THE CLEVELAND-CLIFFS IRON COMPANY

Ore Mining Department

ANNUAL REPORT OF GENERAL MANAGER

For Year Ending December 31, 1950

#2021

1952
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THE CLEVELAND-CLIFFS IRON COMPANY
ORE MINING DEPARTMENT

Manager's Annual Report Year 1950

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GROSS INDEX BY MINES

	Athens	Cambria-Jackson	Cliffs-Shaft	Lake	Lloyd	Maas
Ishpeming, Negaunee, and Iron River Districts:						
General	129	163	14-15	40-41	44	190
Production, shipments & inventories	130-134	163-165	16-18		44-46	191-192
Analysis	134	165	19		46-47	193
Estimate of ore reserves	135-136	165-166	20-21		47-48	194-195
Labor and wages	136-137	166-167	22-23		48-49	196-198
Surface	137-139	168-169	24		50	198-199
Underground	139-147	170-175	24-29		50-56	200-206
Cost of operating and/or opening	147-156	176-182	30-34	42-43	57-60	207-212
Explorations	156	183	34		60-62	
Taxes	157	183	35		63	212
Accidents & personal injuries	158	184	36		63-64	213-214
New construction or equipment	159	184-186	36-37		64-65	214-215
Maintenance & repairs	160	186-188	38		65-66	
Power	160-161	188-189	39		66	
Nationality of employes	162	189			67	
Water supply					66	
Condition of premises	161	189			66	

	Mather "A"	Mather "B"	Morris	Negaunee	Spies	Tilden
Ishpeming, Negaunee and Iron River Districts:						
General	68-69	216-233	109	250	257	117
Production, shipments & inventories	70-72	237-238	109-110		257-259	117-118
Analysis	72	245	111		259	118-119
Estimate of ore reserves	73-74	236-237	111		260	119-120
Labor & wages	75-77	238-239	112	250	260-261	120-121
Surface	78-79		112-114	251	262	
Underground or open pit operations	80-93	234-236	114-116	251-252	262-267	121-125
Cost of operating	94-99	246-247		253	267-270	125-127
Explorations	100-103	239-244			270-273	
Taxes	104	248		254-255	273-274	128
Accidents & personal injuries	105	248-249		256	274	128
New construction or equipment	106			256	275-276	128
Maintenance & repairs	107				276-277	
Power	107				277	
Condition of premises					278	
Nationality of employes	108	249			278	
Water supply	107				278	

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	Agnew	Alworth	Atkins	Canisteo	Hawkins
Mesaba District:					
General	279	287	289	295	309
Production, shipments and inventories	279-280	287	289	295-296	309-310
Analysis	280-281	287	290	296-297	310-311
Estimate of ore reserves	281	287	290-291	297-299	311-312
Labor and wages	282	287	291	299	312
Surface	282	287	291	299-300	313
Underground and open pit operations	282-283	287	292	300-302	313-314
Cost of operating	283-284	287	293-294	305-306	315-317
Explorations	284	288	294	306	317
Taxes	284-285	288	294	306-307	317-318
Accidents and personal injuries	285-286	288	294	307	318
New construction or equipment	286	288	294	308	318-319
Maintenance and repairs	284	287	293	304	315
Beneficiation		287	293	302-304	314-315

	Hill-Trumbull	Holman-Cliffs	Sally	Sargent	Wanless
Mesaba District:					
General	320-321	337-338	353	355	365
Production, shipments and inventories	321-323	338-339	353	355	365
Analysis	323-324	339-340	353	356	365-366
Estimate of ore reserves	324-325	340-341	353	356-357	366-367
Labor and wages	325-326	342	353	357	367
Surface	326	342-343	353	357-358	367
Open pit and underground	326-328	343-345	353	358	367-368
Cost of operating	331-333	348-350	354	359-360	369-370
Explorations	333-334	350	354	360-361	370
Taxes	334	350-351	354	361	370
Accidents and personal injuries	335	351	354	361-364	370
New construction or equipment	336	351-352	354	364	370
Maintenance and repairs	331	348	353	360	369
Beneficiation	328-330	345-347	353	358-359	368

RBM:BB
10-30-51

Ishpeming, Michigan
March 27, 1951

Mr. Walter A. Sterling, Vice President
Cleveland, Ohio

Dear Sir:-

The Ore Mining Department in the Company's centennial year of 1950 again resumed a maximum production schedule in keeping with national defense needs repeated from a decade ago. Due to a late opening of navigation, shipments could not keep pace with production and a heavy movement of ore is therefore predicted during the coming year in which the Company's share is expected to mount to some 9,000,000 tons compared with the 7,887,723 tons forwarded in 1950.

Before listing the more important features of the 1950 record, it is a pleasure to relate the celebration in Michigan and Minnesota of the Company's one hundredth anniversary, and the gratification and pride of the staff and employees in participating in these happy events. Starting with the arrival of the party of officers and directors from Cleveland on the Steamers W. G. Mather and J. H. Sheadle in Marquette on June 28th following the opening luncheon in Cleveland June 26th, the observance included inspection trips, lectures, a dinner including guests and friends in Marquette on the 29th, and a huge C.C.I. family picnic in Ishpeming on the 30th, where the attendance broke all previous records for gatherings in Marquette County with an estimated total of 17,000 persons. Highlights of the above were the viewing in the Research Laboratory of new processes foretelling beneficiation of low grade ores on the Marquette Range, the trip underground linking Mather A and B Shafts, and the hoisting of the first skip of ore at B Shaft, the talks of Messrs. A. C. Brown, President, and C. B. Randall, President of Inland Steel Company at the dinner, and the seemingly impossible change in the weather immediately preceding, and which therefore allowed the picnic to be held on schedule. Formal observance of the centennial was brought to a close July 15th with a dinner at Hibbing, where Mr. L. A. Rossman and again Mr. Brown were the speakers and this gathering included and paid particular tribute to the older employees with long records of service.

Dr. Harlan Hatcher's book "A Century of Iron and Men" provided the fine public record of the events preceding the 1950 observance of the Company's history, and Mr. C. J. Stakel, who had so much to do with the planning and successful celebration, then compiled a written and pictorial record in permanent beautifully bound form for limited distribution within the Company. From the standpoint of those of us in the northern operations, the single disappointment in the eventful observance was not being able to have Messrs. W. G. Mather and E. B. Greene with us due to doctors orders in conserving their health. We trust, however, that the record speaks for itself in imparting to them the feeling of pride we shared in observing this 100 year achievement.

PRODUCTION

Production for the five year period beginning with 1946 follows:

Year	Michigan Mines	Minnesota Mines	Total Tons
1946	2,730,496*	1,642,184 *	4,372,680
1947	4,162,545	3,767,682 *	7,930,227
1948	4,112,679	4,595,354	8,708,033
1949	3,675,240	3,461,590	7,136,830
1950	4,246,613	4,005,229	8,251,842

*These figures do not include previous years' stockpile overrun.

The 1950 production by grades and districts was as follows:

MICHIGAN

Non-Bessemer Standard	3,663,116 tons
Non-Bessemer Special	387,911 "
Silicious	195,586 "
Total	4,246,613 tons

MINNESOTA

Non-Bessemer	3,088,987 tons
Bessemer	916,242 "
Total	4,005,229 tons

SHIPMENTS

Shipments from the underground mines and open pits in Michigan and Minnesota in 1950 were:

Michigan Mines	4,154,529 tons
Minnesota Mines	3,733,194 tons
Total	7,887,723 tons
Shipments in 1949	7,044,990 tons

Production and shipments in 1949 were curtailed by a six weeks' strike. Shipments in 1950 could not keep pace with production and resulted in a much larger than normal year-end stockpile ore inventory at Minnesota Mines.

ANALYSIS

The expected and actual analysis of 2,138,590 tons of Cliffs Group ore shipped in 1950 was as follows:

	Tons	Dried Iron	Silica	Moist.	Natl. Iron
Expected		57.87	10.13	11.92	50.970
Avg. Mine analysis	2,138,590	57.89	10.15	11.96	50.966
Avg. Lower Lake		57.70		11.14	51.272
Guarantee		57.98	9.98	11.55	51.300

The remarkably close lower lake iron natural content to the guarantee may be noted. A comparison of the ores going into Cliffs Group mixture is shown below:

	Expected	Actual
Cliffs Shaft crushed	51.00	51.29
Lloyddale	58.70	58.41
Lloyd silica	52.50	53.03
Maas Standard	58.80	58.90
Maas special	58.80	58.66
Mather A	58.50	58.02
Athens	58.50	58.91
Cambria Jackson	58.75	58.34
Spies	57.70	56.82

The mine analysis record of the larger shipments by grades from Minnesota was as follows:

	Tons	Iron Dried	Phos.	Moist.	Iron Natl.
Newberry Bessemer	744,110	56.861	.037	7.597	52.541
Williamson	1,713,184	55.858	.066	8.516	51.100
St. Paul	682,855	55.742	.066	11.285	49.453

The ironcontent of lower lake analyses exceeded the above in all cases.

COSTS

The line on costs held very well until December 1st, 1950, when a wage increase of 21¢ per hour was granted, 8½¢ of which was under negotiation at the year end in a job evaluation program similar to that previously installed in the steel mills. Illustrative of the small increase to the December 1st date, caused mainly by the upward drift of electric power and supplies, is the following comparison of the Michigan underground mines in 1949 and the first eleven months of 1950:

COSTS (Cont.)

	Tons	Total Cost per ton
Year 1949	3,586,737	$ 3.533
11 months 1950	3,703,038	3.624
Increase per ton		$ .091

The cost in December, including the wage increase and other adjusted charges, jumped to $4.52 per ton and drove the year's cost to $3.70 or an increase of 17¢ per ton instead of the 9¢ that had existed to December 1st.

Costs in Minnesota because of the lower grade ores treated by reason of constantly improving metallurgical practices, are not as representative as the above comparison. These changes extending the life of the open pits as well as expansion of lower cost mining methods such as block caving in the underground mines, together with other plant and equipment improvements calling for a larger than normal capital outlay, were further extended by the technical and supervisory staff in 1950 in seizing every opportunity to keep our mining properties at peak operating levels. Periodic Ore Committee meetings with the sales and executive groups assisted in planning and quickly introducing changes aiding production but which were still consistent with analysis or quality needs, and all indications point to this co-operative planning having an increasingly beneficial effect on costs from the longer range standpoint.

ORE RESERVES

The total ore reserves reported to tax authorities in Michigan and Minnesota showed no basically important changes. The trend continued upward as shown in a later tabulation but was spotty in nature and served only to emphasize the importance of continuing our present enlarged exploratory program so vitally needed because of the much greater period of time (and expense) required to bring a mine into production than formerly. The major rewards in Michigan were the large orebody developed in Mather B, the deep ore body located on Section 11 and confirmation of the enormous reserve of homogeneous low grade iron formation in the Tilden area. The major disappointments occurred in not being able to find reserves which would extend the comparatively short life of the Lloyd, Cambria Jackson and Spies Mines and disclosure of the complicated metallurgical problem involved in separating the iron and silica from the Tilden formation.

Metallurgy played a large part by reason of rapid advances in beneficiation methods and plant practice in adding to the treatable reserves of the Minnesota mines. Profitable recoveries on less than 33% of the crude ore mined at the Hill Trumbull pit were maintained in 1950, and while it is true ore prices have risen, this would have been an unattainable figure a few years ago from the concentrating standpoint alone. The reserve comparison shown below cannot therefore take into account the implied further extension of Minnesota reserves, and may be said

ORE RESERVES (Cont.)

to be on the conservative side:

	12-31-49	12-31-50	Inc. or Dec.
Michigan	24,540,550	29,819,400	5,278,850
Minnesota	32,630,588	33,495,875	865,287

SAFETY PROGRESS

Five fatal accidents occurred in 1950 to temporarily set back the average which has been worked down to about half that figure for the period of the last ten years. Progress was maintained, however, in lowering our frequency rating covering all injuries from 45.01 in 1948 and 43.91 in 1949 to 39.26 in 1950. Favorable comparison may also be made with the latest available figures of national ratings for metal mining.

Classification of the fatalities indicated that inexperience was a contributing factor in two of the five and special attention has been emphasized in further expanding training and supervision of new employees or those with changed jobs.

LABOR

The labor force increased rapidly in Michigan, mainly through needs in developing the Mather B property and showed about the same expansion rate of the year before in Minnesota. The total number of employees in the Lake Superior region therefore reached a new peak as shown in the following comparative record:

	Michigan	Minnesota	Total
December, 1948	3,125	1,100	4,225
December, 1949	3,062	1,206	4,268
December, 1950	3,466	1,316	4,782

The usual statements for the comparative record showing statistics on labor, wages, explosives, timber and other supplies are appended hereto.

Yours very truly

C. W. Adams

General Manager

CWA: DP

THE CLEVELAND-CLIFFS IRON COMPANY
MINING DEPARTMENT
A COMPARISON OF MINING DEPARTMENT MICHIGAN ASSESSED VALUATION AND TOTAL TAXES PAID FROM 1929 THROUGH 1950

YEAR	The C C I Co	The Negaunee Mine Co	The Athens Ir Mng Co	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
1946	11,423,395	4,170,610	2,327,690	2,136,050	20,957,745	D	383,070
1947	11,826,910	4,524,225	2,197,815	2,148,105	20,697,055	D	260,690
1948	11,744,905	4,710,145	2,082,815	2,157,405	20,695,270	D	1,785
1949	11,884,480	5,608,650	2,048,715	3,385,014	22,926,859	I	2,231,589
1950	12,222,610	6,767,390	2,116,750	3,401,977	24,508,727	I	1,581,868
			Taxes - paid				
1929	$ 476,740,79	199,695,33	97,739,13	55,233.01	829,398.26		
1930	522,901.50	190,689.79	95,122.50	51,352.11	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	454,067.26	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	107,861.43	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	674,997.17	I	13,416.21
1940	376,744.89	130,696.88	95,075.43	39,698.46	642,215.63	D	31,785.39
1941	340,282,83	156,845.98	90,003.76	39,846.19	626,978.76	D	15,236.87
1942	321,091.31	182,845.08	91,057.97	37,686.66	632,681.02	I	5,702.26
1943	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	797,510.70	I	67,611.91
1945	425,599.58	191,565.47	104,255.07	40,964.14	762,384.26	D	36,126.44
1946	417,575.92	168,599.05	103,799.44	43,785.56	733,739.97	D	28,644.29
1947	438,298.87	178,769.39	98,262.27	47,743.90	763,074.43	I	29,334.46
1948	470,710.79	194,238.19	93,223.59	52,220.35	810,392.92	I	47,318.49
1949	496,219.03	229,597.68	108,352.31	92,041.23	926,204.25	I	115,811.33
1950	492,851.32	270,829.15	101,440.20	87,917.79	953,038.46	I	26,834.21

Notes: The 15-Mill Tax Amendment went into effect in 1933.
The Michigan State Sales Tax became effective in July 1933, practically replacing the State Ad Valorem Taxes.
The drop in C C I Co 1933 valuation is due to the Inland Steel Co. taking over the Morris Mine.
The State Tax Commission revalued Marquette County in 1949.

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

	1947	1948	1949	1950
PRODUCT - Tons	546,796	602,453	492,405	641,562
POWDER				
Pounds - 60% Gelamite		350	200	58,950
Gelamite #1	52,250	80,500	80,050	106,100
Hercomite 2X	449,650	520,600	391,300	475,400
Hercomite 2XA	47,600			
Total Pounds Powder	549,500	601,450	471,550	640,450
Total Cost	$74,587.53	$ 84,605.78	$ 68,984.15	$ 97,335.14
Fuse - Feet	814,864	838,775	742,670	899,500
Caps, Number	131,140	131,261	114,495	134,934
Electric Caps	15,435	19,830	23,943	51,276
Fuse Lighters	42,500	56,320	42,500	40,000
Connecting Wire - Lbs.	768	727	747	2,238
Tamping Bags	10,200	11,224	4,870	2,578
Powder Bags		12		6
No. 18 Shot Wire	13,081	13,628	6,755	5,869
Total Cost- Fuse, Caps, etc..	$12,050.74	$13,760.42	$12,986.35	$22,892.15
Total Cost - All Explosives..	86,638.27	98,366.20	81,970.50	120,227.29
Average Price per Pound - Powder....	$ .1357	$ .1406	$ .1463	$ .1520
Cost per Ton - Powder	.1364	.1404	.1401	.1517
Cost per Ton - Fuse, etc.	.0220	.0228	.0264	.0357
Cost per ton - All Explosives	$ .1584	$ .1632	$ .1665	$ .1874
Pounds of Powder per ton of Ore	1.005	.998	.9576	.9983

The production increased 149,157 tons, or 30.3% in 1950 compared with 1949. The average price per pound for powder increased $.0058, or 4% over 1949, and $.0115, or 8.2% over 1948. The cost per ton for all explosives increased $.0209, or 12.5% over 1949, and $.0242, or 14.8% over 1948.

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

	1947	1948	1949	1950
PRODUCT - Tons	3,286,638	3,152,904	2,944,310	3,212,232
POWDER				
Pounds - 40%	7,897			
50%	---	---	---	---
60%	13,325	51,758	125,272	29,575
80%	3,206	568	---	---
Hercomite	1,195,381	1,144,255	783,041	879,619
Gelamite	137,100	199,990	315,521	531,442
Herculite		850	600	---
Total Pounds - Powder	1,356,909	1,397,421	1,224,434	1,440,636
Total Cost - Powder	$184,282.70	$ 199,294.38	$186,034.08	$226,692.90
Fuse - Feet	4,377,420	4,121,214	3,311,772	4,170,639
Caps - Number	550,703	528,234	432,647	477,223
Leading Wire - Feet	112,510	17,785	13,730	26,375
Connecting Wire - Pounds	96	128	70	118
Tamping Bags - Number	36,000	2,000	---	---
Tamptite Shells	38,950	34,420	11,280	16,900
Powder Bags	170	190	125	172
Fuse Lighters	124,300	112,350	97,500	12,500
Electric Exploders	15,291	18,306	9,017	15,359
Master Fuse Lighters		1,000	500	112,550
Primacord - Feet		277,286	616,900	771,200
Total Cost, Fuse, Caps, etc.	$ 45,871.33	$ 55,113.19	$ 57,794.56	$ 73,017.00
Total Cost, All Explosives	$ 230,154.03	$ 254,407.57	$243,828.64	$ 299,709.90
Average Price per Pound - Powder	$ .1358	$ .1426	$ .1519	$ .1574
Cost per Ton - Powder	$ .0561	$ .0632	$ .0632	$ .0706
Cost per Ton - Fuse, Caps, etc.	$ .0139	$ .0175	$ .0196	$ .0227
Cost per Ton - All Explosives	$ .0700	$ .0807	$ .0828	$ .0933
Pounds of Powder per ton of Ore	.4128	.4432	.4159	.4485

The mines included in 1950 figures are the Athens, Cambria-Jackson, Lloyd, Maas, Mather "A", and Mather "B".

1950 Production increased 267,922 tons, or 9.1% as compared with 1949, due to increased working schedule.

Average price per pound for powder increased $.0055, or 3.6% over 1949, and $.0148, or 10.4% over 1948.

The cost per ton for all explosives increased $.0105, or 12.6% over 1949, and $.0126, or 15.6% over 1948.

CJB:MS
5-8-51

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

	1947	1948	1949	1950
PRODUCT - Tons	3,286,638	3,152,904	2,944,310	3,212,232
TIMBER				
Lineal Feet - 6-8"	418,939	555,404	351,908	284,906
8-10"	202,301	193,679	87,661	137,850
10-12"	361,575	343,987	162,846	309,154
12-14"	174,390	125,630	192,785	124,053
14-16"	12,835	22,036	65,914	16,525
Treated Timber...	13,499	2,595	---	3,450
Total Feet	1,183,539	1,243,331	861,114	875,938
Total Cost	$163,655.34	$177,526.83	$154,177.77	$144,398.74
LAGGING				
Lineal Feet - 7	6,186,393	6,262,127	4,855,632	4,851,344
Total Feet	6,186,393	6,262,127	4,855,632	4,851,344
Cost	$ 94,068.34	$100,798.92	79,114.43	$73,168.42
Poles - Feet	3,196,555	2,971,360	1,932,207	2,293,741
Poles - Cost	77,184.65	88,446.08	58,737.97	$ 68,649.38
Wire Fencing - Rods	90	60	60	55
Wire Fencing - Cost	$10.52	$63.12	$98.64	$90.42
Steel Sets	$14,491.68	$44,013.04	$50,778.52	$57,230.01
Concrete Sets		11,185.08	20,850.78	5,220.34
GRAND TOTAL COST....	349,410.44	422,033.07	363,758.11	348,757.31
Average Cost per foot -Timber.	$ .1383	$ .1428	.1790	$ .1650
" " " 100' - Lagging	1.521	1.6096	1.6293	1.5082
" " " 100' - Poles..	2.414	2.9766	3.0399	2.9929
" " " Rod - Fencing.	1.18	1.0520	1.6440	1.6440
Feet of Timber per ton of Ore.	.360	.3943	.2925	.2727
" " Lagging " " " " .	1.882	1.9861	1.6491	1.5103
" " Poles " " " " .	.972	.9424	.6563	.7141
" " Fencing " " " " .		.0003	.0003	.0003
Cost per ton for Timber	$ .0498	$ .0563	$ .0524	$ .0450
" " " " Lagging	.0286	.0320	.0269	.0228
" " " " Poles	.0235	.0281	.0199	.0214
" " " " Structural Steel	.0044	.0140	.0172	.0178
" " " " Concrete Sets..		.0035	.0071	.0016
Total Cost per Ton	.1063	.1339	.1235	.1086

The mines included in the 1950 figures are the Athens, Cambria-Jackson, Lloyd, Maas, Mather "A", and Mather "B".

