

PELLETIZING PLANT
ANNUAL REPORT
YEAR 1959

IV. REPAIRS AND CHANGES (CONT'D)

C. Pellet Firing (Cont'd)

New bearings, shaft and seals were installed in the reducer shaft of "D" line disc drive.

Duct work carrying dust collection off the double deck screen and the discharge end of the grate machine was revamped to facilitate the use of an auxiliary fan as a dust collector in the event either No. 5 or No. 6 rotoclone failed.

The No. 26 or product belt conveyor gallery was completed in January. This construction was highly successful as to winter operations and savings realized therefrom.

The 500 H.P. motor driving the No. 1 Process air fan failed and was replaced late in April.

As a result of the 1959 strike action taken by the United Steelworkers of America it was necessary to delay the major shut down period to 1960. Weekly patch and repair work was necessary along the west side of the grate machine in conjunction with the steel supporting the seal bars.

Three of the concentrate day bin table feeders were faced with the expanded metal to produce a wearing surface of concentrate. The fourth table feeder was lined with carbo-frax brick, a silicon carbide material. A cost analysis and study of the two type linings will follow.

PELLETIZING PLANT
ANNUAL REPORT
YEAR 1959

V. GENERAL SURFACE

A. Equipment Received

1. New

None

2. Used

A Bucyrus-Erie H-3 Hydrocrane was transferred from the Cambria Mine to the Pelletizing Plant.

B. Water Supply

No change

C. Roads

Normal road maintenance and improvement was carried on during the year.

D. Buildings

The 320 foot extension on the original 250 foot railroad car thawing shed was completed and placed into operation. The finished installation has nearly eliminated all difficulties relative to frozen cars of concentrate. The 1959 winter production rates would not have been possible without the 570 foot thaw shed.

E. Outside Lighting

Additional poles and flood lights were added to the stock pile loading track and the pocket loading track above and below the pocket.

PELLETIZING PLANT
ANNUAL REPORT
YEAR 1959

VI. COST OF PRODUCTIONTABLE NO. 15

	<u>Monthly Operating Costs</u>												
	<u>January</u>	<u>February</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>September</u>	<u>October</u>	<u>November</u>	<u>December</u>	<u>Total Year</u>
<u>Processing Cost</u>													
<u>Raw Mat'l Unload & Storage</u>													
Operating Labor	.062	.044	.036	.027	.029	.040	.054	-	-	-	.042	.032	.040
Power	.013	.013	.011	.012	.009	.012	.018	-	-	-	.017	.012	.012
Operating Supplies	.028	.058	.007	.008	.001	.005	.021	-	-	-	.101	.044	.026
Maintenance Labor	.023	.019	.017	.009	.009	.013	.016	-	-	-	.025	.031	.017
Maintenance Supplies	.019	.019	.023	.001	.011	.024	.007	-	-	-	.006	.047	.019
Total Month	.145	.153	.094	.057	.059	.094	.116	-	-	-	.191	.166	.114
<u>Material Preparation</u>													
Operating Labor	.336	.306	.316	.268	.235	.242	.263	-	-	-	.293	.263	.278
Power	.346	.349	.299	.313	.244	.332	.479	-	-	-	.444	.332	.334
Operating Supplies	2.051	1.776	1.767	1.612	1.638	1.856	1.934	-	-	-	1.865	1.729	1.788
Maintenance Labor	.241	.169	.204	.163	.153	.182	.240	-	-	-	.283	.221	.199
Maintenance Supplies	.353	.256	.316	.321	.137	.181	.289	-	-	-	.740	.567	.330
Total Month	3.327	2.856	2.902	2.677	2.407	2.793	3.205	-	-	-	3.625	3.112	2.929
<u>Pellet Firing</u>													
Operating Labor	.189	.165	.175	.157	.145	.137	.157	-	-	-	.181	.162	.161
Power	.274	.278	.238	.255	.199	.270	.384	-	-	-	.362	.270	.269
Operating Supplies	.578	.490	.542	.406	.350	.388	.486	-	-	-	.496	.313	.441
Maintenance Labor	.263	.195	.188	.192	.157	.183	.217	-	-	-	.235	.198	.199
Maintenance Supplies	.239	.228	.275	.175	.115	.102	.230	-	-	-	.475	.452	.240
Total Month	1.543	1.356	1.418	1.185	.966	1.080	1.474	-	-	-	1.749	1.395	1.310
<u>Product Screening & Loading</u>													
Operating Labor	.106	.093	.093	.065	.034	.051	.041	-	-	-	.086	.077	.072
Power	.009	.009	.008	.009	.007	.009	.013	-	-	-	.012	.009	.009
Operating Supplies	.036	.080	.081	.050	.023	.027	.028	-	-	-	.031	.086	.049
Maintenance Labor	.090	.089	.058	.055	.027	.041	.071	-	-	-	.074	.042	.058
Maintenance Supplies	.266	.063	.075	.087	.080	.014	.056	-	-	-	.026	.057	.081
Total Month	.507	.334	.315	.266	.171	.142	.209	-	-	-	.229	.271	.269
<u>Water Supply</u>													
Operating Labor	-	-	-	-	-	-	-	-	-	-	-	-	-
Power	.008	.009	.007	.008	.006	.008	.012	-	-	-	.012	.008	.007
Operating Supplies	-	-	-	-	-	-	-	-	-	-	-	.003	.001
Maintenance Labor	-	-	-	-	-	.001	-	-	-	-	.002	.020	.001
Maintenance Supplies	-	.001	-	-	-	-	.006	-	-	-	-	-	.003
Total Month	.008	.010	.007	.008	.006	.009	.018	-	-	-	.014	.031	.012

PELLETIZING PLANT
ANNUAL REPORT
YEAR 1959

TABLE NO. 15 (Cont'd)

	<u>Monthly Operating Costs</u>												<u>Total Year</u>
	<u>January</u>	<u>February</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>September</u>	<u>October</u>	<u>November</u>	<u>December</u>	
<u>Processing Cost</u>													
Control and Analysis													
Operating Labor	.033	.033	.033	.034	.034	.030	.033	-	-	-	.031	.037	.033
Power	.001	-	-	-	.001	.001	-	-	-	-	.001	.001	.001
Operating Supplies	.002	.006	.004	.005	.008	.006	.003	-	-	-	.005	.012	.006
Maintenance Labor	-	-	.001	-	-	-	-	-	-	-	-	-	.000
Maintenance Supplies	-	-	.001	-	-	-	-	-	-	-	-	-	.000
Total Month	<u>.036</u>	<u>.039</u>	<u>.039</u>	<u>.039</u>	<u>.043</u>	<u>.037</u>	<u>.036</u>				<u>.037</u>	<u>.050</u>	<u>.040</u>
<u>Other Direct Plant Expense</u>													
Operating Labor	.255	.196	.235	.181	.181	.157	.263	-	-	-	.368	.282	.225
Power	.010	.010	.009	.009	.007	.010	.014	-	-	-	.013	.017	.011
Operating Supplies	.164	.219	.170	.173	.106	.121	.193	-	-	-	.184	.135	.158
Maintenance Labor	.029	.016	.030	.026	.032	.045	.047	-	-	-	.058	.055	.036
Maintenance Supplies	.020	.023	.025	.002	.021	.024	.088	-	-	-	.039	.021	.025
Total Month	<u>.478</u>	<u>.464</u>	<u>.469</u>	<u>.391</u>	<u>.347</u>	<u>.357</u>	<u>.605</u>				<u>.662</u>	<u>.510</u>	<u>.455</u>
<u>Allocated Expense</u>													
Operating Labor	.093	.071	.064	.060	.061	.058	.062	-	-	-	.066	.017	.061
Operating Supplies	.112	.084	.096	.120	.103	.079	.107	-	-	-	.124	.095	.101
Total Month	<u>.205</u>	<u>.155</u>	<u>.160</u>	<u>.180</u>	<u>.164</u>	<u>.137</u>	<u>.169</u>				<u>.190</u>	<u>.112</u>	<u>.162</u>
<u>Total Processing Cost</u>													
Operating Labor	1.074	.908	.952	.792	.719	.715	.873	-	-	-	1.067	.870	.870
Power	.661	.659	.572	.606	.473	.642	.920	-	-	-	.861	.649	.643
Operating Supplies	2.971	2.722	2.667	2.374	2.229	2.482	2.772	-	-	-	2.806	2.414	2.570
Maintenance Labor	.646	.488	.498	.445	.378	.465	.591	-	-	-	.677	.550	.510
Maintenance Supplies	.897	.590	.715	.586	.364	.345	.676	-	-	-	1.286	1.164	.698
Total Month	<u>6.249</u>	<u>5.367</u>	<u>5.404</u>	<u>4.803</u>	<u>4.163</u>	<u>4.649</u>	<u>5.832</u>				<u>6.697</u>	<u>5.647</u>	<u>5.291</u>

PELLETIZING PLANT
ANNUAL REPORT
YEAR 1959

TABLE NO. 16

<u>Account</u>	<u>YEARLY COST</u>	
	<u>Expenditure</u>	<u>Cost Per Ton</u>
Labor	516,539.42	1.205
Power	275,592.94	.643
Propane	32,868.61	.077
Ignition Coal	136,409.04	.318
Process Coal	346,471.37	.808
Bentonite	76,361.77	.178
Limestone	46,017.17	.107
Grinding Balls	267,740.65	.625
Grate Machine	63,963.55	.149
Pumps	30,583.25	.071
Conveyors	32,488.15	.076
Air System	54,468.39	.127
Direct Charges	178,719.77	.417
R. & M.'s	31,824.27	.074
Shipping	25,448.38	.059
Miscellaneous	<u>177,652.78</u>	<u>.416</u>
	2,293,149.51	5.350

RECAP

Labor	1.205
Power	.643
Raw Materials	2.113
Maintenance Parts	.497
Direct Charges	.417
Shipping Expense	.059
Miscellaneous	<u>.416</u>
	5.350

PELLETIZING PLANT
ANNUAL REPORT
YEAR 1959

VII. STATEMENT OF TAXESTABLE NO. 17

<u>Negaunee Township</u>	<u>Valuation</u>	<u>Taxes</u>
S $\frac{1}{2}$ of NW $\frac{1}{4}$ & NE $\frac{1}{4}$ of SW $\frac{1}{4}$ Sec 36, 48-26 Eagle Mills Pelletizing Plant	1,281,000.00	42,048.82
Tax Rates		32.50

PELLETIZING PLANT
ANNUAL REPORT
YEAR 1959

VIII. ACCIDENTS AND PERSONAL INJURY

Following is the statistics completed by the Safety Department for the Pelletizing Plant during 1959.

TABLE NO. 18

1. Number of Man Hours Worked	163,590
2. Position Rating - All Michigan Properties	11
3. Accidents	
Compensable Injuries (46 Compensable Days)	2
Non Compensable Injuries (2 Days)	<u>1</u>
Total (48 Days)	3
Average Days Lost Per Injury	16
4. Frequency (number of accidents per million man hours worked)	18.34
5. Severity (Number of days lost per million man hours worked)	293

PELLETIZING PLANT
ANNUAL REPORT
YEAR 1959

IX. PROPOSED NEW EQUIPMENT AND CONSTRUCTION

A. Equipment

1. Type N-40 Rotoclone
2. Pocket-stocking Truck
3. Magnet for H-3 Hydrocrane
4. Stationary Air Compressor
5. Car Puller at Pocket
6. Pickup Truck - 1/2 Ton
7. Green Ball Screens
8. Crane for Servicing Ball Mill
9. Pan Type Conveyor for No. 24 Conveyor
10. Crane for Discharge End of Grate Machine
11. Pallet Car Retarder
12. Conveyor to Carry Ignition Coal Across the Top of the Building to Eliminate Truck Haulage
13. Conveyor Arrangement to Carry Crushed Limestone to Ball Mill Eliminating the Need of Pulverizing Limestone

B. Construction

1. Cold Storage Warehouse Space
2. Increased Sump Capacity at Discharge End of Grate Machine
3. Grinding Ball Storage and Handling Facilities Inside Plant Building.
4. Pour Additional Concrete on Top of Present Floors to Produce Floor Slopes for Cleaning Purposes
5. Building for Mobile Equipment Repair and General Maintenance
6. Arrangement for Dewatering the Pulp Going to the Derrick Screens
7. Fresh Air Heating Unit plus Duct Work for Improving Conditions in Dirty Clothes Dry.

PELLETIZING PLANT
ANNUAL REPORT
YEAR 1959

X. YEARLY COMPARISON

A. Introduction

The following five graphs show the change in five of the significant performance figures since the start-up of the plant.

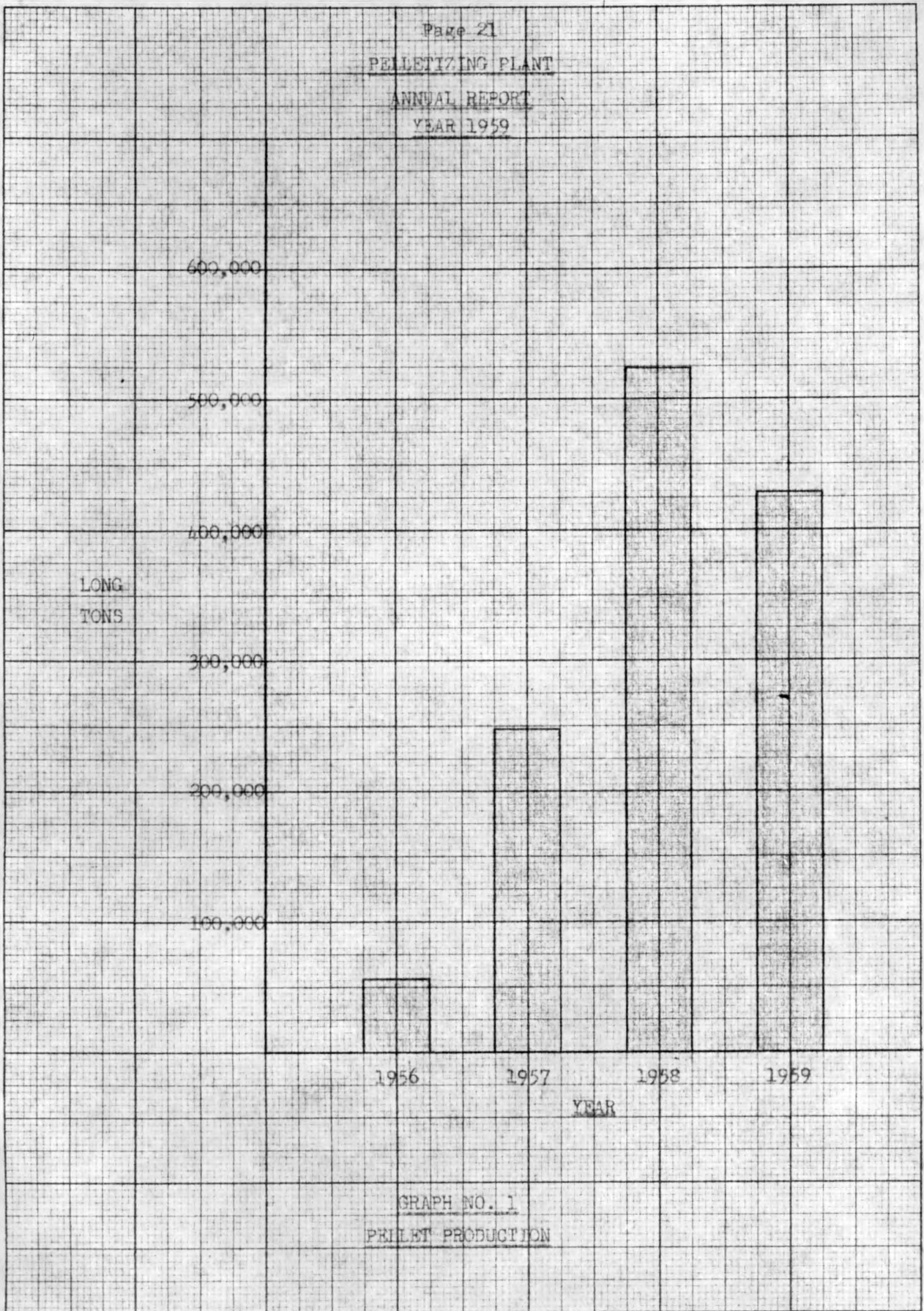
The following history will help provide background for the graphs.

In 1956 the plant operated from September 1 to the end of the year on a three shift per day - five day per week basis. In 1957 the plant was shut down for eight weeks during January, February and March. On April 1 a 7 day per week operating schedule was begun. In 1958 the plant operated on a 6 day per week schedule from June until November. The remaining time it was on a 7 day per week schedule. There was a ten day repair period in the summer of 1958. In 1958 25,666 LT of stockpile overrun was included in the production.

Page 21
PELLETIZING PLANT
ANNUAL REPORT
YEAR 1959

EUGENE DIETZGEN CO.
MADE IN U. S. A.

