizon beneath this dike footwall because along the west boundary of the Section 10 Lease about 600 ft. west of 58 Contract, we have drill data indicating the extension of ore down to the 3rd level elevation. In order to develop this ore vein and test the possibility of downward extension of the ore vein in the neighborhood of 58 Contract, it will be necessary for us to drive a drift south and then west from the 3rd level drift that now ends at coordinates 1220 S - 800 E.

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7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

1. Section 10 Lease: (Cont'd)

The No. 2 area adjoining the "A" Shaft workings was further developed in 1945 by Contract No. 2 which spent the major portion of the year breast stoping to the east in a vein of high quality ore on an elevation between the 4th and 3rd levels. From this development work we conclude that the ore being stoped is part of the same vein cut by Diamond Drill Hole No. 555 on the 3rd level elevation. We also believe that this is part of the same ore horizon as the ore that occurs in the No. 3 area or so-called Moro Mine syncline extension. There may be some faulting between the No. 2 anticlinal structure and the No. 3 area ore body.

As mentioned above, the No. 3 area is the north limb of the so-called main Section 10 syncline and as mentioned under the discussion of the diamond drilling, we determined in 1945 that this ore body has a lateral extent east and west from approximately 1500 E to 2500 E and laterally north and south a width ranging from 0 up to 150 ft. Vertically, we know the ore extends from below the 8th level to above the 3rd level. Four gangs worked in this No. 3 area during 1945 developing the ore vein for future stoping operations. Contract No. 41 drifted west on the 8th level from coordinates 2100 E to 1550 E. The bulk of this drift was in the ore vein and it established the ultimate westward extent of the ore on the 8th level. Contract No. 21 put up two raises from the 8th level elevation to the 7th level elevation and joined them together on that elevation by a drift. They continued one of these raises up to the 5th level elevation through first class ore. Contract No. 80 put a raise up from their small stope on the 7th level to the 5th level elevation and then drifted west in good quality ore. On the 5th level elevation, Contract 96 drifted southeast in order to make a connection with Contract No. 80. This connection had not been completed at the end of the year. Once it is completed we will have access to the main Section 10 ore body via the 5th level, and stoping operations can then be started almost immediately. We plan to continue 21 raise to the 3rd level elevation and drift out to Contract No. 2. We also plan to drift west from 96 drift on the 5th level until we reach the westward limit of the ore vein. Additional raises will be put up from the drift that 41 Contract drove to the west on the 8th level to connect with the drift that 96 Contract will advance west on the 5th level. We also expect to develop the ore vein to the east during the ensuing year on the 8th level and 5th level elevations.

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7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

2. Cliffs Shaft and Bancroft Lease:

The table below shows the number and percentages by months of developing gangs in the mine:

Month	Total Number of Gangs	Gangs Developing	% Developing
January	88	42	47.7
February	87	44	50.1
March	88	43	48.9
April	88	38	43.2
May	88	37	42.0
June	87	38	43.7
July	85	30	35.4
August	79	28	35.4
September	80	35	43.8
October	81	46	56.8
November	78	43	55.1
December	81	38	46.9
Monthly Average	84.2	38.5	45.7
Year 1944			49.8
Year 1943			54.9
Year 1942			53.5
Year 1941			61.0
Year 1940			54.5
Year 1939			53.6

It may be seen from the table above that the average number of developing gangs decreased in 1945 as compared with 1944. This represents probably the lowest proportion of crews on development work in the history of the mine. Some of the developing crews were double mining gangs as in 1944 and one of the crews was the double miner crew equipped with a mine rig and an Eimco shovel for high speed drifting. This latter crew's work increased the efficiency from the standpoint of footage output. Out of the total of 11.9 crews doing direct development for a total of 5122 ft. of drift and raise, this gang did 1396 ft. The rock development footage decreased from 3814 ft. in 1944 to 1969 ft. in 1945. The ore development footage decreased from 4108 ft. in 1944 to 3153 ft. in 1945. Total development footage for the year 1945 was 2800 ft. less than in 1944. Not all of the development crews shown in the percentage table above, however, are engaged in so-called direct development that is drifting or raising. The biggest percentage of the developing gangs are those engaged in breast or raise stoping where they are putting in sight, additional ore reserves in the floors, backs and ribs. The percentage of this type of work carried on in 1945 decreased to an all time low due to the fact that we did not have enough places in which to do this type of work and also due to the fact that we had an extreme shortage of manpower. In the future it will be necessary to correct this condition by sharply increasing the number of gangs working on direct development in order to provide areas where stoping gangs can open up the ore bodies by breast and raise stopes.

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7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

2. Cliffs Shaft and Bancroft Lease: (Cont'd)

No new ore bearing areas were discovered by either diamond drilling or exploratory mining during the year 1945 in either "A" or "B" Shaft. Contract 29 continued to develop the ore vein discovered by Hole No. 524 on the 2nd level Bancroft Lease and their work continued to indicate that a large tonnage of reserves will be available in this area. In the extreme east end of the "A" Shaft workings on the 8th level elevation, Contract's 31,41,61,81 and 101 continued to develop the drifts, raises and breast stopes in veins which we feel will yield large tonnages all the way from the 10th to the 4th level elevations.

In the latter part of 1945 we had one diamond drill crew working on the 1st level elevation in the Section 9 Exploration, exploring for the extensions and limits of the ore vein cut by surface Diamond Drill Hole No. 34. Some ore was encountered in the 4 holes drilled by this crew, but in general, this occurrence looks disappointing because the ore is in thin bands alternating with seams of dike. It is questionable, therefore, whether this ore deposit can be commercially mined. During the ensuing year we expect to continue exploring this area by diamond drilling, hoping to find some ore veins that are large enough to warrant their development.

"A" SHAFT

1st Level

In the first 5 months of 1945, Contract No. 18 breast stoped east in a vein of conglomerate ore about 12 to 15 ft. thick that strikes east and west and dips to the south above dike footwall and beneath slate hanging wall. This is part of the Southwest Vein. By the end of May the crew had reached coordinates 1225 S - 515 E. At the start of shipping season the demand for lump ore was so great, we moved Contract No. 18 miner into "B" Shaft with No. 40 Contract because it was impossible for him to win any appreciable tonnage from the small ore vein in which he was working on the 1st level. This place probably will receive some additonal attention in the future because the breast stope put in by Contract No. 18 was, to some extent, exploratory in its character.

About 200 ft. east of No. 18 Contract's stope, Contract No. 58 spent the major portion of 1945 developing a breast stope to the west and two cross cuts south onto the Section 10 Lease. The main east-west stope was on the Cliffs Shaft fee property and before the end of the year Contract 58 holed to old workings on the 1st level elevation at coordinates 1240 S - 630 E. The ore vein in this stope is about 40 ft. thick along the north edge of the stope. It is overlain by slate hanging wall that dips at an angle of about 10° to the south. Unfortunately it is underlain by dike that dips approximately 20° to the north. The convergence of these rock members on the Section 10 Lease cuts out the ore vein to the south. By the end of 1945, Contract 58 had mined nearly all the available ore from this stope. As mentioned under the Section 10 discussion, there may be ore at lower horizons beneath the dike footwall which we could develop by drifting west from the 3rd level "A" Shaft drift which now terminates at coordinates 1215 S - 790 E.

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7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

2. Cliffs Shaft and Bancroft Lease: (Cont'd)

2nd Level

Contract No. 29 spent the last 6 months of the year doing development work on the Bancroft Lease. This gang stripped the ore from both sides of the short east-west drift along the 410 N coordinate from 1185 E to 1240 E. After enlarging the drift to a stope width of about 20 ft., they developed a cross cut breast stope to the north along the 1200 E coordinate line. This stope was advanced to 440 N by the end of the year. Dike footwall dipping 35° to the east bounds the ore body along the west end of the stope. Some irregular bunches of dike have been encountered in the back of the workings but we are confident that much additonal ore will be developed in this area in the future because Diamond Drill Hole No. 524 shows at least 80 ft. of first class ore northeast of the present stope breast. Geologically, there is good reason to believe that this ore will extend down to at least the 5th level elevation.

On the Section 10 Lease, Contract No. 2 spent the first part of 1945 enlarging the small stope on the 2nd level elevation. They also drifted southeast from the east end of this stope for approximately 50 ft. to coordinates 1370 S - 2320 E. We were hopeful that we would be able to follow the ore vein to the east for a considerable distance at this elevation. The ore exposed in the drift, however, proved to be of a different character namely, magnetite, rather than hematite as in the stope and eventually the magnetite was cut out by dike material. In the latter part of the year, Contract No. 2 dropped down to the 4th level elevation where they mined some floor from their old raise stope on the Section 10 Lease and started a new breast stope to the east at an elevation slightly below the 3rd level. This breast stope is in an excellent quality ore vein which we believe extends south in width to be continuous with the 60 ft. of ore shown in Diamond Drill Hole No. 555 on the 3rd level.

3rd Level

There were only 2 crews that did development work on the 3rd level during the past year. Contract No. 27 breast stoped approximately 70 ft. east and opened up one short cross cut to the south in their ore vein which occurs underneath the 3rd level rock-filled stope located in the Main Vein at coordinates 290 S - 760 E. There is no doubt but what the ore that Contract 27 has developed is the same ore that was mined from the stopes on the 3rd level elevation and which are now filled with rock. To date, Contract 27 has left an arch of 8 to 10 ft. of ore in the back of their stope to serve as support for the rock-fill lying above them. We may find it necessary to remove the rock-fill from the old workings in order to make available the ore in the floor of the old stopes.

The other gang which did some development work on the 3rd level was Contract No. 60 which spent the first 4 months of 1945 putting up a small raise stope from about the 4th level elevation in their ore chute at coordinates 200 S - 1400 E. This raise stope connected at the coordinates 215 S - 1330 E to the breast stope driven by Contract No. 60 in the preceding year. During the remainder of the year, Contract No. 60 stripped

CLIFFS SHAFT MINE
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YEAR 1945

7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

2. Cliffs Shaft and Bancroft Lease: (Cont'd)

ore from the back and ribs of this raise stope connection. The ore vein in this area strikes east and west and dips to the north under slate hanging wall. There are possibilities for future ore reserves both to the east and to the west along the strike of this ore vein although the vein is quite narrow at the west end of the stope.

4th Level

There were only 2 crews that did development work on the 4th level and the work of Contract No. 2 in the Section 10 deposit was discussed above under the heading of the 2nd level. The other crew, Contract 57, advanced a breast stope southeast to coordinates 270 S - 530 E in the North Vein. The ore mined by this crew was magnetite which occurred in a vein that lies horizontal. The ore vein was limited in the back and floor by siderite and dike. By the end of the year the crew encountered this same footwall material in the breast and south rib of the stope forcing us to discontinue mining in this cross cut. They were moved to a second cross cut about 60 ft. north of the coordinates mentioned above where they breast stoped southeast toward the ore shown in old Diamond Drill Hole No. 30.

5th Level

In the North Vein at coordinates 100 S - 810 E, Contract No. 5 spent the last 6 months of the year raising from the main 5th haulage drift. Up to the end of the year, all of the material encountered in the raise was dike. The raise is headed for the floor of Contract 34 stope on the 2nd level at coordinates 50 S - 790 E. This raise will make it possible for us to mine the ore which occurs in the floor of the 2nd level stope.

Contract No. 45 raise stoped due east to coordinates 1160 S - 2825 E in the Southeast Vein. They also drove a cross cut from the south rib of this raise stope in a southwesterly direction to connect, at coordinates 1210 S - 2750 E, with the raise stope which they had put up to the south in the previous year. The ore mined by this crew was excellent quality and occurred in a vein that strikes east and west and dips north beneath slate hanging wall and above dike footwall. The ultimate eastward extent of this ore has not been established. In future operations we expect to continue developing this ore by breast and raise stopes to the east.

As mentioned in the discussion of the Section 10 Lease, there were two gangs that did development work in this Lease area on the 5th level elevation. Contract No. 96 drifted southeast to coordinates 1420 S - 1920 E. Contract 80 drifted west from the top of their raise on the 5th level elevation to coordinates 1420 S - 2085 E. Eventually these two drifts will be connected providing access from the Cliffs Shaft workings on the 5th level to the ore vein on the Section 10 Lease at this elevation. We know that the ore vein strikes east and west and dips to the south under slate hanging wall. We also know that along the 2200 E coordinate line, the ore extends up as high as the 3rd level elevation. On the basis

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7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

2. Cliffs Shaft and Bancroft Lease: (Cont'd)

of this information it seems probable that we can expect sufficient tonnage above the 5th level in the Section 10 Lease to warrant stripping the connecting drift from the Section 10 area to the "B" Shaft haulage drift which now terminates 50 ft. west of "A" Shaft. Such a project would make it possible for us to tram Section 10 ore to "B" Shaft for hoisting thereby helping to keep the two shafts balanced with regard to the product hoisted. Aside from this project, Contract's 96 and 80 will continue to develop by drifting and raising, the Section 10 Lease ore body on the 5th level both to the east and to the west of the current workings.