1950 Production increased 267,922 tons, or 9.1% as compared with 1949 due to increased working schedule,

Total Cost per ton for all timber decreased $.0149 or 12.1%.

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

SOFT ORE MINES

	1947		1948		1949		1950	
PRODUCT - Tons	3,286,638		3,152,904		2,944,310		3,417,851	
CLASSIFICATION	AMOUNT	PER TON	AMOUNT	PER TON	AMOUNT	PER TON	AMOUNT	PER TON
General Supplies	$ 263,751,82	$.080	$ 325,932.61	$ .103	$ 286,302.00	$ .097	$ 393,679.00	$ .115
Iron & Steel	93,845.90	.029	178,906.88	.057	218,120.00	.074	236,113.00	.069
Machinery	184,861.63	.056	290,254.37	.092	255,873.00	.087	292,889.00	.086
Explosives	237,793.22	.072	267,845.53	.085	277,192.00	.094	351,331.00	.103
Lumber and Timber	395,918.94	.120	457,298.10	.145	382,236.00	.130	364,952.00	.107
Fuel	36,880.91	.011	50,356.32	.016	52,668.00	.018	61,878.00	.018
Electric Power	570,798.56	.174	560,968.17	.178	521,703.00	.177	704,995.00	.206
Miscellaneous	72,979.68	.023	86,602.21	.027	60,250.00	.021	81,198.00	.024
Total	$1,856,830.66	$.565	$2,218,164.19	$.703	$ 2,054,344.00	$.698	$ 2,487,035.00	$ .728

HARD ORE MINES

PRODUCT - Tons	546,796		602,453		492,405		641,562	
CLASSIFICATION								
General Supplies	$ 69,518.09	$ .127	$ 79,821.82	$ .134	$ 77,808.00	$ .158	$ 92,064.00	$ .143
Iron & Steel	59,216.76	.108	71,372.95	.118	75,603.00	.154	124,700.00	.194
Machinery	74,426.64	.136	98,662.88	.164	72,885.00	.148	79,768.00	.124
Explosives	86,642.60	.158	98,366.20	.163	81,971.00	.166	120,838.00	.188
Lumber and Timber	29,023.34	.053	24,712.61	.041	21,462.00	.044	24,152.00	.038
Fuel	5,853.67	.012	7,524.44	.012	8,336.00	.017	8,975.00	.014
Electric Power	113,591.74	.208	117,605.65	.195	107,479.00	.218	145,557.00	.227
Miscellaneous	13,044.77	.024	18,009.45	.030	16,477.00	.033	23,471.00	.037
Total	$ 451,317.61	$.826	$ 516,076.00	$ .857	$ 462,021.00	$ .938	$ 619,525.00	$ .965

NOTE: 1950 Soft Ore Mines included in statement: - Athens, Cambria-Jackson, Lloyd, Maas, Mather "A", Mather "B", and Spies.

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THE CLEVELAND-CLIFFS IRON COMPANY

ORE MINING DEPARTMENT

LABOR SUMMARY -- ALL COMPANIES

	1947		1948		1949		1950	
PRODUCTION - TONS		7,970,030		8,605,471		7,134,528		8,162,064
	DAYS	AMOUNT	DAYS	AMOUNT	DAYS	AMOUNT	DAYS	AMOUNT
Surface	484,004	$ 5,129,821.26	524,388	$ 5,977,241.26	451,917¼	$ 5,357,595.59	528,437½	$ 6,325,168.62
Cost per Ton		$.644		$.695		$.751		$.775
Underground	530,893¼	6,108,235.82	573,482¼	7,198,264.61	493,990	6,495,934.84	563,058¾	7,423,649.17
Cost per Ton		.766		.836		.911		.910
Superintendence & General Roll	58,401¼	795,466.17	63,604½	925,453.99	67,265	1,001,379.19	73,665	1,138,043.30
Cost per Ton		.100		.108		.140		.139
GRAND TOTAL	1,073,299½	$ 12,033,523.25	1,161,474¼	$ 14,100,959.86	1,013,172¼	$ 12,854,909.62	1,165,161¼	$ 14,886,861.09
COST PER TON		$1.510		$ 1.639		$ 1.802		$1.824
Average Rate per Day		$11.21		$ 12.14		$ 12.69		$12.78
Tons per Man per Day		7.43		7.19		7.04		7.01

NOTES: The above is the total of all wages and salaries for employees of the Mining Department, including the Cliffs Power & Light Company.
The Mines were idle in 1949 from October 1st to November 14th, due to Union Strike.

WAGES:

Wages were increased 9%, effective July 16th, 1948, based on a sliding scale from 9½¢ to 16½¢ per hour.
Wages were increased 12½¢, effective December 1st, 1950; plus a deferred wage adjustment to be negotiated estimated to equal 8½¢ per hour.

1950 WORKING SCHEDULE:

MICHIGAN

Athens, Cambria-Jackson, and Maas Mines operated 2 shifts 5 days per week to August 21st, when working schedule was increased to 6 days per week.
Lloyd and Mather "A" Shaft operated same schedule, but 3 shifts per day. Mather "B" commenced operating July 1, 1950, 3 shifts 6 days per week.
Spies operated 2 shifts 4 days per week to May 15th, 5 days per week to August 21st, and 6 days thereafter.
Cliffs Shaft operated 2 shifts 5 days per week to February 5th, and 6 days per week to May 15th, 5 days from May 15th to August 21st, 6 days per week thereafter.
Tilden operated 1 shift 5 days per week from June 19th to September 30th.

MINNESOTA

Agnew and Sargent, underground mines, worked 2-8 hr. shifts 5 days per week to July 16th, and 6 days per week thereafter.
Atkins commenced ore operations April 12th, working 2-8 hr. shifts 5 days per week to December 31st.
Canisteo " " " May 16th, " " " " 5 days " " " October 20th.
Hawkins " " " May 16th, " " " " 5 days " " " November 9th.
Hill-Trumbull " " " May 16th, " " " " 5 days " " " October 10th.
Holman-Cliffs " " " May 8th, " " " " 5 days " " " October 20th.
Wanless " " " July 24th, " 1-8 " " 5 days " " " November 9th.

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COMPARISON OF TOTAL DAYS WORKED AND TONS OF ORE MINED

FOR THE YEARS 1950 AND 1949

	1950 DAYS	1949 DAYS	1950 DAYS	1949 DAYS
GRAND TOTAL - ALL OPERATIONS	1,165,161½	1,013,172¼		
NON-OPERATING TIME:				
General Shops & Storehouse	3,522¼	3,159¼		
Miscellaneous Payroll	20,447¼	19,427½		
Michigan Non-operating	166,823½	130,334¼		
The Cliffs Power & Light Company	21,043	21,033		
Minnesota Non-operating	9,381½	8,479		
Total Non-operating	221,217½	182,433½		
Net Operating -Days	943,944	830,738¾	943,944	830,738¾
Total Production - Tons	8,162,064	7,134,528		
Tons per Man per Day	8.65	8.59		

OPEN PIT PRODUCTION	TONS		DAYS	
Tilden Mine	107,465	88,503	4,433½	3,583
Atkins Mine	436,726	441,398	14,300	7,532¾
Canisteo Mine	760,480	551,499	28,904½	23,830
Hawkins Mine	672,986	604,928	29,643¾	23,357¼
Hill-Trumbull Mine	641,295	560,283	32,193½	31,628
Holman-Cliffs Mine	879,753	705,438	30,120¾	27,487
Wanless	65,334	---	3,253½	---
Totals	3,564,039	2,952,049	142,849½	117,418
Open Pit - Tons per Man per Day	24.95	25.14		
Net Days - Underground Mines			801,094½	713,320¾
Net Tons - Underground Mines			4,598,025	4,182,479
Underground Mines - Tons per Man per Day			5.74	5.86

PERCENTAGE OF TOTAL PRODUCTION

	1950 TONS	1950 PER CENT	1949 TONS	1949 PER CENT
Underground Mines	4,598,025	56.33	4,182,479	58.62
Open Pit Mines	3,564,039	43.67	2,952,049	41.38
Totals	8,162,064	100.00	7,134,528	100.00

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THE CLEVELAND-CLIFFS IRON COMPANY

STATEMENT SHOWING PENALTY COST OF OVERTIME WORKED

AND EFFECT ON PRODUCTION COST FOR YEAR 1950

	MICHIGAN PROPERTIES	MINNESOTA PROPERTIES	TOTAL
YEAR 1950			
January	$ 13,683.97	$ 2,137.64	
February	19,611.55	1,295.44	
March	23,168.60	1,327.63	
April	27,341.99	1,961.77	
May	23,506.00	14,062.53	
June	17,920.89	8,500.57	
July	23,077.51	20,389.52	
August	30,742.62	22,072.50	
September	78,049.75	25,702.63	
October	69,238.57	15,809.98	
November	61,309.78	16,789.25	
December	78,240.79	14,867.69	
Total - Year 1950	$ 465,892.02	144,917.15	$ 610,809.17
Total - Year 1949	426,557.42	104,279.00	530,836.42
PRODUCTION			
Tons - Year 1950	4,166,878	3,995,186	8,162,064
Tons - Year 1949	3,675,240	3,459,288	7,134,528
EFFECT THE PENALTY COST HAD ON YEAR'S PRODUCTION COST			
Increased 1950 by	$ .1118	$ .0363	$ .0748
Increased 1949 by	$ .1161	$ .0301	$ .0744

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CLIFFS-SHAFT MINE
ANNUAL REPORT
YEAR 1950

1. GENERAL

For the year 1950, production from the Cliffs Shaft Mine totalled 641,562 tons. The budget estimated production was 637,126 tons. Both shafts operated during the year for a total of 283 days. The mine operated on the following schedules: 5 days per week January 1st to February 5th; 6 days per week February 5th to May 15th; 5 days per week May 15th to August 15th; 6 days per week August 15th to December 30th.

Cost of production decreased from $4.114 in 1949 to $4.041 in 1950 and the total cost decreased from 4.559 in 1949 to 4.415 in 1950. This decrease is a reflection of increased efficiency resulting from three major factors. In 1949 we had anticipated a general improvement in efficiency and consequent reduction in cost because of the fairly general conversion to tungsten carbide bits used in the drilling practice. Failure to achieve increased efficiency was attributed in 1949 to the slowdown of the miners because of a fear that they would work themselves out of a job if the improved drilling technique was too successful. This fear was dispelled early in 1950 when the Cliffs Shaft Mine returned to a 6-day schedule and we began the addition of an afternoon mining shift in certain well-ventilated contracts. A second factor was, of course, the continued conversion to the new drilling technique in which the light jackleg-mounted sinkers replaced the tripod-mounted drifters. The third factor responsible for increasing the efficiency of the mine was the addition of the afternoon mining shift in certain contracts. The additional production thereby gained increased the overall tons per man from 4.40 in 1949 to 4.75 in 1950.

In 1950 there was an average of 91.3 gangs working in the mine compared to 92.3 in 1949. On an average, 48 of these were double crews employing two miners instead of a miner and a helper. This is an increase in this type of contract of 13 gangs compared to the previous year. Approximately 80 of the crews used tungsten carbide bits for drilling during 1950. Of the total contracts, 13.3 gangs or 14½% spent their time on raising or drifting and 50.3 gangs or 55% were engaged in so-called development work which includes the raising and drifting as well as the breast and raise stoping.

Shipments from the mine, both pocket and stockpile, totalled 587,656 tons. The current year overrun from stockpile was 2,501 tons and pocket overrun was 9,233 tons. Total overrun of 11,734 tons divided by the mine tally production of 629,828 tons equals 1.86%. This is a decrease in overrun of .33% compared to the preceding year. The skip weight factor remained at 5.10 tons per skip throughout 1950.

All of the production mined during the year was screened to -2" which produced 73.7% lump ore and 26.3% crushed ore.

Major improvements to the surface plant during 1950 consisted of a remodelling and renovation of the Machine Shop, including the conversion of the equipment to individual motor drives; completion of the new roof on the boiler house and the repair of the roof on the Engine House; repair by Intrusion Prepakt, Inc. of "A" Shaft headframe; enlargement of the parking area by moving the rockpile so as to extend the shoreline of Lake Bancroft. A start was also made on a remodelling project for the main underground dry building.

In the underground category the major improvement was the repair and installation of steel sets back-filled by concrete between the new steel and the old timber in the portion of the shaft from collar down to ledge. A number of purchases were made of underground equipment during 1950 which might be classified as improvements.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1950

1. GENERAL: (Cont'd)

They are enumerated below:

25 - J-50 Ingersoll-Rand drills
19 - C.P.-59 drills
9 - R-38 Ingersoll-Rand stopers
27 - Jacklegs
1 - 15 H.P. Fan used to ventilate the Section 10 area
1 - Model 21 Eimco loader.

Most satisfactory labor relations were obtained at the Cliffs Shaft Mine during 1950. Some grievances were presented in verbal form and resolved to the satisfaction of both the Union and Management. No formal written grievance was processed during the year.

The microseismic listening station, which we had maintained throughout 1949 on the 13th Level where we mined some pillars and some floor, was discontinued in early 1950 because the area in which we had been mining was depleted. The equipment was transferred to the Athens and the Mather "A" Mines where some experimental work was being carried on.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1950

2. PRODUCTION, SHIPMENTS, & INVENTORIES:

a. Production by Grades:

Grades	Tons	% of Total
Cliffs Shaft Lump	372,491	
Cliffs Shaft Crushed	132,594	
Total	505,085	78.73
Bancroft Lump	30,344	
Bancroft Crushed	10,973	
Total	41,317	6.44
Section 10 Lump	69,905	
Section 10 Crushed	25,255	
Total	95,160	14.83
GRAND TOTAL FEE & LEASE ORE	641,562	100.00

Production by grades and percentages of Lumps and Fines for the past ten years follows:

Year	Lump Ore Tons	%	Crushed Ore Tons	%	Run-of-Mine Ore - Tons	Total Tons
1941	464,802	74.14	162,132	25.86	31,813	658,747
1942	225,759	79.98	56,510	20.02	431,261	713,530
1943	200,616	79.82	50,732	20.18	383,280	634,628
1944	443,123	76.29	137,701	23.71	6,227	587,051
1945	430,193	78.19	119,976	21.81		550,169
1946	294,264	73.21	107,675	26.79		401,939
1947	396,561	72.50	150,235	27.50		546,796
1948	427,903	71.00	174,550	29.00		602,453
1949	351,318	71.36	141,087	28.64		492,405
1950	472,740	73.70	168,822	26.30		641,562

The revolving trommel was equipped during 1950 as follows:

Bottom section - 2" Screen
Center " - 2" Screen
Top " - 1½" Screen

From January 1st to May 31st, we used a ratio of separation of product of 27% Crushed, 73% Lump. From May 31st to the end of the year, the ratio used was 26% Crushed, 74% Lump. The actual split at year end proved to be 26.3% Crushed, 73.7% Lump.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1950

2. PRODUCTION, ETC.:

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

	Bancroft Ore Tons	Sec. 10 Ore Tons
1925 to 1945, inclusive	1,109,603	39,076
1946	47,998	17,338
1947	45,030	36,611
1948	53,919	41,920
1949	33,941	48,100
1950	41,317	95,160
Total	1,331,808	278,205

b. Shipments

Grade	Pocket Tons	Stockpile Tons	Total Tons	Total Last Year
Cliffs Shaft Lump	256,915	72,145	329,060	305,329
Cliffs Shaft Crushed	85,911	43,573	129,484	120,212
Bancroft Lump	22,016	5,681	27,697	24,552
Bancroft Crushed	7,011	3,195	10,206	11,077
Section 10 Lump	54,154	12,596	66,750	34,465
Section 10 Crushed	16,770	7,689	24,459	14,455
Total 1950	442,777	144,879	587,656	510,090
Total 1949	295,032	215,058	510,090	
Increase	147,745	--	77,566	
Decrease	--	70,179	--	

c. Stockpile Balances:

Ore in stock as of December 31, 1950:

Cliffs-Shaft Lump	68,355 tons
Cliffs Shaft Crushed	15,719
Bancroft Lump	3,115
Bancroft Crushed	1,235
Section 10 Lump	4,261
Section 10 Crushed	2,123
Total	94,808 tons.

CLIFFS SHAFT MINE
ANNUAL REPORT
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2. PRODUCTION, ETC.: (Cont'd)

f. Production by Months:

Month	Optg. Days	CLIFFS SHAFT Lump	CLIFFS SHAFT Crushed	BANCROFT Lump	BANCROFT Crushed	SECTION 10 Lump	SECTION 10 Crushed	Total
Jan.	21	24,826	9,384	824	304	3,633	1,355	40,326
Feb.	23	28,572	10,541	2,430	883	4,212	1,548	48,186
March	27	33,766	12,464	2,580	940	6,011	2,208	57,969
April	25	33,419	12,122	2,344	734	7,296	2,330	58,245
May	25	34,486	12,017	2,437	967	5,821	2,344	58,072
June	22	31,422	10,630	2,192	708	5,533	1,810	52,295
July	16	19,463	6,441	1,455	502	3,806	1,343	33,010
August	24	32,888	10,799	2,726	802	8,062	2,395	57,672
Sept.	25	33,701	12,220	2,895	1,087	6,508	2,566	58,977
Oct.	26	37,318	12,885	3,833	1,483	6,479	2,403	64,401
Nov.	25	32,787	12,380	2,696	862	5,621	1,826	56,172
Dec.	24	29,843	10,711	3,626	1,226	6,270	2,060	53,736
Current Years Skpl. Overrun				306	475	653	1,067	2,501
Total	283	372,491	132,594	30,038	10,973	69,905	25,255	641,562

g. Ore Statement:

	Cliffs Shaft Lump	Cliffs Shaft Crushed	Bancroft Lump	Bancroft Crushed	Section 10 Lump	Section 10 Crushed	Total	Total Last Year
On Hand Jan. 1, 1950	24,924	12,609	468	468	1,106	1,327	40,902	58,588
Output for Year	372,491	132,594	30,038	10,498	69,252	24,188	639,061	487,489
Overruns	-	-	306	475	653	1,067	2,501	4,916
Total	397,415	145,203	30,812	11,441	71,011	26,582	682,464	550,993
Shipments	329,060	129,484	27,697	10,206	66,750	24,459	587,656	510,091
Balance on Hand	68,355	15,719	3,115	1,235	4,261	2,123	94,808	40,902
Increase in Output							151,572	

The major delays during 1950 occurred on July 25th when 8 hours were lost as a result of a broken eccentric in the crusher and a 6 hour loss of time on December 3rd when ice fell from the roof breaking an exposed air line. The remaining delays were minor in character. All delays totalled 100 hours with an estimated loss of 9,000 tons of production.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1950

3. ANALYSIS:

a. Average Analysis of 1950 Output:

	Iron	Phos.	Silica
Cliffs-Shaft Lump	60.36	.096	9.41
Cliffs Shaft Crushed	51.00	.103	21.31
Bancroft Lump	61.14	.104	8.80
Bancroft Crushed	52.39	.103	18.31
Section 10 Lump	60.38	.114	8.89
Section 10 Crushed	52.46	.116	18.27

The output analyses remained very nearly the same in 1950 as in 1949.

b. Complete Analysis of 1950 Ores as Shipped from Mine:

Grade	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
Lump Ore (*)	60.40	.098	9.26	.21	1.86	.68	.61	.013	.66	.30
Crushed Ore (*)	51.10	.095	21.20	.27	2.16	.76	.76	.016	1.04	2.00

(*) Cliffs Shaft, Bancroft and Section 10 are combined.

c. Analysis of Ore in Stock Dec. 31, 1950:

		Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
C.S. Lump	Dried	60.66	.103	9.09	.25	1.90	.63	.68	.011	.80	.29
C.S. Lump	Natural	60.48	.103	9.06	.25	1.89	.63	.68	.011	.80	--
C.S. Crushed	Dried	51.14	.106	20.88	.27	2.40	.75	.80	.013	1.20	1.98
C.S. Crushed	Natural	50.13	.104	20.47	.26	2.35	.74	.78	.013	1.18	--
Ban. & Sec. 10 Lump	Dried	60.74	.096	9.06	.25	1.90	.63	.68	.012	.80	.30
" " "	Natural	60.56	.096	9.03	.25	1.89	.63	.68	.012	.80	--
Ban. & Sec. 10 Crushed	Dried	53.24	.103	18.19	.27	2.40	.75	.80	.014	1.20	1.98
	Natural	52.19	.101	17.83	.26	2.35	.74	.78	.014	1.18	--

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

	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
Dried	56.52	.108	10.89	.49	2.42	.97	.81	.018	1.21	.85
Natural	56.04	.107	10.80	.49	2.40	.96	.80	.018	1.20	--

The above analysis is expected for the Cliffs Shaft, Bancroft and Section 10 ore.

