

THE CLEVELAND-CLIFFS IRON COMPANY  
Ore Mining Department  
ANNUAL REPORT OF GENERAL MANAGER  
For Year Ending December 31, 1956

MS 86-100  
2027

#2027

THE CLEVELAND-CLIFFS IRON COMPANY  
ORE MINING DEPARTMENT

Manager's Annual Report Year 1956

INDEX

	<u>Page No.</u>
<u>Ishpeming District</u>	
Cliffs Shaft Mine	1-17
Humboldt Mine	18-42
Mather Mine "A" Shaft	43-71
Morris Mine	72-78
Ohio Mine	79-90
Republic Mine	91-121
Tilden Mine	122-131
<u>Negaunee District</u>	
Bunker Hill Mine	132-151
Cambria-Jackson Mine	152-170
Maas Mine	171-188
Mather Mine "B" Shaft	189-216
Pelletizing Plant	217-253
<u>Iron River District</u>	
Spies Mine	254
<u>Mesaba District</u>	
Agnew Mine	255-262
Alworth Mine	263-269
Canisteo Mine	270-290
Cushing Mine	291-292
Hawkins Mine	293-312
Hill-Trumbull Mine	313-335
Holman-Cliffs Mine	336-356
Sally Mine	357-361
Sargent Open Pit	362-372
Wanless Mine	373-380

1958  
151

Continued -

**RETURN TO  
ARCHIVES**

SEC. Da-3

FILE No. 19555

THE CLEVELAND-CLIFFS IRON COMPANY  
ORE MINING DEPARTMENT

Manager's Annual Report Year 1956

INDEX

-2-

---

	<u>Page No.</u>
<u>Safety Department</u>	
a. Fatal accidents	381-385
b. Non-fatal accidents	386-401
c. Safety inspection	402-416
d. Ventilation	417-425
e. Mine safety & mine rescue courses	426-428
f. Miscellaneous	429-432
<u>Mining Engineering Department</u>	
a. List of annual report map books	433
b. Map reports	433-435
c. Mining leases	435-439
d. Engineering force	440-446
e. Distribution of time	447-449
f. Costs	449
h. Automobiles	450
i. Mines	450-456
j. Miscellaneous	456-461
<u>Research Laboratory</u>	
I. General Testing Programs	462-472
II. Pyrolysis & agglomeration	473-475
III. Research & development work and flotation projects	476-479
IV. Microscopy section	480-481
V. Fluosolids Reactor Pilot Plant	482-483
VI. Check sampling program	484
<u>The Electric Power Department</u>	
General operations	485-489
Statistical data	490-492
Charts	493

---

Continued -

THE CLEVELAND-CLIFFS IRON COMPANY  
ORE MINING DEPARTMENT

Manager's Annual Report Year 1956

INDEX

-3-

---

	<u>Page No.</u>
<u>Welfare Department</u>	
General	494-495
1-a. Workman's compensation	496-502
b. Group insurance	503-509
2-a. Pension system	510-518
b. Incapacitated employees	519
c. Safety work	520
d. Medical service	520
e. Iron River Hospital	520-521
f. Physical examination of employees	521
g. Community health	522-523
h. Relief work	523
i. Employment	523
j. Improvement work	523
k. Community service work	523
l. Outdoor activities	524
m. The Mather Inn	524
n. Various department activities	524-525
o. Police Department	525
p. Appreciation	525
 <u>Report of Geologist</u>	
General	526-528
I. Staff	529-533
II. Geological and geophysical field work	533-544
III. Exploration drilling division	545-550
IV. Surface exploration	551-567
V. Underground exploration	568-574
VI. Land offers and outside explorations	575-579
VII. Microscopy	580-592
VIII. Other departmental highlights	593-595

---

RBM:PJB

10-25-57

-3-

THE CLEVELAND-CLIFFS IRON COMPANY  
ORE MINING DEPARTMENT

Manager's Annual Report Year 1956

GROSS INDEX BY MINES

	Bunker Hill	Cambria-Jackson	Cliffs Shaft	Humboldt	Ohio	Maas	Morris
<u>Ishpeming, Negaunee and Iron River Districts:</u>							
General	132-134	152	1	18	79	171-172	72
Production, shipments and inventories	134-135	153-155	2-3	18-19	80-81	173-174	72-74
Analysis	135-136	156	3-4		81	175	74
Estimate of ore reserves	136-137	160	8-9	20	89	176-177	75
Labor and wages	137-138	161-162	9-10	20-22	82-84	177-178	75
Surface	139	163	10	23	89	178-179	75-76
Underground or open pit operations	139-145	164-167	11-16	23-29		179-183	76-78
Cost of opening, equipping, developing and operating	146-149	157-159	4-8	30-40	85-88	184-186	
Taxes	150	168	16	41	90	187	
Accidents & personal injuries	150-151	169	16-17	41	90	187-188	
Power	151	170	17			188	
New construction or equipment				42	90		
	Mather		Pelletizing Plant		Republic	Spies	Tilden
	"A"	"B"					
<u>Ishpeming, Negaunee and Iron River Districts:</u>							
General	43-44	189-190	217	91	254	122	
Production, shipments & inventories	45-47	191-193	218-219	92-93		123	
Analysis	48	194	220			124	
Estimate of ore reserves	56	199		94		126-128	
Labor and wages	57-58	200-201	221-222	94-96		124-125	
Surface	59-61	202-203	241	97-98		129	
Underground or open pit operations	62-68	204-213	242-243	98-103		125-126	
Cost of opening, equipping and developing	49-55	195-198	223-240	104-114		130-131	
Explorations							
Taxes	69	214	244	117		128	
Accidents & personal injuries	70	215	245	118		128	
New construction or equipment			246-247	118-121		128	
Power	71	216					
Nationality of employees							

Continued -

THE CLEVELAND-CLIFFS IRON COMPANY  
ORE MINING DEPARTMENT

Manager's Annual Report Year 1956

GROSS INDEX BY MINES

-2-

	Agnew	Alworth	Canisteo	Cushing	Hawkins
<u>Mesaba District:</u>					
General	255	263	270-271	291	293
Production, shipments & inventories	256-257	263-264	271-273		294-295
Analysis	257	264	273-276		295-296
Estimate of ore reserves	257-258	265-266	276-277	291	297-298
Labor and wages	258-259	266	278		299
Surface	259	267	278-279		299
Underground and open pit operations	259-260	267	279-282		299-301
Beneficiations	260	267	282-284		301-308
Maintenance and repair	260	268	284		308
Cost of operation	260-261	268-269	285-287		308-310
Exploration and future exploration	262	269	287		310
Taxes	262	269	287-288	292	310-311
Accidents and personal injury	262	269	288		311
Proposed new construction	262	269	289		312
Equipment received and proposed new equipment	262	269	290		312
	Holman-Cliffs	Hill-Trumbull	Sally	Open Pit Sargent	Wanless
<u>Mesaba District:</u>					
General	336	313-315	357	362-363	373
Production, shipments & inventories	336-338	316-317	357	364	373-374
Analysis	338-340	318-319	357	364-365	374
Estimate of ore reserves	341-343	320-321	357-358	365-367	374-375
Labor and wages	343	322	359	367-368	376
Surface	344	322-323	356	368	376
Open pit and underground	344-346	323-325	360	368-370	377-378
Beneficiation	347-351	326-330	360	370	378
Maintenance and repair	352	330	360	370	378
Cost of operation	352-353	331-333	360	370-371	378-379
Exploration and future exploration	354	333	360	371	379
Taxes	354	333-334	361	372	379-380
Accidents and personal injury	355	334	361	372	380
Proposed new construction	355	334	361	372	380
Equipment received and proposed new equipment	355-356	334-335	361	372	380

1

CLIFFS SHAFT MINE  
ANNUAL REPORT  
YEAR 1956

I. GENERAL:

The production in 1956 was 643,089 tons and the budget estimate was 510,600 tons. The above tonnage includes 14,256 tons of stockpile overrun. An operating schedule of 2-8 hour shifts per day with hoisting on 1-8 hour shift per day for 5 days per week was continued throughout the year. The mine was idle one day in April for installation of automatic cage hoist controls and 25 days in July and August due to the industry-wide strike.

The cost of production was \$4.520 and the total cost was \$5.758 compared with \$5.852 and \$6.558 respectively in 1955. The lower costs in 1956 are attributable to increased efficiency with the new "C" Shaft plant as evidenced by the comparison of 7.36 tons per man per day in 1956 with 5.49 tons per man per day in 1955. The new plant made it possible to reduce the labor force by approximately 100 men and increased hoisting capacity speeded up all phases of the underground operations. A very favorable improvement was realized particularly in the tramming operation and output by the miners.

There was an average of 71 contracts working in the mine, the same as the previous year. Numerous mining areas were depleted, however better than budget production was maintained by re-entering old workings to recover relatively small areas and continuing a pillar recovery program. A few new mining areas were also brought into production.

Shipments totalled 656,485 tons leaving a balance of all grades of 24,723 tons on stockpile at the end of the year. This compares with 38,119 tons at the end of the previous year. The products were screened to -2" fines and ~~+~~2" lump until May 20, 1956 at which time a screen-deck change was made and the products screened to ~~+~~1" lump and -1" fines. The ratio of lump to fines was 75% and 25% with the 2" screening and a 82% and 18% ratio is being realized with the 1" screen deck. Second-class ore was processed through primary and secondary crushing and shipped as a third grade. This product averaged 15.6% of the total production.

Installation of the automatic pumping system under E. & A. CC-731 was completed and the pumps were placed in operation early in July. With the exception of necessary maintenance, all pumpmen labor has been eliminated with the installation of this system. Renovation of the old boiler house into a central shop building under E. & A. CC-730 was also completed. A reduction in the shop labor force and more efficient use of the shop labor has resulted from consolidation of the various scattered shops.

**CLIFFS SHAFT MINE  
ANNUAL REPORT  
YEAR 1956**

**II. PRODUCTION**

**a. Production by Grade and Months**

Month	Optg. Days	CLIFFS SHAFT			BANCROFT			SECTION 10			Total	Rock
		Crushed			Crushed			Crushed				
		Lump	No. 1	No. 2	Lump	No. 1	No. 2	Lump	No. 1	No. 2		
Jan.	21	17,359	6,426	7,045	2,006	772	1,048	6,584	2,536	3,263	47,039	744
Feb.	21	21,592	8,357	8,102	1,900	724	1,434	6,589	2,508	6,047	57,253	1,460
March	22	22,018	8,640	8,319	4,274	1,651	1,399	5,386	2,067	3,122	56,876	1,536
April	20	18,471	8,866	8,557	5,383	2,584	647	3,910	1,876	2,170	52,464	1,440
May	23	31,902	10,534	3,067	5,268	1,739	192	12,623	4,169	1,200	70,694	1,136
June	21	32,588	5,436	10,229	3,683	614	1,159	11,435	1,908	2,862	69,914	954
July	0											
Aug.	19	23,372	4,549	7,836	4,537	882	560	9,084	1,766	3,553	56,139	704
Sept.	19	22,632	5,405	5,796	3,986	952	120	8,806	2,103	2,021	51,821	252
Oct.	23	34,867	8,040	3,750	4,474	1,032	152	13,802	3,183	1,191	70,491	708
Nov.	21	32,848	7,332	1,625	4,844	1,082	70	15,203	3,394	309	66,707	424
Dec.	18	12,911	2,865	2,274	2,867	634	835	5,396	1,198	455	29,435	2,246
<b>Total</b>		<b>270,560</b>	<b>76,450</b>	<b>66,600</b>	<b>43,222</b>	<b>12,666</b>	<b>7,616</b>	<b>98,818</b>	<b>26,708</b>	<b>26,193</b>	<b>628,833</b>	<b>11,604</b>
<b>Current Year's</b>												
<b>Stkp. Overrun</b>		<b>1,681</b>	<b>8,035</b>		<b>282</b>	<b>1,235</b>		<b>572</b>	<b>2,451</b>		<b>14,256</b>	
<b>Total</b>	<b>228</b>	<b>272,241</b>	<b>84,485</b>	<b>66,600</b>	<b>43,504</b>	<b>13,901</b>	<b>7,616</b>	<b>99,390</b>	<b>29,159</b>	<b>26,193</b>	<b>643,089</b>	<b>11,604</b>

**b. Shipments**

	Pocket Tons	Stockpile Tons	Total Tons 1956	Last Year Tons
Cliffs Shaft Lump	205,380	72,483	277,863	301,436
Cliffs Shaft Crushed #1	48,382	39,471	87,852	111,520
Cliffs Shaft Crushed #2	32,565	37,628	70,193	61,950
Bancroft Lump	32,001	12,372	44,373	43,316
Bancroft Crushed #1	8,419	6,057	14,476	12,655
Bancroft Crushed #2	2,293	4,342	6,635	9,922
Section 10 Lump	78,077	22,909	100,986	74,109
Section 10 Crushed #1	17,896	12,036	29,932	21,732
Section 10 Crushed #2	11,202	12,973	24,175	7,805
<b>Total</b>	<b>436,215</b>	<b>220,271</b>	<b>656,485</b>	<b>644,445</b>

**c. Ore Statement**

	On Hand 1-1-56	Output For Year	Overruns	Total	Shipments	Balance on Hand
Cliffs Shaft Lump	9,374	270,560	1,681	281,615	277,863	3,752
C. S. Crushed #1	6,735	76,449	8,036	91,220	87,852	3,368
C. S. Crushed #2	11,337	66,600	-	77,937	70,193	7,744
Bancroft Lump	1,669	43,222	282	45,173	44,373	800
Bancroft Crushed #1	1,279	12,666	1,235	15,180	14,476	704
Bancroft Crushed #2	963	7,616	-	8,579	6,635	1,944
Section 10 Lump	3,184	98,818	572	102,574	100,986	1,588
Section 10 Crushed #1	2,208	26,708	2,451	31,367	29,932	1,435
Section 10 Crushed #2	1,370	26,193	-	27,563	24,175	3,388
<b>Total</b>	<b>38,119</b>	<b>628,832</b>	<b>14,257</b>	<b>681,208</b>	<b>656,485</b>	<b>24,723</b>
<b>Total Last Year</b>	<b>131,254</b>	<b>512,705</b>	<b>38,605</b>	<b>682,564</b>	<b>644,445</b>	<b>38,119</b>



CLIFFS SHAFT MINE  
ANNUAL REPORT  
YEAR 1956

2. PRODUCTION (Cont'd)

d. Working Schedule

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

<u>Year</u>	<u>Schedule</u>
1956	- 2-8 hour shifts per day with hoisting on 1-8 hour shift per day, 5 days per week.
1955	- 3-8 hour shifts per day with hoisting on 2-8 hour shifts per day, 4 days per week Jan. 1st through April 15th - 5 days per week April 16th through November 28th - then 2-8 hour shifts per day with hoisting on 1-8 hour shift per day for the balance of the year.
1954	- 3-8 hour shifts per day with hoisting on 2-8 hour shifts per day, 5 days per week Jan. 3rd through March 31st - 4 days per week April 1st through December 31st.
1953	- 3-8 hour shifts per day with hoisting on 2-8 hour shifts per day, 5 days per week.
1952	- 3-8 hour shifts per day with hoisting on 2-8 hour shifts per day, 6 days per week May 1st to November 15th - 5 days per week November 15th through December 31st.

e. Production Delays

The following production delays were experienced during the year:

1. The mine was idle April 30th while automatic cage controls were installed.
2. The primary crusher motor burned out on March 15th. Repairs were completed so operations could be resumed on March 17th. Loss of production on this account was 3,900 tons.
3. Hoisting was discontinued after December 14th so that major repairs could be made to the supporting steel under the primary crusher. Repairs were completed so normal operations could be resumed on January 2nd, 1957.

3. ANALYSIS

a. Average Mine Analysis of 1956 Output:

	<u>Iron</u> <u>Dried</u>	<u>Phos.</u>	<u>Silica</u>
Combined Cliffs Shaft Lump	59.86	.102	8.60
Combined Cliffs Shaft Crushed #1	56.03	.104	12.78
Combined Cliffs Shaft Crushed #2	53.30	.098	16.70

b. Average Analysis of Shipments for 1956:

<u>Grade</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moisture</u>
(°) Lump Ore	60.15	.104	8.40	.21	2.08	.83	.84	.005	.90	1.01
(°) Crushed Ore #1	56.40	.106	11.90	.21	2.54	.96	.99	.005	1.34	2.37
(°) Crushed Ore #2	53.60	.091	16.60	.26	2.10	.92	.91	.005	1.38	1.22

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

CLIFFS SHAFT MINE  
ANNUAL REPORT  
YEAR 1956

3. ANALYSIS: (Cont'd)

c. Average Analysis of Ore in Stock Dec. 31, 1956

		<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moist.</u>
Combined C. S. Lump	Dried	59.27	.109	9.94	.21	2.08	.83	.84	.005	.90	-
	Nat'l.	58.67	.108	9.84	.21	2.06	.82	.83	.005	.89	1.01
" C. S. Crush #1	Dried	54.70	.090	14.67	.22	2.54	.96	.99	.005	-	-
	Nat'l.	53.40	.088	14.32	.21	2.48	.94	.97	.005	1.31	2.37
" C. S. Crush #2	Dried	53.30	.084	17.07	.26	2.10	.92	.91	.008	1.38	-
	Nat'l.	52.65	.083	16.86	.26	2.07	.91	.90	.008	1.36	1.22

4. COST OF OPENING, EQUIPPING, DEVELOPING AND OPERATING

Comparative Mining Costs

Product	<u>1956</u>		<u>1955</u>	
	<u>Amount</u>	<u>Cost/Ton</u>	<u>Amount</u>	<u>Cost/Ton</u>
	643,089		551,310	
Underground Costs	\$2,244,236.49	3.490	\$2,363,487.97	4.287
Surface Costs	303,575.40	.472	421,711.10	.765
General Mine Expense	<u>359,135.84</u>	<u>.558</u>	<u>441,264.22</u>	<u>.800</u>
Cost of Production	2,906,947.73	4.520	3,226,463.29	5.852
Depreciation	532,613.18	.828	69,613.99	.126
Taxes	200,391.00	.312	240,106.25	.436
Loading & Shipping	<u>63,238.01</u>	<u>.098</u>	<u>79,481.36</u>	<u>.144</u>
Total Cost at Mine	\$3,703,189.92	5.758	\$3,615,664.89	6.558
Budget Cost of Production		-		6.219
Number of Shifts and Hours	2-8 hour		2-8 hour	
Number of Days Operated	228		234	
Average Daily Product	2,821 Tons		2,191 Tons	

CLIFFS SHAFT MINE  
ANNUAL REPORT  
YEAR 1956

IDLE EXPENSEACCOUNT OF STRIKEUnderground Costs

Tramming	5.46
Ventilation	66.66
Pumping	2,016.04
Compressors and Air Lines	344.58
Underground Superintendence	16,054.91
Maint: Pockets and Chutes	27.78
"    Mining Equipment	1,348.31
Telephones and Safety Devices	124.60
Holiday Pay	<u>485.14</u>

Total Underground Costs 20,473.48

Surface Costs

Hoisting	1,286.26
Dry House	847.91
Policing	1,199.20
General Surface	1,352.06
Maint: Other Mine Buildings	5.94
Holiday Pay	<u>244.26</u>

Total Surface Costs 4,935.63

General Mine Expenses

Geological Department	778.01
Mining Engineering Department	2,125.91
Mechanical Engineering Department	1,199.99
Safety Department	612.00
Research Laboratory	789.15
Analysis & Grading -- Laboratory	842.87
"    "    -- Shipping	440.00
Special Expense -- Pensions	9.00
"    "    -- Retirements	484.00
"    "    -- Hygiene Clinic	198.06
"    "    -- Employment Office	120.00
Ishpeming Office	8,220.00
Mine Office -- Supt. & Clerks	4,444.99
Central Warehouse Overhead	868.77
Insurance -- Property	541.73
"    -- Group, Health & Life	885.64
"    -- Group Annuity	1,136.44
"    -- Catastrophe	356.00
Personal Injury -- Comp. & Doctors	225.60
Taxes -- Unemployment Insurance	63.43
"    -- Old Age Benefit	335.82
Electrical Engineering Department	1,722.03
Employees Insurance & Compensation	<u>768.00</u>