NO. 340-20 DIETZGEN GRAPH PAPER
20 X 20 PER INCH



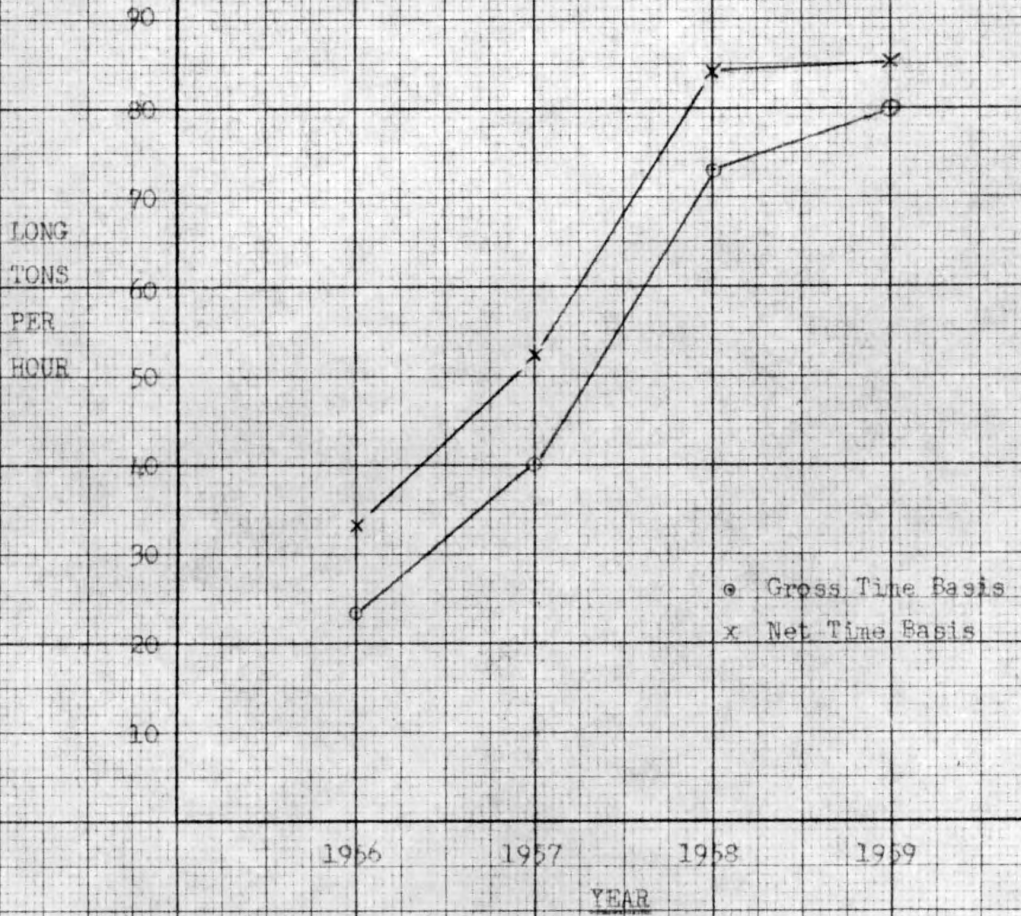
GRAPH NO. 1
PELLET PRODUCTION

Page 22

PELLETIZING PLANT
ANNUAL REPORT
YEAR 1959

EUGENE DIETZGEN CO.
MADE IN U. S. A.

NO. 340-20 DIETZGEN GRAPH PAPER
20 X 20 PER INCH

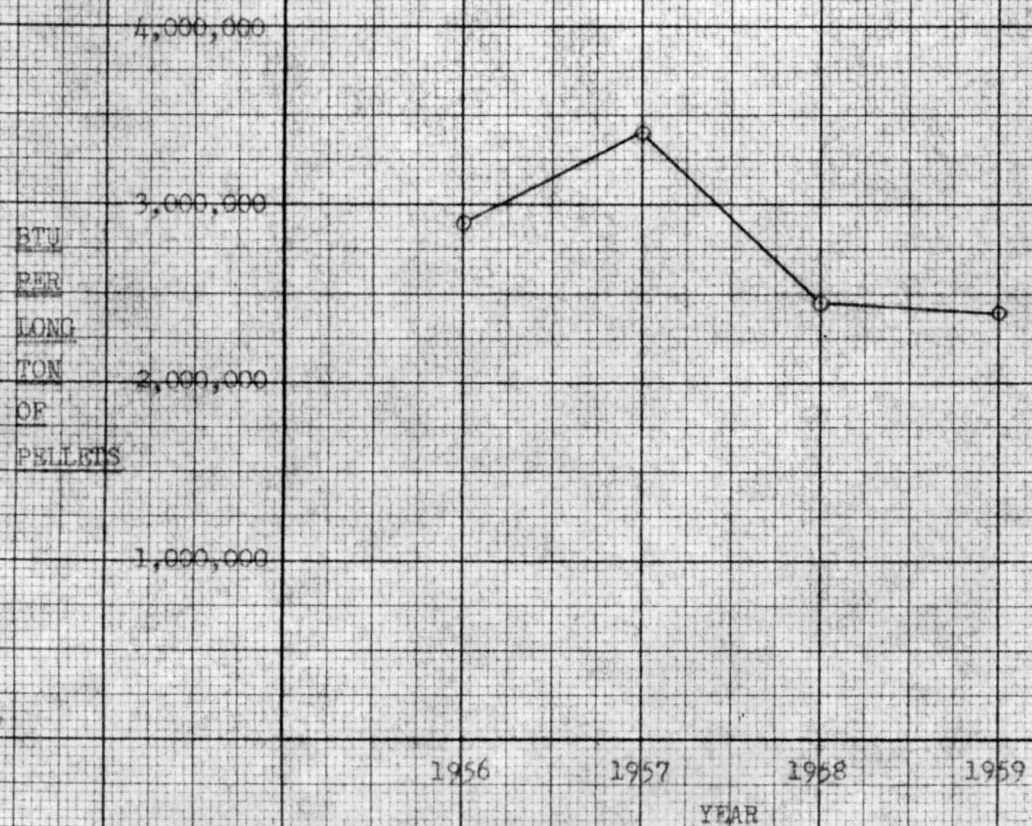


GRAPH NO. 2
PRODUCTION RATES

Page 23
PELLETIZING PLANT
ANNUAL REPORT
YEAR 1959

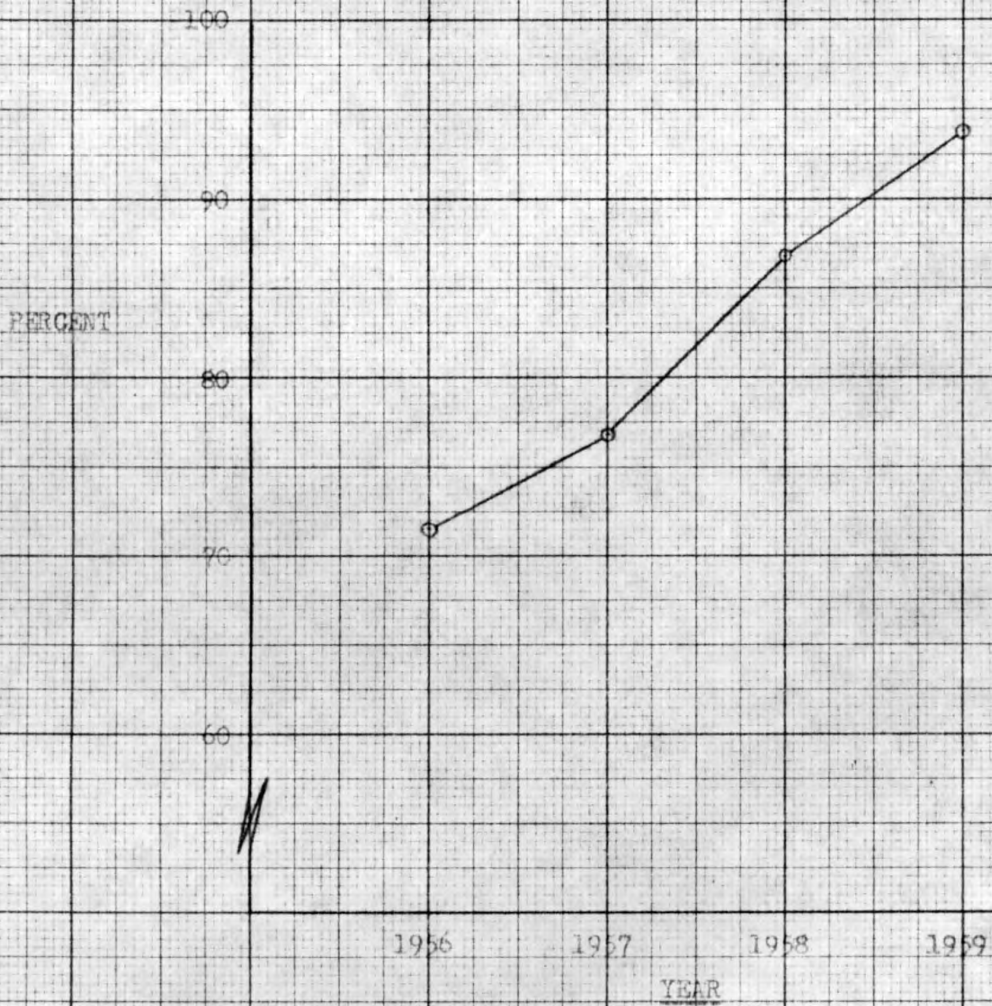
EUGENE DIETZGEN CO.
MADE IN U.S.A.

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20 X 20 PER INCH



GRAPH NO. 3
HEAT CONSUMPTION

Page 2A
PELLETIZING PLANT
ANNUAL REPORT
YEAR 1959



GRAPH NO. 4
OPERATING TIME

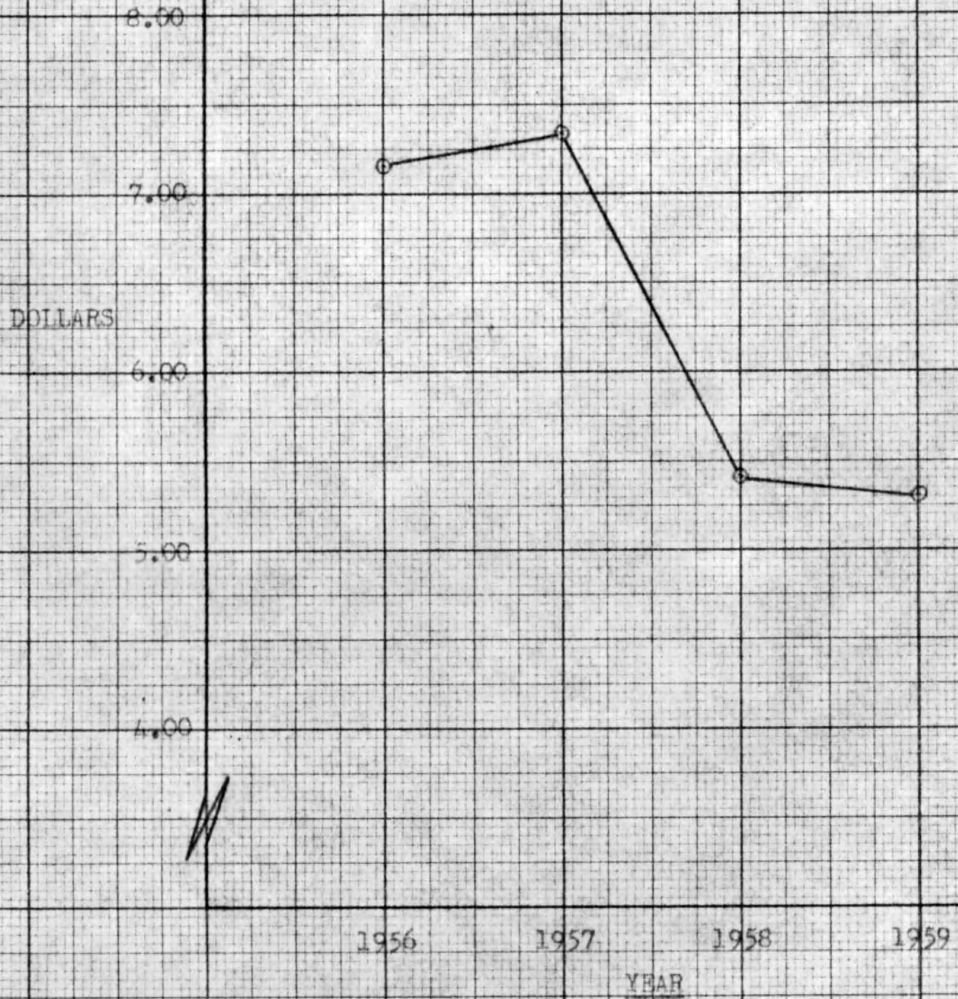
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Page 25
PELLETIZING PLANT
ANNUAL REPORT
YEAR 1959

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GRAPH NO. 5
COST PER LB OF PELLETS

PELLETIZING PLANT
ANNUAL REPORT
YEAR 1959

XI. MONTHLY OPERATING TABLES

TABLE NO. 19 - Raw Materials Consumption - Monthly Operating Data

<u>Month</u>	<u>Concentrates</u>	<u>Tonnages</u>				<u>Gallons Propane</u>	<u>Net Tons Grinding Balls</u>
		<u>Process Coal</u>	<u>Ignition Coal</u>	<u>Limestone</u>	<u>Bentonite</u>		
January	59,486	3,496	1,145	626	306	120,845	149
February	55,937	3,527	946	557	335	121,718	126
March	56,181	3,055	1,142	267	346	116,463	145
April	60,940	3,300	812	915	322	108,936	118
May	63,054	3,380	947	750	348	84,760	160
June	54,760	3,408	892	429	382	77,701	178
July	20,084	1,778	386	272	159	28,578	57
August							
September							
October							
November	43,725	2,080	621	669	214	59,077	79
December	57,153	3,071	908	833	390	98,493	123
Totals	471,320	27,095	7,799	5,318	2,802	816,571	1,135

PELLETIZING PLANT
ANNUAL REPORT
YEAR 1959

TABLE NO. 20

Material Preparation
Regrind Section - Monthly Operating Data

	Tonnage Processed	Hours Operating	Delays	Percent Operation	Regrinding Rate LTPH	
					Gross Time Basis	Net Time Basis
January	68,500	657.4	4.1	99.4	103.5	104.2
February	66,399	619.8	1.1	99.8	106.9	107.1
March	69,179	672.1	1.9	99.7	102.6	102.9
April	68,293	647.3	0.	100.0	105.5	105.5
May	74,392	667.2	5.4	99.2	110.6	111.5
June	75,840	675.2	2.9	99.5	111.9	112.3
July	31,028	286.4	.5	99.8	108.1	103.3
August						
September						
October						
November	47,400	444.3	1.1	99.7	106.4	106.7
December	69,015	640.3	5.9	99.1	106.8	107.8
Totals & Avgs	570,046	5,310.0	22.9	99.5	106.9	107.4

	Power Consumption				Steel		Structure - % -325m			
	KWH/LT		KWH/LT % -325m		Consumption Lbs/LT		Mill Feed		Mill Discharge	
	#1 Ball Mill	#2 Ball Mill	#1 Ball Mill	#2 Ball Mill	#1 Ball Mill	#2 Ball Mill	Concentrate	Returns	#1 Ball Mill	#2 Ball Mill
January	10.59	11.32	48.02	45.15	4.01	4.34	50.15	61.05	75.09	75.23
February	11.36	11.52	53.19	47.47	4.07	4.40	50.14	70.50	75.78	74.42
March	11.39	11.77	51.62	47.28	4.63	4.21	48.11	67.13	75.35	75.03
April	11.45	9.56	45.88	35.74	4.65	3.82	45.91	62.44	74.07	72.67
May	10.47	8.89	42.38	34.04	4.34	4.46	46.22	62.00	73.23	72.32
June	10.13	9.80	49.36	42.40	3.92	3.58	50.83	64.80	74.21	73.95
July	9.84	10.11	45.08	42.84	3.66	3.92	52.03	66.80	74.69	75.62
August										
September										
October										
November	10.49	9.56	43.97	37.14	3.93	3.11	49.30	60.67	74.74	75.05
December	10.68	10.44	40.12	37.39	3.95	3.06	44.87	20.05 & 59.30	71.31	72.11
Totals	10.76	10.32	46.55	40.67	4.21	4.00				

	Pulverizer		Pulverizing Rate - LTPH	Structure % -200 m Discharge	Power Consumption		Heat Consumption BTU/LT
	Tonnage Processed, LT	Process Coal			KWH/LT	KWH/LT % -200 m	
January	3,081		6.85	46.63	19.41	48.37	852,080
February	3,146		7.43	36.46	19.36	62.53	778,012
March	2,640		4.53	35.30	30.00	104.17	1,095,137
April	2,865		5.16	38.60	27.40	85.36	859,529
May	3,015		6.63	36.28	21.96	73.73	718,311
June	3,043		5.50	29.92	24.78	105.80	685,176
July	1,575		5.53	28.54	20.83	94.51	539,876
August							
September							
October							
November	1,847		6.00	29.35	24.69	108.05	638,034
December	2,648		6.09	26.80	22.77	112.18	915,979

PELLETIZING PLANT
ANNUAL REPORT
YEAR 1959

TABLE NO. 20 (CONT'D)

Pulverizer (Cont'd)