CLIFFS SHAFT MINE
ANNUAL REPORT
YEAR 1950

4. ESTIMATE OF ORE RESERVES:

Assumption: 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, 1950:

Bancroft Area - "A" Shaft

Summary:

	Tons
Bancroft Ore Available Sept. 30, 1950	318,318
Less Production Sept. 30, 1950 to Dec. 31, 1950	13,726
Gross Tonnage as of December 31, 1950	304,592
Less 10% for Mining and Rock	31,832
Net Total Bancroft Ore Available	272,760

Section 10 Lease

Summary:

Section 10 Ore Available Sept. 30, 1950	630,126
Less Production Sept. 30, 1950 to Dec. 31, 1950	24,656
Gross Tonnage as of December 31, 1950	605,467
Less 10% for Mining and Rock	63,013
Net Total Section 10 Ore Available	542,454
Net Total Bancroft & Section 10 Leases	815,214

Cliffs Shaft Fee Ore Areas

Summary:

Cliffs Shaft Ore Available Sept. 30, 1950	1,367,679
" " " " Sept. 30, 1950, Section 9 Exploration	29,700
Total Ore Available, Sept. 30, 1950	1,397,379
Less Production Sept. 30, 1950 to Dec. 31, 1950	135,924
Gross Tonnage as of Dec. 31, 1950	1,261,455
Less 10% for Mining and Rock	139,738
Net Total Fee Ore Available	1,121,717

Recapitulation

Net Cliffs Shaft Ore Available	1,121,717
Net Bancroft Ore Available	272,760
Net Section 10 Lease Ore Available	542,454
Grand Total	1,936,931

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

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

	Dec. 31, 1950	Dec. 31, 1949
Cliffs Shaft Ore Available	1,121,717	1,169,491
Ban. & Sec. 10 Ore Available	815,214	673,055
TOTAL	1,936,931	1,842,546
Increase in 1950	94,385	

New Ore Developed in 1950 - 641,562 plus 94,385 equals 735,947 tons.

The following table shows the variations in ore reserves in the Cliffs Shaft Mine since 1941:

Net Available Ore in Sight

Year	Sec. 10 Ore Tons	Bancroft Ore Tons	Cliffs Shaft Ore Tons
1941		232,298	1,336,010
1942		257,758	1,255,912
1943	17,043	267,301	1,196,149
1944	107,904	272,351	1,140,331
1945	191,458	287,382	1,206,720
1946	254,811	267,779	1,181,962
1947	401,249	254,305	1,134,472
1948	364,941	271,298	1,162,651
1949	389,679	283,376	1,169,491
1950	542,454	272,760	1,121,717

The total increase in reserves of 94,385 tons was made up entirely of gains in Lease ore reserves. This could be expected as development of the Section 10 area progressed.

The table below shows that the 1950 reserves are the highest since 1941. As mentioned above, the increase is due to the development of the Section 10 Lease reserves and the development through exploration of "B" Shaft sub-level reserves:

Total Ore Available in Mine at End of Each year:

1950	1,936,931 tons.
1949	1,842,546 "
1948	1,798,890 "
1947	1,816,756 "
1946	1,704,552 "
1945	1,685,560 "
1944	1,520,586 "
1943	1,480,493 "
1942	1,513,670 "
1941	1,568,308 "

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5. LABOR AND WAGES:

a. General

Comparing 1950 with 1949, the record shows one less man in the surface crew but 24 more men in the underground crew during 1950. The additional men were needed to fill out the underground crew at the time we added the afternoon mining shift.

A general wage increase of 12½¢ per hour was granted, effective December 1st, 1950. This was accompanied by an agreement with the Union providing for the evaluation of all jobs and elimination of so-called "job inequities". The total average cost of this program was not to exceed 8½¢ per hour average.

b. Comparative Statement of Wages and Product:

	1950	1949
Product (tons)	641,562	492,405
No. of Shifts and Hours	2-8 Hr.	2-8 Hr.
No. of Days Operated	283	245
Average Number of Men Employed		
Surface	99	100
Underground	368	344
Total	467	444
Average Wages Per Day		
Surface	$11.21	$11.06
Underground	12.75	12.36
Total	12.43	12.06
Product Per Man Per Day		
Surface (tons)	20.91	18.02
Underground	6.15	5.82
Total	4.75	4.40
Labor Cost Per Ton		
Surface	$ .549	$ .629
Underground	2.078	2.126
Total	2.627	2.755

The addition of an afternoon mining shift, the conversion of more contracts to tungsten carbide drilling, the improved incentive morale all contributed to the higher efficiency and consequent lowering of both surface and underground labor costs at the mine in 1950.

Penalty earnings increased as shown below as a result of the longer period of 6 day operation in 1950 as compared to 1949. In 1949, we worked a 6 day schedule for 6 months while in 1950, we worked 6 days for practically 8 months.

1950	$95,578.17
1949	59,009.87
Increase in 1950	$36,568.30

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5. LABOR AND WAGES: (Cont'd)

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

Year	Surface Labor	Underground Labor	Total Labor
1950	.549	2.078	2.627
1949	.629	2.126	2.755 (x)
1948	.585	2.010	2.595
1947	.615	1.958	2.573
1946	.518	1.670	2.188 (•)

(x) Costs for operating 10½ months.
(•) Costs for operating 8½ months.

	Shifts	Earnings	Avg. Wages 1950	Avg. Wages 1949
Contract Miners				
Dev. in Rock	4,502	71,658.70	15.02	13.49
Dev. in Ore & Stoping	39,963	531,650.47	13.30	12.95
Total Contract Miners	44,465	603,309.17	13.57	12.98
Contract Trammers	464	8,271.96	17.83	17.37
Total Contract Labor	44,929	611,581.13	13.61	13.03

The increase in average wages paid to contract miners is up because of increased output on the part of the mining crews.

Total Number of Days

	1950	1949
Surface	30,682	27,316
Underground	104,283	84,553
Total	134,965	111,869

Amount for Labor

Surface	352,253.32	309,718.50
Underground	1,333,026.64	1,047,128.83
Total	1,685,279.96	1,356,847.33

Proportion of Surface to Underground Men

1950	1 to 3.37
1949	1 to 3.09
1948	1 to 3.33
1947	1 to 3.40
1946	1 to 3.54

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6. SURFACE:

a. Buildings and Repairs:

The table below shows cost of repairs to mine buildings for the years 1948, 1949 and 1950:

	1950	1949	1948
Office & Warehouse	653.37	426.05	1,037.22
Shops	2,903.39	4,036.17	7,702.74
Shaft Houses	23,791.39	26,403.77	1,115.74
Engine House	713.03	717.64	1,476.00
Dry House	1,935.96	1,587.80	2,876.71
Coal Dock & Trestle	103.98	1,508.49	765.97
Crusher Building	963.23	820.73	899.74
Miscellaneous	802.68	753.74	1,548.47
Total	31,867.03	36,254.39	17,422.59

The only item worth commenting on in the 1950 cost of repairs to mine buildings, is the shaft house expense. This includes the repairs to "A" Shaft House made by Intrusion Prepakt, Inc. and concludes our program of repairs to the shaft headframes.

7. UNDERGROUND:

a. Development:

1. Section 10 Lease

Production from the Section 10 Lease totalled 95,160 tons or 14.8% of the total product from the Cliffs Shaft Mine. This is an increase of nearly 100% in production compared to the previous year. The number of gangs working in the Section 10 Lease area averaged approximately 10, which was an increase of 1½ gangs over that employed in 1949. The added production is attributable to the fact that we put about 7 of these crews on a double shift thereby, in effect, increasing the number of contracts.

Aside from what may be considered normal development associated with stope mining where breasts are advanced into new area during the production, the major development carried on in the Section 10 Lease was concentrated on the 5th and 8th Levels. On the 5th Level, a short drift was driven north to coordinates 1420 S. and 2350 E. in order to explore the character of the formation east of the main workings in the Section 10 ore vein on this elevation. This drift proved disappointing because it was all in jasper. Still farther to the east on the Moro Mine property, Contract No. 4 advanced a drift east 80' and then to the north 200' to find the ore shown in old drill hole 392 which was drilled from Cliffs Shaft workings. This drift also proved somewhat disappointing because the ore encountered was not as large a deposit as we anticipated from the diamond drilling. However, this area will be productive of some ore both to the west on the Section 10 Lease area and back to the east on the Moro Mine property albeit the veins may be narrow.

On the 8th Level, development consisted of three drifts. One of these was advanced northeast a distance of 500' to coordinates 1170 S - 2720 E. From the end of this drift, a raise was put up to the 6th Level elevation in No. 45 stope. The purpose of this raise was to provide an easier access to the area where No. 45 contract has been stoping ore for the past several years.

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7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

1. Section 10 Lease (Cont'd)

Another drift was extended 320' southeast through first class ore, terminating at the Section 10 Lease boundary by holing to the 10th Level Moro workings. A third drift was advanced southwest to coordinates 1790 S - 2080 E and from the end of this drift a raise with three branches was extended upward to an elevation above the 7th Level exploring for the upward extension of the southernmost ore vein in the Lease area on the 8th Level. A little ore was found.

On the 10th Level, the development program culminated at the end of the year with 230' of drift driven. This development drift was planned to hole to the 12th Level of the Moro Mine workings. While we have very little factual data on which to base this observation, we anticipate that the Moro Mine and adjacent territory will be productive of considerable high grade lump ore reserves. Sometime in the ensuing year entry can be effected into the Moro Mine to examine the ribs and floors of the old workings. An exploration program can also be started to test the areas both north and south of the old workings.

2. Cliffs Shaft and Bancroft Lease

The total average number of gangs working in the mine decreased by one in 1950 compared to 1949. The number of crews engaged in development mining increased from 46.3 in 1949 to 50.3 gangs in 1950. We have always considered that adequate reserves could be maintained when approximately 50% of the total number of crews were engaged in so-called development mining. The number of crews drifting and raising increased from 11.8 in 1949 to 13.3 gangs in 1950. Double crews increased from 35 to 48; that is, crews employing two miners in place of a miner and helper. The number of gangs employing Carset bits nearly doubled in 1950 compared to 1949. The added emphasis on development which might normally lead one to expect reduction in production was more than offset by the added incentive of more double gangs, the greater efficiency of more crews equipped with tungsten carbide bits and the addition of an extra shift for selected crews.

We continued to operate two diamond drills in the mine throughout 1950. In the latter part of the year plans were made for the addition of a third drill in order to increase the speed with which the upper old workings could be explored more fully. As mentioned in the previous year's report, we had instituted a program of short-hole diamond drilling to test the ribs and floors of practically all of the old workings for any additional ore reserves. This program was to be conducted by proceding downward from the upper levels and in conjunction with its development we expected to be able to concentrate some of the mining on upper levels thereby restricting the area and distances involved between contracts. The general theory would be that we would attempt to deplete completely successive levels proceding downward so that we would not have to return into any of the old workings once we had depleted them. No large new ore areas were discovered in the Cliffs-Shaft Mine by the diamond drilling conducted in 1950. The known outlines of the ore areas found in 1949 on the sublevels above the 1st level, "B" Shaft, were extended and large ore extensions were found in drilling on the Section 10 Lease.

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7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

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

Exploration development did not disclose any virgin ore vein in the Cliffs Shaft Mine during 1950. In fact, it is somewhat puzzling that the Cliffs Shaft Mine can continue to show new reserves from year to year when new deposits are so seldom discovered. The truth lies in the fact that most contracts engaged in development stoping put in sight new reserves that are extensions of old deposits thereby adding to the total reserves.

"A" SHAFT

In the "A" Shaft territory immediately east of the shaft, some development work was done from the 8th Level where Contract No. 5 put up a raise into old workings on the 5th Level which holed at coordinates 425 S - 1000 E. Tributary to this raise there is ore which can be mined on the 3rd Level elevation as well as the ore in the floors and benches of the old 5th level workings. Strictly speaking, that may not be adding new reserves but is rejuvenating an old area.

In the northeast part of the mine, ore extensions were found to the east on the 7th Level and also on the 8th level where Contract No. 41 extended a drift in ore 130' east to coordinates 140 N - 3710 E. This is an area relatively new in the Cliffs Shaft Mine where we have previously predicted that additional ore reserves would be found. This area in general lies between 400' and 800' due west of the west boundary of the Harlow estate. There is some probability that this new ore area will continue upward and its pitch carry it across the Harlow estate boundary in the upper levels. Perhaps some consideration should again be given to the possible acquisition of a lease of the Harlow estate property contiguous to the Cliffs Shaft Mine. At best, however, the Harlow estate is not likely to develop any great tonnage of lump ore.

Another area that is perhaps worth mentioning from the standpoint of reserves is in the southeast corner of the "A" Shaft territory bounded by coordinates 800 to 1200 S and 2400 to 2800 E. While this is not a new area the current year's development stoping on the 10th level elevation indicates much more ore than we might have expected from the previous development work in that territory. This ore extends downward practically to the 12th level elevation. In order to eliminate a motor haulage transfer of ore mined from this territory, a drift has been planned on the 15th Level from which a raise can be put up into the center of the area in question. This drift extended will serve as an access to ore which extends below the 10th Level in the Section 10 Lease near the old More workings.

The most significant development on the Bancroft Lease was a drift on the 5th level which was extended nearly west for 230' to coordinates 490 N - 1120 E. From this drift a raise was put up to the 2nd level and a narrow ore vein was developed just above the 5th Level at coordinates 400 N - 1300 E. The other important development on the Bancroft lease was a drift and raise on the 15th level. Contract No. 90 drifted 170' north to coordinates 490 N - 2950 E and then put up a raise which was headed for the 11th level elevation to tap the eastern extension of the Bancroft Vein as it dips north under the slate hanging wall.

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7. UNDERGROUND: (Cont'd)

a. Development: (Cont'd)

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

"B" SHAFT

The new ore vein, which was discovered in 1949 by diamond drilling from the 1220' sub-level, required additional development by drifting and raising in order to make this ore accessible. Contract No. 37 advanced 370' of drift southwest to coordinates 1070 S - 535 W and from this drift put up two raises during 1950 into the new ore territory. With the exception of Section 10 ore veins, this new discovery on the sub-levels is probably the largest single new ore vein found in the last two or three years.

On the 5th Level, Contract No. 63 drifted about 300' east from a location not far northwest of "B" Shaft and put up a raise to the 4th Level which taps ore mined by No. 18 contract on the 2nd level elevation. This drift is intended also to be used for raise development to old ore floors on the 2nd level elevation northeast of "B" Shaft at coordinates 240 S - 150 E and 240 S - 280 E. Most of the remaining development in the "B" Shaft territory was associated with the advance of stopes in the regular stoping process. This development can be seen from an examination of the annual report maps.

From the foregoing brief description of development in the Cliffs Shaft Mine during 1950, it is evident that fairly sizeable reserves of ore have been and continue to be developed on the Section 10 Lease. New ore will probably be found either in or adjacent to the old Moro Mine workings. A new ore vein of sizeable but not unusual magnitude has been discovered on the sub-levels above the 1st level in "B" Shaft. Perhaps some new ore of appreciable importance can be developed in the northeast part of the "A" shaft workings.

Excepting the above-mentioned ore reserve areas of recent development, there has been no new virgin territory opened up in the Cliffs Shaft Mine for several years. The structure is fairly well outlined and we know with fair certainty where to go and look in this structure pattern for additional ore reserves. Therefore, we can to some extent anticipate how much might be developed through future drilling along this known structure and concomitantly this lets us do some guessing as to the ultimate life of the mine. As in the past several annual reports, I wish to emphasize that the only virgin large area which we have not explored for hard ore reserves lies in Section 9, as a westward extension of the so-called hard ore formation. Some exploratory work should be carried on regularly in Section 9 to determine whether or not lump ore reserves exist in that area which can be mined from the 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
1946	1,873'	2,557'	4,430'
1947	3,221'	2,952'	6,173'
1948	3,068'	4,213'	7,281'
1949	2,498'	2,047'	4,545'
1950	5,548'	2,870'	8,418'

d. Explosives, Drilling and Blasting:

Powder consumption per ton of ore decreased .0305 lbs. per ton compared to 1949 usage. The average price for Gelamite increased from $15.25 to $15.60. The average price of Hercomite 2X increased from $14.50 to $14.94. In spite of this, the cost per ton for powder remained the same because of the reduction in consumption. This is in turn attributable to the small size holes being drilled with Carset bits.

The powder consumption per foot of rock development decreased 5.1 lbs. per foot of development compared to 1949 practice, as shown in the table below:

Year	Pounds of Powder Per Foot of Rock Development
1945	21.6 Gelamite
1946	17.0 Hercomite 2X
1947	17.8 " 2X
1948	16.5 " 2X
1949	17.1 " 2X
1950	12.0 " 2X and 60% H.P. Gelatin.

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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 1950	Amount 1949
Gelamite No. 1 CWT	104,400	15.60	$16,286.98	$12,161.89
Hercomite No. 2X	408,700	14.94	61,054.85	50,563.13
Gelatin, Extra, 60%	25,500	17.02	4,339.42	40.00
60% HP 5 x 5	400	20.00	80.00	-
Total Powder	539,050	15.168	$81,761.25	$62,765.02
Blasting Supplies				
Fuse, Per M ft	858,600	8.464 M	7,267.53	6,077.90
No. 6 Caps	129,999	14.91 M	1,937.95	1,651.78
No. 6 El. Caps	26,515	20.08 C	5,325.07	2,268.42
Fuse Lighters, 7 in.	40,000	9.25 M	369.12	334.45
No. 18 Shot Wire	5,869		75.20	47.26
Tamping Shells	2,578		169.07	30.59
Powder Bags	6		32.10	
Connecting Wire	1,386		1,150.11	345.05
Miscellaneous			439.93	90.58
Total Blasting Supplies			16,766.08	10,846.02
TOTAL STOPING AND DEVELOPING IN ORE			98,527.33	73,611.05
PRODUCT, Tons		641,562		492,405
Pounds Powder per Ton of Ore			.840	.8705
Cost per ton for powder			.1275	.1275
Cost per ton for Fuse, etc.			.0261	.0220
Cost per ton for All Explosives			.1536	.1495
DEVELOPMENT IN ROCK				
Gelamite No. 1 CWT	1,700	15.22	258.79	45.75
Hercomite 2X	66,700	14.39	9,595.40	6,173.38
60% HP Gelatin	33,050	17.31	5,719.70	- -
Total Powder	101,450	15.35	15,573.89	6,219.13
Blasting Supplies				
Fuse	40,900	8.19 M	334.97	107.18
No. 6 Bl. Caps	4,935	14.70 M	72.54	31.88
El.Bl. Caps	24,761	20.12 C	4,980.95	1,621.10
Connecting Wire lbs.	852		711.29	246.67
Leading Wire ft.	6,550		83.32	32.08
Fuse Lighters, 7 in.			42.84	48.10
Tamping Shells			47.66	2.81
Miscellaneous			163.50	50.50
Total Blasting Supplies			6,126.07	2,140.32
TOTAL ROCK DEVELOPMENT			21,699.96	8,359.45
Feet of Rock Development			5,548	2,498
Cost Per Foot, Rock Development			3.911	3.346
GRAND TOTAL ALL EXPLOSIVES			120,227.29	81,970.50
AVERAGE COST PER POUND FOR POWDER			.1521	.1463

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8. COST OF OPERATING:

a. Comparative Mining Costs:

	1950	1949
Product - Tons	641,562	492,405
Underground Costs	2.981	2.807
Surface Costs	.487	.536
General Mine Expense	.573	.577
Cost of Production	4.041	4.114
Taxes	.281	.317
Depreciation	.028	.034
Loading & Shipping	.065	.094
Total Cost at Mine	4.415	4.559
Budget Estimate at Mine	4.428	4.449
No. of Days Operating	283	245
No. of Shifts and Hours	2-8 Hr.	2-8 Hr.
Average Daily Product	2,268	2,010

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison
Details of Accounts

	Total 1950		Total 1949	
	Amount	Per Ton	Amount	Per Ton
Underground Costs				
Exploring in Mine	25,426.88	.039	9,449.06	.019
Development in Rock	148,541.76	.232	68,614.14	.139
Stoping & Development in Ore	1,107,396.53	1.725	873,078.55	1.773
Timbering	40,371.90	.063	35,960.02	.073
Tramming	192,630.51	.300	149,815.08	.304
Ventilation	2,533.81	.004	1,303.99	.002
Pumping	36,613.20	.057	34,746.21	.071
Compressors & Air Pipes	78,890.99	.123	54,736.69	.111
Back Filling	1,164.28	.002	2,009.30	.004
Underground Superintendence	73,125.72	.114	53,842.30	.109
Compressors and Power Drills	27,199.50	.042	25,709.88	.052
Scrapers and Mechanical Loaders	103,325.28	.160	104,737.95	.213
Tramming Equipment	68,845.92	.109	56,855.11	.115
Pumping Machinery	6,792.17	.011	7,020.61	.014
Total Underground Costs	1,912,858.45	2.981	1,477,878.89	3.001
Surface Costs				
Hoisting	54,292.24	.085	45,162.93	.092
Stocking Ore	40,360.31	.063	30,368.81	.062
Screening-Crushing at Mine	72,753.45	.113	64,656.14	.131
Dry House	18,456.40	.029	16,301.54	.033
General Surface Expense	31,882.88	.050	21,940.20	.045
Maint. Hoisting Equipment	20,571.45	.032	16,574.59	.034
Shaft	6,026.86	.009	5,722.95	.012
Top Tram Equipment	19,738.04	.031	10,703.60	.022
Docks, Trestles and Pockets	16,154.44	.025	16,170.99	.033
Mine Buildings	31,867.03	.050	36,254.39	.074
Total Surface Costs	312,103.10	.487	263,856.14	.536
General Mine Expense				
Geological	4,837.98	.007	4,855.41	.010
Mining Engineering	12,955.77	.020	8,773.76	.018
Mechanical and Electrical Engrg.	5,381.32	.008	5,069.20	.011
Analysis and Grading	34,294.53	.054	34,885.44	.071
Safety Department	7,363.87	.012	4,297.26	.009
Telephones and Safety Devices	13,459.70	.021	9,301.24	.019
Local and General Welfare	6,310.20	.010	5,045.05	.010
Special Exp. - Pensions & Allowances	13,220.78	.020	2,481.95	.005
Ishpeming Office	41,840.37	.065	27,892.19	.057
Mine Office	43,400.75	.068	34,768.11	.071
Insurance	36,922.48	.058	28,626.79	.058
Personal Injury	30,960.33	.048	31,128.99	.063
Social Security Taxes	41,085.47	.064	28,848.83	.059
Employees Vacation Pay	65,640.00	.102	57,908.65	.118
Research Laboratory	2,650.56	.004	202.54	-
Additional Wage Adjustment	7,529.25	.012	--	-
Total General Mine Expense	367,583.36	.573	284,085.41	.577
COST OF PRODUCTION	2,592,544.91	4.041	2,025,820.44	4.114

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8. COST OF OPERATING: (Cont'd)

a. Comparative Mining Costs: (Cont'd)

The Cost of Production decreased $.073 per ton compared to 1949 costs. The supply cost in the cost of production increased $0.056 per ton in 1950 compared to 1949, so that reduced labor expense was the big factor in decreasing the overall cost of production. This analyses is borne out by the fact that tons per man increased from 4.40 in 1949 to 4.75 in 1950. To a considerable extent, the increase in supply costs was due to increased prices.