Total General Mine Expenses 27,167.44

Cost Of Production 52,576.55

CLIFFS SHAFT MINE  
ANNUAL REPORT  
YEAR 1956

4. COST OF OPENING, EQUIPPING, DEVELOPING & OPERATING: (Cont'd)

Detailed Cost Comparison

	<u>Total 1956</u>		<u>Total 1955</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
<u>Underground Costs</u>				
Development	\$ 60,607.38	.094	\$ 160,212.82	.291
Mining	1,129,590.70	1.758	1,066,731.39	1.935
Tramming	286,410.72	.445	371,412.94	.674
Ventilation	8,332.06	.013	11,691.51	.021
Pumping	44,653.73	.069	42,998.25	.078
Compressors & Air Lines	70,645.26	.110	104,934.93	.190
Crushing & Screening - Undg.	77,147.51	.120	15,943.82	.029
Underground Superintendence	159,668.98	.248	159,608.04	.290
Maint: Pockets & Chutes	52,590.58	.082	66,424.70	.120
Mining Equipment	205,796.18	.320	207,454.97	.376
Shaft	6,513.95	.010	10,136.04	.018
Holiday Pay	27,620.92	.043	38,586.17	.070
Vacation Pay	85,502.01	.133	85,435.25	.155
Telephones & Safety	229,156.51	.045	21,917.14	.040
Total Underground Costs	<u>2,244,236.49</u>	<u>3.490</u>	<u>2,363,487.97</u>	<u>4.287</u>
<u>Surface Costs</u>				
Hoisting	70,503.65	.110	86,233.28	.156
Crushing & Screening - Surface	19,716.47	.030	80,522.48	.146
Stocking	15,629.19	.024	115,014.71	.209
Timber Yard	10,226.06	.016	-	-
Dry House	26,209.69	.041	32,013.25	.058
Policing	13,721.14	.021	13,460.06	.024
General Surface	18,810.83	.029	25,222.94	.046
Maint: Headframe Bldg. & Equip.	11,537.81	.018	6,280.42	.011
Other Mine Buildings	86,616.22	.135	26,745.45	.049
Holiday Pay	5,919.19	.009	10,260.64	.019
Vacation Pay	19,506.80	.031	21,358.81	.039
Telephones & Safety	5,178.35	.008	3,255.09	.006
Deferred Accts.-Top Tram Car	-	-	1,343.97	.002
Total Surface Costs	<u>303,575.40</u>	<u>.472</u>	<u>421,711.10</u>	<u>.765</u>
Geological Department	9,326.59	.015	13,545.62	.025
Mining Engineering Department	19,588.77	.030	22,832.59	.041
Mechanical Engineering Dept.	6,894.07	.010	15,111.88	.027
Safety Department	6,688.20	.010	8,478.42	.015
Research Laboratory	6,317.37	.010	4,962.74	.009
Analysis & Grading-Laboratory	35,059.63	.055	32,478.12	.059
"    "    -Shipping	4,867.21	.008	5,952.91	.010
Special Expense - Pensions	87.97	-	134.32	-
"    "    - Retirements	3,876.92	.006	6,577.11	.012
"    "    - Hygiene Clinic	4,793.12	.007	7,523.26	.014
"    "    - Employment Office	1,025.02	.002	1,470.12	.003
Ishpeming Office	73,911.15	.115	100,056.90	.181
Mine Office-Supt. & Clerks	45,825.17	.070	46,691.27	.085
Central Warehouse Overhead	14,301.55	.022	22,048.41	.040
Insurance - Property	3,538.92	.006	4,285.92	.008

CLIFFS SHAFT MINE  
ANNUAL REPORT  
YEAR 1956

4. COST OF OPENING, EQUIPPING, DEVELOPING & OPERATING: (Cont'd)

Detailed Cost Comparison (Cont'd)

	<u>Total 1956</u>		<u>Total 1955</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
<u>General Mine Expenses</u> (Cont'd)				
Insurance - Group, Health & Life	\$ 32,885.85	.051	\$ 25,162.09	.046
" - Group Annuity	12,256.10	.019	12,615.12	.023
" - Catastrophe	4,537.58	.007	4,693.35	.009
Personal Injury - Comp. & Doctors	15,500.29	.024	30,144.63	.055
" " - Comp. Dept.	-	-	534.82	-
Taxes - Unemployment Insurance	9,592.76	.015	6,091.55	.011
Taxes - Old Age Benefit	31,850.00	.050	41,983.96	.076
Electrical Engineering Department	10,996.19	.017	14,826.52	.027
Design Department	1,834.92	.003	3,644.59	.007
Employees Insurance & Comp.	6,903.72	.011	9,418.00	.017
Power Credit	<u>3,323.23</u>	<u>.005</u>	-	-
Total General Mine Expenses	359,135.84	.558	441,264.22	.800
<u>COST OF PRODUCTION</u>	<u>\$2,906,947.73</u>	<u>4.520</u>	<u>\$3,226,463.29</u>	<u>5.852</u>

The lower cost, compared with 1955, is due chiefly to the higher production and increased efficiency realized with the new "C" Shaft plant. The wage increase, effective July 1st, and increased supply and material costs increased the expense in some accounts.

Underground Costs - The reduction in the labor force and increased efficiency brought about by the "C" Shaft plant accounts for the large reduction in underground costs. The largest cost improvement was in the tramping, mining and development accounts.

Surface Costs - The reduction in the surface labor force and the increased efficiency of the new surface flow-sheet accounts for the large decrease in costs compared with 1955. Repairs to mine buildings increased over last year.

General Mine Expense - The proportion of general expenses incurred at the Cliffs Shaft was reduced because of a major reduction in the labor force at the mine. Completion of the "C" Shaft plant eliminated the overhead expense on this project that was charged to operating.

Expenditure & Authorization Summary

E. & A. CC-705 - Gismo-Diesel Loader Transport

After a thorough trial of the Gismo Diesel loader underground, its performance was found to be unsatisfactory and the unit was returned to the manufacturer. A Diesel Traxcavator was then tested and after some modification its performance was found to be very satisfactory in the larger stopes. This machine is still undergoing further modifications to improve its performance. The project amount authorized was \$28,400.00 and the expenditure was \$16,879.76 in 1956.

E. & A. CC-730 - Automatic Pumping System

Work on the new pumping system was completed and the automatic pumps were placed in operation in July. The automatic pumps have lowered pumping costs as anticipated by eliminating the labor formerly charged to this account. The project amount authorized was \$109,770.00 and total expenditure was \$115,634.78.

CLIFFS SHAFT MINE  
ANNUAL REPORT  
YEAR 1956

4. COST OF OPENING, EQUIPPING, DEVELOPING & OPERATING (Cont'd)

Expenditure & Authorization Summary (Cont'd)

E. & A. CC-731 - Central Shop Facilities

The old boiler house building was converted into a Central Shops. This eliminated the various scattered shop buildings and reduced the shop labor force. Maintenance and repair of mine equipment is now accomplished with minimum handling and more efficient use of the shop crew. The project amount authorized was \$44,000.00 and the total expenditure was \$46,787.34.

E. & A. CC-793 - Dust Control System

Work on a dust collection system in the crusher station underground was started with installation of the equipment and duct work. This system is required to reduce the dust count in this room to an acceptable level. It was not possible to accomplish this using only fans and water sprays. The project amount authorized was \$27,850.00 and the expenditure totalled \$15,602.22 for 1956.

E. & A. CC-865 - Trolley Phones

This E. & A. covers the purchase of additional trolley phones for the underground locomotives. Trolley phones will be installed on all the motors on the lower levels where tramming has become more concentrated. This will provide greater protection against collisions and improve haulage efficiency. The amount of the authorization is \$4,300.00. There was no expenditure against this account in 1956. The phones are on order and delivery is expected early in 1957.

5. ESTIMATE & ANALYSIS OF ORE RESERVES

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

High Grade of 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. Therefore, much of the proven ore reserves and additions are based on an accumulated group of more or less standard breast extensions. This practice accounts for nearly the same magnitude of proven ore reserves each year fluctuating somewhat according to depletion and ore development. No significant ore reserve additions were realized this year.

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

CLIFFS SHAFT MINE  
ANNUAL REPORT  
YEAR 1956

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

	<u>Cliffs Shaft</u>	<u>Bancroft</u>	<u>Section 10</u>	<u>Total Lease</u>	<u>Total Tons</u>
Estimated Reserves-Dec. 31, 1955	666,653	88,165	346,866	435,031	1,101,684
Less 1956 Production	423,326	65,021	154,742	219,763	643,089
Balance as of 1955 Estimate	243,327	23,144	192,124	215,268	458,595
Estimated Reserves-Dec. 31, 1956	609,325	70,643	227,046	297,689	907,014
New Developed Ore	365,998	47,499	34,922	82,421	448,419

Expected Average Analysis of Ore Reserves

	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moisture</u>
Natural	57.50	.107	10.00	.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, 1954, 1955 and 1956. Based on the 1956 revision and that portion of the second-class ore which will be mined, the proven and probable ore reserve is estimated at 2,403,992 tons as of December 31, 1956. The necessity of making a better #2 Grade, together with the additional information obtained from mining during 1956, accounts for the reduction in reserves as compared with 1955.

6. LABOR AND WAGES

Labor relations have been satisfactory although the Committee has been quite active in submitting complaints and a few formal grievances. There were 3 grievances submitted during the year

<u>Name</u>	<u>Nature of Grievance</u>	<u>Step of Grievance Procedure</u>
John Garrett, et. al.	Pay Shortage	(3) dropped
Charles Pelto	Pay Shortage	(1) settled
John Smeltz, et. al.	Seniority	(3) settled

Employment

No. of Men Beginning of Year		400
Separations	47	
Added During Year	7	
Decrease in Men	40	
Total End of Year		360
Avg. No. of Men as per Labor Statement (Statistical)		378
Avg. Absenteeism (Statistical)		26

The following table shows a classification of separations in 1956:

	<u>No. of Men</u>
Quit	13
Retired	6
Transfers	19
Leave of Absence	2
Deceased	3
Absence for 2 years or more on account of sickness	4
Total	47

During 1956, 192 employees were entitled to 3-week vacations, 203 for two-week vacations and 23 for one week.

CLIFFS SHAFT MINE  
ANNUAL REPORT  
YEAR 1956

6. LABOR AND WAGES (Cont'd)

Statement of Wages

a. Average Wages Per Day

	<u>1956</u>	<u>1955</u>
Total Surface & Underground	22.75	21.06

b. Average Wages Per Month

	<u>1956</u>	<u>1955</u>
Total Surface & Underground	472.06	410.67

The mine operated on an average of  $20\frac{3}{4}$  days per month in 1956 while averaging  $19\frac{1}{2}$  days per month in 1955.

c. Tons Per Man Per Day

	<u>1956</u>	<u>1955</u>
Total Surface & Underground	7.36	5.49

d. Labor Cost Per Ton

	<u>1956</u>	<u>1955</u>
Total Surface & Underground	3.05	3.83

7. SURFACE

New Construction

The M.G. set for the Koepe cage hoist and all the necessary electrical controls was installed. Operation of the hoist on automatic control commenced the week of April 28th.

The old boiler house west of the engine house was converted into a central shops building in 1956. A small addition to the west end of this building was erected to house the bit shop. The renovation of the building was completed and the various shop facilities moved into this building in December.

Track was extended from the end of the tunnel to the west storage yard. This allows the direct movement of supplies from the shops or storage area to the shaft collar without any secondary handling.

The demolition of the old flow-sheet structures was completed and following this, tracks were re-located under the new pocket structure. The old shop building was converted into a garage for the mine mobile equipment.

A discharge line for the new pumping system was laid from the collar of "C" Shaft to a point several hundred feet northwest of the dryhouse. From this point, an open ditch was excavated to connect with the Carp River.



CLIFFS SHAFT MINE  
ANNUAL REPORT  
YEAR 1956

8. UNDERGROUND

A. General

Experience gained since the new flow-sheet went into operation, resulted in some revamping of dumping installations on the various levels at the ore-pass raises. Also, vibration caused damage to many structural supporting members and required replacement of the steel that was badly weakened by numerous cracks. Considerable re-enforcement was also necessary to the supporting steel for the flow-sheet equipment.

The development program has continued on a small scale during the year due to lack of new areas to develop for mining. Continued stress on analysis, depletion of a number of stoping areas, ore tied up by haulage and the lack of possible ore exploration areas all contributed to a program of continual stoping area changes and revisions. Pillar recovery continued but at a higher rate than in 1955. The proportion of contracts on this work increased from 25% at the beginning of the year to 36% in December.

Increased pillar recovery has brought more contracts within the "A" Shaft and "A" Shaft East areas while the number of contracts in the Section 10 Lease area increased because of the development of an ore body extension. The number of contracts in the "B" Shaft, "A" Shaft Northeast and Bancroft Lease areas was reduced, however, due to depletion of ore areas.

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.

The New York Mine, also known as the Harlow Clark Estate, occupies the SE $\frac{1}{4}$  of the SE $\frac{1}{4}$  of Section 3 at the extreme northeast corner of the Cliffs Shaft Mine. An offer to lease this property was received in the latter part of 1956 but after an investigation and evaluation the option to lease was turned down. The very small reserves that are indicated and the considerable rock development that would be necessary rules out the possibility of an economical mining proposition in this property.

B. Mining Area

- 1. "A" Shaft East - (East of 2800 E and extending from the south boundary of the Bancroft Lease to 1200 S)

No development was done in the "A" Shaft East area this year. All known ore areas are presently being mined.

The number of contracts here was increased to enable a pillar recovery program to be started in addition to the other mining.

The remaining reserves here lie between the 4th and 8th level. Emphasis on mining the fringe areas will continue to be stressed as we attempt to deplete the outlying ore structures before retreating towards shaft.

CLIFFS SHAFT MINE  
ANNUAL REPORT  
YEAR 1956

8. UNDERGROUND (Cont'd)

B. Mining Area (Cont'd)

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

Development in "B" Shaft consisted of driving sub-level drifts and short raises to develop ore body extensions and provide travelling roads. One raise was driven from the 5th level Barnum to the 1145' sub-level to develop ore encountered in U. H. No. 805. A branch was also driven from this raise to a stope on 1st level "B" Shaft to facilitate mining out the bottom in the stope.

The number of contracts working in "B" Shaft was reduced to 13 in 1956. Seven of the contracts are mining on or above 1st level and 6 have only pillars as reserves.

The bulk of the first class ore reserves continue to lie above 1st level. The "Lake Bancroft" structure, drilled in 1953, continues to be mined below 2nd level elevation and appears to get narrower as mining progresses downward.

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

Some main-level drift was advanced on 8th level to by-pass a section of the old "main line" haulage drift and thus make available for mining a large floor pillar. One raise and two branches from this main raise were driven from 15th to 10th level in the vicinity of old #46 Contract stope to develop ore encountered in several drill holes. Several contracts advanced sub-level drifts and short raises in their respective stopes to develop ore body extensions and provide travelling roads.

Nine contracts have no reserves other than upright and floor pillars. Reserves in "A" Shaft are dispersed and in part, tied up by tramming operations. During the year, mining continued on the 6th level floor pillar and a section of the 8th level floor pillar was also made available for mining. Other such areas will be opened to mining after relocation of travelling and tramming roads.

4. Bancroft and "A" Shaft Northeast

One raise was driven from 10th to 9th level in the "A" Shaft Northeast area to facilitate mining in a stope on 9th level and to make a floor pillar available for mining. Several contracts advanced sub-level drifts and short raises in their respective stopes to develop ore body extensions and provide travelling roads.

The number of stoping contracts remained the same as in 1955 although there was some shifting of contracts in the various stopes. Reserves of ore in the Bancroft Lease and the "A" Shaft Northeast area are now concentrated between the 9th and 11th levels although a small tonnage remains at the 5th level elevation. Three of the contracts in this area have only pillars as ore reserves.

5. Section 10 Lease and the Moro Mine

Development in the Section 10 Lease was fairly extensive during the year. One raise was driven from 8th to 5th level to develop an ore structure adjacent to #80 Contract shrinkage stope. Considerable sub-level drifting was done above 9th level elevation to outline the ore body and develop a fairly large area for mining. Mining, during the year, ranged in elevation from the 5th to 10th level with most crews concentrated between the 5th and 8th levels. Two contracts were added to this area in 1956 and with the present concentration of contracts this is now the most productive area in the mine.

CLIFFS SHAFT MINE  
ANNUAL REPORT  
YEAR 1956

8. UNDERGROUND (Cont'd)

C. Delimiting Ore

The underground diamond drilling program was completed in 1955. There was no drilling done underground or on surface for hard ore reserves in 1956.

A drilling program has been continued from surface to explore for deep-lying soft ore reserves that would be mineable from the "C" Shaft. This exploration is summarized in the following paragraphs.

Section 10, 47-27 - Deep Exploration - Drilling in Section 10, 47-27 has continued throughout 1956 in one hole, D.D.H. No. 29. This hole was located on the basis of the geology predicted in the Deep Soft Ore Study.

D.D.H. No. 29 is located on the old Lake Mine surface on the north shore of Lake Angeline in the NW $\frac{1}{4}$  of the SE $\frac{1}{4}$  of Section 10, 47-27. The hole, which was drilled to a depth of 855' by the end of 1955, was continued to a depth of 4950' by the end of 1956. Intrusive and unoxidized iron-formation have been penetrated and drilling will be continued until the footwall Siamo slates are encountered. Operations at this hole have been hampered by a series of accidents consisting of the loss of strings of drill rods down the hole twice during the year and the collapse of some BX casing. The BX casing was placed in the hole to prevent the possible disturbance of any of the 5 Hall-Row wedges in the hole. Total down time while rods were being recovered, etc. amounted to 110 days.

Section 3, 47-27 - Deep Exploration - Drilling in Section 4, 47-27 was resumed to confirm the knowledge previously gained by drilling and to expand and further outline the predicted ore body. Drilling commenced on the first hole in March and on the second hole in August. Both holes were planned and located on the basis of the geology interpreted from previous drill hole information and that predicted in the Deep Soft Ore Study. The first hole, D.D.H. No. 52, was located approximately 150' due north of D.D.H. No. 44 and was drilled to confirm the cross section interpreted from D.D.H.s No. 43 and No. 44. The second hole is located midway between D.D.H.s No. 37 and No. 44 in an effort to prove or disprove a continuous ore structure between these holes.

D. New Equipment

A large amount of the equipment purchased in 1956 was related to the E. & A. Projects. However, a substantial amount was required for maintenance of existing plant and replacement. Miscellaneous spare parts for the new flow-sheet were also purchased and placed in stock. The following major items were purchased in 1956:

<u>Item</u>	<u>Amount</u>
33 - Fire Extinguishers	\$ 1,744.77
1 - Jackabi Tachoscope	135.73
1 - 60' Aluminum Ladder	445.50
1 - Exide Locomotive Storage Battery	1,931.75
6 - Kellog Phones	366.26
2 - Vertical Hot Water Tanks & Heaters	952.38
4 - T-9 Hand Trucks (Welding Tanks)	116.00
6 - 25 H.P. Scraper Hoist Motors	3,642.00
1 - #448 Valve Body Assembly	590.55
8 - Roller Smith Galvanometers	326.01

CLIFFS SHAFT MINE  
ANNUAL REPORT  
YEAR 1956

8. UNDERGROUND (Cont'd)D. New Equipment (Cont'd)

<u>Item</u>	<u>Amount</u>
6 - DuPont CD-2 Blasting Machines	\$ 831.85
2 - Karbide King Saws	177.30
1 - Hand-Type Machine Cleaner	142.60
1 - Intercooler	723.88
3 - Heat Regulators	405.00
12 - Descalers	231.60
12 - Unit Heaters	1,474.00
6 - Valves	1,099.10
1 - Fig. 12 Expansion Joint	1,165.97
1 - EJ-2 Thor 3/8" Drill	48.75
1 - 5V Thor Air Grinder	262.45
1 - #80 Thor Impact Wrench	435.00
1 - Electric Hoist (H-5 - 5 Ton Lo-Hed)	1,828.00
5 - Mule Hoists (No. 101 - 1½ Ton)	188.15
50 - Pacific Clevis Blocks	2,828.25
1 - Steel Scaffold	1,950.38
1 - Sump Pump	121.37
1 - Set of Track Links for Traxcavator	634.02
1 - Lincoln Welding Machine	632.50
1 - Electric Starter (Westinghouse)	1,403.52
4 - Westinghouse Disconnect Switches	162.00
1 - Industrial Fork Lift Engine	477.00
1 - Pump & Injectors (Euclid)	553.17
Miscellaneous Spare Parts for Undg. Flow-Sheet	<u>29,885.92</u>
Total	\$57,912.73

E. Explosives

Powder consumption decreased considerably compared with 1955 due, principally, to a large carry-over of broken ore in the stopes from 1955. Discontinuance of the use of 2" powder in secondary blasting also effected some reduction in consumption. The average price of powder increased from \$17.50 per cwt. to \$18.18 per cwt.