During the late Fall, Contract 104 spent approximately two weeks extending to the southwest the drift that leads in that direction from the stope just west of "A" Shaft. The coordinates of the breast of this drift are 775 S - 700 E. It is from this drift that we plan to put up a raise to the 3rd level elevation in order to mine the ore in the floor of old stopes and in the pillar where Diamond Drill Hole No. 553 cut approximately 45 ft. of ore. The work of 104 Contract is mentioned here primarily because of the fact that it was done with a Longyear Rotobore machine with which we were experimenting. This machine has a liquid oil hydraulic drive and employs bortz bits similar to those used in diamond drill explorations. The Longyear engineer, Mr. Kurze, believes in very hard ground such as encountered in this drift, rotary bortz drilling can efficiently compete with percussion type drilling. These experiments have not been completed and the work done to date does not seem to bear out Mr. Kurze's contentions. Results, however, are by no means conclusive.

6th Level

Contract No. 51 worked all year in the North Vein at approximately 200 S - 2580 E. In the first part of the year they advanced a breast stope due west to coordinates 225 S - 2560 E. From the north rib of this breast stope they then cross cut north to connect with a previously driven breast stope at coordinates 185 S - 2585 E. The ore vein in this stope is horizontal in its attitude and no persistent limiting rock members have as yet been encountered except along the north rib of the northern-most stope. Good ore remains to be developed along the west wall of the workings. Contract 51 will continue to develop breast stopes and cross cuts to the west through the large pillar area that occurs ahead of them. In the early part of the year, Contract No. 5 started a raise on the 8th level which is intended to cut the 6th level elevation in the area ahead of Contract No. 51 thereby facilitating the removal of the ore mined in Contract 51's stoping operations.

There were two gangs that worked during the year in the Main Vein on the 6th level elevation. Actually, one of these crews, Contract 98, worked between the 6th and 7th elevation where they drove a drift north and then northwest to coordinates 460 S - 1510 E. From the end of this drift, Contract No. 98 will raise due north for the ore shown in old Diamond Drill Hole No. 54 on the 6th level. We also expect to continue this raise to the 5th level elevation where we will hole to an old stope at the base of a broken pile of ore at coordinates 420 S - 1500 E.

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7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

2. Cliffs Shaft and Bancroft Lease: (Cont'd)

Approximately 200 ft. west of Contract 98, Contract 101 raised from the 6th level at coordinates 560 S - 1300 E to the 5th level at coordinates 540 S - 1330 E. This raise cuts the ore body originally discovered by Diamond Drill Hole No. 504 drilled on the 5th level. The ore that we will stope from this ore vein goes down the raise put up by 101 Contract, passes through old workings on the 6th level and enters the mouth of a new raise put up by 101 Contract from the 8th to the 7th levels. On the 8th level the ore is transferred to the haulage cars for hoisting through "A" Shaft.

7th Level

In general, the work on the 7th level Section 10 Lease during the year 1945 was discussed under the Section 10 Development but it is well to give some of the details regarding crews that worked on this level. Contract No. 21 put up two raises from the 8th level to the 7th level elevation at coordinates 1550 S - 2225 E and 1550 S - 2270 E. They connected these two raises with a drift on the 7th level and also put up a branch from the first of these raises toward the north. This branch raise progressed from an elevation just above the 8th level to about 20 ft. above the 5th level. All of this footage was in ore. At the 5th level elevation, Contract 21 drifted west approximately 20 ft. toward No. 80 raise. The completion of this connecting drift has been left for Contract 80 and 21 working together as a double crew. In the early part of the year, Contract No. 80 drifted from coordinates 1510 S - 2130 E to hole to the first raise put up from the 8th level by Contract 21. After this traveling road was completed, Contract No. 80 raise stoped to the 6th level elevation and then raised to the 5th level at coordinates 1425 S - 2140 E. All of this work was in the main ore vein of the Section 10 Lease and opens up the ore body for stoping operations which probably will get underway during the ensuing year.

In the North Vein, Contract No. 15 raise stoped to the west from the end of an old 7th level drift at coordinates 260 S - 2770 E. This raise stope ran into dike and jasper in the back and breast and by the end of the year Contract No. 15 had nearly depleted all of the reserves which they had exposed.

About 250 ft. southeast of Contract No. 15, but shown on the 6th level map, Contract No. 67 breast stoped northwest to the coordinates 420 S - 2830 E. This work was carried on at an elevation slightly above the 7th level. The ore vein strikes northwest-southeast and dips south underneath slate hanging wall. There is some possibility that this ore vein may continue for another 150 ft. to connect with 6th level stopes developed at coordinates 290 S - 2690 E.

The remaining three crews which did development work on the 7th level during the year all operated in the North Vein in the northeast part of the mine. Contract No. 31 raised from the 8th level drift at coordinates 300 N - 3580 E and then drifted southwest on the 7th level elevation to

CLIFFS SHAFT MINE
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7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

2. Cliffs Shaft and Bancroft Lease: (Cont'd)

connect with a drift driven north by 61 Contract to coordinates 210 N - 3540 E. Most of the work performed by 31 crew was in ore but the last part of the drift was driven through rock which separates 31 area from 61 stope. In the future, Contract 31 will open up the ore vein at the top of their raise probably by raise stoping to the east. In addition to driving the drift north to connect with Contract 31 drift, 61 crew drove a drift southwest from their stope workings to coordinates 120 N - 3360 E. This drift was driven entirely in ore but encountered dike near the breast. The crew then stripped ore from the south rib of the drift alternating this work with the development in the same vein of a breast stope to the east which ultimately progressed to coordinates 150 N - 3570 E. The third crew that worked in this general territory was Contract 81 which extended a raise from the old 7th level stope at coordinates 130 N - 3200 E to hole to the end of the 6th level drift at coordinates 175 N - 3210 E. The biggest part of this raise was also in ore and provides a working place from which stoping operations can be conducted. All three of these crews operated in the same general ore horizon in a relatively new territory that gives promise of much additional ore between the 10th and 4th levels. In general, we believe that the ore strikes east and west and dips to the north beneath slate hanging wall. The pitch of the ore vein is apparantly to the west. It is likely, therefore, that the upper reaches of the ore vein will extend east nearly to the boundary of the old New York Mine property.

8th Level

Contract No. 5 put up a raise about 30 ft. in jasper to coordinates 200 S - 2480 E in the North Vein. This is the raise discussed under the work of Contract 51 on the 6th level and it is through this opening that we expect to remove the ore mined by Contract No. 51. The raise probably will be completed sometime in 1946.

In the Southeast Vein, Contract No. 65 breast stoped east to the coordinates 1070 S - 2360 E. This work was carried on at an elevation slightly above the 8th level elevation in an ore vein that strikes east and west and dips north. The stope driven by Contract 65 is bounded on the south or footwall side by dike and also by dike in the hanging wall rib. For the most part, Contract 65 was engaged in depleting work, mining floors of old stopes that connect the 9th and 7th levels in this territory.

In the early part of the year, Contract 16 was moved from their 7th level workings to the Bancroft deposit and Contract 82 was given the job of mining the ore that remained in the old 7th level stopes. In order to get the remainder of the ore out from the floor of these 7th level stopes, Contract 82 raised from the 8th level at coordinates 150 S - 1740 E. This raise constituted the development work done by 82 Contract and during the remainder of the year they were engaged in depleting the ore reserves on the 7th level.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1945

7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

2. Cliffs Shaft and Bancroft Lease: (Cont'd)

The work of Contract 101 in the Main Vein was described in the discussion of the 6th level where we mentioned the fact that Contract 101 put up a raise from the 8th to the 7th levels in order to provide a passageway through which we could remove the ore stoped on the 5th level. This raise is located at coordinates 600 S - 1250 E. About 400 ft. southeast of Contract 101, also in the Main Vein, Contract No. 79 widened the old drift and started a new drift southeast which was advanced to coordinates 800 S - 1635 E. This work was carried on in conglomeritic ore lying under very flat slate hanging wall. Ultimately, the drift will be extended 100 ft. southeast to connect again with the old traveling road drift eliminating the sharp curve in this main haulageway.

As mentioned previously in this report, we had one highly mechanized mining crew operating in the mine throughout the year and this gang spent the entire year in various places on the 8th level. In the first part of the year they completed the drift in the east part of the mine from which we expect to put up a raise to old No. 8 workings on the 4th level. The breast of this drift is located at coordinates 110 S - 3500 E. From this drift, Contract No. 5 started the raise toward the 4th level stopes but this raising project was not resumed again until January 1946. After completing the drift mentioned above, Contract 41 moved about 400 ft. north in the North Vein where they advanced the old drift northeast to coordinates 350 N - 3540 E. This drift encountered dike in the last 40 feet of its penetration. The crew then turned a cross cut off to the east which was ultimately advanced to coordinates 390 N - 3660 E. This cross cut was stopped when it encountered jasper and dike. Good ore was penetrated by this drift in the area along the 300 N coordinate line between 3500 E and 3600 E. It is in this vein of ore that Contract 31 put up a raise to the 7th level elevation. In March, Contract 41 was moved to the Section 10 Lease in order to drive a development drift west longitudinally through the main Section 10 ore body. This drift reached the coordinates 1400 S - 1550 E where it was stopped after having penetrated about 80 ft. of mixed jasper and ore. From this drift Contract 41 started two raises at coordinates 1470 S - 1850 E and 1520 S - 1950 E. The crew was then moved to the North Vein where they drove a drift 300 ft. west through dike and siderite from coordinates 250 S - 1640 E. From this drift we plan to put up a raise to the floor of Contract 76 stope on the 5th level which will make it possible for us to mine the ore in the floor of these old workings.

There was one crew that worked in the Bancroft Vein on the 8th level elevation during 1945. Contract No. 16 breast stoped both to the west and east near the end of the drift that leads to old 76 stope in the Bancroft Vein. Most of the progress was to the west where the crew ultimately advanced to coordinates 235 N - 1520 E. During the remainder of the year Contract No. 16 stoped the ore from the floor of this breast stope below the 8th level elevation.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1945

7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

2. Cliffs Shaft and Bancroft Lease: (Cont'd)

9th Level

Contract No. 91, the only developing crew that worked on the 9th level elevation, stope raised from the 9th level at coordinates 240 N - 2790 E and holed to the 8th level workings at coordinates 200 N - 2800 E. After the completion of the stope raise, Contract 91 mined some ore from the floor of the 8th level stope but during the major part of the year this crew was idle pending additional development work on the 10th level. We plan to put up raises from 62 stope on the 11th level which will hole to the 10th level drift below the floor of 91 stope. Through this raise, or series of raises, we will remove the ore mined from the 8th and 9th level floors in 91 area.

At the east end of the mine, Contract No. 68 developed two breast stopes to the west to coordinates 700 S - 2900 E and 740 S - 2920 E. Both of these breast stopes were driven at an elevation about halfway between the 9th and 10th levels. The ore is bounded by jasper on the north rib of the northernmost stope and by dike on the south side of the southernmost stope.

10th Level

In the northeast part of the mine on the 10th level, two crews did a small amount of development work during 1945. Contract 81 drove 60 ft. of tail-room drift beyond the mouth of their 10th to 6th level raise at coordinates 120 N - 3280 E. From the east end of this tail-room drift they put in 20 ft. of cross cut to the north as an exploratory drift, looking for hard ore. All of this drifting was in lean jasper which did show some rich streaks near the east end of the drift. About 300 ft. northeast of this location, Contract 101 also put in an exploratory drift that serves as tail-room for their raise which connects the 10th and 8th levels. No ore was discovered by this drift. Prior to driving the tail-room drift, Contract 101 completed their raise to the 8th level by holing at coordinates 310 N - 3500 E. Some good ore was encountered in this raise and stoping operations have been started at about the 9th level elevation.

Two gangs did development work in the Main Vein during the year. Contract No. 3 breast stoped through high quality ore beneath slate hanging to coordinates 730 S - 2100 E. This breast stope was driven at an elevation about 30 ft. below the 10th level floor. Not all of the ore has been mined from the back of the stope to expose the slate hanging but we know that the hanging wall slate exists because of a short exploratory raise which encountered the rock. The north rib of the stope has no limiting rock exposed nor do we know how far down we may be able to mine the floor before encountering rock. About 600 ft. east of Contract 3, Contract No. 26 developed a raise stope during the first 5 months of the year between the 10th and 9th levels. This stope was driven from north to south and started in second class jaspery ore and ultimately finished in conglomeritic ore next to the hanging wall slate. Coordinates of the breast of the stope when it was abandoned are 630 S - 2650 E.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1945

7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

2. Cliffs Shaft and Bancroft Lease: (Cont'd)

In the Bancroft Vein there were 6 crews that did development work during 1945. These will be discussed in numerical order. Contract No. 10 did depleting work in the first part of the year but finished 1945 by advancing a breast stope 50 ft. east along the 0 N coordinate line to 2100 E. This stope lies under old 53 stope on the 9th level. There is a normal fault along the south rib of No. 10 stope. The south side of this vertical fault has been raised up with reference to the north block. The ore along the fault is highly jointed and in some cases practically brecciated. This condition makes mining difficult because it is hard to maintain a firm back in such material. In the same ore vein 400 ft. east of Contract No. 10, Contract No. 53 put in the first 2 months of 1945 developing a breast stope west to coordinates 30 N - 2340 E. This breast stope also occurs beneath old 53 stope on the 9th level elevation. During the latter part of the year Contract 53 was engaged in depleting work, mining floor from their stope.

