THE CLEVELAND-CLIFFS IRON COMPANY

Ore Mining Department

ANNUAL REPORT OF GENERAL MANAGER

For Year Ending December 31, 1953

#2024

1955
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THE CLEVELAND-CLIFFS IRON COMPANY
ORE MINING DEPARTMENT

Manager's Annual Report Year 1953

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GROSS INDEX BY MINES

	Athens	Cambria-Jackson	Cliffs Shaft	Humboldt	Lloyd	Maas	Morris
Ishpeming, Negaunee, and Iron River Districts:							
General	139-140	156	15	34-41	46	172	83
Production, shipments & inventories	140-141	156-158	16-17		46-47	173-174	83-85
Analysis	141-142	158	17-18		48	175	85
Estimate of ore reserves	142-143	159	18-19	42	48-49	175-176	85
Labor and wages	143-144	160-161	19-20	42	49	177-178	86
Surface	145	161	20-21		50	178-179	86-87
Underground	145-151	162-167	21-28		50-53	179-185	87-89
Cost of opening, equipping, developing and operating	152-153	167-169	28-31		54-56	186-190	
Taxes	153	170	31	44	56-57	190	
Accidents & personal injuries	154	170-171	31-32	44	57	191	
Power	155	171	33		57	191	

	Mather "A"	Mather "B"	Ohio	Negaunee	Republic	Spies	Tilden
Ishpeming, Negaunee and Iron River Districts:							
General	58	192-193	90	231	122-127	245-247	128
Production, shipments & inventories	59-61	194-196	90-91			247-249	128-129
Analysis	61-62	197	92			249-250	129-130
Estimate of ore reserves	62-63	198	92-94			250	130-132
Labor & wages	64	199-201	94-96	231-232		250-251	132-133
Surface	65-66	202-203	96-97	233		251-252	133-134
Underground or open pit operations	67-73	204-218	98-109	233-235		252-254	134-136
Cost of opening, equipping and developing	74-79	219-227	110-118	236-243		254-257	136-138
Explorations			119				
Taxes	80	228	119	243		257-258	138
Accidents & personal injuries	81	229	120	244		259	138
New construction or equipment			120-121				138
Power	82	230		244		259	
Nationality of employes			121				138

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	Agnew	Alworth	Cainsteo	Hawkins	Sally
Mesaba District:					
General	260	271	281-282	303	376
Production, shipments and inventories	261-262	271	282-285	304-306	376
Analysis	262-263	272	285-287	306-307	376
Estimate of ore reserves	263	272-273	287-289	308-310	376-377
Labor and wages	264	274	289	311	377
Surface	264-265	274-275	290-291	311-312	377
Underground and open pit operations	265-267	275-276	291-293	312-314	377
Beneficiation	267	277	294-296	315-321	377
Maintenance and repair	267	277	297	321	377
Cost of operation	267-269	277-278	297-299	321-323	377
Exploration and future exploration	269	278	299	324	377
Taxes	269	278-279	300	324-325	377-378
Accidents and personal injury	270	279-280	301	325-326	378
Proposed new construction	270	280	301	327	378
Equipment received & proposed new equipment	270	280	302	327	378

	Hill-Trumbull	Holman-Cliffs	Underground Sargent	Open Pit Sargent	Wanless
Mesaba District:					
General	328-330	354	379	390-391	399
Production, shipments and inventories	330-332	355-357	379-380	391-392	400
Analysis	332-333	357-359	380-381	392	401
Estimate of ore reserves	334-335	360-362	381	393	401-402
Labor and wages	335-336	362-363	381-382	394	402-403
Surface	336	363	382-383	394-395	403
Open pit and underground	337-340	363-366	383-384	395-396	403-406
Beneficiation	340-345	366-370	384-385	396-397	
Maintenance and repair	345-346	370	385	397	406
Cost of operation	346-348	371-372	385-387	397-398	406-408
Exploration and future exploration	348-349	373	387	398	408
Taxes	349	373	387	398	408-409
Accidents and personal injury	350	374	388-389	398	409
Proposed new construction	351	374	389	398	409
Equipment received & proposed new equipment	351-353	374-375	389	398	409

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February 13, 1954

Mr. C. W. Allen, Vice President
Cleveland, Ohio

Dear Sir:-

The year 1953 for the first time in three years, witnessed continued operation throughout the year without a shutdown due to strike. Labor conditions continued stabilized well throughout the year. On June 12th a general increase of $.085 per hour was put into effect and in July 1st an increment of 1¢ per hour between job classes was made effective; the price of ore was increased $.20 on July 1st.

Construction work at Humboldt had proceeded from a point of rock excavation at the beginning of the year to find the plant well on the way to completion by the close of 1953, with production scheduled early in 1954. At Republic, the close of the year found the primary crusher excavation complete with concrete retaining walls being poured, the connecting drifts to the secondary practically completed, some work on the secondary crusher plant underway and the ball and rod mill foundations poured. Plans were underway to complete the preliminary engineering for a pelletizing plant.

At the Bunker Hill Mine, the remodeling of the old Negaunee Shaft was completed with the headframe and surface works ready to begin operations on December 31st. At the close of the year, only a pentice remained at the Cliffs Shaft Mine to complete the shaft excavation and the work was well along on the pouring of the concrete headframe and engine house.

PRODUCTION

Production for the five year period beginning with 1949 follows:

	Michigan Tons	Minnesota Tons	Total Tons
1949	3,675,240	3,461,590	7,136,830
1950	4,246,613	4,005,229	8,251,842
1951	4,634,764	4,379,327	9,014,091
1952	3,896,955	3,584,757	7,481,712
1953	5,003,473	3,780,672	8,784,145

The 1953 production by districts and grades follows:

MICHIGAN

Non-Bessemer Standard	3,950,060
" " Special	790,558
Silicious	252,855
Total tons	5,003,473

PRODUCTION (Cont.)

MINNESOTA

Non-Bessemer	2,810,059
Bessemer	970,613
Total tons	3,780,672
Total All Ranges	8,784,145

Note: The above Mesaba production figures do not include the following tonnages:

Alworth Open Pit	122,611	tons	produced by	lessor
I.H.C. Tailings Basin fines	78,164	"	"	" CCI for Harvester acct.
Boeing Mine	300,312	"	"	" Lessor
Total	501,187	"		
Whiteside-Kosmerl	170,874	"	"	" CCI for Snyder Mining Co.
Grand Total	671,961	and O.I.M.Div.		

The 1953 combined produced exceeded that of 1952 by 1,302,433 tons in spite of an early completion of production schedules on the Mesaba Range.

SHIPMENTS

Shipments from Michigan and Minnesota underground and open pit mines for 1953 are shown below:

Michigan Mines	4,771,409
Minnesota Mines	4,084,431
Total Tons	8,855,840
Shipments in 1952	7,510,565

The above shipments indicate an increase in 1953 over 1952 of 1,345,275 tons.

ANALYSIS

Shipments of Cliffs Group regular and Cliffs Group special for the year revealed a close check on iron natural analyses. However, the dried silica was slightly over guarantee figures. Analyses of Minnesota grades indicated an increase in iron natural content over the guaranteed grade.

Shown below is a comparison between the Mine and Lower Lake analyses:

ANALYSIS (Cont.)

MICHIGAN

Cliffs Group Regular	Tons	Iron Dried	Silica	Moist.	Iron Natl.
Avg. Mine Analysis	904,955	57.39	10.21	11.18	50.974
Avg. Mine Analysis	127,558)	57.34	10.16	11.08	50.987
Avg. Lower Lake Analysis	)	57.27	-	10.58	51.211
Total	1,032,513				
Guarantee		57.45	10.08	11.23	51.000

Note: No Lower Lake analysis on above 904,955 tons.

Cliffs Group Special					
Avg. Mine Analysis	1,637,962	57.08	10.17	10.67	50.990
Avg.Lower Lake Analysis		57.11	-	10.43	51.153
Guarantee		57.45	10.08	11.23	51.000

MINNESOTA

Grade	Tons	Mine Iron Natl.	Lower Lake Iron Natl.
Williamson	1,637,077	51.198	51.525
Newberry Bessemer	807,102	52.783	53.040
Saint Paul	1,676,218	49.311	49.438

Shown below are the comparisons between the expected and actual analyses of each mine on the Michigan as well as the Minnesota Ranges for 1953:

MICHIGAN

Mine	Expected Fe.	Actual Fe.
Cliffs Shaft Crushed	51.00	55.45
Lloyddale	58.30	58.99
Lloyd Silica	52.50	51.06
Maas	58.75	57.99
Race Course	58.50	58.25
Mather Mine A Shaft	57.50	57.91
Mather Mine B Shaft	58.00	57.89
Athens	58.50	57.94
Cambria Jackson	58.20	57.89
Spies	56.50	56.92
Ohio	55.00	53.39
Mather A Special	57.50	57.23
Mather B Special	57.50	57.64

MINNESOTA

Mine	Expected Fe.	Actual Fe.
Canisteo	56.00	55.73
Holman liffs	56.41	56.87
Hill Trumbull	56.26	57.69
Hawkins	56.96	56.25
Agnew	54.81	55.69
Sargent,Underground	54.75	55.54
" Open Pit	54.20	53.71
Alworth	54.89	56.28
Wanless	52.42	52.42
McKillican	57.60	56.59

COSTS

Cost at the Mine for Michigan underground ore increased $.07 per ton in 1953 over 1952. The 1952 costs had increased substantially over the 1951 figures due to the strike and with the increased cost of labor throughout the year 1953 these costs were very nearly maintained, while the average cost at mine for the Minnesota open pits showed a decrease in 1953 of $.07 compared with 1952.

The ability to reduce costs in Minnesota lay in the ability to crowd higher tonnages through the plants than had been done the year previously.

	1952	1953	Red-Increase Black-Decrease
Cost at Mine, Michigan Undergrounds	$4.98	$ 4.91	$ .07
" " Minnesota Open Pits	2.93	2.86	.07

The necessity of re-negotiating the leases on the Mesaba Range in 1950 in order to extend the life of these leases reflected in heavy increases in royalties which necessarily trimmed down the margin of profit on Minnesota ores.

ORE RESERVES

Shown below are the ore reserves in Minnesota and Michigan taken from the State Tax Commission figures comparing the years 1952 and 1953 both as of December 31st.

	12-31-52	12-31-53
Michigan	35,565,147	35,816,511
Minnesota	30,396,931	26,954,240

It will be noted that reserves in Michigan remained very nearly static despite production which actually represents an extension of these reserves due mainly to underground exploration during the year. The above figures do not include any credit for reserves in the Humboldt and Republic operations which will no doubt be reflected in 1954 figures.

Minnesota reserves dropped almost in proportion to shipments due to the fact new estimates are not made every year and many of the properties were carried over on the basis of the old reserve by deducting shipments. No credit is given in Minnesota reserves to the new Cushing Mine which to date indicates a reserve of 17,000,000 tons of concentrates, and with the leasing of the Cushing annex to the east and negotiations completed to lease the W.S.Moore Company reserves adjoining the Cushing on the north, the above figures should be increased substantially.

SAFETY

Fatal accidents in 1953 were reduced to a total of two vs. a total of

SAFETY (Cont.)

five in 1952. Accidents in general took a very substantial drop over previous years as shown in the figures below:

Year	Compensable Days Lost
1950	37,063
1951	22,657
1952	47,716
1953	20,587

The above record is evidenced in the frequency and severity ratings shown below:

	Frequency	Severity
5 year average 1948-1952	39.54	3.264
Year 1953	23.39	2.11

Very substantial reductions in both frequency and severity indicate the elimination of major accidents.

Frequency in the above table represents the number of lost time accidents per million man hours worked,and severith the number of days lost per thousand hours worked. The charge for the fatalities was 30,000 which was nearly double the compensable days lost due to injuries.

LABOR

Shown below the first half of 1953 saw an increase in the amount of hirings at the Michigan mines whereas subsequent to July 1st, a substantial decrease in hiring was prevalent as noted by the fact from December 1952 to December 1953 the working force was reduced a total of 255 men.

From December 1952 to December 1953 the Minnesota payrolls increased 46 men.

	Michigan	Minnesota	Total
December 1950	3,466	1,316	4,782
1951	3,752	1,187	4,939
1952	3,787	1,119	4,906
1953	3,532	1,165	4,697

It will be noted the total number of men employed in both Michigan and Minnesota has begun a downward trend which will probably carry at least through the year 1954, although any decrease in Michiganwill be offset somewhat by the

starting of production at the Humboldt property, with another increase in 1955 due to Republic.

The usual statements, in a more condensed form, showing the comparative statistics on taxes, labor, wages and supplies are appended hereto.

Yours very truly

General Manager

GJH:DP

THE CLEVELAND-CLIFFS IRON COMPANY
MINING DEPARTMENT
A COMPARISON OF MINING DEPARTMENT MICHIGAN ASSESSED VALUATIONS AND TOTAL TAXES PAID FROM YEAR 1944 TO DATE

YEAR	The C. C. I. Co.	The Negaunee Mine Co.	The Athens Iron Mining Co.	Humboldt Mining Co.	The C. P. & L. Co.	Total Five Companies
			Assessed Valuations			
1944	$ 12,326,490	5,022,010	2,868,550		2,134,755	22,351,805
1945	11,949,265	4,809,060	2,446,740		2,135,750	21,340,815
1946	11,423,395	4,170,610	2,327,690		2,136,050	20,957,745
1947	11,826,910	4,524,225	2,197,815		2,148,105	20,697,055
1948	11,744,905	4,710,145	2,082,815		2,157,405	20,695,270
1949	11,884,480	5,608,650	2,048,715		3,385,014	22,926,859
1950	12,222,610	6,767,390	2,116,750		3,401,977	24,508,727
1951	13,296,480	8,124,100	2,276,750		3,419,775	27,117,105
1952	14,195,345	10,007,000	2,365,400		3,431,618	29,999,363
1953	14,259,675	10,872,350	2,220,140	385,000	4,142,693	31,879,858
			Taxes Paid			
1944	436,214.77	200,703.60	121,015.20		40,577.13	797,510.70
1945	425,599.58	191,565.47	104,255.07		40,964.14	762,384.26
1946	417,575.92	168,599.05	103,799.44		43,785.56	733,739.97
1947	438,298.87	178,769.39	98,262.27		47,743.90	763,074.43
1948	470,710.79	194,238.19	93,223.59		52,220.35	810,392.92
1949	496,219.03	229,597.68	108,352.31		92,041.23	926,204.25
1950	492,851.32	270,829.15	101,440.20		87,917.79	953,038.46
1951	526,996.81	322,304.11	104,513.09		87,884.60	1,041,698.61
1952	594,122.04	413,143.20	119,333.29		92,134.33	1,218,732.86
1953	583,814.94	453,923.20	103,932.55	7,777.00	124,570.36	1,274,018.05

Note: The State Tax Commission revalued Marquette County in 1949.

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STATEMENT SHOWING COMPARATIVE COST FOR ALL EXPLOSIVES

USED AT MICHIGAN HARD ORE MINES

	1950	1951	1952	1953
PRODUCT - Tons.....	641,562	700,346	548,076	551,261
POWDER				
Pounds - 60% Gelamite.....	58,950	29,700	16,400	14,250
Gel. #1.....	106,100	172,250	162,400	189,850
Hercomite 2X.....	475,400	484,800	385,750	365,600
TOTAL POUNDS OF POWDER.....	640,450	686,750	564,550	569,700
TOTAL COST.....$	97,335.14	112,185.28	93,819.78	96,130.08
TOTAL COST-FUSE,CAPS,ETC....$	22,892.15	33,560.09	30,141.33	35,059.89
AVG. PRICE PER POUND,POWDER $	.1520	.1634	.1662	.1687
Cost per ton - Powder.....	.1517	.1602	.1712	.1744
Cost per ton - Fuse,etc.....	.0357	.0479	.0550	.0636
Cost per ton,All Explosives,	.1874	.2081	.2262	.2380
Pounds of Powder per Ton of Ore	.9983	.9806	1.03	1.03

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STATEMENT SHOWING COMPARATIVE COSTS FOR ALL EXPLOSIVES USED AT MICHIGAN SOFT ORE MINES

	1950	1951	1952	1953
PRODUCT - Tons.....	3,212,232	3,590,206	3,281,862	4,148,939
POWDER				
Pounds - 60%.....	29,575	177,095	287,092	436,161
80%.....	-	8,750	800	8,650
Hercomite.....	879,619	823,776	1,001,114	1,336,307
Gelamite.....	531,442	896,944	952,275	582,194
Herculite.....	-	-	-	-
TOTAL POUNDS - POWDER	1,440,636	1,906,565	2,241,281	2,363,312
TOTAL COST - POWDER $	226,692.90	322,570.05	386,337.55	424,493.48
TOTAL COST - FUSE,CAPS,ETC.$	73,017.00	119,136.58	136,430.40	145,096.98
TOTAL COST OF ALL EXPLOSIVES $	229,709.90	441,706.63	522,767.95	569,590.46
AVG. PRICE PER POUND-POWDER $	.1574	.1692	.1724	.1796
Cost per ton - Powder..... $	.0706	.0898	.1177	.1023
Cost per ton - Fuse,Caps, etc.	.0227	.0332	.0416	.0350
Cost per Ton-All Explosives $	.0933	.1230	.1593	.1373
POUNDS OF POWDER PER TON OF ORE	.4485	.5310	.6829	.5696

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STATEMENT SHOWING COMPARATIVE COST FOR ALL MINE TIMBER

USED IN MICHIGAN SOFT ORE MINES

	1950	1951	1952	1953
PRODUCTION - Tons.....	3,212,232	3,590,206	3,196,497	4,148,939
Cribbing)			43,166.22)	
Stulls).....	144,398.74	176,790.76	94,700.38)	167,610.18
Lagging.....	73,168.42	119,789.79	121,032.22	115,393.73
Poles.....	68,649.38	80,192.74	78,808.80	76,875.23
Steel & Concrete Materials.....	62,450.35	360,695.04	351,986.18	652,100.71
Cost per ton - Timber.....	.0450	.0492	.0431	.0404
Lagging.....	.0228	.0334	.0378	.0278
Poles.....	.0214	.0223	.0246	.185
Steel.....	.0194	.1005	.1101	.1572

The mines included in the 1953 figures are the Athens, Cambria Jackson, Lloyd, Maas, Mather A and B Shafts and Spies.

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

MICHIGAN MINES ONLY

	1950		1951		1952		1953	
PRODUCT - Tons.....	4,059,413		4,527,647		3,829,938		4,700,200	
CLASSIFICATION	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton
General Supplies.....$	485,743	.120	703,129	.155	765,912	.200	806,968	.171
Iron & Steel.....	360,813	.088	509,776	.113	621,973	.162	921,205	.196
Machinery.....	372,657	.092	556,466	.123	534,880	.140	680,454	.145
Explosives.....	472,169	.116	601,218	.133	569,285	.149	734,093	.156
Lumber & Timber.....	389,104	.096	465,831	.103	439,670	.115	455,445	.097
Fuel.....	70,853	.017	79,132	.017	87,349	.022	88,544	.019
Electric Power.....	850,552	.210	1,000,237	.221	902,313	.235	1,100,987	.234
Miscellaneous.....	104,669	.026	201,057	.044	52,064	.014	54,566	.012
TOTAL	3,106,560	.765	4,116,846	.909	3,973,446	1.037	4,842,262	1.030

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THE CLEVELAND CLIFFS IRON COMPANY
LABOR SUMMARY - ALL COMPANIES

	1950		1951		1952		1953	
PRODUCTION - TONS	8,162,064		8,888,859		7,352,149		8,846,870	
	Man Days	Amount	Man Days	Amount	Man Days	Amount	Man Days	Amount
Surf.& Undg.....	1,091,495-3/4	13,748,817.79	1,274,308-3/4	18,813,200.37	1,111,403	18,968,567.54	1,172,516	21,814,204.37
Cost per ton.....		1.685		2.117		2.580		2.466
Supt.& Genl.Roll....	73,665	1,138,043.30	85,354½	1,423,339.71	80,670	1,614,702.64	90,285	1,894,374.13
Cost per ton.....		.139		.160		.219		.214
GRAND TOTAL.....	1,165,161-3/4	14,886,861.09	1,359,663¼	20,236,540.08	1,192,073	20,583,270.18	1,262,801	23,708,578.50
COST PER TON.....		1.824		2.277		2.799		2.680
Average rate per day		12.78		14.88		17.26		18.77
Tons per man per day		7.01		6.54		6.2		7.01

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

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SUMMARY OF PRODUCTION, SHIFTS WORKED, LABOR COST AND AVERAGE UNIT RATES