The cost analysis which follows will deal only with the categories that show appreciable divergences from the previous year's cost.

Exploring in Mine

During 1950, a total of 39 holes were drilled in the Cliffs Shaft Mine for a combined footage total of 6,118'. Most of these holes were short holes drilled above the 1st level although a number of the holes were put in in the Section 10 area. The costs per ton of exploration increased markedly over the 1949 cost because we had much more drilling going on in the current year. The labor costs approximately doubled and supply costs in this category were four times as high in 1950 as compared to 1949.

The table below gives the footage and percentage of each type of material drilled during 1950 and 1949:

	1950		1949	
Type of Material	Footage	%	Footage	%
Ore	900	14.7	716½	21.4
Lean Ore & 2nd Class Ore	675	11.0	634	18.9
Conglomerate	42	.7	86	2.6
Hard Hematite Cherty Iron Formation	1426	23.3	634	19.0
Intrusive	1699	27.8	899½	26.9
Argillite	652	10.7	315	9.4
Unoxidized Iron Formation	466	7.6	43	1.3
Graywacke and Quartzite	258	4.2	17	.5
Totals	6,118	100.0	3,345	100.0

Development in Rock

Comparative costs for the last 5 years are shown below. The cost decreased $0.70 per foot in spite of the fact that supply costs increased $1.09 per foot. Here again the advantage of Carset bits utilized to full capacity has achieved a higher labor efficiency.

		Labor Cost		Supply Cost		Total Cost	
Year	Footage	Total	Per Ft.	Total	Per Ft.	Total	Per Ft.
1946	1,873	42,521.61	22.70	6,983.87	3.73	49,505.48	26.43
1947	3,221	65,283.16	20.27	16,902.58	5.25	82,185.74	25.51
1948	3,068	57,440.20	18.72	18,409.42	6.00	75,849.62	24.72
1949	2,498	53,452.09	21.40	15,162.05	6.07	68,614.14	27.47
1950	5,548	108,817.00	19.61	39,724.76	7.16	148,541.76	26.77

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8. COST OF OPERATING: (Cont'd)

a. Comparative Mining Costs (Cont'd)

Development in Ore & Stoping

In 1949 this category was divided into development in ore and stoping, both considered separately. This year the two accounts have been combined and in a true comparison we find the cost per ton decreased in 1950 by $.048. Comparative costs for the last two years follow:

Year	Labor Cost	Supply Cost	Total Cost
1950	871,015.55	236,380.98	1,107,396.53
1949	708,406.93	164,671.62	873,078.55

Supply costs in this category increased from $.334 per ton in 1949 to $.367 per ton in 1950. Labor cost, on the other hand, decreased from $1.439 per ton to $1.358 per ton reflecting the increased efficiency of the mining crews who had the advantage not only of added incentive pay to more crews where the miner helpers were given miners status but also the addition of light-machine drilling to practically all of the contracts.

Compressors & Air Pipes

Supply costs in this category jumped from $43,000 to better than $78,000 primarily because of the drilling conversion program which necessitated the purchase of a large number of new type drills. Even so the total cost of this category increased only $.012 compared to 1949.

Scrapers & Mechanical Loaders

The costs decreased $0.053 per ton compared to 1949 costs. Labor accounted for $.027 of this and the remainder came from the supply account.

From the table below it may be seen that the 5/8" wire rope jumped about $3,000.00 in 1950 although we used slightly more than 2,000 less feet of rope in this size. The principal reduction in the scraper account was in general and electrical repairs which decreased from $74,000.00 to approximately $25,000.00 in 1950.

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	Cost Per Ton	Feet per Ton Ore
1946	401,949	"Trulay"	72,638'	12,778.28	.0317	.180
1947	546,796	"	81,212'	14,969.85	.0274	.149
1948	602,453	"	99,297'	21,563.67	.0358	.165
1949	492,405	"	95,715'	19,256.67	.0391	.194
1950	641,562	"	93,460'	22,193.41	.0358	.146

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8. COST OF OPERATING: (Cont'd)

a. Comparative Mining Costs (Cont'd)

Scrapers and Mechanical Loaders (Cont'd)

The following table shows a comparison between the 1949 and 1950 costs:

	1950		1949	
	Amount	Cost	Amount	Cost
3/8" Wire Rope	1,860'	179.54	625	62.50
1/2" Wire Rope	3,415'	657.72	3,285	526.15
5/8" Wire Rope	93,460	22193.41	95,715	19,256.67
Scraper Cable	2,895	2200.20	5,317	4,029.69
Scraper Sheaves		1296.00		-
Gen.Electrical Repairs.		25905.95		74,098.16
Loader Motors		-		1,569.10
Scraper Blocks	140	5437.64	68	2,868.54
Impact Wrench		375.00		--
New Lund Hoists		-		2,327.14
TOTAL		$ 58,245.46		$ 104,737.95

c. Comparative Mining Costs - Surface

Total surface costs were reduced $.049 per ton compared to 1949 costs. Both supply and labor cost contributed to this reduction in about equal proportions. Practically all of the categories in the surface cost with minor exception decreased due to the general increase in overall efficiency in the mine resulting from the higher rate of production.

9. EXPLORATIONS:

Two underground diamond drills were employed in the Cliffs-Shaft Mine throughout the year 1950. A total of 39 holes were drilled for a footage of 6,118. As mentioned in the cost figures under the heading "Exploring in Mine", 14.7%, or 900' of this footage was in first class ore. There was also 675' of lean or second class ore cut by these drills during the year, which amounts to 11% of the total footage drilled. Locations of these holes, which range from #629 to #667, inclusive, are kept in the Geological Department files as well as being shown on the operating maps.

In view of the importance of continued exploration, particularly since a great deal of emphasis is being placed on improvement of the quality of the Cliffs Shaft ore, a third drill was predicated for 1951 operations. I believe it is important that the underground diamond drilling program be stepped up in tempo in order to outline ore areas or to prove the absence of ore reserves in areas where we have long believed that first class ore existed. Such information is essential to an orderly plan of operations by the operator.

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10. TAXES

Comparative data for 1950 and 1949 follows:

	1950		1949	
	Valuation	Taxes	Valuation	Taxes
Realty	2,410,000	91,176.08	2,033,000	75,833.75
Minerals under NW¼ of Sec. 9, 47-27	(with Cliffs Shaft)		-	-
Personal	336,100	12,715.47	916,100	34,171.81
Lot 2, Sec. 3, 47-27 (Bancroft)	815,000	30,833.41	735,000	27,416.53
Lot 174, Nelson Addition	100	3.78	100	3.73
S. 35.91 feet of Lot 179	50	1.89	50	1.87
S½-NW¼ of Sec. 10, 47-27	1,200,000	45,398.88	1,100,000	41,031.54
TOTAL	4,761,250	180,129.51	4,784,250	178,459.23
Taxes per ton produced		.2805		.3614
Taxes per ton shipped		.3065		.3499

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

Year	Taxes	Valuation	Tax Rate
1950	$180,129.51	4,761,250	37.8324
1949	178,459.23	4,784,250	37.3014
1948	196,814.41	4,953,250	39.7344
1947	181,298.27	5,063,250	35.8067
1946	175,372.16	4,883,250	35.9130
1945	178,544.98	4,968,250	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

Valuations decreased $23,000 and taxes increased $1,670.28 over 1949.

City of Ishpeming Tax Levy

	1950		1949	
	Amount	Rate	Amount	Rate
VALUATION	$18,578,850.00		$17,622,500.00	
Tax Levy by Funds				
County Tax	124,478.30	6.70	118,070.75	6.70
County Road Tax	30,655.10	1.65	29,077.13	1.65
School Tax	167,209.65	9.00	167,413.75	9.5
School Debt Service Tax	8,962.50	.4824	9,387.50	.5328
Gen'l Oprtg. Debt Service	266,234.92	14.33	210,480.52	11.9439
Capital Improvement	105,342.08	5.67	122,914.48	6.9747
TOTAL TAXES	702,882.55	37.8324	657,344.13	37.3014

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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. Undg. Mines	C. C. I. Co. All Operations
Tons of Ore Mined	641,562	4,671,494	8,235,333
Hours of Labor	1,069,082¼	6,258,010½	9,322,411½
Number of Fatalities	0	4	5
No. of Compensable Accidents	18	132	145
No. of Non- " "	25	195	216
Total Lost Time Accidents	43	331	366
Days Lost, Compensable Injuries	1,154	6,482	7,063
Days Lost, Non-Compensable "	60	444	499
Total Days Lost	1,214	30,926	37,562
Frequency Rate	40.22	52.89	39.26
Severity Rate	1.135	4.942	4.029

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 OR EQUIPMENT:

The following E. & A.'s were carried over or approved in 1950:

E. & A. No. CC-93-1 - was originally authorized in 1942 for diamond drill exploration of Section 9, 47-27 for hard ore reserves. This E. & A. was rejuvenated in October 1950 with an additional $50,000. Original E. & A. in 1942 was for $30,000, most of which was spent in 1942 and 43.
Spent in 1950 - $7,186.50. Remaining - $50,801.59.

E. & A. No. CC-150 - was for purchase and installation of a ventilating fan for the mine. The amount authorized was $8,662.50. Fan was installed in 1948 but some rock work was continued into 1950, for ventilation airway improvements.
Spent in 1950 - $597.88. Remaining - $2,544.19 (Account closed)

E. & A. No. CC-302 - was authorized in 1949 for purchase of jackhammers and jacklegs to replace drifters. Amounted to $9,060.00.
Spent in 1950 - $310.00. Account closed $9.67 in red.

E. & A. No. CC-305 - was authorized in 1949 for repairs to roofs of boiler house and engine house. Amounted to $8,725.00.
Spent in 1950 - $2,577.20. Remaining at end of year $1,258.82.

E. & A. No. CC-316-1 - was originally authorized in 1949 for repairs to "B" Shafthouse. Was reactivated for "A" Shafthouse repairs in 1950. Work was completed in 1950.
Spent in 1950 - $19,149.52. Account closed $790.86 in red.

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12. NEW CONSTRUCTION OR EQUIPMENT:

E. & A. No. CC-335 - was authorized in 1949 for repair of upper portion of "A" Shaft. Work was practically completed in 1950.
Spent in 1950 - $21,401.83. Remaining in account - $898.17.

E. & A. No. CC-338 - was authorized in 1949 for purchase of light drill machines to replace drifters. Amount was $9,200.00
Spent in 1950 - $4,428.50. Account closed in red $55.70.

E. & A. No. CC-339 - was authorized in late 1949 in the amount of $4,600.00 for purchase of a new Eimco Model 21 loader for underground.
Spent in 1950 - $4,600.00. Account closed in 1950.

E. & A. No. CC-348 - was authorized in the amount of $10,000 for purchase of light drill machines to replace drifters.
Spent in 1950 - $10,000.00. Account closed in 1950.

E. & A. No. CC-368 - authorized $5,150.00 for purchase of new stockpile shovel dipper.
Spent in 1950 - $00.00 Remaining in account - $5,150.00.

E. & A. No. CC-370 - authorized $1,150.00 for purchase of a new bitgrinder.
Spent in 1950 - 0. Remaining in account - $1,150.00.

E. & A. No. CC-376 - authorized $10,000 for purchase of light drill machines to replace drifters.
Spent in 1950 - $6,465.48. Remaining in account - $3,534.52.

E. & A. No. CC-385 - authorized $2,400.00 for purchase and erection of new cooling tower.
Spent in 1950 - $3,109.78. Account closed in red - $709.78.

E. & A. No. CC-409 - authorized $40,000.00 for remodeling of dry building.
Spent in 1950 - $14,023.71. Remaining in account $25,976.29.

E. & A. No. CC-416 - authorized $80,000.00 for conversion of hoist motors to D. C. drive.
Spent in 1950 - 0. Remaining in account - $80,000.00.

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14. MAINTENANCE AND REPAIRS:

Dwellings

	Labor	Supplies	Total
Hard Ore Location	$1,252.35	$ 358.54	$ 1,610.89
Barnum Location	155.57	21.15	176.72
Outhwaite Purchase	105.43	48.36	153.79
Hyde Purchase No. 1	626.29	265.21	891.50
Hyde Purchase No. 2	827.50	787.84	1,615.34
Smith Purchase	309.86	13.05	322.91
Berg Purchase	379.06	344.63	723.69
Ramsdell Purchase	128.15	164.57	292.72
Total	$3,784.21	$2,003.35	$ 5,787.56

Comparative figures for the past five years follow:

Total for the year	1950 -	$ 5,787.56
	1949 -	16,009.64
	1948 -	11,392.18
	1947 -	18,505.26
	1946 -	8,559.19

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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.
1950	8,956,466	145,557.13	.016251
1949	6,890,166	107,479.26	.015375
1948	8,422,715	117,605.65	.013964
1947	8,119,492	113,591.74	.013988
1946	5,824,429	83,288.58	.014299

The detail of distribution of power at the mine follows:

	K. W. H.	Cost
Scraping Ore and Rock	1,183,793	$18,941.49
Pumping	1,305,970	21,411.32
Hoisting	1,481,536	24,078.98
Stocking Ore	27,000	437.37
Crushing Ore	231,750	3,764.14
Dry House Expense	78,478	1,264.97
Surface	45,760	751.48
Telephone & Safety Expense	105,890	1,714.99
Mine Office	11,016	179.75
Machine & Carpenter Shop	3,350	56.59
Drill and Bit Shop	59,358	980.70
Heating Plant	11,044	170.36
Compressors	3,634,800	59,288.22
Electric Haulage	734,900	11,834.89
Ventilation	41,821	681.88
Total	8,956,466	$145,557.13

Comparative data for 1950 and 1949 follows:

	1950	1949	Difference	Increase %	Decrease %
Production - Tons	641,562	492,405	149,157	30.29	
	K.W.H.	K.W.H.			
Scraping Ore & Rock	1,183,793	807.570	+ 376,223	46.58	
Pumping	1,305,970	1,317,612	- 11,642		8.83
Hoisting	1,451,536	1,147,971	+ 333,565	26.44	
Stocking Ore	27,000	21,160	+ 5,540	27.60	
Crushing Ore	231,750	237,800	- 6,050		2.54
Dry House Expense	78,478	58,936	+ 19,542	33.15	
Surface	45,760	44,766	+ 3,994	9.56	
Telephone & Safety Expense	105,890	93,384	+ 12,506	13.39	
Mine Office	11,016	9,448	+ 1,568	1.65	
Machine & Carpenter Shop	3,350	4,985	- 1,635		3.27
Drill & Bit Shop	59,358	43,156	+ 16,202	37.54	
Heating Plant	11,044	12,380	- 1,336		1.08
Compressors	3,634,800	2,458,198	+1,176,602	47.86	
Electric Haulage	734,900	607,800	+ 127,100	20.91	
Ventilation	41,821	28,000	+ 13,821	49.36	
Totals	8,956,466	6,890,166	+2,066,300	29.98	

LAKE MINE
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Near the end of 1949 it was decided to mine a small tonnage of ore lying close to the surface at the extreme East end of the Lake Mine deposit. The records of some diamond drilling done several years ago showed approximately 80,000 tons in an area 200 feet by 100 feet with the average depth of overburden 35 feet and 70 feet of ore.

On November 23, 1949, Lindberg & Sons started their shovel casting material for a roadway from the Lake Mine #4 Shaft to this pit approximately 2,000' to the East. A ditch was dug along the North side of the proposed pit to divert the water from a small stream and a 14" pipe was installed from a small dam 1,000' East of the pit to carry this water and discharge it into Lake Angeline. Since mining was complated in the mines adjacent to Lake Angeline and pumping closed, the water had risen in the old Lake bed and caved area to a heighth of approximately 70' above the bottom of the proposed pit. There was a barrier of rock between the lake itself and a small pit immediately West of the proposed mining and an attempt was made to dewater the latter. However, it became apparent that there was an underground connection between the two and therefore the water could not be lowered. A barrier of ore and rock was then left and a considerable amount of the stripping was added to make a sufficient dam to hold back any large flow of water from the West.

Actual stripping operations started on December 9, 1949 and by January 23, 1950 loading of ore began. The confined area made it necessary to strip on the day shift and load ore on the afternoon shift. Further complications were caused by the freezing of discharge lines, maintaining tracking for the trucks on the very steep and slippery road, and building up height on the ore as stocked. This latter was necessary as the stockpile ground available was quite small. When there was sufficient stripping in advance of the loading, it was possible at times to stock on both shifts. There was a total of 113,739 yards stripped at a cost of .412 per yard. To combat the heavy layer of frost on the ore, a churn drill was operated to drill several 9" diameter shallow holes which, when blasted, materially speeded up the loading.

As the pit became deeper the water problem became more pronounced causing several sumps to be built and pumps installed relaying the water from one sump to another until it was finally discharged into the lake. At the same time, the water level in Lake Angeline was held more or less constant by the installation of two large pumps on a floating barge discharging the water over the hill to the North and into an old pit East of the steam power plant. Water from this pipe line was also used in the steam plant.

With the approach of warmer weather in March, road conditions made it impossible to operate and all work ceased on March 7th. On May 16th stripping was again started and also the removal of considerable silt and loose rock which had washed into the pit during the spring break-up. Loading of ore was resumed on June 6th and continued until June 12th when it was decided that the depth and confined space at the bottom made it unprofitable to do anything further. Intrusions of rock from the footwall had also increased in size and it being almost impossible to separate this material when loading, the grade materially fell off. These factors together reduced the tons per shift and raised the percentage of silica too high for an economical operation.

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After removing all pumps, pipe and other material that could be salvaged, the barrier was blasted, the pit allowed to fill with water, and a barricade erected at the end of the road descending into the pit. Loading of the ore from the stockpile into trucks for transportation to a ramp, erected for loading into railroad cars to the North of the Holmes Mine, occupied two different occasions, one in July and the other in October, when the trucks could be spared from the Tilden operations.

Total Ore Produced	Total Loaded	Balance on hand December 31, 1950
79,735 tons	21,057 tons	58,678 tons

Analysis of Ore Shipped

Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
57.50	.119	9.05	.41	4.02	.29	.39	.014	3.07	12.55

Analysis of Ore in Stock

Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
54.97	.158	11.53	.38	4.34	.29	.39	.015	3.07	13.11

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COST OF OPERATING

(Includes November & December, 1949)

Tons Produced 79,735

Direct Ore	Amount	Per Ton
Drilling & Blasting	10,633.06	.134
Power Shovels, Operating	9,279.75	.116
Stripping	56,869.50	.713
Trucks, Operating	11,810.78	.148
Trucks, Maintenance	5,044.16	.063
Pit Roads & Ramps	1,765.98	.022
Total Direct Ore	95,403.23	1.196
General Pit Expense		
Pumping & Drainage	18,504.81	.232
General Open Pit Expense	1,007.62	.013
Open Pit Superintendence	3,097.58	.039
Exploratory Drilling	1,420.88	.018
Total General Pit Expense	24,030.89	.302
Total Pit Operating	119,434.12	1.498
Loading & Shipping	5,464.49	.068
GRAND TOTAL	124,898.61	1.566
General Mine Expense		
Mining Engineering	3,254.84	.041
Analysis & Grading	1,447.10	.018
Safety Department	18.35	.000
Mine Office Expense	630.06	.008
Insurance	104.97	.001
Personal Injury	1.50	.000
Social Security Taxes	390.98	.005
Geological	271.66	.004
Total General Mine Expense	6,119.46	.077
COST OF PRODUCTION	131,018.07	1.643
Depreciation, Motorized Equipment	851.38	.011
Taxes	2,269.94	.028
TOTAL COST AT MINE	134,139.39	1.682

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The explanation for the high cost on a few of the accounts is shown below:

Both Truck Operating and Maintenance were unusually high on account of it being impossible to maintain proper roads on the very steep grade from the pit to the stockpile and there was not a sufficiently large operation to stand the expense of hard surfacing.

Loading & Shipping was also very high, partly for the same reason and also on account of the extremely long haul from the Lake to the Holmes Mine.

Pumping costs were also high on account of working below the water level of Lake Angeline.