In what might be termed the hanging wall ore vein on the Bancroft Lease, Contract No. 70 developed a cross cut just north of 53 stope at an elevation between the 9th and 10th levels. The center of this cross cut is located at coordinates 80 N - 2450 E. It bisects a long pillar leaving approximately 2/3 of this pillar east of the cross cut and 1/3 to the west of it. Nearly 300 ft. west of Contract No. 70, Contract 84 increased the outline of their hanging wall stope by mining north underneath the slate hanging wall to coordinates 200 N - 2210 E. Some ore remains in the floor of this 84 stope and it will be necessary for us to do some additional development work on the 11th level elevation before we can mine this ore in the floor. We plan to drive a short drift southeast from old 101 raise and from the end of this, raise to the floor of 84 stope thereby providing a transfer through which we can scrape the ore. During the first part of 1945, Contract No. 69 depleted all the ore reserves in the floor of their hanging wall ore vein 200 ft. west of 84 Contract. In the latter part of the year this crew cut out a new stope at about the 9th level elevation in their traveling road raise at coordinates 140 N - 1900 E. This ore body is part of the same general vein in which Contract 69, 70 and 84 have been working. The whole ore vein strikes east and west and dips north underneath the slate hanging wall.

At coordinates 380 N - 1900 E in the Bancroft Vein, Contract 89 cut out a stope in an east-west vein of conglomerate ore that dips about 80° to the north beneath slate hanging wall. This may be a portion of the same hanging wall vein in which Contract's 69, 70 and 84 worked but if so, it has been displaced by faulting and folding to occupy a position laterally 200 ft. north from where the other three gangs are working. Not all of the geology of this area is explainable on the basis of present information. In the future, Contract 89 probably will have the best possibilities for continued mining west of the location indicated in the discussion above.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1945

7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

2. Cliffs Shaft and Bancroft Lease: (Cont'd)

11th Level

During the first 2 months of 1945, Contract 82 completed a raise which had been started on the 15th level by holing to the floor of 53 stope on the 10th level Bancroft Vein. The ore produced by the floor stoping operations of Contract 53 was removed through this raise. Ore was encountered in the raise at about the 11th level elevation after having penetrated a mass of siderite and dike from the 15th to the 11th level.

Along the 270 N coordinate line, Contract 62 breast stoped from 2620 E to 2710 E. This breast stope started on the Bancroft Lease and crossed the east boundary of the Lease property projecting into the Cliffs Shaft fee holdings. The ore vein strikes east and west and dips north under slate hanging wall. It is the downward extension of the same ore vein discussed under the 10th level Bancroft group of contracts. From this stope we plan to put up raises at about 100 foot intervals to the 10th level drift in order to make it possible to remove the ore that will be mined from the floor of 91 stope above the 10th level as well as the floor of the 10th level itself.

One contract did development work in the Main Vein on the 11th level, namely, No. 39. This crew breast stoped north in the Main Vein to coordinates 510 S - 2050 E. Rock was encountered by this gang in the breast of their stope and during the remainder of the year they were engaged in mining floor on the 11th level.

15th Level

Strictly speaking, there was no development work on the 15th level during 1945 since no ore was put in sight by the work that was performed on that elevation. However, Contract No. 99 spent about 6 months cutting out a pumphouse east of the old pumphouse. We expect to install our new 1,000 g.p.m. Horizontal Duplex pump in this new pumphouse during 1946. The new pumphouse is about 25 ft. wide by 40 ft. long by 20 ft. high. We had not intended that the pumphouse should be more than 12 ft. high but rock conditions proved to be such that in order to make it safe it was necessary for us to bar out an additional 9 ft. of ground from the back. To preclude the possibility of any chunks dropping on the machinery while in motion, we deemed it advisable to line the back of this pumphouse with steel plate erected over steel beams.

"B" SHAFT

1st Level and Subs Above the 1st Level:

On the 1205 ft. sub-level at coordinates 770 S - 275 E, Contract 17 breast stoped east in the Main Vein which strikes east and west and dips north about 30° beneath slate hanging wall. This ore vein is conglomeritic and is underlain by a seam of slate which definitely places it as a member in the Goodrich formation. This gang also drove a breast stope to the west to coordinates 720 S - 60 E. This second breast stope is in the same ore vein but at the opposite end of No. 17 workings. Both of the breast stopes will eventually connect to old workings on the 1205 ft. sub-level.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1945

7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

2. Cliffs Shaft and Bancroft Lease: (Cont'd)

Of the three crews that worked on the 1165 ft. sub-level, only one did development work, namely 85, and this consisted of putting up a small raise stope to the 1205 ft. sub-level at coordinates 1170 S - 120 E. This raise stope is in the Southwest Vein which strikes east and west and dips south between slate hanging wall and dike footwall.

On the 1st level elevation, Contract No. 73 put up 4 short raises during early 1945. Three of these were to the north exploring for a sizable ore vein up the dip of the Southwest Vein which had been exposed in this area between coordinates 400 W and 600 W along the 1250 S coordinate line. None of the raises encountered any appreciable width of ore and we were forced to stop all of them due to the convergence up the dip of the dike footwall and slate hanging wall. One short raise was tried to the east at coordinates 1250 S - 400 W but this also encountered rock in the back and was discontinued. During the remainder of the year, Contract 73 stripped ore from the raises and the ribs of the drift which runs parallel to the strike of the Southwest Vein.

2nd Level

At an elevation between the 2nd and 1st levels, Contract 72 developed a breast stope south to coordinates 470 S - 370 W. This stope was advanced in hard red specular hematite which occurs in a flat lying body of ore overlain by slate hanging wall. In the latter part of the year, Contract 72 put up a short branch raise from an old raise that terminated on the 3rd level at coordinates 500 S - 380 W. This branch raise holed to the floor of the breast stope that Contract 72 had developed above the 2nd level. The reason for putting in this new raise was that 72 stope had encountered dike across the breast of the 2nd level stope and it was not possible to continue any further development on that elevation. The gang will mine floor from this stope, scraping the ore through the new raise. When the floor elevation has been sufficiently lowered it may be possible to extend the stope outlines to the east and west.

4th Level

Two gangs developed ore on the 4th level during 1945. Contract 13 breast stoped to the northeast to coordinates 220 S - 220 W in the North Vein. This ore vein is made up of second class ore and strikes northeast-southwest. The ore is limited along the south rib of the stope by jasper but the north rib still shows some second class ore which we may be able to mine in the future. The other contract, No. 33, breast stoped east in the Main Vein to coordinates 570 S - 200 W. The ore mined by this crew is first class quality hard steel ore that occurs in a vein striking east-west and probably dipping to the north. The south rib of this stope is made up of siderite and some dike with veins of magnetite ore. There is a possibility that one of these magnetite veins may be wide enough to permit the development of a small stope along the south side of 33 workings. No rock limits have been encountered in the north rib of 33 stope and we expect to develop cross cuts to the north at regular intervals. In order to facilitate ore removal from 33 stope, we are driving a drift on the 5th level elevation from which we will be able to put up a raise near the breast as located by the coordinates.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1945

7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

2. Cliffs Shaft and Bancroft Lease: (Cont'd)

5th Level

In the discussion of Contract 33 on the 4th level, we mentioned the fact that one contract was being used to drive a drift under 33 stope from which we could put up a raise to the floor of that stope. At the end of the year Contract 63 had advanced this drift to coordinates 560 S - 340 W. About 400 ft. northwest of this location in the Main Vein, Contract 71 holed a raise from the 6th level to the 5th level and then put up a raise to the floor of the 4th level stope at coordinates 420 S - 700 W. During the remainder of the year this crew stoped ore from the 4th level floor removing it through the new raise.

6th Level

The only development work performed on the 6th level during 1945 was the aforementioned raise put up by 71 Contract.

7th Level

Two crews worked on development jobs in the Main Vein on the 7th level. The first, Contract 42, breast stoped and holed to old workings at coordinates 30 S - 70 E. This crew also put up a short raise from the back of the 7th level to the floor of an old stope below the 6th level elevation and during the remainder of the year they were engaged in mining this floor from the 6th level workings. 1000 ft. southwest along the Main Vein, Contract 56 spent the major part of the year depleting but they did put up a short raise stope to coordinates 580 S - 770 W. This ore was discovered by drilling a test hole through the dike rib of the old workings in this area and it was necessary for the crew to break this rock before they could expose the new ore. The discovery proved disappointing, however, because the ore vein continued to be interbanded with seams of dike making it almost impossible to mine a clean product. Eventually, at the coordinates given above, the mining gang ran into solid dike and had to discontinue the stoping operations.

In the Section 9 Exploration at approximately the 7th level elevation, but shown on the 9th level "B" Shaft Section 9 map, Contract 88 developed a pattern of incline drifts and raises in the area at coordinates 800 S - 4275 W. The ore vein in this territory strikes northwest-southeast and dips about 25° to the southwest. Contract 88 has driven an incline drift up the dip of this ore and from this drift developed cross cuts to the northwest and to the southwest. The ore varies in thickness from 10 to 20 ft. and is overlain by slate hanging wall. The footwall generally is dike. The problem of ore removal from this type of operation is acute but additional development on the 10th level in order to get new raises into the territory does not, as yet, seem warranted since the ore vein is so small.

8th Level

At coordinates 30 N - 130 W, Contract No. 90 did development work by cutting through a jasper seam into a vein of ore that lies to the north of the stope in which they have been stoping floor for the past several months.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1945

7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

2. Cliffs Shaft and Bancroft Lease: (Cont'd)

9th Level

In the North Vein from coordinates 120 N - 620 W, Contract No. 36 drove a narrow breast stope west to 130 N - 770 W. The ore vein varies from 12 to 25 ft. in width and dips south between dike footwall and dike hanging wall. It will not be possible for Contract 36 to advance any farther to the west because the dike in the back and floor converge rapidly to pinch off the ore vein. Some ore remains to be mined in the back of this long narrow stope and Contract 36 will spend the next few months engaged in this activity.

About 600 ft. west of "B" Shaft in the Main Vein, Contract No. 77 holed a raise stope from the 9th level to the 8th level floor at coordinates 230 S - 500 W. This raise stope was put up in first class quality ore that dips to the west under slate hanging wall. Some ore remains to be mined from the back and floor of this raise stope.

At the coordinates 500 S - 1160 W, Contract No. 19 discontinued the advance of a breast stope which they had been driving to the northeast as an extension from old workings on the 9th level. From this new extension, Contract 19 put up two short raises to their 1944 stope on the 8th level and mined floor through both of these raises.

10th Level

Only one crew did development work on the 10th level namely, Contract 14. They sliced ore from the west rib of their old workings and put up a short raise stope which holed to the 9th level at coordinates 740 S - 1440 W. No definite rock limits exist in the stope that Contract 14 developed except some rock that occurs in the bench at coordinates 725 S - 1400 W. This rock may be just a seam or bunch with good ore beneath it.

12th Level

During 1945, Contract No. 40 continued to advance their raise which was started 65 ft. above the 15th level at the knuckle of the old safety raise west of No. 1 storage pocket. Before the end of the year, Contract 40 completed their branch of the raise when they holed to the floor of 10th level stopes at coordinates 320 S - 785 W. This raise will make available ore in the floor of 10th level workings and before the end of the year, ore from the back of the 10th level stopes was already being removed through this raise. After the completion of their branch of the raise, Contract 40 moved down to the 12th level and resumed the extension of the drift which Contract 31 had started northwest from their branch of this same raise. Contract No. 40 holed the drift to old 12th level workings at coordinates 40 S - 1020 W. Most of this drift was driven in ore that seems to strike northwest-southeast and dip to the southwest. During the ensuing months, Contract No. 40 will continue to develop this ore discovery which was originally made by Diamond Drill Hole No. 265.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1945

7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

2. Cliffs Shaft and Bancroft Lease: (Cont'd)

14th Level

Two crews, Contract's 37 and 48, did development work on the 14th level during 1945. Contract 37 stripped ore from the northwest corner of their stope and developed a cross cut to the east which terminated at coordinates 260 S - 1410 W. From the back of this stope near the breast, 37 Contract put up a small raise to the floor of old 13th level stopes. The raise proved that the material in the back of 37 Contract workings was too jaspery to be suitable for mining. 250 ft. west of Contract 37, the other mining crew advanced a breast stope northwest to coordinates 275 S - 1680 W and cross cut from this stope to hole into old workings at coordinates 270 S - 1590 W. The ore vein in this entire territory is overlain by flat lying jasper. Diamond drill holes drilled on the 14th level elevation penetrated nothing but jasper and yet all of the workings developed by Contract's 37 and 48 have been in this same territory directly beneath the diamond drill explorations. This situation demonstrates how readily the geologists may be mislead and overlook ore reserves where diamond drilling reports seem unfavorable.