	MICHIGAN			MINNESOTA		
	1953	1952	1951	1953	1952	1951
PRODUCTION - TONS						
1. Underground Mines	4,700,200	3,829,938	4,527,647	3,465,081	346,951	527,316
2. Open Pit Mines	303,273	59,507	103,022	378,316	3,115,753	3,730,874
3. TOTAL	5,003,473	3,889,445	4,630,669	3,843,397	3,462,704	4,258,190
MAN DAYS OPERATED						
4. Underground mines	698,488	634,958	737,114	22,581	27,476-3/4	60,272¼
5. Open Pit Mines	13,590	9,693½	4,216	164,604	136,975½	134,141-3/4
6. TOTAL DIRECT	712,078	644,651½	741,330	187,185	164,452¼	194,414
7. Indirect	230,375	232,561¼	252,313¾	112,386	129,118	150,555
8. GRAND TOTAL DAYS	942,453	877,212-3/4	993,643¼	299,571	293,570¼	344,969
LABOR COST						
9. Underground	13,236,241.80	10,966,436.83	11,065,471.71	414,582.62	503,738.99	980,399.77
10. Open Pit	255,157.75	162,924.18	60,977.83	2,927,434.74	2,448,862.38	2,001,014.92
11. TOTAL DIRECT COST	13,491,399.55	11,129,361.01	11,126,449.54	3,342,017.36	2,952,601.37	2,981,414.69
12. Indirect	4,360,731.16	4,007,855.88	3,594,363.19	2,111,640.00	2,157,259.41	2,244,824.73
13. GRAND TOTAL COST	17,852,130.71	15,137,216.89	14,720,812.73	5,453,657.36	5,109,860.78	5,226,239.42
STATISTICAL INFORMATION						
Tons per Man per Day						
Underground	6.729	6.032	6.142	15.345	12.627	8.749
Open Pit	22.316	6.139	24.436	22.983	22.747	27.813
Combined	7.027	6.033	6.246	20.533	21.056	21.903
GRAND TOTAL	5.309	4.434	4.660	12.830	11.795	12.344
Labor Cost per Ton						
Underground	2.816	2.863	2.444	1.196	1.452	1.859
Open Pit	.841	2.738	.592	.774	.786	.536
Combined	2.696	2.86	2.403	.869	.853	.700
GRAND TOTAL	3.568	3.892	3.241	1.419	1.476	1.227
Average Rate per Shift						
Underground	18.949	17.271	15.012	18.359	18.333	16.266
Open Pit	18.775	16.807	14.463	17.785	17.878	14.917
Combined	18.946	17.264	15.008	17.854	17.954	15.335
GRAND TOTAL	18.942	17.256	14.793	18.205	17.406	15.150
Cliffs Power & Light has been excluded from above on lines 8 and 13 as follows:						
Days	20,777	21,290½	21,051			
Amount	402,790.43	336,192.51	289,487.93			

BF:DP

THE CLEVELAND CLIFFS IRON COMPANY

STATEMENT SHOWING PENALTY COST OF OVERTIME WORKED AND EFFECT ON PRODUCTION COSTS FOR YEAR 1953

	MICHIGAN PROPERTIES	MINNESOTA PROPERTIES	TOTAL 1953
January	$ 29,074.59	6,505.23	
February	22,099.51	4,768.81	
March	22,946.44	4,788.32	
April	24,291.45	12,710.32	
May	30,815.56	19,556.27	
June	31,391.94	13,932.51	
July	28,586.38	14,848.16	
August	38,886.06	18,223.19	
September	32,985.60	12,409.55	
October	37,251.75	9,174.43	
November	28,051.48	10,349.30	
December	29,208.13	8,023.03	
TOTAL YEAR 1953	$ 355,588.89	135,289.12	490,878.01
TOTAL YEAR 1952	$ 647,507.78	293,663.58	941,171.36
TOTAL YEAR 1951	$ 884,346.86	308,311.13	1,192,657.99
PRODUCTION			
Tons - Year 1953	5,003,473	3,843,397	8,846,870
Tons - Year 1952	3,889,445	3,462,704	7,352,149
Tons - Year 1951	4,630,669	4,258,190	8,888,859
Effect of Penalty Cost on Year's Production Cost			
Increased 1953 by	.0711	.0352	.0555
Increased 1952 by	.1665	.0848	.1280
Increased 1951 by	.1910	.0724	.1342

BF:DP

CLIFFS SHAFT MINE
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I. GENERAL

The production in 1953 was 551,261 tons and the budget estimate was 552,200 tons. The operating schedule was 3-8 hour shifts per day with hoisting on 2-8 hour shifts per day for 5 days per week. The mine was idle one week in August for vacation purposes and there were no other shutdowns during the year.

The Cost of Production was $5.933 and the total cost was $6.525 compared with $5.185 and $5.675 respectively in 1952. The increase in wages of approximately 10% and higher supply costs together with some loss in operating efficiency, due to continued emphasis on improving the quality of the lump grade, accounts for the higher cost.

There was an average of 77 contracts working in the mine compared with 82 in the previous year. The reduction in the number of contracts is chiefly the result of abandoning operations in areas where the material is too lean for grading and still accomplish the improvement in lump quality. A larger number of contracts were also placed on a two-shift basis to concentrate the mining in the higher-grade areas.

Shipments from the mine, both pocket and stockpile, totalled 517,715 tons leaving a balance of all grades totalling 115,164 tons on hand at the end of the year. This compares with a total of 81,618 tons on hand at the end of the previous year. The current year's overrun from stockpile was 6,836 tons and pocket overrun was 28,633 tons. A favorable increase in overrun was realized during the year and on the basis of this increase the skip factor was increased from 5.10 tons to 5.25 tons on December 1st.

The product has continued to be screened to -2" fines and plus 2" lump, yielding an average during the year of 70.5% lump and 29.5% fines. New concaves were installed in the crusher, late in May, reducing the closed side setting in the crusher from 6½ to 5-3/8 inches and resulting in better sizing of the product.

The major new development during the year was the starting of the New Shaft Project under E. & A. CC-560. The new shaft is located nearly midway and on line between "A" and "B" Shafts. Excavation and construction of the concrete shaft lining from collar elevation to a depth of 35' in ledge and 60' of the concrete headframe above collar elevation, was let on contract to C. R. Meyers & Sons Company. A total of 87' of concrete-lined shaft was completed below the collar and 25' of the concrete super-structure was completed above the collar at the end of the year.

Underground development in connection with the New Shaft Project has consisted of driving the shaft pilot raise above the various levels to within 9' of the bottom of the excavation from surface. Main level extensions were also driven to the New Shaft site on five different levels and some shaft station excavation was also completed.

Major improvements in the surface plant consisted of rebuilding the track system in the mine year, in conjunction with the L. S. & I. Railway Company. New rail was laid on the lead track for the loading pockets and also a new grade was established and new track laid to improve the gravity movement of cars to the loading pockets. Due to the large carry-over of ore on stockpile at the close of the shipping season it became necessary to extend the stocking area to the south by filling and grading.

CLIFFS SHAFT MINE
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2. PRODUCTION

a. Production by Grade and Months

Month	Optg. Days	CLIFFS SHAFT Lump	CLIFFS SHAFT Crushed	BANCROFT Lump	BANCROFT Crushed	SECTION 10 Lump	SECTION 10 Crushed	Total	Rock
Jan.	21	18,073	8,058	4,764	2,108	5,206	2,371	40,580	3,378
Feb.	20	20,208	9,053	2,125	927	5,635	2,465	40,413	2,612
March	22	22,551	10,138	3,779	1,654	5,545	2,453	46,120	4,722
April	22	26,102	10,454	5,046	1,975	4,862	1,996	50,435	4,894
May	21	25,385	12,512	3,675	1,932	4,135	2,149	49,788	4,306
June	22	24,930	11,007	3,335	1,617	4,642	2,120	47,651	4,360
July	22	26,011	10,190	4,727	1,883	4,634	1,960	49,405	4,114
Aug.	16	18,706	7,761	1,888	691	3,844	1,404	34,294	2,028
Sept.	21	25,667	9,863	2,766	1,108	5,721	2,323	47,448	2,846
Oct.	22	28,568	10,007	4,156	1,697	5,264	2,154	51,846	2,574
Nov.	19	21,263	8,659	4,340	1,747	5,179	2,110	43,298	3,186
Dec.	21	23,796	9,659	2,838	1,113	4,141	1,600	43,147	4,920
Total		281,260	117,361	43,439	18,452	58,808	25,105	544,425	43,940
Transfers		-53	53						
Current Year's Stockpile Overrun				1,820	703	3,112	1,201	6,836	-
Total	249	281,207	117,414	45,259	19,155	61,920	26,306	551,261	43,940

b. Shipments

	Pocket Tons	Stockpile Tons	Total Tons 1953	Last Year Tons
Cliffs Shaft Lump	169,841	85,472	255,313	270,724
Cliffs Shaft Crushed	76,423	37,405	113,828	111,172
Bancroft Lump	30,432	12,063	42,495	44,319
Bancroft Crushed	12,191	6,590	18,781	15,965
Section 10 Lump	40,168	20,653	60,821	65,578
Section 10 Crushed	15,202	11,275	26,477	23,862
Total 1953	344,257	173,458	517,715	531,620
Total 1952	343,588	188,032	531,620	
Increase	669			
Decrease		14,574	13,905	

c. 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, 1953	60,999	10,729	1,417	1,505	4,183	2,785	81,618	65,163
Output for Year	281,207	117,414	45,259	19,155	61,920	26,306	551,261	548,076
Total	342,206	128,143	46,676	20,660	66,103	29,091	632,879	613,239
Shipments	255,313	113,828	42,495	18,781	60,821	26,477	517,715	531,621
Balance on Hand	86,893	14,315	4,181	1,879	5,282	2,614	115,164	81,618
Increase in Output							6,680	

CLIFFS SHAFT MINE
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2. PRODUCTION (Cont'd)

c. Ore Statement (Cont'd)

The table below shows a comparison of working schedules for the past five years:

Year	Schedule
1953	3-8 hr. shifts per day with hoisting on 2-8 hr. shifts per day, 5 days per week.
1952	3-8 hr. shifts per day with hoisting on 2-8 hr. shifts per day, 6 days per week May 1st - November 15th; 5 days per week Nov. 15th - Dec. 31st.
1951	3-8 hr. shifts per day with hoisting on 2-8 hr. shifts per day, 6 days per week.
1950	3-8 hr. shifts per day with hoisting on 2-8 hr. shifts per day, 5 days per week Jan. 1st - Feb. 5th; 6 days per week Feb. 5th - May 22nd; 5 days per week May 22nd - Aug. 21st; 6 days per week Aug. 21st - Dec. 31st.
1949	3-8 hr. shifts per day with hoisting on 2-8 hr. shifts per day, 6 days per week Jan. 1st - July 1st; 5 days per week July 1st - December 31st.

e. Production Delays

The only major delay occurred on May 4th for 8 hours when the "A" Shaft skip motor short-circuited. There were numerous minor delays of one or two hours principally caused by damage to the skip chairs at different levels.

The estimated loss in production caused by all delays was 4,000 tons.

3. ANALYSIS

a. Average Mine Analysis of 1953 Output:

	Iron	Phos.	Silica
Cliffs Shaft Lump	58.67	.107	9.55
Cliffs Shaft Crushed	55.41	.109	13.23
Bancroft Lump	59.67	.113	8.89
Bancroft Crushed	55.69	.115	13.07
Section 10 Lump	59.09	.115	9.75
Section 10 Crushed	56.00	.114	12.62

b. Average Analysis of Shipments for 1953:

Grade	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
Lump Ore (°)	59.50	.114	9.03	.28	2.18	.75	.76	.012	1.07	.34
Crushed Ore (°)	55.30	.114	13.69	.33	2.46	.83	.87	.015	1.32	2.31

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

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3. ANALYSIS (Cont'd)

c. Average Analysis of Ore in Stock Dec. 31, 1953

Grade		Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
C. S. Lump	Dried	58.53	.106	10.80	.31	2.05	.80	.80	.011	1.05	
	Natural	58.33	.106	10.76	.31	2.04	.80	.80	.011	1.05	.34
C. S. Crushed	Dried	56.03	.108	13.34	.33	2.49	.85	.85	.014	1.30	
	Natural	54.74	.106	13.29	.32	2.43	.83	.83	.014	1.27	2.30
Banc. & Section 10 Lump	Dried	59.27	.118	9.64	.31	2.05	.80	.80	.011	1.05	
	Natural	59.07	.118	9.61	.31	2.04	.80	.80	.011	1.05	.34
Banc. & Section 10 Crushed	Dried	56.23	.120	13.27	.26	2.49	.80	.85	.015	1.30	
	Natural	54.94	.117	12.97	.25	2.43	.78	.83	.015	1.27	2.30

4. ESTIMATE & ANALYSIS OF ORE RESERVES

The reserves are estimated on the basis of the following factors:

High Grade or First Class Ore	-	8 cu. ft. per ton
Second Class Ore	-	9 cu. ft. per ton
Conglomerate & Second Class Ore	-	10 cu. ft. per ton

The annual increase in the estimated reserves is due largely to the method employed in making up the tax estimates. Experience has shown that extension of proven ore reserves for any considerable distance away from a working area has been an unreasonable assumption at this property due to the complex mine geology. As a result, much of the proven ore reserves and additions are based on an accumulated group of more or less standard ore extensions. This practice accounts for the same magnitude of proven ore reserves each year fluctuating somewhat according to depletion and ore development. The most significant ore reserve additions realized this year were those drilled from Lake Bancroft which lie above 4th level, "B" Shaft.

The following table shows a comparison of developed ore with the previous year as reported to the State Tax Commission.

	Cliffs Shaft	Bancroft	Sec. 10	Total Lease	Total Tons
Estimated Reserves-Dec. 31, 1952	1,148,347	232,093	423,414	655,507	1,803,854
Less 1953 Production	398,621	64,414	88,226	152,640	551,261
Balance as of 1952 Estimate	749,726	167,679	335,188	502,867	1,252,593
Estimated Reserves-Dec. 31, 1953	1,018,058	152,854	389,823	542,677	1,560,735
New Developed Ore	268,332	-14,825	54,635	39,810	308,142

Expected Average Analysis of Ore Reserves

	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
Natural	57.00	.107	10.90	.35	2.10	.80	.80	.014	1.20	.85

The geological and engineering study of hard ore reserves, which was made in 1952, was reviewed in 1953. During the eighteen-month period between estimates, several trends have become apparent:

(1) Exploration and development has added approximately the same tonnage to the proven and probable ore as it has deducted from probable and possible ore areas.

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

(2) Comparison of production and depletion of estimated areas during the period indicates the original estimate was conservative.

The total proven and probable reserves are estimated to be approximately 7,063,000 tons as of January 1, 1954. Prospective tonnage has been eliminated from this figure for the above stated reasons. The reserves include first and second class ore in a ratio of approximately 75%-25% respectively. About 60% of the second class ore will be mined as an intermediate grade giving a 60%-40% lump-crushed split. If further improvement in the quality of the lump grade is necessary, the ratio of lump to crushed will decrease.

5. LABOR AND WAGES

Labor relations have been quite satisfactory during the year. There were four grievances submitted during the year. One grievance was dropped in Step 2, one was settled in Step 3 and two cases have progressed to Steps 3 and 4. Very likely, the latter two grievances will be carried to arbitration.

Employment

No. of Men Beginning of Year		477
Separations	55	
Added During Year	75	
Increase in Men	20	20
Total End of Year		497
Avg. Absenteeism (Statistical)		25

The following table shows a classification of separations in 1953:

	No. of Men
Military Service	7
Quit	36
Retired	2
Transfers	7
Discharged	1
Died	2
Total	55

As indicated above, the turnover in labor was quite large and due to the shortage of labor early in the year many replacements were hired from Baraga County and Dickinson County and the western part of Marquette County. The labor force was gradually built to provide crews for the New Shaft Project.

During 1953, 166 employees were eligible for three week vacations, 182 for two weeks and 90 for one week with the remainder not eligible for vacation privileges.

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5. LABOR AND WAGES: (Cont'd)

Statement of Wages

a. Average Wages Per Day

	1953	1952
Total Surface & Underground	$18.91	$17.25

Figures above for 1953 and 1952 include retroactive and holiday pay.

b. Average Wages Per Month

	1953	1952
Total Surface & Underground	$410.58	$420.00

The mine operated an average of 20¾ days per month in 1953 while averaging 24-1/3 days per month in 1952 with eight weeks idle in 1952 as a result of the labor strike.

c. Tons Per Man Per Day

	1953	1952
Total Surface & Underground	4.68	4.73

d. Labor Cost Per Ton

	1953	1952
Total Surface & Underground	$4.008	$3.586

6. SURFACE

A. New Shaft

The new shaft development, located approximately midway between "A" and "B" Shafts, was begun in January under E. & A. CC-560.

A. Lindberg & Sons, General Contractors, excavated overburden at the shaft site to an elevation of plus 1408' early in the year. Several holes were standpiped to ledge and pumping tests run. C. R. Meyers & Sons, General Contractors of Oshkosh, Wisconsin were awarded the contract in April to sink to ledge, seal off the overburden and concrete the shaft section back to surface. The sheet pile coffer-dam was successfully interlocked on June 15th after a strike by the A. F. of L. Carpenters delayed work for three weeks in May. Excavation within the piling was completed to ledge and sinking to plus 1330' in fractured quartzite finished early in September. A series of pours advanced the base of the reinforced concrete headframe to 25' above collar elevation or 118' above the opening excavated from surface.

C. R. Meyers & Sons were awarded a contract in November to construct the concrete superstructure to a height of 60' above collar elevation. Piling was removed and back filling began late in December.

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6. SURFACE

B. Existing Plant

The gravity movement of cars to the loading pockets was improved by building up the track grade after the L. S. & I. had purchased the Mine trackage from the Chicago & Northwestern Railway Company. New track was relaid for pocket loading as well as new rail on the approach track at the west end of the mine yard.

Due to the large carry-over of ore on the stockpile at the close of the shipping season it became necessary to extend the stocking area to the south by filling and grading.

E. & A. CC-608 was approved late in the year and plans were underway for the installation of a secondary jaw crusher within the framework of the existing crusher building. Ore that is too lean for grading with first class material will be processed through second-stage crushing and mixed with the fines from the standard ore.

7. UNDERGROUND

During 1953, a fairly heavy development program was maintained. New shaft development, in addition to operational development, tied up the available equipment. Increased stress on analyses, depletion of a number of stoping areas, ore tied up by haulage and the reduced number of possible ore exploration areas all contributed to a reduction in the number of stoping contracts. These factors also have resulted in a larger proportion of the production coming from pillars. In December, seven contracts had no ore reserves other than pillars.

With the reduced number of contracts, greater stress has been placed on the speed of mining. Several methods of pillar recovery have been and are being tried. Long-hole drilling has been introduced and more sub drift ore development has been used in preference to breast stoping.

A. New Shaft

A large portion of the development underground during the year was in conjunction with the new shaft project. Shaft pilot raises were extended from 2nd, 5th, 8th, 10th and 15th levels. During the sinking operation these will be stripped and the pentices between each section broken through.

New Shaft drift connections were driven on 1st, 5th, 8th, 10th and 15th levels. The following tabulation summarizes the underground development progress for 1953:

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7. UNDERGROUND (Cont'd)

A. New Shaft (Cont'd)

New Shaft Project Development Summary

Level & Operation	Status	Cont. No.	Rock Footage-1953
1st "B" - Drifting - Main	Complete	41	465'
5th "A" - " "	Incomplete	41	424'
8th "A" - " "	Complete	13 & 10	460'
10th "A" - " "	Complete	41	73'
15th "A" - " "	Incomplete	13	108'
Total			1530'
2nd "A" to Ledge-Raising @ 90°	Complete	10	250'
5th "A" to 3rd---Raising @ 90°	Complete	47	61'
8th "A" to 5th--- " @ 50°)			3')
" @ 90°)	Complete	10	123')
10th "A" to 8th--- " @ 90°	Complete	10	86'
15th "A" to 10th-- " @ 50°)			19')
" @ 90°)	Incomplete	47	104')
Total			646'

B. Mining Areas

Many of the haulage drifts are in ore and, as a result, mining of inlying areas is continuously being tied up by tramming operations. There is a choice of (1) driving by-pass haulage drifts and mining out the area or (2) moving the contracts that become tied up by main level haulage to outlying areas. Generally, the latter practice has been followed and the shift from "A" Shaft to outlying areas is well illustrated by the following table:

Distribution of Stoping Contracts

	No. of Stoping Contracts			No. of Double Shift Contracts			Total Contract Shifts		
	12/'51	12/'52	12/'53	12/'51	12/'52	12/'53	12/'51	12/'52	12/'53
"A" Shaft	27	22	16	3	3	2	30	25	18
"B" Shaft	25	23	23	1	3	1	26	26	24
Banc. & "A" Shaft Northeast	14	12	11	0	1	1	14	13	12
Sec. 10 & Moro	10	10	11	6	7	7	16	17	18
"A" Shaft East	4	6	7	1	0	2	5	6	9
Total	80	73	68	11	14	13	91	87	81

	% Contract Shift Distribution		
	12/'51	12/'52	12/'53
"A" Shaft	33.0	28.7	22.2
"B" Shaft	28.5	29.9	29.6
Banc. & "A" Shaft Northeast	15.4	14.9	14.9
Section 10 and Moro	17.6	19.6	22.2
"A" Shaft East	5.5	6.9	11.1
Total	100.0	100.0	100.0

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7. UNDERGROUND: (Cont'd)

B. Mining Areas

Several trends are significant. First, the number of stoping contracts was decreased appreciably due to the necessity of improving lump grade and depletion. A compensating amount of double shift operations has not been practical either, due to grade, stope conditions or ventilation.

Secondly, there has been a relative shift of personnel from "A" Shaft to the Section 10 and "A" Shaft East areas. This trend will undoubtedly continue and increase in magnitude as more and more of the inlying contracts become tied up by ore haulage drifts. The practice, as mentioned above, has been to move these inlying contracts to outlying areas in an over-all program of depletion and retreating towards shaft. The necessity of driving by-pass drifts should be minimized by this practice.

The mine is logically split into mapping areas in which "A" and "B" Shaft map units represent the inlying areas in which a large proportion of the contracts are mining in old stopes. Bancroft and "A" Shaft Northeast, "A" Shaft East and the Section 10 Lease and Moro Mine represent the outlying or fringe areas which must be depleted prior to the inlying areas for orderly mining.

1. "B" Shaft - (West of 400 E)

Development in "B" Shaft included main level drifting on 15th, 5th and 1st levels. Raises were extended from 1st level to a pillar area on the sub-levels and from 5th level towards the by-passed area on 1st level and to the area above 4th level proven by drilling on Lake Bancroft early in the year. The "Lake Bancroft" structure, the major operational development for the year, is summarized as follows:

"Lake Bancroft" Structure Development Summary

Level	Cont. No.	Operation	Footage in 1953 Ore	Rock	Total
5th "B"	104	Drifting - Main	70'	362'	432'
2nd "B"	57	" - Sub	42'	)	
2nd "A" & "B"	66	" - Sub	189'	98')	329'
5th "B" to 2nd "B"	4	Raising	86'	136'	222'

Although the number of contracts remained the same, a reduction in the double shift contracts took place. Over 80% of these contracts are now above 5th level and 8 of these are the direct result of the short-range diamond drill program begun in 1949. Two contracts have only pillars as ore reserves.