Stripping costs were higher than usual on account of the confined area causing delays while waiting for trucks and also having to practically restrip the East end after the spring break-up had caused a large amount of surface material to be washed into the pit.

The balance of the ore on hand will be removed during 1951 when the trucks are available from the Tilden Mine.

LLOYD MINE
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1. GENERAL

The production was 221,636 tons compared with 207,954 tons in 1949. The bulk of the tonnage was obtained from ore areas above the 9th Level and a relatively small amount was mined late in the year from the deposit that was developed for mining above the 8th Level. The labor force was increased 6% compared with the size of the crew at the beginning of the year. A working schedule of three eight-hour shifts, five days per week was in effect until August 21st and the schedule was then increased to six days per week.

Shipments from the mine increased and the bulk of the tonnage or approximately 77% was Lloyddale grade. A small tonnage of high sulphur grade was produced and it was all shipped. Silica grade shipments were relatively small but all the Lloyddale grade in stockpile was loaded out before the end of the shipping season and a small stockpile overrun was realized. The stockpile inventory at the close of the year showed 24,984 tons of Lloyddale grade and 98,984 tons of Silica grade.

A drilling program was started about the middle of the year to explore several fault structures south and below the present levels. The drilling is being done from a drift that was driven to the south on the 8th Level to reach a favorable location to explore this area. Three holes were completed and some concentration was encountered in one hole. The program is being continued to more thoroughly explore this area for a possible deep-lying deposit.

Effective December 1st a wage increase of 12½¢ per hour was granted hourly rate employees and a deferred adjustment averaging 8½¢ per hour was also negotiated with the Union. In addition to the six regular holidays that were observed during the year a one-week vacation was allowed employees during the week of August 14th and there was no production during this period.

2. PRODUCTION, SHIPMENTS AND INVENTORIES

a. Production by Grades

Grade	Tons	Percent
Lloyddale	129,779	58.5
Lloyd Silica	88,121	39.8
Lloyd Special	3,736	1.7
Total	221,636	100.0

The proportion of Silica grade is being increased as standard grade ore areas are worked out.

b. Shipments

Total shipments were larger than last year although the tonnage of Silica grade was relatively small. The amount of this grade mixed in the Cliffs Group cargoes has dropped sharply in the past two years. A stockpile overrun of 3,579 tons of Lloyddale grade was realized when the pile of this grade was loaded out.

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2. PRODUCTION, SHIPMENTS AND INVENTORIES (Cont'd)

b. Shipments (Cont'd)

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

Year	Lloyddale	Lloyd Silica	Lloyd Special	Total
1950	142,929	38,153	3,736	184,818
1949	127,384	21,586	-	148,970
1948	55,767	108,388	-	164,155
1947	145,480	272,632	-	418,112
1946	182,664	17,711	-	200,375
1945	238,045	101,423	-	339,468

c. Stockpile Inventories

Grade	Tons
Lloyddale	24,984
Lloyd Silica	98,984
Total	123,968

There was a substantial increase in the tonnage on hand at the end of the year compared with a year ago and the Silica grade again represents the bulk of the inventory.

d. Division of Product by Levels

	Lloyddale	Lloyd Silica	Lloyd Special	Total
8th Level	8,586	1,857	-	10,443
9th Level	121,193	86,264	3,736	211,193
Total	129,779	88,121	3,736	221,636

The small production above the 8th Level was chiefly from ore development in the small deposit southwest of the main orebody.

e. Production by Months

Month	Days	Lloyddale Ore Tons	Lloyd Silica Ore Tons	Lloyd Special Ore Tons	Total Ore Tons	Rock Tons	Tons Per Man Per Day
January	21	13,500	6,056	-	19,556	319	6.09
February	20	8,891	9,085	-	17,976	916	5.84
March	23	9,813	9,603	-	19,416	2,542	5.89
April	20	14,377	4,448	-	18,825	1,605	6.04
May	22	9,546	7,726	345	17,617	2,888	5.00
June	22	11,160	4,632	503	16,295	2,423	4.93
July	21	8,475	7,154	-	15,629	1,925	4.91
August	20	9,596	5,301	-	14,897	1,878	4.85
September	29	10,820	5,978	-	16,798	1,611	4.48
October	31	9,879	8,502	981	19,362	189	4.74
November	29	6,725	10,669	1,975	19,369	87	5.09
December	28	13,418	8,967	2	22,383	66	5.85
Total	286	126,200	88,121	3,802	218,123	16,449	5.37
Transfers		-	-	-			
Cur. Yr. Stkpile Overrun		3,579	-	66	3,513		
Grand Total		129,779	88,121	3,736	221,636	16,449	5.37

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2. PRODUCTION, SHIPMENTS AND INVENTORIES (Cont'd)

f. Ore Statement

	Lloyddale Tons	Lloyd Silica Tons	Lloyd Special Tons	Total Tons	Total Last Year
On Hand January 1, 1950	38,134	49,016	-	87,150	28,166
Output for Year	126,200	88,121	3,802	218,123	207,954
Transfers	-	-	-		
Overruns	3,579	-	66	3,513	-
Total	167,913	137,137	3,736	308,786	236,120
Shipments	142,929	38,153	3,736	184,818	148,970
Balance on Hand	24,984	98,984	-	123,968	87,150

Increase in Output	10,169
Increase in Shipments	35,848
Increase in Ore on Hand	36,818

The operating schedule for the past five years follows:

1950 - Hoisting and mining operations three eight-hour shifts per day, five days per week, Jan. 1 to Aug. 21. Effective Aug. 21 hoisting and mining operations three eight-hour shifts per day, six days per week.

1949 - Hoisting and mining operations three eight-hour shifts per day, six days per week, Jan. 1 to June 27. Effective June 27 hoisting and mining three eight-hour shifts, five days per week.

1948 - Hoisting operations two eight-hour shifts and mining three eight-hour shifts, six days per week, Jan. 1 to Nov. 29. Effective Nov. 29, hoisting and mining operations three eight-hour shifts, six days per week.

1947 - Hoisting operations two eight-hour shifts and mining three eight-hour shifts, six days per week Jan. 1 to March 1. Effective March 1, hoisting and mining operations two eight-hour shifts, six days per week.

1946 - Two eight-hour shifts per day hoisting and three eight-hour shifts per day mining, six days per week.

g. Delays

There were no delays of consequence during the year. The minor delays that occurred caused no loss in production because it was possible in these cases to make up the loss on succeeding shifts.

3. ANALYSIS

a. Average Mine Analysis on Output

Grade	Tons	Iron	Phos.	Sul.	Sil.
Lloyddale	129,779	58.41	.132	.082	9.37
Lloyd Silica	88,121	53.03	.124	.049	17.57
Lloyd Special	3,736	58.73	.118	.232	8.97

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3. ANALYSIS (Cont'd)

b. Analysis of Ore in Stock December 31, 1950

Grade	Tons	Iron	Phos.	Sil.	Mang.	Alum	Lime	Mag.	Sul.	Loss	Moist.
Lloyddale Dried	24,984	58.94	.129	9.18	.23	2.40	.72	.55	.083	2.45	
Lloyddale Nat'l.		51.47	.113	8.02	.20	2.10	.63	.48	.072	2.14	12.68
Lloyd Sil. Dried	98,984	52.83	.130	17.33	.22	2.60	.50	.67	.041	2.77	
Lloyd Sil. Nat'l.		45.92	.113	15.06	.19	2.26	.43	.58	.036	2.41	13.08

c. Complete Analysis of Ores Shipped

Grade	Tons	Iron	Phos.	Sil.	Mang.	Alum	Lime	Mag.	Sul.	Loss
Lloyddale	142,929	59.00	.140	8.72	.27	2.37	.71	.56	.065	2.55
Lloyd Sil.	38,153	52.55	.123	18.36	.24	2.53	.69	.55	.034	2.50
Lloyd Special	3,736	59.00	.119	8.54	.27	2.16	1.05	.54	.270	2.40

d. Complete Analysis of Straight Cargoes

There were no straight cargo shipments.

4. ESTIMATE OF ORE RESERVES

a. Developed Ore

The following is an estimate of ore reserves as of December 31, 1950 using a factor of 12 cubic feet per ton:

	Standard Ore No. 1 Deposit	Sulphurous Ore No. 2 Deposit	Total Tons
Between 8th and 9th Levels	152,346	103,536	255,882
Total Gross as of Oct. 1, 1950	152,346	103,536	255,882
Less Oct. 1 - Dec. 31, 1950 Production	30,022	2,954	32,976
Total Gross as of Dec. 31, 1950	122,324	100,582	222,906
Less 10% for Mining and Rock	15,235	10,353	25,588
Net Total as of Dec. 31, 1950	107,089	90,229	197,318

The following table shows a comparison of developed ore during the past three years:

	1948	1949	1950
Reserves on January 1	341,211	533,848	352,559
Production	72,071	143,512	133,515
Balance	269,140	390,336	219,044
Reserves on December 31	533,848	352,559	197,318
New Ore Developed	264,708	37,777	21,726

The reduction in the estimated reserves is due to the fact that no new ore extensions have been proven and in the sulphurous deposit mining and drilling disclosed a barren area that formerly was included in the ore estimate. The two small deposits above the 9th Level are well delineated by the mining and development and there is no possibility of proving additional tonnage in either of these deposits.

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4. ESTIMATE OF ORE RESERVES (Cont'd)

a. Developed Ore (Cont'd)

The lower extension of a small deposit that was mined from the 6th Level is being explored and developed for mining from the 8th Level. A small amount of new ore has been proven by the development and a preliminary estimate indicates about 35,000 tons of mineable ore.

The small remaining reserves indicates slightly more than one year of operating life. The only hope of extending operations beyond this time lies in the drilling program that is being conducted to explore for new deposits to the south and below the present levels.

b. Estimated Analysis of Ore Reserves

Grade	Iron	Phos.	Sil.	Mang.	Alum	Lime	Mag.	Sul.	Loss	Moist.
Lloyddale Dried	58.33	.141	9.76	.26	2.97	.86	.57	.071	3.57	-
Lloyddale Nat'l.	51.04	.123	8.54	.23	2.60	.75	.50	.062	3.12	12.50

5. LABOR AND WAGES

a. General

Membership in the Union at the close of the year was 89.9% of eligible employees compared with 95.6% a year ago. The decrease in membership is due to the large turnover in the labor force to maintain it at the desired strength. The turnover in the labor represented 24% of the force. Employee relations have continued on a satisfactory basis and evidence of this is again reflected in the very few complaints that have been brought up during the year. The complaints were minor in nature and were settled in Step 1 of the grievance procedure in each case.

There were 159 men on the payroll at the end of the year compared with 150 a year ago. There were nine men transferred to other mines, twelve quit, four entered military service, three were retired and one died. There were thirty-six men hired and two transferred from other mines making a net increase of nine men.

b. Comparative Statement of Wages and Product

	1950	1949	Incr.	Decr.
Product	221,636	207,954	13,682	
No. of Shifts and Hours				
Jan. 1 to Aug. 21	3 8-Hr. Hoisting (5 Days Per Week) 3 8-Hr. Mining (5 Days Per Week)			
Aug. 21 through Dec. 31	3 8-Hr. Hoisting (6 Days Per Week) 3 8-Hr. Mining (6 Days Per Week)			
Average Number of Men Working	**1950**	**1949**	**Incr.**	**Decr.**
Surface	43¼	38	5¼	
Underground	112	102⅜	9¾	
Total	155¼	140⅜	14½	
Average Wages Per Day				
Surface	11.67	11.62	.05	
Underground	12.93	12.79	.14	
Total	12.58	12.47	.11	

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5. LABOR AND WAGES (Cont'd)

b. Comparative Statement of Wages and Product (Cont'd)

The following table shows a comparison of the average wages per day for surface and underground for the past five years:

Year	Surface	Underground
1950	11.67	12.93
1949	11.62	12.79
1948	11.09	13.02
1947	10.32	11.86
1946	9.31	10.46

Wages Per Month of 24 Days	1950	1949	Incr.	Decr.
Surface	280.08	278.88	1.20	
Underground	310.32	306.96	3.36	
Total	301.92	295.20	2.64	
Wages Per Month of 22 Days				
Surface	256.74	255.64	1.10	
Underground	284.46	281.38	3.08	
Total	276.76	274.34	2.42	
Product Per Man Per Day				
Surface	19.29	22.40		3.11
Underground	7.45	8.29		.84
Total	5.37	6.05		.68
Labor Cost Per Ton				
Surface	.605	.518	.087	
Underground	1.736	1.543	.193	
Total	2.341	2.061	.280	
Average Product Stoping	27.88	29.44		1.56
Average Wages Contract Miners	14.57	13.76	.81	
Total Number of Days				
Surface	11,490¼	9,283	2,207¼	
Underground	29,764	25,085½	4,678½	
Total	41,254¼	34,368½	6,885¾	
Amount of Labor				
Surface	134,026.66	107,808.27	26,218.39	
Underground	384,875.60	320,810.90	64,064.70	
Total	518,902.26	428,619.17	90,283.09	

Proportion of Surface to Underground Men

1950 - 1 to 2.59
1949 - 1 to 2.70
1948 - 1 to 1.67
1947 - 1 to 2.80
1946 - 1 to 3.59

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6. SURFACE

a. Buildings

There was no building construction and only minor repairs were required to maintain the existing buildings in good condition.

On the top landing a 10' x 12' addition was constructed of sheet metal on the east side of the shaft house for storing supplies. Two large wooden doors were constructed to close off the tramway on the top landing during holidays and weekends.

A room 8' x 12' was constructed of sheet metal in one of the garage building compartments for storing old office records.

b. Stocking Grounds

The stockpile of Lloyddale grade in the area to the east of the shaft was loaded out before the end of the shipping season and 20 bents of wood trestle were erected along the south side. It was not necessary to dismantle the trestle on the north side of this area but after the pile was loaded out several broken bents were repaired and new bracing installed.

The small shipment of Silica grade was loaded from the pile east of the shaft where the bulk of the inventory of this grade is stocked. A comparatively small tonnage of this grade remains in stockpile to the north and also west of the shaft.

Five bents of wood trestle were erected directly west of the shaft for stocking the small tonnage of Lloyd Special grade and this was all shipped.

The rock trestle south of the shaft was repaired when settling of the pile into the adjacent cave caused movement of the trestle. It has not been necessary to erect new rock trestle for many years because the rock is being bull-dozed into the nearby cave.

c. Roads

Heavy rainfall in the summer caused wash-outs in a number of places in the roads around the mine and wherever this occurred the roads were back-filled with mine rock and graded to put them into good condition again. There were no new roads constructed.

7. UNDERGROUND

a. Shaft Sinking

There was no shaft sinking in 1950.

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7. UNDERGROUND

b. Development

A substantial amount of development was driven on the 8th Level in connection with the drilling program under E & A cc-346. A drift was advanced about 1300' south in jasper to reach a favorable location to explore below the present levels. The lower extension of the small orebody that was mined from the 6th Level was encountered in the drift and two raises were put up to explore and develop the deposit. Development for sub level stoping was driven to the east from each raise until the top of the ore was reached.

The major part of the development was confined to areas above the 9th Level and nearly all of it was in ore. There were no main level extensions driven and the work was concentrated on the development of sub level stopes and caving areas.

In the main orebody the development was confined to two caving areas at the west end and one at the east end of the deposit. Scraping drifts were driven on the ∠ 95' Sub Level and numerous mill raises were put up and connected at a height of 20' above the scraping drift.

In the sulphurous deposit the development was primarily for sub level stopes excepting at the east end where a caving area was developed. Two transfer drifts were advanced from loading slides above the east and west crosscuts along the strike of the ore and the balance of the development comprised driving numerous mill raises that were connected on intermediate subs above the transfer. In the caving area at the east end of the deposit a scraping drift was advanced on the ∠ 95' Sub Level and a pillar 50' in height was developed for mining.

c. Stoping

Caving and stoping methods have been employed exclusively and the bulk of the production was mined by caving operations. Mining was conducted on four sub levels above the 8th Level and six above the 9th Level. There was an average of eight contracts employed, six of which were engaged in mining and two on development.

The following is a detailed description of the mining:

Subs above the 8th Level
390', 360', 350' and 285' Sub Levels

The small deposit above the 8th Level was developed for sub level stoping and small areas were mined on three subs above the transfer in the narrow crotch at the east end. A widening of the ore area is indicated by the development as mining retreats west under the jasper hanging. A small tonnage was also mined at the west end of the deposit on the 285' Sub. The mining and development at the close of the year had outlined a narrow deposit pitching at a flat angle to the west.

Subs above the 9th Level
Main Orebody
170', 145', 120' and 95' Sub Levels

Sub caving has been continued in the main orebody with two contracts employed at the west end and one at the east end. Two small pillars were recovered on the 170' Sub Level early in the year to complete the operations above the scraping drift on the 145' Sub. Upon completing the development for another 50' sub interval

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7. UNDERGROUND (Cont'd)

c. Stoping (Cont'd)

Subs above the 9th Level (Cont'd)
Main Orebody (Cont'd)
170', 145', 120' and 95' Sub Levels (Cont'd)

on the 95' Sub an area 180' x 60' was mined in the center of the orebody. A large triangular area at the west end of the deposit was also mined by the two contracts working in this area. At the east end one contract was continuing the caving operation above the east crosscut and recovery of a pillar west of No. 921 Raise was nearing completion. At the close of the year mining in this deposit had reached an elevation of 65' above the 9th Level.

170', 145', 120', 95', 70' and 45' Sub Levels
Sulphurous Deposit

Mining was completed above the 145' Sub Level in this deposit early in the year upon recovery of two pillars at the east end by sub caving. Another 50' vertical interval was developed for caving above the 95' Sub Level to recover ore lying along the footwall side. A small area south of No. 928 Raise was also mined and at the close of the year caving was being conducted northeast of the raise in a pillar that extends to the diabase dike. Sub Level stoping was employed at the west end of the deposit and mining was completed to practically the 9th Level elevation. Two small areas in the central part of the orebody were also mined to practically the 9th Level elevation by stoping. On the south footwall side mining was nearing completion in a scram operation that is being employed to recover a narrow pillar between two transfer drifts.

d. Timbering

There was less timber used than last year due to a reduction in the number of mining areas. There was a slight increase in the cost per ton for all timber used due to substantial increases in the price of these supplies. Factors that have affected timber costs favorably, however, are the continued use of caving and stoping methods and the absence of a large repair program.

Some timber repair work was required on the 9th Level and it consisted of installing lining sets in a short section of each of the crosscuts. A section of the footwall drift between the crosscuts also required some timbering due to slabbing of the rock formation. The use of steel sets has been confined to repairs in the ventilation drifts and particularly in a section of the 4th Level drift near Section 6 Shaft. Rotted timber in a large portion of this airway is being replaced with steel sets.

Repairs to raises has again comprised the major part of the repair program and it was necessary to reline the chute compartments of the long raises above the 9th Level with hardwood plank and steel wearing plates once during the year.

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7. UNDERGROUND (Cont'd)

d. Timbering (Cont'd)

The following is a comparative timber statement for the past two years:

	Lineal Feet	Avg. Price Per Foot	Amount 1950	Amount 1949
6" to 8" Cribbing Timber	18,292	.0739	1,334.96	1,768.55
8" to 10" Stull Timber	9,102	.1186	1,079.63	739.67
10" to 12" Stull Timber	7,044	.1803	1,269.77	2,031.74
12" to 14" Stull Timber	2,599	.2999	779.57	1,648.09
Total Timber 1950	37,037	.1205	4,463.93	
Total Timber 1949	47,537	.1302		6,188.05
	Per 100 Feet			
7' Lagging	269,337	1.400	3,771.66	2,711.46
9½' Poles	97,826	3.222	3,152.43	1,570.44
Total Lagging and Poles 1950	367,163	1.886	6,924.09	
Total Lagging and Poles 1949	249,815	1.71		4,281.90
Product - Tons			221,636	207,954
Feet of Timber Per Ton of Ore			.167	.229
Feet of Lagging Per Ton of Ore			1.215	.899
Feet of Lagging Per Foot of Timber			7.272	3.934
Cost Per Ton For Timber			.0201	.0298
Cost Per Ton For Lagging			.0170	.0130
Cost Per Ton For Poles			.0142	.0075
Cost Per Ton For All Timber			.0514	.0503
Equivalent Stull Timber to Board Measure			63,427	95,614
Feet of Board Measure Per Ton of Ore			.2862	.4598
E & A cc-346				
10" to 12" Stull Timber	378	.1569	59.30	-
7' Lagging	5,495	1.486	81.64	-
9½' Poles	5,843	3.326	194.32	-
Total Lagging & Poles E&A cc-346	11,338	2.434	275.96	-
Equivalent Stull Timber to Board Measure			64,194	-

The following table shows a comparison of total cost of timbering for the past five years:

Year	Amount	Cost Per Ton
1950	11,388.02	.0514
1949	10,469.95	.0503
1948	9,079.00	.0924
1947	12,291.85	.0484
1946	23,571.68	.0951

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7. UNDERGROUND (Cont'd)

e. Drifting and Raising

There was more footage driven than in 1949 and it was again chiefly drifting and raising in ore in connection with the stoping and caving operations.