2. Cliffs Shaft, Bancroft and Section 10 Lease:

The following table shows the gangs that did development work during 1945. The tonnage after each is the amount broken by these crews in development and allocated to the proper level by estimate.

	Contract Number	Mine Tally Ore	Mine Tally Rock	Shifts Mining	Shifts Barring While Developing
"A" SHAFT					
1st Level	18	701	94	55	
	58	7,217	117	206	
2nd "	2	2,259		244	
	29	1,795		160	
3rd "	27	4,962		293	3
	60	979		90	
4th "	2	4,580		206	3
	57	5,962		299	2
5th "	5		1,015	74	19
	45	7,400		291	
	80	1,040	296	120	
	96		428	192	
	104		61	10	
6th "	21	332	5	75	
	51	9,920	128	304½	
	98	209	428	72	3
	101	224		93	
	81		199	27	

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1945

7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

2. Cliffs Shaft, Bancroft and Section 10 Lease: (Cont'd)

	Contract Number	Mine Tally Ore	Mine Tally Rock	Shifts Mining	Shifts Barring While Developing
7th Level	15	6,916	77	243	5
	21	1,040		159	
	31	1,112	780	104	
	61	7,568		303½	
	67	2,392	204	125	25
	80	2,611		153	
	81	173	77	50	
8th "	5		862	74	19
	21	260	179	132	
	31	377	173	83	
	41	5,381	8,757	596¼	
	65	2,168	4	81	
	79	571	214	56	
	80	306		26	
	82	658		74	
	101	474	377	101½	
9th "	16	3,973	15	219½	5
	91	1,907		99	
10th "	3	9,111		283	10
	10	4,100		158	39
	26	2,892		145	5
	53	933	5	44	6
	68	1,403		83	13
	69	490	26	40	8
	70	928		60	5
	81	383	933	121	
	84	1,816		68	8
	89	2,407		93½	
	101	102		28	
11th "	39	5,926		116	
	62	5,692	10	298½	
	82	199	41	46	2
15th "	99		1,234	144	3
Total "A" Shaft		121,849	16,740	7,219½	186
"B" SHAFT					
1st Level	1	2,165	15	102	
	17	5,878		222	2
	73	829		95	
	85	2,318	20	204½	10½
2nd "	72	2,308		170	25
3rd "	72	390	184	63	36
4th "	13	4,758		244½	59
	33	5,534		334	
5th "	63		1,418	119	4
	71	1,357	5	123	3
6th "	71	224	268	70	1

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1945

7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

2. Cliffs Shaft, Bancroft and Section 10 Lease: (Cont'd)

	Contract Number	Mine Tally Ore	Rock	Shifts Mining	Shifts Barring While Developing
7th Level	42	1,844		170	18
	56	2,392	10	96	
	88	2,499		222	6
8th "	90	1,484		49	
9th "	19	8,142	46	279	10
	36	3,978	150	306½	
	77	1,974		108	
10th "	14	3,407		124	
11th "	40		255	96	
12th "	40	1,234	173	148	
13th "	40		77	26	
14th "	37	3,193		142½	1
15th "	48	6,755	36	299	1
Total "B" Shaft		62,661	2,657	3,813	176½
Grand Total Developing		184,510	19,397	11,032½	362½

The contract sheet tonnage, which includes no overrun, equals 534,819 tons. The 184,510 tons mined by developing gangs is 34.5% of the total.

The following table gives the mine tally production totals without overrun for the past six years:

1940	525,133	Tons
1941	642,327	"
1942	(1) 690,266	"
1943	629,555	"
1944	569,871	"
1945	535,454	"
Total	3,592,617	"

(1) Actual tally is 694,807 tons which includes 4,541 tons of Incline Lump.

Developing gangs have mined the following tonnages during the past six years:

1940	252,208	Tons
1941	281,542	"
1942	310,365	"
1943	252,869	"
1944	206,926	"
1945	184,510	"
Total	1,488,420	"

From 1940 to 1946 inclusive, developing gangs mined 1,488,420 tons (41.4%) per the contract sheet tally and depleting gangs mined 2,104,164 tons (58.6%) making a total of 3,592,584 tons. Total mine tally by skip count for the same period is 3,592,617 tons without overrun.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1945

7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

2. Cliffs Shaft, Bancroft and Section 10 Lease: (Cont'd)

The following table gives the average number of development gangs, the tonnage mined by them, the shifts involved and the tons per gang per shift for the past six years:

Year	Avg. No. of Gangs on Ore Development	Tonnage Mine Tally	Shifts Worked	Tons Per Gang Per Shift
1945	38.5	184,510	11,395	16.19
1944	48.1	206,926	14,786½	13.99
1943	56.2	252,869	16,836½	15.02
1942	55.4	310,365	16,946½	18.31
1941	61.0	281,542	12,611	22.32
1940	50.0	252,208	11,345	22.23

b. Stoping:

	Contract Number	Location by Coordinates at Approx. Center of Operations	Character of Work
"A" SHAFT			
1st Level	30	320 S - 600 E	Mining Floors
	34	70 S - 550 E	Mining Pillar & Floor
	58	1240 S - 670 E	Mining Floors
2nd Level	12	340 S - 1430 E	" "
	34	70 S - 550 E	Mining Pillar
3rd Level	9	0 S - 1180 E	Mining Floors
	12	350 S - 1460 E	" "
	22	150 S - 1230 E	" "
	60	200 S - 1350 E	Mining Back
	92	190 S - 1380 E	Mining Floors
5th Level	29	150 N - 1230 E	Mining Back
	76	150 S - 1325 E	Mining Floors
6th Level	92	230 S - 1580 E	" "
7th Level	6	1200 S - 1920 E	" "
	15	240 S - 2760 E	Mining Floors & Back
	20	150 S - 2160 E	Mining Floors & Arch
	66	100 S - 2600 E	Mining Floors
	67	430 S - 2880 E	" "
	82	150 S - 1780 E	" "
	92	230 S - 1580 E	" "
	98	480 S - 1630 E	" "
8th Level	35	570 S - 3050 E	" "
	52	250 S - 2330 E	" "
	54	185 S - 1960 E	" "
	59	450 S - 1800 E	" "
	65	1060 S - 2310 E	" "
	79	100 S - 2070 E	" "
	94	530 S - 1650 E	" "
	95	320 S - 2600 E	Mining Floors & Back

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7. UNDERGROUND: (Cont'd)

b. Stoping: (Cont'd)

	Contract Number	Location by Coordinates at Approx. Center of Operations	Character of Work
"A" SHAFT			
9th Level	16	250 N - 1550 E	Mining Floors
	31	530 S - 1920 E	Mining Pillars
	35	570 S - 3020 E	Mining Floors
	55	1070 S - 2650 E	" "
	78	20 N - 3030 E	" "
	91	200 N - 2800 E	" "
10th Level	10	30 N - 1980 E	" "
	23	80 N - 2600 E	" "
	46	630 S - 1360 E	Mining Floors & Back
	53	30 N - 2480 E	Mining Floors
	64	250 N - 2900 E	" "
	68	700 S - 2950 E	" "
	69	170 N - 2100 E	" "
	70	80 N - 2460 E	Mining Bench & Back
	84	140 N - 2310 E	Mining Floors
	89	380 N - 1950 E	" "
11th Level	7	550 S - 2250 E	" "
	39	570 S - 2025 E	" "
12th	24	680 S - 2290 E	Mining Floors & Pillar
	83	600 S - 2520 E	Mining Floors
"B" SHAFT			
1st Level	1	1250 S - 240 E	Mining Floors
	17	730 S - 90 E	" "
	38	920 S - 1410 W	" "
	73	1230 S - 500 W	Mining Back
	75	1170 S - 175 W	Mining Floors & Back
2nd Level	63	400 S - 230 W	Mining Back
4th Level	38	830 S - 1380 W	Mining Floors
5th Level	38	770 S - 1350 W	" "
	49	800 S - 1260 W	" "
	71	400 S - 650 W	Mining Floors & Back
	93	130 N - 160 W	Mining Back
6th Level	100	670 S - 1020 W	Mining Floors
7th Level	42	40 S - 40 E	Mining Back
	87	0 S - 420 W	" "
8th Level	56	570 S - 900 W	Mining Floors
	90	0 S - 110 W	" "
	100	610 S - 1090 W	" "
9th Level	77	230 S - 550 W	Mining Back
10th Level	14	720 S - 1425 W	Mining Floors
	77	300 S - 690 W	" "
11th Level	86	50 S - 1150 W	Mining Pillars
12th Level	86	370 S - 1220 W	Mining Floors
14th Level	37	200 S - 1450 W	Mining Back
	43	400 S - 1470 W	Mining Floors

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7. UNDERGROUND: (Cont'd)

b. Stoping: (Cont'd)

The table below shows the ore broken by the stoping gangs mining developed reserves:

	Contract Number	Mine Tally Ore	Mine Tally Rock	Shifts Mining	Shifts Barring While Depleting
"A" SHAFT					
1st Level	30	4,468	128	269½	23
	34	4,233	561	176	26
	58	1,301	92	70	
2nd "	12	2,270		75	24
	34	4,865	26	171	69
3rd "	9	4,412	112	255	22
	12	3,769	270	170	27
	22	4,055		264	18
	60	969		57	
	92	46		14	9
5th "	29	4,748		135	16
	76	5,248		203	6
6th "	92	2,040		100	18
7th "	6	7,961	5	303	
	15	770	51	51	
	20	7,625	112	267½	29
	66	8,119	408	303	
	67	3,784		146	2
	82	3,677	194	162	5
	92	1,765	189	116	13
	98	5,722	107	210	13
8th "	4	122			
	35	561		46	4
	52	7,252	10	290½	2
	54	9,522	26	282	20
	59	8,104		284	17
	65	5,299		197	
	79	2,601		154	
	94	571		18	
	95	7,477	15	292	
9th "	16	1,556		78½	
	31	316		19	57½
	35	5,166		245	3
	55	12,551		263	80
	78	12,189		302½	
	91	4,626		116	19
10th "	68	4,195		155	38
	10	2,540	31	95	7
	23	9,149		299	
	46	7,609		240½	10
	53	8,007	219	245½	2
	64	4,656	444	282	4
	69	5,528	26	244½	2
	70	4,417		202	18
	84	6,186		222	4
	89	2,519		155½	2

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7. UNDERGROUND: (Cont'd)

b. Stoping: (Cont'd)

	Contract Number	Mine Tally Ore	Mine Tally Rock	Shifts Mining	Shifts Barring While Depleting
"A" SHAFT					
11th Level	7	8,537			
	39	4,281		100½	
12th "	24	9,149		304	13
	83	6,023		208	160
Total "A" Shaft		242,556	3,024	8,859	782½
"B" SHAFT					
1st Level	1	2,690	365	137	59½
	17	2,081		76	
	38	2,366	92	69	6
	73	1,928		115	
	75	5,187		293	
2nd "	63	5,811		138	38
4th "	38	2,216		49	
5th "	38	8,790	10	178	
	49	13,390		288	9
	71	1,920		82	17
	93	4,355		186	26
6th "	100	5,845	51	208	
7th "	42	446		67	
	87	8,854		262	39
8th "	56	9,236	51	193	
	90	5,034		245	2
	100	2,657		74	3
9th "	77	2,795		44	
10th "	14	7,074		178	
	77	2,354	41	122	2
11th "	86	5,814	156	170¾	54
12th "	86	1,918	174	56	21
14th "	37	36		131½	20
	43	4,957	107	225	94
Total "B" Shaft		107,756	1,045	3,587¼	390½
Grand Total Depleting		350,312	4,069	12,446¼	1,173

The mine tally from the contract sheets was 534,819 tons of which the depleting gangs broke 65.5%.

The following table gives a six year comparison:

Year	Avg. No. of Gangs Stoping	Tonnage Mine Tally	Shifts Worked	Tons Per Gang Per Shift
1945	46	350,312	13,619¼	25.72
1944	48	364,650	13,984	26.07
1943	46	377,262	13,569½	27.80
1942	48	379,801	14,250	26.65
1941	40	357,135	13,961	25.58
1940	43	275,004	9,739	28.23

CLIFFS SHAFT MINE
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7. UNDERGROUND: (Cont'd)

c. Drifting and Raising:

Year	Rock Drifts and Raises	Ore Drifts and Raises	Total
1945	1,969'	3,153'	5,122'
1944	3,814'	4,108'	7,922'
1943	5,180'	4,059'	9,239'
1942	2,855'	3,166'	6,021'
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'

d. Explosives, Drilling and Blasting:

The pounds of powder used per ton of ore remained practically constant in comparison to 1944 and the overall cost per ton for all explosives for stoping and development in ore also remained nearly static.