The "B" Shaft ore reserve picture was enhanced somewhat when D.D.H. #48 (drilled from Lake Bancroft) cored 32' of first class ore in a structure estimated to contain nearly 200,000 tons from plus 1028' to the mining limit. Development results to date have substantiated this estimate. The bulk of the first class ore reserves continue to be above first level and in the "Lake Bancroft" structure.

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7. UNDERGROUND (Cont'd)

2. "A" Shaft - (400 E - 2800 E, between the Bancroft & Section 10 Leases)

"A" Shaft development, other than new shaft, was minor for the year but did provide for contract relocation due to grade with a raise from 5th to 4th level.

The number of stoping contracts decreased sharply due to the maintenance of ore haulage drifts, grade problems and depletion. Due largely to depletion and grade, four additional contracts were entirely on pillar recovery at the end of the year. Long-hole drilling and raising in pillars have and are being tried in an effort to develop a more efficient practice of pillar removal.

Reserves in "A" Shaft are dispersed and, in part, tied up by tramming operations. It is significant that three contracts are not mining in areas proven by drilling in the last two years.

3. Bancroft & "A" Shaft Northeast

An extension of an 8th level northeast drift was begun for exploration and development of a possible ore structure, extending from 8th level to the mining limit. The only other development consisted of raising in ore from 11th to 9th levels to provide for contract relocation from "A" Shaft.

Depletion of three stopes resulted in a net loss of one contract compared with the previous year. The number of contracts that can be maintained in this area is limited, in part, by ore haulage drifts, particularly 10th level.

Reserves are largely concentrated between 9th and 11th levels. In the northeast area, drilling has shown a large lean conglomerate ore structure running continuously from 12th level up through 7th level. The extension of this structure to the mining limit will be explored from the 8th level drift extension.

4. Section 10 Lease and the Moro Mine

Raising from 10th level, Moro to ore areas on 8th level, Moro and several raises in ore from 5th level, Section 10, constituted the major portion of the development in this area for the year.

The mining continues to be concentrated on 5th and 8th levels. The number of contracts was increased by one. Sub-drifting and stripping, as a method of mining, has been used extensively the past year and long-hole drilling was used to advantage.

Since the reserves in this part of the mine amount to about 40% of the total, a gradual increase in production from this area is planned. Ventilation presents a problem in continuing to concentrate mining in the area. Most of the reserves above 5th level are now mined out and the major portion of the reserves lie in a continuous ore area extending from 5th to 9th levels.

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7. UNDERGROUND: (Cont'd)

B. Mining Areas (Cont'd)

5. "A" Shaft East - (East of 2800 E and extending from the north boundary of Section 10 to 1200 S)

Two raises begun the previous year were completed this year with favorable results. An additional two raises were extended later in the year.

The number of contracts mining in this area increased by one over 1952 with several contracts working two shifts. One contract was lost due to poor grade.

The known ore reserves changed little from last year since the developments during the year were generally favorable and substantiated the estimates. Emphasis on mining in this area will continue to be stressed as we attempt to deplete the outlying areas before retreating towards shaft. The New York Mine, if it is to be re-entered, will have to be reentered in the near future.

C. Delimiting Ore

During the year, the short-range underground diamond drilling program was reduced from three rigs to two rigs. A total of 6,047' of drilling was done in 70 holes. The planning of the program was largely guided by the New Shaft ore estimate and its 1953 revision. Underground diamond drilling was done in all working areas of the mine.

The table below summarizes the material encountered:

Hole Numbers Series	Material	Feet	Percent
#829 to #898	Ore	1,085	17.9
	Lean & 2nd Class Ore	655	10.8
	Iron Formation	1,267	21.0
	Intrusive	2,095	34.7
	Argillite & Quartzite	943	15.6
	Total	6,047	100.0

Drilling in "A" Shaft, Section 10 and Bancroft Leases, "A" Shaft East and "B" Shaft, may be considered nearly complete. The old Moro Mine workings and "B" Shaft far west remain to be drilled. Significant tonnage additions were proven in "A" Shaft and the Bancroft Lease.

Surface drilling for hard ore in areas immediately available to Cliffs Shaft should be included in an over-all summary of exploration.

One hole, D.D.H. #47, drilled in Section 3, 47-27, was discontinued when the structure encountered was not as had been anticipated. The other hole, D.D.H. #48, drilled in Section 3 encountered the anticipated structure and cored 32' of first class hard ore. This hole, along with U.H. #792, proved up a significant tonnage addition in the "B" Shaft area and served to aid the planning of development necessary to mine this body.

Two holes in Section 10, 47-27, failed to prove any enrichment east of the Moro Mine workings and served to discourage further exploration for hard ore in this area.

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7. UNDERGROUND: (Cont'd)

D. New Equipment

A program of gradual replacement of some of the two-drum type hoists has continued. The latter type hoist minimizes cross hauling, is speedier and with the remote control feature, less manpower is needed.

The following equipment was purchased in 1953:

3 - J.R.-38 Drill Machines
1 - C.P.-32 Drill Machine
1 - B.B.E.- Atlas Drill Machine
6 - D-50 Drill Machines
1 - Chain Saw
2 - Small Piston-type Pumps
2 - 3-Drum Hoists
1 - Car Conveyor for Model 21 Eimco Loader
1 - Welding Machine

E. Explosives

Powder consumption per ton of ore decreased slightly compared to 1952 due to more depletion mining. Average price of Hercomite 2X increased from $16.35 to $16.54 while Gelamite increased from $17.01 to $17.32 and Gelatin - 60% increased from $19.10 to $19.67 per cwt. The overall explosives costs are summarized in the statement that follows Section (F) of Underground discussion.

F. Carset Bits

Since tungsten carbide bits were introduced into Cliffs Shaft, a footage record per bit has been kept for the purpose of determining the performance of various type bits and a comparison of costs. The following table shows the pertinent data:

Description	Quantity	Price	Amount 1953	Amount 1952
Ingersoll-Rand, Series 113 - 1-3/8"	255	9.96	$ 2,539.80	$ 1,104.00
" " , " 115 - 1-5/8"	2,695	11.90	32,070.50	41,435.24
" " , " 115 - 1-3/4"	84	12.83	1,077.72	-
Rockbits " 113 - 1-3/8"	49	9.45	463.05	-
Rockbits " 115 - 1-5/8"	353	11.90	4,200.70	3,084.80
Timken " 115 - 2"	69	14.20	979.80	472.50 (°)
Total	3,505	11.79	$41,331.57	$46,096.54

(°) Figure is for 1-5/8" size

Production - Tons	551,261	548,076
Cost Per Ton Ore	.075	.084
Feet Drilled - Rock & Ore	661,365	562,995
Average Feet Drilled Per Bit	189	149
Cost Per Foot of Hole	.063	.082

The tabulation above shows that the cost per ton decreased due, in part, to a drop in bit costs and in part to a substantial gain in bit performance. The increased amount of development has tended to raise the cost per ton.

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7. UNDERGROUND: (Cont'd)

D. Explosives (Cont'd)

Statement of Explosives Used:

	Quantity	Average Price	Amount 1953	Amount 1952
STOPING & DEVELOPMENT IN ORE				
Gelamite #1 (Cwt.)	187,950	17.32	$ 32,544.43	$ 27,467.30
Hercomite 2-X (Cwt.)	306,200	16.54	50,664.04	56,150.49
Gelatin - 60%	6,900	19.67	1,357.49	1,585.70
Gelatin - 40%	4,150	18.80	780.40	-
Total Powder	505,200	16.89	85,346.36	85,203.49
Blasting Supplies				
Fuse - Per M Ft.	246,445	9.70 M	2,389.89	3,478.42
No. 6 Caps	47,490	16.62 M	789.38	829.40
No. 6 Electric Caps	105,348	21.68 C	22,834.73	17,865.03
Shot Firing Cord-#18	24,340	28.25 M	687.56	418.08
Tamping Bags	980	6.60 M	6.47	121.41
Tamping Plugs	27,218	47.12 M	1,282.64	221.42
Powder Bags - each	6	5.42	32.52	-
Connecting Wire - Lbs.	3,082	.84	2,597.76	2,626.00
Fuse Lighters	13,700	8.95 M	122.65	126.75
Miscellaneous	-		334.04	1,197.53
Total Blasting Supplies			31,077.64	26,884.04
TOTAL STOPING & DEVELOPING IN ORE			$116,424.00	$112,087.53
Product - Tons			551,261	548,076
Lbs. Powder Per Ton Ore			.916	.936
Cost Per Ton For Powder			.155	.155
Cost Per Ton For Fuse, Etc.			.056	.049
Cost Per Ton, All Explisives			.211	.204
DEVELOPMENT IN ROCK				
Hercomite 2X - Cwt.	59,400	16.54	$ 9,821.79	$ 6,906.63
Gelamite No. 1 (Cwt.)	1,900	17.21	327.00	153.55
Gelatin - 60%	3,200	19.84	634.93	1,556.11
Total Powder	64,500	16.72	$ 10,783.72	$ 8,616.29
Blasting Supplies				
Fuse - Ft.	2,995	9.38 M	28.09	27.77
No. 6 Caps	480	16.00 M	7.68	6.19
No. 6 Electric Caps	14,052	22.57 C	3,172.54	2,684.69
Fuse Lighters	1,010	9.51 M	9.60	11.75
No. 18 Shot Firing Cord	5,525	24.81 M	137.09	27.06
Powder Bags - each	6	5.42	32.52	-
Powder Plugs	3,200	41.22 M	131.90	26.03
Connecting Wire - Lbs	367	1.01	372.68	372.00
Miscellaneous			90.15	101.77
Total Blasting Supplies			3,982.25	3,257.29
TOTAL ROCK DEVELOPMENT			$ 14,765.97	$ 11,873.58
Feet Rock Development			3,220	3,475
Cost Per Foot, Rock Development			4.580	3.417
GRAND TOTAL ALL EXPLOSIVES			$131,189.97	$123,961.11
AVERAGE COST PER POUND FOR POWDER			.1687	.1661

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7. UNDERGROUND: (Cont'd)

G. Pumping

There have been no changes in the pumping equipment on the 15th level. The pumping log shows a decrease in mine water from 776 g.p.m. in 1952 to 655 g.p.m. in 1953. Pumping at the New Shaft site, no doubt, accounts for the significant portion of this reduction.

8. COST OF OPENING, EQUIPPING, DEVELOPING AND OPERATING

Comparative Mining Costs

	1953		1952	
Product	551,261		548,076	
	Amount	Cost/Ton	Amount	Cost/Ton
Underground Costs	$2,334,277.90	4.234	$2,034,347.29	3.711
Surface Costs	340,236.61	.617	359,350.31	.655
General Mine Expense	596,216.51	1.082	449,076.50	.819
Cost of Production	3,270,731.02	5.933	2,842,774.10	5.185
Depreciation	36,769.00	.067	34,563.00	.063
Taxes	233,164.45	.423	181,120.19	.330
Loading & Shipping	56,313.06	.102	53,252.24	.097
Total Cost at Mine	$3,596,977.53	6.525	$3,111,709.53	5.675
Budget: Estimated Cost Per Ton		6.284		5.762
Number of Shifts and Hours	2-8 hr.		2-8 hr.	
Number of Days Operated	249		243½	
Average Daily Product	2,214 Tons		2,251 Tons	

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8. COST OF OPERATING: (Cont'd)

Detailed Cost Comparison

	Total 1953		Total 1952	
	Amount	Per Ton	Amount	Per Ton
Underground Costs				
Exploring in Mine	50,281.05	.090	38,672.63	.071
Wage Adjustment	41,194.64	.075	154,552.88	.282
Development in Rock	115,699.27	.209	100,295.00	.184
Stoping & Dev. in Ore	1,166,590.34	2.115	1,065,853.00	1.943
Timbering	71,409.93	.130	54,975.36	.100
Tramming	280,528.33	.509	242,233.34	.442
Ventilation	10,897.63	.002	3,721.83	.007
Pumping	44,012.36	.080	36,796.62	.067
Compressors & Air Pipes	86,116.63	.156	73,904.95	.135
Underground Superintendence	157,542.72	.286	106,677.24	.194
Compressors & Power Drills	14,642.94	.026	29,897.34	.054
Scrapers & Mech. Loaders	170,019.12	.309	119,713.90	.218
Tramming Equipment	112,676.86	.204	62,790.55	.115
Pumping Machinery	12,666.08	.023	4,057.33	.007
Total Underground Costs	2,334,277.90	4.234	2,034,347.29	3.711
Surface Costs				
Hoisting	66,130.25	.120	53,414.75	.097
Stocking Ore	44,045.64	.080	35,193.03	.064
Screening-Crushing at Mine	86,232.16	.157	72,588.95	.133
Dry House	20,824.41	.038	18,408.05	.034
General Surface Expense	41,159.87	.075	33,035.65	.060
Maint. Hoisting Equipment	29,524.93	.053	25,174.89	.046
Shaft	13,710.45	.025	68,470.14	.125
Top Tram Equipment	8,205.66	.015	13,043.76	.023
Docks, Trestles & Pockets	18,678.25	.034	23,780.57	.043
Mine Buildings	11,724.99	.020	16,240.52	.030
Total Surface Costs	340,236.61	.617	359,350.31	.655
General Mine Expenses				
Geological	16,201.52	.029	8,466.23	.015
Mining Engineering	29,836.55	.054	21,253.06	.039
Mechanical & Elec. Engr.	21,394.62	.039	11,443.34	.023
Analysis & Grading	65,585.88	.120	63,748.27	.116
Safety & Personnel Departments	8,960.95	.016	5,818.37	.011
Telephones & Safety Devices	21,454.74	.039	23,570.75	.043
Local & General Welfare	5,155.60	.009	5,619.34	.010
Special Exp.-Pensions & Allow.	17,318.95	.032	16,364.69	.030
Ishpeming Office	65,721.45	.119	49,447.65	.090
Mine Office	80,466.05	.147	65,470.23	.118
Insurance	45,418.50	.082	34,962.02	.064
Personal Injury	14,816.37	.027	21,671.58	.040
Social Security Taxes	48,071.92	.087	42,595.48	.078
Employees Vacation Pay	115,405.09	.209	75,239.62	.136
Research Laboratory	2,928.95	.005	3,405.87	.006
Holiday Pay	37,479.37	.068	-	-
Total General Mine Expenses	596,216.51	1.082	449,076.50	.819
COST OF PRODUCTION	3,270,731.02	5.933	2,842,774.10	5.185

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8. COST OF OPERATING (Cont'd)

Detailed Cost Comparison (Cont'd)

The Cost of Production increased $.523 per ton compared with 1952. Labor costs increased an average of 10.8% while Supply costs increased an average of 10.3%. An explanation of accounts that show a significant change compared with 1952 is given below.

Exploring in Mine

The number of underground diamond drill rigs was reduced in September from three to two. Surface drilling early in the year, by a Longyear contract rig, was charged directly to this account.

Timbering

An increased amount of contract relocation due to grade and depletion resulted in more chute construction, thus more total labor charges.

Underground Superintendence

Three shiftbosses were added to the supervisory group, one of which acts in the capacity of a Trammer Boss while the other two were added to improve the supervision on the increasingly dispersed day and afternoon shifts. Major salary adjustments also increased this account.

Underground Maintenance

Abnormally high maintenance costs on Eimco loaders and the purchase of 2 new 3-drum hoists and a track-mounted conveyor increased the Scrapers & Mechanical Loaders account.

A necessary program of underground locomotive overhaul and reconditioning was initiated early in the year. Costs of this program are reflected in the Tramming Equipment account.

Employees Vacation Pay

Provisions in the Company-Union contract providing for greater vacation privileges have increased this account.

Taxes

Total taxes were larger in 1953 than in 1952 due to a slight increase in valuation and a 4.3% increase in the local tax rate. Reduced production raised the tax load per ton appreciably.

Expenditure & Authorization Summary

E. & A. No. CC-560 - New Shaft Project

This project was approved in December, 1952 in the amount of $2,114,900 for sinking and equipping the new shaft. Expenditures up to and including December 1953 were $519,501.65. Work done under this E. & A. is detailed under Sections 6 and 7 of this report.

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8. COST OF OPERATING: (Cont'd)

Detailed Cost Comparison (Cont'd)

Expenditure & Authorization Summary (Cont'd)

E. & A. No. CC-560-M

Approval of this expenditure, in the amount of $259,480.00, was granted in December to include in the New Shaft Project second stage crushing for processing an intermediate grade. There was no expenditure under this account in 1953.

E. & A. No. CC-608 - Jaw Crusher for Intermediate Grade

Approval of an expenditure of $32,000.00 was granted in November under this E. & A. In 1953, $245.42 was charged to this project which should be completed in March of 1954.

9. TAXES

Comparative data for 1953 and 1952 is shown below:

	1953		1952	
	Valuation	Taxes	Valuation	Taxes
Realty	3,270,000	127,366.50	3,230,000	120,640.50
Personal	816,100	31,787.10	601,100	22,451.08
Lot 2, Sec. 3,47-27-Bancroft	800,000	31,160.00	800,000	29,880.00
Lot 174, Nelson's Addition	100	3.90	100	3.74
S. 35.91' of Lot 179	50	1.95	50	1.87
S½ of NW¼ of Sec. 10, 47-27	1,100,000	42,845.00	1,100,000	41,085.00
Total Cliffs Shaft Mine	5,986,250	233,164.45	5,731,250	214,062.19°

(°) Taxes charged to Idle Expense - $32,942.00 included above.

Taxes per ton produced	.423	.330
Taxes per ton shipped	.450	.341

10. ACCIDENTS AND PERSONAL INJURY

Fourteen compensable and six non-compensable injuries occurred in 1953 for a total time lost of 568½ days. This record of 20 accidents compared favorably with the 29 incurred during 1952 and ranked Cliffs Shaft third on safety during 1953 among the Company's underground mines.

Comparison of Frequency and Severity in 1952 and 1953 is as follows:

Year	Frequency	Severity
1952	31.32	.415
1953	21.12	.600

Frequency Rate - Number of accidents for every 1,000,000 man hours

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

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10. ACCIDENTS & PERSONAL INJURY (Cont'd)

A summary of the compensable accidents is listed below:

#1296 - Einar Pentti - Miner - January 20, 1953 - chunk fell and struck leg while barring - laceration on right leg and pulled ligaments on left ankle - lost time, 49 days.

#1297 - Elmer Heikkila - Timberman - February 13, 1953 - dislodged shaft casing plank struck right leg - severe bruises of right calf - lost time, 13 days.

#1298 - Robert E. Anderson - Miner - March 24, 1953 - while leaning over operating hoist, miner slipped and fell backwards on a overturned plank and a spike penetrated rectum - lost time, 107 days.

#1299 - Donald Salli - Brakeman - April 7, 1953 - while barring chute from haulage car he slipped, fell and struck his right leg against chunk - abrasion below right knee - lost time, 9 days.

#1300 - Toivo Pelto - Car Repairer - April 6, 1953 - Sharp piece of rock penetrated knee while getting under haulage car - small break in skin near knee-cap of right leg and swelling - lost time, 26 days.

#1301 - Calvin Palomaki - Miner - May 7, 1953 - fell 20' down raise when ground broke away around drilling platform hanger peg - abrasion and swelling of leg - lost time, 8 days.

#1302 - Matt Kampinen - Miner - April 9, 1953 - bar struck knee after placing bar in moving hoist drum to stop drum and prevent scraper from dropping further down raise - fractured kneecap - lost time, 27 days.

#1303 - Werner Jacobson - Surface Laborer - July 15, 1953 - Werner was preparing to pull a three foot section of rope from tractor drum as slack was unwound while at the same time withdrawing a bolt from the clevis. Tractor operator mistakenly reversed the tractor drum which drew Werner's hand onto the drum - abrasion and contusion of index finger, right hand - lost time, 34 days.

#1304 - John Blocken - Picking belt Attendant - August 28, 1953 - small piece of ore from gyratory crusher struck right eye - foreign body in anterior chamber of right eye - has not returned to work yet.

#1305 - Eino Aalto - Underground Laborer - August 5, 1953 - while barring chute, small chunk rolled through and struck right hand - fracture, 2nd joint, little finger, right hand - lost time, 24 days.

#1306 - Urho Konster - Miner - September 3, 1953 - drill rod slipped from inclined hole and struck foot - fracture of 2nd metatarsal bone, right foot - lost time, 38 days.

#1307 - Vilho Johnson - Motorman - October 5, 1953 - when stepping off slightly moving locomotive, locomotive pushed foot against track tie - squeezed left foot - lost time, 37 days.

#1308 - Gordon Fitzgerald - Brakeman - September 29, 1953 - while lifting chunk into haulage car he strained his back - sore back - lost time, 11 days.

#1309 - Matthew W. Maki - Miner - December 19, 1953 - water from drilling caused that portion of the ore pile under Maki and against a stope brow, to cave; chunks pinned Maki in the cave up to his chest until removed - hernia and bruises on arms, legs and body - lost time, 60 days estimated.

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11. POWER:

The power cost for 1953 compares favorably with the cost in 1952:

	1953	1952
K. W. H.	8,622,471	7,731,256
Average Cost Per K.W.H.	.016986	.016489
K.W.H. Per Ton	14.5	14.1
Cost Per Ton	.248	.232

The increase in total consumption of K.W.H. is due to the idle period incurred in 1952. The energy rates were the same as the previous year; however, fluctuations of consumption in the demand period and in the use of fuel-driven generators resulted in a slight increase in the average cost per K.W.H.