	<u>Tonnage Processed, LT</u>	<u>Pulverizing Rate - LTPH</u>	<u>Structure % -325 m</u>	<u>Power Consumption</u>		<u>Heat Consumption</u>
	<u>Limestone</u>		<u>Discharge</u>	<u>KWH/LT</u>	<u>KWH/LT % -325 m</u>	<u>BTU/LT</u>
January	614	15.35	74.60	17.92	25.13	317,611
February	538	10.89	72.00	22.12	31.15	408,993
March	171	12.60	69.25	21.60	31.40	585,000
April	-					
May	278	10.20	71.67	27.34	38.55	490,715
June	-					
July	-					
August	-					
September	-					
October	-					
November	-					
December	-					

PELLETIZING PLANT
ANNUAL REPORT
YEAR 1959

TABLE NO. 21

Material Preparation
Balling Section - Monthly Operating Data

	Tonnage Processed LT (Dry)	Processing Rate LT/Disc-Hour	Average No. of Disc Opt. - Net Time Basis	A Disc	Percent Operating Hours - Net Time Basis			
					B Disc	C Disc	D Disc	
January	62,595	25.41	3.97	100.00	99.75	99.64	99.32	
February	60,529	25.75	3.91	100.00	99.91	99.56	99.61	
March	63,181	25.21	3.92	100.00	99.36	99.21	99.46	
April	62,590	25.94	3.95	100.00	99.66	99.52	99.47	
May	67,875	27.52	3.98	100.00	99.76	99.72	98.59	
June	69,067	27.33	3.98	100.00	99.68	99.76	99.65	
July	28,183	26.36	3.99	100.00	100.00	99.63	99.25	
August								
September								
October								
November	43,176	26.03	3.96	100.00	99.44	99.56	99.58	
December	63,066	25.49	3.97	100.00	99.86	99.77	99.30	

PELLETIZING PLANT
ANNUAL REPORT
YEAR 1959

TABLE NO. 22

Pellet Firing - Monthly

	<u>Pellets Produced</u>	<u>Hours Operating</u>	<u>Delays</u>	<u>Percent Operating</u>	<u>Pelletizing Rate - Net Time Basis</u>			<u>Fuel Consumption MBTU/LT</u>
					<u>LT/PH</u>	<u>LT/Sq Ft/Day</u>		
					<u>Over Firing Zone</u>	<u>Over Up Draft</u>		
January	46,447	620.2	43.3	93.5	74.9	3.57	1.92	3.030
February	48,254	601.8	27.2	95.7	80.2	3.82	2.06	2.806
March	50,970	638.9	32.6	95.1	79.8	3.80	2.05	2.522
April	52,697	610.5	51.6	92.2	86.3	4.11	2.21	2.376
May	62,197	619.9	56.8	91.6	100.3	4.78	2.57	2.126
June	60,153	635.1	42.9	93.7	94.7	4.51	2.43	2.187
July	24,350	267.9	19.9	93.1	90.9	4.33	2.33	2.688
August								
September								
October								
November	33,106	414.2	29.9	93.3	79.9	3.80	2.05	2.460
December	<u>50,928</u>	<u>619.1</u>	<u>25.7</u>	<u>96.0</u>	<u>82.3</u>	<u>3.92</u>	<u>2.11</u>	<u>2.361</u>
Totals & Avg	428,633	5,027.6	329.9	93.9	85.3			2.402

PELLETIZING PLANT
ANNUAL REPORT
YEAR 1959

TABLE NO. 23PELLET QUALITY REPORT

Tonnage	428,633
% Delays	6.15
<u>Screen Analysis, %</u>	
+ 1"	9.69
- 1" + 3/4"	6.01
- 3/4" + 1/2"	23.38
- 1/2" + 3/8"	33.59
- 3/8" + 3M	17.17
- 3M + 4M	3.09
- 4M + 6M	1.49
- 6M + 8M	.90
- 8M + 10M	.39
- 10M + 14M	.26
- 14M + 20M	.16
- 20M + 28M	.15
- 28M	3.72
Cumulative -8M	4.68
<u>Tumble Test</u>	
% - 8M	17.54
% - 28M	13.50
<u>Chemical Analysis, %</u>	
Fe	63.02
SiO ₂	9.09
P	
S	
H ₂ O	2.99
<u>Bulk Density</u>	
#/Ft ³	111.80

ORE IMPROVEMENT PLANT
ANNUAL REPORT
YEAR 1959

INDEX

<u>ITEM</u>	<u>PAGE</u>
1. INTRODUCTION	1
2. PLANT PROCESSES:	2
a. DISTRIBUTION AND ANALYSES OF FEED	2
b. DRYER BALANCE	2
c. PRIMARY SECTION	3
d. PRODUCTION FIGURES	3
e. METALLURGICAL BALANCES	3
f. METALLURGICAL BALANCE, HEAVY MEDIA SECTION	4
g. FERROSILICON CONSUMPTION	4
h. PROCESS OIL CONSUMPTION	5
i. FINAL DISTRIBUTION OF ORES TO THE PLANT	5
3. COST OF OPERATIONS:	6
a. COMMENTS	6
b. YEARLY COST	6
4. HOURLY OPERATING RATES - 1959 SEASON:	6
a. DRYER SECTION DELAYS	8
b. UNLOADING POCKET DELAYS	9
c. NUMBER 1 LOADING POCKET DELAYS	10
d. NUMBER 17 CONVEYOR TRUCK POCKET	10
e. CRUSHER DELAYS	11
f. HEAVY MEDIA SECTION DELAYS	12
5. LABOR AND WAGES:	13
a. COMMENTS	13
b. REPORT OF VACATIONS PAID	13
c. STATEMENT OF PRODUCTION AND WAGES	13
d. ANNUAL STATEMENT OF LABOR	14
6. ORE STRUCTURES - PRODUCT:	15
a. GROUP I STRUCTURE	15
b. GROUP II STRUCTURE	15
c. GROUP III STRUCTURE	16
d. GROUP IV STRUCTURE	16
7. ACCIDENTS AND PERSONAL INJURY:	17
a. ACCIDENT STATISTICS	17
b. COMPENSABLE INJURIES	17
8. TAXES:	17
a. COMPARATIVE STATEMENT OF TAXES	17
9. PROPOSED NEW EQUIPMENT AND CONSTRUCTION	18
10. RESEARCH	18

ORE IMPROVEMENT PLANT
ANNUAL REPORT
YEAR 1959

1. INTRODUCTION:

Production for 1959 began on a three shift per day, seven day per week basis on March 30 and continued on this basis until midnight July 14th. A general strike called by the United Steel Workers, AFL-CIO against the mining companies prevented further operation of the plant despite the fact that the plant is still not unionized. On November 9th operations were resumed with the temporary termination of the strike and continued uninterruptedly through December 31st. The last cargo shipped from Marquette harbor was loaded out of the plant on December 10th.

Because of extensive ore sales requirements for improved grades for the 1960 season, a decision was made to operate the plant after the close of shipping season. A stockpile of approximately 700,000 tons of Group III product (Dried Only) will be accumulated to meet 1960 sales requirements. A production record of slightly over 11,000 tons of this material was established during the 24 hour period from 8:00 A.M. December 13th to 8:00 A.M. December 14th through the number one Dryer.

A new product designated Group IV was introduced during the 1959 season. This product is the $+\frac{1}{2}$ inch to $-1\frac{3}{4}$ inch coarse material separated from the plant feed in the screening section that is sufficiently high in natural iron and low in natural silica to be an acceptable product without heavy density concentration. This product is obtained by a selective separation of higher grade feed ores with the coarse product from screening being bypassed around the heavy density concentrator over a bypass system installed during the winter idle period.

ORE IMPROVEMENT PLANT
ANNUAL REPORT
YEAR 1959

2. PLANT PROCESSES:

a. Distribution and Analyses of Feed:

	<u>Tons</u>	<u>%age</u>	<u>Iron</u>	<u>Sil.</u>	<u>Moist.</u>
Athens Pocket	42,302	4.26	60.14	5.92	12.72
Athens Stockpile	186,567	18.79	58.70	7.78	11.51
Maas Pocket	55,042	5.54	60.72	6.80	11.94
Maas Stockpile	37,408	3.77	60.61	6.76	11.65
Cambria-Jackson Stockpile	25,155	2.53	59.49	8.69	11.83
Mather "A" Pocket	30,946	3.11	59.88	6.96	10.08
Mather "A" Stockpile	56,287	5.67	58.58	8.45	10.39
Mather "B" Pocket	286,306	28.83	60.04	7.74	9.12
Mather "B" Stockpile	<u>273,140</u>	<u>27.50</u>	<u>60.02</u>	<u>7.67</u>	<u>9.95</u>
Total Ores to Plant	993,153	100.00	59.74	7.60	10.37
Less ore Between Scales & Plant	<u>3,367</u>				
Total Ores Through Plant	989,786	100.00	59.74	7.60	10.37
Natural Mine Analysis			53.54	6.81	
Natural Plant Analysis			53.27	7.21	
O.I.P. Moisture Check					11.10

b. Dryer Balance:

Average Moisture - Feed - 10.95

Average Moisture - Product - 7.19

	<u>Natural Tons</u>	<u>Percent Recovery</u>	<u>Percent Moisture</u>	<u>Dry Tons</u>
Product	942,201	95.86	7.19	874,457
Moisture Loss	39,932		100.00	
Estimated Dust Loss	<u>738</u>			<u>738</u>
Total	982,871		10.95	875,295

Heavy Media Section

	<u>Tons</u>
Total + $\frac{1}{2}$ "	44,708
Less Proportion of Moisture Loss	<u>1,884</u>
Heavy Media Feed	42,824

ORE IMPROVEMENT PLANT
ANNUAL REPORT
YEAR 1959

2. PLANT PROCESSES: (Cont'd.)

c. Primary Section:

	<u>Tons</u>	<u>Split</u>
Tons Unloaded	989,786	100.00%
Tons Group III (Includes Moisture Loss)	473,351	47.82%
Tons -1/2" (Includes Moisture Loss)	415,097	41.94%
Tons +1/2" (Includes Moisture Loss)	101,338	10.24%
Ore as received: -1/2"		80.38%
+1/2"		19.64%

d. Production Figures:

	<u>Tons</u>	<u>Iron</u>	<u>Sil.</u>	<u>Phos.</u>	<u>Sul.</u>	<u>Moist</u>
Group I C.C.I. Dry		59.81	7.30	.100	.037	
Nat.	397,601	55.42	6.76	.093	.034	7.34
Group II C.C.I. Dry		59.34	8.99	.098	.032	
Nat.	26,649	55.68	8.44	.092	.030	6.17
Group III C.C.I. Dry		59.89	7.35	.099	.042	
Nat.	454,447	55.54	6.82	.092	.039	7.27
Group IV C.C.I. Dry		56.80	11.57	.100	.034	
Nat.	<u>46,827</u>	<u>53.56</u>	<u>10.91</u>	<u>.094</u>	<u>.032</u>	<u>5.71</u>
Total Product Dry		59.68	7.59	.099	.039	
Nat.	925,524	55.39	7.04	.092	.036	7.19

Average Improvement Fe Nat'l. -- 1.85 Units (Fe)

Average Improvement Fe Nat'l. by Met. Balance Calc. -- 2.51 Units (Fe)

e. Metallurgical Balances:

<u>Product - Natural</u>	<u>Tons</u>	<u>% Wt. Crude</u>	<u>Cuml. % Wt. Crude</u>	<u>% Fe</u>	<u>% SiO₂</u>	<u>% Moist.</u>
Group I	397,601	40.17	40.17	55.42	6.76	7.34
Group II	26,649	2.69	42.86	55.68	8.44	6.17
Group III	454,447	45.91	88.77	55.54	6.82	7.27
Group IV	46,827	4.73	93.50	53.56	10.91	5.71
Tailings & Rejects	16,175	1.64	95.14	40.50	27.00	10.00
Moisture Loss	39,932	4.04	99.18	---	---	100.00
Dust Loss	738	.07	99.25	60.39	3.96	1.00
In Surge I-II	<u>7,417</u>	<u>.75</u>	<u>100.00</u>	<u>50.39</u>	<u>16.35</u>	<u>6.00</u>
Total Feed (Shipping Dept.)	989,786	100.00		53.54	6.81	10.37
Total Feed (Metallurgical Balance Calculation)				52.88	7.16	10.97

ORE IMPROVEMENT PLANT
ANNUAL REPORT
YEAR 1959

2. PLANT PROCESSES: (Cont'd.)

e. Metallurgical Balances: (Cont'd.)

<u>Product - Dry</u>	<u>Tons</u>	<u>% Wt. Crude</u>	<u>Cuml. % Wt. Crude</u>	<u>% Fe.</u>	<u>% SiO₂</u>
Group I	368,417	41.81	41.81	59.81	7.30
Group II	25,005	2.84	44.65	59.34	8.99
Group III	421,409	47.82	92.47	59.89	7.35
Group IV	44,153	5.01	97.48	56.80	11.57
Tailings	14,558	1.65	99.13	45.00	30.00
Dust Loss	731	.08	99.21	61.00	4.00
In Surge I-II	<u>6,972</u>	<u>.79</u>	<u>100.00</u>	<u>53.61</u>	<u>17.39</u>
Total Feed (Shipping Dept.)	881,245	100.00		59.74	7.60
Total Feed (Metallurgical Balance Calculation)				59.39	8.04

f. Metallurgical Balance, Heavy Media Section:

<u>Product</u>	<u>Tons</u>	<u>% Wt.</u>	<u>% Wt. H.M. Feed</u>	<u>% Fe</u>	<u>% SiO₂</u>
Feed	42,824		100.00	50.91	
Sink	24,393	61.49	56.96	58.99	9.63
Float	15,277	38.51	35.67	36.42	
H. M. Drum Feed	39,670	100.00	92.63	50.30	
Class. Sands	2,256	71.53	5.27	59.61	7.71
Class. Overflow	898	28.47	2.10	55.90	
Class. Feed	3,154	100.00	7.37	58.57	
Total	42,824		100.00	50.91	
Sink	24,393	91.53	56.96	58.99	9.63
Class. Sands	2,256	8.47	5.27	59.61	7.72
Total Concentrate	26,649	100.00	62.23	59.05	9.46

g. Ferrosilicon Consumption:

	<u>Tons H.M. Feed</u>	<u>Lbs. Fe Si Dumped</u>	<u>FeSi Loss Lbs/Ton H.M. Feed</u>	<u>Tons H.M. Concentrate</u>	<u>FeSi Lbs/Ton of H.M. Concentrate</u>	<u>% Recovery</u>
1959 Totals	39,670	37,111	.94	24,393	1.52	61.49
1958 Totals	30,556	54,171	1.77	21,757	2.49	71.20

ORE IMPROVEMENT PLANT
ANNUAL REPORT
YEAR 1959

2. PLANT PROCESSES: (Cont'd.)

h. Process Oil Consumption:

	<u>Tons Dryer Feed</u>	<u>Process Oil Used</u>	<u>Gals. Oil/ Ton Feed</u>	<u>Tons Dryer Product</u>	<u>Gals. Oil/ Ton Product</u>	<u>Cost/Ton Product For Oil</u>
1959 Totals	982,871	962,002	.979	942,201	1.021	.090
1958 Totals	379,760	445,673	1.174	367,288	1.213	.098

With an uninterrupted operating schedule made possible by the increased 1959 demand for improved ore the gallons of oil required to produce a ton of product dropped to 1.021 gallons per ton. This reduction was also made possible (despite operations under winter conditions in March, April, November, and December) by selective purchases of high B.T.U. fuel oils from the Group 3 market. This also resulted in a saving of \$0.008 per ton of product under 1958 despite a "tighter" oil market with the nation in full productive swing.

i. Final Distribution of Ores to the Plant:

	<u>C. Jackson</u>	<u>Mather A</u>	<u>Mather B</u>	<u>Maas</u>	<u>Athens</u>	<u>Bunker Hill</u>	<u>Total</u>
Tons Unloaded	25,155	84,572	558,740	92,450	32,272	196,597	989,786
Tons Recovered	22,274	78,337	524,338	86,781	29,926	183,868	925,524
In Surge		1,021	6,396				7,417
Loss	2,881	5,214	28,006	5,669	2,346	12,729	56,845
Percent Recovery (Incl. Surge End of Year)	88.55	93.83	94.99	93.87	92.73	93.53	94.26
Tons Shipped	22,274	53,720	414,078	76,709	28,621	175,283	770,685
Balance in Stockpile	---	24,617	110,260	10,072	1,305	8,585	154,839

ORE IMPROVEMENT PLANT
ANNUAL REPORT
YEAR 1959

3. COST OF OPERATIONS:

a. Comments:

With increased production in 1959, and despite the fact that a substantial tonnage was stocked in late March and early April, and later reloaded and shipped from stockpile with resultant increased costs, the total cost at the plant decreased \$.02 per ton under 1958. The significant figure, however, is the "Cost of Production" which decreased from \$.649 in 1958 to \$.460 in 1959 or a total decrease of \$189 per ton of product.

b. Yearly Cost:

<u>Account</u>	<u>1959</u>		<u>1958</u>	
	<u>Amount</u>	<u>Per Ton Product</u>	<u>Amount</u>	<u>Per Ton Product</u>
Unloading	74,517.80	.080	26,837.84	.074
Drying	177,166.09	.192	69,105.49	.190
Screening & Crushing	29,113.58	.031	22,176.95	.061
Heavy Media	21,520.59	.023	12,991.86	.036
Stocking Expense	35,761.22	.039	381.15	.001
Other Direct Plant Expense	77,788.96	.084	49,292.62	.136
Allocated Expense	47,321.75	.051	43,875.72	.121
Screening Tests	--	--	10,787.10	.030
Winter & Idle Expenses	<u>37,166.00</u>	<u>.040</u>	--	--
Cost of Production	426,023.99	.460	235,448.73	.649
Damage to R.R. Cars & Crossover	9,696.46	.010	--	--
Freight - Mines to Plant	62,312.00	.067	25,019.44	.069
Advalorem Taxes	13,003.13	.014	17,030.41	.047
Depreciation	207,666.11	.225	6,721.75	.019
Shipping Expense	<u>32,284.53</u>	<u>.035</u>	<u>16,933.78</u>	<u>.047</u>
Total Cost at Plant	750,986.22	.811	301,154.11	.831

4. HOURLY OPERATING RATES - 1959 SEASON:

A detailed outline of operating delays during the 1959 season follows. The significant causes of delay in the dryer section were:

1. Dryer Feed Chute Plugged -- This chute has been enlarged to the large st possible opening but large chunks (particularly frost chunks) received from the mines frequently plug the chute. A breaker similar to a pellet clinker breaker is being fabricated to eliminate this source of delay.