The table below shows a sharp increase in powder consumption per foot of rock development in 1945 compared to prior years. This is attributable to the fact that our mechanized drifting crew did 826 ft. of the 1,969 ft. of rock development and the drifts they drove are much larger.

Year	Pounds of Powder Per Foot of Rock Development	
1941	16.97	Gelamite
1942	19.91	(½ Gelamite & ½ Gelatin)
1943	17.8	Gelamite
1944	18.7	Gelamite
1945	21.1	Gelamite

In 1946, we expect to experiment extensively with Hercamite 2X which is rated on a par with Gelamite powder but which is $0.50 per hundred weight less in cost. Preliminary tests indicate that this powder is just as satisfactory as Gelamite where dry conditions prevail.

The table below gives kinds and percentages of ore broken during 1944 and 1945.

	1944	1945
Specular Ore	53.4	52.2
Slate Ore	12.9	12.6
Steel Ore	21.1	28.3
Magnetite Ore	6.6	4.8
Conglomerate Ore	6.0	2.1
	100.0%	100.0%

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7. UNDERGROUND: (Cont'd)

d. Explosives, Drilling and Blasting: (Cont'd)

Statement of Explosives Used: (Stoping and Development in Ore)

	Quantity	Average Price	Amount 1945	Amount 1944
Gelamite No. 1 - Lbs.	481,900	11.50	55705.50	59133.00
60% Gelatin, L.F. - Lbs.	300	11.50	34.50	-
Total Powder	482,200	23.00	55740.00	59133.00
Fuse - Ft.	777,554	5.75 M	4526.84	4682.16
No. 6 Caps	122,165	12.20 M	1490.40	1622.01
Electric Caps	6,361	10.94 C	696.21	709.17
Fuse Lighters	33,000	6.75 M	222.07	214.63
No. 18 Shot Wire - Ft.	4,760	15.20 M	72.39	148.02
Tamping Bags	10,998	5.59 M	61.57	147.25
Connecting Wire - Lbs.	327	5.75	168.66	149.32
Miscellaneous			19.20	143.44
Total Fuse, Etc.			7257.34	7816.00
Total Stoping & Dev. in Ore			62997.34	66949.00
Product - Tons			550,169	587,051
Lbs. Powder Per Ton Ore			.8764	.8758
Cost Per Ton For Powder			.1013	.1007
Cost Per Ton For Fuse, Etc.			.0131	.0152
Cost Per Ton For All Explosives			.1145	.1159
(Development in Rock)				
Gelamite No. 1 - Lbs.	41,550	11.50	4803.25	8234.00
60% Gelatin, L.F. - Lbs.	50	11.50	5.75	-
Total Powder	41,600	23.00	4809.00	8234.00
Fuse - Ft.	13,640	5.75 M	80.43	121.90
No. 6 Caps	1,995	12.20 M	24.34	43.48
Electric Caps	5,997	11.00 C	659.88	1033.81
Fuse Lighters	2,000	7.09 M	14.18	21.62
No. 18 Shot Wire - Ft.	3,000	15.20 M	45.60	280.14
Tamping Bags	702	5.59 M	3.93	16.64
Connecting Wire - Lbs.	310	5.56	172.46	224.12
Miscellaneous			64.90	5.03
Total Fuse, Etc.			1065.72	1746.74
Total Rock Development			5874.72	9980.74
Feet Rock Development			1,969	3,814
Cost Per Ft. Rock Development			2,983	2,617
GRAND TOTAL ALL EXPLOSIVES			68872.06	76929.74
AVERAGE COST PER LB. FOR POWDER			.115	.115

CLIFFS SHAFT MINE
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8. COST OF OPERATING:

a. Comparative Mining Costs:

	1945	1944
Product - Tons	550,169	587,051
Underground Costs	1.950	2.037
Surface Costs	.338	.325
General Mine Expense	.377	.348
Cost of Production	2.665	2.710
Taxes	.325	.310
Depreciation	.021	.023
Loading and Shipping	.084	.086
Total Cost at Mine	3.095	3.129
Budget Estimate at Mine	3.082	3.132
No. of Days Operating	303	305
No. of Shifts and Hours	2-8 hr.	2-8 hr.
Average Daily Product	1816	1925

CLIFFS SHAFT MINE
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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison
Details of Accounts

	Total 1945		Total 1944	
Underground Costs	Amount	Per Ton	Amount	Per Ton
Exploring in Mine	21659.60	.039	20446.82	.035
Development in Rock	44866.47	.082	92891.52	.159
Development in Ore	52728.71	.096	81635.19	.139
Stoping	574876.85	1.045	593206.28	1.010
Timbering	27552.58	.050	27525.93	.047
Tramming	102878.88	.187	129496.21	.220
Ventilation	1420.59	.002	330.88	.001
Pumping	33798.81	.061	35140.36	.060
Comp. & Air Pipes	48364.11	.088	55605.22	.095
Back Filling	3746.87	.007	112.18	-
Underground Suptce.	41465.08	.075	40111.98	.068
Comp. & Power Drills	11009.17	.020	9639.65	.016
Scrapers & Mech. Loaders	61955.82	.113	67389.93	.115
Elec. Tram Equipment	40089.43	.073	38824.48	.066
Pumping Machinery	6380.19	.012	3611.23	.006
Total Undg. Costs	1072793.16	1.950	1195967.86	2.037
Surface Costs				
Hoisting	37881.44	.068	38824.87	.066
Stocking Ore	23469.37	.043	35548.70	.061
Screening,Crushing at Mine	42335.96	.076	44348.06	.076
Dry House	15642.38	.029	14022.10	.024
General Surface Expense	18605.65	.034	20144.05	.034
Hoisting Equipment	16539.03	.030	11130.09	.019
Shaft	6774.62	.012	6242.72	.011
Top Tram Equipment	5268.84	.010	4824.78	.008
Docks, Trestles & Pockets	12133.16	.022	4885.09	.008
Mine Buildings	7670.98	.014	10778.92	.018
Total Surface Costs	186321.43	.338	190749.38	.325
General Mine Expenses				
Mining Engineering	4581.04	.008	6823.35	.012
Mech. & Elec. Engineering	2556.47	.005	2398.74	.004
Analysis and Grading	28139.25	.051	28922.41	.049
Safety Department	2661.78	.005	2991.65	.005
Tel. & Safety Devices	8057.94	.015	6520.27	.011
Local & Gen. Welfare	5562.36	.010	5626.23	.010
Spec, Exp. Pens. & All.	12234.04	.022	12222.39	.021
Ishpeming Office	27886.08	.050	29000.45	.049
Mine Office	25381.74	.046	25714.46	.044
Insurance	7487.08	.014	8824.71	.015
Personal Injury	26941.72	.049	21764.04	.037
Social Security Taxes	22055.66	.040	24568.17	.042
Employees Vacation Pay	34267.90	.062	28998.81	.049
Total Gen. Mine Exp.	207813.06	.377	204375.68	.348
Cost of Production	1466927.65	2.665	1591092.92	2.710
Taxes	178544.98	.325	181682.98	.310

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison
Details of Accounts

	LABOR				SUPPLIES			
	1945		1944		1945		1944	
Underground Costs	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton
Exploring in Mine	13238.81	.024	14694.95	.025	8420.79	.015	5751.87	.010
Development in Rock	36203.46	.065	76810.49	.131	8663.01	.016	16081.03	.027
Development in Ore	42187.72	.077	65611.64	.112	10540.99	.019	16023.55	.027
Stoping	472773.68	.859	486420.22	.831	102103.17	.187	106786.06	.180
Timbering	15753.49	.029	16804.64	.029	11799.09	.021	10721.29	.018
Tramming	93904.22	.171	123955.04	.212	8974.66	.016	5541.17	.009
Ventilation	333.11	-	94.63	-	1087.48	.002	236.25	-
Pumping	10436.48	.019	10980.00	.019	23362.33	.042	24160.36	.041
Comp. & Air Pipes	6413.71	.012	6159.67	.010	41950.40	.077	49445.55	.085
Back Filling	3685.71	.007	-	-	61.16	-	112.18	-
Underground Suptce.	41336.18	.075	39988.33	.068	128.90	-	123.65	-
Cave-In	-	-	-	-	-	-	-	-
Comp. & Power Drills	2315.23	.004	811.56	.001	8693.94	.016	8828.09	.015
Scrapers & Mech. Loaders	23256.46	.042	24398.11	.042	38699.36	.070	42991.82	.072
Elec. Tram Equipment	23559.69	.043	21999.22	.038	16529.74	.030	16825.26	.029
Pumping Machinery	3079.85	.006	1790.05	.003	3300.34	.006	1821.18	.003
Total Undg. Costs	788477.80	1.433	890518.55	1.521	284315.36	.517	305449.31	.516
Surface Costs								
Hoisting	18354.49	.033	19060.87	.033	19526.95	.034	19764.00	.034
Stocking Ore	20305.53	.037	28282.51	.048	3163.84	.006	7266.19	.012
Screening,Crushing at Mine	31482.90	.057	31556.63	.054	10853.06	.020	12791.43	.022
Dry House	10364.14	.019	8642.39	.015	5278.24	.010	5379.71	.009
General Surface Expense	16423.90	.030	18048.90	.030	2181.75	.004	2095.15	.004
Hoisting Equipment	6481.08	.012	6902.08	.012	10057.95	.018	4228.01	.007
Shaft	4043.64	.007	4794.36	.009	2730.98	.005	1448.36	.002
Top Tram Equipment	3233.18	.006	2096.35	.004	2035.66	.004	2728.43	.005
Docks, Trestles & Pckts.	7061.74	.013	2332.87	.004	5071.42	.009	2552.22	.004
Mine Buildings	5592.76	.010	7483.60	.013	2078.22	.004	3295.32	.006
Total Surface Costs	123343.36	.224	129200.56	.220	62978.07	.114	61548.82	.105
General Mine Expenses								
Social Security Taxes	-	-	-	-	22055.66	.040	24568.17	.041
Insurance	-	-	-	-	7487.08	.014	8824.71	.015
Mining Engineering	3202.04	.006	5601.76	.010	1379.00	.003	1221.59	.002
Mech. & Elec. Engr.	1806.03	.003	1856.04	.003	750.44	.001	542.70	-
Analysis & Grading	21313.97	.040	21452.99	.037	6825.28	.012	7469.42	.013
Personal Injury	-	-	-	-	26941.72	.048	21764.04	.037
Safety Department	33.70	-	98.18	-	2628.08	.005	2893.47	.005
Tel. & Safety Devices	1863.19	.003	1730.80	.003	6194.75	.011	4789.47	.008
Local & Gen. Welfare	-	-	-	-	5562.36	.010	5626.23	.010
Spec. Exp. Pens. & All.	867.26	.001	1970.00	.003	11366.78	.021	10252.39	.018
Ishpeming Office	-	-	-	-	27886.08	.051	29000.45	.050
Employees Vacation Pay	34267.90	.063	28998.81	.050	-	-	-	-
Mine Office	21660.22	.039	21223.11	.036	3721.52	.007	4491.35	.008
Total Gen. Mine Exp.	85014.31	.155	82931.69	.141	122798.75	.223	121443.99	.207
Cost of Production	996835.47	1.812	1102650.80	1.882	470092.18	.854	488442.12	.828
Taxes	-	-	-	-	178544.98	.325	181682.98	.310
Total Cost	996835.47	1.812	1102650.80	1.882	648637.16	1.179	670125.10	1.138
		60.6%		62.2%		39.4%		37.8%

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8. COST OF OPERATING: (Cont'd)

b. Comparative Mining Costs:

The cost of production for 1945 was 0.05 less than in 1944 in spite of the retroactive fringe payments being included in 1945. Supply costs were higher by .026 in 1945 than in 1944 so the overall reduction had to be the result of reduced labor charges to the extent of .07 per ton. An analysis of the general conditions at the mine explains why we were able to achieve lower costs when hampered by a manpower shortage. All the manpower we had was concentrated on essential tonnage producing activities. Much maintenance and development had to be neglected. The result was lowered costs for labor per ton of ore; but it probably is merely deferring the time when these costs will be incurred.

In the following pages, only those categories will be discussed which show costs varying for reasons other than outlined under the general considerations above.