Determination of the cost per period results from the total K.W.H. used and is calculated under the following schedule:

A. Energy Charges

1. $.041 per K.W.H. for the first 72 KWH per KW of demand, demand being determined as the lowest of the average KW supplied during the three 15-minute periods of maximum use during the billing period.

2. $.0096 per KWH for all additional KWH.

B. Fuel Adjustment

A rate calculated as $.00018 per KWH for each one-cent above $.29 in the cost per million British Thermal Units of Fuel is applied to that portion of the total mine KWH which, on a Cliffs Power & Light percentage basis, was produced by fuel or purchased from other companies during the period.

During the year there was no delay of a prolonged nature due to power failure which interfered with production.

HUMBOLDT MINE
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General Summary

Various deterring factors prevented the start-up of the Humboldt Mine beneficiating plant during 1953 as had been anticipated. The most serious delay on the project was caused by delinquent delivery of fabricated steel for the crushing and concentrating plants. The O. W. Walvoord Company, the designer and builder, was hampered by a three week strike of the building trades union, (A F of L). Much of the concrete work and steel and equipment erection was subcontracted in an attempt to expedite the project. However, while the manpower was available, and all concrete work was completed in a satisfactory manner, the failure of essential steel to arrive on schedule slowed down the progress of the project.

The office, shop and dry building was substantially completed during August and placed in use at that time.

Stripping of the ore body was continued and the initial mining area on the south end of the mine area was prepared for initial mining development by the use of a hydraulic monitor.

The mining of ore on the southwest "knob" was begun, using wagon drills and a churn drill for drilling purposes. Development of the initial area progressed in a satisfactory manner and at the end of the year there was 41,000 tons of crude ore stockpiled.

At the end of the year most of the auxiliary surface projects such as water supply, tailings disposal, sewage disposal, the concentrate stockpile area, railroad facilities, power supply and distribution, haul roads, etc., had been completed and were ready for plant operation.

Since the Humboldt Mine project remained in the construction stage during 1953 and because development appropriations have been granted according to the pattern of E and A HM-4, an account of progress can best be presented by following the authorization pattern.

E&A HM-4 - Progress Report

A. General Expense

1. Engineering

Engineering work in the mine area included grading of haul roads, grading and locating of drill holes, grading on the pit benches, cross sectioning the pit area, iron pin surveys and other miscellaneous jobs.

Engineering work outside the pit area included sounding Lake Lory, location of all pipe lines and permanent structures and sampling and estimating old lean ore stockpiles. Profiles were made for two proposed pelletizing plant locations.

Engineering plans were made for the potable water supply system, plant water supply system, the jet piercing installation, dust collection systems, the electrical distribution system and other auxiliary facilities.

Mine engineering studies included drilling equipment evaluation, ore reserve estimates, pit planning and other related work.

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2. Research

Test work was continued by the Research Laboratory on flotation cell and reagent evaluation. Flotation tests were carried out on composite samples from three diamond drill holes put down in 1953 in the footwall area to be mined during 1954. Additional surface samples from this area were also tested. A study was made of relative grinding media wear rates.

A test was made to determine if the Humboldt concentrates could be added to a typical direct shipping underground ore of Cliffs Group type. For this experiment, Humboldt concentrates produced in the pilot plant were added to Mather Standard ore and an uncontaminated mixture and a mixture contaminated with radioactive tracer material were prepared. These two lots were then shipped to the Ford Motor Company for experimental work in evaluating flue dust losses.

The pilot plant was operated on Humboldt ore to furnish additional information to be translated into large scale operation.

3. Geological

Three diamond drill holes (total of 514 feet) were drilled in the initial footwall mining area to assist in the determination of ore characteristics and to obtain additional information about the structural geology in this area. Composites of these holes were sent to the Research Laboratory for metallurgical study and mineralagraphic analysis.

Samples were taken from all churn drill holes to assist in the accumulation of data regarding the structure, analysis, etc., of ore going onto the stockpile.

The geological department cooperated in sampling and determining the potentiality of relatively large tonnages of lean ore which were left in piles during bygone underground mining days.

A weather station was established at the Humboldt Mine near the end of 1953. Daily readings will be made of maximum and minimum temperature and precipitation. The water level of Lake Lory will also be logged and if necessary, outlet flow measurements will be made.

The area to be worked in initial pit development was plane tabled to obtain a detailed map of the surface geology.

4. Safety Department

Safety features of the Humboldt operation were given consideration and fire protection equipment was installed wherever possible under the guidance of the Safety department. Preparation of standard safety regulations was discussed and a basic set of rules prepared.

A survey of all old pits and shafts was made and Humboldt area maps were brought up to date to show these in detail. All pits and shafts were protected by filling in or fencing.

5. Mine Office

The mine staff moved into the permanent quarters in the new office building on August 24th. The warehouse was placed under the jurisdiction of a supply clerk and the orderly storage of incoming supplies was instituted. The mine office has proved to be well planned and should be of great assistance in providing adequate and efficient facilities for supervision and other related functions.

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B. General Surface

1. Roads, Bridges and Ditches

All work of this nature required for operation was completed. The main haul road to the primary crusher required a large amount of fill material to construct a safe and adequate road for main ore haulage.

Culverts were placed as required for drainage.

2. Clearing and Grading

Grading and clearing was completed except for final cleanup in the office and shop and mill areas. The concentrate stockpile area was prepared for use and the tailings disposal area was completed.

No work was done on the proposed stripping dump area.

3. Acquisition and Moving of Houses

The Oja property, located southwest of the mining area, is the only property which is still close to the proposed mine. However, all negotiations for this property have now been terminated and no further action is contemplated. The property is not jeopardized by blasting operations, but could be useful for stripping roads and other purposes.

Old Highway US 41 was barricaded to isolate the mine area.

4. Fire Protection Equipment and System

The major portion of the plant fire protection system has been installed, but some pipe and two hydrants remain to be placed after the ground thaws out in the spring.

Interior fire protection of buildings has been studied and the majority of fire extinguishers have been located in accordance with regulations.

C. Shop, Office and Dry Building

This building was completed and placed in service during 1953. The building was erected by Arrowhead Steel Buildings, Inc. of Duluth. All concrete and interior finishing was completed by Klippen and Holm under their contract. Electrical, plumbing, heating and crane installations were made by CCI Co. and Humboldt Mining Company employees.

This building has proved to be well planned from the standpoint of maintenance and warehouse facilities and should contribute markedly to the efficiency of the operation.

The storage building included under this section of the E and A was not built during the past year.

D. Concentrating Plant

a. Crushing Section

1. Superstructure

Erection of steel was begun for the secondary crushing building on September 14th and for the primary crushing building on October 22nd. The exterior sheeting on both buildings was completed at the end of the year and sheeting of conveyors 1, 2 and 3 was well along toward completion. Interior steel was erected as fast as it was received.

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a. Crushing Section (Cont'd.)

2. Foundations

All concrete for the crushing sections was completed prior to the advent of freezing weather.

3. Heating and Dust Collection

A heating unit was installed in the secondary crushing plant and the installation of a dust collection system in the secondary crushing plant was begun.

4. Cranes

The cranes were installed in both crushing plants and were used in equipment and steel erection.

5. Crushers and Screens

The primary, secondary and tertiary crushers were installed and both screens in the secondary crushing plant were ready for operation.

6. Feeders and Conveyors

The installation of belt feeders and conveyors 1, 2 and 3 was started in December. The Ross feeder in the primary crushing plant could not be installed because of slow deliveries of steel in that section.

7. Chutes and Bins

The surge bin in the secondary crushing plant was completed. Most of the chutes were installed.

b. Concentrator Section

1. Superstructure

The main mill superstructure was completed and most sheeting and insulation was completed. Slow steel deliveries on some stairs and platforms prevented completion of this phase of the work.

2. Foundations

All mill concrete work was completed by fall.

3. Heating

The mill heating system was placed in operation in October and has facilitated construction work inside the mill building. The building is heated by unit heaters and steam for the heaters is provided by the boilers in the shop building.

4. Plumbing and Piping

This phase of the mill construction project had progressed satisfactorily and was substantially completed, at the end of the year, by the subcontractor.

5. Bins

The mill fine ore bin was erected during December.

6. Cranes

The 25-ton mill crane was installed in May and was used during the remainder of the year for equipment erection and supply and equipment unloading.

b. Concentrator Section (Cont'd.)

7. Equipment and Machinery

Equipment and machinery was installed during the year and at the end of the year, most of the mill equipment was in operating condition. The largest and heaviest pieces of equipment installed in the mill section were the two grinding mills. Representatives of the various equipment manufacturers assisted in supervising machinery assembly and testing, both in the mill and crushing plants.

Painting of the interior of the mill was subcontracted and was partially completed at the end of the year.

Items still remaining to be installed included part of the conveyors and several chutes and launders. These all are dependent on the delivery of structural steel.

Several changes of a minor nature were made as construction progressed, but unless absolutely necessary, no major changes were instituted, which would delay completion. Constant contact between the various groups involved has been necessary to answer the many day to day problems that arise in a project of this nature.

C. Stocking and Shipping Section

No work in this area had been completed at the end of the year. All erection was pending the delivery of structural steel. It should be noted that this phase of the project will not stop mill operation, since temporary provisions for concentrate handling can be provided.

The L. S. & I. Railroad installed the loading pocket track and lower yard storage track as well as a spur to the Driox unit.

D. Reagent Storage and Handling

This phase of the project was completed at the end of the year except for a few minor piping details. The reagent storage tanks have been placed in the basement of the repair bay. The compressor was installed in the same location and was placed in operation in September for use in mine wagon drilling.

E. Heating Plant and Power Distribution

The heating plant originally included under this section was transferred to the office, shop and dry building as noted above.

All major work on the power distribution system was completed. Power panels were installed and permanent distribution lines were in use at the end of the year. The switch vault building was completed in September.

Pole lines were installed to the mining area for power shovel operation. Lines were also installed to Lake Lory for both pumphouses. A feeder line was carried to the jet piercing sub-station location.

Plans were prepared by the Wisconsin-Michigan Power Co. for the relocation of their line in the vicinity of old US 41.

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G. Mining Equipment

Additional mining equipment purchased during 1953 included the following:

3 - GDURMB-99 Wagon Drills (4")
1 - IR 315 Rotary Portable Compressor
Backhoe and Shovel front attachments for the Bucyrus Erie 22-B Crane.

After studying the terrain of the initial mining area, it became evident that a large amount of wagon drilling would be required and the three wagon drills were purchased in July, August and September.

H. Water Supply

1. Pumps

Four pumps were installed during the year. Two were placed at Lake Lory for fresh water and two were installed at the tailing basin for reuse water. The Lake Lory pumps are vertical, 5 stage, 1,000 gallon per minute units. The reuse water pumps are a horizontal, 1 stage, 1,500 gallon per minute type.

2. Pipe Lines

Pipe lines for the two water supply systems were buried from the Lake Lory and tailing basin water pumps. Some rock had to be blasted to permit a uniform six foot cover for all buried lines. The pipe for both installations consists of twelve inch Spiralweld joined by Victaulic couplings. All pipe was given a coat of Bitumastic water proofing, in addition to the original mill tar coating, before the lines were buried.

3. Supporting Structures

The pump house at Lake Lory was built on piling driven out in the lake to permit the use of the vertical pumps.

4. Foundations

A concrete foundation was poured for the reuse pump house. It was necessary to locate this pump house further east than originally planned to obtain a solid foundation for the footings.

5. Pump Houses

The Lake Lory pump house was built by using an existing galvanized building available at Humboldt. This building was insulated and can be heated if necessary. An electric cable was installed on the pump intake casings to prevent freezing during shutdowns.

The reuse pump house is a new structure and was constructed by Arrowhead Steel Buildings, Inc. It is a galvanized, insulated building and provision has been made for ultimate plant expansion and pump addition. The building is heated for winter operation.

6. Potable Water Supply

Several 4 inch well drill holes were drilled in an attempt to obtain a suitable potable water supply. After the most promising location was found, two 9 inch holes were drilled and a pumping system was installed in the old office building. The water is pumped to the mill building in a buried plastic pipeline. A large storage tank (salvaged from concrete plant) in the mill is used to supply a pressure tank system, which provides water for all domestic purposes in the mill and office and shop building. The water has been sampled and approved, on several tests, by the Michigan Department of Health.

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I. Tailings Disposal Area

1. Dikes

Dike construction was completed after an agreement was reached with the Oliver Mining Company for use of their lands as tailing area.

2. Pipe Lines

The installation of the tailing line was substantially completed at the end of the year. The tailing line will be all on surface and drains to a low spot at a point about midway between the mill and the tailings basin. A dumping valve was located at this point. This system was used to eliminate the need for an expensive filling or trestle installation required to obtain a single grade from the mill to the basin. The line is also 12 inch Spiralweld joined by Victaulic couplings.

J. Stripping

Stripping was carried on during the year with the 4-yard P and H shovel in the south pit area. All stripping material was used for road building, backfill and grading projects.

Stripping of surface overburden in the first "knob" to be mined posed a particular problem because of the irregularity of the terrain. To overcome this problem, a hydraulic monitor was utilized and a twelve inch line was carried on surface from Lake Lory to the pit area. The mill fresh water supply pumps were used to supply water to the pit. Using this method, sometimes in combination with a bulldozer, the irregular area was washed off satisfactorily before cold weather required the suspension of further hydraulic operation.

During 1953, 84,361 cu. yards of overburden were removed at a cost of .28 per yard. Total stripping to date totals 218,061 cu. yards at a cost of .57 per yard.

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EXPENDITURES

Expenditures under E and A HM-1, 2, 3 and 4 and Deferred Mining

Includes all labor and supplies by Humboldt Mining Company and contractors:

Classification of Expenditures
Labor & Supplies

	Authorization	1953	1952	Total
Inc. O. W. W. Expenditures				
E&A HM-1-Lands	$ 275,584.28	$ 12,125.00	$ 263,459.28	$ 275,584.28
HM-2-Exploration	111,166.83	—	111,166.83	111,166.83
HM-3-Testing & Plant Design	95,198.31	—	95,198.31	95,198.31
HM-4-A-Gen. Expense	192,000.00	129,344.92	85,950.14	215,295.06
HM-4-B-Gen. Surface	140,000.00	19,078.20	80,178.39	107,256.59
HM-4-C-Shop, Office & Dry	425,000.00	253,755.70	119,724.00	373,479.70
HM-4-Da-Mill Crushing Section	1,675,500.00	1,182,141.58	349,945.54	1,532,087.12
HM-4-Db-Mill Conc. Sec.	1,691,500.00	1,183,484.05	438,138.08	1,621,622.13
HM-4-Dc-Mill Stocking & Shipping Section	36,000.00	(Inc. under	D-b)	—
HM-4-Dd-Mill Reagent Storage & Handling	16,350.00	3,189.70	—	3,189.70
HM-4-Ec-Power Distribution	90,000.00	49,933.99	6,072.33	56,006.32
HM-4-F-Pelletizing	—	—	—	—
HM-4-G-Mining Equip.	777,300.00	106,204.25	442,510.27	548,714.52
HM-4-H-Water Supply	123,000.00	111,671.23	112.50	111,783.73
HM-4-I-Tailings Disposal	60,000.00	41,201.46	4,702.73	45,904.19
HM-4-J-Stripping	168,000.00	77,110.00	43,867.60	120,977.60
Total E&A Expense	5,876,599.42	3,169,240.08	2,049,026.00	5,218,266.08
Deferred Charges - Crude Ore Prod. (40,800 Tons)	—	90,116.17	—	90,116.17
Total Expense	$ 5,876,599.42	$ 3,259,356.25	$ 2,049,026.00	$ 5,308,382.25

All figures exclusive of depreciation.

SUPPLY INVENTORY	1-1-53	1-1-54
Dollar value of supplies and spare parts	$17,931.33	$64,395.50

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General Considerations - Humboldt Mine

1. Estimate of Reserves

Estimated reserves were changed during 1953 because of revised evidence pointed out by the drilling of three diamond drill holes in the footwall area and re-evaluation of other geological information. Shown in the following table is a comparison of 1952 and 1953 estimates of ore potential and stripping requirements based on carrying the ultimate mine bottom to various depths. (See table on following sheet)

It should be noted that ore reserve estimates are calculated using a figure of 160 pounds per cu. ft. for ore in place. This figure is on the low side and actual reserves would then be higher.

However, since much will be learned about the ore body during coming years, it is well to remain on the conservative side in an ore reserve estimate. Initial development also would seem to indicate that the intrusives in the first section of the ore body to be worked may be of such a nature that ore recovery in these areas will not be too high.

Lean Ore Stockpiles

As mentioned previously, there are several old stockpiles of lean material in the Humboldt area which were left from the previous underground mining operations. Eight of these piles were sampled and surveyed and tonnages estimated during 1953. The eight stockpiles contain approximately 90,000 tons of treatable ore and the average analysis of the material in the piles is 38.20 % Fe and 45.74 % SiO_2.

Laboratory investigations indicate that it will be possible to beneficiate this waste material to produce acceptable concentrate at a good recovery.

Plans have been made to use as much as possible of the above material during early mill operation. About 68,000 tons of the stockpile ore is located on the Weber Lease property and to take advantage of the royalty agreement, as much ore as possible should be removed prior to July 1, 1954.

In addition to the 8 piles discussed above, there are other stockpiles in old eastern (e.g. - East Hill) section of the Humboldt lands, which will be investigated in the spring. Most of these do not appear to be as promising as those sampled during 1953.

2. Labor and Wages

No. of men 1-1-53	24
Added during 1953	52
Total	76
Separation	11
Total on 1-1-54	65
Net gain	41

Additions Include		Separations Include	
9	Rehires	6	- quit
3	Temporary Transfers	4	- laid off
11	New Hires	1	- Transfer
11	Transfers (Ohio Mine)	11	Total
3	" (Mather "B")		
14	" (Tilden)		
2	" (Gen'l Storehouse)		
52	Total		

Statement of Wages	1953	1952
Average No. Men Working	40.5	16.75
Average Wages Per Day	$16.71	$15.61
Scheduled No. of days	256	120
Amount for Labor	$172,517.52	$29,190.90

ORE RESERVES AT HUMBOLDT MINE

1952 Estimate	46% Rec.	2.3 Eq. Strip.				
	Tons				Cu. Yds.	Cu. Yds.
Pit Bottom	Crude	Concentrates	Cu. Yds. Rock	Cu. Yds. Surf.	Equiv. Surf.	Total Equiv. Stripping
1310	18,033,400	8,295,364	2,015,653	4,246,250	9,766,375	11,781,928
1210	25,184,032	11,584,654	2,830,560	7,949,025	18,282,757	21,113,317
1110	32,113,440	14,772,182	3,664,204	13,685,752	31,477,230	35,141,434
1010	39,124,473	17,997,257	4,979,542	20,904,442	48,080,217	53,059,759
1953 Estimate	46% Rec.					
1310	22,190,143	10,207,466	1,694,400	4,518,900	10,393,470	12,087,870
1210	29,593,543	13,613,030	2,130,100	8,976,300	20,645,490	22,775,590
1110	37,170,514	17,093,436	2,633,900	15,017,000	34,539,100	37,173,000
1010	44,674,200	20,550,132	3,209,100	22,807,500	52,457,250	55,666,350

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3. Taxes

Valuation and taxes assessed Humboldt Mine for the year 1953 are given below. Also shown are taxes for 1952 which were on mineral lands only.

1953			
Humboldt Mining Co.	Valuation	Rate	Taxes
Real	$ 50,000		$1,000.00
Personal	335,000		6,700.00
Total Tax	385,000	$20.00	7,700.00
Coll. Fee 1%		.20	77.00
Total Payment	$385,000	$20.20	$7,777.00

1952			
Cleveland Cliffs Iron Co.	Valuation	Rate	Taxes
Mineral Lands *	$ 40,305	$15.00	$ 604.56
Coll. Fee 1 %		.15	6.04
Total Payment	$ 40,305	$15.15	$ 610.60

* Includes Weber Lease and Auxiliary Lands.

4. Accidents and Personal Injury

There were no compensable accidents at Humboldt Mine during 1953. This record is good considering the diversity of jobs performed by the employees and the fact that many of them are relatively inexperienced in the type of work they are called on to do.

Only one accident (a cut leg) resulted in lost time (3½ days).

There were six other minor accidents during the year.

5. Nationality of Employees

	American Born	Foreign Born	Total
Finnish	25	1	26
French	12		
English	9		
Swedish	6		
Irish	4		
German	3		
Austrian	1		
Italian	1		
Norwegian	1		
Polish	1		
Scotch	1		
	64	1	65

Residence of Employees

Ishpeming	22	Negaunee	3
Lanse	15	Pelkie	1
Champion	10	Michigamme	1
Republic	7	Covington	1
Baraga	5		65

6. Labor Relations

A request for an election was filed by the United Steelworkers of America (C.I.O.) Soon after they indicated they had a majority of the Humboldt Mining Company employees signed up. A N.L.R.B. authorized election was held on August 17th, at which time the Humboldt Mining Company employees voted 20 to 5 for U.S.W. (C.I.O.) representation.

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7. O. W. Walvoord Contract

The O. W. Walvoord Company continued as designers and builders of the Humboldt Mill. Their work consists essentially of the crushing plants and concentrating plant. All other related and auxiliary projects and construction have been done by the Humboldt Mining Co. and Cleveland Cliffs Iron Company or has been awarded to individual contractors by the Cleveland Cliffs Iron Company.

During the year, several subcontracts were awarded by the O. W. Walvoord, Co., to various firms, upon instructions from Cleveland Cliffs Iron Company. Subcontractors who were awarded work are as follows:

Proksch Construction Co. - Concrete
Reuben L. Anderson & Cherne Co., Inc. - Plumbing & Pipefitting
John Hennes Trucking Co. - Machinery erection and remainder of steel erection
Al Tuch Co. - Mill Painting

On Monday, May 25th, all activity of the O. W. Walvoord Co. in the field was stopped due to a strike of the carpenters and iron workers unions. This strike was basically for union recognition and on June 18th an election, by qualified voters, required O. W. Walvoord Co. to bargain with various trade unions of the A. F. of L. Resumption of work was allowed on the same day. Satisfactory agreements were reached with all the craft unions and no wage increases were received.