	Drifting			Raising			Grand
Year	Ore	Rock	Total	Ore	Rock	Total	Total
1950	4698'	139'	4837'	3457'	135'	3592'	8429'
1949	3470'	119'	3589'	1895'	15'	1910'	5499'

Development Under E&A cc-346	
Rock Drift	1401'
Rock Stripping	79'
Rock Raise	65'

The following table shows a comparison of the development footage excluding the footage classified under small drift and raise:

	Drifting			Raising			Grand
Year	Ore	Rock	Total	Ore	Rock	Total	Total
1950	2322'	24'	2346'	240'	-	240'	2586'
1949	884'	57'	941'	116'	-	116'	1057'

f. Explosives, Drilling and Blasting

There was a large increase in the amount of explosives consumed over last year due to the larger development program. The cost per ton for explosives increased due to substantial price increases in nearly all explosives supplies. Gelamite 1-X powder has continued to be used exclusively in the mining and development and high pressure Gelatin in 5lb. cartridges is used in blasting large chunks in the caving and stoping operations. A small quantity of Hercomite powder was used in blasting the frozen stockpile ahead of the loading operations during the early part of the shipping season.

In the rock development on the 8th Level under E & A cc-346 tungsten carbide bits were used and very satisfactory results were obtained. This development was mostly in extremely hard jasper but favorable advance was realized with the use of this bit. Nearly all the other development was in ore and consequently there has been no need for more general use of this type of bit.

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7. UNDERGROUND (Cont'd)

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

The explosives statements are shown in the following tables:

	Quantity Lbs.	Average Price	Amount 1950	Amount 1949
Breaking Ore				
Gelamite 1-X 60%	102,051	15.80 C	16,119.96	8,602.50
Gelatin Hi-Pressure 60% 5x5	6,195	20.56 C	1,273.50	993.80
Herculite No. 4 5x22				81.00
Hercomite 2-X				2,206.06
Gelatin 60%Ex.				2,310.20
Total Powder	108,246	16.07 C	17,393.46	14,193.56
Fuse - Feet	315,219	8.79 M	2,769.32	1,554.67
Blasting Caps No. 6	36,426	14.70 M	535.35	607.70
Fuse Lighters 7"	5,300	9.85 M	52.21	22.50
Primacord - Feet	700	32.00 M	22.40	32.00
Total Fuse, Caps, Etc.			3,379.28	2,216.87
Total Expense Breaking Ore			20,772.74	16,410.43
Product - Tons			221,636	207,954
Lbs. Powder Per Ton of Ore			.488	.437
Cost Per Ton for Powder			.078	.068
Cost Per Ton for Fuse, Caps, Etc.			.015	.011
Cost Per Ton for All Explosives			.093	.079
DEVELOPMENT IN ROCK				
Gelamite 1-X 60%	481	15.66	75.33	-
Fuse - Feet	1,360	8.68	11.80	-
Caps	510	14.70	7.50	-
Total Fuse, Caps, Etc.			19.30	-
Total All Explosives			94.63	-
Rock Drifting - Feet			24	-
Cost Per Foot for Powder			3.14	-
Cost Per Foot for Fuse, Caps, Etc.			.80	-
Cost Per Foot All Explosives			3.94	-
Total Explosives - Breaking Ore & Rock Development			20,867.37	16,410.43
Cost Per Ton			.094	.079
BLASTING STOCKPILE				
Gelamite 1-X 60%	100	15.25	15.25	-
Hercomite Bag X	600	13.54	81.25	-
Total Explosives - Blasting Stockpile			96.50	-
E & A CC-346				
Gelamite 1-X 60%	16,448	14.45	2,377.13	-
Fuse - Feet	47,102	8.39	395.22	-
Caps	6,584	14.70	96.80	-
Total Explosives - E & A cc-346			2,869.15	-
Grand Total Explosives Used in Mine			23,833.02	16,410.43
Average Price Per Lb. For Powder			.1893	.1560

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7. UNDERGROUND (Cont'd)

g. Ventilation

Two fans operating in series have continued to provide good ventilation in the mine. The main fan located at Section 6 Shaft and the other on the 8th Level together deliver a volume slightly in excess of 18,000 C.F.M. In the summer months the fans exhaust up the Section 6 Shaft and in freezing weather the direction of the ventilation current is reversed for long periods to exhaust up the hoisting shaft and prevent the formation of ice.

In the mining area above the 8th Level and also two separate areas above the 9th Level, ventilation is supplied by auxiliary fans with metal pipe extending from the level to the working place and exhausting air into raises and drifts that connect with the 4th Level airway.

There were no new ventilation connections driven and the existing drifts and raises between the 4th and 9th Levels will continue to serve for ventilation purposes until the small remaining reserves are mined. On the 5th Level a long section of the old haulage drift has caved but the drift has not been blocked and still serves satisfactorily as an airway.

8. COST OF OPERATING

a. Comparative Mining Costs

	1950	1949
Product - Tons	221,636	207,954
Underground Costs	2.408	2.058
Surface Costs	.512	.507
General Mine Expenses	.601	.509
Cost of Production	3.521	3.074
Depreciation	.290	.277
Taxes	.034	.031
Loading and Shipping	.089	.064
Total Cost at Mine	3.934	3.446
Budget Estimated at Mine	3.530	3.355
No. of Shifts and Hours	18, 1-8 Hr.	2, 1-8 Hr.
	24, 2-8 Hr.	5, 2-8 Hr.
	244, 3-8 Hr.	237, 3-8 Hr.
Total Operating Days	286	244
Average Daily Product	775	852

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8. COST OF OPERATING (Cont'd)

b. Detailed Cost Comparison

		1950		1949	
		Amount	Per Ton	Amount	Per Ton
1.	Exploring in Mine	1,454.63	.007	1,265.79	.006
3.	Development in Rock	841.46	.004		
4.	Development in Ore	96,928.17	.437	46,550.37	.224
5.	Stoping	138,431.12	.625	134,528.08	.648
6.	Timbering	54,883.99	.248	49,796.84	.239
7.	Tramming	103,361.42	.466	101,737.05	.489
8.	Ventilation	5,417.95	.024	4,462.68	.021
9.	Pumping	34,149.83	.154	13,485.32	.065
10.	Compressors and Air Pipes	25,954.73	.117	18,890.84	.091
12.	Underground Superintendence	19,190.09	.087	17,065.66	.082
14.	Maint.: Comp. & Power Drills	5,985.08	.027	3,140.90	.015
15.	Scrapers & Mech. Loaders	15,345.25	.069	17,551.82	.084
16.	Tramming Equipment	21,420.81	.096	17,989.30	.087
17.	Pumping Machinery	10,390.53	.047	4,050.80	.019
	Total Underground Costs	533,755.06	2.408	427,983.87	2.058
18.	Hoisting	40,397.26	.183	33,743.07	.162
19.	Stocking Ore	17,523.95	.079	21,153.40	.102
20.	Screening-Crushing at Mine	1,241.19	.006	186.03	.001
21.	Dry House	14,463.94	.065	14,018.14	.067
22.	General Surface Expense	18,272.58	.082	14,913.99	.072
23.	Maint.: Hoisting Equipment	12,890.68	.058	12,285.61	.059
24.	Shaft	2,884.26	.013	4,933.61	.024
25.	Top Tram Equipment	3,488.43	.016	2,830.92	.014
26.	Docks, Trestles & Pockets	860.16	.004	412.75	.002
27.	Mine Buildings	1,347.90	.006	974.28	.004
	Total Surface Costs	113,370.35	.512	105,451.80	.507
28.	Geological	1,200.00	.005	933.50	.004
29.	Mining Engineering	4,038.28	.018	4,431.99	.021
30.	Mechanical & Electrical Engineering	1,641.08	.007	1,591.02	.008
31.	Analysis and Grading	17,232.33	.078	15,821.82	.076
32.	Safety Department	1,981.36	.009	1,426.53	.007
33.	Telephones & Safety Devices	3,058.54	.014	2,339.47	.011
34.	Local and General Welfare	2,042.23	.009	1,692.43	.008
35.	Special Exp., Pensions & Allowances	4,278.46	.019	4,049.33	.020
36.	Ishpeming Office	13,540.23	.061	8,947.51	.043
37.	Mine Office	20,987.19	.095	16,785.65	.081
38.	Insurance	13,196.81	.060	9,679.79	.047
39.	Personal Injury	13,652.98	.062	12,435.74	.060
40.	Social Security Taxes	13,198.82	.060	9,141.76	.044
41.	Employees Vacation Pay	20,160.00	.091	16,455.80	.079
42.	Research Laboratory	718.64	.003		
43.	Additional Wage Adjustment	2,392.66	.010		
	Total General Mine Expenses	133,319.61	.601	105,732.34	.509
	Cost of Production	780,445.02	3.521	639,168.01	3.074

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8. COST OF OPERATING (Cont'd)

b. Detailed Cost Comparison (Cont'd)

		1950		1949	
		Amount	Per Ton	Amount	Per Ton
44.	General Supplies	22,669.81	.102	25,635.88	.123
45.	Iron and Steel	14,209.81	.064	9,693.73	.047
46.	Oil and Grease	2,225.63	.010	2,429.71	.012
47.	Machinery Supplies	20,803.09	.094	13,302.60	.064
48.	Explosives	20,963.87	.095	16,410.43	.079
49.	Lumber and Timber	17,051.63	.077	22,528.30	.108
50.	Fuel	5,115.32	.023	5,922.21	.028
51.	Electric Power	51,084.45	.230	33,670.53	.162
52.	Sundries	16,666.21	.075	10,591.87	.051
	Total Supplies	170,789.82	.770	140,185.26	.674

Following are explanations of operating costs that show significant variations compared with the previous year:

1. Exploring in Mine

The increase in this account is due to the drilling in the sulphurous deposit to explore for an ore extension.

4. Development in Ore

The increase is due to a larger ore development program and the increase in the cost of supplies and labor.

5. Stoping

The total expenditure was larger due to the purchase of some new equipment and the increase in labor cost but the cost per ton was slightly lower due to the larger production.

	1950		1949	
	Amount	Per Ton	Amount	Per Ton
General Supplies	2,091.66	.009	2,749.33	.013
Iron and Steel	3,444.93	.016	2,755.36	.013
Oil and Grease	430.53	.002	640.62	.003
Machinery Supplies	5,451.46	.025	2,497.30	.012
Explosives	12,386.80	.056	13,326.61	.064
Lumber and Timber	22.71		13.50	
Electric Power	6,415.07	.029	4,239.15	.021
Sundries	181.54	.001	958.94	.005
Expense Accounts	1,993.49	.009	1,861.99	.009
Total Supplies	32,418.19	.147	29,042.80	.140
Payroll Labor	97,404.09	.439	95,605.38	.461
Gen'l. Sthse. & Gen'l. Shops Labor	469.84	.002	441.83	.002
Shops, Labor, Etc.	8,139.00	.037	9,438.07	.045
Total Labor	106,012.93	.478	105,485.28	.508
Grand Total	138,431.12	.625	134,528.08	.648
Production Tons Stoped	184,667		188,428	
Average Miner's Rate Stoping	13.92		13.67	
Average Tons Per Man Stoping	27.88		29.44	

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8. COST OF OPERATING (Cont'd)

b. Detailed Cost Comparison (Cont'd)

6. Timbering

The larger expenditure in this account is due to the increase in the cost of timber.

7. Tramming

The total expenditure was slightly higher due to the increase in wages but the cost per ton was lower due to the larger production.

8. Ventilation

The increase in this account is due to the purchase of some new equipment.

9. Pumping

The large increase in this expense is due to the additional pumpmen required when diversion of water to the Morris Mine was stopped and it became necessary to pump all the mine water through the Lloyd shaft. An increase in water in both the Morris and Lloyd Mines made it advisable to make this change. The installation of additional pumps was completed in August and all the mine water since then has been pumped through the Lloyd shaft. The following table shows a comparison of the charges by the Inland Steel Company for pumping a portion of the Lloyd Mine water. The charges in 1950 are for a period of eight months.

	Total Inland Steel Co.			C.C.I. Co. Proportion		
Year	Amount	Avg. G.P.M.	Percent	Amount	Avg. G.P.M.	Percent
1950	63,975.21	1805.3	93.59	7,286.86	123.7	6.41
1949	100,820.55	1192.5	93.24	5,400.93	86.4	6.76
1948	84,077.89	1076.3	93.07	5,855.38	80.2	6.93
1947	65,474.05	966.8	90.00	7,482.69	109.2	10.00
1946	43,090.37	887.4	91.40	5,600.69	83.5	8.60

In 1950 an average of 274.3 G.P.M. was pumped compared with 182.7 in the previous year. The peak in mine water was reached in May after the spring break-up when an average of 584.6 G.P.M. was pumped and during a short period in the same month the volume reached a maximum of 719 G.P.M.

12. Underground Superintendence

The size of the supervisory force has remained the same. The salaries of the supervisors was increased effective August 15th when the operating schedule was increased to 48 hours per week and again on December 1st when the general increase in salaries was made. A Christmas bonus of $100.00 was also paid each salaried supervisor.

14. Maintenance of Compressors and Power Drills

The increase in this expenditure is due to repairs on the Sullivan compressor. New crankshaft and motor armature shaft bearings were installed on this unit and it was also given a general over-hauling. While the compressor was down for repairs, compressed air was supplied by the Morris Mine compressor through a pipe line laid on surface.

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8. COST OF OPERATING (Cont'd)

b. Detailed Cost Comparison (Cont'd)

16. Tramming Equipment

The increase in this expense is due to quite extensive repairs on the tram cars.

17. Pumping Machinery

The large increase in this expense is due to installation of additional pumps when it became necessary to pump all the mine water through the Lloyd shaft.

18. Hoisting

The larger expense in this account is due to the increase in wages and higher power cost.

19. Stocking Ore

The decrease in this expense is due to less trestle construction.

24. Maintenance of Shaft

The decrease in this expense is due to less repairs.

28. - 43. Inclusive

The expense in direct charges was higher in nearly every account due to the increase in wages, salaries and supply costs.

9. EXPLORATION AND FUTURE EXPLORATION

Upon completion of the exploration drift to the south on the 8th Level drilling was started to explore an area below this level. Three steeply dipping holes were drilled from a station 900' south of the 8th Level haulage drift and some concentration was encountered in one of the holes. Numerous dikes and a substantial amount of iron formation was penetrated in each of the holes but no ore of consequence was proven. The fault structures in this area will be explored further by drilling from the south end of the drift and preparations were being made to drill the first hole from this location early in 1951. The results of the program at the close of the year were disappointing but the favorable structure and formation that has been proven warrants further exploration to more thoroughly explore for deep-lying deposits. This exploration is being done under E&A cc-346.

In the sulphurous deposit above the 9th Level one hole was drilled from the ∠ 145' Sub to explore the central part of the orebody for a possible ore extension. No ore of importance was proven and the program was stopped upon the completion of one hole. The following are logs of the drilling during the year:

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9. EXPLORATION AND FUTURE EXPLORATION (Cont'd)

D. D. H. 181
∠ 145' Sub Level - Course N 67° W - Dip 0°

0' - 5'	Ore
5' - 15'	Cherty Iron Formation
15' - 20'	Lean Ore
20' - 30'	Cherty Iron Formation
30' - 35'	Lean Ore
35' - 40'	Ore
40' - 109'	Cherty Iron Formation
109' - 123'	Dike
123' - 181'	Cherty Iron Formation

D. D. H. 182
8th Level Due North Dip -85°

0' - 71'	Iron Formation
71' - 75'	Dike
75' - 182'	Iron Formation
182' - 221'	Dike
221' - 232'	Iron Formation
232' - 250'	Dike
250' - 251'	Iron Formation and Dike
251' - 254'	Iron Formation
254' - 348'	Dike
348' - 360'	Iron Formation
360' - 361'	2nd Class Ore
361' - 380'	Ore
380' - 408'	2nd Class Ore
408' - 418'	Ore
418' - 423'	Lean Ore
423' - 424'	Iron Formation
424' - 460'	Dike
460' - 493'	Slate

D. D. H. 183
8th Level N 1° 46' E Dip -55°

0' - 190'	Hem. Goeth. Chty. Iron Form.
190' - 225'	Dike
225' - 230'	Lean Ore
230' - 231'	Dike
231' - 234'	Lean Ore
234' - 294'	Dike
294' - 307'	Hem. Chty. Iron Form.
307' - 312'	Dike
312' - 324'	Hem. Chty. Iron Form.
324' - 328'	Dike
328' - 344'	Hem. Chty. Iron Form.
344' - 347'	Dike
347' - 362'	Hem. Chty. Iron Form.
362' - 377'	Lean Ore
377' - 380'	Iron Form.
380' - 390'	Lean Ore
390' - 400'	Hem. Chty. Iron Form.

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9. EXPLORATION AND FUTURE EXPLORATION (Cont'd)

D. D. H. 183 (Cont'd)

400' - 404'	Lean Ore
404' - 409'	Hem. Chty. Iron Form.
409' - 420'	Ore
420' - 427'	Hem. Arg. Iron Form.
427' - 494'	Arg. and Graywacke

D. D. H. 184
8th Level Due North Dip -75°

0' - 71'	Hem. Chty. Iron Form. and Lean Ore
71' - 83'	Dike
83' - 112'	Rich Hem. Chty. Iron Form.
112' - 117'	Lean Soft Hem. Ore
117' - 274'	Normal Hem. Chty. Iron Form.
274' - 354'	Hem. Chty. Iron Form.
354' - 396'	Dike
396' - 451'	Lean Hem. Chty. Iron Form.
451' - 454'	Dike
454' - 465'	Hem. Chty. Iron Form.
465' - 475'	Dike
475' - 484'	Hem. Chty. Iron Form.
484' - 485'	Dike
485' - 487'	Lean Hem. Chty. Iron Form.
487' - 504'	Dike
504' - 529'	Hem. Chty. Iron Form.
529' - 531'	Dike
531' - 534'	Hem. Chty. Iron Form.
534' - 543'	Dike
543' - 544'	Rich Hem. Chty. Iron Form.
544' - 550'	Dike
550' - 554'	Hem. Chty. Iron Form.
554' - 558'	Dike
558' - 582'	Very Lean Iron Form.
582' - 585'	Ore
585' - 599'	Rich Iron Form.
599' - 625'	Iron Form.
625' - 693'	Argilite and Graywacke

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10. TAXES

The following shows a comparison of the taxes paid in 1950 and 1949 in Ishpeming Township:

	1950		1949	
Lloyd and Section 6	**Valuation**	**Taxes**	**Valuation**	**Taxes**
SW¼ of NW¼ of Sec. 6, 47-27, 40 Acres)				
N½ of SW¼ of Sec. 6, 47-27, 81.67 ")				
N½ of SE¼ of Sec. 6, 47-27, 80 ")	125,000	1,990.51	150,000	2,285.45
Personal, Ore in Stock, Supplies and Equipment	345,000	5,493.81	330,000	5,027.98
Total by State Tax Commission	470,000	7,484.32	480,000	7,313.43
Collection Fee		74.84		73.13
Total	470,000	7,559.16	480,000	7,386.56
C.C.I. Co. Misc. Lands				
S½ of NE¼ of Sec. 6, 47-27, 80 Acres	550	8.76	550	8.38
SE¼ of NW¼ of Sec. 6, 47-27, exc. R/W 41.08A	550	8.76	550	8.38
S½ of SW¼ of Sec. 6, 47-27, 81.26 A	900	14.33	900	13.74
SW¼ of SE¼ of Sec. 6, 47-27	550	8.76	550	8.38
SE¼ of SE¼ of Sec. 6, 47-27	600	9.55	600	9.14
Total	3,150	50.16	3,150	48.02
Collection Fee		.50		.48
Total Lloyd Mine	473,150	7,609.82	483,150	7,435.06
West Ishpeming				
Lot 4 Block 2	75	1.20	75	1.15
North Lake Location				
Houses on Sec. 6, 47-27	10,075	162.05	10,075	155.04
Total Ishpeming Township	483,300	7,773.07	493,300	7,591.25
Rate		1.59241		1.52363

	1950	1949	1948	1947	1946
Taxes Per Ton Produced	.034	.031	.117	.048	.056
Taxes Per Ton Shipped	.041	.044	.070	.029	.069

11. ACCIDENTS AND PERSONAL INJURY

The accident frequency and severity rates were lower than last year. There were seven compensable accidents compared with thirteen in the previous year but none of the accidents, fortunately, were very serious in nature. The total man days worked increased from 34,544 in the previous year to 41,771 in 1950 and the man days lost on account of all accidents was 323. There were 290 man days lost for compensable accidents only. The following table shows a comparison of the severity and frequency rates:

Year	Frequency Rate	Severity Rate
1950	59.84	.966
1949	79.65	1.259

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

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11. ACCIDENTS AND PERSONAL INJURY (Cont'd)

The compensable accidents are listed in detail as follows:

Accident No. 899, April 19, 1950, William Nelson, Cage Rider. While pushing a loaded timber truck on the cage one end of the truck jumped off the track causing it to swing sideways squeezing his left leg between the side of the cage and the bunk of the truck - fracture head of left fibula - time lost - 174 days.

Accident No. 900, June 20, 1950, Gerald Marietti, Motorman. A loaded car was being pushed on the winze cage with the motor while Marietti was standing to the side waiting to throw in the safety catches. He was resting one hand on the shaft timber and when the loaded car rolled into the cage it shifted to one side squeezing his third finger between the cage and shaft timber - contusion left middle finger - time lost - 12 days.

Accident No. 901, July 20, 1950, George Carlson, Miner. Carlson was placing an explosives charge on a large chunk in a mill raise when another chunk about 10" x 10" rolled out from under the chunk he was going to blast and struck him in the calf of the left leg - contusion calf of left leg with hemorrhage into the muscle - time lost - 32 days.