2. Bearing troubles and brush troubles with the motor generator set that drives the Number 1 Dryer was another major source of delay. Some of the difficulty has been corrected but a shutdown for a period of a week or more would be required to make more permanent corrections. The set is of 1904 vintage and suffers from advanced age.

3. The inability of the Simplicity dryer screen to handle full dryer production seriously cut back operating efficiency in this section during 1959. The screen drive mechanism was replaced during the strike but screening efficiency improved little if any.

ORE IMPROVEMENT PLANT
ANNUAL REPORT
YEAR 1959

4. HOURLY OPERATING RATES - 1959 SEASON: (Cont'd.)

Delays in the unloading section were primarily caused by frozen ore from mine stockpiles. This occurs at all times of the year but particularly in early spring and late fall. A second major source of delay is caused by a lack of coordination or cooperation from the railroad. During the summer months many seasonal employees are used by the railroad and their lack of cooperation and efficiency defies description. The fact that railroad crews operating at the plant work on shifts with little opportunity for overtime make the job unattractive to experienced men who could keep the job running smoothly. Several appeals have been made by the undersigned to top railroad officials to take steps necessary to make the position attractive to at least an experienced conductor but to no avail. The railroad would gain in operating efficiency and the plant would gain by always having ore available at pockets and empty cars available to carry it away.

The only mechanical failure of consequence in the crusher section occurred with the 6' x 20' Simplicity primary screen. It was impossible to keep bearings in the unit and the screen was finally bypassed and taken out of service. This section operated only very intermittently during 1959.

The major source of delay in the heavy media section was a lack of railroad cars. The reason for the delay is covered above. An additional reason in this instance is inadequate trackage for car storage above and below the loading pocket.

ORE IMPROVEMENT PLANT
ANNUAL REPORT
YEAR 1959

4. HOURLY OPERATING RATES - 1959 SEASON: (Cont'd.)

a. Dryer Section Delays:

<u>Source of Delay</u>	<u>Total Delay Hours</u>	<u>% of Total Delay</u>	<u>% of 3588 Hours Operated</u>
<u>Dryer Cone</u>			
Plugged	57.00	19.71	1.59
Repairs	7.08	2.45	.19
Chunks	31.92	11.04	.89
<u>Dryer</u>			
Plugged	13.16	4.55	.36
Seal	.25	.09	.01
Repairs	6.00	2.07	.16
Building Heat	5.08	1.76	.14
<u>Discharge Chute</u>			
Plugged	5.72	1.98	.16
Repairs	1.00	.35	.03
<u>Screen</u>			
Change Screen Cloth	5.67	1.96	.16
Electrical Trouble	2.16	.75	.06
Ore to Wet	17.43	6.03	.49
Plugged	3.66	1.27	.10
Repairs	21.75	7.52	.61
Bearing Failure	1.50	.52	.04
<u>Feed End</u>			
Chunks on Grizzley	.42	.14	.01
Feed Chute Plugged	1.75	.60	.05
<u>M.G. Set</u>			
Repair	1.42	.49	.04
Electrical Trouble	.50	.17	.01
Hot Bearing	6.75	2.33	.19
Brushes	5.83	2.02	.16
Breakdown	25.67	8.88	.72
<u>Belts</u>			
#1-A	.83	.29	.02
#2	3.50	1.21	.10
#3	2.67	.92	.07
#3-A	.17	.06	.01
#2-C	10.59	3.66	.29
Falk Repair	1.25	.43	.03
Flame Out	6.69	2.31	.19
Jackpot	2.25	.78	.06
No Steam	.17	.06	.01
Dust Collector	4.17	1.44	.12
Conveyors	3.74	1.29	.10
Closing Down	2.00	.69	.06
Starting Up	4.50	1.56	.13
Lighting	.58	.20	.02
Power Failure	14.08	4.87	.39
Ducon Fan	2.00	.69	.06
Sump Pump	4.33	1.50	.12
Dryer Blowpipe	.17	.06	.01
Scrubber	3.00	1.04	.08
Change Wear Plate	.75	.26	.02
Total	289.16	100.00	8.06

ORE IMPROVEMENT PLANT
ANNUAL REPORT
YEAR 1959

4. HOURLY OPERATING RATES - 1959 SEASON: (Cont'd.)

b. Unloading Pocket Delays:

<u>Source of Delay</u>	<u>Total Delay Hours</u>	<u>% of Total Delay</u>	<u>% of 3588 Hours Operated</u>
<u>Ore</u>			
Sticky	6.67	2.72	.19
Hang Up (bin)	2.17	.88	.06
Blowing Cars	2.42	.99	.07
Ice Chunks	7.08	2.88	.20
Dumping (Ice & Mud)	.67	.27	.02
Frozen Ore	49.92	20.33	1.39
Chunks	15.84	6.45	.44
Mud	.50	.20	.01
No Ore On Grade	16.83	6.85	.47
<u>Feeder</u>			
Electrical	3.00	1.22	.08
Plugged	8.83	3.60	.25
Repair	21.51	8.76	.60
Belts	2.42	.99	.07
Motor	4.50	1.83	.13
Chunks	39.48	16.08	1.10
<u>Pocket</u>			
Plugged	5.58	2.27	.16
Repair	8.01	3.26	.22
<u>Conveyor Belts</u>			
<u>No. 1 Belt</u>			
Elders	.33	.14	.01
Repair	2.67	1.09	.07
Overloaded	1.58	.64	.04
V-Belts on Motor	.58	.24	.02
Chunks	1.34	.55	.04
Checking	.17	.07	.01
<u>No. 2 Belt</u>			
Overloaded	.42	.17	.01
<u>No. 3 Belt</u>			
Overloaded	.25	.10	.01
<u>Car Quake</u>			
Trouble & Repair	11.66	4.75	.32
<u>Cars</u>			
Moving	16.76	6.83	.46
Switching	.92	.38	.02
Car Doors	12.50	5.09	.35
Got Away	.42	.17	.01
Repair Hammermill	.50	.20	.01
Total	245.53	100.00	6.84

ORE IMPROVEMENT PLANT
ANNUAL REPORT
YEAR 1959

4. = HOURLY OPERATING RATES - 1959 SEASON: (Cont'd.)

c. No. 1 Loading Pocket Delays:

<u>Source of Delay</u>	<u>Total Delay Hours</u>	<u>% of Total Delay</u>	<u>% of 3004 Hours Operated</u>
<u>Loading Pocket</u>			
Plugged	5.92	13.21	.20
Frozen	1.25	2.79	.04
<u>Cars</u>			
Move Cars	8.32	18.56	.28
No Cars	.92	2.05	.03
Got Away	.67	1.49	.02
Off Track	.58	1.29	.02
Car Doors	3.33	7.43	.11
Changing Groups	22.09	49.28	.73
Closing Down	<u>1.75</u>	<u>3.90</u>	<u>.06</u>
Total	44.83	100.00	1.49

d. No. 17 Conveyor Truck Pocket:

<u>Source of Delay</u>	<u>Total Delay Hours</u>	<u>% of Total Delay</u>	<u>% of 560 Hours Operated</u>
Waiting for Trucks	6.66	47.88	1.19
Pocket Empty	2.67	19.19	.48
Pocket Plugged	1.58	11.36	.28
Repair #17 Conveyor	.58	4.17	.10
Changing Groups	<u>2.42</u>	<u>17.40</u>	<u>.43</u>
Total	13.91	100.00	2.48

ORE IMPROVEMENT PLANT
ANNUAL REPORT
YEAR 1959

4. HOURLY OPERATING RATES - 1959 SEASON: (Cont'd.)

e. Crusher Delays:

<u>Source of Delay</u>	<u>Total Delay Hours</u>	<u>% of Total Delay</u>	<u>% of 1953 Hours Operated</u>
<u>No. 3 Belt</u>			
Clean	.25	.47	.01
<u>No. 4 Belt</u>			
Iron on Belt	.25	.47	.01
Stopped	4.08	7.72	.21
Speed Switch	.75	1.42	.04
Fuses	.34	.64	.02
Pocket Plugged	1.25	2.36	.07
Change No. 6 Belt	.08	.15	.01
<u>No. 7 Belt</u>			
Overloaded	4.99	9.44	.26
<u>No. 8 Belt</u>			
Stopped	1.00	1.89	.05
<u>No. 9 Belt</u>			
Cleaning	1.00	1.89	.05
Broken	5.50	10.40	.28
<u>No. 10-A Belt</u>			
Repair	.50	.95	.03
<u>No. 11 Belt</u>			
Head Pulley	2.00	3.79	.10
<u>No. 17 Belt</u>			
Overloaded	.75	1.42	.04
Iron in Crusher	.58	1.10	.03
No Feed	.25	.47	.01
Wet Ore	2.00	3.79	.10
Vibrator Pulley	2.00	3.79	.10
Divider	.25	.47	.01
Simplicity Screen	3.58	6.77	.18
Hot Bearing	.75	1.42	.04
Power Failure	3.50	6.62	.18
Clean Feeder	1.38	2.61	.07
South L. B. Feeder	4.58	8.67	.23
Broken Feeder Wire	1.67	3.16	.09
Pan Feeder	2.00	3.79	.10
Reciprocating Plate Feeder Belts	.33	.62	.02
Repair Feeder	1.00	1.89	.05
Feeder Plugged	1.00	1.89	.05
Feeder Belts	1.75	3.31	.09
Tumbling Drum	.58	1.10	.03
No. 2 Lighting Panel	.17	.32	.01
Oil Conveyor Motor	.50	.95	.03
No. 7 Chute	1.00	1.89	.05
Repair Hewitt-Robins Screen	.25	.47	.01
Electrical Repairs	<u>1.00</u>	<u>1.89</u>	<u>.05</u>
Total	52.86	100.00	2.71

ORE IMPROVEMENT PLANT
ANNUAL REPORT
YEAR 1959

4. HOURLY OPERATING RATES - 1959 SEASON: (Cont'd.)

f. Heavy Media Section Delays:

<u>Source of Delay</u>	<u>Total Delay Hours</u>	<u>% of Total Delay</u>	<u>% of 206 Hours Operated</u>
Out of Water	.25	.65	.12
Out of Feed	.91	2.37	.44
No Railroad Cars	11.58	30.16	5.61
Sink Chute Repairs	.25	.65	.12
D. D. Screen Repairs	1.58	4.12	.77
Loading Pocket Trouble	1.17	3.05	.57
Shutting Down	.75	1.96	.37
Building Gravity (Beyond One Hour)	1.17	3.05	.57
Sink Discharge Plugged	.58	1.51	.28
Hardinge Plugged	2.50	6.51	1.21
Power Failure	5.83	15.18	2.83
Feeder Belts	.67	1.74	.32
Clean Media	1.42	3.70	.69
Euclid Trouble	1.33	3.46	.65
<u>Loading Pocket</u>			
Moving Cars	1.08	2.81	.52
Railroad - Moving Cars	.25	.65	.12
Repair	-	-	-
No. 13 Belt Chute Plugged	.17	.44	.08
No. 16 Tail Pulley Bearing	3.00	7.81	1.45
Fueling Bulldozer	.08	.21	.04
Chute Under DP Screen Plugged	2.00	5.21	.97
Change Screen Cloth	.75	1.95	.36
Sink Screen Bearing	<u>1.08</u>	<u>2.81</u>	<u>.52</u>
Total	38.40	100.00	18.61

ORE IMPROVEMENT PLANT
ANNUAL REPORT
YEAR 1959

5. LABOR AND WAGES:

a. Comments:

Employees of the Ore Improvement Plant did not affiliate with the AFL - CIO Steelworkers during the 1959 season. The job descriptions and classifications presently in force between Cleveland-Cliffs and the Steelworker's union at all other properties were used as standard at the plant.

There were no grievances submitted as such. Differences were settled in conference between the employee himself, his supervisor, and the mill foreman or the plant superintendent. Relations were basically very friendly and the efforts exerted by all personnel were commendable.

b. Report of Vacations Paid:

A total of 48 employees were eligible for vacation pay in 1959. They were paid a total of \$7,204.69.

c. Statement of Production and Wages:

	<u>1959</u>	<u>1958</u>
Product - Concentrates	925,524	362,522
Number of Days Operated	153-2/3	92
Average Daily Product - Tons	6,023	3,940
Average Number of Men Employed	39-3/4	30
Product Per Man Per Day (Operating)	120.73	116.42
Average Wages per Man Per Day	23.41	22.07
Total Amount Paid for Labor (Optg. and Winter & Idle)	214,836.58	104,923.38
Labor Cost Per Ton	.232	.289

ORE IMPROVEMENT PLANT
ANNUAL REPORT
YEAR 1959

5. LABOR AND WAGES (Cont'd.)d. Annual Statement of Labor:

<u>Mine Payroll</u>	<u>Stat.</u> <u>Men</u>	<u>Hours</u>	<u>Amount</u>	<u>Avg.</u> <u>Rate</u>
Straight Time	42	71,508	186,950.90	2.614
Overtime		(5,744 $\frac{1}{2}$)	7,796.83	1.357
Afternoon Differential		(15,665 $\frac{1}{4}$)	1,320.09	.084
Night Differential		(13,694 $\frac{1}{4}$)	1,804.96	.132
Holiday Allowance		(2,522)	6,506.35	2.580
Holiday Worked - Premium Time Only		(62)	215.66	3.478
Sunday Premium Pay		(7,092 $\frac{1}{2}$)	4,478.18	.631
Sub Total	42	71,508	209,072.97	2.924
Other Allowed Time		(45 $\frac{3}{4}$)	135.67	2.965
Vacation Pay Accrual			13,604.69	
Total Hourly Employees	42	71,508	222,813.33	3.116
Average Job Class				9.224
 <u>General Payroll</u>				
Salaried - Straight Time	3	5,245 $\frac{1}{4}$	19,028.16	3.628
Labor from other Mines	3 $\frac{3}{4}$	6,266 $\frac{1}{4}$	24,956.21	3.983
Total Labor	48 $\frac{3}{4}$	83,019 $\frac{1}{2}$	266,797.70	3.214
 <u>Distributed as follows:</u>				
Strike Idle	3 $\frac{3}{4}$	6,257 $\frac{1}{4}$	25,505.56	4.076
Operating Mine	36	61,328 $\frac{1}{4}$	189,154.30	3.084
Winter and Idle	4 $\frac{1}{2}$	7,607 $\frac{1}{2}$	25,682.28	3.376
Uncompleted Construction	2 $\frac{1}{2}$	4,311	14,621.06	3.392
Other Mines	1 $\frac{3}{4}$	1,341	4,299.09	3.206
Other Accounts	1 $\frac{1}{4}$	2,174 $\frac{1}{2}$	7,535.41	3.465
Grand Total as Above	48 $\frac{3}{4}$	83,019 $\frac{1}{2}$	266,797.70	3.214

ORE IMPROVEMENT PLANT
ANNUAL REPORT
YEAR 1959

6. ORE STRUCTURES - PRODUCT:

a. Group I Structure:

The structure listed below is approximate and represents a typical composite taken at the dryer screen during the operating season.

	<u>Size</u>	<u>% Wt.</u>	<u>Cuml. % Wt.</u>	<u>% Fe</u>
	+3/4"	.45	.45	54.84
	+1/2"	3.73	4.18	56.35
	+1/4"	26.09	30.27	58.62
+	+1/8"	20.85	51.12	59.36
	<u>-1/8"</u>	<u>48.88</u>	<u>100.00</u>	<u>60.28</u>
	Head	100.00		59.48

b. Group II Structure:

The structure listed below represents a typical composite taken during the 1959 operating season.