8. Mining Activities

Wagon drilling was begun in ore on July 6th at the pit development grade (1585) on the northwest side of the south "knob". For the remainder of the year, the drilling, blasting and loading tempo was increased and for the last two months, three wagon drills worked two shifts per day in ore body development work.

The top of the south "knob" is being flattened by wagon drilling so that the jet piercing machine can operate effectively when placed in service in the spring of 1954. A total of 46,610 feet of 2½" hole was drilled with tungsten carbide bits during 1953.

Some churn drilling was done on the north end of the south "knob" to develop a straight face from the haul road east to the footwall. Penetration rates were very poor and the drill was shut down as soon as the face was developed.

J. A. Poll

J. A. Poll, Superintendent
Humboldt Mine

JAP:jei

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1. GENERAL

The production at the Lloyd Mine for the year was 138,900 tons, of which 47% was Lloyddale grade and 53% Silica grade. All of the Silica production was mined from above the 9th Level, where mining was stopped in July, due to the exhaustion of ore. The Lloyddale grade being produced from above the 10th Level has a higher iron content and a lower sulphur content than had been indicated by the preliminary exploration and development work.

The 10th Level drift had reached a point 92' east of the winze shaft plat at the close of 1952. By the end of May the 10th Level drifting program was completed (approximately 1,350' of rock drifting), and development of the sulphurous deposit for mining was started. Due to local rolls in the formation south of the main East-West dike and in the dike itself, the sulphurous deposit is considerably larger than indicated by diamond drilling, while the standard deposit is cut off at a much higher elevation than anticipated.

During the year a great deal of repair and new construction work was carried out, both on surface as well as underground. This work had not been done due to the imminent closing down of the property, late in 1951, upon the exhaustion of the 9th Level, and was necessary in order to reduce operating costs and overhead as much as possible. The major project in this respect was the installation of a completely automatic three stage pumping system. A new storage trench was constructed and placed in service on the 8th Level for loading the skips in the main shaft. This trench had sufficient storage capacity to eliminate the midnight hoisting shift.

Much of the repair modernization work was carried on under E. & A. No. CC-505, even though this work was not anticipated in the original request.

The average working schedule throughout the year was 5 days per week, 3 shifts per day. There were no major delays in production during 1953, due in large part to an effective program of preventative maintenance work.

Because the 10th Level is at or near the bottom of the ore trough, there are no indications of any possible extensions of ore. Thus, there has been no program of exploration in effect and no plans for any future program.

2. PRODUCTION

a. Production by Grade and Months

Month	Days	Lloyddale Tons	Lloyd Silica Tons	Total	Rock Tons	Tons per Man per Day
January	21	738	16,331	17,069	3,146	6.57
February	20	1,600	12,729	14,329	3,003	6.04
March	22	8	12,198	12,206	6,185	4.80
April	22	60	10,201	10,261	3,287	4.22
May	21	73	10,881	10,954	3,046	4.35
June	22	3,911	2,152	6,063	794	2.29
July	17	5,340	3,731	9,071	776	3.60
August	21	5,432	5,022	10,454	984	3.60
September	21	4,564	839	5,403	541	1.84
October	22	11,836	109	11,945	288	3.82

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2. PRODUCTION (CONT'D)

a. Production by Grade and Months (Cont'd)

Month	Days	Lloyddale Tons	Lloyd Silica Tons	Total	Rock Tons	Tons per Man per Day
November	19	12,688	4	12,692	198	4.72
December	22	18,239	-	18,239	44	6.18
Total	250	64,489	74,197	138,686	22,292	4.34
Overrun		214		214		
	250	64,703	74,197	138,900	22,292	4.34
Transfers		714	714			
Grand Total	250	65,417	73,483	138,900	22,292	4.34

b. Shipments

Total shipments increased from 1952, due primarily to the fact that a two months strike occurred during the shipping season in 1952.

Year	Lloyddale	Lloyd Silica	Total
1953	44,603	70,043	114,646
1952	38,218	32,902	71,120

c. Ore Statement

	Lloyddale Tons	Lloyd Silica Tons	Total Tons	Total Last Year
On hand Jan. 1, 1953	5,542	158,609	164,151	149,906
Output for Year	64,489	74,197	138,686	84,667
Transfers	714	714	-	-
Overruns	214	-	214	698
Total	70,959	232,092	303,051	235,271
Shipments	44,603	70,043	114,646	71,120
Balance on Hand	26,356	162,049	188,405	164,151
Increase in Output	40,093	13,926	54,019	
Increase in Shipments	58,532	15,006	43,526	
Increase in Ore on Hand	20,814	3,440	24,254	

The operating schedule for the past two years follows:

1953 - Hoisting and mining operations 3 8-hour shifts per day, 5 days per week

1952 - Hoisting and mining operations 3 8-hour shifts per day, 5-2/3 days per week January 1 to November 17. Effective November 17, 5 days per week.

d. Division of Product by Levels

Level	Lloyddale	Lloyd Silica	Total
9th	9,040	70,709	79,749
10th	56,377	2,774	59,151

e. Production Delays

There were no major production delays in 1953.

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3. ANALYSIS

a. Average Mine Analysis on Output

Grade	Tons	Iron	Phos.	Sil.	Sul.
Lloyddale	65,417	59.28	.135	4.55	.616
Lloyd Silica	73,483	51.06	.120	18.86	.132

b. Average Analysis of Shipments

Grade	Tons	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
Lloyddale	44,603	59.40	.150	4.84	.31	2.32	1.54	.60	.590	3.81	9.65
Lloyd Silica	70,043	52.00	.130	18.26	.27	2.67	.76	.59	.134	2.83	10.06

c. Average Analysis of Ore in Stock Dec. 31, 1953

Grade	Tons	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
Lloyddale Dried	26,356	59.88	.141	4.49	.27	2.45	1.01	.65	.556	3.82	
Lloyddale Natural		54.19	.128	4.06	.24	2.22	.91	.59	.503	3.46	9.51
Lloyd Silica Dried	162,049	51.86	.130	18.70	.23	2.32	.51	.54	.051	3.07	
Lloyd Silica Natural		45.83	.115	16.53	.20	2.05	.45	.48	.045	2.71	11.62

d. Analysis of Straight Cargo Shipments

There Were no straight cargo shipments during 1953.

4. ESTIMATE AND ANALYSIS OF ORE RESERVES

The estimated ore reserves are almost totally limited to the ore above the 10th Level, with only a small amount of ore left in small pillars above the 9th Level. These small pillars were left between and above old mining areas and can be recovered by caving from below if the grade is right. The bulk of the tonnage above the 10th Level is high sulphur ore and the actual production and reserves are limited to Lloyddale grade only. Because the 10th Level lies at or very near the bottom of the ore trough in this area, the possibility of any increase in reserves is nil. The extent of the ore in the sulphurous deposit south of the main East-West dike, is very well defined. However all indications point to the fact that the standard deposit north of the dike is much smaller than originally indicated by diamond drilling.

a. Comparison of Production to Reserves

Reserves on January 1, 1953	349,540
Production Jan. 1 to Dec. 31, 1953	138,900
Balance	210,640
Reserves as of Dec. 31, 1953	276,352
New Ore Developed	65,712

b. Developed Ore

The following is an estimate of ore reserves as of December 31, 1953, using a factor of 12 cubic feet per ton.

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4. ESTIMATE AND ANALYSIS OF ORE RESERVES(CONT'D)

b. Developed Ore (cont'd)

	Sulphurous Ore
Total Gross as of Aug. 31, 1953	359,643
Less Production Aug. 31, to Dec. 31, 1953	47,327
Total Gross as of Dec. 31, 1953	312,316
Less 10% for Mining Loss and Rock	35,964
Net Total as of Dec. 31, 1953	276,352

Grade	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
Lloyddale Dried	58.50	.129	6.50	.30	2.50	.70	.50	.745	3.50	
Lloyddale Natural	51.48	.114	5.72	.26	2.20	.62	.44	.656	3.08	12.00

5. LABOR AND WAGES

a. Labor Relations

Membership in the union was 98.3% of the eligible employees. This is an increase of 1.6% over the previous year. The turnover in labor was quite large, due to men quitting to work elsewhere, and personnel being transferred to other properties as the development program neared completion, Employee relations were excellent throughout the year, with all minor complaints being settled locally. Meetings with the local grievance committee averaged one per month. No formal grievances were filed.

b. Employment

	1953	1952
Number of Men Beginning of Year	137	162
Added During Year	25	36
Separations	28	61
Total End of Year	134	137
Avg. No. of Men as per Dec. Labor Statement	129	112

Ten men quit to work elsewhere, 11 men were transferred to other properties, 2 men entered the Armed Forces, 2 men were retired, 1 died, 1 man was put on the inactive list, and 1 man was laid off. Twenty four men were hired and 1 man was transferred from other properties.

c. Statement of Wages

During the year 8% of the total labor was charged to E & A CC-505, compared with 42% in 1952. A comparison of the average hourly and daily wage, excluding E & A labor, is shown below.

Year	Per Hour	Per Day
1953	2.377	19.02
1952	2.038	16.30

Several wage adjustments were made during June and July, bringing the company account rate of job class 14 to $2.23½ per hour or $17.88 per day. At the end of the year the average contract miner's wage rate was $2.495 per hour, or 11.5% above the company account rate.

The retroactive wage adjustment, due to the employees as a result of the wage contract with the union, was paid on February 11, 1953. The average payment was $391.00 to 172 employees.

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6. SURFACE

a. Buildings

There was no construction of new buildings during the year, and only normal repairs were required to keep the existing buildings in good condition. Two stokers were purchased and placed in service, one, a new stoker, in the shafthouse, and another reconditioned one was placed in the enginehouse to eliminate hand firing. A new cooling pond was poured to replace the old one which was leaking badly. The water leaking from the old cooling pond was running into the timber tunnel, shaft, and enginehouse basement. Early in the year while the ground was still frozen, new steel sets were used to reline the timber tunnel replacing the old wood sets which were badly rotted.

b. Stocking Grounds

Some additional grading and track layout work was done to provide better spotting facilities for loading purposes. The two trestles to the east of the shaft were lengthened to provide additional room for the 1953-54 stocking season. In order to prevent the contamination of stockpiled ore during the loading season, part of the loading sollar was renewed, using slabs from a local sawmill.

7. UNDERGROUND

a. Development

At the close of 1952, the 10th Level drift had reached a point 92' east of the winze shaft plat. Approximately 1350' of drifting for the development of the 10th Level was completed in May. Three crosscuts were driven to the south on 150' centers to intercept the ore and secure the maximum advantage for tramming and ventilation purposes. The west crosscut was intended to cut the standard deposit north of the main dike, however the dike had shifted to the north and cut off the ore at a much higher elevation. The center and east crosscuts intercepted the sulphurous deposit south of the dike and development for mining purposes was started as soon as each crosscut was completed. Due to the shape of this deposit, somewhat elliptical near the 9th Level elevation and tapering to a point just below the 10th Level, it was developed to permit mining by two lifts. The transfer sub-level being 50' vertically from the 10th Level. The area above the transfers was developed for the sub-level stope method of mining, while the area below the transfers will be caved from top timber transfers upon completion of mining above. By the end of the year, development for four stope areas had been completed and they were in full production. The stope areas and pillars are so placed that maximum recovery of Lloyddale grade can be effected before dilution to Silica grade takes place. A 30' floor pillar was left to support the 9th Level. It will eventually cave and be recovered. This pillar is supported by a pillar running east and west in the center of the deposit. Stope areas were developed on the north and south sides of this central pillar, and on each end of the deposit.

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7. UNDERGROUND(CONT'D)

a. Development (cont'd)

Preliminary development in the standard deposit north of the dike, indicated that the ore was cut off by a local roll in the dike at a much higher elevation than had been indicated by diamond drilling. In order to permit a more rapid development of the sulphurous deposit, all development work in the standard deposit was postponed until production was obtained from the sulphurous deposit.

b. Mining

In 1952 all mining above the 9th Level was stopped during the period in which the winze shaft was being sunk to the 10th Level elevation. Late in 1952 mining above the 9th Level was resumed in a series of small pillars, left between the old workings. In August 1953, all mining above the 9th Level was stopped due to the uncertainty of maintaining a favorable grade of ore.

As the development work above the 10th Level progressed, stoping areas were opened up and production resumed as rapidly as possible. In November two stopes were in full production and two others were being opened. By December the production approached the maximum limit as governed by hoisting of loaded cars in the winze. It should be mentioned that the depth of the winze is about 300 feet from the 8th Level to the 10th Level. The record hoist per shift amounts to 115 cars or 460 tons, however, the average for 3 shifts is 266 cars or 1066 tons. During the coming year with the need of handling supplies, timber, rock, etc., the overall average will probably hit about 70 - 80 cars per shift.

c. Timbering

There was a great deal more timber used than in 1952 due to the different type of operation that was being carried out. In 1952 very little mining or development work was done, while in 1953 a large amount of development work was carried out.

Steel sets were used where timbering was necessary on most of the 10th Level work, because of the ease of handling, strength, and the longer life it has over timber.

Statement of Timber Used

	Lineal Feet	Avg. Price per Foot	Amount 1953	Amount 1952
Cribbing	32,422	.1019	3,302.34	46.16
Stulls	15,596	.2195	3,422.92	1,601.60
H-Beams	1,348	.7554	1,018.26	2,525.46
Lagging	243,981	.0225	5,480.58	1,518.38
Poles	45,425	.0354	1,606.71	916.74
Total Expense, Timbering			14,830.81	6,608.34
H-Beams	323	.9784	316.02	-
Total Expense, E&A No. CC-505			316.02	-
Grand Total			15,146.83	6,608.34

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7. UNDERGROUND(CONT'D)

c. Timbering (cont'd)

Explosives

	Quantity Lbs.	Average Price	Amount 1953
Gelamite 1	2,250	.1745	392.63
Gelamite 1-X	43,714	.1689	7,384.44
Gelatin 60% Extra	13,744	.2146	2,950.52
Gelatin Hi-Pressure 60% 5x5	12,572	.2292	2,881.55
Hercomite 2	1,900	.1670	317.30
Hercomite 2-X	18,352	.1669	3,062.94
Total Powder	92,532	.1836	16,989.38
Fuse, Caps, Etc.			3,514.54
Total Expense, Development & Mining			20,503.92
Product - Tons		138,900	
Lbs. Powder per Ton of Ore		.666	
Cost per Ton of Powder		.122	
Cost per Ton-Fuse, Caps, Etc.		.025	
Cost per Ton-All Explosives		.148	
Gelamite 1-X	4,836	.2183	1,055.87
Gelatin 60% Extra	8,256	.1965	1,622.48
Gelatin Hi-Pressure 60% 5x5	478	.2347	112.20
Hercomite 2-X	6,648	.1652	1,098.06
Total Powder	20,218	.1923	3,888.61
Fuse, Caps, Etc.			1,046.54
Total Expense-E&A CC-505			4,935.15
Grand Total Explosives Used in Mine			25,439.07
Average Price per Pound for Powder			.1852

Note: The above figures have not been compared with the previous year, 1952, due to the dissimilar operations that were carried out during these years.

d. Pumping

During the year the mine pumping system was converted to a completely automatic system. This system incorporates three automatic pumping systems working in relays (10th Level to 8th Level, 8th Level to 5th Level, and 5th Level to surface). Each pumping station has a spare pump and an extra sump, which is readily available, if any electrical or mechanical failure occurs. In the check shanty, on surface, there are recording instruments which give the accumulative hours of each pump's operation. During week-ends, or holidays, the policemen keep track of the pump operations and advise the electrician of any failure. The entire system has been very satisfactory, and very little emergency attention has been necessary.

During the first 6 months of the year, prior to the automatic system, 32 man shifts per week were required to operate the 3 pumping stations. Since July 1, 1953, the operational labor has been cut to less than 2 man shifts per week, resulting in a very substantial saving.

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7. UNDERGROUND(CONT'D)

d. Pumping (cont'd)

Since the present pumping system has been in operation (July 1st), the average rate has amounted to 220 G.P.M. This figure is slightly higher than the average for a similar period in 1952.

8. COST OF OPENING, EQUIPPING, DEVELOPING AND OPERATING

a. Comparative Mining Costs

	1953	1952
Product - Tons	138,900	85,365
Underground Costs	4.040	3.095
Surface Costs	.920	.906
General Mine Expense	1.143	.975
Cost of Production	6.103	4.976
Depreciation	.567	.367
Taxes	.064	.061
Loading and Shipping	.116	.079
Total Cost at Mine	6.850	5.483
Budget Estimated at Mine	6.276	4.458
No. of Shifts and Hours	2-1-8 hr 248-3-8 hr	7-1-8 hr 29-2-8 hr 148-3-8 hr
Total Operating Days	250	169
Average Daily Product	556	462

Proportion of Labor and Supplies

	1953	Per Cent
Labor	608,423.58	80
Supplies	152,520.58	20
Total	760,944.16	100

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8. COST OF OPENING, EQUIPPING, DEVELOPING AND OPERATING (CONT'D)

b. Detailed Cost Comparison

	1953		1952	
	Amount	Per Ton	Amount	Per Ton
Retroactive Wage Adjustment	8,709.90	.063	13,689.09	.160
1. Exploring in Mine	-	-	1,906.72	.022
2. Sinking in Shaft	-	-	-	-
3. Development in Rock	18,914.69	.136	3,805.89	.045
4. Development in Ore	103,673.66	.748	18,179.91	.213
5. Stoping	104,516.60	.754	76,724.28	.899
6. Timbering	77,839.55	.561	25,145.23	.295
7. Tramming	115,345.35	.832	52,554.49	.616
8. Ventilation	5,510.28	.040	2,600.88	.030
9. Pumping	11,231.95	.081	13,932.66	.163
10. Compressors & Air Pipes	21,488.59	.155	10,539.85	.123
11. Back Filling	-	-	-	-
Additional Wage Adjustment	1,551.08	.011	-	-
12. Underground Superintendence	29,317.70	.211	13,205.57	.155
13. Cave-in or Fire in Mine	-	-	-	-
14. Maint.-Compressors & Power Drills	2,405.61	.017	660.50	.008
15. Scrapers & Mech. Loaders	23,718.28	.171	10,266.30	.120
16. Tramming Equipment	18,951.01	.137	13,432.73	.157
17. Pumping Machinery	17,119.72	.123	7,569.87	.089
Total Underground Costs	560,293.97	4.040	264,213.97	3.095
18. Hoisting	45,448.92	.328	21,752.39	.255
19. Stocking Ore	13,212.06	.095	15,636.32.	.183
20. Screening-Crushing at Mine	177.34	.001	16.95	-
21. Dry House	12,664.43	.091	6,847.43	.080
22. General Surface Expense	25,046.70	.181	11,234.05	.132
23. Maint.-Hoisting Equipment	16,095.17	.116	11,577.21	.136
24. Shaft	9,991.45	.072	1,880.68	.022
25. Top Tram Equipment	1,778.31	.013	2,326.74	.027
26. Docks, Trestles & Pockets	1,625.80	.012	3,381.72	.040
27. Mine Buildings	1,507.34	.011	2,662.70	.031
Total Surface Costs	127,547.52	.920	77,316.19	.906
28. Geological	305.33	.002	630.21	.007
29. Mining Engineering	7,638.80	.055	3,744.97	.044
30. Mech. & Electrical Engineering	2,592.47	.019	1,386.81	.016
31. Analysis & Grading	12,699.71	.092	8,702.46	.102
32. Safety Department	2,370.98	.017	818.63	.010
33. Telephone & Safety Devices	7,785.90	.056	3,510.00	.041
34. Local & General Welfare	1,575.15	.011	1,079.89	.013
35. Spec. Exp.-Pensions & Allowances	5,702.82	.041	3,695.89	.043
36. Ishpeming Office	19,479.29	.140	8,479.82	.099
37. Mine Office	26,670.63	.193	13,323.58	.156
38. Insurance	13,634.33	.098	4,344.67	.051
39. Personal Injury	6,252.71	.045	6,128.79	.072
40. Social Security Taxes	13,746.68	.099	8,447.73	.099
41. Employees Vacation Pay	27,642.44	.200	18,593.44	.218
42. Research Laboratory	23.83	-	377.28	.004
Holiday Pay	10,408.24	.075	-	-
Total General Mine Expenses	158,529.31	1.143	83,264.17	.975
Cost of Production	846,370.80	6.103	424,794.33	4.976

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8. COST OF OPENING, EQUIPPING, DEVELOPING AND OPERATING (CONT'D)

b. Detailed Cost Comparison (cont'd)

	1953		1952	
	Amount	Per Ton	Amount	Per Ton
43. General Supplies	19,936.42	.144	12,155.76	.142
44. Iron & Steel	9,933.30	.072	4,513.55	.053
45. Oils & Greases	1,898.47	.014	872.57	.010
46. Machinery Supplies	24,143.41	.174	10,855.63	.127
47. Explosives	20,503.92	.148	5,311.85	.062
48. Lumber & Timber	21,265.51	.153	8,852.83	.104
49. Fuel	4,295.32	.030	2,966.56	.035
50. Electric Power	41,163.52	.297	22,764.77	.267
51. Sundries	9,380.71	.068	8,244.73	.096
Total Supplies	152,520.58	2.100	76,538.25	.896

In a comparison of costs, it will be noted that there has been increases in the cost of almost all items. These increases are due to the increased production, the large amount of development work that was done as compared with 1952, the increased wages paid, and the general increase in the cost of supplies.

There were decreases in the cost of some items, which by their very nature would be less because of the increased production. The decrease in pumping is due, in a large part, to the automatic pumping system that was installed to eliminate a high labor charge.