Starting in January, DuPont explosives replaced Hercules explosives throughout the mine. In April, 1956, a credit of \$5,370.40 was received from DuPont in payment for defective powder supplied to the mine in the first quarter of 1956. The net result of the increase of explosive cost, the credit for defective powder and the discontinuance of the use of 2" powder in secondary blasting, was a decreased explosives cost per ton which is summarized in the following tables:

TABLE I

Cost of Explosives - Operating

	<u>Quantity</u>	<u>Avg. Price</u>	<u>1956</u>	<u>1955</u>
Powder, Lbs. - All Kinds	513,300	18.18	\$ 87,941.12	\$111,590.55
Misc. Supplies (Caps, Fuse, Testers, etc.)			<u>51,149.22</u>	<u>47,322.62</u>
Total			\$139,090.34	\$158,913.17

CLIFFS SHAFT MINE  
ANNUAL REPORT  
YEAR 1956

8. UNDERGROUND (Cont'd)E. Explosives (Cont'd)

TABLE II

Unit Cost and Consumption of Explosives

	<u>1956</u>	<u>1955</u>
Pounds of Powder Per Ton of Ore	.798	1.157
Tons Ore Per Pound of Powder	1.253	.865
Cost Per Ton For Powder	.137	.202
Cost Per Ton For Blasting Supplies	.080	.086
Cost Per Ton For All Explosives	.216	.288

TABLE III

	<u>1956</u>	<u>1955</u>
Cost Per Ton Developing	.001	.046
Cost Per Ton Mining	<u>.215</u>	<u>.239</u>
Total	.216	.285

F. Tungsten Carbide Insert Bits

Since tungsten carbide insert 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. Numerous bit tests were made during the year and the results show the Ingersol-Rand Carset bit is still superior to other types. The following table shows the pertinent data:

<u>Description</u>	<u>Quantity</u>	<u>Price</u>	<u>Amount</u> <u>1956</u>	<u>Amount</u> <u>1955</u>
Ing. Rand, Series 113 - 1-3/8"	3,264	11.00	\$35,904.00	\$27,213.12
" " 113 - 1-1/2"			-	2,262.00
" " 113 - 1-5/8"	50	13.65	682.50	322.50
" " 115 - 1-5/8"	280	12.90	3,612.00	19,143.60
" " 115 - 1-3/4"	50	14.73	736.25	884.40
" " 115 - 2"			-	158.95
Rockbits " 113 - 1-3/8"	125	10.30	1,287.50	3,038.50
" " 115 - 1-5/8"			-	524.40
" " 115 - 2-1/8"	24	19.15	459.60	-
" " HM - 2-1/4"			-	57.30
Copco " 113 - 1-3/8"			-	784.00
Vascoloy " 113 - 1-3/8"			-	475.00
Kennametal " 113 - 1-3/8"	<u>31</u>	<u>10.90</u>	<u>337.90</u>	-
Total	3,824	11.25	\$43,019.75	\$55,020.85
Production - Tons			643,089	551,310
Cost Per Ton of Ore Produced			.067	.100
Feet Drilled - Rock & Ore			628,337	867,271
Average Feet Drilled Per Bit			164	183
Cost Per Foot of Hole			.068	.063

CLIFFS SHAFT MINE  
ANNUAL REPORT  
YEAR 1956

8. UNDERGROUND: (Cont'd)

F. Tungsten Carbide Insert Bits

The average price per bit decreased slightly compared with 1955. This decrease was effected by the continued conversion of mining contracts from the 1-5/8" bit to the smaller 1-3/8". The average footage per bit decreased because the greatest amount of footage was drilled in ore and very little was drilled in rock. The lower footage per bit is also partly due to the increased production of the normally very hard secondary grade ores. The bit cost per foot of hole is nearly the same as in the previous year.

G. Pumping

The development of the sump and installation of the automatic pumps was completed and the plant was placed in operation in July. Two 500 g.p.m. centrifugal pumps, that were received from the Spies Mine, are connected in parallel and operate as a unit. A 1375 g.p.m. centrifugal pump is used as a standby. This system has been operating very satisfactorily.

9. TAXES

Comparative data for 1956 and 1955 is shown below:

	<u>1956</u>		<u>1955</u>	
	<u>Valuation</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Taxes</u>
Realty	3,600,000	146,880.00	3,200,000	131,200.00
Personal	451,100	18,404.88	1,116,100	45,760.10
Lot 2, Sec. 3,47-27, Bancroft	545,000	22,236.00	580,000	23,780.00
Lot 174, Nelson's Addition	100	4.08	100	4.10
S. 35.91' of Lot 179	50	2.04	50	2.05
8½ of NW¼ of Section 10,47-27	<u>900,000</u>	<u>36,720.00</u>	<u>960,000</u>	<u>39,360.00</u>
Total Cliffs Shaft Mine	5,496,250	224,247.00	5,856,250	240,106.25
Taxes Per Ton Produced		.349		.436
Taxes Per Ton Shipped		.348		.373

10. ACCIDENTS & PERSONAL INJURY

Nine compensable and fourteen non-compensable injuries occurred in 1956 for a total time lost of 491 days. This record of 23 accidents, compared with the 37 incurred during 1955, ranked Cliffs Shaft second on safety during 1956 among the Company's underground mines.

Comparison of Frequency and Severity in 1956 and 1955 is as follows:

<u>Year</u>	<u>Frequency</u>	<u>Severity</u>
1955	20.04	.771
1956	33.65	.718

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

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

CLIFFS SHAFT MINE  
ANNUAL REPORT  
YEAR 1956

10. ACCIDENTS & PERSONAL INJURY (Cont'd)

A summary of the compensable accidents is listed below:

#1349 - Nels Wirtala - Scraper Operator - January 23, 1956 - slipped and fell while carrying a block and injured right wrist - lost time, 65 days.

#1350 - Clayton Weinberg - Contract Miner - March 17, 1956 - struck on left arm by rope socket and clevis which broke from a scraper - fracture of the upper and lower left arm - lost time, 150 days.

#1351 - Oscar Stolen - Motorman - August 7, 1956 - left foot and ankle - slipped between box and underground car while dumping car. Contusions, no fracture - lost time, 37 days.

#1352 - William J. Johnson - Motorman - August 23, 1956 - slipped and twisted neck while avoiding chunk coming through chute - time lost, 8 days.

#1353 - John Armitage - Contract Miner - September 7, 1956 - struck on right foot by chunk while barring. Severe contusions and abrasions. Lost time, 62 days.

#1354 - Albert Manty - Car Repairman - September 26, 1956 - strained back while lifting air tugger. Low back pain - time lost, 7 days.

#1355 - Alfred Hendra - Contract Miner - October 16, 1956 - strained right arm while lifting drill machine. Rupture of tendon of right bicep muscle-time lost, 56 days.

#1356 - John Bess - Contract Miner - December 14, 1956 - Hit on right elbow by jackleg when machine fell. Broken bone right arm. Time lost - 8 days in December, and 40 more days estimated in 1957.

#1357 - Francis Marketty - Motor Brakeman - December 20, 1956 - left foot squeezed between drawhead and car when he stepped between train of cars. Compression fracture, left medial cuniform. Time lost, 4 days in December and 20 estimated days in 1957.

11. POWER

	<u>1956</u>	<u>1955</u>
Total Cost	\$81,464.60	\$97,017.06
K. W. H.	8,960,441	10,412,790
Average Cost Per K.W.H.	.0090916	.0093171
K.W.H. Per Ton	13.9	18.9
Cost Per Ton	.127	.176

The decrease in K.W.H. consumption per ton is due to discontinuing operations in the old "A" and "B" Shafts on a two-shift basis and replacing them with the "C" Shaft operation on a one-shift basis. Power consumption for the air compressors was also reduced with the one-shift hoisting schedule in "C" Shaft. Lower power consumption and lower peak demand, which is characteristic of the Koepe hoist, compared with a drum hoist, is reflected in the lower energy cost.

HUMBOLDT MINE  
ANNUAL REPORT  
YEAR 1956

1. GENERAL:

The Humboldt Mine discontinued the production of concentrate at the end of October, 1955, and remained idle until April 18, 1956. During the first two months of the year, there was limited activity at the mine with repairs to the pit equipment being resumed by late February and repairs in the mill and crushing plants beginning in March.

Following the startup, the mill ran  $7\frac{1}{4}$  months producing 206,901 tons of concentrate for an average of 28,500 tons per month. This can be compared to the 1955 monthly average of 21,500 tons. Also, during the year, a total of 519,904 tons of crude ore, 47,026 tons of waste, 191,545 cubic yards of earth and 64,697 cubic yards of rock were handled at the Humboldt Mine. The grade of the concentrate produced was 61.80% iron, 0.084% phosphorous, 9.50% silica, 0.018% sulfur and 6.64% moisture which is practically identical to the guarantee.

During the operating months, the mill produced concentrate on a schedule of twenty shifts per week while seven day shifts per week were scheduled for mining ore. Thirteen additional shifts (6 days-7 afternoons) were utilized for stripping and waste removal throughout the summer. Because of the heavy shipping schedule and the need for moving a large yardage of waste rock associated with the ore, the development of the pit to the north was retarded slightly during the year. For this reason, an additional pit crew for stripping overburden began work in November adding five midnight shifts to the schedule described above.

The steel strike terminated operations at the end of June and the mine did not resume production until August 10th. This date was four days following the general settlement as repairs to the grinding section of the mill and the primary crusher necessitated the additional idle time.

A monthly production record was set during June when 34,156 tons of concentrate were produced.

At the end of the year, the pit was developed throughout the areas known as knobs one, two, three and four. This total pit length encompasses an area bordering near the primary crushing plant to the south and extending northward for 2,500 feet.

2. PRODUCTION, SHIPMENTS AND INVENTORIES:

a. Operating Schedule:

	<u>No. of Days</u>	<u>Shifts Per Day</u>	<u>Hours Per Shift</u>	<u>Total Shifts</u>
Mining	210	1 & 2	8	287
Hauling and Crushing	210	1 & 2	8	287
Mill Operating	210	1 & 2	8	595



HUMBOLDT MINE  
ANNUAL REPORT  
YEAR 1956

2. PRODUCTION, SHIPMENTS AND INVENTORIES: (Con't.)

b. Production by Months:

<u>Month</u>	<u>Tons of Crude</u>		<u>Tons of Concentrate</u>
	<u>Crushed</u>	<u>Milled</u>	
April	26,948	28,233	9,749
May	78,551	78,394	28,063
June	79,660	78,005	34,156
July	-	-	-
August	52,327	51,898	19,227
September	75,109	73,654	30,795
October	72,264	71,796	29,636
November	70,346	70,806	29,478
December	64,699	65,258	24,000
Stockpile Overrun			<u>1,797</u>
Total	519,904	518,044	206,901

c. Production Averages:

	<u>1956</u>	<u>1955</u>
Average Crude Ore Per Day	2,476	2,009
Average Concentrate Per Day	985	745
Tons Per Man Per Day - Crude Ore	33.06	30.30
Tons Per Man Per Day - Concentrate	13.16	11.05
Average Weight Recovery	39.94	36.51

d. Shipments, Inventory and Analysis:

<u>Shipments</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Sul.</u>	<u>Moist.</u>
On hand - December 31, 1955	56,596	61.60	.094	9.43	.009	7.84
Production - 1956	206,901	61.80	.084	9.50	.018	6.64
Stockpile to Presque Isle	122,202	61.29	.088	9.90	.011	6.88
Pocket to Presque Isle	90,149	62.01	.088	9.19	.020	6.47
*Pocket to O. Bohlin & Son	134	61.50	.084	9.01	.288	6.57
Stockpile to M. A. Hanna Co.	2	62.25		9.88		
On hand - December 31, 1956	51,010	61.65	.077	10.01	.013	6.84

\* All Rail

e. Estimated Production and Analysis - 1956:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Sul.</u>	<u>Moist.</u>
Dried		61.80	.090	9.50	.010	
Natural	179,985	57.17	.083	8.79	.009	7.50

HUMBOLDT MINE  
ANNUAL REPORT  
YEAR - 1956

3. ESTIMATE OF ORE RESERVES:

a. Estimated Reserves:

1956 Estimate - 40% Recovery

	<u>Total Crude</u>	<u>Concentrates</u>		<u>Total</u>
		<u>Humboldt Mining Co.</u>	<u>Weber</u>	
1210' Elev.(Proven)	30,063,600	11,204,240	821,200	12,025,440
1110' Elev.(Probable)	7,566,100	2,776,300	250,100	3,026,400
1010' Elev.(Prespect)	7,514,600	2,758,000	247,800	3,005,800
Grand Total	45,144,300	16,738,540	1,319,100	18,057,640

Stripping

	<u>Cu. Yds. Surface</u>	<u>Cu. Yds. Rock</u>	<u>Cu. Yds. Pit Waste</u>
1210' Elevation	1,712,455	8,826,603	1,701,742
1110' Elevation	503,800	6,040,700	316,395
1010' Elevation	575,200	7,790,500	308,800

4. LABOR AND WAGES:

a. General:

The hourly rate crew at Humboldt averaged 95 men from April through October and 110 men during November and December. This increase reflected the addition of a stripping crew, the need for extra men in the crushing plants during the winter season and a slight increase in the maintenance gangs.

In order to increase the supervisory staff at Humboldt, hourly rate leaders were utilized for operating the crushing plants and heading the mill maintenance crews.

Labor relations continued on a high level as no formal grievances were filed. However, three men were discharged during the year because of absenteeism and stealing.

The following changes were made involving salaried personnel during 1956:

<u>Name</u>	<u>Title</u>	<u>Status</u>	<u>Date</u>
Lester Lundin	Master Mechanic	Placed on Salary	April
Otto Urpila	Mill Foreman	Placed on Salary	April
Vivian Delbridge	Chemist	Placed on Salary	April
Harriette Dougherty	Stenographer	Hired	April
James Villar	Geologist	Hired	July

HUMBOLDT MINE  
ANNUAL REPORT  
YEAR 1956

4. LABOR AND WAGES: (Con't.)

b. Report of Men Hired, Transferred and Separated:

<u>Month</u>	<u>First of Month</u>	<u>Hires</u>	<u>Trans. from Other Mines</u>	<u>Separated</u>	<u>Trans. To Other Mines</u>	<u>End of Month</u>
January	1					1
February	1	4				5
March	5	23				28
April	28	62	2			92
May	92	6	2		1	99
June	99		1		3	97
July	97					97
August	97	1	1	2		97
September	97	3	1			101
October	101	1	2			104
November	104	4	8	2		114
December	114		2	3		113

The above table includes only hourly and salaried men on the Humboldt Mine payroll.

c. Report of Vacations Paid:

<u>Year</u>	<u>No. Men</u>	<u>Total Hours</u>	<u>Total Amount</u>	<u>Avg. Rate Per Hour</u>
1956	90	5,360	\$ 12,965.28	2.419
1955	95	5,000	\$ 11,405.00	2.281

HUMBOLDT MINE  
ANNUAL REPORT  
YEAR 1956

4. LABOR AND WAGES: (Con't.)

d. Annual Statement of Labor:

<u>Hourly Employees</u>	<u>Sta. Men</u>	<u>Hours</u>	<u>Amount</u>	<u>Avg. Rate</u>
Straight Time	49 $\frac{3}{4}$	130,678 $\frac{1}{2}$	\$300,347.04	2.298
Overtime		4,673	5,629.90	1.205
Shift Differential - Afternoon		36,459	2,220.01	.061
Shift Differential - Night		13,308	1,231.69	.092
Holiday Allowance		2,472	5,727.13	2.317
Holiday Worked		789	1,841.20	2.333
Vacation Pay Accrual			11,577.92	
Premium Time		5,860 $\frac{1}{2}$	1,527.13	.260
Total Hourly Employees	49 $\frac{3}{4}$	130,678 $\frac{1}{2}$	\$330,102.02	2.526
<u>Salaried Employees</u>				
Mine Payroll	2 $\frac{1}{2}$	6,538 $\frac{1}{2}$	\$ 21,213.94	3.244
Total Mine Payroll	52 $\frac{1}{4}$	137,216 $\frac{1}{4}$	\$351,315.96	2.560
<u>General Payroll</u>				
Salaried Straight Time	3	7,793	\$ 20,525.62	2.634
Overtime		290	332.83	1.148
Labor from Other Mines	5 $\frac{1}{4}$	13,526	41,809.15	3.091
Total Labor	60 $\frac{1}{2}$	158,535 $\frac{3}{4}$	\$413,983.56	2.611
<u>Distributed as Follows:</u>				
Idle Expense	3 $\frac{3}{4}$	2,199	\$ 5,865.64	2.667
Operating Humboldt Mine	48	125,805 $\frac{1}{2}$	326,529.60	2.595
Winter & Idle Expense	3 $\frac{1}{2}$	8,890 $\frac{1}{4}$	22,446.53	2.525
Stripping	6	15,525	40,634.34	2.617
Uncompleted Construction	1 $\frac{1}{4}$	3,460	10,666.96	3.083
Other Mines	1 $\frac{1}{2}$	1,338	4,053.81	3.029
Other Accounts	1 $\frac{1}{4}$	1,318	3,786.68	2.873
Total as Above	60 $\frac{1}{2}$	158,535 $\frac{3}{4}$	\$413,983.56	2.611

e. Labor Cost:

Production of Concentrates - Long Tons	206,901
Number of Days Operated	210
Number of Shifts Operated	595
Average Daily Production	985
Average Production Per Shift	348
Tons of Concentrate Per Man Day	13.16
Average Wages Per Man Day	\$20.76
Average Job Class	10
Total Amount Paid for Labor (Production)	\$326,529.60
Labor Cost Per Ton of Concentrate	\$1.578

HUMBOLDT MINE  
ANNUAL REPORT  
YEAR 1956

5. GENERAL SURFACE:

a. Buildings and Repairs:

A small concrete extension along the west dumping area of the primary crusher building was added during the fall. This extension formed a box which permitted the slide dumping of crude ore to the crusher.

To improve the storage facilities at the mine, the principal warehouse within the shop building was completely enclosed by placing a roof over the area. In order to facilitate the storage of additional electrical supplies, a small wood framed warehouse was erected immediately west of the shop-garage building.

A new 20,000 gallon fuel tank was installed in an excavation east of the garage-shop building to handle a heavier furnace oil and to allow for storage of larger quantities of fuel. At the end of the year, only the plumbing work remained to be completed on this project.

b. Water Supply:

Lake Lory continued to supply fresh water make-up for the Humboldt plant. The elevation of water in the lake ranged from a high of 1560.1' in May to a low of 1558.0' in October. Periodic checks were made of the solids content of the tailing dam overflow entering Lake Lory. The amount of solids entering the lake in parts per million was about twenty with highs of forty-five being reached during periods of intense or lengthy rainfall. Such action increased the water flow rate through the swamp and hindered the normal settling and filtering action. This situation was also true during the winter months when the vegetation was dormant and much less filtering medium was present.

c. Roads, Transmission Lines, Etc:

The transmission line from the main breaker station, feeding power to the pit, was replaced in March with heavier copper wire. This new line, running 1,600 feet in length, was necessary to avoid voltage drops hampering the pit operation.

6. OPEN PIT:

a. Stripping:

The surface overburden stripping program began in April and continued throughout December except during the steel strike in July. The bulk of this stripping was for the opening of the 1545 foot bench along the northern end of the pit. Some dragline work was completed on the footwall side of the third knob. After November 15th, all dragline work was abandoned due to freezing conditions and only shovel work was undertaken after that date.

The rock stripping during 1956 represented material from both the first and third knob areas. This material was made up of dikes and associated unoxidized iron formation that intruded the ore body. Also partially completed in the first knob area was a footwall access road to the primary crusher extending from the plant down to the 1585 foot bench.

HUMBOLDT MINE  
ANNUAL REPORT  
YEAR 1956

6. OPEN PIT: (Con't.)

a. Stripping:

The following table summarizes the stripping for 1956:

<u>Month</u>	<u>Surface</u>	<u>Rock</u>	<u>Total</u>	<u>Man Days</u>	<u>Yds. Per Man Day</u>
January			-		
February			-		
March			-	26	
April	7,745	3,804	11,549	122	94.66
May	4,355	9,930	14,285	133	107.41
June	35,480	5,596	41,076	296	138.77
July	-	-	-	-	-
August	20,620	7,840	28,460	166	128.36
September	33,895	14,043	47,938	213	225.06
October	51,975	8,520	60,495	325	186.14
November	14,635	8,580	23,215	256	90.33
December	22,840	6,384	29,224	403	72.52
Total - 1956	191,545	64,697	256,242	1,940	132.08
Total - 1955	227,670	154,588	382,258	3,955	96.65
Total to Date	719,706	255,695	975,401	9,273½	105.18

b. Stripping Expenditures:

	<u>Amount Authorized</u>	<u>Amount Expended</u>	<u>Amount Unexpended</u>
E&A HM - 12	95,400.00	95,400.00	-
E&A HM - 22	151,182.00	146,917.48	4,264.52

HUMBOLDT MINE  
ANNUAL REPORT  
YEAR 1956

6. OPEN PIT: (Con't.)

c. Open Pit Mining:

A total of 514,844 tons of crude ore was hauled to the crusher from the pit. The majority of this tonnage was mined from the 1545 foot bench in the first knob area with the remainder from the 1580 foot bench of the third knob area. The crude ore from the first knob was of good grade except for those areas associated with igneous dikes. Unoxidized and lean iron formations were experienced along these intrusives making selective mining difficult. This resulted in a lowering of the grade of crude ore delivered to the crusher. The material from the third knob area was also lean with the analysis for all crude mined for the year averaging 29.7% Fe.

Most of the primary drilling was accomplished by the jet piercing machine. Wagon drills were used to drill small areas in difficult terrain and where sloping banks needed relief for the jet pierced holes. To realize the savings from deep, widely-spaced jet holes, 45 foot holes at spacings from 21' x 21' to 26' x 26' were utilized for blasting throughout most of the year.