	<u>Size</u>	<u>% Wt.</u>	<u>Cuml. % Wt.</u>	<u>% Fe</u>
	+1-1/2"	15.02	15.02	59.98
	+1"	11.56	26.58	58.39
	+ 3/4"	18.67	45.25	58.92
	+1/2"	27.90	73.15	60.25
	+1/4"	13.21	86.36	61.36
	+1/8"	5.45	91.81	60.78
	<u>-1/8"</u>	<u>8.19</u>	<u>100.00</u>	<u>60.02</u>
	Total	100.00		59.90

ORE IMPROVEMENT PLANT
ANNUAL REPORT
YEAR 1959

6. ORE STRUCTURES - PRODUCT: (Cont'd.)

c. Group III Structure:

The structure listed below represents a typical composite taken during the 1959 operating season.

<u>Size</u>	<u>% Wt.</u>	<u>Cuml. % Wt.</u>	<u>% Fe</u>
+1-1/2"	3.15	3.15	58.63
+1"	4.75	7.90	54.98
+3/4"	7.32	15.22	57.38
+1/2"	11.81	27.03	58.31
+1/4"	20.86	47.89	59.03
+1/8"	15.33	63.22	59.33
-1/8"	36.78	100.00	60.38
Total	100.00		59.16

d. Group IV Structure:

The structure listed below represents a typical composite taken during the 1959 operating season.

<u>Size</u>	<u>% Wt.</u>	<u>Cuml. % Wt.</u>	<u>% Fe</u>
+1-1/2"	6.01	6.01	59.86
+1"	14.06	20.07	58.49
+3/4"	21.43	41.50	58.85
+1/2"	33.11	74.61	57.43
+1/4"	12.40	87.01	60.02
+1/8"	3.46	90.47	60.00
-1/8"	9.53	100.00	60.57
Total	100.00		58.74

ORE IMPROVEMENT PLANT
ANNUAL REPORT
YEAR 1959

7. ACCIDENTS AND PERSONAL INJURY:

a. Accident Statistics:

Number of hours of Labor	71,508
Number of Fatalities	0
Number of Compensable Injuries	1
Number of Non-Compensable Injuries	0
Days Lost - Compensable Injuries	13
Days Lost - Non-Compensable Injuries	0
Frequency Rate	13.98
Severity Rate	182.00
Average Number of Days Lost Per Injury	13
Position Rating (Independent Units)	6

b. Compensable Injuries:

Accident No. 1 -- Kenneth Koski -- March 3, 1959

There had been a considerable fall of wet snow the night before the accident. The area had been swept clear of snow before starting work but the floor plate on which he stood was wet and in the process of working around the area his shoes had accumulated a certain amount of adhering snow. At the time of the accident the injured was holding a steel plate upright while his partner was moving the chain fall to a new lifting position. The injured man's foot slipped out from under him and in attempting to regain his balance he jerked the plate toward himself knocking himself off balance. Infalling the injured landed on an angle iron bracket which was in position to receive the subject plate and the weight of the plate impaled his leg on the bracket.

8. TAXES:

a. Comparative Statement of Taxes:

NEGAUNEE TOWNSHIP	<u>1959</u>		<u>1958</u>	
	<u>Valuation</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Taxes</u>
Real Estate	385,000	12,637.63	385,000	11,023.90
Personal Property	<u>60,000</u>	<u>1,969.50</u>	<u>105,000</u>	<u>3,006.51</u>
Total	445,000	14,607.13	490,000	14,030.41

ORE IMPROVEMENT PLANT
ANNUAL REPORT
YEAR 1959

9. PROPOSED NEW EQUIPMENT AND CONSTRUCTION:

- a. Purchase a Model 40 Gaffner Loader.
- b. New Pocket for Classifier Sands.
- c. Replace Media Sumps and Raise Screens.
- d. Convert and repower No. 2 Conveyor to 36".
- e. New Conveyor Scales.
- f. Overhead Shop Crane.
- g. Electrify Crusher Section Overhead Crane.
- h. Move Substation and Provide Power Outlet for Shovel - Stocking Ground.
- i. Speed Up and Raise Discharge End of No. 17 Conveyor.
- j. New Storage Warehouse.
- k. Tower Lighting for Stocking Ground.
- l. Expand Settling Basis Area.
- m. Increase Oil Storage Capacity.
- n. Increase Shop Area.
- o. Increase plant capacity and Provide screening at + & -1/4 inch and crushing at 1 inch in closed circuit.
- p. Purchase two new 40 ton stocking trucks.

10. RESEARCH:

Beginning in early August several comprehensive economic studies were made to determine the feasibility of increasing plant capacity by the addition of a second dryer and necessary screening and crushing facilities. Both capital and operating costs were attractive and two operational screen tests were run to test the feasibility of 1/4 inch screening and to provide a -1/4 inch product for test purposes at McLouth Steel and Bethlehem Steel plants. The screen tests were run on present plant equipment and actual practice verified theoretical capacities very well.

Western-Knapp Engineering Company was engaged to make a preliminary engineering design for such a plant, working in close conjunction with representatives of Cliffs operating, mechanical, engineering, electrical engineering and project engineering departments. The design completed is excellent and would provide an efficient operating plant with minimum manpower requirements. In early December five responsible engineering firms submitted bids for detailed design and construction of this plant, but no decision to build had been made by December 31st.

AGNEW MINE
ANNUAL REPORT
YEAR 1959

1. GENERAL

The South Agnew Mining Company (M. A. Hanna) produced and shipped no trespass ore from the open pit under terms of the Agnew-South Agnew cross mining agreement.

2. ESTIMATE of ORE RESERVES as of DECEMBER 31, 1959

Based on Estimated Production

<u>Open Pit</u> <u>NE-NE 11-57-21</u>	<u>Reserves</u> <u>12-31-59</u>
Merch	24,423
Wash	<u>1,908</u>
	26,331*

*16,000 tons only available.
Excessive slumping of high
dumps makes 26,331 tons too
costly to remove.

Open Pit Ore
Hanna Trespass on Agnew
Based on Joint Estimate by CCI & Hanna

<u>NE-NE 11-57-21</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>
Merch	24,423	55.75	.050	11.00	.60	1.50
Wash	<u>1,908</u>	<u>55.45</u>	<u>.052</u>	<u>11.88</u>	<u>.33</u>	<u>1.48</u>
	26,331	55.73	.050	11.06	.58	1.50

Agnew Mine
Annual Report
Year 1959
Page Two

12. TAXES

<u>Real Estate</u>	<u>1959</u>		<u>1958</u>		<u>Increase-Decrease</u>	
	<u>Assessed Value</u>	<u>Taxes</u>	<u>Assessed Value</u>	<u>Taxes</u>	<u>Assessed Value</u>	<u>Taxes</u>
Mineral	\$10,691	\$2,237.94	\$10,691	\$1,980.08		/\$257.86
Lands, Bldgs, Machinery	401	83.94	401	74.28		/ 9.66
	\$11,092	\$2,321.88	\$11,092	\$2,054.36		/\$267.52
Average Mill Rate		209.33		185.21		/ 24.12

Note: No change in valuation. Increase by 13.02 per cent in mill rate. Total taxes charged to Rhude & Fryberger Incorporated as their liability for extension of Agnew-Alworth lease for their operation.

223

ALWORTH LAND RESERVE

ANNUAL REPORT

YEAR 1959

1. GENERAL

There was no production by the Scranton from a trespass on the Alworth during 1959.

Rhude & Fryberger shipped and produced from their sublease 15,705.50 tons which included 1,005 tons from stockpile. 27,036 cubic yards of surface were stripped and 1,220 tons of lean ore placed in stockpile.

2. PRODUCTION-SHIPMENTS-INVENTORIES

a. Production & Shipments

<u>Alworth Open Pit</u>	<u>Production</u>	<u>Shipments</u>
Rhude & Fryberger-Merch	15,705.50	15,705.50
Scranton Trespass	None	None

3. ANALYSIS

a. Tonnage & Analysis of Ore Produced & Shipped

<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>	<u>Moisture</u>	<u>Natural</u>	
							<u>Iron</u>	<u>Silica</u>
15,705.50	57.78	.100	6.92	1.38	3.00	16.14	48.45	5.80

Alworth Land Reserve
Annual Report
Year 1959
Page Two

4. ESTIMATE of ORE RESERVES

b. Estimate of Ore Reserves as of December 31, 1959

<u>Description</u>	<u>Reserve</u> <u>12-31-58</u>	<u>Mined</u> <u>1959</u>	<u>Reserve</u> <u>12-31-59</u>
N $\frac{1}{2}$ -NW $\frac{1}{4}$ 12-57-21	133,279	15,706	117,573

c. Estimated Analysis of Ore Reserves

<u>Non-Bessemer</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>
117,573	56.70	.075	8.80	0.81	1.72

12. TAXES

<u>Real Estate</u>	<u>1959</u>		<u>1958</u>		<u>Increase-Decrease</u>	
	<u>Assessed</u> <u>Value</u>	<u>Taxes</u>	<u>Assessed</u> <u>Value</u>	<u>Taxes</u>	<u>Value</u>	<u>Taxes</u>
Mineral	\$69,729	\$20,945.20	\$98,319	\$26,696.56	-\$28,590	-\$5,751.36
Land	2,667	801.12	2,667	724.17		+ 76.95
Bldgs, Machy, Accts Rec.	5,289	1,588.72	5,289	1,436.13		152.59
	<u>\$77,685</u>	<u>\$23,335.04</u>	<u>\$106,275</u>	<u>\$28,856.86</u>	<u>-\$28,590</u>	<u>-\$5,521.82</u>
Average Mill Rate		300.38		271.53		+ 28.85

Note: Reduction in mineral value of \$28,590 by mining of 61,471 tons open pit merch ore by Hoyt Mining Company.

Above taxes liability of and charged to:

Rhude & Fryberger	\$21,843.06
Oliver Iron Mining Division	<u>1,491.98</u>
	<u>\$23,335.04</u>

CANISTEO MINEANNUAL REPORTYEAR 19591. GENERAL

Plant repairs under way at the Canisteco mine in the fall of 1958 continued until January 10 when all repair work except shovel repair was suspended. Pit and plant equipment repairs were resumed February 15 and continued until the start of ore operations on April 27.

The 4-day-week schedule for hourly employees in effect since January 20, 1958, continued until March 30, 1959, when the schedule was increased to 5 days a week.

Shipment of ore from stockpile started April 20 and continued intermittently until June 9 when the 1958 stockpile was depleted. After the steel strike, shipment of ore from stockpile was resumed on November 7 and completed on December 3. The 1959 stockpile book balance as of January 1, 1960, was 17,484 tons and included both Canisteco and Sally concentrates.

Ore operations started April 27 on a 2-shift, 5-day-week basis. On May 10, a 2-shift, 6-day-week schedule went into effect and continued until operations were shut down by the steel strike on July 14. 767,863 tons of crude ore--including 79,421 tons of screen rock--were mined. In addition, 37,452 tons of pit rock, lean material, and cleanup were moved during mining.

Operating the same schedule as the pit, the main concentrating plant received 688,442 tons of crude ore and produced 258,713 tons of concentrates. The fine ore plant was not in operation.

Minor pit equipment repair was started on December 7 in preparation for stripping at the Sally mine which started December 13. No plant equipment repairs were conducted in the fall of 1959.

There was no stripping at the Canisteco in 1959.

The Henry Schultze Drilling Company drilled 4 structure drill holes on the north side of the Canisteco pit for a total of 900 feet.

Canisteo Mine
Annual Report
Year 1959
Page 2

2. PRODUCTION-SHIPMENTS-INVENTORIES

a. Production by Grades

<u>Crude Retreat</u>	<u>Tons</u>
Snyder	184,495
Bovey	362,071
Hemmens	<u>140,876</u>
	688,442

<u>Concentrates</u>	<u>Retreat</u>		<u>Total</u>
	<u>Bessemer</u>	<u>Non-Bessemer</u>	
Snyder	10,903	58,626	69,529
Bovey	19,312	120,145	139,457
Hemmens	<u>6,004</u>	<u>43,723</u>	<u>49,727</u>
	36,219	222,494	258,713

b. Shipments by Grades

<u>Ore</u>	<u>Retreat</u>		<u>Concentrates</u>			<u>Stockpile</u>		<u>Total</u>
	<u>Bess</u>	<u>Non-Bess</u>	<u>1958</u>	<u>1959</u>		<u>Bess</u>	<u>Non-Bess</u>	
			<u>Non-Bess</u>	<u>Bess</u>	<u>Non-Bess</u>			
Snyder	7,365	40,536	1,822					49,723
Bovey	6,665	44,956	4,766					56,387
Hemmens	3,752	31,908	856					36,516
Canisteo				16,848	91,401	1,590	94,084	203,923
	<u>17,782</u>	<u>117,400</u>	<u>7,444</u>	16,848	91,401	1,590	94,084	346,549

c. Stockpile Inventories

<u>Retreat Concentrates</u>	<u>Tons</u>
Snyder	2,068
Bovey	8,270
Hemmens	<u>1,380</u>
	11,718

d. Production by Months

Crude Retreat

<u>Month</u>	<u>Snyder</u>	<u>Bovey</u>	<u>Hemmens</u>	<u>Total</u>
April		53,543		53,543
May		122,688		122,688
June	185,495	47,456	140,876	373,827
July		<u>138,384</u>		<u>138,384</u>
	<u>185,495</u>	<u>362,071</u>	<u>140,876</u>	<u>688,442</u>

Concentrates

April		21,433		21,433
May	1,822	45,897	856	48,575
June	67,707	21,822	48,945	138,474
July		49,682	-44	49,638
Nov		623		623
Dec			<u>-30</u>	
	<u>69,529</u>	<u>139,457</u>	<u>49,727</u>	<u>258,713</u>

3. ANALYSIS

a. Crude Retreat Ore Produced

<u>Ore</u>	<u>Tons</u>	<u>Iron</u>	<u>Silica</u>
Snyder	185,495	43.68	32.88
Bovey	362,071	45.28	29.73
Hemmens	<u>140,876</u>	<u>42.01</u>	<u>32.69</u>
	<u>688,442</u>	<u>44.18</u>	<u>31.18</u>

Canisteo Mine
Annual Report
Year 1959
Page 4

b. Retreat Concentrates Produced

<u>Ore</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>	<u>Moist</u>
<u>Snyder Retreat</u>							
Bessemer	10,903	59.09	.040	9.73	.25	.54	6.03
Non-Bessemer	58,626	57.87	.045	11.03	.28	.60	6.86
<u>Bovey Retreat</u>							
Bessemer	19,312	58.52	.042	10.64	.30	.62	6.19
Non-Bessemer	120,145	58.07	.054	10.65	.31	.59	5.96
<u>Hemmens Retreat</u>							
Bessemer	6,004	56.36	.053	12.11	.41	.84	7.22
Non-Bessemer	43,723	56.61	.055	11.21	.63	.69	6.31
	<u>258,713</u>	<u>57.81</u>	<u>.051</u>	<u>10.82</u>	<u>.36</u>	<u>.61</u>	<u>6.27</u>

c. Tonnage & Complete Analysis of Concentrates Shipped

<u>Concentrates</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag</u>	<u>Sulf</u>	<u>Ign Loss</u>	<u>Moist</u>
<u>Snyder Retreat</u>											
Bessemer	7,365	59.12	.039	9.54	.24	.53	.20	.15	.015	4.60	6.12
Non-Bessemer	40,536	57.75	.041	11.16	.27	.61	.20	.15	.015	4.81	7.31
<u>Bovey Retreat</u>											
Bessemer	6,665	57.57	.042	11.65	.33	.73	.20	.14	.015	4.38	6.86
Non-Bessemer	44,956	57.85	.058	10.52	.32	.61	.20	.14	.015	5.21	6.14
<u>Hemmens Retreat</u>											
Bessemer	3,752	54.76	.059	13.30	.49	1.01	.12	.16	.025	6.25	8.04
Non-Bessemer	31,908	56.02	.056	11.39	.75	.73	.12	.16	.025	6.27	6.48
<u>Canisteo-1958</u>											
Non-Bessemer Concts	7,444	57.30	.097	11.50	.27	.56	.12	.20	.015	5.07	5.59
Bessemer Stockpile	1,590	54.87	.051	15.47	.29	.60	.12	.20	.015	4.61	7.55
Non-Bess Stockpile	94,084	57.10	.068	11.77	.39	.72	.12	.20	.015	4.82	6.14

Canisteo Mine
Annual Report
Year 1959
Page 5

<u>Concentrates</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag</u>	<u>Sulf</u>	<u>Ign Loss</u>	<u>Moist</u>
<u>Canisteo-1959</u>											
Bessemer	16,848	59.02	.042	10.12	.28	.56	.12	.20	.015	4.10	5.84
Non-Bessemer	91,401	58.30	.049	10.61	.31	.58	.12	.20	.015	4.56	5.76
	<u>346,549</u>	<u>57.61</u>	<u>.055</u>	<u>11.09</u>	<u>.37</u>	<u>.65</u>	<u>.14</u>	<u>.18</u>	<u>.016</u>	<u>4.90</u>	<u>6.22</u>

d. Mine Analysis of Ore in Stockpile

<u>Canisteo Concentrates</u>						
<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>	<u>Moist</u>
11,718	57.92	.053	11.09	.34	.57	6.70