E. & A. No. CC-505

In January 1952, work was started to develop the 10th Level under E. & A. No. CC-505, with original estimate indicating a capital outlay of $236,200.00. A number of plant and equipment changes were made that were not included in the original estimate.

Until November 1951, when the decision was made to develop the 10th Level, plans had been made to abandon the property early in 1952. Because of the abandonment plans, much of the repair, maintenance, and modernization work that would have been done in the years from 1950 to 1952 was not done. When the decision was made to develop the 10th Level, it was necessary to make a lot of improvements that would help to keep costs down and to rejuvenate most of the mining equipment. A considerable amount of money was spent in the purchase of new equipment to replace old worn out items. The major projects, carried out in 1953, were the completion of the 8th Level trench, putting the automatic pumping system, including pumps, control equipment, and sumps, into operation, improvements on surface buildings, new shop equipment, and major repairs to the main shaft.

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8. COST OF OPENING, EQUIPPING, DEVELOPING AND OPERATING (CONT'D)

b. Detailed Cost Comparison (cont'd)

Detailed Statement of Expenditures, E. & A. No. CC-505

Item	Authorized	Expended	Unexpended
General Mine Expense	138,000.00	134,188.97	3,811.03
8th Lev. Eng. House & Rock Drift.	5,950.00	5,914.79	35.21
8th Lev. Trench Development	9,000.00	9,332.52	332.52
Hoist Foundation & Installation	14,100.00	14,035.91	64.09
Sinking Winze	81,000.00	80,921.86	78.14
10th Level Drifting	99,950.00	99,601.15	348.85
10th Level Pump - Valves	620.00	619.00	1.00
Sumps & Pumps	7,700.00	5,884.74	1,815.26
Surface Water Supply Line	1,630.00	1,624.16	5.84
8th Level Sump	12,500.00	12,453.46	46.54
Equipment	15,600.00	16,093.11	493.11
Ad Valorem Taxes	5,000.00	4,920.00	80.00
Additional Wage Adjustment	15,800.00	15,794.15	5.85
Warehouse Overhead	3,500.00	3,491.71	8.29
Laboratory Expense	1,200.00	1,195.23	4.77
Social Security Taxes	6,500.00	7,074.21	574.21
Total	418,050.00	413,144.97	4,905.03
Charged to Inland Steel Co. (Surface Water Supply			1,206.61
Total	418,050.00	413,144.97	3,698.42

9. TAXES

The following shows a comparison of the taxes paid in 1953 and 1952.

	1953		1952	
Lloyd and Section 6	Valuation	Taxes	Valuation	Taxes
SW¼ of NW¼ of Sec. 6,47-27, 40 A.)				
N½ of SW¼ of Sec. 6,47-27,81.67 A)				
N½ of SE¼ of Sec. 6,47-27,80 A.)	90,000.00	1,922.51	100,000.00	2,100.00
Pers., Ore in Stk., Supplies & Eqt.	260,000.00	5,553.91	365,000.00	7,665.00
Total by State Tax Commission		7,476.42		9,765.00
Collection Fee		74.76		97.65
Total	350,000.00	7,551.18	465,000.00	9,862.65
C.C.I. Co. Misc. Lands				
S½ of NE¼ of Sec. 6,47-27 80 A.	550.00	11.74	550.00	11.54
SE¼ of NW¼ of Sec.6,47-27Exc.R/W41.08A.	550.00	11.75	550.00	11.55
S½ of SW¼ of Sec. 6,47-27, 81.26 A.	900.00	19.21	900.00	18.90
SW¼ of SE¼ of Sec. 6,47-27	550.00	11.75	550.00	11.55
SE¼ of SE¼ of Sec. 6,47-27	600.00	12.82	600.00	12.60
NE¼ of NE¼ of Sec. 19,48-27 40 A.	135.00	2.88	135.00	2.84
Total	3,285.00	70.15	3,285.00	68.98
Collection Fee		.70		.69
Total Lloyd & Miscellaneous	353,285.00	7,622.03	468,285.00	9,932.32
West Ishpeming				
Lot 4, Block 2	75.00	1.62	75.00	1.60
North Lake Location				
Store on Sec. 6, 47-27	1,000.00	21.58	1,000.00	21.21
Total Ishpeming Township	354,360.00	7,645.23	469,360.00	9,955.13
Tax Rate		2.13612		2.100

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9. TAXES (CONT'D)

	1953	1952	1951	1950	1949
Taxes per Ton Produced	.055	.117	.037	.034	.031
Taxes per Ton Shipped	.066	.140	.042	.041	.044

10. ACCIDENTS AND PERSONAL INJURY

According to Safety Department statistics for 1953, the Lloyd Mine was first in position ratings for Michigan and Minnesota underground properties. This is a great improvement over 1952 when the Lloyd Mine ranked third. It should also be mentioned that it is the first time the Lloyd Mine has held first place since 1928. This improved record also resulted in a saving in the personal injury account of $6,264.59 for the year 1953.

There were 2 compensable accidents in 1953 as compared with four in 1952. The following table shows a comparison of the severity and frequency rates of 1953 and 1952.

Year	Frequency Rate	Severity Rate
1953	19.10	0.202
1952	41.09	0.945
Average for U.G. properties 1953	29.11	1.708

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

The accidents are listed in detail as follows:

Accident No. 917, June 9, 1953, Nestor Korpi, Contract Miner. Injured had just completed spragging a set and had stepped to the drift floor from the stage plank, when a chunk fell from the breast, hit the stage plank, bounced off and hit injured on the left foot. Severe contusions left foot. Time lost - 11 days.

Accident No. 918, October 23, 1953, Angelo Corradina, Contract Miner. While jacking a cap into place on top of timber set, auger drill steel being used as a jack bar, broke, and piece of steel struck injured on right hand. Puncture wound and fracture right index finger. Time lost - 33 days.

11. POWER

A fixed minimum charge of $00.041 per KWH is charged for the first approximate 44,000 KWH used to provide facilities to meet a maximum demand load at any time. A charge of $00.0096 per KWH is made for all power consumed over the minimum rate. To the foregoing charges, an additional fuel adjustment is made based on the amount of power consumed against the cost of operating the steam and diesel plants during the billing period.

The following is a comparison of the power cost:

Year	K.W.H.	Cost	Rate
1953	2,259,033	$41,163.52	.01822
1952	2,193,600	$39,257.74	.01790

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1. GENERAL:

The production for the year 1953 was 1,159,749 tons and the shipments for the year were 1,189,142 tons. Shipments from the pocket and the stockpiles were started early in April and were continued until the 19th of November. Nineteen fifty three was the sixth consecutive year that the mine produced more than one million tons. The increase in production over the previous year was 144,545 tons. The mine operates on a 5 day per week schedule, excluding a small production crew working on Saturday day shift.

Mining operations continued on the 3rd, 5th, 6th, and 7th Levels. Production ceased on the 3rd and 5th Levels during the year; however, mining operations will begin in 1954 above the #7 Cross-cut on the 5th Level. Production by levels for the year was as follows: 3rd Level - 63,681 tons or 5.5% of the total for the mine; 5th Level - 3,442 tons or 0.2% of the total for the mine; 6th Level - 243,834 tons or 21.1% of the total for the mine; 7th Level - 846,778 tons or 73.2% of the total for the mine.

Exploration continued on the 3rd, 5th, and 7th Levels during the year. A total of 34 underground holes were drilled. The gross reserves were increased by 81,903 tons.

Labor relations were generally good throughout the year. There were no formal grievances. Informal discussion sessions with the local grievance committee solved all incidents or misunderstandings.

In March the pentice in the shaft was removed. Normal operations stopped March 7th; all necessary shaft work was completed by March 24th and the mine resumed normal operations. Development was completed on the 8½ and 9½ Levels. The plats were nearly completed on the 8th and 9th Levels, and the footwall drift was begun on the 9th Level.

There was a decrease in the amount of underground water pumped to surface. In 1952 the mine averaged 463 gpm; whereas, in 1953 the amount was 452 gpm.

The cost of production decreased $.095 per ton as compared to the previous year, while the total cost at the mine including depreciation, taxes, loading and shipping costs, showed a slight increase of $.006 per ton. An average of 7.46 tons per man per day was produced during the year which is an increase of 0.73 tons per man per day over the previous year.

There were less compensable accidents during 1953 as compared to the previous year. The severity rate dropped for 10.952 in 1952 to .909 in 1953 and the frequency rate decreased from 55.80 in 1952 to 27.73 in 1953.

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2. PRODUCTION:

a. Production by Grade and Months:

Grade:	Product	Stockpile Overrun	Total	1952 Total
Mather	1,027,645	-	1,027,645	
Mather Special	130,090	2,014	132,104	
Total	1,157,735	2,014	1,159,749	1,015,204
Rock			74,686	112,486

Months:	Ore	Rock
January	87,287	4,917
February	85,120	5,819
March	42,722*	2,574
April	104,394	8,162
May	110,937	7,227
June	116,401	6,138
July	99,047	6,673
August	109,486	4,873
September	106,884	3,201
October	114,027	6,864
November	85,749	8,118
December	97,695	10,120
Total	1,159,749**	74,686

* Removal of shaft pentice.

** Total includes 2,014 tons, current year stockpile overrun pro-rated monthly.

b. Shipments:

	Pocket	Stockpile	Total	1952 Total	Increase
Mather	517,264	392,064	909,328	673,333	
Mather Special	88,846	190,968	279,814	151,018	
Total	606,110	583,032	1,189,142	824,351	364,791

The north and center stockpiles were loaded out by the end of the shipping season. These piles developed an overrun of 2,014 tons. The south pile was not entirely cleaned up this year.

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2. PRODUCTION: (Continued)

c. Ore Statement:

	Mather	Mather Special	Total	1952 Total
On Hand January 1, 1953	164,504	147,710	312,214	121,361
Output for Year	1,136,290	21,445	1,157,735	1,005,085
Transfers	108,645	108,645	- - -	- - -
Overruns	- - -	2,014	2,014	10,119
Total	1,192,149	279,814	1,471,963	1,136,565
Shipments	909,328	279,814	1,189,142	824,351
Balance on Hand	282,821	- - -	282,821	312,214
Increase in Output			154,664	135,301
Decrease in Ore on Hand			29,393	
Increase in Ore on Hand				190,853

Working Schedule:

1953 - 3-8 hr. shifts, 5 days per week, Jan. 1st to Dec. 31st.
(Excluding small production crew, Saturday, Day shift)

1952 - 3-8 hr. shifts, 5-2/3 days per week, Jan. 1st to May 31st.
3-8 hr. shifts, 5-1/2 days per week, June 1st to Sept. 30th.
3-8 hr. shifts, 5-1/3* days per week, Oct. 1st to Dec. 31st.
(Excluding small production crew, Saturday, afternoon shift.)

1951 - 3-8 hr. shifts, 6 days per week, Jan. 1st to Mar. 31st.
3-8 hr. shifts, 5-2/3 days per week, April 1st to Dec. 31st.

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.

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2. PRODUCTION: (Continued)

d. Division of Product by Levels and Months:

Months	Third (1750') Level	Fifth (2050') Level	Sixth (2200') Level	Seventh (2400') Level	Total	Rock
January	7,842	1,743	27,012	50,538	87,135	4,917
February	10,197	1,699	19,544	53,532	84,972	5,819
March	4,691		8,530	29,427	42,648	2,574
April	9,379		25,011	69,823	104,213	8,162
May	8,860		23,256	78,628	110,744	7,227
June	6,972		20,916	88,311	116,199	6,138
July	4,944		17,798	76,133	98,875	6,673
August	2,186		24,045	83,065	109,296	4,873
September	3,201		26,675	76,823	106,699	3,201
October	4,553		21,628	87,648	113,829	6,864
November	856		12,840	71,904	85,600	8,118
December			16,579	80,946	97,525	10,120
	63,681	3,442	243,834	846,778	1,157,735	74,686
Current Year Stockpile Overrun					2,014	
					1,159,749	

e. Production Delays:

After the night shift on March 6th normal operations were halted; the pentice section in the shaft had to be removed. Shaft sets, cage and skip runners, counterweight pipe, air line column, and sheeting were installed through the section from which the pentice was removed. On March 24th the required shaft work was finished. A total of 13 days was lost, which resulted in a loss of production of approximately 60,000 tons.

On April 13th the cage hoist motor-generator set burned a bearing causing a 14 hour delay.

3. ANALYSIS:

a. Average Mine Analysis on Output:

Grade	Iron	Phos.	Silica	Sulphur
Mather	57.86	.100	9.87	.136
Mather Special	57.23	.094	9.73	.600

The Mather Standard ore average iron analysis was above that of the previous year and the silica analysis was lower, but the sulphur analysis increased slightly. The sulphur and silica analysis increased this year for the Mather Special ore; however, the iron analysis was greater than that of 1952.

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3. ANALYSIS:
(Continued)

b. Average Analysis of Shipments:

Grade	Iron	Phos.	Silica	Mang.	Alum.	Sulphur	Lime	Mag.	Loss	Moist.
Mather	57.60	.103	10.25	.37	3.09	.115	.41	.61	2.16	11.45
Mather Special	57.00	.101	10.00	.36	3.12	.302	.92	.62	2.83	11.79

c. Average Analysis of Ore in Stock: (Natural)

Grade	Tons	Iron	Phos.	Silica	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
Mather	282,821	51.15	.094	8.92	.32	2.62	.59	.58	.126	1.95	11.30

4. ESTIMATE AND ANALYSIS OF ORE RESERVES:

The ore reserves for all areas of the mine above the 7th Level in Section 2, 47-27 total 1,965,500 tons. In addition, 130,930 tons in Section 1, 47-27 are included in the Mather Mine "A" Shaft estimate as of December 31, 1953. Ore reserves below the 7th Level total 1,360,815 tons as shown by Diamond Drilling and 318,607 tons by Underground Development.

This estimate indicates a gross gain of 81,903 tons as compared with a gross loss of 226,081 tons in 1952.

Net Total December 31, 1952	4,851,336*
Net Total December 31, 1953	3,775,852
Net Loss in Reserves	1,075,484
1953 Production	1,157,387**
Gross Gain in Reserves	81,903

* Section 1 tonnage was omitted from the net total on the 1952 annual report.

** This tonnage excludes the 2,362 tons of Mather Mine "B" Shaft ore, which was hoisted by the Mather Mine "A" Shaft.

Expected Average Natural Analysis of Ore Reserves

Grade	Tons	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
Mather - Surface Diamond Drilling.....	1,360,815	53.15	.122	5.08	0.25	2.62	.58	.60	.014	1.97	12.50
Mather - Underground Development	2,415,037	51.50	.100	8.75	0.20	2.45	1.00	.50	.110	2.25	11.50
	3,775,852										

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

There was a gross increase of 415,540 tons in reserves as indicated by underground development. The increase was from two main areas; the main ore body east of the Mather Fault, and the westward trending ore body over the 7th Level #1 Cross-cut.

The decrease in surface diamond drilling of 333,637 tons occurred when reserves in D.D.H. #40 were included in the underground development estimate. Thus, total gross reserves were increased 81,903 tons during the year.

The tonnage and analysis figures shown in the preceding table are the same as the figures that were turned in to the Michigan State Tax Commission.

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5. LABOR AND WAGES:

a. Employment:

There was a loss of 28 men with 89 additions and 117 separations. Of the additions 84 were new men, 3 were transfers from other mines, and 2 were transfers from the General Storehouse. Of the separarions 88 quit, 7 joined the service, 6 were discharged, 1 died at home, 4 retired, 10 transferred to other mines, and 1 transferred to the General Roll.

Number of Men 1/1/53.....	748
Added to Roll During the Year.....	89
Total.....	837
Separations.....	117
Total on Payroll 12/31/53.....	720
Average Number of Men as per December Labor Statement.....	657

b. Statement of Wages:

	1953	1952
Average Wages Per Day:		
Surface	$17.87	$16.13
Underground	19.22	17.97
Total	$18.94	$17.58
Average Wages Per Month (20½ Days):		(20½ Days)
Surface	$361.87	$326.63
Underground	389.20	363.89
Total	$383.54	$356.00
Tons Per Man Per Day:		
Surface	35.91	31.93
Underground	9.42	8.53
Total	7.46	6.73
Labor Cost Per Ton:		
Surface	$ .498	$ .505
Underground	2.041	2.107
Total	$2.539	$2.612

c. Labor Relations:

Labor relations were satisfactory during the year. There were no formal grievances presented by the union and all incidents or misunderstandings were disposed of at informal discussion sessions with the local grievance committee.

The manpower situation was less favorable. There was a general shortage of men and this was especially so in the skilled miner class. The housing problem for this area has eased somewhat, but it hasn't come to be entirely satisfactory.

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6. SURFACE:

Buildings:

Maintenance of buildings was of a routine nature during the year, consisting mainly of painting the garage, shops, warehouse office, and a portion of the engine house.

Headframe and Trestles:

The headframe equipment operated without any serious delays throughout the year. To provide additional clearance between the head sheave and skip when in the dump position, the dump scroll was lowered 3' 4". The Kennedy-Van Saun pan feeder was completely overhauled during the year and a new butterfly door was installed below the feeder. All other repairs were of a routine nature.

Stocking:

Stocking of ore with the trestle cars continued with very few delays. Presently three old style and two new style cars are in operation.

Parking Area:

The parking area south of the engine house was paved, primarily to prevent dust from contaminating the cooling pond water.

Cribbing Framer:

A machine for cutting all tamarack cribbing at Mather Mine "A" and "B" Shafts was operated successfully during the year. It gives a much improved job over the hand method and at a rate of 120 pieces per hour.

Engine House:

Enclosures were installed over the Hoistmen's stand to reduce noise and improve reception from the radio-transmitter set and cage phones. To reduce cleanup and improve appearance, hoods were placed over the hoist drums to prevent dirt and grease from dropping on floors and machinery.

Skips:

To increase the rope safety factor, an aluminum bale was fabricated in place of the original steel bale and installed on the south skip. Fabrication of an aluminum bale for the north skip was near completion as the year ended. In addition, both skip boxes were completely repaired and new liner plates were installed.

Underground Cars:

Over the past several years minor car repairs have been made underground, but no facilities were available to do a complete job. As a result practically all cars are in need of a complete overhaul. In September a two man crew was formed and a shop was set up in a storage building to completely overhaul the cars, and to make necessary revisions in design to improve operation. During the year sixteen cars were completely rebuilt.

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6. SURFACE: (Continued)

Shaft Rail:

As a result of the wear on skip rails it has been found necessary to replace all 80 lb. rail. Orders were placed for the necessary material and it is planned to replace the rails on weekends commencing in the Spring of 1954.

D.D.H. #65:

Microseismic studies were continued in D.D.H. #65. Observations did not indicate any substantial rock movements. In July the air flow reversed in the hole. This reversal is believed to have been caused by the change in air direction underground when the 7th Level was connected between Mather Mine "A" and "B" Shafts. In order to obtain further information on the progression of caving and as a correlation between recordings in D.D.H. #65, plans were completed to drill a long hole from the 1st Level to house a geophone over a large stope area.

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7. UNDERGROUND:

Shaft Development:

Preparations for the removal of the pentice were completed during March. Normal operations at the plant were stopped after the night shift on March 6th. The pentice section was removed and shaft sets, cage and skip runners, counterweight pipe, air line column, and sheeting were installed throughout the section from which the pentice was removed. All the necessary shaft work was completed on March 24th, and the mine resumed normal operations on March 25th.

1st Level:

A sump was driven on the skip road side 90' to the south. The purpose was to install an automatic Byron-Jackson four stage centrifugal pump on the 6th Level which will discharge into this sump. Another automatic pump will then pump from 1st Level to surface. By using an automatic pumping system maintenance and labor will be reduced.

3rd Level:

The 3rd Level produced 63,681 tons or 5.5% of the total mine production. Operations were ended in the #1 Cross-cut during July; about 12,000 tons were produced from this area during the year. Approximately 51,000 tons were produced from the #4 Cross-cut. The reserves in this area were depleted in November.

Diamond drilling from the -340' elevation, above the #7 Cross-cut on 5th Level, proved a substantial ore reserve above 3rd Level; therefore, main line development was begun to provide ventilation and to expedite the handling of supplies for developing this ore body. The #6, #8, and #9 Cross-cuts were developed, and mining from this area is scheduled for early next year. All production from above the 3rd Level will be transferred via an ore pass raise in the #8 Cross-cut to a crusher station above the #7 Cross-cut on 5th Level, and the crushed material will be trammed to the shaft on the 5th Level.

Underground holes #181 and #191 drilled from the breast in the #6 Cross-cut indicated the western extremity of the ore body, and holes #217 and #228 drilled from the #9 Cross-cut located the eastern extremity. Near the #8 Cross-cut, holes #194 and #206 intercepted the ore body and proved the anticipated structure from 3rd Level to above the 2nd Level elevation.

5th Level:

Production on 5th Level amounted to 3,442 tons or 0.2% of the entire mine output. This tonnage came from above the #7 Cross-cut; in February production ceased. Development of the new ore body above the #7 Cross-cut should be started early in 1954. This is the same ore body mentioned in the 3rd Level section of this report.

A crusher plant was installed at the loading point for the ore above the #7 Cross-cut. The ore pass raise will be lined with steel sets for 30' at the bottom and the top and then concreted in order to alleviate excessive wear.

The footwall drift was advanced to within 1,000' of the Mather Mine "B" Shaft. The Mather Mine "B" Shaft #5, #4, #3, and #2 Cross-cuts were turned to facilitate developing at a later date.

Underground holes #145, #171, #182, #215, and #216 continued to outline a high sulphur ore body in Section 1, 47-27. This exploration is discussed in the Mather Mine "B" Shaft report.