A new 5½ inch Gardner-Denver wagon drill was under test during the fall. The exceptionally good bit footages realized during the test indicated reasonable costs for drilling with this machine. Four and one half inch diameter bits were tested in both the crude ore and hanging wall conglomerate.

In addition to the two regular Humboldt shovels, an additional 54-B was transferred to the Humboldt Mine during the fall. This shovel greatly aided pit development as it not only served as a spare shovel if a breakdown occurred, but reduced the long moves required as the mining faces and stripping areas became widely separated.

There were two major breakdowns that hampered the pit operation involving the P&H shovel. In November, the spur gear driving the left track broke, while in December, the boom developed cracks that needed considerable welding.

As the 1545 foot bench was opened during the year, large quantities of water were encountered resulting in the pumping of up to 800 gallons per minute to maintain a dry pit.

HUMBOLDT MINE  
ANNUAL REPORT  
YEAR 1956

6. OPEN PIT: (Con't.)c. Open Pit Mining:Summary of Pit Production

Crude Ore from Pit to Crushing Plant		514,844 tons
Crude Ore from Stockpile to Crushing Plant		5,060 tons
Total Crude Ore from Pit to Crushing Plant		519,904 tons
Crude in Stockpile - December 31, 1955		36,597 tons
Crude Ore from Pit to Stockpile - 1956		-
Crude Ore from Stockpile to Crushing Plant - 1956		5,060 tons
Crude Ore in Stockpile - December 31, 1956		31,537 tons
Waste Rock, Pit to Dump - Yards		23,513 yards
Total Footage Drilled Jet Piercer		20,470 feet
Total Footage Drilled Wagon Drills		24,320 feet
Jackhammer Hours - Secondary Drilling		394 hours
Average Grade of Crude Ore	29.70 Iron	56.45% Silica
Cost Per Ton of Crude Ore		.783

Working Schedule

Wagon Drilling	2 Shifts Per Day - 5 Days Per Week
Jet Drilling	2 & 3 Shifts Per Day - 5 Days Per Week
Crude Ore Hauling	1 & 2 Shifts Per Day - 7 Days Per Week

Summary of Powder Used:Primary Blasting - Jet Holes

<u>Type</u>	<u>Unit Cost</u>	<u>Amount Used</u>	<u>Total Cost</u>
7/8"x 8"Gelamite	19.90 C	50 lbs.	\$ 9.95
2"x 8"Gelamite	18.20 C	1,200 lbs.	218.40
2 1/4"x 16"Gelamite	18.496 C	8,975 lbs.	1,660.02
1 1/2"x 24"Gelamite	18.95 C	1,116 lbs.	211.49
3 1/2"x 10"Gelamite	18.95 C	4,800 lbs.	909.60
E.P. 152	18.047 C	147,070 lbs.	26,542.76
E.P. 158	18.75 C	240,150 lbs.	45,028.19
E.P. 194	12.273 C	13,750 lbs.	1,687.65
Ammonium Nitrate	9.50 C	71,250 lbs.	6,768.75
Tritex	10.694 C	9,225 lbs.	986.53
Regular Primacord	32.50 M	32,123 ft.	1,043.99
Plastic Primacord	36.66 M	39,400 ft.	1,442.30
Connecting Wire	1.15 lb.	192 lbs.	220.80
XC-45 Boosters	50.00 C	650	325.00
17 M.S. Connectors	45.50 C	250	113.75
#6 Plastic Caps	15.00 C	100	15.00
Dry Fuse	5.697 C	1,427	8.13
Electric Caps	21.74 C	113	\$ 24.57
			\$ 87,216.88
Cost Per Ton of Material Broken			\$ .118



HUMBOLDT MINE  
ANNUAL REPORT  
YEAR 1956

6. OPEN PIT: (Con't.)

c. Open Pit Mining:

Summary of Powder Used:

Primary Blasting - Wagon Drill Holes

<u>Type</u>	<u>Unit Cost</u>	<u>Amount Used</u>	<u>Total Cost</u>
7/8"x 8"Gelamite	23.16 C	50 lbs.	\$ 11.58
1 1/4"x 8"Gelamite	18.35 C	780 lbs.	143.13
2"x 8"Gelamite	18.20 C	275 lbs.	50.05
2 1/4"x 8"Gelamite	18.20 C	250 lbs.	45.50
2 1/4"x 16"Gelamite	18.455 C	4,600 lbs.	848.93
2 3/4"x 16"Gelamite	18.20 C	1,725 lbs.	313.95
1 1/2" x 24" Gelamite	18.95 C	3,619 lbs.	685.80
Regular Primacord	32.00 M	26,465 ft.	846.88
Dry Fuse	.625 C	24 ft.	.15
#6 EB Cap	1.73 C	3	.05
Electric Caps	21.95 C	13	2.85
			<u>\$ 2,948.87</u>

Secondary Blasting

7/8"x 8' Gelamite	19.90 C	10 lbs.	\$ 1.99
1 1/4"x 8' Gelamite	18.537 C	1,800 lbs.	333.67
2"x 8" Gelamite	18.20 C	45 lbs.	8.19
2 1/4" x 16" Gelamite	18.98 C	50 lbs.	9.49
2 3/4" x 16" Gelamite	18.20 C	40 lbs.	7.28
1 1/2" x 24" Gelamite	18.523 C	65 lbs.	12.04
Regular Primacord	30.728 M	2,675 ft.	82.20
Friction Tape	.52 lb.	1/2 lb.	.26
17 M.S. Connectors	45.50 C	100	45.50
Cap Crimpers	2.15 Ea.	6	12.90
Trucking, Servicing			6.58
			<u>\$ 520.10</u>

Summary of Footages Drilled:

<u>Month</u>	<u>Jet Piercing</u>	<u>Wagon Drilling</u>
April	2,064	769
May	3,701	5,302
June	2,721	4,912
July	-	-
August	1,714	2,141
September	2,460	3,183
October	3,739	3,824
November	1,647	1,372
December	2,424	2,817
Total	<u>20,470</u>	<u>24,320</u>

HUMBOLDT MINE  
ANNUAL REPORT  
YEAR 1956

6. OPEN PIT: (Con't.)

c. Open Pit Mining:

Summary of Jet and 4½" Diameter Drill Holes Blasted

<u>Date</u>	<u>No. of Holes</u>	<u>Avg. Depth</u>	<u>Average Spacing</u>	<u>Powder Factor*</u>	<u>Gross Tons</u>	
					<u>Ore</u>	<u>Rock</u>
4-16	19	29.9	19 x 20	1.69	15,150	2,200
4-24	35	25.2	18 x 18	1.78	18,000	5,000
5-9	59	31.0	20 x 20	1.98	52,870	17,380
5-23	38	43.6	26 x 26	1.78	96,580	-
6-15	27	43.8	26 x 26	1.75	53,590	16,080
8-20	42	42.2	17 x 25	1.36	47,410	18,210
8-23	6	34.2	20 x 16	1.03	5,800	-
8-31	80	19.7	13 x 13	1.21	6,000	17,470
9-12	29	42.9	25 x 20	1.54	30,530	23,750
9-25	31	44.0	25 x 20	1.73	52,860	7,770
10-9	33	44.0	24 x 20	1.97	32,300	32,300
10-25	40	44.3	24 x 18	1.30	39,920	20,750
10-31	20	43.9	24 x 18	1.40	31,710	6,580
11-6	10	33.5	21 x 15	1.18	2,720	6,690
11-6**	43	25.0	9 x 9	1.00	8,000	8,000
12-7	55	28.1	18 x 17	1.36	36,625	4,125
12-21	31	39.5	18 x 18	1.02	35,320	-
					565,385	186,305

Total 555 Jet Holes  
\*\* 43 4½" Diameter Holes Drilled by 5½" Gardner-Denver 143 Wagon Drill

\* Tons of Material Broken per Pound of Powder Used.

Average stemming - 12 feet.  
All drilling four feet below bench grade.

HUMBOLDT MINE  
ANNUAL REPORT  
YEAR 1956

6. OPEN PIT: (Con't.)

c. Open Pit Mining:

Summary of Jet Piercer Operating Costs

<u>Month</u>	<u>Oxygen</u>	<u>Fuel Oil</u>	<u>Reamer Shells</u>	<u>Kelley</u>	<u>Burner Assembly</u>	<u>Piping</u>	<u>Misc. Oper. Supply</u>	<u>Misc. Maint. Supply</u>	<u>Royalty</u>	<u>Maint. Labor</u>	<u>Oper. Labor</u>	<u>Reamer</u>	<u>Total</u>
March		4.94	25.02			.65	51.60	406.05		785.71			1273.97
April	4199.01	533.00	363.08		163.07	22.03	566.89	511.32	936.50	479.51	1501.92	280.13	9556.46
May	10792.25	1699.14	272.17	107.90	150.00	104.40	427.90	744.53	2072.59	372.17	2820.36	402.20	19965.61
June	9192.90	1782.66	123.86	471.90	166.35	375.18	765.00	549.52	1604.69	627.51	1930.48	457.28	18047.33
July	-	-	-	-	-	-	-	-	-	-	-	-	-
August	4686.76	1206.27	253.36	219.65	200.62	220.09	833.83	327.59	1070.62	365.24	1636.34	265.34	11285.71
September	6887.12	1668.99	183.18	157.05	91.92	510.51	337.72	556.78	1601.26	154.54	1903.14	444.56	14496.77
October	10742.09	2111.16	59.60	237.29	104.72	-	352.36	515.47	2412.07	378.08	3251.33	445.51	20609.68
November	3899.99	890.30	159.54	353.55	64.34	80.60	530.01	423.21	1257.95	714.06	2395.29	296.30	11065.14
December	6804.57	1326.46	217.54	199.66	8.34	5.71	537.70	557.66	1032.28	1107.66	2025.52	248.20	14071.30
<b>Total</b>	<b>57204.69</b>	<b>11222.92</b>	<b>1657.35</b>	<b>1747.00</b>	<b>949.36</b>	<b>1319.17</b>	<b>4403.01</b>	<b>4592.13</b>	<b>11987.96</b>	<b>4984.48</b>	<b>17464.38</b>	<b>2839.52</b>	<b>120371.97</b>

Total Loaded Footage Jet Drilled Holes	19,487'
Total Drilled Footage Jet Drilled Holes	20,470'
Cost Per Foot of Loaded Footage	6.177
Cost Per Foot of Drilled Footage	5.880
Total Tons Blasted Ore and Waste	735,690 tons
Total Cost Per Ton Blasted - Ore and Waste	.164

HUMBOLDT MINE  
ANNUAL REPORT  
YEAR 1956

7. PLANT:

a. General:

The crude ore utilized during the year was higher in grade than that processed in 1955. The net feed rate for the year was 111 L.T.P.H. The feed rate was limited somewhat throughout the year because of the extreme hardness of the crude ore.

The various rates were:

	<u>Crusher Feed L.T.P.H.</u>		<u>Concentrator Feed L.T.P.H.</u>		<u>Concentrate L.T.P.H.</u>	
	<u>Gross Time</u>	<u>Net Time</u>	<u>Gross Time</u>	<u>Net Time</u>	<u>Gross Time</u>	<u>Net Time</u>
1956	237.81	306.64	106.02	111.13	42.34	44.38
1955	221.90	300.53	86.50	98.60	31.59	36.00

The recoveries from the crude were:

	<u>Tonnage</u>	<u>Crude</u>	<u>% Fe</u>	<u>% Wt. Recovery*</u>	<u>Concentrate</u>	<u>% Fe Unit Recovery*</u>
1956	518,044		29.70	37.42		77.94
1955	587,511		27.63	33.90		75.64

\* Based on dry tons of feed and concentrate.

The operating time for the crushing plant and mill were:

	<u>Crushing Plant</u>	<u>Mill</u>
1956	77.55	95.40
1955	74.85	87.73

The outstanding mill delays were caused by mechanical failures in the pit and crushing plant which caused "out of feed" delays in the mill. These delays accounted for 58% of the total mill delay time. Operational type delays were responsible for 28% and mill mechanical failures accounted for the remaining 14% of the total delay time.

HUMBOLDT MINE  
ANNUAL REPORT  
YEAR 1956

7. PLANT:(Con't.)

b. Monthly Production and Grade:

<u>Month</u>	<u>Tonnage</u>	<u>% Fe</u>	<u>% P</u>	<u>% SiO2</u>	<u>% S</u>	<u>% H2O</u>
April	9,749	61.57	.066	10.17	.010	7.30
May	28,063	61.57	.088	9.35	.014	7.05
June	34,156	61.85	.098	8.90	.040	7.22
August	19,227	61.55	.094	9.75	.013	6.39
September	30,795	62.18	.078	9.51	.011	6.03
October	29,636	62.24	.073	9.30	.012	6.07
November	29,478	61.81	.094	9.47	.023	6.46
December	24,000	61.71	.065	10.45	.008	6.95
Year	206,901	61.80	.084	9.50	.018	6.64

c. Metallurgical Balance:

<u>Product</u>	<u>% Wt.</u>	<u>% Wt. Crude</u>	<u>% Fe</u>	<u>% SiO2</u>	<u>% Fe Unit Recovery</u>
Concentrate	39.19	37.42	61.86*	9.48*	77.94
Flotation Tailing	60.81	58.06	9.41		18.40
Flotation Feed	100.00	95.48	29.97		96.34
Secondary Cyclone Overflow		4.52	24.08		3.66
Calculated Head		100.00	29.70		100.00

\* Based on weighted averages carried at Humboldt Mill.

	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Sul.</u>	<u>Moist.</u>
Concentrate Assay (Shipping Dep't.) (Dry)	61.80	.084	9.50	.018	6.64
(Natural)	57.70		8.87		
Guarantee for 1956 - (Dry)	61.80	.090	9.50	.010	7.50

HUMBOLDT MINE  
ANNUAL REPORT  
YEAR 1956

7. PLANT: (Con't.)

d. Hourly Operating Rates:

<u>Feed to Primary Crusher</u>	<u>Tons</u>	<u>Gross Hours of Operation</u>	<u>Net Hours of Operation</u>	<u>LTPH (Gross)</u>	<u>LTPH (Net)</u>
1956 Season	519,904	2186.25	1695.50	237.81	306.64
1955 Season	591,179	2652.50	1958.50	222.88	301.85
Ore in Process	1,728				
Ore for Roads	1,312				

Fine Ore Bin to Concentrator

1956 Season	518,044	4886.33	4661.51	106.02	111.13
1955 Season	587,511	6791.83	5958.42	86.50	98.60

Concentrates

1956 Season	206,901	4886.33	4661.51	42.34	44.38
1955 Season	214,532	6791.83	5858.42	31.59	36.00

Operating Time

1956 Season	95.40%
1955 Season	87.73%

e. Monthly Hourly Operating Rates:

	<u>Feed to Primary Crusher</u>	<u>Fine Ore Bin to Concentrator</u>	<u>Concentrates</u>
1) <u>Long Tons Per Gross Hour:</u>			
April	213.87	92.87	32.07
May	264.93	113.12	40.49
June	268.67	114.63	50.19
August	231.02	108.12	40.06
September	301.34	110.92	46.38
October	260.88	99.60	41.11
November	189.10	104.13	43.35
December	188.90	98.28	36.14
Year	237.81	106.02	42.34

2) Long Tons Per Net Hour:

April	288.21	97.58	33.70
May	306.84	116.08	41.55
June	326.48	116.31	50.93
August	305.11	114.44	42.40
September	365.49	111.52	46.63
October	340.07	106.95	44.15
November	260.05	108.53	45.18
December	267.35	110.90	40.79
Year	306.64	111.13	44.38

HUMBOLDT MINE  
ANNUAL REPORT  
YEAR 1956

7. PLANT (Con't.)

f. Pit - Crusher Time Distribution:

	<u>Hours</u>	<u>Percent Delays</u>	<u>Percent Total Yearly Delay</u>	<u>Percent of Total Yearly Working Time</u>
1) <u>Pit</u>				
Pit Delay	167.75	100.00	34.18	7.67
			34.18	7.67
2) <u>Crushers</u>				
Primary Chute Plugged	79.00	24.46	16.10	3.62
Chunks in Primary Crusher	53.00	16.41	10.80	2.42
Tertiary Crusher Repair	37.50	11.61	7.64	1.72
Primary Crusher Jammed	26.50	8.20	5.40	1.21
Ross Feeder Repair	19.50	6.04	3.97	.89
#1 Buffer Belt	18.50	5.73	3.77	.85
#4 Conveyor	10.00	3.10	2.04	.46
#3 Conveyor	9.00	2.79	1.83	.41
Feed Box Plugged - Secondary Crusher	8.50	2.63	1.73	.39
Install Air Jets - Primary Chute	7.00	2.17	1.43	.32
#1 Screen	5.50	1.70	1.12	.25
Repair Secondary Crusher	5.50	1.70	1.12	.25
Tramp Steel in Secondary Crusher	5.00	1.55	1.02	.23
Ross Feeder Chute	5.00	1.55	1.02	.23
#2 Buffer Belt	5.00	1.55	1.02	.23
#1 Fines Chute	5.00	1.55	1.02	.23
Fire in Grid, Controller - Sec. Crusher	4.50	1.39	.92	.21
Primary Crusher Chute Repair	4.50	1.39	.92	.21
#1 Conveyor	2.50	.77	.51	.11
Metal Detector	2.50	.77	.51	.11
Surge Bin Belt	2.50	.77	.51	.11
Surge Bin Full	2.50	.77	.51	.11
Plant Down-Approaching thunder storms	2.00	.62	.41	.09
#2 Conveyor	1.00	.31	.20	.05
Power Failure	1.00	.31	.20	.05
Adjust Secondary Crusher	.50	.16	.10	.02
Total	323.00	100.00	65.82	14.78
Grand Total	490.75		100.00	22.45

HUMBOLDT MINE  
ANNUAL REPORT  
YEAR 1956

7. PLANT: (Con't.)g. Pit - Crusher Monthly Time Distribution:

Month	Hours Delay Time	Monthly Percent Operating Time	Monthly Percent Delay Time	Percent of Total Yearly Delays	Percent of Total Yearly Working Time
April	32.50	74.21	25.79	6.62	1.49
May	40.50	86.34	13.64	8.25	1.85
June	52.50	82.29	17.71	10.70	2.40
August	55.00	75.72	24.28	11.21	2.52
September	43.75	82.45	17.55	8.91	2.00
October	64.50	76.71	23.29	13.14	2.95
November	101.50	72.72	27.28	20.69	4.64
December	100.50	70.66	29.34	20.48	4.60
	490.75	77.55	22.45	100.00	22.45

h. Concentrator Delay Time:

	Hours Delay	Percent Delay	Percent Total Yearly Delay	Percent of Total Yearly Working Time
1) <u>Operational:</u>				
No feed - Tertiary Crusher Repairs	82.50	42.85	36.70	1.69
Startup and Shutdown - Repair Shift	26.20	13.61	11.65	.53
No feed - Ross Feeder Repairs	16.00	8.31	7.12	.33
No feed - Primary Chute Plugged	14.25	7.40	6.34	.29
Main Mill Breaker Overload	8.88	4.61	3.95	.18
Power Failure	8.16	4.24	3.63	.17
No feed - Pit Delay	7.92	4.11	3.52	.16
Hydroscillator Rakes Overloaded	5.92	3.07	2.63	.12
#3 Conveyor Motor Burned Out - No feed	5.67	2.94	2.52	.12
Thickener Overloaded	5.17	2.68	2.30	.11
Mill Pumps Sanded	4.50	2.34	2.00	.09
Flotation Machines Sanded	3.25	1.69	1.45	.07
No feed - Primary Crusher Jammed	3.00	1.56	1.33	.06
No feed - Fine Ore Bin Empty	.50	.26	.22	.01
Grinding Chutes Plugged	.47	.24	.21	.01
Feed Checks	.17	.09	.08	-
	192.56	100.00	85.65	3.94
2) <u>Equipment:</u>				
Mill Pumps	16.19	50.19	7.20	.33
Thickener Drive Thrust Bearing Failure	7.91	24.52	3.52	.16
Hydroscillator Rake Repair	4.41	13.67	1.96	.09
Completion of Ball Mill Relining Job	2.50	7.75	1.11	.05
Hydroscillator Bowl Repair	1.25	3.87	.56	.03
	32.26	100.00	14.35	.66
Total	224.82		100.00	4.60



HUMBOLDT MINE  
ANNUAL REPORT  
YEAR 1956

7. PLANT: (Cont.)i. Concentrator Monthly Delay Time:

<u>Month</u>	<u>Hours Delay Time</u>	<u>Monthly Percent Operating Time</u>	<u>Monthly Percent Delay Time</u>	<u>Percent of Total Yearly Delays</u>	<u>Percent of Total Yearly Working Time</u>
April	14.67	95.17	4.83	6.53	.30
May	17.63	97.46	2.54	7.84	.36
June	9.83	98.56	1.44	4.37	.20
August	26.50	94.48	5.52	11.79	.54
September	3.53	99.47	.53	1.57	.07
October	49.50	93.13	6.87	22.02	1.01
November	27.58	95.94	4.06	12.27	.57
December	75.58	87.73	11.38	33.61	1.55
Year	224.82	95.40	4.60	100.00	4.60

j. Monthly Rod, Ball and Reagent Consumption:

<u>Month</u>	<u>Rods</u>		<u>Balls</u>		<u>Reagents</u>	
	<u>#</u>	<u>#/ton feed</u>	<u>#</u>	<u>#/ton</u>	<u>#</u>	<u>#/ton</u>
April	74,600	2.642	28,300	1.002	26,884	.952
May	116,809	1.490	60,600	.773	98,622	1.258
June	98,451	1.262	57,560	.725	144,415	1.851
August	73,150	1.410	47,850	.922	72,255	1.391
September	129,560	1.759	62,045	.842	112,846	1.532
October	128,835	1.794	71,660	.998	131,044	1.825
November	80,990	1.144	81,055	1.145	120,394	1.700
December	80,035	1.226	52,000	.797	70,971	1.088
	782,430	1.510	461,070	.890	777,431	1.501

HUMBOLDT MINE  
ANNUAL REPORT  
YEAR 1956

7. PLANT: (Con't.)

k. Plant Testing:

Plant testing was continued on a limited basis during the year. Changes in equipment, reagents and grinding media were made to effect immediate improvements as well as to continue a study of certain problems on a long-range basis.