4. ESTIMATE of ORE RESERVES

a. Developed Ore - Factors Used

<u>Concentrates</u>	<u>Cubic Feet per Ton</u>	<u>Per Cent Recovery</u>
Wash	14	47
Retreat	14	32

b. Ore Reserves as of December 31, 1959

<u>Lease</u>	<u>Reserve 12-31-58</u>	<u>Mined 1959</u>	<u>Balance after Mining</u>	<u>Changed by Re-estimate</u>	<u>Reserve 12-31-59</u>
Bovey	1,012,184	139,457	872,727		872,727
Snyder	693,066	69,529	623,537		623,537
Hemmens	<u>1,136,801</u>	<u>49,727</u>	<u>1,087,074</u>		<u>1,087,074</u>
	2,842,051	258,713	2,583,338		2,583,338

Canisteo Mine
Annual Report
Year 1959
Page 6

c. Estimated Analysis of Ore Reserves

<u>Concentrates</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>
<u>Bovey</u>				
Bessemer Wash	58,978	58.80	.030	8.90
Non-Bessemer Wash	216,667	58.70	.100	8.30
Bessemer Retreat	226,407	56.46	.028	11.52
Non-Bessemer Retreat	<u>370,675</u>	<u>56.34</u>	<u>.102</u>	<u>10.72</u>
	872,727	57.12	.077	10.20
<u>Snyder</u>				
Bessemer Wash	200,745	61.10	.037	8.60
Non-Bessemer Wash	321,406	61.10	.055	8.10
Bessemer Retreat	50,621	57.40	.031	12.00
Non-Bessemer Retreat	<u>50,765</u>	<u>59.43</u>	<u>.061</u>	<u>9.94</u>
	623,537	60.66	.048	8.73
<u>Hemmens</u>				
Bessemer Wash	263,254	59.50	.027	9.30
Non-Bessemer Wash	139,489	58.50	.047	9.00
Bessemer Retreat	390,833	56.91	.030	11.69
Non-Bessemer Retreat	<u>293,498</u>	<u>56.94</u>	<u>.061</u>	<u>9.94</u>
	1,087,074	57.75	.040	10.79
<u>Mine Totals</u>				
Bessemer Wash	522,977	60.03	.031	8.99
Non-Bessemer Wash	<u>677,562</u>	<u>59.80</u>	<u>.068</u>	<u>8.35</u>
	1,200,539	59.90	.052	8.63
Bessemer Retreat	667,861	56.79	.029	11.66
Non-Bessemer Retreat	<u>714,938</u>	<u>56.81</u>	<u>.082</u>	<u>11.10</u>
	1,382,799	56.80	.056	11.37
Total Bessemer	1,190,838	58.21	.030	10.49
Total Non-Bessemer	<u>1,392,500</u>	<u>58.26</u>	<u>.075</u>	<u>9.76</u>
Total Mine	2,583,338	58.24	.054	10.10

5. LABOR & WAGES

The nationwide steel strike shut down all operations from July 14 to November 7. Emergency work was conducted when necessary by agreement with the Union. Shutdown, startup, and emergency work were conducted in an orderly manner.

Canisteo Mine
Annual Report
Year 1959
Page 7

Labor relations were generally satisfactory. One grievance processed in 1959 is still unresolved. A cost-of-living increase of \$0.01 was made effective as of January 1, 1959.

b. Comparative Statement of Production & Wages

	<u>1959</u>	<u>1958</u>
Concentrate Tonnage	258,713	600,753
Number of Days Operated	45.5	79
Number of Shifts Operated	91	169.5
Average Product per Shift	2,836	3,544
Average Number of Men Employed	130	129
Tons per Man per Day	39.41	48.77
Average Wages Paid per Day	\$27.05	\$25.34
Total Amount of Labor	\$177,583.45	\$279,889.88
Labor Cost per Ton	\$0.6864	\$0.466

6. GENERAL SURFACE

a. Buildings & Repairs

No new buildings were constructed in 1959 and repairs were minor. All Canisteo houses except the superintendent's house were either sold to occupants or advertised for sale to the public.

b. Roads, Transmission Lines, etc. None

c. Miscellaneous General Construction None

7. OPEN PIT

a. Stripping None

b. Open Pit Mining

Pit cleanup and blasthole drilling in preparation for the 1959 ore season started April 13. Ore operations started April 27 on a 2-shift, 5-day-week schedule which continued until May 10 when a

2-shift, 6-day week was effected and continued until the mine shut down on July 14 because of the steel strike. Pit operations were not resumed at the cessation of the steel strike on November 7.

The pit operated 91 shifts to produce 767,863 tons of crude which included 79,421 tons of screen rock. 37,452 tons of pit rock, cleanup, and lean material were also moved. 805,315 tons were removed from the pit at an average rate of 8,849 tons a shift.

Gross crude removed from the various leases is shown below and includes 147,543 tons of crude mined from lean ore stockpiles:

<u>Lease</u>	<u>Tons</u>
Bovey	422,928
Hemmens	147,636
Snyder	<u>197,299</u>
	<u>767,863</u>

Bovey: Ore was produced from the North Bovey forties and from the South Bovey forty along the Hunner line. Ore from the Sally crude ore stockpile was mixed with ore from the Bovey lease in the Canisteo.

Hemmens: Ore in the Hemmens lease came from the area along the Hemmens-Walker line and from lean ore stockpiles.

Snyder: Ore was mined in the west and middle Snyder forties along the Snyder-Hunner line.

c. Pumping & Drainage

Approximately 2,507 gallons per minute were pumped from the pit at a cost of \$0.045 per ton of concentrates. Mine water pumped out of the pit flows north and eventually enters Prairie River.

Canisteco Mine
Annual Report
Year 1959
Page 9

8. BENEFICIATION

a. Plant Operation

Operating the same schedule as the pit, the concentrating plant received 688,442 tons of crude ore and produced 258,713 tons of standard concentrates at an average rate of 2,843 tons a shift and a weight recovery of 37.58 per cent of plant crude and 33.70 per cent of pit crude. All of the ore produced was retreat concentrates.

The Heavy-Media plant received 201,304 tons of feed and produced 114,550 tons of concentrates at a weight recovery of 56.90 per cent. Coarse tailings from the Heavy-Media plant totalled 86,754 tons.

The scrubber unit operated satisfactorily and helped to upgrade the ore. An automatic device was installed to control the amount of water to the scrubber. Experimental work was conducted to determine the effect of per cent solids on effectiveness of the scrubber on different types of ores.

The fine ore plant did not operate.

During the operating season it was necessary to stockpile 116,234 tons of concentrates. Of this amount, 104,516 tons were shipped from stockpile, leaving a balance of 11,718 tons in stock as of January 1, 1960.

Of the total standard concentrates produced, 56 per cent were split coarse and fine. Of the split ore, 52 per cent was coarse and 48 per cent fines.

Concentration data for 1959 follows:

Canisteo Mine
Annual Report
Year 1959
Page 10

<u>Retreat Product</u>	<u>Tons</u>	<u>%Weight</u>		<u>Per Cent</u>			<u>Iron Units</u>
		<u>Plant</u>	<u>Pit</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	
Crude to Plant	688,442		87.42	44.14		31.18	
Pit Rock	19,647		2.50	25.41		61.34	
Screen Rock	79,421		10.08	27.11		59.02	
Pit Crude	787,510		100.00	41.95		34.74	
Concentrates Produced	251,269	36.50	31.91	57.70	.050	10.98	
Stockpile Overrun	7,444						
Total Concts Produced & Shipped	258,713	37.58	32.85	57.70	.050	10.98	
Heavy-Media Concentrates	114,550	16.64	14.54	58.29		9.85	
Heavy-Media Rejects	86,754	12.60	11.02	41.45		33.48	
Heavy-Media Feed	201,304	29.24	25.56	52.18		18.52	
Total Fine Tailings (by difference)	342,975	49.82	43.55	34.59		45.83	

Following is a brief classification of delay time at the beneficiation plant:

<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent of Total Working Hours</u>
<u>Washing Plant</u>		
Screening Plant	21.50	2.95
Plant Conveyor	13.75	1.89
Plant Machines	9.00	1.23
Tailings Line	1.00	0.14
Electric Power	3.25	0.45
Windstorm	<u>1.75</u>	<u>0.24</u>
	50.25	6.90
<u>Heavy-Media Plant</u>		
Plant Machines	11.50	1.58
Plant Charging	1.25	0.17
Plant Conveyor	3.00	0.41
Surge Pile	<u>1.00</u>	<u>0.14</u>
	16.75	2.30

Canisteo Mine
Annual Report
Year 1959
Page 11

9. MAINTENANCE & REPAIR

Plant repair under way at the Canisteo in the fall of 1958 continued until January 10, 1959, when all repair work except on shovels was suspended. Pit and plant equipment repair was resumed on February 15 and continued until the start of ore operations on April 27. No repair program was conducted in the fall of 1959--except running repairs necessary to pit equipment to conduct stripping operations at the Sally.

10. COST of OPERATIONS

a. Comparative Mining Costs

<u>Product</u>	<u>1959</u>		<u>1958</u>
	<u>Budget</u>	<u>Actual</u>	<u>Actual</u>
Wash Concentrates	5,000		5,331
Retreat Concentrates	465,000	258,713	533,273
Fine Ore Concentrates			62,149
	<u>470,000</u>	<u>258,713</u>	<u>600,753</u>
Per Cent Recovery	33.94	33.70	40.21
Average Product per Shift		2,843	3,556
Tons per Man per Day		39.41	48.77
Days Operated		45.5	79
	<u>Costs</u>		
Pit Operating	\$0.230	\$0.281	\$0.220
Beneficiation	0.152	0.155	0.139
Fine Ore Concentration			0.713
Loading Stockpile Ore	0.010	0.051	0.037
Sampling & Analysis	0.029	0.038	0.026
Safety & First Aid Supplies	0.001	0.001	0.001
Employees Vacation Pay	0.064	0.061	0.051
Personal Injury Expense	0.010	0.002	0.010
Social Security Taxes	0.024	0.031	0.016
Total Pit & Beneficiation	<u>\$1.241</u>	<u>\$1.468</u>	<u>\$1.062</u>
General Mine Expense	0.185	0.200	0.150
Winter & Idle	0.443	0.274	0.459
Cost of Production	<u>\$1.869</u>	<u>\$1.942</u>	<u>\$1.671</u>

Canisteo Mine
Annual Report
Year 1959
Page 12

<u>Costs</u>	<u>1959</u>		<u>1958</u>
	<u>Budget</u>	<u>Actual</u>	<u>Actual</u>
<u>Depreciation</u>			
Plant & Equipment		\$0.217	\$0.233
Motorized Equipment		0.070	0.026
Movable Equipment		0.006	0.006
<u>Amortization</u>			
Leasehold		0.105	0.110
<u>Taxes</u>			
Ad Valorem		0.261	0.202
Occupational		0.868	0.416
Royalty		<u>0.060</u>	<u>0.042</u>
Total Depreciation & Amortization		\$1.587	\$1.035
Royalty		<u>0.330</u>	<u>0.330</u>
Total Cost on Cars		<u>\$3.859</u>	<u>\$3.036</u>

b. Detailed Cost Comparison

Over-all Mining Costs: \$1.942. \$0.073 over the budget of \$1.869. Decreases in recovery and rate of crude ore consumption accounted for most of the increase. A large percentage of the ore mined was either rocky or painty and had an unfavorable effect on the rate of crude ore consumption. Costs were also increased by a considerable amount of drilling, blasting, and cleanup prior to the ore season and subsequently charged off against a low tonnage because of the strike.

Pit Operating: \$0.051 over the budget of \$0.230.

Beneficiation: \$0.003 over budget of \$0.152.

Miscellaneous Pit & Beneficiation: \$0.036 over the budget of \$0.138. The large tonnage of ore loaded out of stockpile as compared to the total tonnage produced accounted for a major increase in costs. Also contributing to the increase were personal injury expense and social security taxes.

General Mine Expense: \$0.015 over the budget of \$0.185.

Winter & Idle: \$0.169 under the budget of \$0.443 because of an adjustment in costs by the Cleveland office due to the strike.

11. EXPLORATION & FUTURE EXPLORATION

During 1959, the Henry Schultz Drilling Company drilled four holes for a total of 900 feet on the north side of the Canisteo pit on the North Bovey forties to determine the extent of mineable ore in this area. No appreciable change in ore reserves resulted from this drilling.

Additional drilling in the North Bovey—as well as on the east and south sides of the pit—will be required before ultimate pit limits and actual reserves can be determined.

12. TAXES

<u>Real Estate</u>	<u>1959</u>		<u>1958</u>		<u>Increase-Decrease</u>	
	<u>Assessed Value</u>	<u>Taxes</u>	<u>Assessed Value</u>	<u>Taxes</u>	<u>Assessed Value</u>	<u>Taxes</u>
Mineral	\$333,004	\$ 82,710.69	\$410,537	\$ 88,233.31	-\$77,533	-\$5,522.62
Lands,Bldgs,Machinery	84,479	21,207.12	85,625	18,680.55	- 1,146	✓ 2,526.57
<u>Personal Property</u>						
Equipment	99,108	24,508.42	108,736	23,274.95	- 9,628	✓ 1,233.47
Stockpile Concts	6,264	1,549.02	4,982	1,066.40	✓ 1,282	✓ 482.62
Tailings Basin Stockpile	14,420	3,565.92	18,748	4,013.01	- 4,328	- 447.09
	<u>\$537,275</u>	<u>\$133,541.17</u>	<u>\$628,628</u>	<u>\$135,268.22</u>	<u>-\$91,353</u>	<u>-\$1,727.05</u>
Average Mill Rate		248.55		215.17		✓ 33.28

Note: Mineral reserve valuation reduced by production of 622,186 tons. Equipment valuation reduced by depreciation. Tailings basin tonnage revalued from \$0.418 in 1958 to \$0.3215 in 1959.

From the taxes shown above, \$15,720.92 was charged to Sally mine operations for their share of movable equipment, washing plant, shops, etc., used in their production.

Canisteo Mine
Annual Report
Year 1959
Page 14

13. ACCIDENTS & PERSONAL INJURIES

Two compensable accidents occurred at the Canisteo in 1959:

James Crowe: On March 8, 1959, while backing truck into position at shovel, Crowe leaned forward under steering wheel to check box controls and first bucket of dirt being loaded jarred truck causing him to fall out, land on his left arm, and fracture wrist. Time Lost: 11 weeks, 6 days. Compensation Paid: \$743.

Eli Travica: On November 8, 1959, iron bar slipped out of his hands while cleaning around a switch--due to wet and slippery conditions--fell on his left foot and fractured bone. Time Lost: 3 weeks, 4 days. Compensation Paid: \$218.

14. PROPOSED NEW CONSTRUCTION

Construction of a cyclone plant and necessary alterations to existing facilities has been approved under E&A CC-22 in the amount of \$1,173,980. Present plans call for start of construction in the fall of 1960 with completion scheduled for March, 1961. Construction of the cyclone plant proper is to be let out on contract and the alterations to the existing facilities is to be done by the mine crews.

15. EQUIPMENT RECEIVED & PROPOSED NEW EQUIPMENT

a. Equipment Received

- 2 Pickups
- 1 Reich Combination Rotary & Down-th-Hole Drill

b. Proposed New Equipment

- 2 40-ton Haulage Trucks
- 1 Motor Grader
- 2 Pickups
- 1 Service Truck

CUSHING RESERVE

ANNUAL REPORT

YEAR 1959

1. GENERAL

There was no ore production or stripping from the Cushing in 1959.

The Cushing mine and surrounding areas were photographed from the air on November 2, 1959, by Aero Service Company of Philadelphia. Partial horizontal and vertical control on the ground was established. Purpose of this was mapping for proposed mining and stripping.

Proposed plans for tailings ponds, dumps, plant, and mining were prepared and are narrowed down to almost final form.

The Great Northern Railway Company received notification for removal of its Canisteo yard tracks and has done a considerable amount of work on this relocation.

Following are land purchases which have been consummated:

<u>Purchased from</u>	<u>Description</u>	<u>Acres</u>	<u>Cost</u>
Elmer T. Eckland	SE $\frac{1}{4}$ -NW $\frac{1}{4}$ Section 28,56-25	40	\$ 3,200
Bovey-DeLaittre Interests	N $\frac{1}{2}$ -NE $\frac{1}{4}$ Section 1,55-25	80	20,000
Bovey-DeLaittre Interests	E $\frac{1}{2}$ -NW $\frac{1}{4}$ Section 1,55-25	80	20,000

The Eckland forty is northwest of the Cushing mine. The four Bovey forties are adjacent to the mine on the south and will be designated as forties for surface stripping only.