MATHER MINE "A" SHAFT
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7. UNDERGROUND: (Continued)

6th Level:

The tonnage for 6th Level was 243,834 tons or 21.1% of the total mine production. Because of depleted reserves, the production in 1953 was approximately one-half of the production in 1952. A further decrease in tonnage will occur in the coming year, because the producing areas will be reduced from five in 1953 to one in 1954.

The inter-bedded ore body over the #2 and #5 Cross-cuts yielded approximately 10,000 tons, with production terminated in July. Due to the high cost of production in the inter-bedded ore, no further development is planned for the immediate future. Operations in the #4 Cross-cut were concluded in October after 33,500 tons were mined. Production will continue into the next year in the #7 Cross-cut which has furnished about 184,000 tons during 1953. In November 75,000 tons were added to the estimated reserves in this area. This is a hanging wall ore body and the height of concentration above the 6th Level is not definitely known. In the #9 Cross-cut approximately 14,000 tons were produced; operations were completed in December.

7th Level:

The 7th Level produced 846,778 tons or 73.2% of the total mine output. There are eleven caving areas that produced the majority of this tonnage. The areas are over the #1, #2, #2 East, #4, #5, #6, and #7 Cross-cuts, and two caving areas north of the footwall drift. In addition, caving operations were carried on in the #7 and the #8 Cross-cuts, Mather Mine "B" Shaft. The areas over the #7 and #8 Cross-cuts were assigned to Mather Mine "A" Shaft for mining. The entire output was transported to the shaft by conveyor belt. A short tram by underground locomotive was required to bring a majority of the ore to the loading point of the belt; however, a substantial tonnage has been transferred to the loading end by direct scraping from caving areas over the loading end storage trench.

The area over the #1 Cross-cut produced 23,000 tons, which was mainly from development. It is anticipated that production from this area will continue throughout the coming year. Underground Diamond Drill Holes #172, #173, #179, #183, #184, #185, #193, and #207 indicated the southern limit and the continued westward extension of this ore body. Underground Diamond Drill Hole #212 which was drilled due south from the breast of #1 Cross-cut indicated a flattening of the footwall to the 3000 south co-ordinate where a major intrusive was encountered. Operations over #2 Cross-cut were considerably reduced toward the end of the year. A total of 160,000 tons were produced in 1953 from this area. Sub-caving over the #2 East Cross-cut was terminated after a production of approximately 15,000 tons. A total of 112,500 tons were mined from over the #4 Cross-cut. During August, excessive ground pressures halted operations over the #5 Cross-cut after a production of approximately 150,000 tons. Some of the remaining ore is being mined from the #6 Cross-cut and the rest will be recovered by 8th Level mining operations. Caving operations over the #6 Cross-cut produced 109,000 tons and it is anticipated that mining in the area will continue throughout most of the coming year. Mining over the #7 Cross-cut was confined mostly to development work with a production of approximately 19,000 tons. Underground Holes #195 and #205, which are west of the Mather fault in the #5 Cross-cut, and Underground Holes #222 and #223, which are east of the Mather fault in the #6 Cross-cut, have indicated that the dip from the 7th to the 8th Level is normal, and also have proven a substantial reserve of ore available for 8th Level mining.

The North Block Center, which is one of the caving areas north of the footwall drift, is an operation planned to recover some pillars left above the #4 Cross-cut on the 6th Level. This area produced 38,000 tons in 1953.

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7. UNDERGROUND: (Continued)

7th Level: (Continued)

The North Block East produced approximately 137,000 tons in 1953 and production will continue throughout most of next year. Additional diamond drilling from the 7th Level which has not been mentioned above consisted of Underground Holes #151, #157, #211, and #219 which were drilled east of the present mining operations for the purpose of outlining ore reserves for 8th Level mining. Operations over the #7B and #8B Cross-cuts, Section 1, Mather Mine "B" Shaft, which was assigned to Mather Mine "A" Shaft for mining produced approximately 44,000 tons from over the #7B Cross-cut and approximately 39,500 tons from over the #8B Cross-cut. Production will continue from both of these cross-cuts throughout the coming year.

Development operations increased during the year. In June the footwall drift between Mather Mine "A" and "B" Shafts was connected with good alignment and grade. The #7 North, and #7 South Cross-cuts were driven, and the #1, #5 North, and #6 Cross-cuts were extended. Extensive development work was carried on above all the cross-cuts. A short conveyor drift was started from above the #5 North Cross-cut to an ore raise discharging into the loading end storage trench of the main 7th Level conveyor belt. This project is an experiment to determine the feasability of using a conveyor belt to feed a centrally located crusher and belt loading station.

8th Level:

The cage road plat was opened up for a total of 201 feet south of the shaft. The plat was excavated 108 feet on the skip road side. All ore and rock will be dumped into an ore pass raise which will discharge into a trench on the 8½ Level. Hoisting will be done from the 8½ Level. Development of the footwall drift will commence in the first part of 1954.

8½ Level:

Pre-fabricated steel measuring pockets were installed. A storage trench 100 feet long, 9 feet wide, and 8 feet deep was practically completed. The bottom of the trench was lined with steel rails and concreted, and the sides of the trench were lined with steel rail.

9th Level:

Both the cage road and the skip road plats were opened up and completed during the year. Work progressed satisfactorily on the 9th Level sump. This sump will handle all mine water below the 6th Level. This will eliminate the pumps which are presently in use on the 7th Level. The pumping will be automatic and will lift the water to the 6th Level where additional pumps will lift the water either to the 1st Level or to surface. Development of the footwall drift was started and the heading was advanced 220' by the end of the year.

9½ Level:

Excavation and installation of a pre-fabricated steel measuring pocket was completed during the year. A storage trench which will handle all of the ore and rock from the 9th Level was also completed. Both of these installations are very similar to the 8½ Level installation.

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7. UNDERGROUND: (Continued)

Main Level Development:

The following table of main level development includes drifting on the 3rd, 7th, 8th, and 9th Levels:

	Timbered Ore Drift	Timbered Rock Drift	Naked Rock Drift	Total
NM 81 - 3rd Level	27'	1,707'	9'	1,743'
NM 81 - 7th Level	42'	2,259'	-	2,301'
NM 81 - 8th Level	-	389'	-	389'
NM 81 - 9th Level	-	322'	-	322'
	69'	4,677'	9'	4,755'

Track Cleaner:

Operation of the revamped track cleaner, manufactured by the American Mine Door Company, has proven successful in the removal of mud from underground haulage-ways. It is now run by a 5 HP D-C motor which receives the power from the battery on the underground locomotive. The flight conveyor was altered and the digging conveyor was lowered to increase the efficiency of mud removal. When the track cleaner is in operation, it averages about 1.5 cars per hour, and cleans drift at approximately 85 feet per hour. It would take 8 to 10 men to hand shovel a similar portion of drift. A three man crew operates the machine.

Roof-Bolting:

The results from roof-bolting to date are satisfactory. The intermediate scraping sub above 9½ Level was roof-bolted along with #3 sump drift which used expanded screen in conjunction with the bolts. With a systematic method of installing roof-bolts with expanded steel screen, a great advantage can be obtained in driving footwall drifts. Some thought is being given to advancing the 9th Level drift using roof-bolt support.

By reducing the feed for the drifter machines from 8' to 6', a two boom jumbo was converted into a machine which will be tested to determine its application in the roof-bolting operation. This jumbo will be used when roof-bolts are being installed in main level haulage drifts. At present stoper machines are being used in the roof-bolting operation on main levels as well as on sub-levels.

Steel Sets:

A heavier section for arch and circle steel sets is now being used to minimize drift repair work. Mather Mine "A" and "B" Shafts have gone exclusively to a 5'x 5"- 18.9 lb. arch set, and 5"x 5"- 18.9 lb. and 6"WF - 25 lb. circle sets. The light 6"WF - 15.5 lb. sets will eventually be eliminated when the present supply is depleted.

7th Level Conveyor:

Operation of the 7th Level conveyor belt was very successful with very few operating delays, and maintenance was held to a minimum. Since it was installed, the belt has handled 1,148,841 tons of ore.

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7. UNDERGROUND: (Continued)

Rotary Drilling:

The CP 555 Rotagur is performing the majority of our rotary drilling. It is rated at 12.5 H.P., and its drilling speed is much greater than previous rotary machines. The overall length is 64" which increases its maneuverability in circular steel drifts.

Experiments were conducted with a CP 555 Rotagur having a CP water swivel. Type EX 3' diamond drill rods were used. When this type machine drilled in hard ground, it was observed that in some instances the penetration was faster than the standard wet percussion type drilling. The bits used were the 2-3/8" Kennametal Drag Bit and the Kennametal RDC with an EX threaded shank. With a properly designed bit harder ground can be drilled with this wet rotary machine, but to date the present bit design is not satisfactory.

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7. UNDERGROUND: (Continued)

Statement of Timber Used - All Operations

	AVE. PRICE PER FOOT	AMOUNT 1953	AMOUNT 1952
Cribbing	.10134	$ 16,782.02	$ 12,815.24
Stulls	.32356	30,506.16	4,110.84
Total	.18196	$ 47,288.18	
Total 1952	.12137		$ 16,926.08
	Per 100'		
Lagging	2.103	$ 27,758.37	$ 27,793.29
Poles	3.573	24,577.53	31,839.46
Slabs	-	-	716.10
Total	2.606	$ 52,335.90	
Total 1952	2.9109		$ 60,348.85
	Per Foot		
"H" Beams	.79652	$111,155.58	$ 45,676.66
"I" Beams	1.19968	16,771.49	5,267.99
Angle Iron	.05315	10,260.89	6,186.86
Misc. (Bolts, Plates, etc.)	.07674	7,319.51	5,620.46
Total		$145,507.47	
Total 1952			$ 62,751.97
Arched "H" Beams	1.97002	$ 45,267.10	$ 27,267.12
Circular "H" Beams	1.84105	186,595.80	106,140.15
"H" Beams	-	-	54,921.40
"I" Beams	2.5625	2,531.75	-
Misc. (Bolts, Plates, etc.)	.20	10,743.20	4,725.40
Total		$245,137.85	
Total 1952			$193,054.07
Steel Hat Sections	.45969	$ 16,118.51	$ 11,568.57
Total	.45969	$ 16,118.51	
Total 1952	.42024		$ 11,568.57
Minecrete Poles	.24567	$ 660.35	$ 280.02
Minecrete Blocks	-	445.22	106.78
Total		$ 1,105.57	
Total 1952			$ 386.80
"H" Beams	-	-	$ 367.38
Angle Iron	-	-	330.76
Flat Mild Steel	-	-	3,422.43
Misc. (Bolts, etc.)	-	-	54.40
Total		-	
Total 1952			$ 4,174.97
GRAND TOTAL INCLUDING STEEL & CONCRETE		$507,493.48	$349,211.31

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7. UNDERGROUND: (Continued)

Explosives:

The average price paid for explosives increased 3½% from $17.102 to $17.726 per hundredweight. The use of Hercomite #2 - 2" x 24" and Hercomite 1¼" x 16" for block cave undercutting was discontinued, and Hercomite 1¼" x 24" was substituted instead. Some economies were obtained by substituting Gelamite - 2x - 1¼" x 8" for 60% Gelatin Extra 1¼" x 8" used in rock drifting and raising. Experience indicates the same results are produced. High Pressure 60% Gelatin 5" x 5" was used exclusively for mill raise blasting in the caving and stoping operations.

The following table is a record of all explosives and supplies used on all operations during the year:

Record of Explosives - All Operations

	AVERAGE PRICE	AMOUNT 1953	AMOUNT 1952
Hercomite	16.686 cwt	$107,913.41	$ 87,337.69
60% HP Gelatin	22.832 cwt	25,983.01	15,215.02
60% Gelatin Extra	19.640 cwt	8,975.41	7,364.99
#147 E.P. Powder	25.500 cwt	127.50	-
Gelamite	17.820 cwt	694.99	16,787.60
Total	17.726 cwt	$143,694.32	
Total 1952	17.102 cwt		$126,705.30
Misc. Blasting Supplies (Fuse, Caps, Bags, etc.)		$ 74,730.58	$ 55,701.72
Total		$ 74,730.58	
Total 1952			$ 55,701.72
GRAND TOTAL		$218,424.90	$182,407.02
Product		1,157,387	(does not include 2,362 tons of Mather "B" ore)
Pounds of Powder per Ton of Ore		.537	
Tons of Ore per Pound of Powder		1.860	
Cost per Ton for Powder		.092	
Cost per Ton for Fuse, Caps, etc.		.043	
Cost per Ton for all Explosives		.135	

Pumping:

Pumping of underground water to surface continued on 3rd and 6th Levels throughout the year. Pumping slightly increased on 3rd Level from an average of 80 gpm in 1952 to 85 gpm in 1953. This is an increase of 5.8%. However, the volume of water pumped on 6th Level decreased from an average of 383 gpm in 1952 to 367 gpm in 1953. This is a decrease of 4.2%.

The water on the 7th Level is collected in two sumps. The water is then pumped to the 6th Level sumps where it is pumped to surface.

The mine discharge water is carried through a 16" pipe line and then by ditch to the Carp River, approximately two miles towards the west.

8. COST OF OPENING, EQUIPPING AND DEVELOPING:

TOTAL EXPENDITURES TO DECEMBER 31, 1953

	E&A REFERENCE	TOTAL AUTHORIZED	GROSS EXPENDITURES	CREDITS A/C ORE MINED IN DEVELOPMENT	NET EXPENDITURES	UNEXPENDED BALANCE	1953 EXPENDITURES
1. BUILDINGS AND EQUIPMENT:							
a. Main buildings	(10-10&19) (10-10-&19A)	280,000.00	279,990.27	-	279,990.27	9.73	-
b. Change house & shop equip	10-26	60,000.00	60,000.00	-	60,000.00	-	-
c. Initial shop equipment	(10-4/10-4A)	5,732.73	5,732.73	-	5,732.73	-	-
d. One 35 ton overhead crane	(10-9/10-9A)	8,894.94	8,894.94	-	8,894.94	-	-
e. Temporary equipment	10-18	15,000.00	14,079.62	-	14,079.62	920.38	-
f. Erecting &equipping storage building	31	20,900.00	20,900.00	-	20,900.00	-	-
g. Compressor plant	10-23/47	137,203.07	137,203.07	-	137,203.07	-	-
h. Hot milling equipment	43	2,871.20	2,871.20	-	2,871.20	-	-
i. Steam boiler & heating equip	52	58,958.60	58,958.60	-	58,958.60	-	-
j. Concrete plant	83	20,000.00	24,853.99	-	24,853.99	4,853.99	9,113.76
TOTAL BUILDING AND EQUIPMENT		609,560.54	613,484.42	-	613,484.42	3,923.88	9,113.76
2. SURFACE:							
a. Equipment:							
1. Temporary surface plant	10-3	31,130.00	26,506.28	-	26,506.28	4,623.72	-
2. Truck and tractor	10-1	18,575.00	18,289.42	-	18,289.42	285.58	-
3. Electric shovel	18	85,000.00	85,000.00	-	85,000.00	-	-
4. Top tram equipment	(10-24/10-24A) 70	171,000.00	167,636.22	-	167,636.22	3,363.78	-
5. Timber tunnel, tracks, pumphouse & sump	(10-20/10-20A)	58,000.00	57,867.78	-	57,867.78	132.22	-
6. Timber tunnel & yards	29/29-1	124,800.00	122,522.95	-	122,522.95	2,277.05	-
7. Mechanical additions - headframe	32	27,500.00	27,500.00	-	27,500.00	-	-
8. Crawler crane	51	12,000.00	12,000.00	-	12,000.00	-	-
9. F. W. D. truck	53	7,500.00	7,497.72	-	7,497.72	2.28	-
10. Spare armature for hoist motors and generator	49	14,747.00	14,747.00	-	14,747.00	-	-
11. Crawler mounted crane	58	12,500.00	12,524.01	-	12,524.01	24.01	-
12. International 4-ton truck	64	6,000.00	6,381.41	-	6,381.41	381.41	-
13. Willys 3/4-ton truck	67	2,100.00	2,114.84	-	2,114.84	14.84	-
14. Euclid 20-ton truck-used	68	6,342.08	6,342.08	-	6,342.08	-	-
15. Caterpillar Model D 8 tractor	78	17,804.66	17,841.26	-	17,841.26	36.60	-
16. F. W. D. truck	80	7,665.96	9,665.96	-	9,665.96	2,000.00	-
Total		602,664.70	594,436.93	-	594,436.93	8,227.77	-
b. General:							
1. Diamond drilling	9	81,000.00	80,965.78	-	80,965.78	34.22	-
2. Moving two houses	10-2	3,458.00	3,458.00	-	3,458.00	-	-
3. Drainage well	10-11/56	36,896.00	28,852.93	-	28,852.93	8,043.07	-
4. Road bldg., paving parking lot, etc	25	23,760.00	23,736.73	-	23,736.73	23.27	-
5. Surface test hole	61	80,000.00	77,494.49	-	77,494.49	2,505.51	1,850.96
6. Mine payroll machine	75	5,024.40	5,166.60	-	5,166.60	142.20	-
7. Diamond drilling	77	50,000.00	13,279.51	-	13,279.51	36,720.49	-
8. Diamond drill equipment	84	20,000.00	15,265.45	-	15,265.45	4,734.55	-
9. 1/2 cost of road between Mather A & B Shafts	85	10,000.00	3,634.64	-	3,634.64	6,365.36	743.51
10. 4 dwellings-Cliffs Realty	86	54,750.00	54,750.00	-	54,750.00	-	-
Total		364,888.40	306,604.13	-	306,604.13	58,284.27	2,594.47
TOTAL SURFACE		967,553.10	901,041.06	-	901,041.06	66,512.04	2,594.47

8. COST OF OPENING, EQUIPPING AND DEVELOPING: (Continued)

	B&A REFERENCE	TOTAL AUTHORIZED	TOTAL EXPENDITURES TO DECEMBER 31, 1953 GROSS EXPENDITURES	CREDITS A/C ORE MINED IN DEVELOPMENT	NET EXPENDITURES	UNEXPENDED BALANCE	1953 EXPENDITURES
3. SHAFT, HEADFRAME AND TRESTLE:							
a. Sinking in sand	10-15/10-15A	16,302.44	16,302.44	-	16,302.44	-	-
b. Sinking in rock (2,879 ft.)	10-16/10-16A	440,000.00	435,677.44	2,559.15	433,118.29	6,881.71	-
c. Shaft sets (2,870')	10-5/10-5A	160,975.45	159,754.21	-	159,754.21	1,221.24	-
d. Headframe foundation & ore trestle	10-21/10-21A	78,000.00	77,417.73	-	77,417.73	582.27	-
e. Headframe & trestle	10-7/10-7A	186,028.83	186,028.83	-	186,028.83	-	-
f. Extensions to permanent stockpile trestles	36/42/42-1/66	370,152.48	342,069.45	-	342,069.45	28,083.03	7,058.55
g. Headframe & powerhouse equip	10-22/10-22A	225,000.00	224,451.51	-	224,451.51	548.49	-
h. Electric equipment for cage & skip hoists	10-8	221,783.00	221,783.00	-	221,783.00	-	-
i. 1 cage hoist, 1 skip hoist	10-6	143,000.00	143,000.00	-	143,000.00	-	-
j. Elevator for headframe	10-12/10-12A	4,853.00	4,853.00	-	4,853.00	-	-
k. Spare double deck cage	37	7,000.00	3,134.75	-	3,134.75	3,865.25	-
l. Pinion brake for cage hoists	45	4,000.00	4,000.00	-	4,000.00	-	-
m. Crushing & screening plant in headframe	72	75,000.00	76,219.00	-	76,219.00	1,219.00	-
o. Bottom dump skips	76	40,000.00	40,000.00	-	40,000.00	-	-
TOTAL SHAFT, HEADFRAME AND TRESTLE		1,972,095.20	1,934,691.36	2,559.15	1,932,132.21	39,962.99	7,058.55
4. UNDERGROUND:							
a. Plant:							
1. Pumping-3rd Level	10-25/10-25A	55,000.00	53,738.88	-	53,738.88	1,261.12	-
2. Pumping plant-6th Level	39	227,823.06	227,823.06	-	227,823.06	-	-
3. 5th Level crusher & 9th Level crusher & conveyor	90	495,000.00	30,705.08	-	30,705.08	464,294.92	30,705.08
Total		777,823.06	312,267.02	-	312,267.02	465,556.04	30,705.08
b. Equipment							
1. Mining equipment	19	44,550.00	44,550.00	-	44,550.00	-	-
2. Mining equipment	28	51,700.00	51,700.00	-	51,700.00	-	-
3. Mining equipment	40	61,710.00	61,710.00	-	61,710.00	-	-
4. Mining equipment	41	28,050.00	28,050.00	-	28,050.00	-	-
5. Mining equipment	55	23,870.00	23,870.00	-	23,870.00	-	-
6. Mining equipment	62	30,000.00	29,596.10	-	29,596.10	403.90	-
7. Mining equipment	65	60,000.00	60,000.00	-	60,000.00	-	-
8. Haulage equipment	10-29/10-29A	110,000.00	110,000.00	-	110,000.00	-	-
9. Haulage equipment	23	90,420.00	89,732.02	-	89,732.02	687.98	-
10. Haulage equipment	46	84,755.00	84,755.00	-	84,755.00	-	-
11. Haulage equipment	59	46,000.00	45,616.42	-	45,616.42	383.58	-
12. Haulage equipment	82	24,480.00	23,522.39	-	23,522.39	957.61	-
13. Underground sub-stations	38	14,300.00	14,300.00	-	14,300.00	-	-
14. Main ventilating fan	48	24,200.00	17,536.23	-	17,536.23	6,663.77	-
15. Twelve scraper hoists	50	33,000.00	32,980.80	-	32,980.80	19.20	-
16. Scraper hoist	54	49,500.00	49,500.00	-	49,500.00	-	-
17. Mining equipment	78	55,050.00	55,032.45	-	55,032.45	17.55	16,350.00
18. Electric cap lamps	88	22,000.00	22,584.20	-	22,584.20	584.20	1,058.22
19. Communications system	89	10,000.00	9,546.26	-	9,546.26	453.74	9,546.26
Total		863,585.00	854,581.87	-	854,581.87	9,003.13	24,838.04
c. Development:							
1. Main level development plats and pockets	10-28/10-28A/26 26A/27-27A/57/63 71/74	704,460.00	664,612.01	-	664,612.01	39,847.99	180,752.32