The new Denver flotation machines, which were installed during the idle period in 1955, were placed in operation in 1956. As originally furnished, the rougher cells were continually overloaded and produced a tailing which was relatively high in iron content. After several months of operation and numerous minor adjustments, the Denver Equipment Company furnished Type M mechanisms to replace the Sub-A mechanisms that were originally installed in the rougher cells. After the installation of the Type M mechanisms in the roughing section, this machine produced a much better tailing. The Type M mechanism also drew much less power and, therefore, it became possible to increase the feed rate to this machine without overloading the motors.

The high consumption of Acintol #2 was under consideration throughout the year. This abnormal consumption was apparent only when treating knob one ore. When treating knob three ore, the reagent consumption was normal as compared to 1955 when a Neofat 139-Red Oil mixture was used as the primary collector. In December, an Acintol #2-Neofat 139 mixture was used for a limited time on knob one ore. This mixture reduced the actual consumption by one-third and slightly better metallurgical results were obtained. On knob three ore, which is leaner and often argillaceous, little difference in results or consumption was noted. As far as costs were concerned, the reduction in reagent quantities was offset by the higher cost of Neofat 139. Plant testing on knob one ore with the Neofat 139-Tall Oil mixture will be continued in 1957 to establish more definite information.

In December, a car load of Pamak 1, produced by the Hercules Powder Company, was tested. The Pamak 1 was similar in composition to Acintol #2 and competitively priced. Metallurgically speaking, there was little or no difference found in the two tall oil products. In the future, Pamak 1 will be used at Humboldt instead of Acintol #2.

In the grinding circuit, changes were made in the size of the grinding rods. Grinding rods measuring 3", 3½" and 4" were charged into the rod mills at various times during the year. Indications are that a higher circulating load in the grinding circuit is obtained with the larger rods. Accordingly, it is now planned to continue the use of the larger rods along with the addition of some 1½" balls to the normal ball charge of 1¼" balls. A charge of 15% of 1½" balls and 85% of 1¼" balls will be used along with the larger rods. The advantages gained by using the larger rods are: 1) a better wear pattern on the rods and subsequent lower rod consumption and 2) a slight gain in grinding capacity.

HUMBOLDT MINE  
ANNUAL REPORT  
YEAR 1956

8. MAINTENANCE, REPAIRS AND CHANGES:

a. Crushing Plant:

In addition to routine repairs in the crushing plant, the following major repairs and plant changes were completed in 1956:

- 1) April - A new hydraulic reset system was installed on the Hydrocone crusher.
- 2) August - The eccentric sleeve and bottom shell bushing was replaced on the primary crusher.
- 3) October - The eccentric sleeve was replaced on the Hydrocone crusher.
- 4) November - The splitter beam was removed and the dead bed slide dumping arrangement into the primary crusher was completed.
- 5) November - The Roto-Clone dust collector unit in the secondary building was put into operation. The entire dust collection system is not complete.
- 6) December - New drive gears on the Ross Feeder were installed to replace broken gears.
- 7) December - All sixteen of the top shell studs in the Hydrocone crusher were replaced. Thirteen of the sixteen studs broke on December 4th.

b. Concentrator:

Major repairs in 1956 were:

- 1) The heads and rotors in both of the vacuum pumps were replaced.
- 2) A new oscillator was installed on the hydrooscillator.
- 3) Larger feed and equalizer lines were installed on the filtrate pumps.
- 4) A new pinion gear was installed on both rod mills.
- 5) The thickener drive thrust bearing was replaced four times during the year because of the inadequate design of the thrust bearing assembly.
- 6) The ball mill was completely relined. This was the first time the cylinder liners were replaced since the beginning of operations at Humboldt Mine.
- 7) The eight Sub-A mechanisms in the rougher section of the new Denver flotation machines were replaced with Type M mechanisms.

HUMBOLDT MINE  
ANNUAL REPORT  
YEAR 1956

9. E & A's:

Construction and Stripping E & A's:

	<u>1956</u> <u>Expenditures</u>	<u>Total</u> <u>Expenditures</u>
HM-6 Drop Ball	\$ 64,832.21	\$ 64,832.21
HM-9 Plant Changes	3,646.22	40,321.66
HM-11 Dust Collection	21,328.51	21,328.51
HM-12 Stripping	16,982.16	95,400.00
HM-13 Tractor	22,351.00	22,351.00
HM-16 Air Trac Drill	4,757.88	4,757.88
HM-17 Pit Pump	962.59	962.59
HM-18 Power Lines	6,313.11	6,313.11
HM-20 Control Center	3,497.81	3,497.81
HM-21 Plant Improvement	4,824.22	4,824.22
HM-22 Stripping	147,742.54	147,742.54
HM-23 Pick-up Truck	1,878.64	1,878.64
HM-25 Rock Box	2,165.61	2,165.61
HM-26 2½ Yd. Bucket	4,336.44	4,336.44
HM-27 Pumps	3,178.89	3,178.89
HM-29 Primary Crushing Plant Improvements	557.38	557.38
HM-30 TD-18 Tractor	2,000.00	2,000.00
HM-35 Share of Costs - MOC Pilot Plant	8,419.54	8,419.54
HM-36 Preliminary Design and Plant Expansion	206.12	206.12
Total	<u>\$319,980.87</u>	<u>\$435,074.15</u>

10. COST OF PRODUCTION:

a. Comparison:

	<u>1956</u>	<u>1955</u>
Pit Expense	\$1.967	\$1.915
Crushing and Screening	.633	.676
Milling Expense	2.230	2.482
Tailings Disposal	.029	.027
Stocking Expense	.050	.070
General Expense	.608	.714
Crude Charged to Operating	.027	.039
Miscellaneous	.094	.068
Taxes	.097	.119
Other Expenses and Income	.160	.182
Depletion and Depreciation	1.031	.968
Shipping Expense	<u>.085</u>	<u>.086</u>
Cost at Mine	\$7.011	\$7.346*

\* Includes W&I Costs

HUMBOLDT MINE  
ANNUAL REPORT  
YEAR 1956

10. COST OF PRODUCTION:

b. Detail of 1956:

	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Total</u>
Pit Expense	2.669	1.997	1.672	-	1.885	1.960	1.935	1.681	2.607	1.967
Crushing & Screening	.700	.619	.425	-	.631	.567	.624	.631	.975	.633
Milling Expense	3.276	2.329	1.805	-	2.219	2.069	2.387	2.114	2.208	2.230
Tailings Disposal	.052	.036	.019	-	.022	.052	.023	.019	.020	.029
Stocking Expense	.090	.077	.030	-	.044	.024	.053	.022	.101	.050
General Expense	1.062	.502	.450	-	.862	.543	.462	.307	1.245	.608
Crude Chg'd. to Oper.	-	-	-	-	.291	-	-	-	-	.027
Miscellaneous	.010	.103	.040	-	.106	.113	.056	.122	.173	.094
Taxes	.297	.103	.085	-	.121	.094	.065	.065	.091	.097
Other Exp. & Income	.309	.158	.155	-	.190	.164	.152	.100	.178	.160
Depl. and Deprn.	1.158	.938	.899	-	.975	.901	1.354	1.199	.961	1.031
Shipping Expense	<u>.016</u>	<u>.031</u>	<u>.050</u>	-	<u>.160</u>	<u>.202</u>	<u>.084</u>	<u>.104</u>	-	<u>.085</u>
TOTAL COST	9.639	6.893	5.630		7.496	6.689	7.195	6.364	8.559	7.011
Production	9,749	28,063	34,156		19,227	30,795	29,636	29,478	24,000	206,901*

\*Includes 1,797 tons of overrun

January, February and March - Winter & Idle Expense  
July - Idle Expense

HUMBOLDT MINE  
ANNUAL REPORT  
YEAR 1956

10. COST OF PRODUCTION:

c. Analysis of Costs:

The total cost of producing concentrate at the Humboldt Mine during 1956 again was lower than the preceding year. The yearly decline since the opening of the mine is shown in the following table:

<u>Year</u>	<u>Cost of Production</u>	<u>Total Cost</u>
1954	\$ 7.383	\$ 8.754
1955	5.869	7.123
1956	5.638	7.011

To permit an accurate comparison, the 1955 figures in the above table are adjusted from these shown on cost sheets because of idle charges.

Although the life of the Humboldt operation has extended over three years, the plant, at the end of 1956, had actually run only 27 $\frac{1}{4}$  months. This comparatively limited operating time, accompanied by idle periods and an almost continuous program of changes, has greatly affected overall costs in each of the years. Of even greater consequence, has been the cost of mining because of the complex geology and rugged terrain. Mining costs will undoubtedly show the greatest improvement in the future when the irregular knobs are removed and stripping has progressed to the extent that more elaborate mining plans can be used to off-set the geological problems.

During 1956, two general factors affected operating expenditures and prevented a larger decrease in the cost of production. A large portion of the pit and mill equipment had reached a point where replacement parts were required which increased maintenance costs over 1955 by at least \$11,000 per month. It is expected that this cost will level off and not increase over the 1956 total. Secondly, mining was conducted in the first knob area which, because of joints, fractures and dikes, tended to fragment in large chunks when blasted. Although experimentation with hole spacings and powder charges improved the situation slightly, mining and crushing costs were, in general, affected by the need for utilizing this ore during most of the operating months in 1956. Of a more detailed nature, but also adding to the 1956 costs, were high rental charges, as five new trucks, one shovel and one tractor were operated on this basis. Referring again to the geological problems of the pit, waste removal charged to the ore operation, involving dikes, lean and unoxidized iron formation within the ore body also added to mine expenditures during 1956.

Since most of the above items that have been affecting costs to date at the Humboldt operation should be largely eliminated in the future, it is reasonable to estimate that a steady improvement to the Humboldt profit margin will be realized over the coming years.

HUMBOLDT MINE  
ANNUAL REPORT  
YEAR 1956

11. TAXES:

<u>Description</u>	<u>1956</u>		<u>1955</u>	
	<u>Valuation</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Taxes</u>
Humboldt Mine, including stockpile, supplies and equipment as placed by State Mine Appraiser:				
Real Estate	\$ 862,000	\$ 17,240.00	\$ 850,000	\$17,000.00
Personal Property	730,000	14,600.00	410,000	8,200.00
Dr. Burke Camp	400	8.00	400	8.00
		31,848.00		25,208.00
Collection Fee		318.48		252.08
 TOTAL HUMBOLDT MINING CO.	 \$1,592,400	 32,166.48	 1,260,400	 \$ 25,460.08
 Tax Rate		 \$20.00		 \$20.00

12. ACCIDENTS AND PERSONAL INJURY:

<u>Name</u>	<u>Date of Injury</u>	<u>Nature of Injury</u>	<u>Days Lost</u>	<u>Compensation Paid</u>
George Auge	June 18	Broken bone - Right hand	40	\$ 336.00
George Karvela	August 21	Laceration - 3rd finger Right hand	25	\$ 259.45
Norman Bradbury	August 31	Strained back	42	\$ 390.00

13. PROPOSED NEW CONSTRUCTION:

The principal construction change definitely scheduled for 1957 is a remodeling of the primary crushing building to facilitate the installation of a pan feeder under the crusher. This work involves mainly concrete and steel changes in the area between the crusher discharge and the tail end of conveyor #1.

Also planned for 1957 is the extending of the concrete floor in the mill. This project will help solve the clean-up problem associated with ball mill #2 as the floor in this section of the mill has never been finished.

HUMBOLDT MINE  
ANNUAL REPORT  
YEAR 1956

14. EXPLORATION:

An exploration diamond drilling program was initiated during the latter part of December. Crews moved into the area and set up on DDH #8 (Sec. 2), located at co-ordinates 4809.09 S. and 8394.90 W. The hole is being drilled on a course of S. 38° 46' E. at an inclination of -45° from an elevation of 1541.83'. At the close of the year, 68' of clear, sandy overburden plus 8' of broken quartzite ledge and boulders had been penetrated. It is hoped that this hole will provide pertinent information relevant to (1) the location of the hanging wall contact, (2) the magnitude of the extension of iron formation as indicated by DDH #7 (Sec. 2), (3) the nature of the iron formation present including some indication as to the degree of contamination by dikes and lean zones, (4) the interpreted fault zone possibly relating its general trend and (5) the mining footwall contact.

In conjunction with diamond drilling, a program of detailed geophysical exploration has been set up for the coming year. The survey will initiate with north-south lines at the southwest portion of the Weber Lease and continue eastward until anomalies indicate it no longer possible.

Cursory field examination indicated the possibility of finger-like protuberances of oxidized iron formation beyond the present mining footwall limits. A thorough plane table mapping project has been proposed for the coming field season. Although outcrops are scarce, certain areas may appear fruitful meriting a few short drill holes.

15. EQUIPMENT RECEIVED AND PROPOSED NEW EQUIPMENT:

a. Equipment Received:

- 1 - 2½ Yard Dipper
- 1 - 2000 GPM Pit Pump
- 2 - 200 GPM Pit Pumps
- 1 - F-250 Pick-up Truck
- 1 - MG Set for Grind Section
- 2 - 400 Amp. Welders
- 1 - Air Trac Wagon Drill
- 1 - D-7 Tractor
- 1 - 1200 GPM Pit Pump
- 1 - Roto Clone Dust Collector
- 1 - Multi Clone Dust Collector
- 1 - 5" Hazelton Pump
- 1 - Control Center for Flot Section
- 1 - Hydrocone Reset System
- 1 - Oscillator Bowl

b. Proposed New Equipment:

- Pioneer Pan Feeder
- 13 - Flotation Tanks
- 1 - Merrick Weightometer
- 1 - Hough Payloader
- 1 - #143 5½" Air Trac Drill
- 1 - TD-18 Tractor
- 1 - Set of Shells for Tertiary Crusher
- 1 - Pick-up Truck



MATHER MINE "A" SHAFT  
ANNUAL REPORT  
YEAR 1956

1. GENERAL:

Production for the Mather Mine, "A" Shaft for the year was 1,252,192 tons. This is the highest annual tonnage produced to date at the "A" Shaft. This production was achieved in spite of a five week shut-down due to the steel strike. Operations were on a three shift five and one-third day per week schedule until November 11th when a five day per week schedule went into effect. Shipments from the pocket commenced on April 6th and continued through November 26th and shipments from the stockpile commenced on April 9th and continued through December 3rd. A total of 1,118,694 tons were loaded out during that period.

The analysis of the Mather Mine, "A" Shaft product for the year was 58.33 Fe., 9.02 Si., and .017 Sul. The analysis of the shipments for the year was 52.543 Fe. Natural. This analysis compares most favorably with the analysis in 1955 when the shipments were 51.45 Fe. Natural.

Notwithstanding the five week production loss because of the steel strike and the increase in the cost of labor and supplies, the cost of production decreased \$.037 per ton as compared to 1955. The total cost at the mine including depreciation, taxes, and loading and shipping costs showed a decrease of \$.160 per ton. The tons per man per day increased from 9.17 in 1955 to 10.04 in 1956, another new high for the Mather Mine, "A" Shaft.

The steel shortage continued during the year and necessitated substitutions in structural steel fabrication. The Bethlehem yielding steel arches were introduced as supports during the year and were found to be very satisfactory.

The underground drilling program for outlining new ore reserves continued throughout 1956. Diamond drills operated from the 7th, 8th and 9th Levels with the emphasis of the drilling being placed on outlining the reserves between the 8th and 9th Levels and exploring below the 9th Level. New ore reserves disclosed were not sufficient to offset the production during the year, with the result being a net loss in reserves of 587,641 tons.

Labor relations for the year were satisfactory. The steel strike went off quietly and maintenance men needed for service work were allowed to enter the property. There was one formal grievance presented with respect to the filling of a job vacancy. The union dropped this grievance in the 4th step.

Mining operations were conducted principally on the 7th and 8th Levels with the 5th and 9th Levels contributing a minor percentage of the production. By levels, production was as follows: 5th Level - 26,490 tons or 2.13% of the total product; 7th Level - 598,787 tons or 48.15% of the total product; 8th Level - 611,792 tons or 49.20% of the total product; and 9th Level - 6,486 tons or .52% of the total product.

Main level drifting was completed on the 9th Level and cross-cut development will continue into 1957. All cross-cut development was completed on the 8th Level during the year. The main conveyor belt project on the 9th Level was about 95% complete at the end of the year and this unit will go into operation early in 1957.

One sub-level conveyor went into operation on the 8th Level during the year. Excava-

Mather "A" 1956

MATHER MINE "A" SHAFT  
ANNUAL REPORT  
YEAR 1956

1. GENERAL: (Continued)

tion for a second sub-level conveyor on 8th Level and one on the 9th Level was completed. The installation work on these additional units will carry over into 1957.

The development of ore reserves below the 9th Level at the Mather Mine, "A" Shaft was begun recently to make available the ore between the 12th and 9th Levels. Because of the length of time required to reach a depth three levels below the present lowest operating level, and then to bring the new levels into production, it was important that the development be started at the earliest possible date.

After careful consideration of all the factors involved, it was decided that a single inclined belt conveyor for handling ore and rock, together with the extension of the shaft (cage, ladder, and pipe compartments only) for handling men and supplies, would provide the best solution to the problem. At each level below the 9th, only the cage plat need be cut and no skip loading pockets at the shaft would be required.

Plans for the actual development of the inclined drift and the installation of the belt conveyor are quite unique. After driving the first 500 to 800 feet of the belt drift by the conventional slusher method, a portion of the belt conveyor will be installed. The tail pulley section will be an integral part of a scraper slide, which can be moved down the inclined drift as required. The scraper slide will protect the belt during the blasting operation and also provide a simple method for loading out the development rock. Additional belting will be spliced in each time the scraper slide is advanced.

Because of the extremely long inclined drift, it is planned to install a single drum-shaft type hoist to handle men and supplies through this drift during the development period. The hoist will operate a car on a standard 30" gauge track. The track will be installed alongside of the belt conveyor as development work progresses.

After the conveyor drift is completed a crushing and feeding station similar to the arrangement on the 7th and 9th Levels will be installed.

During the mining operation, ore will be transferred by tram cars and sub-level conveyor belts to a main storage trench located adjacent to the crushing and feeding station. The ore will then be scraped from the trench over a scalper screen, with the oversize material discharging into a jaw crusher and the undersize to a pan feeder, which in turn will load the belt. The material will travel 3700 feet along the 36" conveyor belt to the head pulley end where it will be discharged into a raise leading to the 9½ Level skip loading station.

By use of the inclined conveyor system the lower operating levels will come into production in a minimum length of time and the usual skip plats, pockets, and shaft skip compartments will be eliminated below the present shaft bottom.

WORLD WIDE

Transparent Sheet Protector  
U. S. Pat. 2,592,373



Mather Mine, "A" Shaft Surface Plant  
(Looking East)

MATHER MINE "A" SHAFT  
ANNUAL REPORT  
YEAR 1956

2. PRODUCTION:

a. Production by Grade and Months:

<u>Grade:</u>	<u>Product</u>	<u>Stockpile Overrun</u>	<u>Total</u>	<u>1955 Total</u>
Mather	1,243,555	8,637	1,252,192	
Mather Special	-	-	-	
Total	<u>1,243,555</u>	<u>8,637</u>	<u>1,252,192</u>	1,045,409
Rock			57,860	67,705

<u>Months:</u>	<u>Ore</u>	<u>Rock</u>
January	100,857	5,533
February	107,957	5,335
March	109,430	7,678
April	112,699	8,118
May	126,503	4,400
June	112,719	2,376
July	-	-
August	111,436	4,664
September	121,116	5,962
October	141,948	6,523
November	112,314	3,146
December	95,213	4,125
Total	<u>1,252,192*</u>	<u>57,860</u>

\* Total includes 8,637 tons, current year stockpile overrun pro-rated monthly.

b. Shipments:

	<u>Pocket</u>	<u>Stockpile</u>	<u>Total</u>	<u>1955 Total</u>	<u>Decrease</u>
Mather	699,378	419,316	1,118,694	1,415,286	
Mather Special	-	-	-	56,719	
	<u>699,378</u>	<u>419,316</u>	<u>1,118,694</u>	<u>1,472,005</u>	353,311

A balance of 230,325 tons of ore was left in stock as of the end of the year. An overrun of 8,637 tons was developed from the north and center stockpiles which were completely loaded out at the end of the shipping season.