Exploring in Mine

	1945	1944
Labor for Undg. Drilling	$ 9,633.96	$ 11,425.44
Prop. of D.D. Supt.'s Time	384.92	258.18
Carbon Loss	469.58	2,813.71
Bortz Loss	5,874.78	-
Pipe and Fittings	269.35	260.28
Drill Equipment and Repairs	1,469.48	585.79
Rental of Drill Equipment	1,132.50	1,287.50
Miscellaneous Supplies	271.78	201.79
Compressor Expense	1,050.00	1,200.00
Credit on Bortz Bits	1,520.28	299.96
Adjustment of Selling Price of Carbon		1,084.15
Total	19,036.07	16,648.58
Geological Expense for Drill	647.15	689.34
Analysis Expense	453.59	743.85
Total Underground Drilling Cost	20,136.81	18,081.77
Geological Dept. Exp. for Mine Mapping	1,522.79	2,365.05
Total as Per Cost Sheet	21,659.60	20,446.82
Feet drilled underground with carbon	4,820	5,816
Cost Per Foot	4.177	3.108

The two drills used underground in 1945 did not work steadily as the personnel was borrowed for other more pressing jobs on several occasions. This accounts for the decrease in footage. The cost per foot was fictitiously low in 1944 because of the credit item on carbon selling price adjustment. Nonetheless, the cost per foot of 1945 drilling showed a true increase of about .85 per foot over 1944 costs. This was mainly due to the high cost of bortz drilling as compared to carbon drilling. Bortz proved to be .576 more expensive per foot. The other factors responsible for increased cost were high repair costs and an increase in superintendence cost. One No. 4 steam type drill was repaired for drilling the Moro Mine drainage hole. This drill will be used in 1946. Properly speaking, the cost of this repair does not belong under Exploring in Mine but under pumping or drainage of an idle property.

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8. COST OF OPERATING: (Cont'd)

b. Comparative Mining Costs: (Cont'd)

Exploring in Mine: (Cont'd)

The table below gives the footage and percentage of each type of material drilled by the diamond drills during 1944 and 1945.

	1944		1945	
Ore	422½'	7.2%	230'	4.8%
Dike	2,838½'	48.8%	2,182'	45.3%
Slate	471'	8.1%	793'	16.5%
Cong. & Lean Ore	206'	3.6%	246'	5.1%
Quartzite	-	-	484'	10.0%
Siderite	789'	13.6%	231'	4.8%
Jasper	1,089'	18.7%	654'	13.5%
Total	5,816'	100.0%	4,820'	100.0%

There is $7,988.09 of unexpended balance in E. & A. account CC-93. No work was done under this surface exploration authorization in Section 9 - 47 - 27 during 1945, but when crews are available it is likely that some additional work will be carried on in Section 9.

Development in Rock

Comparative costs for the past five years are shown below:

		Labor Cost		Supply Cost		Total Cost	
Year	Footage	Total	Per Ft.	Total	Per Ft.	Total	Per Ft.
1945	1,969	36,203.46	18.39	8,663.01	4.40	44,866.47	22.79
1944	3,814	76,810.49	20.14	16,081.03	4.21	92,891.52	24.35
1943	5,180	90,353.18	17.44	19,488.14	3.76	109,841.32	21.20
1942	2,855	44,755.36	15.68	11,351.66	3.97	56,107.02	19.65
1941	2,196	33,351.58	15.19	8,005.31	3.64	41,356.89	18.83

Although total footage of rock development was low for 1945 and even though the greater proportion of this footage was in the larger size of openings, the per foot cost dropped 1.56 in 1945 compared to 1944. This, we believe, is due to the fact that a large proportion (826') of the rock footage was driven by a highly mechanized crew equipped with a Jumbo and Eimco shovel.

The contract cost of drifting for this crew is between ten and eleven dollars per foot for all drilling, blasting and rock handling. This is about half of the cost for the other gangs on rock development. The following table shows footage in different categories for the last 5 years:

	1945	1944	1943	1942	1941
Rock Raises	493'	1678'	1124'	1152'	993'
10' x 10' Main Haulage Drifts	1304'	1533'	2855'	1140'	631'
8' x 8' Main Haulage Drifts	172'	603'	1201'	563'	572'
Total	1969'	3814'	5180'	2855'	2196'

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8. COST OF OPERATING: (Cont'd)

b. Comparative Mining Costs: (Cont'd)

Development in Rock: (Cont'd)

The next table helps to explain unit cost per foot, because the type of material has a marked effect on costs.

	Jasper or Lean Ore	Siderite	Dike or Slate	Total
Rock Raises	157'	46'	290'	493'
10' x 10' Rock Drifts	275'	243'	786'	1304'
8' x 8' Rock Drifts	31'	12'	129'	172'
Total	463'	301'	1205'	1969'

Development in Ore and Stoping

These two accounts are combined in this discussion because there is no accurate separation of costs into these two categories on the cost sheet.

Comparative costs for the last two years follows:

Year	Labor Cost	Supply Cost	Total Cost
1945	514,961.40	112,644.16	627,605.56
1944	555,621.27	119,220.20	674,841.47

The detailed cost for the two years are shown below:

	1945		1944	
Labor	Total	Cost Per Ton	Total	Cost Per Ton
Miner's Labor	208,792.89	.380	223,382.09	.381
Other Labor	306,168.51	.556	332,239.18	.566
Total	514,961.40	.936	555,621.27	.947
Supplies				
General	2,604.08	.005	2,020.94	.003
Iron and Steel	19,263.42	.035	20,543.24	.035
Oils	760.45	.001	851.98	.001
Machinery	1,531.06	.003	2,192.27	.003
Explosives	62,997.34	.115	66,939.84	.114
Lumber	42.04	-	38.19	-
Sundries & Clearing Acct.	18,143.25	.033	20,220.40	.034
Electric Power	7,302.52	.013	6,413.34	.011
Total	112,644.16	.205	119,220.20	.202
Total Labor & Supplies	627,605.56	1.141	674,841.47	1.149
Tons Hoisted	550,169		587,051	

As in 1944, this account includes the cost of scraping the ore into the raises which deliver the ore to the tramming level. No appreciable change in cost occurred between 1945 and 1944.

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8. COST OF OPERATING: (Cont'd)

b. Comparative Mining Costs: (Cont'd)

Tramming

	Labor		Supplies		Total	
Year	Total	Per Ton	Total	Per Ton	Total	Per Ton
1945	93,904.22	.171	8,974.66	.016	102,878.88	.187
1944	120,365.63	.205	9,130.58	.015	129,496.21	.220
Decrease	26,461.41	.034	155.92		26,617.33	.033
Increase				.001		

The tramming decreased due to more mechanization on the night shift in the form of mechanical loaders and to a shift of personnel to the stoping account in order to scrape ore.

Pumping

	1945		1944	
	Total	Per Ton	Total	Per Ton
Operating Cost	33,798.81	.061	35,140.36	.060
Maintenance Cost	6,380.19	.012	3,611.23	.006
Total	40,179.00	.073	38,751.59	.066

The detailed cost for the two years follows:

	1945	1944
Maintenance	6,380.19	3,611.23
Pumpmen Labor	8,423.54	8,544.47
Other Labor	2,012.94	2,435.53
Total Labor	10,436.48	10,980.00
Compressor Expense	600.00	600.00
Oil, Waste, & Packing	446.84	304.92
Tools, Etc.	26.64	22.88
Electric Light	418.12	394.51
Electric Power	21,870.73	22,838.05
Total Operating Expense	33,798.81	35,140.36
Total Maintenance and Operating	40,179.00	38,751.79
Gallons of Water Pumped	444,687,684	438,361,410
Gallons of Water Pumped Per Minute	846	831

With the exception of pump maintenance the accounts for 1944 and 1945 are almost identical with little change in the quantity of water pumped. The maintenance cost was boosted by $1,079.00 for a new impeller unit in the Gould centrifugal pump; by $743.00 for constructing a dam in the Holmes Mine; and by several other shop repair charges on small auxiliary pumps.

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8. COST OF OPERATING: (Cont'd)

b. Comparative Mining Costs: (Cont'd)

Pumping: (Cont'd)

The average number of gallons of water pumped per minute for each month during the last five years is given in the table below:

Month	1945	1944	1943	1942	1941
January	826	663	613	624	668
February	804	694	603	612	653
March	808	750	644	613	630
April	913	751	720	652	637
May	835	815	762	662	653
June	907	829	838	663	661
July	909	840	861	657	658
August	848	882	798	642	642
September	861	995	731	633	634
October	834	998	686	676	675
November	828	962	688	653	697
December	799	1033	674	631	662
Average For Year	846	831	710	642	654

Compressors, Air Pipes, & Power Drills

Costs per ton remained nearly the same under this account in 1945 as compared to 1944.

During 1945, eleven drills were purchased at a cost of $5,241.16 and one Cleveland Mine Rig was put in use at a cost of $2,187.11. The table below shows types and makes of drills purchased in the last five years.

	1945	1944	1943	1942	1941
R-58 Stoping Machine	-	1	-	-	-
DA-35 Automatic Ingersoll-Rand Drifters	1	-	-	-	-
DA-35 Ingersoll-Rand Drifters	6	6	11	5	7
D-12 Automatic Cleveland Drifters	2	-	-	-	-
D-12 Cleveland Drifters	1	3	6	2	2
Gardner-Denver Drifters	1	1	-	2	-
J-45 Ingersoll-Rand Blockholers	-	-	-	-	2
JB-4 " " "	-	2	3	-	3
Total	11	13	20	9	14

A detailed study of our machine inventory reveals the fact that stoping crews using drill machines up to 4 years old produced an average of 12.39 cars per miner per day. On the other hand, crews using machines over 4 years old produced only 9.10 cars per miner per day. The former group produced 41% of the total product and the latter 44% of the total product. From this we conclude that we have not been scrapping our old machines fast enough to maintain an economic balance.

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8. COST OF OPERATING: (Cont'd)

b. Comparative Mining Costs: (Cont'd)

Back Filling

Year	Total	Cost Per Ton
1945	3,746.87	.007
1944	112.18	-
Increase	3,634.69	.007

In 1944 there were men engaged in scraping out old rock-fills for transfer to different stopes. This labor should have gone into back filling costs but was not differentiated from stoping charges. In 1945 we keptthese charges separate and consequently, the cost in this category is higher.

Scrapers & Mechanical Loaders

In this category, costs for 1945 remained nearly identical with those for 1944. For the sake of record, the principal items are shown in the table below:

	1945		1944	
	Amount	Cost	Amount	Cost
3/8" Wire Rope	2,275'	193.98	2,307'	193.62
1/2" Wire Rope	5,525'	622.96	11,520'	1302.91
5/8" Wire Rope	84,145'	14449.76	103,746'	17760.31
No. 4 Electric Cable	5,920'	2524.90	2,570'	932.77
No. 6 Electric Cable	315'	126.00	3,484'	1297.97
25 H.P. Electric Motors	-	-	2	496.40
New Scraper Slides	-	-	3	1957.76
Scraper Hoists	-	-	2	1205.84
Scraper Blocks	91	2408.47	156	3816.69
Gen.Electrical Repairs & Renew.		41629.75		38425.66
Total		61955.82		67389.93

The tonnage and unit cost for the past five years for 5/8" Wire Rope are compared below:

Year	Product	Type of 5/8" Rope Used	Purchased	Cost	Unit Cost	Feet Per Ton Ore
1945	550,169	"Trulay"	84,145'	14,449.76	.0263	.153
1944	587,051	"	103,746'	17,760.31	.0303	.177
1943	634,530	"	83,032'	14,693.88	.0231	.131
1942	713,530	"	102,819'	17,928.55	.0251	.144
1941	658,747	"	108,698'	18,582.14	.0282	.165

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8. COST OF OPERATING: (Cont'd)

b. Comparative Mining Costs: (Cont'd)

Electric Tram Equipment

	1945			1944		
	Labor	Supplies	Total	Labor	Supplies	Total
Generators	1264.81	1013.15	2277.96			
Locomotives	3823.59	5326.69	9150.28	5858.12	6509.38	12367.50
Wiring	790.13	1001.72	1791.85	985.08	758.71	1743.79
Tracks	10045.10	3695.71	13740.81	8737.51	4089.02	12826.53
Cars	7637.06	5370.55	13007.61	6418.51	5332.54	11751.05
Spotting Engine	-	120.92	120.92	-	135.61	135.61
Total	23560.69	16528.74	40089.43	21999.22	16825.26	38824.48

The over-all cost for this account increased $1,264.95 over 1944 costs. Principle items charged were - 1. A 100 K.V.A. Converter purchased from the Oliver Iron Mining Company - Holmes Mine at a cost of $600.00. This was installed as a spare in the Engine House. 2. One 25-cell and one 48-cell battery for underground locomotives. 3. 90,468 lbs. of 40 lb. rail costing $1,925.71. 4. Depreciation on 18 cars purchased in 1942 amounting to $3,009.60.