8. COST OF OPENING, EQUIPPING AND DEVELOPING: (Continued)

TOTAL EXPENDITURES TO DECEMBER 31, 1953

	E&A REFERENCE	TOTAL AUTHORIZED	GROSS EXPENDITURES	CREDITS A/C ORE MINED IN DEVELOPMENT	NET EXPENDITURES	UNEXPENDED BALANCE	1953 EXPENDITURES
4. UNDERGROUND:							
c. Development: (Continued)							
Drifting	10-27/24/26-26A 27B-27-27A/33/60 71/74/27C	2,308,911.20	2,272,105.21	80,404.67	2,191,700.54	117,210.66	310,026.14
Ventilation & 2nd outlet	26-26A/27-27A	53,900.00	40,955.57	-	40,955.57	12,944.43	-
Excavation & hoist installation	57/63/74	54,300.00	8,566.73	-	8,566.73	45,733.27	-
290' winze	57/63/74	30,085.00	39,568.14	-	39,568.14	9,483.14	3.00
Preparation of skip pit	57/63/74	56,400.00	46,058.98	-	46,058.98	10,341.02	3,387.06
Shaft sinking	57/63/74	479,525.00	554,224.06	-	554,224.06	74,699.06	55,390.46
Loading & discharge ends	71	100,000.00	76,318.43	-	76,318.43	23,681.57	-
2500' conveyor system	71	200,000.00	156,471.81	-	156,471.81	43,528.19	-
Pan, screen, crusher	71	50,000.00	49,131.81	-	49,131.81	868.19	-
Ventilation connection - 1,000 @ $25.00	71	25,000.00	19,249.32	-	19,249.32	5,750.68	-
2. Development & mining above levels	(24/26-26A/27C-27A 34)	203,728.80	194,487.12	49,921.83	144,565.29	59,163.51	-
3. Underground exploration	21/87	245,000.00	169,257.38	-	169,257.38	75,742.62	90,752.77
Total		4,511,310.00	4,291,006.57	130,326.50	4,160,680.07	350,629.93	640,311.75
d. Dewatering hematite workings	30	66,000.00	64,232.28	-	64,232.28	1,767.72	-
TOTAL UNDERGROUND		6,218,718.06	5,522,087.74	130,326.50	5,391,761.24	826,956.82	695,854.87
GRAND TOTAL BEFORE CONTINGENCIES		9,767,926.90	8,971,304.58	132,885.65	8,838,418.93	929,507.97	714,621.65
Plus 10% for contingencies		228,217.26	-	-	-	228,217.26	
GRAND TOTAL INCLUDING CONTINGENCIES		9,996,144.16	8,971,304.58	132,885.65	8,838,418.93	1,157,725.23	714,621.65
General expense	10-13	-	271,716.98	-	271,716.98	-	-
Maintenance	10-14	-	37,050.73	-	37,050.73	-	-
Building Roads & Landscaping	10-17	-	9,455.40	-	9,455.40	-	-
Total to Negaunee Mine Company Idle Expense		-	318,223.11	-	318,223.11	-	-
TOTAL		9,996,144.16	9,289,527.69	132,885.65	9,156,642.04	1,157,725.23	714,621.65

MATHER MINE "A" SHAFT
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8. COST OF OPENING, EQUIPPING AND DEVELOPING: (Continued)

Capital account expenditures amounted to $714,621.65, which brought the total at the end of the year to $8,838,418.93. This total figure does not include an additional $318,223.11 charged in a prior year to Negaunee Mine Company "Idle Expense". The inclusion of this amount brings the grand total to date to $9,156,642.04. "General Expense" and "Maintenance" for the past nine years have been charged into "Operating".

Total Charge-Offs	$1,061,565.43
Total Capital Account Charges as Above	714,621.65
Actual Net Decrease in Capital Account	$ 346,943.78

Pentice removal, plat development, main level development, and underground exploration accounted for 89.6% of the capital account expenditures for the year, or approximately $640,300. Underground equipment accounted for 7.8%, or approximately $55,500, surface projects accounted for 1.7%, or approximately $11,700 and extensions to permanent stocking trestles accounted for 0.9%, or approximately $7,000 of the capital account expenditures for the year.

The average cost per foot of main level drifting was $75.90 for the year. Main level development costs varied considerably and especially on the 7th Level where heavy ground was encountered frequently and spiling ahead and the installation of lining sets for added support was often necessary.

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8. COST OF OPENING, EQUIPPING, DEVELOPING AND OPERATING: (Continued)

The cost of production decreased $.095 per ton as compared with the previous year. A decrease in underground costs of $.219 per ton is due primarily to an increase of 0.73 tons per man per day over the previous year. The decrease in underground costs more than offsets an increase of $.028 per ton in surface costs and an increase of $.096 per ton in general mine expense.

The increase in depreciation amounted to $.058 per ton. Taxes increased $.018 per ton and the cost of loading and shipping increased $.014 per ton. These additional increases brought the total cost at the mine to $5.426 per ton, an increase of $.006 per ton over 1952.

		1953	1952
Product		1,159,749*	1,015,204
Underground Costs	(1)	3.069	3.288
Surface Costs	(1)	.403	.375
General Mine Expense	(1)	.751	.655
Cost of Production	(1)	4.223	4.318
Cost of Production (including Mather "B")	(2)	4.221	
Depreciation: Plant and Equipment	(1)	.135	.172
Development after 12-31-44	(1)	.166	.151
Pre-Production Development	(1)	.014	.023
Movable Equipment	(1)	.006	.008
Amort. of Defense Facilities	(1)	.073	.086
Allowance under Section 309	(1)	.508	.404
Taxes	(1)	.236	.218
Loading and Shipping	(2)	.054	.040
Total Cost at Mine	(2)	5.426	5.420
Budget - Estimated Cost Per Ton		5.132	5.234
Number of Shifts and Hours		242-2/3, 3-8 hr.	243, 3-8 hr.
Total 8 hour Operating Shifts		728	729
Number of Operating Days		242-2/3, 3-8 hr.	243, 3-8 hr.
Average Daily Product		4,779	4,178

Proportion of Labor and Supplies

Labor	(2)	$3,210,724.44	2.768/ton	57%
Supplies	(2)	2,392,191.80	2.063/ton	43%
Total Cost at Mine	(2)	$5,602,916.24	4.831/ton	100%

* The production total of 1,159,749 tons includes 2,362 tons of Mather Mine "B" Shaft production that was hoisted through Mather Mine "A" Shaft. Those costs indicated by (1) have been calculated using 1,157,387 tons as the divisor. Those indicated by (2) have been calculated using 1,159,749 tons as the divisor.

MATHER MINE "A" SHAFT
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8. COST OF OPENING, EQUIPPING, DEVELOPING AND OPERATING: (Continued)

Detailed Cost Comparison:	1953 Amount	1953 Per Ton	1952 Amount	1952 Per Ton
Exploring in Mine	7,113.17	.006	28,191.27	.028
Est. Wage Adjustment	22,403.28	.019	235,444.01	.232
Development in Rock	198,435.64	.171	241,764.27	.238
Development in Ore	249,543.97	.216	88,138.40	.087
Stoping	1,166,002.09	1.007	1,115,791.35	1.099
Timbering	911,006.51	.787	732,404.72	.721
Tramming	328,861.80	.284	317,932.45	.313
Ventilation	26,488.00	.023	18,246.01	.018
Pumping	42,739.06	.037	32,690.54	.032
Compressors and Air Pipes	107,088.40	.093	79,375.83	.078
Underground Superintendence	232,369.52	.201	157,202.59	.155
Cave-in, or Fire in Mine	585.26	.001		
Maintenance:				
Compressors and Power Drills			27,127.79	.027
Scrapers & Mechanical Loaders	187,634.66	.162	180,509.64	.178
Tramming Equipment	90,787.35	.078	61,502.90	.061
Pumping Machinery	25,547.66	.022	21,382.36	.021
Total Underground Costs	3,551,799.81	3.069	3,337,704.13	3.288
Hoisting	148,093.62	.129	123,312.18	.121
Stocking Ore	42,033.30	.036	46,897.44	.046
Screening-Crushing at Mine	36,060.49	.031	24,100.61	.024
Dry House	55,377.95	.048	45,566.29	.045
General Surface Expense	49,377.87	.043	29,783.95	.030
Maintenance:				
Hoisting Equipment	71,149.99	.061	54,137.92	.053
Shaft	10,077.38	.009	7,461.74	.007
Top Tram Equipment	20,151.83	.017	20,307.98	.020
Docks, Trestles & Pockets	16,480.59	.014	9,875.08	.010
Mine Buildings	17,745.51	.015	19,556.13	.019
Total Surface Costs	466,548.53	.403	380,999.32	.375
Geological	7,981.90	.007	5,904.31	.006
Mining Engineering	48,636.83	.042	36,755.50	.036
Mechanical & Electrical Engineering	28,380.24	.025	21,231.18	.021
Analysis and Grading	79,720.99	.069	65,169.13	.064
Safety & Personnel Departments	12,300.23	.011	7,664.42	.008
Telephones & Safety Devices	90,266.39	.078	43,399.39	.043
Local & General Welfare	7,374.24	.006	8,614.30	.008
Sp. Expense, Pensions & Allowances	29,346.57	.025	22,284.61	.022
Ishpeming Office	92,539.32	.080	67,666.03	.067
Mine Office	129,793.59	.112	102,659.91	.101
Insurance	61,158.06	.053	57,734.02	.056
Personal Injury	26,740.12	.023	64,768.77	.064
Social Security Taxes	70,802.47	.061	66,201.69	.065
Employees Vacation Pay	130,448.79	.112	95,121.04	.094
Holiday Allowance	54,231.40	.047		
Total General Mine Expense	869,721.14	.751	665,174.30	.655
COST OF PRODUCTION	4,888,069.48	4.223	4,383,877.75	4.318
*Mather Mine "B" Shaft Production	7,299.71	3.090		
COST OF PRODUCTION	4,895,369.19	4.221		

* See footnote on preceding page.

MATHER MINE "A" SHAFT
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9. TAXES:

Taxes for the year at the Mather Mine "A" Shaft totaled $272,675.32. The assessed valuation set for Section 2, 47-27 by Mr. Hardenberg, the state mine appraiser, remained the same, but the tax rate increased from $37.35 to $38.95 per thousand.

	1953			1952		
	VALUATION	RATE	TAXES	VALUATION	RATE	TAXES
Section 2, 47-27 Except the N 600' NE of NE and the Rights of Way						
Real	$4,470,000		$174,106.50	$6,025,000		$225,033.75
Personal	2,530,000		98,543.50	975,000		36,416.25
Total	$7,000,000	$38.9500	$272,650.00	$7,000,000	$37.3500	$261,450.00
Mather Mine Pipe Line, parcel in Section 3, 47-27	$ 650	$38.9500	$ 25.32	$ 650	$37.3500	$ 24.28
Total Mather Mine "A" Shaft (Sec. 2, City of Ishpeming)	$7,000,650	$38.9500	$272,675.32	$7,000,650	$37.3500	$261,474.28

	1953		
	TAXES	PER TON PRODUCED	PER TON SHIPPED
Total Operating	$272,675.32	$0.236	$0.229

	1952		
	TAXES	PER TON PRODUCED	PER TON SHIPPED
Operating	$221,835.28	$0.218	$0.269
Idle Expense	39,639.00	$0.040	0.048
Total	$261,474.28	$0.258	$0.317

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10. ACCIDENTS AND PERSONAL INJURY

There were 29 compensable injuries during the year, which occasioned lost time of 1,216 days. There were 9 non-compensable accidents, which added 30 days lost time, for a grand total of 1,246 days lost time. This resulted in a severity rate of 0.909 days lost per thousand man hours and a frequency rate of 27.73 injuries per million man hours, compared with Company averages for underground mines of 1.708 and 29.11. The total hours worked were 1,370,147 as compared with 1,361,937 last year, an increase of approximately 0.7%. The following is a brief summary of the compensable accidents.

DATE	NAME	NATURE OF INJURY
1/21/53	Layton Hupp	Fractured skull.
2/4/53	John Nault	Sprained back and right inguinal hernia.
2/17/53	Arthur Ayotte	Severe contusion-left arm, and crushing injury without fracture of the left chest.
2/17/53	Clarence Colombe	Severe contusion of right upper leg, lower right back, and lower right abdomen.
4/20/53	Albert Carlson	Amputation, middle right finger.
4/22/53	George Cardoni	Fracture & lacerations, ring finger, left hand.
4/25/53	David Pepin	Lacerations & contusion of scalp.
4/30/53	Andrew Guizzetti	Bruised right knee.
5/ 1/53	Robert Gustafson	Contusion right & left thigh, laceration upper & lower lip, broken tooth, contusion of nose.
5/ 5/53	Otto Talus	Severe sprain left foot. Incomplete fracture left outer malleolus.
5/ 6/53	Waino Mutka	Severe contusion, marked swelling of left leg.
5/ 9/53	Milton Cain	Traumatic amputation, tip of 5th right finger.
5/18/53	Lawrence Gaboury	Laceration of distal phalanx, right hand.
5/28/53	Wiljo Lahde	Laceration, right instep.
6/29/53	Dewey Tippett	Fractured right wrist.
8/11/53	Theodore Valeski	Abrasion, swelling left shoulder blade.
8/15/53*	Waino Mutka	Wrenched back.
10/ 1/53	Theodore Valeski	Severe strain - right knee, moderate strain - left knee.
10/ 2/53	Urho Nummela	Cut on instep,right foot.
10/12/53	Uno Kangas	Contusion of left hip region.
10/21/53	Arvo Nevala	Cut on left heel.
10/26/53	Matt Hangas	Bruised ribs on right side.
11/ 5/53	John Maki	Sprain to his right thumb & forefinger.
11/11/53	Albert Kamowski	Sprained right ankle, strained right middle finger & thumb, strained cervical spine.
11/19/53	Roy LeBoeuf	Contusion of the left thumb.
11/25/53	Ralph Coombe	Fractured right arm between elbow & hand.
12/ 1/53	Aloysius Ruesing	Strain of muscles of back.
12/14/53	Paul Hinsa	Severe contusion - calf of right leg.
12/23/53	Arne Luoma	Two rope burns on the right side and a bruise on the back.
12/23/53	Joel Pine	Compound fracture of index finger, right hand.

* Not listed by the Safety Department.

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11. POWER:

The total consumption of electric power was 17,431,000 kilowatt hours. This is approximately 2,897,000 kilowatt hours greater than the previous year. The reason is that a strike occurred in 1952 with 43-1/3 days lost; thereby the consumption was lowered. An average rate of $.0164 per kilowatt hour was based on an average monthly demand of 3,720 kilowatts. A rate of $.041 per kilowatt hour for the first 72 kilowatt hour per kilowatt of demand and $.0096 per kilowatt hour for all additional kilowatt hours, was the formula used to compute the power cost. A small fuel adjustment is added to the computed cost.

	CONSUMPTION K. W. HOURS	AVERAGE MAX. DEMAND	AVERAGE DEM. FACTOR	COST OF CURRENT	AVERAGE PRICE PER K.W. HOUR
1953	17,431,000	3720 K.W.	54%	$283,853.29	$.0164
1952	14,534,000	3120	54	230,920.07	.0159
1951	16,213,000	3130	60	248,362.70	.0153
1950	15,053,000	3100	56	235,302.80	.0156
1949	11,384,000	2460	53.5	171,034.60	.0150

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I. GENERAL:

The production for the year was 328,342 tons compared with 287,080 tons in 1952. The smaller production in 1952 is due to the industry-wide strike in June and July of that year. Production from Fee Lands was 86,179 tons or 26.2% of the total production. The working schedule was maintained at 2-8 hour shifts per day, 5 days per week throughout the year. Some improvement in efficiency over the previous year is reflected in the increase in tons per man per day from 5.98 to 6.51 in 1953.

Total shipments kept pace with production and totalled 324,150 tons. The stockpile carry-over at the close of the year was 38,520 tons compared with 34,328 tons in 1952.

There was no exploration drilling carried on in 1953 and for the first time in a number of years, development and mining failed to prove a substantial tonnage of new ore. The engineer's estimate of 3,666,154 tons shows a net gain of 11,224 tons in the reserves after deducting the 1953 production from the 1952 estimate. On the Fee Lands, additional ore was proven but the bulk of it was cancelled out by substantial decreases in the estimated reserves on Chase Lease #9 and #24.

Deep-well surface pumping has been continued and at the end of the year five were operating and two were down for repairs. Five wells were also in operation at the end of 1952. Surface well pumping averaged 1237 g.p.m. compared with 1173 g.p.m. in 1952. Underground water showed a decrease from an average of 1658 g.p.m. to 1621 g.p.m. in 1953.

The major new development underground has consisted of sinking the shaft to the 10th level elevation and 30' below. The shaft was sunk by stripping a pilot raise that was put up in the previous year. A small winze, located a short distance south of the shaft, was sunk to the 10th level in the previous year and a drift from the bottom of the winze to the shaft site comprised the preliminary development for the pilot raise and shaft sinking. At the close of the year the development for cleaning the skip pit was completed below the 10th level and work was underway excavating and constructing the loading pockets at the 10th level. Work on this project has been conducted on a 1-8 hour shift schedule per day throughout the year.

2. PRODUCTION, SHIPMENTS AND INVENTORIES:

a. Production

	Grade	Tons
1953	Morris	328,342
1952	"	287,080

The 1953 production came from Fee and Leased lands in the following proportions:

	Fee	Leased	Total
Production	86,179 tons	242,163 tons	328,342 tons
Percentage	26.2%	73.8%	100.0%
Percentage 1952	23.2%	76.8%	100.0%

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

a. Production (Cont'd)

A summary of the total production, Fee and Lease, since the Inland Steel Company took over the Morris Mine lease is listed below:

	Tons	Percent
Lease Ore Production 1933-1953	4,677,857	74.6
Fee Ore Production 1933-1953	1,591,905	25.4
Total	6,269,762	100.0

b. Shipments

Grade	Pocket	Stockpile	Total
Morris	206,025	118,125	324,150

Grade	Fee	Lease	Total
Morris	82,705	241,445	324,150

The following table shows the shipments for the past five years:

Year	Total
1953	324,150
1952	294,569
1951	353,704
1950	307,357
1949	256,749

Total shipments since Inland acquired lease in 1933 - 6,231,241 tons.

c. Ore In Stock December 31, 1953

Grade	Tons
Morris	38,520

d. Production by Months

	Days Worked	Average No. of Men	Tons Per Man Per Day	Production
January	21	211	5.66	24,210
February	20	208	5.99	23,090
March	22	205	5.91	25,376
April	22	204	6.08	25,146
May	21	205	6.52	25,934
June	22	205	6.84	28,681
July	23	209	7.13	30,417
August	21	210	6.43	25,430
September	21	204	6.66	26,526
October	22	203	6.99	28,821
November	20	201	6.85	24,935
December	21	200	6.75	27,108
Total	256	205	6.51	315,674
Stockpile Overrun				12,668
Total				328,342

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

e. Working Schedule

The mine operated 2-8 hour shifts per day 5 days per week.

f. Delays

There were no significant delays to operations during the year.

3. ANALYSIS:

a. Shipments

Grade	Tons	Iron	Phos.	Sil.	Mang.	Alum.	Sul.	Moist.
Morris	324,150							
Dried		55.54	.087	12.94	.50	2.70	.036	-
Natural		49.05	.077	11.43	.44	2.38	.032	11.69

b. Ore in Stock December 31, 1953 (Natural)

Grade	Tons	Iron	Phos.	Sil.	Mang.	Alum.	Sul.	Moist.
Morris	38,520	48.50	.068	13.15	.45	2.14	-	11.00

c. Ore Reserves - Expected Natural Analysis

Grade		Iron	Phos.	Sil.	Mang.	Alum.	Sul.	Moist.
Morris	3,212,758	49.06	.071	12.00	.44	2.25	.015	12.00
Hi-Sul	453,396	50.00	.094	10.00	.40	2.26	.398	11.00

4. ESTIMATE OF ORE RESERVES:

The estimated ore reserves after allowance for ore mined in 1953 shows only 11,224 tons of new ore developed. The bulk of the reduction in estimated reserves is in Chase Lease #9 and #24. In these areas, a substantial reduction in reserves was estimated above the 7th level elevation because of the large expense for development in comparison to recoverable tonnage and also due to water conditions. Additional tonnage will be added to the reserves with the development of the 10th level due to the fact that ore is only included to a depth of 50' below the 9th level for estimating purposes.

	Estimate 10- 1-52	Production 10-1-52 to 10- 1-53	Estimated Deducting Product	Actual Estimate 10- 1-53	Incr. or Decr. From 1952 Estimate
Chase Lease #26	26,140	-	26,140	26,140	-
Chase Lease #25	33,273	-	33,273	33,273	-
Chase Lease #24	210,315	8,184	202,131	150,672	51,459
Chase Lease #24 Hi-Sul	444,446	57,723	386,723	420,212	33,489
Chase Lease #9	2,246,707	178,783	2,067,924	2,027,545	40,379
Total Chase Leases	2,960,881	244,690	3,716,191	2,657,842	58,349
CCI Lands	993,348	81,982	911,366	975,128	63,762
CCI Lands Hi- Sul.	35,218	7,845	27,373	33,184	5,811
Total CCI Lands	1,028,566	89,827	938,739	1,008,312	69,573
GRAND TOTAL	3,989,447	334,517	3,654,930	3,666,154	11,224