MATHER MINE "A" SHAFT  
ANNUAL REPORT  
YEAR 1956

2. PRODUCTION: (Continued)

c. Ore Statement:

	<u>Mather</u>	<u>Mather Special</u>	<u>Total</u>	<u>1955 Total</u>
On Hand January 1, 1956	96,827	-	96,827	523,423
Output for Year	1,243,555	-	1,243,555	1,037,680
Transfers	-	-	-	-
Overruns	8,637	-	8,637	7,729
Total	<u>1,349,019</u>	-	<u>1,349,019</u>	<u>1,568,832</u>
Shipments	<u>1,118,694</u>	-	<u>1,118,694</u>	<u>1,472,005</u>
Balance on Hand	230,325	-	230,325	96,827
Decrease in Output				
Increase in Output			206,783	130,004
Decrease in Ore on Hand				426,596
Increase in Ore on Hand			133,498	

Working Schedule:

- 1956 - 3-8 hr. shifts, 5-1/3 days per week, Jan. 1st to Nov. 11th.  
3-8 hr. shifts, 5 days per week, Nov. 11th to Dec. 31st.
- 1955 - 2-8 hr. shifts, 4 days per week, Jan. 1st to April 18th.  
2-8 hr. shifts, 5 days per week, April 18th to Aug. 1st.  
3-8 hr. shifts, 5-1/3 days per week, Aug. 1st to Dec. 31st.
- 1954 - 3-8 hr. shifts, 5 days per week, Jan. 1st to March 1st.  
(Excluding a small production crew, Saturday, day shift.)  
3-8 hr. shifts, 5 days per week, March 1st to April 5th.  
3-8 hr. shifts, 4 days per week, April 5th to May 15th.  
2-8 hr. shifts, 4 days per week, May 15th to Dec. 31st.
- 1953 - 3-8 hr. shifts, 5 days per week, Jan. 1st to Dec. 31st.  
(Excluding a 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 a small production crew, Saturday, afternoon shift.)

MATHER MINE "A" SHAFT  
ANNUAL REPORT  
YEAR 1956

2. PRODUCTION: (Continued)

d. Division of Product by Levels and Months:

<u>Months</u>	<u>Fifth (2050') Level</u>	<u>Seventh (2400') Level</u>	<u>Eighth (2590') Level</u>	<u>Ninth (2810') Level</u>	<u>Total</u>	<u>Rock</u>
January	425	51,750	47,700	175	100,050	5,533
February	1,762	54,975	49,488	925	107,150	5,335
March	1,550	60,875	44,675	1,475	108,575	7,678
April	5,073	73,640	32,102	1,077	111,892	8,118
May	4,872	68,862	51,869	57	125,660	4,400
June	3,341	48,953	59,253	413	111,960	2,376
July	-	-	-	-	-	-
August	1,907	44,888	63,845	85	110,725	4,664
September	-	47,732	72,530	95	120,357	5,962
October	-	57,980	83,101	-	141,081	6,523
November	935	46,569	62,654	1,397	111,555	3,146
December	6,625	42,563	44,575	787	94,550	4,125
	<u>26,490</u>	<u>598,787</u>	<u>611,792</u>	<u>6,486</u>	<u>1,243,555</u>	<u>57,860</u>
Current Year Stockpile Overrun					<u>8,637</u>	
					<u>1,252,192</u>	

e. Production Delays:

Delays due to mechanical or electrical difficulties during the year were few and minor, with no delays of more than a single shift duration.

During the month of June a loss of five operating shifts was caused by the Mather Mine, "B" Shaft underground fire.

The industry wide steel strike interrupted operations from July 2nd to August 6th. Work was resumed on August 7th.

MATHER MINE "A" SHAFT  
ANNUAL REPORT  
YEAR 1956

3. ANALYSIS:

a. Average Mine Analysis on Output:

<u>Grade</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Sulphur</u>
Mather	58.33	-	9.02	.017

b. Average Analysis of Shipments:

<u>Grade</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Sulphur</u>	<u>Lime</u>	<u>Mag.</u>	<u>Loss</u>	<u>Moist.</u>
Mather	58.20	.094	9.27	.33	3.08	.015	.53	.99	1.85	9.72

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

<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Sulphur</u>	<u>Lime</u>	<u>Mag.</u>	<u>Loss</u>	<u>Moist.</u>
Mather	230,325	52.615	.085	8.16	.30	2.78	.019	.48	.89	1.67	9.72

MATHER MINE "A" SHAFT  
ANNUAL REPORT  
YEAR 1956

4. COST OF OPENING, EQUIPPING,  
DEVELOPING AND OPERATING:

Expenditures under E&A's amounted to \$871,264.87. The following table shows the main items of capital expenditures which are included in the total charges above.

	<u>Percentage of Total</u> <u>E&amp;A Charges in 1956</u>
Main Level Development	42.2
Underground Conveyor Belt and Crusher Systems	24.5
Underground Exploration	5.7
Underground Equipment	20.1
Surface Projects	2.0
Subsidence	5.5
	<u>100.0</u>



MATHER MINE "A" SHAFT  
ANNUAL REPORT  
YEAR 1956

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

Comparative Mining Costs:

The Cost of Production of \$3.670 showed a decrease of \$.037 per ton as compared to 1955. The decrease in cost was achieved despite an increase in the cost of labor and supplies.

The results achieved in keeping the cost down were a reflection of the increase in unit production from 9.17 tons per man per day in 1955 to 10.04 in 1956.

The Total Cost at Mine was \$.160 less than 1955.

Both the Cost of Production and Total Cost at Mine were the lowest they have been since 1950.

	<u>1956</u>	<u>1955</u>
Product	1,252,192	1,045,409
Underground Costs	2.859	2.862
Surface Costs	.359	.347
General Mine Expense	<u>.452</u>	<u>.498</u>
Cost of Production	3.670	3.707
Depreciation: Pre-Production Development	.013	.013
Plant & Equipment	.186	.162
Movable Equipment	.004	.007
Development	.103	.104
Miscellaneous Equipment	.001	.001
Amort. of Defense Facilities	.043	.096
Current Year's Development	.373	.494
Adjustment Prior Year's Charges	-	.090
Taxes	.245	.283
Administration	.050	.050
Loading and Shipping	<u>.054</u>	<u>.075</u>
Total Cost at Mine	4.742	4.902
Budget - Cost of Production	3.983	3.969
Budget - Total Cost at Mine	4.684	4.655
Number of Shifts and Hours	33 1-8 hr.	22 1-8 hr.
	36 2-8 hr.	136 2-8 hr.
	204 3-8 hr.	97 3-8 hr.
Total 8 Hour Operating Shifts	717	585
Number of Operating Days	239	240-2/3
Average Daily Product	5,239	4,344

MATHER MINE "A" SHAFT  
ANNUAL REPORT  
YEAR 1956

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

	<u>Proportion of Labor and Supplies</u>		
Labor	\$3,181,749.53	2.541/ton	59%
Supplies	<u>2,235,652.13</u>	<u>1.785/ton</u>	<u>41%</u>
Total Cost at Mine	\$5,417,401.66	*4.326/ton	100%

\*Does not include Amortization of Defense Facilities and Allowance Under Section 616.

MATHER MINE "A" SHAFT  
ANNUAL REPORT  
YEAR 1956

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

Detailed Cost Comparison:

	<u>1956</u>		<u>1955</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
<u>Underground Costs:</u>				
Development	834,977.79	.667	635,272.64	.608
Mining	1,384,713.19	1.106	1,142,013.01	1.094
Tramming	586,347.37	.468	504,120.48	.482
Power Adjustment	4,539.86	.003		
Ventilation	13,449.59	.011	20,096.70	.019
Pumping	59,135.90	.048	56,857.06	.055
Compressors and Air Lines	56,493.18	.045	45,250.84	.043
Crushing and Screening - UG	30,633.35	.024	23,319.10	.022
Underground Superintendence	194,365.75	.155	195,057.01	.186
<u>Maintenance:</u>				
Pocket and Chutes	10,240.39	.008	6,994.78	.006
Mining Equipment	128,754.20	.103	119,299.94	.115
Levels and Cross-cuts	43,709.33	.035	42,687.95	.041
Shaft	4,433.66	.003	8,990.44	.008
Telephones and Safety Devices	48,740.04	.039	42,407.24	.040
Vacation Pay	141,855.19	.113	101,514.35	.097
Holiday Allowance	46,476.51	.037	48,106.79	.046
Fire Loss	365.16	.000		
Total Underground Cost	3,580,150.74	2.859	2,991,988.33	2.862
<u>Surface Costs:</u>				
Hoisting	167,029.41	.133	112,987.64	.110
Crushing and Screening - Surface	14,335.89	.012	12,991.34	.012
Stocking	65,227.81	.052	43,730.66	.042
Timber Yard	61,527.46	.049	47,948.17	.045
Dry House	42,097.04	.033	42,665.52	.041
Policing	19,755.54	.016	19,106.55	.018
General Surface	17,070.79	.014	24,171.89	.023
<u>Maintenance:</u>				
Headframe Bldg. and Equipment	12,057.94	.010	7,936.35	.007
Other Mine Buildings	7,096.99	.005	17,504.08	.017
Telephones and Safety Devices	1,389.61	.001	1,018.47	.001
Vacation Pay	35,463.78	.028	25,378.59	.024
Holiday Allowance	6,676.64	.006	7,303.07	.007
Total Surface Cost	449,728.90	.359	362,742.33	.347
<u>General Mine Expenses:</u>				
Geological Department	9,966.11	.008	10,119.26	.009
Mining Engineering Department	39,740.45	.032	37,424.47	.036
Mech. Engineering Department	6,725.08	.005	8,354.45	.008
Safety Department	10,541.34	.009	8,995.65	.009

MATHER MINE "A" SHAFT  
ANNUAL REPORT  
YEAR 1956

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

Detailed Cost Comparison: (Continued)

	<u>1956</u>		<u>1955</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
<u>General Mine Expenses:</u> (Continued)				
Research Laboratory	5,704.54	.005	16,120.87	.015
Analysis and Grading - Laboratory	41,433.41	.033	40,498.50	.039
"    "    "    - Shipping	7,363.00	.005	6,489.31	.006
Special Expense - Pensions	142.67	.000	146.42	.000
"    "    - Retirements	6,384.86	.005	7,169.75	.007
"    "    - Hygiene Clinic	9,119.20	.008	8,856.51	.008
"    "    - Employment Office	1,693.43	.001	1,602.60	.001
Ishpeming Office	122,642.99	.098	107,519.48	.103
Mine Office - Supt. and Clerks	71,136.08	.057	63,540.16	.061
Central Warehouse Overhead	28,884.75	.023	24,001.48	.023
Insurance - Property	4,195.85	.003	4,309.51	.004
"    - Group, Health and Life	54,019.11	.044	27,148.83	.026
"    - Group Annuity	15,610.60	.012	12,224.42	.012
"    - Catastrophe	6,414.71	.005	4,749.00	.005
Personal Injury - Comp. & Doctors	34,624.30	.028	52,605.24	.050
"    "    - Comp. Department	6.91	.000		
Taxes - Unemployment Insurance	25,467.30	.020	18,078.75	.017
"    - Old Age Benefit	50,492.09	.040	47,023.36	.045
Electrical Engineering Department	2,790.69	.002	2,948.84	.003
Employees Insurance & Compensation	11,372.56	.009	10,849.67	.011
Design Department	67.66	.000		
Total General Mine Expenses	566,539.69	.452	520,776.53	.498
COST OF PRODUCTION	4,596,419.33	3.670	3,875,507.19	3.707

MATHER MINE "A" SHAFT  
ANNUAL REPORT  
YEAR 1956

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

Detailed Cost Comparison: (Idle Expense Due to Strike)

The industry wide steel strike interrupted operations from July 2nd to August 6th. Work was resumed on August 7th.

	<u>Amount</u>
<u>Underground Costs:</u>	
Development	1,220.25
Mining	2,379.70
Tramming	8,603.66
Ventilation	1,120.21
Pumping	3,604.43
Compressors & Air Lines	2,993.08
Crushing and Screening - UG	39.10
Underground Superintendence	8,035.81
Maintenance:	
Pockets and Chutes	292.91
Mining Equipment	658.98
Levels and Cross-cuts	6,839.31
Telephones and Safety Devices	2,522.24
Holiday Allowance	<u>161.12</u>
Total Underground Cost	38,470.80
<u>Surface Costs:</u>	
Hoisting	5,275.39
Timber Yard	96.34
Dry House	1,280.45
Policing	2,118.84
General Surface	537.93
Telephones and Safety Devices	294.40
Holiday Allowance	<u>148.28</u>
Total Surface Cost	9,751.63
<u>General Mine Expenses:</u>	
Geological Department	1,198.79
Mining Engineering Department	3,010.26
Mech. Engineering Department	516.57
Safety Department	1,008.00
Research Laboratory	184.16
Analysis and Grading - Laboratory	1,201.91
"    "    "    - Shipping	732.00
Special Expense - Pensions	17.00
"    "    - Retirements	796.00
"    "    - Hygiene Clinic	348.72
"    "    - Employment Office	192.00

Mather "A" 1956

MATHER MINE "A" SHAFT  
ANNUAL REPORT  
YEAR 1956

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

Detailed Cost Comparison: (Idle Expense Due to Strike) Continued

	<u>Amount</u>
<u>General Mine Expenses:</u> (Continued)	
Ishpeming Office	13,494.00
Mine Office - Supt. and Clerks	7,169.28
Central Warehouse Overhead	2,033.40
Insurance - Property	482.35
"    - Group, Health and Life	835.64
"    - Group Annuity	2,016.86
"    - Catastrophe	446.37
Personal Injury - Comp. & Doctors	348.00
Taxes - Unemployment Insurance	42.54
"    - Old Age Benefit	401.04
Electrical Engineering Department	396.64
Employees Insurance & Compensation	1,260.00
Design Department	<u>16.91</u>
Total General Mine Expenses	38,148.44
Total Cost as Above	86,370.87
Proportion of Taxes	35,304.00
Depreciation - Movable & Misc. Equipment	829.02
Loading and Shipping	<u>64.58</u>
TOTAL IDLE EXPENSE	122,568.47

Mather "A" 1956

MATHER MINE "A" SHAFT  
ANNUAL REPORT  
YEAR 1956

5. ESTIMATE AND  
ANALYSIS OF  
ORE RESERVES:

The net ore reserves reported to the Michigan Tax Commission on December 31, 1956 were 8,238,042 tons. This is a decrease of 1,839,833 net tons from the 1955 estimate. Included in the 1956 estimate are 863,222 net tons in Section 1, 47-27, to be mined by Mather Mine, "A" Shaft.

Reserves on the 8th Level and above were decreased and reserves between the 8th and 9th Levels increased. The increase in reserves between the 8th and 9th Levels was not sufficient to offset the decrease on the 8th Level and above.

Mining, a decrease in the anticipated reserves of some of the ore areas due to contamination by large intrusives, abandonment of small isolated areas for economic reasons, and a decrease in the size of some ore areas due to a more accurate delineation by development drifts and raises all contributed to the general decrease in reserves on the 8th Level and above.

The 1956 estimate indicates a net loss in reserves of 587,641 tons as compared to a gain in 1955 of 3,282,952 tons.

Estimated Net Reserves as of December 31, 1955	10,077,875
Production, January 1, 1956 to December 31, 1956	<u>1,252,192</u>
Net Reserves December 31, 1956 by Subtraction	8,825,683
Estimated Net Reserves as of December 31, 1956	<u>8,238,042</u>
Net Loss in Reserves	<u>587,641</u>

Expected Average Natural Analysis of Ore Reserves as of December 31, 1956

<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moist.</u>
Mather - Surface											
Diamond Drilling.....	551,938	53.15	.122	5.08	0.25	2.62	.58	.60	.014	1.97	12.50
Mather - Underground											
Development.....	<u>7,686,104</u>	51.62	.100	8.75	0.20	2.45	1.00	.50	.050	2.25	11.00
	8,238,042										

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

Mather "A" 1956

MATHER MINE "A" SHAFT  
ANNUAL REPORT  
YEAR 1956

6. LABOR AND WAGES:a. Employment:

The total mine payroll at the end of the year was 597 with a decrease of five men from the previous year.

Number of Men 1/1/56.....	602
Added to Roll During the Year.....	26
Total.....	<u>628</u>
Separations.....	<u>31</u>
Total on Payroll 12/31/56.....	597
Average Number of Men as per December Labor Statement.....	556

During the year there were thirty-one separations and twenty-six additions. Of the separations, twelve quit, three died, four retired, two were transferred to the Republic Mine, one was transferred to the Humboldt Mine, three were transferred to the Pelletizing Plant, one entered the service, two were disabled, one was discharged, and two were dropped from the payroll because of extended illness. Of the additions, two were transferred from the Lloyd Mine, five were returned servicemen, two were rehired, thirteen were Cliffs Shaft men, two were transferred from the Maas Mine, one was transferred from the Mather Mine, "B" Shaft, and one returned from a leave of absence.

b. Statement of Wages:

	<u>1956</u>	<u>1955</u>
<u>Average Wages Per Day</u>		
Surface	\$21.09	\$18.15
Underground	<u>23.97</u>	<u>22.79</u>
Total	\$23.40	\$21.83
<u>Average Wages Per Month</u>		
Surface	(21 $\frac{3}{4}$ Days) \$458.70	(20 Days) \$363.00
Underground	521.35	455.80
Total	<u>\$508.95</u>	<u>\$436.60</u>
<u>Tons Per Man Per Day</u>		
Surface	50.57	44.40
Underground	<u>12.53</u>	<u>11.56</u>
Total	10.04	9.17
<u>Labor Cost Per Ton</u>		
Surface	\$ .417	\$ .410
Underground	<u>1.913</u>	<u>1.971</u>
Total	\$2.330	\$2.381



MATHER MINE "A" SHAFT  
ANNUAL REPORT  
YEAR 1956

6. LABOR AND WAGES: (Continued)

c. Labor Relations:

Labor relations in general were satisfactory during the year.

One formal grievance was presented during the year. John T. Mattson submitted a grievance regarding seniority as applied to a job vacancy. His grievance was denied by management and later dropped due to the failure of the union to appeal the case to arbitration within the time limit specified in the basic agreement.

An industry wide strike affected the mine from July 2nd to August 6th. The strike was conducted in an orderly fashion. Salaried personnel and certain hourly rate personnel performed necessary maintenance work during the period of the strike.

The men benefited by six paid holidays, New Year's, Memorial Day, Independence Day, Labor Day, Thanksgiving, and Christmas, in accordance with the provisions of the labor contract.

MATHER MINE "A" SHAFT  
ANNUAL REPORT  
YEAR 1956

7. SURFACE:

Buildings:

Only a minimum amount of maintenance was required on the mine buildings during the year.

Headframe and Trestles:

The headframe equipment operated throughout the year with only minor delays. The Kennedy Van Saun pan feeder was again overhauled with fifty new wheels, eighteen shafts, and seven new pads being installed. New wedge style pocket doors were installed for loading the trestle cars. Manganese wear plates were replaced on the rock pocket and the butterfly door. The railroad loading pockets and rock pocket section below the trestle deck was sheeted in to prevent snow and ice from building up in this area. Also closed in for improved winter operation was the Euclid truck loading area below the rock pocket chute. The north and south skip sheaves were ground to provide the correct operating clearances and the bearing blocks for these two sheaves were rebabbitted.

Stocking:

The trestle cars operated without any delays and only normal maintenance during the year.

Engine House:

The four 2700 c.f.m. air compressors were overhauled including the cleaning of electric motors and intercoolers. An electrical short in one of the skip hoist armatures caused an eight hour shut-down on April 17th. This was temporarily repaired and then changed with the spare unit later in the month. On April 19th the skip hoist was again shut down because of damage to the two drive pinions and bull gear. Operation resumed in eight hours after the raised surfaces of the teeth were filed smooth, and the gearing completely cleaned.

On November 25th the cage motor armature was removed for a thorough cleaning and replaced with a spare unit.

Skips:

The skips operated successfully throughout the year.

Hoist Ropes:

The cage rope was removed from service on September 2nd because of three loosened strands 1700-1900 feet from the cage end after operating three years, eight months, and eighteen days.

On May 26th the North skip rope was removed from service after hoisting 1,001,721 tons and on June 3rd the South skip rope was removed after hoisting 1,329,273 tons.