Cushing Reserve
Annual Report
Year 1959
Page Two

4. ESTIMATE of ORE RESERVES as of MAY 1, 1959

Concentrates	Bessemer				Non-Bessemer				Total
	Tons	Iron	Phos	Silica	Tons	Iron	Phos	Silica	
<u>NE$\frac{1}{4}$-SW$\frac{1}{4}$ 36-56-25</u>									
Wash					105,255	57.50	.045	8.10	105,255
Retreat	74,661	56.50	.035	11.00	157,414	56.50	.045	11.00	232,075
	74,661	56.50	.035	11.00	262,669	56.90	.045	9.84	337,330
<u>NW$\frac{1}{4}$-SW$\frac{1}{4}$ 36-56-25</u>									
Wash					560,628	58.90	.045	8.80	560,628
Retreat	395,112	56.50	.035	11.00	853,227	56.50	.045	11.00	1,248,339
	395,112	56.50	.035	11.00	1,413,855	57.45	.045	10.13	1,808,967
<u>SW$\frac{1}{4}$-SW$\frac{1}{4}$ 36-56-25</u>									
Wash					392,152	58.90	.045	8.80	392,152
Retreat	126,141	56.50	.035	11.00	69,860	56.50	.045	11.00	196,001
	126,141	56.50	.035	11.00	462,012	58.54	.045	9.26	588,153
<u>Total Cushing Reserve</u>									<u>2,734,450</u>
<u>Total Breakdown</u>									
Wash					1,058,035	58.76	.045	8.73	1,058,035
Retreat	595,914	56.50	.035	11.00	1,080,501	56.50	.045	11.00	1,676,415
	595,914	56.50	.035	11.00	2,138,536	57.63	.045	9.86	2,734,450
<u>Grand Total</u>						<u>57.38</u>	<u>.043</u>	<u>10.08</u>	

Cushing Reserve
Annual Report
Year 1959
Page Three

11. EXPLORATION & FUTURE EXPLORATION

One exploration hole was started by H. Schultze & Company by structure drill in 1959 and completed to 365 feet on January 2, 1960:

Drill Hole CW18
Coordinates: 31355-9670W

<u>Footages</u>	<u>Material</u>	<u>Classification</u>
0- 31	Surface	NG
31- 80	Taconite, DT, Ore	NG
80-105	PR, DT, Ore	NG
105-165	Sand, DT, Limonitic Ore	NG
165-315	DT, Sand, Ore	Retreat
315-330	DT, Ore, Taconite	NG
330- <u>365</u>	Taconite, DT, Ore	Retreat

12. TAXES

<u>Real Estate</u>	<u>1959</u>		<u>1958</u>		<u>Increase-Decrease</u>	
	<u>Assessed Value</u>	<u>Taxes</u>	<u>Assessed Value</u>	<u>Taxes</u>	<u>Assessed Value</u>	<u>Taxes</u>
Mineral	\$183,989	\$54,635.53	\$183,989	\$51,066.15	/\$3,569.38	
Lands, Bldgs, Machinery	5,397	1,550.97	4,556	1,264.52	/\$841	/ 286.45
	<u>\$189,386</u>	<u>\$56,186.50</u>	<u>\$188,545</u>	<u>\$52,330.67</u>	/\$841	/\$3,855.83
Average Mill Rate		296.68		277.55	/	19.13

Note: Land value increased by purchase of five additional forties. Mill rate increased by 11.95 per cent.

Cushing Reserve
Annual Report
Year 1959
Page Four

15. PROPOSED NEW EQUIPMENT & CONSTRUCTION

(Proposed on tentative basis)

- 1 8-cubic yard Electric Shovel
- 5 40-ton Haulage Trucks
- 1 Combination Shop-Office Building

HAWKINS MINE
ANNUAL REPORT
YEAR 1959

1. GENERAL

Stripping operations in progress under E&A No. CC-974 at the turn of the year were carried forward on a 3-shift, 5-day-week schedule until March 13, after which crews were reduced for winter repairs to plant and pit equipment.

Pit and plant equipment repairs after the first of the year were fairly extensive due to curtailment of repairs in 1958. Because of the low production for that year, repairs were deferred until after January 1, 1959. Plant flowsheet changes consisted of installation of a dewatering screen in the cyclone plant under E&A No. CC-986.

Ore operations started on April 27 on a 2-shift, 5-day-week schedule and were increased to 2 shifts, 6 days a week on May 11 in order to get as much production as possible before the pending steel strike.

At the end of the 1958 season, 32,147 tons of ore remained in stockpile, 54,849 tons were placed in stockpile during the season and 78,451 tons removed, leaving a balance in stockpile of 8,545 tons at the end of the 1959 season. All of the ore placed in stockpile in 1959 was split into coarse and fines to meet customer demands. Stockpile loading started Tuesday, April 21, on a 1-shift schedule and after the steel strike was resumed on November 9.

The International Harvester fines plant operated on the same shift schedule as the Hawkins mine. Production from Pond "B" was completed on May 16 when operations were shifted into the jointly-owned Pond "C". Pond "B" production was 53,232 tons of concentrates against an estimate of 57,000 tons.

All operations were suspended on July 15 when the steel strike went into effect.

After the Taft-Hartley injunction on November 7, the mine--except for intermittent stockpile loading--was put on a standby basis with one hourly employee throughout the month of November. On December 1, drilling was started in the east pit extension for rock stripping which will be started after the first of the year.

Hawkins Mine
Annual Report
Year 1959
Page 2

2. PRODUCTION-SHIPMENTS-INVENTORIES

a. Production by Grades

<u>Hawkins</u>	<u>Retreat</u>	<u>Total</u>
<u>Crude</u>	918,326	918,326
<u>Concentrates</u>		
Bessemer	51,069	51,069
Non-Bessemer	267,052	267,052
	318,121	318,121

IHC Fines

<u>Crude</u>		
IHC-Cliffs		90,573
<u>Concentrates</u>		
Cliffs		24,715
IHC		2,691
		27,406

b. Shipments by Grades

<u>Ore</u>	<u>Bessemer</u>	<u>Non-Bessemer</u>	<u>Total</u>
<u>Retreat</u>			
Hawkins	57,478	284,245	341,723
<u>Fines</u>			
Cliffs			24,715
IHC			2,691
			27,406

Hawkins Mine
Annual Report
Year 1959
Page 3

c. Stockpile Inventories

Hawkins Retreat 8,545

d. Production by Months

<u>Month</u>	<u>Hawkins Retreat</u>	<u>Crude Ore</u>		
		<u>Fines</u>		<u>Total</u>
		<u>IHC</u>	<u>IHC-Cliffs</u>	
April	49,917	2,334		2,334
May	335,356	32,487		32,487
June	377,122		33,288	33,288
July	159,068		22,464	22,464
Nov	-3,137			
	<u>918,326</u>	<u>34,821</u>	<u>55,752</u>	<u>90,573</u>

<u>Month</u>	<u>Hawkins Retreat</u>	<u>Concentrates</u>		
		<u>IHC</u>	<u>IHC-Cliffs</u>	<u>Total</u>
April	17,366	350		350
May	112,256	2,341	5,392	7,733
June	124,682		11,643	11,643
July	54,583		7,680	7,680
Nov	3,325			
Dec	<u>5,909</u>			
	<u>318,121</u>	<u>2,691</u>	<u>24,715</u>	<u>27,406</u>

3. ANALYSIS

a. Tonnage & Analysis of Crude Ore Produced

<u>Hawkins Crude</u>	<u>Tons</u>	<u>Iron</u>	<u>Silica</u>
Retreat	918,326	31.81	49.65
Fine Ore	90,573	41.12	37.51

Hawkins Mine
Annual Report
Year 1959
Page 4

b. Tonnage & Analysis of Concentrates Produced

<u>Ore</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>	<u>Moist</u>
<u>Hawkins Retreat</u>							
Bessemer	51,069	56.96	.033	11.15	.29	.44	6.26
Non-Bessemer	<u>267,052</u>	<u>56.30</u>	<u>.036</u>	<u>11.69</u>	<u>.69</u>	<u>.49</u>	<u>6.22</u>
	318,121	56.41	.035	11.61	.63	.48	6.22
<u>Fines</u>							
IHC	2,691	57.17	.032	13.39	.31	.74	8.51
Cliffs-IHC	<u>24,715</u>	<u>57.72</u>	<u>.029</u>	<u>13.12</u>	<u>.31</u>	<u>.60</u>	<u>7.74</u>
	27,406	57.67	.029	13.15	.31	.61	7.82

c. Tonnage & Complete Analysis of Concentrates Shipped

<u>Hawkins Retreat</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag</u>	<u>Sulf</u>	<u>Ign Loss</u>	<u>Moist</u>
Bessemer	57,478	56.73	.033	11.66	.30	.45	.12	.20	.007	5.94	6.20
Non-Bessemer	<u>284,245</u>	<u>56.30</u>	<u>.036</u>	<u>11.72</u>	<u>.67</u>	<u>.50</u>	<u>.12</u>	<u>.20</u>	<u>.007</u>	<u>5.91</u>	<u>6.14</u>
	341,723	56.37	.036	11.71	.61	.49	.12	.20	.007	5.92	6.15
<u>Fines</u>											
IHC	2,691	57.17	.032	13.39	.31	.74	.08	.22	.007	3.30	8.51
Cliffs	<u>24,715</u>	<u>57.72</u>	<u>.029</u>	<u>13.12</u>	<u>.31</u>	<u>.60</u>	<u>.08</u>	<u>.22</u>	<u>.007</u>	<u>2.93</u>	<u>7.74</u>
	27,406	57.67	.029	13.15	.31	.61	.08	.22	.007	2.97	7.82

d. Tonnage & Analysis of Ore in Inventory

<u>Ore</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>	<u>Moist</u>
Hawkins Retreat	8,545	55.62	.033	12.82	.65	.47	6.96

Hawkins Mine
Annual Report
Year 1959
Page 5

4. ESTIMATE of ORE RESERVES

a. Developed Ore - Factors Used

<u>Concentrates</u>	<u>Cubic Feet Per ton</u>	<u>Per Cent Recovery</u>
Wash	14	50
Retreat	14	30

b. Ore Reserves as of December 31, 1959

<u>Lease</u>	<u>Reserves 12-31-58</u>	<u>Mined 1959</u>	<u>Balance after Mining</u>	<u>Changed by Re-estimate</u>	<u>Reserve 12-31-59</u>
<u>SE-NE 31, 57-22</u>					
Open Pit Wash	111,204		111,204		111,204
Open Pit Retreat	<u>364,379</u>	<u>77,049</u>	<u>287,330</u>		<u>287,330</u>
	475,583	77,049	398,534		398,534
<u>NE-SE 31, 57-22</u>					
Open Pit Wash	182,178		182,178		182,178
Open Pit Retreat	<u>674,305</u>	<u>119,645</u>	<u>554,660</u>		<u>554,660</u>
	856,483	119,645	736,838		736,838
<u>SW-NW 32, 57-22</u>					
Open Pit Wash	31,043		31,043		31,043
Open Pit Retreat	<u>207,705</u>	<u>12,820</u>	<u>194,885</u>		<u>194,885</u>
	238,748	12,820	225,928		225,928
<u>NW-SW 32, 57-22</u>					
Open Pit Wash	227,455		227,455	-34,308	193,147
Open Pit Retreat	75,929	108,607	-32,678	<u>34,308</u>	1,630
Underground Wash	<u>127,319</u>		<u>127,319</u>		<u>127,319</u>
	430,703	108,607	322,096		322,096
<u>Total Hawkins Mine</u>					
Open Pit Wash	551,880		551,880	-34,308	517,572
Open Pit Retreat	1,322,318	318,121	1,004,197	<u>34,308</u>	1,038,505
Underground Wash	<u>127,319</u>		<u>127,319</u>		<u>127,319</u>
	2,001,517	318,121	1,683,396		1,683,396

Hawkins Mine
Annual Report
Year 1959
Page 6

c. Estimated Analyses of Ore Reserves

<u>Concentrates</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>
<u>SE-NE 31, 57-22</u>				
Bessemer Wash Open Pit	72,117	61.13	.026	8.72
Non-Bessemer Wash Open Pit	39,087	61.20	.047	7.38
Bessemer Retreat Open Pit	187,333	59.38	.028	10.66
Non-Bessemer Retreat Open Pit	<u>99,997</u>	<u>61.75</u>	<u>.061</u>	<u>9.87</u>
	398,534	60.47	.038	9.79
<u>NE-SE 31, 57-22</u>				
Bessemer Wash Open Pit	127,205	59.95	.029	8.72
Non-Bessemer Wash Open Pit	54,973	60.58	.058	8.37
Bessemer Retreat Open Pit	<u>554,660</u>	<u>57.48</u>	<u>.029</u>	<u>11.78</u>
	736,838	58.13	.031	11.00
<u>SW-NW 32, 57-22</u>				
Bessemer Wash Open Pit	21,370	56.60	.012	9.87
Non-Bessemer Wash Open Pit	9,673	56.76	.063	10.15
Bessemer Retreat Open Pit	162,314	57.50	.028	10.90
Non-Bessemer Retreat Open Pit	<u>32,571</u>	<u>57.97</u>	<u>.064</u>	<u>10.59</u>
	225,928	57.45	.033	10.73
<u>NW-SW 32, 57-22</u>				
Bessemer Wash Open Pit	71,774	59.08	.029	7.63
Non-Bessemer Wash Open Pit	121,373	56.85	.062	9.78
Bessemer Retreat Open Pit	1,630	65.54	.028	7.17
Bessemer Wash Underground	62,974	58.00	.030	9.00
Non-Bessemer Wash Underground	<u>64,345</u>	<u>57.00</u>	<u>.060</u>	<u>9.50</u>
	322,096	57.65	.048	9.08
<u>Total Open Pit Wash</u>				
Bessemer	292,466	59.78	.027	8.54
Non-Bessemer	<u>225,106</u>	<u>58.51</u>	<u>.058</u>	<u>9.03</u>
	517,572	59.23	.040	8.76
<u>Total Open Pit Retreat</u>				
Bessemer	905,937	57.89	.029	11.38
Non-Bessemer	<u>132,568</u>	<u>60.82</u>	<u>.062</u>	<u>10.05</u>
	1,038,505	58.26	.033	11.21
<u>Total Underground Wash</u>				
Bessemer	62,974	58.00	.030	9.00
Non-Bessemer	<u>64,345</u>	<u>57.00</u>	<u>.060</u>	<u>9.50</u>
	127,319	57.49	.045	9.25
<u>GRAND TOTAL HAWKINS MINE</u>	<u>1,683,396</u>	<u>58.50</u>	<u>.036</u>	<u>10.31</u>

5. LABOR & WAGES

a. Comments

An ample labor supply was available during the year and very little turnover was experienced. Ten men retired after reaching age 65.

A \$0.01 cost-of-living adjustment made on January 1, 1959, increased wage and fringe benefits during the year.

b. Comparative Statement of Production

	<u>1959</u>	<u>1958</u>
Concentrate tonnage	318,121	412,983
Number of shifts	128	167
Number of hours	70,317	92,694
Average number of men working	78	112
Average wages per hour	\$3,391	\$3,175
Production per man per day	36.19	35.64
Labor cost per man per ton	\$0.7321	\$0.7408
Number of days	64	84
Amount paid for labor	\$232,893.98	\$305,950.51

6. GENERAL SURFACE

a. Building & Repairs

Only necessary repairs were made to mine buildings.

b. Roads, Transmission Lines, etc.

1500 feet of power line were relocated to make room for heavy-media reject dumps.

c. Miscellaneous General Construction - None

7. OPEN PIT

a. Stripping

Rock stripping in the east pit extension under E&A No. CC-974 was completed on March 13. This operation was conducted on a 3-shift, 5-day-week basis using 2 shovels and 10 trucks. Because of a change in mining plans, it was necessary to extend the stripping program over the original estimate. Bank breakoff made it necessary to haul a high percentage of the rock from the pit bottom which increased the lift and length of haul.

Because of the strike, no fall stripping was started in 1959. However, rock drilling and blasting was started in December for stripping to be conducted after the first of the year.

Following is a table which shows Hawkins stripping completed in 1959:

<u>Cubic Yards</u>	<u>Shifts</u>	<u>Yards/Shift</u>	<u>Man Hours</u>	<u>Cost/Yard</u>
518,120	147	3,525	44,685	\$0.639

b. Open Pit Mining

Ore operations began on April 27 on a 2-shift, 5-day-week basis and were increased to a 2-shift, 6-day-week schedule on May 11 in order to get as much production as possible before the steel strike.

Production from the pit averaged 7,938 tons a shift for a total of 1,016,089 tons for the season. Pit operations were conducted in the east pit extension with one shovel in the northwest corner of the pit for high manganese ore.

During May and June, 4,954 tons of special size and grade concentrates were produced for the Lincoln Electric Company.

Crude production from the pit was as follows:

<u>Wash Plant Retreat</u>				<u>Pit Retreat</u>					
Shifts	<u>2"</u> Rejects	Plant Crude	Tons per Shift	Shifts	Screen Rock	Rock	Crude	Tons per Shift	Cost per Ton
128	223	918,549	7,176	128	95,524	2,016	1,016,089	7,938	\$0.299

c. Pumping & Drainage

Pumping from the pit averaged approximately 1200 gallons per minute.

d. General Pit Activity

Pit activity was confined to mining of ore and removal of pit rock.

8. BENEFICIATION

a. Washing Plant

The plant operated on the same shift schedule as the pit except for a small maintenance crew on the third shift. Production rate through the plant was good with no major delays. No additions or flowsheet changes are contemplated for this unit in 1960.