Hoisting

Comparative data for 1945 and 1944 is shown below:

	1945	1944
Maintenance	16,539.03	11,130.09
Operating Expense:		
Engineers' Labor	16,163.28	17,060.02
Other Labor	2,191.21	2,000.85
Total	18,354.49	19,060.87
Supplies		
Oil	130.95	200.86
Tools and Misc. Supplies	258.03	192.42
Electric Light	1,029.16	680.99
Electric Power	16,643.46	17,374.20
Compressor Expense	480.00	480.00
Heating Expense	985.35	835.53
Total Supplies	19,526.95	19,764.00
Total Operating Expense	37,881.44	38,824.87
Total Maint. & Operating Expense	54,420.47	49,954.96
Cost Per Ton Produced	.099	.085
Tons Ore and Rock Hoisted	572,025	617,687
Average Depth Hoisted	756'	740'

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8. COST OF OPERATING: (Cont'd)

b. Comparative Mining Costs: (Cont'd)

Hoisting: (Cont'd)

The maintenance cost was the only item that changed appreciably in 1945 as compared to 1944. From the breakdown between labor and supplies, it may be seen that this increased entirely because of supplies. We spent $10,057.95 in 1945 compared to $4,228.01 in 1944. The principle purchases in 1945 were as follows:

1.	A set of hoist motor stator coils	$1140.00
2.	Eleven rubber-lined sheaves	510.74
3.	Three hoisting ropes charged out in 1945 (No ropes purchased in 1944)	1979.64
4.	Two auxiliary hoist brakes	3957.00
	Total	$7587.38

Stocking Ore

Year	Total Cost	Cost Per Ton
1945	23,469.37	.043
1944	35,548.70	.061
Decrease	12,079.33	.018

Both labor and supplies decreased materially for ore stocking in 1945. Charges for 1944 were unusually high, however, because we found it necessary to replace much of our square trestle timber in that year. We also purchased a somewhat higher proportion of fir in 1944 anticipating delivery difficulties.

Screening & Crushing at Mine

The following tabulation itemizes the principle equipment charges in this account for 1945.

1	Ring Gear	$ 388.50
2	Bevel Pinions	156.10
8	Screen Sections	2002.41
56	Manganese Straps	896.00
	55' of belt	150.43

Docks, Trestles and Pockets

	1945		1944	
	Amount	Per Ton	Amount	Per Ton
Labor	7,061.74	.013	2,332.87	.004
Supplies	5,071.42	.009	2,552.22	.004
Total	12,133.16	.022	4,885.09	.008

We had the steelmen at the Cliffs Shaft Mine for several weeks reinforcing the crusher building at the top tram trestle and building a new rock pocket. These activities raised the cost of this category.

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9. EXPLORATIONS:

Diamond drill holes drilled during the year 1945 were as follows:

	Total Depth	Feet of Ore
D. D. Hole No. 477	128'	No Ore
551	219'	No Ore
552	120'	No Ore
553	530'	No Ore
554	898'	2'
555	310'	64'
556	478'	61'
557	256'	29'
558	600'	No Ore
559	174'	21'
560	260'	44'
561	432'	2'
562	313'	No Ore
563	102'	7'
Total	4,820'	230'
		4.8%

On the 2nd level "A" Shaft, Hole No. 553 was drilled horizontally south from coordinates 1360 S - 2241 E. Elevation of the collar of this hole was +1095. This hole was drilled in order to determine if the Section 10 ore vein extended as high as the 2nd level. The hole was drilled to a depth of 530 ft. and encountered nothing but slate and quartzite proving that at this coordinate location, the ore does not extend up to the 2nd level.

In order to definitely locate the top of the Section 10 ore body in the neighborhood of the 2200 E coordinate line, Diamond Drill Hole 555 was put in on the 3rd level "A" Shaft from coordinates 1293 S - 2181 E. This hole was drilled horizontally due south. It encountered 64 ft. of first class ore between 25 ft. and 98 ft. in depth thereby establishing the fact that the ore in the Section 10 vein comes up to at least the 3rd level elevation.

In the early part of the year, Hole No. 551 was completed from a depth of 298 ft. to a total depth of 517 ft. This hole is located on the 5th level "A" Shaft at coordinates 1265 S - 1991 E. The footage drilled in 1945 was hanging wall followed by dike and soft ore jasper at the bottom of the hole.

On the 6th level, three new holes were drilled in 1945 and one old hole was completed. All of this drilling was to locate any possible ore veins on the Section 10 Lease or the extensions of the known portion of the Section 10 ore vein. Hole 552 was completed from a depth of 238 ft. to a depth of 358 ft. No first class ore was penetrated in this footage and the hole was bottomed in footwall material. Near the east end of the Section 10 Lease, Hole No. 556, which was started on the Cliffs Shaft territory at coordinates 1130 S - 2394 E, encountered a total of 61 ft. of first class ore. The first appreciable run of ore was on the Cliffs Shaft territory between 67 and 80 ft. but the longest run of ore occurred

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9. EXPLORATIONS: (Cont'd)

on the Section 10 Lease between 383 ft. and 423 ft. The hole was bottomed in slate hanging wall which lies above this ore vein. Holes No. 562 and 563 were drilled from coordinates 1268 S - 979 E. The first hole dipped +4° and was drilled S 4° E. The second hole dipped a —29° along approximately the same course. No footages of first class ore were encountered in either of these holes. On the basis of the information garnered from the drilling of Holes 552, 562 and 563, we concluded that the Section 10 ore vein has been pinched out in this portion of the Lease which is slightly west of the center of the Lease area.

On the 10th level, the only exploration conducted in the Section 10 Lease area was the drift driven south along the 2200 E coordinate line to coordinates 1800 S. This drift was in dike, siderite and some hard ore jasper indicating that we were in footwall material at this elevation. In order to test the Section 10 Lease still farther to the south for the possible westward extension of a south limb of the Section 10 postulated syncline, Hole No. 558 was drilled horizontally south from coordinates 1796 S - 2204 E. This hole was drilled to a total depth of 600 ft. and encountered nothing but footwall material such as chert, dike, siderite and soft ore jasper.

During 1944, we completed a raise and short development drift on the 1st level elevation in the "B" Shaft Section 9 Exploration. From this drift, four holes were drilled during the year in order to explore for the extent and attitude of the ore discovered by surface drill hole No. 34. Hole No. 557 was drilled horizontally north from coordinates 1310 S - 4135 W. It encountered 29 ft. of first class ore in the first 38 ft. of drilling. The longest continuous run of ore was between 15 ft. and 38 ft. Hole No. 559 was drilled horizontally N 45° W from coordinates 1315 S - 4143 W. Again some first class ore was encountered in the first part of this hole but in this case, it was divided in small runs of from 2 to 5 ft. in thickness, alternating with similar thicknesses of dike. It would be practically impossible to mine any of this ore clean enough to make it an economically sound proposition. Hole No. 560 was drilled horizontally N 25° W approximately bisecting the angle between Holes 557 and 559. The two major runs of ore discovered in this hole are from 11 to 28 ft. and 35 to 54 ft. This is evidently the same ore which was cut by the previous two holes although in this hole there are fewer dikes. Hole No. 561 was drilled horizontally S 35° E from coordinates 1330 S - 4130 W. No ore was encountered in this hole which was finally bottomed in hanging wall material at a depth of 513 ft.

On the 10th level "B" Shaft, Section 9 Exploration, old Hole No. 477 was deepened from 255 ft. to 283 ft. without encountering any ore. All of this material was soft ore jasper or dike. The hole was deepened to look for the possible downward extension of the ore being mined by 88 Contract between the 9th and 7th levels directly above this area at approximately the coordinates 700 S - 4300 W. At coordinates 923 S - 2522 W, Hole No. 554 was drilled horizontally south to a total depth of 898 ft. This was a general exploration hole drilled in order to test for ore occurrences and also to gain geological information that would help us to decifer the structure of the Section 9 area. All of this footage in Hole 554 was dike.

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10. TAXES:

Comparative data for 1945 and 1944 follows:

	1945		1944	
	Valuation	Taxes	Valuation	Taxes
Realty	2,545,000	91,460.17	2,680,000	96,451.32
Minerals under NW¼ of Sec. 9-47-27	175,000	6,289.01	175,000	6,298.13
Personal	746,100	26,812.74	786,100	28,291.19
Lot 2, Sec. 3-47-27 (Bancroft)	800,000	28,749.76	750,000	26,991.97
SE¼ of NE¼ of Sec. 9-47-27 (Barnum)	52,000	1,868.73	52,000	1,871.44
Lot 174, Nelson Addition	100	3.59	100	3.60
South 35.91 ft. of Lot 179	50	1.80	50	1.80
Total	4,318,250	155,185.80	4,443,250	159,909.45
Taxes per ton produced		.2821		.2724
Taxes per ton shipped		.2560		.2682

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

Year	Taxes	Valuation	Tax Rate
1945	155,185.80	4,318,250	35.9372
1944	159,909.45	4,443,250	35.9893
1943	146,539.81	4,268,250	33.9926
1942	143,225.85	4,093,250	34.6443
1941	144,195.60	4,042,150	35.3198
1940	137,284.25	3,982,150	34.4748
1939	141,248.04	4,007,150	34.8999
1938	140,789.79	3,852,150	36.1865
1937	127,643.22	3,712,150	34.0444
1936	110,614.68	3,232,150	33.8861

Valuations and taxes both dropped slightly from 1944 figures.

City of Ishpeming Tax Levy

	1945		1944	
	Amount	Rate	Amount	Rate
Valuation	11,829,970.00		11,883,020.00	
Tax Levy by Funds				
County Tax	65,064.83	5.5	66,544.91	5.6134
County Road Tax	16,561.96	1.4	23,766.04	2.0048
School Tax	95,822.76	8.1	87,824.93	7.400
School Debt Serv. Tax	11,087.50	.9372	11,512.50	.9711
Gen'l Optg. Debt Ser.	177,449.55	15.000	177,820.80	15.000
Capital Improvement	59,149.85	5.000	59,273.60	5.000
Total Taxes	425,136.45	35.9372	426,642.78	35.9893

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11. ACCIDENTS AND PERSONAL INJURY:

The accident record for the year is shown below:

	Cliffs Shaft Mine		C. C. I. Co. All Underground Mines	
	Compensable Accidents	All Accidents	Compensable Accidents	All Accidents
Hours of Labor	983,160	983,160	5,211,076	5,211,076
No. of Accidents	16	28	99	222
Fatalities	-	-		
Days Lost	1,500	1,539	13,340	13,661
Frequency Rate	16.27	28.48	19.00	42.60
Severity Rate	1.526	1.565	2.56	2.622

Frequency Rate - Number of accidents for every 1,000,000 man hours. Fatalities 6,000 days.
Severity Rate - Number of days lost per 1,000 man hours.

12. NEW CONSTRUCTION ORE EQUIPMENT:

The following E. & A.'s were continued from 1944 or authorized during 1944:

E. & A. No. CC-93

This E. & A. was authorized in 1942 and drilling began in March of that year in the NW¼ of SW¼ of Section 9-47-27. Drilling was stopped in August of 1943 in order to use the equipment and men for more urgent needs. Total cost of this E. & A. was $22,011.91 at the end of 1944 leaving about $8,000 of the original authorization unexpended. There was no work done under the E. & A. in 1944 or 1945 but an adjustment on the carbon inventory selling price raised the amount of unexpended funds.

E. & A. No. CC-140

This E. & A. was authorized in December 1944 for $35,002.00 and covers the purchases and installation of a 1,000 gallon per minute Plunger Pump to handle additional water anticipated because of the opening of the Section 10 Lease. During 1945, the new pump house was prepared but the pump was not delivered in time to install it during 1945. There is an unexpended balance of $3,134.73 in this account.

E. & A. No. CC-146

This covers the purchase of a 3/4 ton truck for the laboratory. Total authorized was $1,166.28 and total expended was $1,208.22.

E. & A. No. CC-148

In May of 1945, E. & A. CC-148 was approved for the purchase and installation of auxiliary post brakes for the "A" and "B" Shaft hoists. These brakes are primarily a safety improvement. Total authorized was $7,370.00. Brakes will be installed in 1946.

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12. NEW CONSTRUCTION ORE EQUIPMENT: (Cont'd)

E. & A. No. CC-150

In order to improve the ventilation in the Cliffs Shaft Mine, authorization was granted to expend $8,662.50 for a forced air ventilating system. This will be installed in 1946.

E. & A. No. CC-153

In order to replace our main dry heating plant and stoker, which were worn out, authority was secured to purchase and install the replacements at a cost of $5,390.00. Boiler and stoker will be installed in 1946 when the equipment is delivered.

E. & A. No. CC-163

This E. & A. was approved in December 1945 for the purchase of an Eimco Model 40 Loader for underground at a cost of $8,900.00. The loader was in test use prior to purchase and has proved to be a very satisfactory additon to our underground loading equipment.

14. MAINTENANCE AND REPAIRS:

Dwellings

	Labor	Supplies	Total
Hard Ore Location	2,638.76	424.31	3,063.07
Barnum Location	881.66	1,281.43	2,163.09
Second Addition	108.09	56.74	164.83
Outhwaite Purchase	357.19	80.72	437.91
Hyde Purchase No. 1	171.15	52.20	223.35
Hyde Purchase No. 2	1,809.05	1,509.92	3,318.97
Smith Purchase	172.89	57.27	230.16
Nelson Purchase	92.16	14.41	106.57
Berg Purchase	482.60	200.12	682.72
Ramsdell Purchase	322.47	9.84	332.31
Grand Total	7,036.02	3,686.96	10,772.98

Repair costs dropped appreciably partly due to the fact that personnel shifts were practically nonexistent in 1945 and renovation programs are thereby reduced.