MATHER MINE "A" SHAFT  
ANNUAL REPORT  
YEAR 1956

7. SURFACE: (Continued)

New Equipment:

A new fork lift truck for use in handling supplies on the property was purchased and the old concrete mixer for the batching plant was replaced with a new electrically driven unit.

Subsidence Studies:

D.D.H. #65 was re-entered early in February for the following reasons:

- (1) To attempt to locate the position of the void above the old 5th and 6th Level workings by extending the hole.
- (2) To follow progressively the advancement of the void towards surface.
- (3) To correlate all information so obtained with the general subsidence studies.

During the re-entry period, difficulties were encountered which caused abandonment of all attempts to deepen the hole.

Observations of significant value were:

- (1) There appears to be ground fracturing and movement at a depth of 1,000'.
- (2) After setting a cement plug below 800', the hole stopped taking air and water.

The hole was again cemented off at 767' and a microseismic recorder and other associated equipment were set up at the hole. A geophone was set in the hole and located at various depths until July 3rd. On July 30th, a newly designed geophone was set at the bottom of the hole, 767' below the collar, and remained there the rest of the year. The microseismic activity recorded at Hole #65 during the year indicated very little disturbance in the area under test. Enough activity was noted however, to warrant continued study in this area.

D.D.H. #68 was completed in May with the final effective bottom being at a depth of 861'. The collar of this hole is 100' West and 400' North of D.D.H. #65, and it was drilled at an inclination of  $-65^{\circ}$  due South. The hole bottom is over the principal mined out area above the 5th Level.

In September, a geophone was installed at D.D.H. #68. It was set at hole bottom, 861' from the collar. During the remainder of the year, microseismic disturbances were present in the area but the disturbances were infrequent and of very low magnitude.

D.D.H. #69 was the third subsidence hole to be drilled in the Mather "A" area. It was collared 250' North and 400' East of D.D.H. #65, and drilled at an inclination of  $-65^{\circ}$  due South. The hole bottom is over the principal mined out area above the 6th Level.

Mather "A" 1956

MATHER MINE "A" SHAFT  
ANNUAL REPORT  
YEAR 1956

7. SURFACE: (Continued)

Subsidence Studies: (Continued)

The drilling was completed in September with a depth of 1,326' being attained. On October 31st, a geophone was lowered to a depth of 1,215'. It was readily discovered that the hole was not supporting a head of water and that air was flowing into the hole. Consequently, on November 7th a drill crew plugged and cemented off the hole at 1,150'. The seal is not entirely satisfactory but it does support a small column of water allowing the geophone to function properly.

Except for a group of noises recorded coincidentally in Hole #65 and Hole #69 on December 26th, microseismic activity in the area was of very low magnitude. Holes #65, #68, and #69 are critically located and a triangulation network can be set up which might enable the performance of tests to establish the source of rock disturbances in the Mather Mine, "A" Shaft area above the 5th and 6th Level mining areas. For the present however, the plan to triangulate on the noise sources will have to be postponed until energy of greater magnitude is received by all geophones and a high percentage of the same disturbances recorded coincidentally.

The subsidence studies undertaken during 1956 indicate that ground fracturing above the old 5th and 6th Level workings has reached an elevation between 1,200' and 1,000' from surface. However, the rate of subsidence as indicated by microseismic activity does not seem to be rapid. Further information of the rate of subsidence can be noted by determining when additional ground fracturing will cause the lowering of the water columns that are now present in D.D.H. #65, #68, and #69. Air entering or exhausting from the holes will give further indication that fracturing of the ground above the old workings has reached the effective bottoms of the subsidence holes.

During the month of September, Mr. L. Bacon, Geophysics Department, Michigan College of Mining and Technology, spent considerable time at the Mather Mine, "A" Shaft conducting a reflection seismograph survey. The results of the survey have not as yet been submitted. The purpose of the survey was to further attempt to locate the void over the old mining areas above the 5th and 6th Levels.

MATHER MINE "A" SHAFT  
ANNUAL REPORT  
YEAR 1956

8. UNDERGROUND:

5th Level:

Production from the 5th Level was 26,490 tons, or 2.13% of the total mine production. All of the ore was Standard grade and came from over the #7 Cross-cut.

Drift development was completed and all the remaining reserves will be mined from the -160', -225' and the -275' elevations. It is anticipated that mining will be completed during the first half of 1957.

The crusher, which had been located over the #7 Cross-cut was removed and placed in service on the 9th Level. All 5th Level ore has since been crushed in the headframe.

7th Level:

Production from the 7th Level was 598,787 tons or 48.15% of the total mine output. The production came from seven areas in Section 2 and three areas in Section 1. The areas in Section 2 were as follows: North Block East, #5 South Cross-cut, #6 Cross-cut, #1 Cross-cut, #5 North Cross-cut, #780 Block, and #7 South Cross-cut. The areas in Section 1 were the #7B Cross-cut, #8B Cross-cut and #9B Cross-cut.

During the year mining was completed over the #5 South, the #5 North and #6 Cross-cuts. Reserves over the #5 North and #5 South Cross-cuts were exhausted, and heavy ground conditions over the #6 Cross-cut caused the end of operations in that area. The reserves remaining over the #6 Cross-cut will be recovered from the 8th Level. Of the four areas still active in Section 2, all but one are located in the pillar over the footwall drift.

Production for the year from the areas where mining was completed was as follows: #5 Cross-cut South - 2,983 tons; #6 Cross-cut - 49,775 tons; and #5 Cross-cut North - 45,000 tons.

Mining from the North Block East, which is located immediately above the loading end of the 7th Level belt conveyor, produced 56,255 tons. Two more mining transfers still remain to be developed in this area. 72,577 tons were produced from over the #1 Cross-cut. One transfer is all that will be required to mine the remaining pillar. The area over the #780 transfer drift produced 50,561 tons. Mining in this area is expected to continue for the greater part of 1957. 55,681 tons were produced from the #7 South Cross-cut and mining in this area, also, is expected to continue for the greater part of the coming year.

In Section 1, the #7B Cross-cut produced 81,551 tons; #8B Cross-cut - 55,428 tons; and #9B Cross-cut - 123,501 tons. All three cross-cuts are still active although no further development is required in the #7B and #8B areas and the remaining reserves over these cross-cuts are very small. The reserves in the area over the #9B Cross-cut will permit mining throughout most of 1957.

Diamond drilling on the 7th Level consisted of two holes. U.H. #352 actually was drilled from the 6th Level on the 9962 W. section. The hole was drilled to test for ore northeast of present mining operations over the #9B Cross-cut on 7th Level. No enrichment was encountered.

MATHER MINE "A" SHAFT  
ANNUAL REPORT  
YEAR 1956

8. UNDERGROUND: (Continued)

7th Level: (Continued)

In October an old diamond drill hole, U.H. #210, located along the 13,400 W. section, was re-entered after having previously been bottomed at 1,239'. The purpose of the hole is to test for ore above the footwall at 12th Level elevation. Drilling was still in progress at the end of the year.

8th Level:

8th Level production increased to 611,792 tons which represented 49.20% of the total mine production. The production came from five areas; the #7, #8, and #9 Cross-cuts, and the #811 and #812 transfers. The latter two areas listed are loading transfers over the #81 sub-level belt conveyor.

Production from the various areas was as follows: #7 Cross-cut - 176,151 tons; #8 Cross-cut - 192,259 tons; #9 Cross-cut - 129,690 tons; #811 transfer - 55,861 tons; #812 transfer - 42,492 tons. A small tonnage was produced from development work for the #82 sub-level belt conveyor.

On the 8th Level, more than one-half of the reserves to be mined will be transported by belt conveyors. Two conveyors, which will service an area approximately 1,000' long along the strike of the ore body are required. These conveyors, which are discussed later, are called the #81 and #82 belts. The ore will be transported by the belts to an ore pass raise which will transfer the ore to the 9th Level. On the 9th Level the ore will be crushed and transported over the main 9th Level conveyor to the shaft.

During the year the #81 sub-level belt conveyor was placed in operation and has worked successfully to date. This belt has carried a total of 98,357 tons.

Development work for the #82 belt conveyor was completed and development for mining above the belt is well underway. Installation of the #82 belt conveyor will coincide with the completion of the 9th Level crushing and conveying system.

During the year four diamond drill holes were completed on the 8th Level. U.H.'s #315, #318, and #319 were drilled from the #3 Cross-cut to outline the ore body above the level in advance of development for mining. U.H. #358 was drilled from the footwall drift on the 10,075 W. section to outline the ore east of present mining operations in the #9 Cross-cut.

9th Level:

Work on the 9th Level consisted of main level drift development, cross-cut development, development of sub-level belt conveyor drifts, development for block caving over the sub-level belt conveyor drifts, completion of the excavation work for the main 9th Level belt conveyor system and installation of the main belt conveyor.

Three sub-level belt conveyors are planned for the 9th Level. These conveyors will handle practically all of the production from the level. The conveyors will work in progression with the #93 conveyor discharging onto the #92 conveyor, the #92 onto the #91 and the #91 into the loading trench of the main 9th Level belt conveyor.

MATHER MINE "A" SHAFT  
ANNUAL REPORT  
YEAR 1956

8. UNDERGROUND: (Continued)9th Level: (Continued)

The drift for the #91 belt conveyor has been completed, the drift for the #92 conveyor is half completed, and work preparatory to development of the #93 conveyor was underway at the end of the year. Development for block caving over the #91 and #92 conveyor drifts is in progress. Installation of the #91 belt conveyor will coincide with the completion of the main 9th Level belt conveyor system.

A brief summary is shown below in tabular form for the various conveyor projects that are being developed or are installed.

	<u>Conveyor Length</u>	<u>Belt Width</u>	<u>Belt Speed</u>	<u>Number of Loading Points</u>
*Main Conveyor - 7th Level	2500'	30"	500'/min.	1
*#81 Sub Conveyor - 8th Level	400'	36"	350'/min.	2
#82 Sub Conveyor - 8th Level	480'	36"	535'/min.	3
#91 Sub Conveyor - 9th Level	200'	36"	525'/min.	1
#92 Sub Conveyor - 9th Level	490'	36"	535'/min.	2
#93 Sub Conveyor - 9th Level	690'	36"	535'/min.	3 or 4
*Main Conveyor - 9th Level	3100'	30"	500'/min.	1

## \*Installed.

The 9th Level footwall drift was connected through to "B" Shaft during the month of December with excellent results on alignment and grade. Five levels, the 5th through the 9th, now connect "A" Shaft and "B" Shaft.

The following table indicates the amount of main level development completed during the year.

	<u>Timbered Ore Drift</u>	<u>Timbered Rock Drift</u>	<u>Naked Rock Drift*</u>	<u>Total</u>
NM 116 - 8th Level	-	-	68'	68'
NM 116 - 9th Level	-	1,700'	130	1,830
NM 113 - 9th Level	-	1,163	110	1,273
	-	2,863'	308'	3,171'

## \*Rock bolted.

In addition to the projects listed above preparatory work was begun on a belt conveyor drift that will lift ore from the -2100' elevation to the 9th Level. Because of the length of time required to reach a depth three levels below the present operating level, and then to bring the new levels into production, it is important that the development is started at this time. The cage, ladder and pipe compartments of the present shaft will be deepened to handle men and supplies.

Eleven underground diamond drill holes, U.H. #314, U.H. #323, U.H. #324, U.H. #332, U.H. #333, U.H. #334, U.H. #335, U.H. #342, U.H. #343, U.H. #344, and U.H. #357, were drilled from the 9th Level during the year. All the holes except U.H. #332, U.H. #333,

MATHER MINE "A" SHAFT  
ANNUAL REPORT  
YEAR 1956

8. UNDERGROUND: (Continued)

9th Level: (Continued)

and U.H. #334 were drilled to outline the ore body above the 9th Level. U.H. #332, U.H. #333, and U.H. #334 were drilled from a location south of a major East-West trending fault and along the 11,100 W. section. The purpose of these particular holes was to establish the dip of the East-West fault and to begin the exploration of the area south of the fault and below the 9th Level. U.H. #334 was drilled due south and at a dip parallel to the dip of the fault. A total of 155' of ore was encountered in this hole above the -2100' elevation. This ore was correlated with the ore encountered in Surface D.D.H. #44.

Mining Methods and Developments:

Block caving with the radial drilling system of undercutting continued as the mining method during the year.

Steel sets continued as the principal means of support in both main level and sub-level development. Four different type sets were used during the year. A three-piece set consisting of a 9' cap and 9' legs was used in main level development; a rigid arch set was used for the development of sub-level belt conveyor drifts, for cutting raises and for tigger rooms; a yielding arch set was used in undercutting drifts; and a three-piece set consisting of a 6' straight cap and 7½' straight legs was used for transfer drifts.

Extensive use of 42" diameter steel raise tube liners was practiced during the past year. Use of the liners has reduced maintenance on raises considerably.

Mining Engineering:

Each month a complete survey of the mine was made to map the geology and the work completed in the various areas of the mine. This information was used to prepare four sets of maps which were distributed to the district superintendent of underground mines, mine superintendent, mine engineer, and mine captain. At the end of each quarter an additional set of maps was prepared and sent to the Bethlehem Steel Company. Ten sets of point maps were prepared each month for use by the supervisory personnel underground.

Routine survey work required the greater part of the time of two two-man survey crews. All development contracts were provided with lines and grades and frequently rechecked during the progress of the work. Usually approximately twenty crews were engaged in sub-level development work and two to three crews in main level development work.

Other work accomplished during the year was as follows: Ventilation survey and posting of fire maps, shaft gauging, tax estimates, stope analysis, stockpile analysis of iron, silica, and sulphur with accumulative totals for each pile being carried, stockpile surveys, accumulation of data on underground water, preparation of quarterly steel and timber requirements.

Weekly and monthly reports on all activities at the mine were prepared. A separate report of the activities most directly concerned with the mining engineering phase of the operation was also prepared each month.



MATHER MINE "A" SHAFT  
ANNUAL REPORT  
YEAR 1956

8. UNDERGROUND: (Continued)Statement of Timbering Supplies Used in Operating Accounts

<u>ITEM</u>	<u>AMOUNT</u>	<u>COST PER TON</u>
Cribbing	\$ 9,393.04	\$.00750
Stulls	3,282.42	.00262
Lagging	20,288.69	.01620
Poles	12,606.72	.01007
Steel	380,435.41	.30382
Minecrete Supplies	<u>135.76</u>	<u>.00011</u>
Total 1956	\$426,142.04	\$.34032
Total 1955	\$291,747.41	\$.2791

Explosives:

The following tables show the cost of explosives used in mining 1,252,192 tons of ore (Table I), the unit costs and consumption of explosives (Table II), and the cost per ton of explosives used in Development for Mining as compared to the cost per ton for mining (Table III).

TABLE ICost of Explosives - Operating

	<u>1956</u>	<u>1955</u>
Powder - All Kinds	\$100,849.90	\$ 93,865.71
Miscellaneous Blasting Supplies (Fuse, Caps, Bags, etc.)	<u>54,050.11</u>	<u>43,711.95</u>
Total	\$154,900.01	\$137,577.66

TABLE IIUnit Costs and Consumptions of Explosives

	<u>1956</u>	<u>1955</u>
Pounds of Powder per Ton of Ore	0.443	0.500
Tons of Ore per Pound of Powder	2.256	2.000
Cost per Ton for Powder	\$0.081	\$0.090
Cost per Ton for Fuse, Caps, etc.	\$0.043	\$0.041
Cost per Ton for all Explosives	\$0.124	\$0.131

TABLE III

	<u>1956</u>	<u>1955</u>
Cost per Ton in Development for Mining	\$ .042	\$ .040
Cost per Ton in Mining	<u>.082</u>	<u>.091</u>
Total	\$ .124	\$ .131

MATHER MINE "A" SHAFT  
ANNUAL REPORT  
YEAR 1956

8. UNDERGROUND: (Continued)

Pumping:

Pumping of underground water was continued from the 3rd and 6th Levels. The average total pumping rate decreased from 432 gallons per minute in 1955 to 425 gallons per minute in 1956, a decrease of 1.6%.

The average pumping rate from the 3rd Level decreased from 84 gallons per minute in 1955 to 59 gallons per minute in 1956. This is due to the fact that "A" Shaft no longer pumps the water from the 8th Level Cambria-Jackson workings.

The average pumping rate on the 6th Level increased from 348 gallons per minute in 1955 to 366 gallons per minute in 1956. The 6th Level pumps handle all the drainage below the 3rd Level, together with the 7th and 9th Level pump discharge, and all of the water from "B" Shaft. The "B" Shaft water increased from an average of 166 gallons per minute in 1955 to an average of 182.5 gallons per minute in 1956.

	<u>Mather Mine, "A" Shaft Water G.P.M. Av.</u>	<u>Mather Mine, "B" Shaft Water G.P.M. Av.</u>	<u>Cambria-Jackson Water G.P.M. Av.</u>	<u>Total Water Pumped G.P.M. Av.</u>
<u>1955</u>				
3rd Level	64	-	20	84
6th Level	182	166	-	<u>348</u>
Total				<u>432</u>
<u>1956</u>				
3rd Level	59	-	-	59
6th Level	183.5	182.5	-	<u>366</u>
Total				<u>425</u>

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.

To provide for greater pumping capacities on the lower levels, various changes and additions have been made in the discharge columns and pump stations.

9th Level Pumping:

A 500 gallons per minute pump purchased from the Spies Mine was installed in the 9th Level pumphouse, thus increasing the pumping capacity to 1500 gallons per minute from the 9th to 6th Levels. To carry this additional water a 6" pipe line will be used.

6th Level Pumping:

A 500 gallons per minute automatic Ingersoll Rand pump was relocated in the 6th Level pumphouse. This pump handles all the 6th Level water under normal operating conditions and pumps to the 1st Level through a 6" column. A 400 gallons per minute Byron Jackson automatic centrifugal pump acts as a standby unit for the Ingersoll Rand pump.

Preparations have been made for the installation in the 4th pump stall and adjacent area of three automatic series pumps to handle 1,000 gallons per minute to surface. Delivery of these pumps is scheduled for January 1957 with the installation to follow.

Mather "A" 1956

MATHER MINE "A" SHAFT  
ANNUAL REPORT  
YEAR 1956

8. UNDERGROUND: (Continued)

6th Level Pumping: (Continued)

immediately thereafter. With the three 500 gallons per minute Worthington plunger pumps, the total pumping capacity will be 3,000 gallons per minute from this level.

New 10" Discharge Line:

A new 10" discharge line from the 3rd Level to surface was completed during the year. This allows the original 10" column to handle only 6th Level water while the new column carries 3rd and 1st Level water.

Alarm System:

An electrical alarm system will be used to give a warning in the event of failure of pumps on any level. Installation of this equipment was underway at the end of the year and when completed will assure efficient operation of the automatic pumping system.

MATHER MINE "A" SHAFT  
ANNUAL REPORT  
YEAR 1956

9. TAXES:

Taxes for the year at the Mather Mine, "A" Shaft totaled \$342,338.52. The assessed valuation set for Section 2, 47-27, by Mr. Hardenberg, the state mine appraiser, was \$1,180,000 higher than in 1955.