Accident No. 902, July 10, 1950, Carl Hilberg, Miner. Hilberg was charging holes in the breast of a bench when a small chunk of ore fell from the back and struck him in the left foot - contusion left foot - time lost - 36 days.

Accident No. 902-A, July 13, 1950, William Billings, Jr., Miner. Billings was lifting and pulling a chute lining plate that was partly buried in the dirt pile and he suffered a strain in the left side - left inguinal hernia - time lost - 7 days.

Accident No. 903, July 20, 1950, Samuel Seppi, Miner. Seppi was one of a crew driving a rock drift and while he was moving the slide rails for the loader ahead, a small chunk fell from the back as he was stooped over and struck him on the left side of the back - contusion of back - time lost - 26 days.

Accident No. 904, September 19, 1950, Lester Warner, Brakeman. On the 9th Level winze plat an electric hoist is used for pulling empty cars off the cage and the rope is hooked to the first car and kept there until a six-car train is made up. It is the brakeman's duty to remove the rope from the car before the motor picks up the train of empties. Warner forgot to remove the rope and as the train was being pushed through the switch near which he was standing the rope squeezed him against the rib of the drift - contusion of back - time lost - 23 days.

12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

There was very little construction on surface and the usual erection of stocking trestle at the close of the shipping season comprised most of the work. In the stocking area east of the shaft 20 bents of trestle were erected on the south side for stocking Silica and Lloyddale grades. In the area west of the shaft five bents of trestle were erected for stocking Lloyd Special grade.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION (Cont'd)

New construction underground consisted of installing a 500 G.P.M. reciprocating pump on the 9th Level and a 6" discharge line extending from this level to the pump station on the 5th Level. Work was underway on this project at the close of the year. This pump will replace four small centrifugal pumps that have been used to relay water from the lower levels to the 5th Level pump station. There is no new construction of importance anticipated in the near future.

13. EQUIPMENT AND PROPOSED EQUIPMENT

There was very little new equipment purchased in view of the short remaining life of the mine. A number of new transformers were purchased for use with the additional pumps that are required when it became necessary to pump all the mine water through the Lloyd shaft.

Item	Number	Cost
Transformers	6	$ 1,957.14
Jeffrey Blower	1	480.65
I. R. Utility Hoist	1	690.00
Westinghouse 5 h.p. Motor	1	123.00
Air Mover 3"	1	50.71
Air Mover 6"	1	86.54
Winze Cage	1	2,217.56
RB12 Jackhammers	2	570.00
I. R. Portable Grinder	1	156.51
Modine Unit Heater	1	147.40
Riveting Hammer	1	124.70

14. MAINTENANCE AND REPAIRS

a. Mine

There were no major breakdowns and only normal repairs have been required on most of the equipment. The Sullivan compressor was fitted with new crankshaft and motor armature bearings and the unit was given a general overhauling and cleaning to put it into good condition. During the vacation week in August the motor generator set was taken to the General Shops and three new coils were installed in the motor armature.

In the cage compartment about 600' of new shaft runners were installed between the 2nd and 5th Levels replacing runners that were quite badly worn. The balance of the repair work in the shaft consisted of replacing occasional damaged and worn runners and also casing plank where required. In the skip compartment above the 4th Level the runners are showing signs of excessive wear after many years of service and new runners will be installed in this section during the vacation period in 1951.

The numerous small capacity centrifugal pumps that are used to relay water from the lower levels to the large capacity pump on the 5th Level required quite a lot of repairs. After the spring break-up when the mine water reached its peak, maintenance on the pumps was quite high due to pumping water with a high percentage of solids. On this account a large capacity reciprocating pump is being obtained for service on the 8th Level to replace the small centrifugal pumps.

Transferring the underground tram cars through the winze between the 8th and 9th Levels causes more than the usual amount of wear on the cars and these have required a lot of attention to realize the best efficiency in tramming.

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14. MAINTENANCE AND REPAIRS (Cont'd)

b. Location

1. General Maintenance

There has been no location maintenance expense since the water supply system was turned over to the Township. A monthly charge was made to the Township for pumping water from the Morris Mine well until June when the Township started receiving water from the City of Ishpeming.

2. Rented Buildings

The maintenance expense on rented buildings was less than last year. Some minor repairs were made to the Manager's house and in the store buildings some improvements were made in the plumbing. The following is a comparison of the expenditures on rented buildings for the past five years:

Year	Amount
1950	$ 486.37
1949	1504.12
1948	455.91
1947	581.23
1946	92.22

15. POWER

There was an increase in the amount of power consumed due mainly to the larger volume of mine water pumped. There were no delays to operations due to lack of electric power. The following is a five-year comparison of the power cost:

Year	K.W.H.	Cost	Rate
1950	3,026,400	51,125.78	.01689
1949	2,208,000	35,444.04	.01605
1948	1,994,400	31,640.64	.01586
1947	2,335,200	36,760.08	.01580
1946	2,011,200	29,830.08	.01480

16. WATER SUPPLY

The water supply has continued to be obtained from the Morris Mine deep well and the location was also supplied with water from this source until June. Beginning late in June the City of Ishpeming has supplied the location with water and the well supply is now used only for mine purposes. A gradual decline in the output from the well is taking place and if the trend continues this source of water will be abandoned and water will again be obtained from the 2nd Level. The water supply is being chlorinated as done in the past.

17. CONDITION OF PREMISES

There were no improvements or landscaping done on the premises but the trees and shrubbery around the mine buildings and the lawn have been maintained in an attractive condition during the summer months.

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18. NATIONALITY OF EMPLOYEES

	American Born	Foreign Born	Total	Percent
Finnish	52	9	61	38.4
Italian	18	15	33	20.8
English	25		25	15.7
French	22		22	13.9
Swedish	13	2	15	9.4
Norwegian	1		1	.6
Austrian		1	1	.6
German	1		1	.6
	132	27	159	100.0

MATHER MINE "A" SHAFT
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1. GENERAL:

The production for the year 1950 was 1,251,963 tons, and the shipments for the year were 1,274,440 tons. This production established a new record for underground iron ore mines in this country, and was an increase of 189,799 tons over the previous year. The mine operated five days per week up to August 21st, when the working schedule was increased to six days per week.

Satisfactory labor relations were continued, as evidenced by the fact that only one formal grievance was presented by the union during the year. This grievance was the result of a layoff imposed upon one of the employees for sleeping underground, and was dropped by the union after it had gone through Step Three of the grievance procedure.

Man-power was plentiful except in the skilled class. Of the total new men hired, less than 10% had previous mining experience.

Shipments from stockpile were started early in April and pocket loading was started in the latter part of May, both continuing without interruption into early December.

Production continued from the 2nd, 3rd, 5th and 6th Levels, with the 6th producing the largest tonnage of approximately 536,000. The 5th produced approximately 400,000 tons, the 3rd approximately 235,000 and the 2nd approximately 65,000 tons. Approximately 2,000 tons were produced on the 7th Level from the interbedded ore encountered in the main level drift.

Development on the 7th Level proceeded at a satisfactory rate; the skip and cage road plats were completed, the main footwall drift was advanced to the loading end of the conveyor belt and the conveyor belt drift was approximately two-thirds completed.

Plans were completed for sinking the shaft to the 9th Level, and were subsequently changed to include the 10th Level. By the end of the year, the winze was deepened to the point where it could handle the rock from shaft sinking. A trench drift was driven to the shaft location and 42' of shaft were completed.

MATHER MINE "A" SHAFT
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1. GENERAL:
(Continued)

Of major importance underground was the design of an arch steel set for support in major caving areas. The development of the first block caving area with the arch steel sets was completed late in the year, and it is apparent that this type of support will be far superior to wood timber.

During the vacation period in August, a crusher, screen and pan feeder were installed in the headframe. Considerable trouble was encountered with this equipment during the early stages of its operation, due mainly to blanking of the screen and bearing failures in the crusher. After the screen deck was altered and water cooled bearings were installed in the crusher, this equipment operated satisfactorily. A new bottom dump skip was also installed at this time.

Two of the three new larry cars were received late in the year. As is true of all new equipment, some changes will have to be made before putting the cars into operation.

MATHER MINE "A" SHAFT
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2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production by Grade:

	Product	Stockpile Overrun	Total	1949 Total
Mather	1,236,712	15,251	1,251,963	1,062,164
Rock			169,026	122,012

b. Shipments:

	Pocket Tons	Stockpile Tons	Total Tons	Total 1949	Increase
Mather	645,386	629,054	1,274,440	1,015,634	258,806

All three stockpiles were cleaned up by the end of the year, developing an overrun of 15,251 tons.

c. Stockpile Inventories:

	1950	1949
Mather	124,540	147,017

d. & e. Division of Product by Levels and by Months:

Months	Second (1600') Level	Third (1750') Level	Fifth (2050') Level	Sixth (2200') Level	Seventh (2400') Level	Total	Rock
January	13,864	13,349	33,806	28,491	-	89,510	11,187
February	15,662	13,137	36,136	29,687	-	94,622	15,004
March	8,859	16,290	37,080	27,406	-	89,635	20,229
April	475	12,931	34,178	30,952	-	78,536	17,479
May	3,540	13,071	39,640	54,874	-	111,125	16,863
June	3,521	14,418	36,807	54,126	-	108,872	13,024
July	2,925	21,180	35,273	57,476	-	116,854	10,615
August	3,106	16,139	27,799	45,236	-	92,280	7,579
September	4,030	24,663	29,765	60,894	-	119,352	11,132
October	4,886	31,502	28,435	54,036	-	118,859	15,433
November	344	30,920	34,413	44,226	548	110,451	15,389
December	3,746	27,793	25,121	48,520	1,436	106,616	15,092
	64,958	235,393	398,453	535,924	1,984	1,236,712	169,026
Current Year Stockpile Overrun						15,251	
						1,251,963	

MATHER MINE "A" SHAFT
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2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

f. Ore Statement:

	1950	1949
On Hand January 1, 1950	147,017	100,487
Output for Year	1,236,712	1,028,582
Overrun	15,251	33,582
Total	1,398,980	1,162,651
Shipments	1,274,440	1,015,634
Balance on Hand	124,540	147,017
Increase in Output	189,799	61,163
Increase in Ore on Hand		46,530
Decrease in Ore on Hand	22,477	

Working Schedule:

1950 - 3-8 hr. shifts, 5 days per week, Jan. 1st to Aug. 20th.
3-8 hr. shifts, 6 days per week, Aug. 21st to Dec. 31st.

1949 - 3-8 hr. shifts, 6 days per week, Jan. 1st to June 26th.
3-8 hr, shifts, 5 days per week, June 27th to Sept. 30th.
Idle account of strike, Oct. 1st to Nov. 13th.
3-8 hr. shifts, 5 days per week, Nov. 14th to Dec. 31st.

1948 - 2-8 hr. shifts*, 6 days per week, Jan. 1st to Dec. 31st.
(Practically a three shift operation by the end of the year)

1947 - 2-8 hr. shifts*, 6 days per week, Jan. 1st to Feb. 18th.
Idle account of water trouble, Feb. 19th to 26th.
2-8 hr. shifts*, 6 days per week, Feb. 27th to Dec. 31st.

1946 - 2-8 hr. shifts*, 6 days per week, Jan. 1st to Feb. 7th.
Idle account of strike, Feb. 8th to May 21st.
2-8 hr. shifts*, 6 days per week, May 22nd to Dec. 31st.

1945 - 3-8 hr. shifts, 5 days per week, Jan. 1st to 3rd.
2-8 hr, shifts, 5 days per week, Jan. 4th to 19th.
2-8 hr. shifts, 6 days per week, Jan. 22nd to Dec. 31st.

1944 - 3-8 hr. shifts, 5-1/3 days per week, Jan. 1st to July 31st.
3-8 hr. shifts, 5 days per week, Aug. 1st to Dec. 31st.

1943 - 3-8 hr. shifts, 5-2/3 days per week, Jan. 1st to 31st.
3-8 hr. shifts, 5-1/3 days per week, Feb. 1st to Dec. 31st.

* Main level development 3-8 hr. shifts, 6 days per week.

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2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

g. Operating Delays:

There were only two important operating delays during the year. A delay of approximately twelve hours occurred on January 25th, when it was necessary to change the north skip rope. This rope went bad between daily inspections, necessitating changing the rope on a week day.

A second delay of twelve hours occurred on May 10th, when both guide rails in the south compartment of the skip broke and had to be replaced.

In addition to the above, there were the usual number of minor delays, due mostly to trouble with the top tram larry cars, and totaled approximately twenty-one hours for the year.

3. ANALYSIS:

a. Average Mine Analysis on Output (Dried):

Grade	Iron	Phos.	Silica	Sulphur
Mather	58.02	.113	9.32	.145

The sulphur content of the ore mined during the year was slightly higher than that of the previous year, due to the increased tonnage mined on the 3rd Level, where the bulk of the ore is high sulphur.

b. Average Analysis on Straight Cargoes:

All of the shipments during 1950 were in mixed cargoes.

c. Complete Analysis of Ores in Stock (Dried):

Grade	Tons	Iron	Phos.	Silica	Mang.	Alum.	Lime	Mag.	Sulphur	Loss	Moist.
Mather	124,540	57.23	.104	9.98	.31	3.10	.72	.67	.228	2.38	11.91

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4. ESTIMATE AND ANALYSIS OF ORE RESERVES:

The ore estimate shows a net total reserves of approximately 9,800,000 tons. Of this total, approximately 4,600,000 tons are estimated from underground development and approximately 5,200,000 tons from surface drilling. This estimate includes both Standard and Sulphurous ore, since these two grades are being mined and shipped as one grade.

Assumption: 12 cu. ft. equal one ton.

	Mather Standard	Mather Sulphurous	Total Underground	Diamond Drilling	Total Tons
Reserves Indicated By Surface Diamond Drilling.....				5,733,318	
Reserves Indicated By Underground Development:					
Above 2nd Level.....	43,360	62,120	105,480		
Between 2nd & 3rd Levels..	52,854	452,069	504,923		
Between 3rd & 5th Levels..	696,048	286,181	982,229		
Between 5th & 6th Levels..	2,404,349	105,608	2,509,957		
Below 6th Level.....	1,432,625	75,500	1,508,125		
	4,629,236	981,478	5,610,714	5,733,318	11,344,032
Less Production 9/1/50 to 12/31/50.....	301,963	153,315	455,278	-	455,278
Total Gross as of December 31, 1950.....	4,327,273	828,163	5,155,436	5,733,318	10,888,754
Less Loss in Mining and Rock.....	454,967	94,169	549,136	573,332	1,122,468
Net Total as of December 31, 1950.....	3,872,306	733,994	4,606,300	5,159,986	9,766,286

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4. ESTIMATE AND ANALYSIS OF ORE RESERVES: (Continued)

This estimate indicates a gross loss of 1,257,327 tons as compared with a gross gain of 1,183,973 tons in 1949.

	Total Tons
Net Total December 31, 1949	12,275,576
Net Total December 31, 1950	9,766,286
Net Loss in Reserves	2,509,290
1950 Production	1,251,963
Gross Loss in Reserves	1,257,327

The bulk of the loss in reserves is in the interbedded ore horizon, where considerable tonnages cannot be mined economically and are considered unavailable. This ore is extremely hard, with a very soft hanging wall slate, and the various methods of recovering this ore which have been devised and tried have not proved very successful.

Expected Average Natural Analysis of Ore Reserves:

Grade	Total Tons	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sulph.	Loss	Moist.
Mather by Surface Diamond Drilling...	5,159,986	53.15	.122	5.08	.25	2.62	.58	.60	.014	1.97	12.50
Mather by Undg. Development.....	4,606,300	51.50	.100	8.15	.20	2.45	1.00	.50	.110	2.25	11.85
	9,766,286										

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5. LABOR AND WAGES:

a. Comments:
There was a net gain of 79 men for the year, with 260 additions and 181 separations. Of the additions, 228 were new men and 32 were transfers from other mines. Of the separations, 89 were transferred to Mather "B" Shaft, 24 were transferred to other mines, 48 quit, 3 retired, 13 went into the Armed Forces, 3 were discharged and 1 died.

Number of Men 1/1/50.....	693
Added to Roll During the Year.....	260
Total.....	953
Separations.....	181
Total on Payroll 12/31/50.....	772
Net Gain.....	79

Due to the large number of transfers and the number of inexperienced men hired, the overall efficiency of the mine suffered. This problem of transfers, plus the added problem of losing experienced men to the Armed Forces, with very little hope of obtaining experienced miners, will become more acute in the coming year.

During the year, an agreement was made with the union that all of the men who wished to be transferred to "B" Shaft would sign a request by July 1st and transfers would be made as soon as replacements could be obtained. A total of 126 men signed the request. By the end of the year, 59 had been transferred, with a balance of 67 remaining to be transferred. In addition to the above, 30 men had been transferred prior to the agreement.

The number of veterans employed at the mine increased from 218 at the end of 1949 to 276 at the end of this year.

A number of changes were made in the operating staff at the mine: F. J. Haller was promoted to Manager of Michigan Mines. J. S. Westwater was made Superintendent in charge of the overall operations of the Mather Mine, with H. H. Korpinen as Assistant Superintendent in charge of operations at Mather "A" Shaft. Mine Captain John Bjorne, Jr. was transferred to "B" Shaft, with Mine Captain Allen Hjelt remaining in charge of "A" Shaft operations. Mine Foremen Egidio Torreano and William Treloar were transferred to "B" Shaft, and Mine Foreman James Marietti was transferred to the Negaunee Mine. Toivo Laitinen was promoted from shift boss to mine foreman; and five sub-shift bosses, James Rice, Frank Taccolini, Edward Summerville, Walter Tuominen and Oiva Leiviska were promoted to salaried shift bosses. Five miners, Danzil Matthews, Arthur Nault, Jr., Dewey Tippett, William Wigg and Arne Andelin, a graduate Mining Engineer, were promoted to the position of sub-shift boss.

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5. LABOR AND WAGES: (Continued)

a. Comments: (Continued)
Very satisfactory relations between Management and Labor were continued throughout the year. A union shop vote was conducted by the National Labor Relations Board on October 18th at "A" Shaft and on October 20th at "B" Shaft. Of the total 964 Negaunee Mine Company employees eligible to vote, 595 voted "yes", 258 voted "no", with 111 eligibles not voting. This brought the final figures to 595 "yes" and 369 "no", with percentages of 61.75 and 38.25 respectively. This compares with Cleveland-Cliffs Iron Company mines with a total eligible to vote of 1,520, with 1,083 "yes", 290 "no" and 147 who did not vote, bringing the final figures to 1,083 "yes" and 437 "no", for percentages of 71.25 and 28.75 respectively. Prior to the vote, the supervisory personnel contacted each employee at the plant and explained the issue on which the vote was being held. The first reactions indicated that the majority of the men were not in favor of a union shop. The union, with a better organized campaign, was able to convince the men otherwise.

The C.I.O. continued as the representative of Labor and the percentage of union membership decreased from 89% at the end of the previous year to 79% at the end of the current year. There was only one grievance presented during the year, which went into Step (3) of the grievance procedure. The aggrieved member in this case was an officer of the union, who was given a 3-day layoff for sleeping underground, and who maintained through the different steps of the grievance procedure that he had not been sleeping. Although there were no other witnesses other than the shift boss who imposed the layoff, the union accepted the layoff and the grievance was dropped. Various minor matters were discussed with the union grievance committee during the year.

A wage increase of 12½¢ per hour was negotiated between the union and the Company and was put into effect as of December 1st. In addition to this, an agreement was made to re-examine the present wage rate schedule and establish a new wage rate structure. In this new wage rate structure, the Company agreed to a maximum average increase of 8½¢ per hour. This will be accomplished by revaluating the jobs and establishing a wage scale in which the lowest rate will be $1.31 per hour and the increments between the wage rates of this scale will be 3½¢ per hour, with the resulting adjustments effective December 1, 1950. This new scale of rates will involve a simple and concise description of the content of each job, the jobs will be placed in proper relationship, and the job classifications will be reduced to the smallest possible number by grouping the jobs having substantially the equivalent content.

The high contract pay for a single period during the year was $25.00 as compared with $24.12 the previous year.