Comparative figures for the past six years follows:

Total for Year	1945	-	$10,772.98
"	1944	-	12,771.58
"	1943	-	18,006.43
"	1942	-	7,708.55
"	1941	-	7,208.75
"	1940	-	6,140.09

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15. POWER:

The following five year comparison shows power consumption, cost and rate per K.W.H.:

Year	K. W. H.	Cost	Rate Per K.W.H.
1945	7,097,196	102385.23	.014426
1944	7,800,360	111649.01	.014313
1943	7,431,998	107603.42	.0144783
1942	7,093,627	104081.28	.0146725
1941	6,981,570	101144.56	.0144874

The detail of distribution of power at the mine follows:

	K. W. H.	Cost
Scraping Ore & Rock	529,843	7,643.60
Pumping	1,545,037	22,288.85
Hoisting	1,225,040	17,672.62
Stocking Ore	10,220	147.44
Crushing Ore	218,676	3,154.66
Dry House Expense	85,290	1,230.42
Surface	38,369	553.52
Telephone & Safety Devices	82,536	1,190.69
Mine Office	11,752	169.54
Machine & Carpenter Shops	4,439	64.05
Drill & Jackbit Shops	49,401	712.67
Heating Plant	7,015	101.21
Compressors	2,710,896	39,107.80
Electric Haulage	565,172	8,153.26
Ventilation	13,510	194.90
Total	7,097,196	102,385.23

Comparative data for 1945 and 1944 follows:

	1945	1944	Difference	Inc.%	Dec.%
Production - tons	550,169	587,051	36,882		6.70
	K.W.H.	K.W.H.			
Scraping Ore & Rock	529,843	573,219	43,376		7.56
Pumping	1,545,037	1,577,132	32,095		2.03
Hoisting	1,225,040	1,261,561	36,521		2.89
Stocking Ore	10,220	34,200	23,980		70.11
Crushing Ore	218,676	210,000	8,676	4.13	
Dry House Expense	85,290	90,949	5,659		6.22
Surface	38,369	29,732	8,637	2.90	
Telephone & Safety Devices	82,536	81,909	627	.70	
Mine Office	11,752	11,465	287	2.50	
Mach. & Carp. Shops	4,439	5,575	1,136		2.03
Drill & Jackbit Shops	49,401	52,281	2,880		5.50
Heating Plant	7,015	10,532	3,517		3.33
Compressors	2,710,896	3,269,205	558,309		17.07
Electric Haulage	565,172	580,600	15,428		2.65
Ventilation	13,510	12,000	1,510	1.25	
Total	7,097,196	7,800,360	703,164		9.01

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18. NATIONALITY OF EMPLOYEES

The following table shows the various nationality groups employed at the mine as of December 31, 1945:

	American Born	Foreign Born	Total
English	89	20	109
Finnish	84	59	143
Swedish	50	7	57
Italian	13	17	30
French	38	4	42
Norwegian	22	2	24
Irish	8	1	9
German	7	-	7
Austrian	1	-	1
Czechoslovakian	1	-	1
Total	313	110	423

Comparison for 1945, 1944 and 1943 follows:

	1945		1944		1943	
	Number	% of Total	Number	% of Total	Number	% of Total
English	109	25.7	102	24.7	124	25.5
Finnish	143	33.8	139	34.0	182	37.4
Swedish	57	13.5	55	13.3	61	12.5
Italian	30	7.1	34	8.2	36	7.4
French	42	10.0	38	9.2	45	9.3
Norwegian	24	5.7	22	5.0	22	4.5
Irish	9	2.1	12	3.0	7	1.5
German	7	1.7	7	2.0	6	1.5
Austrian	1	0.2	1	0.2	2	0.4
Polish	-	-	1	0.2	-	-
Russian	-	-	-	-	1	-
Slovanian	-	-	1	0.2	-	-
Czechoslovakian	1	0.2	-	-	-	-
Total	423	100.0	412	100.0	486	100.0

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1. General

The production in 1945 was 326,633 tons as compared with 376,863 tons in 1944. A decline in production during the remaining years of the life of the mine is very evident due to the gradual reduction in the extent of the orebody as lower elevations are reached. Early in the year, shortage of labor resulting from men being drafted and quitting late in the previous year was a factor that effected production adversely, but this situation was relieved later in the year by the reduced size of the underground operation that was made necessary by a decrease in mining areas. In sharp contrast to the previous year loss of employees into the armed services was a negligible factor and by V-J Day the labor force was about normal for the size of the operation that could be conducted in the rapidly depleting orebody.

In an effort to disclose additional reserves to supplement the rapidly depleting orebody, an exploration drilling program has been continued during the major part of the year. With possibly one exception, results of this program have continued to be disappointing as no appreciable tonnage of additional reserves has been disclosed. The extent of the known ore below the 8th Level was further explored by drilling and some additional tonnage was proven. The most favorable find of additional ore was in the area south of the main deposit and diabase dike. By the end of the year development and mining in the latter area had disclosed a very narrow orebody which extended along the strike for a substantial distance but a relatively small tonnage has been outlined above the 8th Level. There is a good possibility however that a considerably larger tonnage will be found below this level. One inclined drill hole into this area encountered a run of ore that averaged .813% in sulphur from a depth of 190' to 260' vertically below the 8th Level. The extent of the high sulphur bearing ore will be the determining factor regarding the tonnage that will be mineable in this orebody from the preposed 9th Level.

Two additional deep holes were drilled horizontally to the south and southeast from the main haulage drift. Favorable structure and some concentration has been developed in this area from numerous drill holes and also from the development and mining in the Morris Mine near the boundary. However, to date only short insignificant runs of ore have been encountered in several of the holes drilled from both the 7th and 8th Levels. Shortly after the middle of the year exploration drilling into this area was stopped due to the failure of proving up ore of any importance.

On the basis of numerous holes drilled to explore the extent of the known ore below the 8th Level and in the adjacent area to the south, sufficient tonnage was disclosed to warrant development of a 9th Level. A study of the comparative cost of developing a 9th Level favored sinking a winze near the orebody instead of sinking the main hoisting shaft. In September, work was started on this project, driving a drift to the winze site and excavating a plat and hoist room preliminary to starting the sinking operations.

LLOYD MINE
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1. General - Cont.

Shipments from both the stockpile and pocket totaled 339,468 tons during the year as compared with 277,049 in 1944. Approximately 70% of the total shipments was Lloyddale grade and the balance Silica grade, which represents a large increase in shipments of the latter grade as compared with the previous year. The large increase in shipments of Silica grade was due entirely to including a small proportion of this ore in the Cliffs Group cargoes, in contrast to the previous year when no Silica ore was mixed into the Cliffs Group grade. At the close of the shipping season a small amount of Lloyddale grade remained in stockpile, most of which represented stockpile over-run. At the end of the year there was a stockpile inventory of 23,224 tons of Lloyddale grade and 183,642 tons of Silica grade. The increased shipments of Silica grade together with a smaller production of this grade during the year has resulted in decreasing the stockpile inventory as compared with the previous year.

During the first three weeks of January the mine continued on an operating schedule of five days per week similarly as during the last six months of the previous year. Effective January 27, the schedule was increased to a six day operation with hoisting conducted on a basis of 2-8 hour shifts per day and mining on a schedule of 3-8 hour shifts per day. During the early part of the year approximately 70% of the mining contracts were on a 3-8 hour shift schedule per day but later as mining areas were depleted, making additional miners available, all the producing contracts were put on a 3-8 hour shift per day schedule excepting several contracts on development work. Due to a gradual reduction in size of the underground operation it is evident that it will be necessary to continue an operating schedule similar to the latter during the remaining years of the life of the mine to maintain the best efficiency. The lateral extent of the orebody does not permit placing a sufficient number of contracts on production to maintain a steady tramming and hoisting operation on an equal basis with mining operations.

In addition to the six regular legal holidays that were observed during the year, several additional holidays were observed. A two day national holiday on August 15th and 16th was observed following V-J Day and December 24th was also observed as a holiday. In accordance with the new contract that was negotiated with the C.I.O., retroactive wage adjustments for shift differential and also vacation pay was paid late in December. In both cases the adjustments were made retroactive to January 4, 1944. The shift differential adjustment consisted of payment of an additional 5¢ per hour for any work performed on the afternoon and night shifts. The vacation adjustment was made on the basis of new eligibility requirements. On the basis of the new contract one week vacation pay was allowed employees with one year of service and two weeks vacation pay allowed for employees with five years or more. For any work performed on the designated legal holidays, rate and one-half was paid and this rate was also paid for any work in excess of eight hours per day or 40 hours per week. In accordance with revocation of the President's former directive, rate and one-half was also paid for work on the seventh consecutive day effective August 21, in contrast to double time penalty payment for work on the 7th consecutive day prior to this date. Vacation time off was allowed eligible employees in August. During a two week period a total of 122 eligible men took time off and the mine was operated on a one shift hoisting schedule during the first week and due to more men being available in the second week, hoisting and mining was done on a two shift schedule.

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1. General - Cont.

Mining operations have been confined almost entirely to the Lloyd East deposit and by the end of the year had reached a top elevation at the extreme east end of approximately 50' above the 7th Level. A small amount of mining was also done in the small orebody disclosed by diamond drilling south of the main deposit and diabase dike. A relatively large amount of development was carried on in the latter area during the year to explore the extent of the ore and also for stope development. At the end of the year two stope operations were being conducted above the 8th Level elevation in the area south of the dike. To maintain maximum production from the depleting orebody, every available area has been developed for mining and crowding of contracts into relatively small areas throughout the orebody has been necessary.

The bulk of the product was obtained from top slicing and several small stope operations between the 7th and 8th Levels in contrast to the previous year when the major portion of the product was mined from above the 7th Level. The larger portion of the total product was mined by top slicing operations and due to the softer character of the ore encountered at depth and the fact that the south footwall dike caves readily the opportunities for stoping are becoming less. The small orebody south of the main deposit offers the best possibilities for development of stopes in the future but the major portion of the tonnage in this deposit is mineable from the 9th Level.

Late in the year work was started on the 9th Level development program and a substantial amount of rock drifting will be done on the 8th Level before sinking operations can be started. The winze will be located in the footwall slate west of the orebody and it will be sunk to a depth of 200' below the 8th Level. Development of the 9th Level will then be undertaken at an elevation of 200' below the 8th Level and it will comprise driving a relatively short main level haulage drift extending east from the winze with three crosscuts branching to the south. Work will be concentrated on this project throughout 1946 in an effort to complete the large scale development program so uninterrupted production can be maintained as mining proceeds to lower elevations.

2. PRODUCTION, SHIPMENTS AND INVENTORIES

a. Production by Grades

Grade	Tons	Percent
Lloyddale	244,273	74.8
Lloyd Silica	82,360	25.2
	326,633	100.0

There was a decrease of 50,230 tons in the ore produced in 1945 as compared with the previous year. However, there was a material increase in the percentage of Lloyddale grade produced and the tonnage of this grade was only about 4,000 tons less than in the previous year. The percentage of Lloyddale grade to the total was 74.8% compared with 65.9% in 1944. Production during the major part of the year was based on a proportion of 75% Lloyddale grade and 25% Silica grade and during the latter months of the year, efforts were concentrated on increasing the Silica proportion to approximately 30%. The fact that the bulk of the product is being mined by top slicing operations makes it difficult, and to some extent inadvisable, to increase the Silica proportion beyond certain limits. Silica grade ore, as in the past, is obtained most readily, and with less cost, from stope operation, particularly during the last stages of the operation after caving has begun.

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2. PRODUCTION, SHIPMENTS AND INVENTORIES (Cont.)

b. Shipments

There was a substantial increase in the shipments in 1945 as compared with the previous year. This was due to the large increase in shipments of Silica grade which more than offset the smaller amount of Lloyddale grade shipped. The decrease in shipments of Lloyddale grade was due to the slightly smaller product of this grade during the year and the fact that all the ore of this grade in stock was not cleaned out by the end of the shipping season.

The following table shows the total shipments during the past six years:

Year	Lloyddale	Silica	Total
1940	390,561	120,031	510,592
1941	406,526	51,397	457,923
1942	366,505	214,352	580,857
1943	289,257	283,254	572,511
1944	260,472	16,577	277,049
1945	238,045	101,423	339,468

c. Stockpile Inventories

Grade	Tons
Lloyddale	23,224
Lloyd Silica	183,642
Total	206,866

The stockpile inventory at the close of the year was 12,835 tons less than last year with a substantial decrease in the Silica grade inventory and a slightly higher Lloyddale grade balance.

d. Division of Product by Levels

The ore produced above various Levels was as follows:

	Lloyddale Tons	Lloyd Silica Tons	Total Tons
Seventh Level	89,480	31,955	121,435
Eighth Level	153,318	51,880	205,198
Total	242,988	83,835	326,633

The bulk of the product was mined from between the 7th and 8th Levels in contrast to the last two years when the bulk was mined from between the 6th and 7th Levels. Mining is rapidly progressing to lower elevations and as a consequence the ore remaining above the 7th Level will be depleted during the coming year and the entire product for some time will then be obtained from between the 7th and 8th Levels.