	1956		1955	
	<u>VALUATION</u>	<u>TAXES</u>	<u>VALUATION</u>	<u>TAXES</u>
Mather Mine "A" Shaft including Stockpiles, Supplies & Equipment as placed by State Mine Appraiser:				
Real Estate	\$7,440,000	\$303,552.00	\$3,795,000	\$155,595.00
Personal Property	950,000	38,760.00	3,415,000	140,015.00
Pipeline - Cloverdale Tract	<u>650</u>	<u>26.52</u>	<u>650</u>	<u>26.65</u>
Total Mather Mine "A" Shaft (Sec. 2, City of Ishpeming)	\$8,390,650	\$342,338.52	\$7,210,650	\$295,636.65

	1956		
	<u>TAXES</u>	<u>PER TON PRODUCED</u>	<u>PER TON SHIPPED</u>
Total Operating	\$342,338.52	\$0.273	\$0.306
	1955		
	<u>TAXES</u>	<u>PER TON PRODUCED</u>	<u>PER TON SHIPPED</u>
Total Operating	\$295,636.65	\$0.283	\$0.201

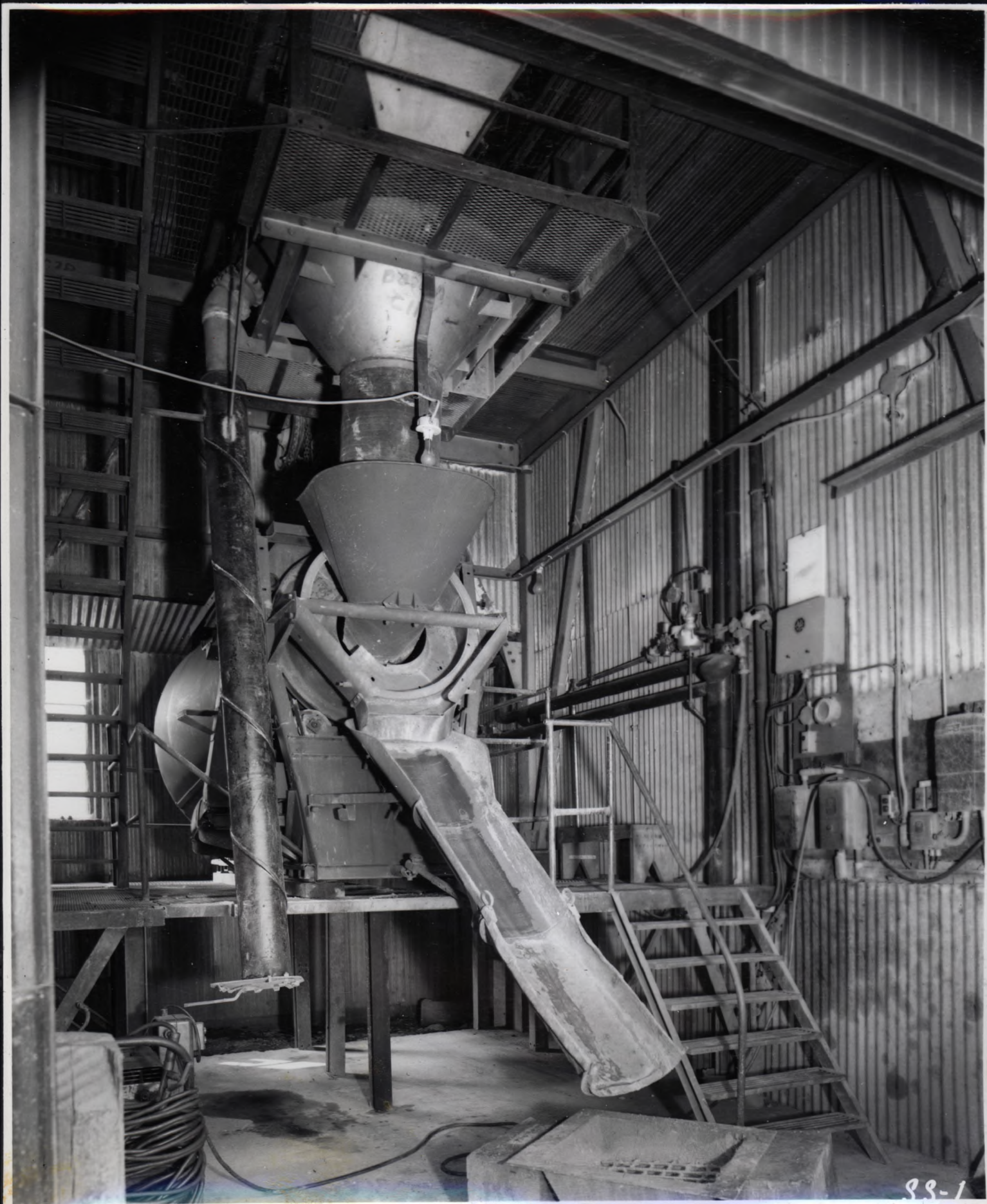
MATHER MINE "A" SHAFT  
ANNUAL REPORT  
YEAR 1956

10. ACCIDENTS  
AND  
PERSONAL  
INJURY

There were 26 compensable injuries during the year with a lost time of 953 days for these injuries. There were 15 non-compensable injuries, which added 49 days lost time for a grand total of 1,002 days. The severity was 889 and the frequency was 36.36 compared with company averages for underground mines of 1,063 on severity and 38.60 on frequency. The total hours worked was 1,127,568 as compared with 1,030,395 in 1955 for an increase of 9.4%.

<u>DATE</u>	<u>NAME</u>	<u>NATURE OF INJURY</u>	<u>NUMBER OF DAYS LOST</u>
1/18/56	Robert Lind	Multiple puncture wounds, forehead, face, neck, shoulders, chest.	7
1/18/56	Wiljo Leppanen	Multiple puncture wounds and lacerations face, neck, shoulders, chest, abdomen, arms. Fracture radius, mid, left.	99
2/17/56	Eino Leklin	Lumbo-sacral strain.	15
2/23/56	Sylvester Wiitala	Infected wound of finger extending into the palm of the hand. (Middle finger, right hand.)	25
2/22/56	Otto Talus	Two broken bones, right foot.	68
2/29/56	John Mattonen	Fracture, distal metacarpal, index finger, left.	27
2/29/56	Waino Lehtinen	Bruised left shoulder.	9
3/14/56	Michael Manzoline	Fracture 1st, 2nd, and 3rd metatarsal - right foot.	100
3/14/56	Richard LaMere	Contusion sacrum, left thigh. Strain lumbar back.	9
6/ 1/56	Severino Guizzetti	Bad bruise on left thigh.	7
6/12/56	Arthur Seablom	Strain left inguinal region.	46
6/21/56	Louis Colombo	Lumbo-sacral strain.	25
6/24/56	Waino Mutka	Fractures 3rd and 4th fingers - left hand.	65
6/30/56	Salvatore Tasson	Contusion of both thighs. Sprained right ankle and fracture, right fifth metatarsal.	85
6/30/56	Norman Powers	Fracture of superior and inferior ramus of right ischial and pubic bones.	110
6/30/56	Henry Kuisti	Simple fracture of 8th rib axillary line, left side.	15
8/14/56	Charles E. Townsend	Muscle strain - lower back region.	10
8/22/56	Clarence Saari	Contusions, right posterior, hip region.	33
9/ 5/56	John Maki	Laceration, right hand - medial edge.	8
10/18/56	Maurice Hansen	Fracture middle phalanx, left index finger.	31
11/ 7/56	Walter Lummukka	Contusions due to crushing injury between timber truck and motor. Superficial abrasions - no swelling. No fractured bones.	7
11/10/56	Dominic Carello	Fracture, right patella.	60
11/17/56	Arthur F. Eliassen	Fracture, middle phalanx, right hand.	50
11/23/56	Leslie Hutchens	Contusion left knee.	15
12/14/56	Leo McGlone	Contusion - severe left chest.	20
12/16/56	Vernon LaVeau	Cut little finger, left hand.	7
		Total Days Lost	<u>953</u>

Mather "A" 1956





New fork lift tractor for materials handling.

80-16

MATHER MINE "A" SHAFT  
ANNUAL REPORT  
YEAR 1956

11. POWER:

A total of 18,229,341 kilowatt hours of electric power was consumed during 1956. This was approximately 2,000,000 kilowatt hours greater than the preceding year, and is a direct result of the longer work week.

The power rate was determined by dividing the total operating cost of the Cleveland-Cliffs Electric Power Department by the total kilowatt hours sold and charging each consumer proportionately. To this is added a wheeling charge by the Upper Peninsula Power Company for distributing the power to the property.

	<u>CONSUMPTION</u> <u>K.W. HOURS</u>	<u>AVERAGE</u> <u>MAX. DEMAND</u>	<u>AVERAGE</u> <u>DEM. FACTOR</u>	<u>COST OF</u> <u>CURRENT</u>	<u>AVERAGE PRICE</u> <u>PER K.W. HOUR</u>
1956	18,229,341	3120 K.W.	68%	\$164,413.16	\$.0090
1955	16,245,161	3620	52%	150,266.76	.0092
1954	14,249,248	3550	46%	132,087.61	.0093
1953	17,431,000	3720	54%	283,853.29	.0164
1952	14,534,000	3120	54%	230,920.07	.0159



RECEIVED  
THE CLEVELAND IRON CO  
CLEVELAND, OHIO

MORRIS MINE  
ANNUAL REPORT  
YEAR 1956

57 JUN 12 AM 9:30

I. GENERAL:

The production for the year was 300,518 tons compared with 340,601 tons in 1955. The proportion of tonnage mined from Fee Lands was small due to operations approaching the 9th level elevation at the east end of the ore body and necessitating transfer of contracts to other areas. After the new development from the 10th level is completed into this area, additional contracts will be added and the proportion of production from this property will increase. The mine was idle five weeks in July and August due to the industry-wide strike.

A working schedule of 2-8 hour shifts per day for 5 days per week has been continued throughout the year. Hoisting is done on a 20-hour per day basis. A decrease in efficiency over the previous year is reflected in the comparison of 6.74 tons per man per day in 1956 with 7.00 tons per man per day in 1955. Total shipments were slightly in excess of production and amounted to 302,710 tons. The stockpile carry-over at the end of the year was 29,694 tons.

There was no exploration drilling done on surface or underground. A relatively small tonnage of new ore was proven by development and mining. The engineer's estimate of 3,013,308 tons shows a net gain of 63,460 tons in reserves after deducting the year's production from the 1955 estimate. The additional reserves were proven in Fee Lands and are the result of the 10th level development. A substantial reduction in reserves has been estimated in Chase Lease #24.

Deep-well surface pumping has been continued and an average of 1035 g.p.m. was pumped compared with 1299 g.p.m. in the previous year. Seven wells have been in operation but many of these have been very intermittently due to pump breakdowns and some delays due to power failure. The decrease in water pumped is due partly to the above reasons but chiefly because of a reduction in the output from Wells #8 and #10. A rapid decline took place during the year in the output from the above wells. The volume of underground water averaged 1600 g.p.m. compared with 1535 g.p.m. in 1955. The downward trend in underground water that occurred from 1952-1955 has been reversed with the increase that occurred in 1956.

Development of the 10th level has been underway throughout the year. A second sump drift was excavated on the west side of the plat to complete the development for the pump station. The first cross cut branching to the southeast from the main haulage drift was completed and stope development started above this drift. A footwall drift along the north side of the ore body was also completed as part of the development for the east end of the ore body. Some test drift was also advanced from the latter drift to outline the ore body more completely. All of this development has been in Fee Lands.

22. PRODUCTION, SHIPMENTS  
AND INVENTORIES:

a. Production

<u>Year</u>	<u>Grade</u>	<u>Tons</u>
1956	Morris	300,518
1955	"	340,601

MORRIS MINE  
ANNUAL REPORT  
YEAR 1956

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

The 1956 production came from Fee and Leased Lands in the following proportions:

	<u>Fee</u>	<u>Leased</u>	<u>Total</u>
Production - Tons	54,009	246,509	300,518
Percentage	18.0%	82.0%	100.0%
Percentage - 1955	14.5%	85.5%	100.0%

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

	<u>Tons</u>	<u>Percent</u>
Lease Ore Production 1933-1956	5,455,054	75.4
Fee Ore Production 1933-1956	<u>1,780,096</u>	<u>24.6</u>
Total	7,235,150	100.0

b. Shipments

<u>Grade</u>	<u>Pocket</u>	<u>Stockpile</u>	<u>Total</u>
Morris	167,470	135,240	302,710
<u>Grade</u>	<u>Fee</u>	<u>Lease</u>	<u>Total</u>
Morris	50,494	252,216	302,710

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

<u>Year</u>	<u>Total</u>
1956	302,710
1955	335,939
1954	326,001
1953	324,150
1952	294,569

Total shipments since Inland acquired lease in 1933 - 7,195,891 tons.

c. Ore in Stock December 31, 1956

<u>Grade</u>	<u>Tons</u>
Morris	29,694

MORRIS MINE  
ANNUAL REPORT  
YEAR 1956

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

d. Production by Months

<u>Month</u>	<u>Days Worked</u>	<u>Average No. of Men</u>	<u>Tons Per Man Per Day</u>	<u>Production</u>
January	21	197	6.65	26,688
February	21	196	6.65	26,738
March	22	196	6.29	25,892
April	21	194	7.26	28,296
May	22	195	7.22	31,570
June	21	200	7.29	28,788
July	0	0	-	225 (°)
August	20	196	7.07	26,214
September	19	197	6.98	26,582
October	23	198	6.83	29,422
November	21	196	5.71	21,057
December	19	196	5.46	19,936
<b>Total</b>	<b>230</b>	<b>196</b>	<b>6.74</b>	<b>291,408</b>
Stockpile Overrun				9,110
<b>Total</b>				<b>300,518</b>

(°) Carry-over from June

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

<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Sulphur</u>	<u>Moisture</u>
Morris	302,710							
Dried		55.34	.085	13.70	.47	2.65	.040	-
Natural		49.01	.075	12.13	.42	2.35	.035	11.44

b. Ore in Stock December 31, 1956 (Natural)

<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Sulphur</u>	<u>Moisture</u>
Morris	29,694	49.36	.080	15.02	.43	-	-	11.00

c. Ore Reserves - Expected Natural Analysis

<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Sulphur</u>	<u>Moisture</u>
Morris	2,656,211	49.06	.071	12.00	.44	2.25	.015	12.00
Hi-Sul	357,097	49.06	.093	12.00	.40	2.23	.393	12.00

MORRIS MINE  
ANNUAL REPORT  
YEAR 1956

4. ESTIMATE OF ORE RESERVES

The estimated reserves, after allowance for ore mined in 1956, shows 63,460 tons of new ore developed. This tonnage has been proven between the 9th and 10th levels in Fee Lands as the result of 10th level development. In Chase Lease #24, a substantial reduction was estimated in reserves in Deposit #33 and also Deposit #79 due to major changes in the ore outline. In Chase Lease #9, an increase was estimated in Deposit #86 due to a revision in the ore area used for estimating purposes.

As development on the 10th level expands, particularly in a westerly direction, it is expected that a substantial tonnage of new ore will be added to the reserves in Fee Lands.

	Estimate 9-1-55	Production 9-1-55 to 9-1-56	Estimated Deducting Product	Actual Estimate 10- 1-56	Incr. or Decr. from 1955 Estimate
Chase Lease #24	95,853	576	95,277	39,342	55,935
Chase Lease #24 Hi-Sul	359,699	45,942	313,757	283,505	30,252
Chase Lease #9	1,972,471	177,253	1,795,218	1,803,175	7,957
Chase Lease #9 Hi-Sul	5,090	26,557	21,467	45,623	67,090
<b>Total Chases Leases</b>	<b>2,433,113</b>	<b>250,328</b>	<b>2,182,785</b>	<b>2,171,645</b>	<b>11,140</b>
CCI Lands	787,311	48,217	739,094	813,694	74,600
CCI Lands Hi-Sul	27,969	-	27,969	27,969	-
<b>Total CCI Lands</b>	<b>815,280</b>	<b>48,217</b>	<b>767,063</b>	<b>841,663</b>	<b>74,600</b>
<b>GRAND TOTAL</b>	<b>3,248,393</b>	<b>298,545</b>	<b>2,949,848</b>	<b>3,013,308</b>	<b>63,460</b>

5. LABOR AND WAGES

The labor force has remained practically constant as indicated by the average of 196 men in 1956 compared with 197 in the previous year. The industry-wide wage increase of \$0.003 increase between job classes and \$.07½ to base became effective July 1st, 1956.

6. SURFACE

The flume for the discharge from #9 surface well was rebuilt and also a new submersible pump installed in #3 surface well. Due to a likely probability of an extension of the Lloyd Mine surface cave involving the water main to the mine, a pumping plant was constructed near the Carp River, west of the mine, to furnish water for the mine.

To prevent bad icing conditions in the ventilation shaft, additional heaters were installed to pre-heat the intake air into the mine.

At the extreme west end of the 9th level the drift was dammed up for storage of water and a pump installed to deliver the water through a pipeline directly to the 9th level sump. This eliminated considerable mud and water from the haulage drifts and has improved tramming conditions.

Surface Pumping

The table below shows the amount of water pumped from surface wells in December 1955 and 1956:

MORRIS MINE  
ANNUAL REPORT  
YEAR 1956

6. SURFACE (Cont'd)Surface Pumping (Cont'd)

<u>Well No.</u>	<u>G.P.M.</u> <u>Dec. 1956</u>	<u>G.P.M.</u> <u>Dec. 1955</u>
1	87	190
2	10	75
3	170	105
3A	257	306
5	-	-
8	125	275
9	92	83
10	<u>272</u>	<u>318</u>
	1013	1352

The average drop in the water level in the surface material above ledge, since pumping started in 1937, to December 28, 1956, is shown in the table below:

<u>Test Hole</u>	<u>Drop 8-25-37 to</u> <u>12-28-56</u>	<u>Depth Remaining</u> <u>To Ledge</u>
501	79.7	13.8
506	63.4	23.8
510	36.9	86.7
511	41.1	113.0
514	30.3	97.6
515	19.9	108.7
517	29.3	82.8
522	30.0	83.5
524	17.7	65.1
527	51.9	23.1
528	12.2	87.3
531	5.8	70.9
534	1.4	95.4
Total	<u>356.8</u>	<u>951.7</u>
Average	27.5	73.2

Operating Expense for surface drainage amounted to \$16,997.00 compared with \$24,014.00 in 1955. The cost per ton was \$0.06 compared with \$0.07 in 1955.

7. UNDERGROUNDa. Pumping

The bulk of the underground water is being handled by the two automatically operated 1200 g.p.m. centrifugal pumps located on the 9th and 4th levels.

The following table shows a comparison of the mine water pumped over a five year period:

<u>Year</u>	<u>4th</u>	<u>6th</u>	<u>7th</u>	<u>8th</u>	<u>9th</u>	<u>Total</u>
1956	51.0	109.0	109.0	476.0	855.0	1600.0
1955	57.2	52.0	108.0	509.3	791.0	1534.6
1954	71.9	43.5	96.8	553.9	797.0	1574.2
1953	76.1	37.1	77.0	546.2	882.4	1620.9
1952	94.6	27.1	69.2	495.8	971.4	1658.1

147

MORRIS MINE  
ANNUAL REPORT  
YEAR 1956

7. UNDERGROUND (Cont'd)

a. Pumping

The following table shows a comparison of the underground pumping cost per ton for the last six years:

<u>Year</u>	<u>Cost Per Ton</u>
1956	\$.61
1955	.51
1954	.46
1953	.55
1952	.65
1951	.49

b. Development

The major development consisted of work on the 10th level. A suction sump and a pumphouse were excavated on the west side of the shaft plat. This development has been completed and is ready for the pump installation. Construction of the two scraping trenches north and south of the loading pockets was completed and also the incline drift from the 10th level to the skip pit.

The first cross cut branching to the southeast from the main haulage drift intersected the ore body and was stopped when the south footwall dike was reached. About 110' of ore was encountered in this development. Development for the first stope was started above this drift with the driving of a transfer drift east along the strike. About 500' of footwall drift was advanced to the east along the north side of the ore body. Small test drifts were advanced south from the drift at 200-foot intervals to determine the strike and outline of the ore body. A small test drift was also advanced due south from the end of the first cross cut for exploration purposes.

In Chase Lease #24, raise development was started from the 9th to 8th levels. This raise will serve as an ore pass or transfer for the production from #30 stope at the west end of the 8th level. The product from this area will be transferred to the 9th level for tramming to shaft and thereby eliminate the need to maintain tramming operations on the 8th level.

Chase Lease #24

An average of three contracts have mined in this Lease during the year. One contract continued stoping in Deposit #79 above the 8th level and development was advanced further east along the strike. At the close of the year, operations had crossed the east boundary of the Lease into Chase Lease #9 on the higher subs. At the west end of Deposit #79, caving operations have been continued and have approached very close to the 9th level elevation. In Deposit #82, a stoping operation was continued and operations completed about the middle of the year. Two contracts were conducting mining operations in this Lease at the close of the year.

Fee Lands

An average of four contracts have mined in Fee Lands and operations have been confined mostly between the 8th and 9th levels. A very small tonnage was mined at the 8th level and above by caving in Deposit #76 near the west boundary of the Lease.

In Deposit #87, a caving operation has been continued throughout the year and mining has extended across the east boundary of Chase Lease #9 into Fee Lands.

MORRIS MINE  
ANNUAL REPORT  
YEAR 1956

RECEIVED  
U.S. DEPT. OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
WASHINGTON, D.C.  
MAR 11 1957

7. UNDERGROUND (Cont'd)

b. Development (Cont'd)

Fee Lands (Cont'd)

At a lower elevation in Deposit #87, a stoping operation has been continued near the west boundary of the Lease. Development and mining, here, ranges from the 9th level to the -270' Sub. In Deposits #84B and #84C, at the extreme east end of the mine, caving operations have been continued and have practically reached the 9th level elevation. Relatively small pillars are all that remain to be recovered to complete operations in this area. Development from the 10th level will be driven into these deposits in the coming year so mining can continue below the 9th level.

Chase Lease #9

There was an average of ten contracts mining in this Lease during the year and the bulk of the production was from this property. Mining has been concentrated in Deposits #33, 75C and 76, between the 8th and 9th levels. Sub-level caving has been employed mostly in these deposits with one sub-level stope operation being conducted in Deposit #33.

One contract has continued sub-level caving in Deposit #87 near the east boundary of the Lease and a considerable part of the operation here extended east across the line into Fee Lands as mentioned previously.

Near the central part of the 9th level in Deposit #86, a sub-level stope was developed and mining has continued here throughout the year. Development and mining here has progressed above a transfer drift near the 9th level to the 8th level and above.

Sub-level caving has continued to be used in most areas and sub-level stoping to a smaller extent.