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5. LABOR AND WAGES: (Continued)

b. Comparative Statement of Wages and Product:
(Operating Only - Not Including E&A Work)

	1950	1949
Product	1,251,963	1,062,164
Number of Shifts & Hours:		
Equiv. to	263 3-8 hr.	240-1/3 3-8 hr.
Average No. of Men Working:		Idle / Operating
Surface	114	22⅝ / 118
Underground	548	31¼ / 490
Total	662	53½ / 608
Average Wages Per Day:		
Surface	$ 11.84	$ 11.64
Underground	13.23	13.12
Total	$ 12.98	$ 12.83
Wages Per Mo. of 22 Days:		(23 Days)
Surface	$260.48	$267.72
Underground	291.06	301.76
Total	$285.56	$295.09
Tons Per Man Per Day:		
Surface	41.05	36.87
Underground	8.70	9.05
Total	7.18	7.27
Labor Cost Per Ton:		
Surface	$ .288	$ .316
Underground	1.521	1.448
Total	$ 1.809	$ 1.764
Average Product Stoping	31.41	34.89
Average Wages Contract Miner	$15.04	$15.20
Total No. of Days:		
Surface	30,495-3/4	28,810
Underground	143,968	117,317-3/4
Total	174,463-3/4	146,127-3/4
Amount for Labor:		
Surface	$ 360,952.52	$ 335,441.47
Underground	1,904,376.13	1,538,973.18
Total	$2,265,328.65	$1,874,414.65
Proportion Surface to Underground Men	1:4.8	1:4.2

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6. SURFACE:

a. Buildings:

Building maintenance was of a routine nature throughout the year.

b. Headframe:

A considerable amount of work was done in the headframe during the year. The north loading pockets were redesigned and rebuilt. Alterations were made in the headframe to accommodate the installation of the pan feeder, screen, crusher and bottom dump skip. The north loading pockets were completed in March and were a considerable improvement over the old pockets. The bottom dump skip, which was the first skip of this design to be installed in this country, operated with very little trouble from the beginning. The skip is much faster than the Kimberley type and discharges all of its load at each trip, eliminating the necessity for blowing any material which sticks to the bottom or sides of the skip. The Kennedy Van-Saun pan feeder worked satisfactorily, as did the simplicity vibrating screen after a few minor revisions. Considerably more difficulty was experienced with the crusher due to overheating of the bearings, which were made up of a high percentage lead babbitt and wiped on numerous occasions. Under the supervision of the Allis-Chalmers engineers, the mine crew dismantled the crusher and refitted the bearings several times. The trouble was finally overcome with the installation of a water cooling system which the Allis-Chalmers Company, at first, maintained would not be necessary.

c. Stocking:

Two of the three new larry cars and the three motors required to push these cars were received late in the year. Actually, very little ore was stocked with these cars, as some revisions have to be made on the hydraulic braking system and the gravity-closing of the doors. The erection of the final extensions to the permanent stocking trestles was completed by the Worden-Allen Company in February. The mine crew completed the installation of the decking, rails and other facilities in April. Widening of the structure to accommodate a double track to the north and middle trestles, resulted in faster stocking and less delays. With the addition of the south trestle, the stocking capacity is adequate.

d. Landscaping, Roads and Parking Area:

The new parking area west of the main entrance was put into operation during the winter and eliminated parking congestion during heavy snow storms.

e. Timber Tunnels and Yards:

No work of any importance was done in the timber tunnels and yards during the year.

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6. SURFACE:

f. Surface drainage and Subsidence:

Surface Hole #65 was drilled with the intention of using it to estimate the progress of subsidence over the main mining area. The tool which it is hoped will give pertinent information is the geophone, which is a modification of the microphone. The geophone, with its tape recorder, will record all vibrations, such as those caused by falls of ground, blasting and fracturing of ground under pressure. Also, it will record vibrations from ground under pressure without actual fracturing occurring. This last item is very important, since it is these vibrations which will give warning in advance of actual ground movement. In June, the geophone was first lowered into Hole #65, but no readable records were obtained because the equipment would not withstand the high water pressures. Early in August, new equipment designed to operate under high water pressures was lowered into the hole. This was more successful, but still not entirely satisfactory. Blasting and a small amount of vibration were recorded but nothing to indicate that there is any subsidence in the vicinity of the drill hole. Recordings were taken on an average of 3½ hours a day from August 4th to November 25th, at which time the geophone was removed for redesign and repairs.

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7. UNDERGROUND:

a. Shaft Sinking:

Early in the year plans were completed to deepen the shaft approximately 650', which will bring "A" Shaft down to the same elevation as "B" Shaft. These plans included sinking the Winze an additional 80' and cutting out a loading trench and engine room approximately 55' below the present shaft bottom to handle the shaft rock. Work on this project was started early in August during the two week vacation period. At the end of the year the shaft was completed to a total depth of 42' below the 21' pentice and excavation for the engine room was started. Upon completion of the engine room, shaft sinking operations will be resumed. A small skip has been designed to handle the shaft rock and the hydro-mucker will be used for loading the rock.

A change in the design of the shaft plat layout was also made. This new layout will place the trench and pockets approximately 55' below the level itself. With this layout, the excavation of the skip side of the plat will be considerably less and will leave a larger pillar between the cage plat and skip plat. The initial opening on the cage plat and the loading pockets at the 8th, 9th and 10th Levels will be excavated as the shaft sinking reaches these elevations.

b. General:

The bulk of the production for the mine was obtained by block caving and sub-level radial stoping. A small amount of sub-level caving was also done in some of the smaller ore areas. Under-cutting in the block caves was continued with the long hole drilling from timbered drifts. This method has proven very satisfactory and one or more transfer drifts can be under-cut from one drilling sub. The experiments with arched steel sets were continued and from the results obtained, this type of support has proven far superior to the wood timber supports. Numerous changes have been made in the design and the latest set is practically a full arch with a 4' straight section on the bottom to accommodate the riding rails.

Production was continued on the 2nd, 3rd, 5th and 6th Levels with the 2nd Level producing approximately 5% of the total tonnage, the 3rd Level approximately 20%, the 5th Level 30% and the 6th Level 45%. Mining on the 2nd Level was nearing completion with only a small amount of reserves remaining for the coming year. The 3rd Level has reserves for approximately two years, however, the total reserves aren't too large. The 5th Level is practically all mined out with only a few pillars remaining in the east end. The 6th Level should continue as a large producer for approximately two years although, the remaining tonnage on this level is not too large. A small amount of ore was produced on the 7th Level from main level development and by the end of 1951, production will be started on this level.

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7. UNDERGROUND: (Continued)

b. General: (Continued)

2nd Level:

The bulk of the production on this level came from the area above #4 Cross-cut. Approximately 52,000 tons were produced from this cross-cut with only a small percent of ore remaining to be recovered. The balance of the production on this level came from #1 Cross-cut, and mining operations in this area were completed in April.

3rd Level:

Operations on this level were confined to three areas: one above #1 Cross-cut, one between #4 and #5 Cross-cuts and one above #7 Cross-cut, adjacent to the Jackson Strip.

#1 Cross-cut

The production from this cross-cut totaled approximately 40,000 tons and came from the area above the -160' sub-level and below #1 and #2 Cross-cuts on the 2nd Level. Development was continued above the -260' and -225' sub-levels in this area.

#4 and #5 Cross-cuts

The production in this area totaled approximately 125,000 tons. 60,000 tons were produced by block caving in the area north and south of the dike and above the -160' and -185' sub-levels. The balance of the tonnage in this area came from above the south footwall drift above the -225', -250' and -260' sub-levels. The ore in the latter area is very hard and low in height and the sub-level radial stoping mining method was used.

#7 Cross-cut

70,000 tons were produced in the area south of the Jackson Strip above the -200' and -260' sub-levels. Both the block caving and radial drill stoping systems of mining were used in this area.

5th Level:

There were seven mining areas on this level including the interbedded ore horizon. Of the total 398,000 tons produced on this level, 313,000 tons came from the main ore body and the balance from the interbedded ore body. There were four areas in the main ore body between #1 and #2 Cross-cuts, one area above #6 Cross-cut and one area above #7 Cross-cut. The mining in the interbedded ore body extended between #2 and #4 Cross-cuts.

#1 and #2 Cross-cuts

188,000 tons were produced from the block caving area above these two cross-cuts. The caving area west of the fault and south of #5 dike produced 105,000 tons above the -500' and -535' sub-levels. The area north of #5 dike and east of the fault produced 8,000 tons above the -535' sub-level. The area north of the dike and west of the fault produced 75,000 tons above the -390' and -485' sub-levels. There is very little ore remaining above these cross-cuts and mining operations in this area should be completed early in 1951.

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7. UNDERGROUND: (Continued)

b. General: (Continued)

5th Level: (Continued)

#6 Cross-cut

74,000 tons were produced in this area above the -550' and -570' sub-levels. Mining operations in this area were completed in September.

#7 Cross-cut

51,000 tons were produced in this area abovethe -340', -360', -390' and -435' sub-levels. There is only one pillar remaining in this area below the 3rd Level footwall drift.

Interbedded Ore:

Experiments with mining methods in this ore were continued throughout the year and the only method that proved at all successful was the radial stoping method. However, it is questionable whether this ore can economically be recovered even with this method as there is a considerable amount of rock development required, due to the flat dip and narrow width of this ore body. Mining in this ore body reached to the -435' sub-level above #4 Cross-cut and the -460' sub-level above #2 Cross-cut.

Main Level Development

Operations on the level were confined to the extension of #7 Cross-cut to the south under the ore found in D.D.H. #35. Exploration on the 5th and 6th Levels, by sub-level drifting and raising, has proven an ore body approximately 200' long, 180' wide and approximately 200' high. From this exploration, it has been determined that this ore can be mined from the 6th Level with one big block cave.

6th Level

Production in the main ore body on this level was confined to four areas: one between #2 and #3 Cross-cuts; between #3 and #4 Cross-cuts, between #4 and #5 Cross-cuts and east of #5 Cross-cut. Development of the small ore area under #1 Cross-cut on the 5th Level was started above #2 Cross-cut and a small amount of mining was done in the interbedded ore body.

#2 Cross-cut

Development of the ore below #1 Cross-cut on the 5th Level was started with two raises near the interbedded ore contact in this cross-cut.

#2 and #3 Cross-cuts

Mining between these cross-cuts produced 130,000 tons of ore and was confined to two areas; one west of the fault in the south end of this cross-cut and one east of the fault and north of the main footwall drift. Mining west of the fault produced 52,000 tons above the -700' sub-level and the main level. Mining east of the fault produced 78,000 tons above the -615' sub-level.

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7. UNDERGROUND: (Continued)

b. General: (Continued)

6th Level: (Continued)

#3 and #4 Cross-cuts

Mining in this area produced 214,000 tons and was confined to two areas; one south of #7 Dike and one north of #7 Dike. The area north of the dike produced 130,000 tons and the area south of the dike produced 84,000 tons. All of the ore recovered in these two areas came from above the -725' sub-level.

#4 and #5 Cross-cuts

Mining in this area produced 102,000 tons. 55,000 tons came from the area above the -725' sub-level north of #7 Dike and 47,000 tons came from the area above the -725' sub-level south of #7 Dike.

East of #5 Cross-cut

This area produced 90,000 tons of ore from the area north of the main footwall drift above the -615' and -650' sub-levels.

Main Level Development

Development on the level included completing the connection between the "A" and "B" Shafts and extending #7 and #9 Cross-cuts.

#7 Cross-cut

A second limb was driven in this cross-cut under the eastern extension of the ore found in D.D.H. #54 drilled on this level and D.D.H. #35 drilled on the 5th Level. Exploration above this level and above the 5th Level showed that the footwall and hanging wall were practically vertical and plans were completed to mine this ore by block caving from the 6th Level. From an estimate made of this area, there is approximately 500,000 tons of Standard ore in this ore body.

#9 Cross-cut

East of "A" and "B" Shaft Boundary 580'

This cross-cut was driven to the southeast parallel to the Cambria-Jackson fault. A total of 285' of ore was encountered, 160' of this ore was Standard grade north of the dike and 125' was high sulphur grade south of the dike. Exploration above the level in the Standard ore proved disappointing in that no height was developed.

A small drift connection was completed between the drifts from "A" and "B" Shafts in the latter part of May. This small drift was subsequently stripped to full size and at 11:00 A.M. June the 30th, Mr. A. C. Brown, President of the Company, drove the "golden" spike connecting the last two lengths of rails. The drifting between the two shafts involved more than 8,600' of drift and both the engineering and operating staffs at both shafts can be highly complimented for the fine job done in connecting these two shafts.

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7. UNDERGROUND: (Continued)

b. General: (Continued)

7th Level:
The large development program on this level was continued throughout the year. The skip and cage road plats were completed, the main level drift was advanced to the loading end of the belt and the conveyor belt drift was advanced to a distance of 1,695' from the shaft.

Skip and Cage Road Plats
Concreting of the trench on the skip road side of the plat was completed and the cage road plat was stripped and timbered to full size. The small sump and pumphouse was completed south of the shaft.

Main Level Drifting
The main footwall drift was advanced a distance of 2,529' to the loading end of the belt. Raises at 300' intervals were put up from this drift to the elevation of the conveyor belt drift to accommodate the driving of this drift. At the loading end of the belt, an excavation will be made below the level to accommodate the crusher and pan feeder and a trench will also be excavated for dumping and storage of ore and rock. The material from the trench will be scraped over an inclined grizzly, the fines going through to the pan feeder and the chunks through the crusher and then on to the feeder. The feeder in turn will load the material on to the belt.

Conveyor Belt Drift
Three discharge raises were put up from the back of the skip plat over the trench to the elevation of the discharge end of the belt. These raises were concreted to a height of 7' above the back of the plat and at the top of these raises a box will be excavated to accommodate the butterfly, which will direct the flow of material into these raises. The raise for the take-up of the belt was started on the east side of the plat. This raise will be put up small size and then will be stripped and steel will be installed to accommodate the take-up pulley and a traveling road. The conveyor belt drift was driven a total of 1,659', 330' of which was driven at an inclination of 10% up to the discharge end and the balance, horizontal, toward the loading end. This drift will continue horizontal for an additional 491' and then will be driven at a -10% inclination for 350' to the bottom of the loading end of the belt, which will be approximately 25' below the level.

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7. UNDERGROUND:
(Continued)

d. Timbering:

The use of 8' hardwood stull timber was continued in sub-level stoping and caving transfer drifts. This type of support has always required a considerable amount of maintenance and repair, particularly in the block caving areas where extreme weight is encountered. During the year, an arched steel set was designed with the help of the Commercial Shearing and Stamping Company, who specialize in fabrication of support for large tunnel work. The original sets, made of 4", 13# per foot H-beams, were installed in a fairly heavy area above the 5th Level. Although some repairs were necessary during caving operations, this support proved far superior to wood timber supports. A new set was later designed using 6", 15.5# per foot H-beams. This 6" section has approximately twice the strength of the 4", 13# per foot section. All new caving and stoping transfers, where the height of the ore warrants the expense, will be supported with the 6" arched sets.

The replacing of the wood timber support in the main level drifts with steel, including covering the back with the steel "hat" sections and the concrete slabs, was completed during the year. All of the new main level development during the year was supported with steel. The most popular section for this support is the 4", 13# per foot H-beam, as it is simple to fabricate and install, and is adequate in strength for most of the footwall drifting. In parts of the footwall drift and in the cross-cuts where extreme pressures are encountered, the normal interval between sets is not adequate and additional sets have to be installed. To remedy this, a heavier and stronger section will be used in the future.

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7. UNDERGROUND:-
(Continued)

d. Timbering: (Continued)

Statement of Timber Used - All Operations

	LINEAL FEET	AVG. PRICE PER FOOT	AMOUNT 1950	AMOUNT 1949
5'4" Cribbing	127,446	.07996	$ 10,190.01	$ 13,867.14
7' Stulls	18,271	.17381	3,175.65	.00
8' & 16' Stulls	139,072	.23273	32,366.57	28,734.01
9' & 18' Stulls	27,900	.21180	5,909.24	7,122.85
Total	312,689	.16515	$ 51,641.47	
Total 1949	307,290	.16181		$ 49,724.00
		PER 100'		
7' Lagging	2,345,105	1.5124	$ 35,468.41	$ 30,048.31
9½' Poles	817,734	2.9959	24,498.53	19,238.83
Total	3,162,839	1.8960	$ 59,966.94	
Total 1949	2,483,920	1.9842		$ 49,287.14
		PER FOOT		
4" x 4" "H" Beam 13# Per Foot	73,371	.63608	$ 46,669.62	$ 44,213.58
4" x 8" "I" Beam 23# Per Foot	5,272	.98148	5,174.34	5,328.17
3/8" x 2" x 2" Angle Iron	143,344#	.04940	7,081.31	5,493.47
Miscellaneous (Bolts, Plates, Etc.)			2,807.08	3,209.92
Total			$ 61,732.35	
Total 1949				$ 58,245.14
4" x 4" Arch "H" Beam 13# Per Foot	1,113	1.34762	$ 1,499.90	
4" x 4" "H" Beam 13# Per Foot	1,582	.64896	1,026.66	
Miscellaneous (Bolts, Etc.)			173.24	
Total			$ 2,699.80	
Total 1949				.00
6' Steel "Hat" Section	23,070	.32396	$ 7,473.69	
7' Steel "Hat" Section	30,121	.32851	9,894.95	
Total	53,191	.32653	$ 17,368.64	
Total 1949				.00
2¼" x 8" x 6' Minecrete Poles	22,176	.22333	$ 4,952.64	$ 21,689.24
2¼" x 8" x 3' Minecrete Poles	420	.25	105.00	267.00
4" x 8" x 12" Minecrete Blocks	1,333 pcs.	.18	239.94	238.68
6" x 8" x 12" Minecrete Blocks	980 pcs.	.22	215.60	288.20
8" x 8" x 12" Minecrete Blocks	66 pcs.	.26	17.16	468.78
Total			$ 5,530.34	
Total 1949				$ 22,951.90
GRAND TOTAL INCLUDING STEEL AND CONCRETE			$198,939.54	$180,208.18

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7. UNDERGROUND: (Continued)

d. Timbering: (Continued)

Statement of Timber Used Under Operating Account "Timbering":

	LINEAL FEET	AVG. PRICE PER FOOT	AMOUNT 1950	AMOUNT 1949
5'4" Cribbing	127,446	.07996	$ 10,190.01	$ 13,867.14
7' Stulls	18,271	.17381	3,175.65	.00
8' & 16' Stulls	139,072	.23273	32,366.57	28,734.01
9' & 18' Stulls	27,711	.21179	5,868.86	7,041.64
Total	312,500	.16512	$ 51,601.09	
Total 1949	306,804	.16181		$ 49,642.79
		PER 100'		
7' Lagging	1,894,616	1.5123	$ 28,652.64	$ 26,168.18
9½' Poles	706,440	2.9943	21,152.92	16,822.49
Total	2,601,056	1.9148	$ 49,805.56	
Total 1949	2,165,675	1.9851		$ 42,990.67
		PER FOOT		
4" x 4" "H" Beam 13# Per Foot	41,441	.62793	$ 26,022.00	$ 31,815.45
4" x 8" "I" Beam 23# Per Foot	3,519	.97704	3,438.19	3,772.94
3/8" x 2" x 2" Angle Iron	77,201#	.04980	3,844.65	4,112.85
Miscellaneous (Bolts, Plates, etc.)			1,611.87	2,406.65
Total			$ 34,916.71	
Total 1949				$ 42,107.89
4" x 4" Arch "H" Beam 13# Per Foot	1,113	1.34762	$ 1,499.90	
4" x 4" "H" Beam 13# Per Foot	1,582	.64896	1,026.66	
Miscellaneous (Bolts, etc.)			173.24	
Total			$ 2,699.80	
Total 1949				$ .00
6' Steel Hat Section	4,620	.30999	$ 1,432.15	
7' Steel Hat Section	11,102	.32671	3,627.08	
Total	15,722	.32179	$ 5,059.23	
Total 1949				$ .00
2¼" x 8" x 6' Minecrete Poles	21,096	.22333	$ 4,711.44	$ 19,309.40
2¼" x 8" x 3' Minecrete Poles	420	.25	105.00	267.00
4" x 8" x 12" Minecrete Blocks	1,097 pcs.	.18	197.46	238.68
6" x 8" x 12" Minecrete Blocks	884 pcs.	.22	194.48	288.20
8" x 8" x 12" Minecrete Blocks	46 pcs.	.26	11.96	468.78
Total			$ 5,220.34	
Total 1949				$ 20,572.06
GRAND TOTAL, INCLUDING STEEL AND CONCRETE			$149,302.73	$155,313.41

	1950	1949
Product for Year	1,251,963	1,062,164
Foot Timber per Ton of Ore	.2496	.2888
Foot Lagging per Ton of ore	1.5133	1.5150
Foot Poles per Ton of Ore	.5643	.5239
Foot Lagging per Foot of Timber	6.0629	5.2451
Cost Per Ton for Timber	.0412	.0467
Cost Per Ton for Lagging	.0229	.0246
Cost Per Ton for Poles	.0169	.0158
Cost Per Ton for Steel & Concrete Supplies	.0383	.0590
Cost Per Ton for All Timbering Supplies, Including Steel and Concrete Supplies	.1193	.1461

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7. UNDERGROUND:
(Continued)

e. Drifting and Raising:

The following table includes all of the miscellaneous development work on all operations throughout the year, including the main level drift and conveyor belt drift on the new 7th Level, and also the raising and drifting in the new shaft sinking project below the 7th Level. 60,971' were driven at an average rate of approximately 5,100' per month as compared with 4,600' per month during 1949.

	Drifting		Raising		
	Ore	Rock	Ore	Rock	Total
Large Size	11,618'*	17,000'**	27'***	412'****	29,057'
Small Size	4,940'	2,335'	17,400'±	7,239'±±	31,914'
	16,558'	19,335'	17,427'	7,651'	60,971'

* Timbered
** 14,278' Timbered
*** Cribbed
**** 149' Cribbed
± 4,211' Cribbed
±± 2,854' Cribbed

Grand Total Last Year..... 48,168'

The following table of main level drifting includes a small amount of drifting on the 3rd Level, with the balance on the 5th, 6th and 7th Levels.

	Timbered Ore Drift	Timbered Rock Drift	Naked Rock Drift	Total
NM-60 3rd Level		141'		141'
NM-26A 5th Level	91'	738'*		829'
NM-27A 6th Level "A"	387'	806'		1,193'
NM-44L6 6th Level "B"		1,378'		1,378'
NM-71 7th Level	162'	3,018'	148'	3,328'
Total	640'	6,081'	148'	6,869'
Total 1949	216'	3,141'	---	3,357'

* 35' driven with timber support.

In addition to the above, there were 2,367' of drifting and raising for the conveyor belt installation on the 7th Level.