Delay time is shown as follows--delays shown do not necessarily mean an interruption in plant production as in most instances bypassing of these units was possible:

<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent</u>	<u>Per Cent of 1024.00 Working Hours</u>
Out of Ore	5.67	16.20	0.56
Pit Screening Plant	4.01	11.45	0.39
Crude Ore Conveyor	2.75	7.86	0.27

Hawkins Mine
Annual Report
Year 1959
Page 10

<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent</u>	<u>Per Cent of 1024.00 Working Hours</u>
Primary Screens	0.91	2.60	0.09
Secondary Screens	5.33	15.22	0.52
Crushers	0.25	0.71	0.02
Crusher Product Conveyor	0.75	2.14	0.07
Surge Pile Conveyor	3.34	9.54	0.33
Classifier Overflow Line	4.00	11.43	0.39
Water Recirculating Pump	0.75	2.14	0.07
Miscellaneous Chutes & Launderers	3.67	10.48	0.36
Air Compressor	0.41	1.17	0.04
Fresh Water	0.50	1.43	0.05
Electric Power	<u>2.67</u>	<u>7.63</u>	<u>0.26</u>
	35.01	100.00	3.42

Recapitulation

Crude Ore to Head of Mill	12.43	35.51	1.22
Ore Processing	<u>22.58</u>	<u>64.49</u>	<u>2.20</u>
	35.01	100.00	3.42

b. Heavy-Media Plant

The Heavy-Media plant operated satisfactorily with a minimum of down time. Rate of crude through the plant averaged 307 tons an hour. Media losses averaged 1.44 pounds a ton of feed. This is slightly higher than 1958 and would have been reduced if the season had not been shortened by the steel strike.

Delays were as follows:

<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent</u>	<u>Per Cent of 1022.25 Working Hours</u>
Out of Ore	49.34	49.33	4.83
Surge Pile Feeder	5.44	5.44	0.53
Heavy-Media Feed Conveyor	0.50	0.50	0.05
Feed Prep Screen	5.35	5.35	0.53
Akins Separator	16.33	16.32	1.60
Dirty Media Pump	0.58	0.58	0.06

Hawkins Mine
Annual Report
Year 1959
Page 11

<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent</u>	<u>Per Cent of 1022.25 Working Hours</u>
Coarse Reject Screen	0.27	0.27	0.03
Coarse Concentrate Conveyor	2.67	2.67	0.26
No Reject Truck	1.34	1.34	0.13
Frost Chunks in Ore	0.40	0.40	0.04
Miscellaneous Chutes & Launderers	0.25	0.25	0.02
Wash Ore	8.00	8.00	0.78
Tie Up	3.00	3.00	0.29
Electric Power & Storms	<u>6.55</u>	<u>6.50</u>	<u>0.64</u>
	100.02	100.00	9.79

Recapitulation

Crude Ore to Head of Mill	55.28	55.27	5.41
Ore Processing Delays	<u>44.74</u>	<u>44.73</u>	<u>4.38</u>
	100.02	100.00	9.79

c. Cyclone Plant

The dewatering screen installed under E&A No. CC-986 improved operations of the cyclone plant considerably. A higher gravity was maintained which increased production and resulted in a higher grade product. Media losses dropped from 13.75 pounds a ton of cyclone feed in 1958 to 10.30 pounds in 1959.

Delays were as follows:

<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent</u>	<u>Per Cent of 998.00 Working Hours</u>
Out of Ore	15.00	29.67	1.51
Feed Dewatering Screen	3.90	7.71	0.39
Cyclone Feed Pumps	2.91	5.76	0.29
Magnetic Separators	0.75	1.48	0.08
Symons Float Screens	4.00	7.91	0.40
Symons Tramp Screens	7.50	14.83	0.75
Media Return Pump	0.33	0.65	0.03
Tailings Pump	2.00	3.96	0.20

Hawkins Mine
Annual Report
Year 1959
Page 12

<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent</u>	<u>Per Cent of 998.00 Working Hours</u>
Recirculating Water Pump	3.00	5.94	0.30
Charging	0.50	0.99	0.05
Wash Ore	5.00	9.89	0.50
Electric Power and Storms	<u>5.67</u>	<u>11.21</u>	<u>0.57</u>
	50.56	100.00	5.07
<u>Recapitulation</u>			
Crude Ore to Head of Mill	18.90	37.38	1.90
Ore Processing	<u>31.66</u>	<u>62.62</u>	<u>3.17</u>
	50.56	100.00	5.07

d. International Harvester Tailings Basin Plant

The fine ore plant was operated on the same schedule as the Hawkins mine. After completion of Pond "B" on May 16, the operations were shifted into the jointly-owned Pond "C". Production for the season from Pond "B" amounted to 2,691 tons of concentrates, from Pond "C" 24,715 tons, for a total of 27,406 tons.

Pond "C" production, although higher in natural iron content, had a higher iron-silica ratio. The grade produced for the season ran 53.12 natural iron and 12.17 natural silica compared to an estimated 52.50 natural iron and 12.00 natural silica.

1959 plant production statistics are as follows:

<u>Product</u>	<u>1959</u>		<u>1958</u>
	<u>Estimate</u>	<u>Production</u>	<u>Production</u>
Concentrates	50,000	27,406	50,541
Per Cent Recovery	28.00	30.26	27.53
Average Daily Output	373	428	568
Tons per Man per Day		24.86	24.63
Days Operated	134	64	89

Hawkins Mine
Annual Report
Year 1959
Page 13

Delay time was as follows:

<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent</u>	<u>Per Cent of 1024.00 Working Hours</u>
Out of Ore-Dragline	26.74	12.41	2.61
Moving Screening Plant	55.16	25.60	5.38
Screen Plant Feeder	15.49	7.19	1.51
Trash Screen	2.67	1.24	0.26
Trash Conveyor	0.25	0.11	0.02
Miscellaneous Screening Plant	12.75	5.92	1.25
Plant Feed Pump	12.42	5.77	1.21
Booster Pump	4.25	1.97	0.41
Feed Pipeline	11.75	5.45	1.15
Snow and Frost Chunks	17.58	8.16	1.72
Concentrate Pump	12.98	6.02	1.27
Concentrate Dewatering Class.	5.57	2.59	0.54
Plant Startup	0.67	0.31	0.07
Clear Water Pump	10.76	5.00	1.05
Clear Water Line	19.00	8.82	1.86
Railroad Cars and Tracks	2.33	1.08	0.23
Electric Power and Storms	5.08	2.36	0.50
	<u>215.45</u>	<u>100.00</u>	<u>21.04</u>
<u>Recapitulation</u>			
Crude Ore to Head of Mill	159.06	73.82	15.52
Ore Processing	<u>56.39</u>	<u>26.18</u>	<u>5.52</u>
	<u>215.45</u>	<u>100.00</u>	<u>21.04</u>

e. Complete Concentration Data

<u>Retreat Ore</u>	<u>Tons</u>	<u>Per Cent Weight</u>		<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Iron Units</u>
		<u>Plant</u>	<u>Pit</u>				
Crude to Plant	918,542	100.00	90.40	31.81		49.65	
Pit Rock	2,016		0.20	19.47		67.25	
Screen Plant Rock	95,531		9.40	19.86		66.86	
Pit Crude	1,016,089		100.00	30.66		51.30	
Total Concentrates Produced	315,773*	34.38	31.08	56.35	.034	11.67	60.90

Hawkins Mine
Annual Report
Year 1959
Page 14

<u>Retreat Product</u>	<u>Tons</u>	<u>Per Cent Weight</u>		<u>Per Cent</u>			<u>Iron Units</u>
		<u>Plant</u>	<u>Pit</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	
Unsize Concentrates Produced	106,804	11.63	10.51	56.27	.029	10.99	
Coarse Concentrates Produced	156,188*	17.00	15.37	57.03	.035	10.79	
Fine Concentrates Produced	52,781	5.75	5.19	54.63	.037	15.44	
1958 Stockpile Overrun	2,348	0.26	0.23				
1959 Stockpile Overrun	9,234*						
Total Concentrates Produced & Shipped	318,121	34.63	31.31	56.35	.034	11.67	61.35
Heavy-Media Concentrates	216,079	23.52	21.27	57.32		10.35	
Heavy-Media Reject	110,176	11.99	10.84	39.12		37.89	
Heavy-Media Feed	326,255	35.52	32.11	51.15		19.75	
Cyclone Concentrates	59,053	6.43	5.81	55.11		14.16	
Cyclone Reject	33,760	3.68	3.32	41.39		34.48	
Cyclone Feed	92,813	10.10	9.13	50.12		21.55	
1/2" Scalp Rock	216	0.02	0.02	18.40		68.70	
Total Fine Tailings(by difference)	456,269	49.67	44.91	12.24		80.07	

*1959 Stockpile Overrun included in 1959 Concentrate Figures

Tailings Basin Plant

Crude to Plant	90,573	100.00		41.12		37.51	
Total Concentrates	27,406	30.26		57.72	.029	13.14	42.49
Total Fine Tailings(by difference)	63,167	69.74		33.91		48.08	

9. MAINTENANCE & REPAIRS

After the first of the year, 1958 deferred plant repairs were resumed. Repairs to the plant consisted of belt repairing, overhauling of magnetic separators in the cyclone plant, and general repairs and replacement of chutes, sumps, etc. Pit equipment repairs were carried on in conjunction with stripping. No repair work was done either in the plant or pit after the Taft-Hartley injunction in November. 1959 repairs will be deferred until after the first of the year.

Hawkins Mine
Annual Report
Year 1959
Page 15

10. COST of OPERATIONS

a. Comparative Mining Costs

<u>Product</u>	<u>1959</u>		<u>1958</u>
	<u>Estimated</u>	<u>Production</u>	<u>Production</u>
Wash Concentrates			155
Retreat Concentrates	600,000	318,121	412,829
Per Cent Recovery	30.00	31.37	30.47
Total Production	600,000	318,121	412,984
Per Cent Recovery	30.00	31.37	30.48
Average Daily Output	4,478	4,971	4,976
Tons per Man per Day		36.19	35.64
Days Operated	134	64	84
 <u>Costs</u>			
Total Pit Operating	\$0.269	\$0.299	\$0.295
Total Concentrating	0.208	0.191	0.195
Loading Stockpile Ore	0.007	0.018	0.008
Miscellaneous Pit & Beneficiation	<u>0.146</u>	<u>0.154</u>	<u>0.184</u>
Total Pit & Beneficiation	<u>\$1.678</u>	<u>\$1.676</u>	<u>\$1.742</u>
General Mine Expense	0.218	0.198	0.218
Winter & Idle	<u>0.533</u>	<u>0.421</u>	<u>0.573</u>
Cost of Production	<u>\$2.429</u>	<u>\$2.295</u>	<u>\$2.533</u>
 <u>Depreciation</u>			
Plant & Equipment		0.322	0.298
Motorized & Other Equipment		0.068	0.062
Movable Equipment		0.014	0.019
 <u>Taxes</u>			
Ad Valorem		0.375	0.487
Occupational		-0.036	0.051
Royalty		<u>0.183</u>	<u>0.210</u>
Total Depreciation & Taxes		\$0.926	\$1.127

Costs	1959		1958
	Estimated	Production	Production
Administrative Expense	\$0.050		\$0.050
Miscellaneous Expense & Income	0.013		0.022
Royalty	<u>1.443</u>		<u>1.425</u>
Total Cost on Cars	<u>\$4.727</u>		<u>\$5.157</u>

b. Detailed Cost Comparison

Pit Costs: \$0.004 over 1958 costs and \$0.030 over the estimate. Some cleanup was done the first week of the ore season. If the steel strike had not shortened the season, these costs would have balanced off.

Concentrating: \$0.004 under 1958 costs and \$0.017 under the estimate. Costs were normal.

Loading Stockpile: \$0.010 over 1958 costs and \$0.011 over the estimate. Stockpile loading was carried on after the Taft-Hartley injunction. Cold weather caused considerable waiting time for car service.

Miscellaneous Pit & Beneficiation: \$0.030 under 1958 costs and \$0.008 over the estimate.

Total Pit & Beneficiation: \$0.066 under 1958 costs and \$0.002 under the estimate.

General Mine Expense: \$0.020 under 1958 costs and estimate.

Winter & Idle: \$0.152 under 1958 costs and \$0.112 under the estimate.

Cost of Production: \$0.238 under 1958 costs and \$0.134 under the estimate. All costs were affected by the steel strike and cannot be used for comparative purposes.

Hawkins Mine
Annual Report
Year 1959
Page 17

11. EXPLORATION & FUTURE EXPLORATION - None

12. TAXES

	1959		1958		Increase-Decrease	
	Assessed Value	Taxes	Assessed Value	Taxes	Assessed Value	Taxes
<u>Real Estate</u>						
Mineral	\$162,851	\$ 87,421.67	\$182,206	\$ 86,977.86	-\$19,355	\$ 443.81
Lands, Bldgs, Machinery	139,575	72,367.71	131,034	61,413.69	8,541	10,954.02
IHC Basin Lands, Plant	3,474	1,381.54	12,015	4,349.68	- 8,541	- 2,968.14
<u>Personal Property</u>						
Equipment	99,636	53,486.60	107,000	51,077.52	- 7,364	2,409.08
Stockpile Concentrates	875	470.00	2,598	1,240.18	- 1,723	- 770.18
Hawkins Tailings Basin	14,045	5,586.02			14,045	5,586.02
	<u>\$420,456</u>	<u>\$220,713.54</u>	<u>\$434,853</u>	<u>\$205,058.93</u>	<u>-\$14,397</u>	<u>\$15,654.61</u>
Average Mill Rate		524.94		471.56		53.38

Note: Mineral valuation decreased by mining. Completion of IHC tailings basin and operation of plant on mine tailings increased taxes on lands, buildings, and machinery chargeable to mine. Equipment valuation decreased by depreciation. Personal property tax on Hawkins tailings basin new for 1959--first year of operation on joint tailings. Mill rate increase of 11.32 per cent offset small valuation decrease for increase in over-all taxes.

13. ACCIDENTS & PERSONAL INJURY

George Rajkovich: On February 12, 1959, while talking to shovel operator about placing chunks under shovel pads to prevent shovel from sliding, had his back to bank and rock came down striking him in back. Bruised lower lumbar area of right side. Time lost: 22 days. Compensation paid: \$195.

Hawkins Mine
Annual Report
Year 1959
Page 18

Gancho Christoff: On January 21, 1959, while removing 3" plank from sawhorse, partner dropped his end of plank, jerking Christoff and causing him to fall. Inquinal hernia. Lost 25 days. Compensation paid: \$225

Joel Olson: On August 5, 1959, while standing on bench to change light bulb, bench collapsed under his weight. Fell to floor and dislocated and fractured left foot. Lost 73 days. Compensation paid: \$652.50

14. PROPOSED NEW CONSTRUCTION - None

15. EQUIPMENT & PROPOSED NEW EQUIPMENT

a. Equipment Received

3 3/4-ton Pickups
1 TD-20 Tractor
1 Derrick Screen for Cyclone Plant

b. Proposed New Equipment - None

HILL-TRUMBULL MINEANNUAL REPORTYEAR 1959I. GENERAL

After being shut down during the year 1958, the Hill-Trumbull mine was reactivated on March 30, 1959. Equipment which had been transferred to other mines during 1958 was returned during the latter half of March. Repairs to equipment and plant were started on March 30 in preparation for the ore season and cleanup operations carried on from April 20 to 24 on a 1-shift basis with one shovel and four trucks. Stockpile loading began on April 25. Ore operations beginning April 27 on a 2-shift, 5-day schedule were increased to a 2-shift, 6-day schedule during the last half of May and continued on this basis until the steel strike on July 14, 1959. At the time operations were suspended by the strike, ore was produced from only two leases--the Gross-Marble and the Hill.

A general strike terminated operations at 11 p.m. on July 14 and the shutdown was orderly. Mobile equipment was brought out of the pit to the shop area, shovels were moved clear of the banks, and plants were cleaned out. Pit pumping was also discontinued. A strike settlement was looked for throughout the ore season but by October 30, when a settlement seemed hopeless, crews were called out to wash down the concentrating plants. The strike was terminated on November 7 by invoking the Taft-Hartley Act. Stockpile loading crews were called out on November 9 and stripping crews on November 15.

The concentrate stockpiles have been completely loaded out and no ore is available for spring loading.

Theft of 1150 feet of 1,000,000 circular mil, bare stranded copper cable was discovered on the afternoon shift of August 26. This cable was a feeder for the trolley wire of the electric locomotive haulage system. The theft was reported to the sheriff but the thieves have not been apprehended to date.

A cave-in was discovered on September 21 in the crude ore conveyor tunnel near the #2 station and a repair crew immediately called out so that no further damage would be done and the ore operation could be resumed immediately after termination of the strike. A crew was also called out to winterize equipment during a cold snap in the month of September.

Following are E&A projects completed prior to the 1959 ore season:

Hill-Trumbull
Annual Report
Year 1959
Page 2

MC-344	Revise pit power line	\$ 12,000
MC-350	Pit voltage changes	4,951
MC-353	1-1/2 ton service truck	4,800
MC-354	Demagnetizing coils & cleanup cyclones	6,600

The following projects were approved in 1959:

MC-364	Purchase 40 acres of land	3,000
MC-365	Purchase land in Calumet, Minnesota	5,000
MC-366	Cyclone plant revisions	149,130
MC-368	800,000 yard stripping program	231,200
MC-370	2-inch scalping screen in pit	35,280
RM-8	Electric power shovel cable	5,475
RM-9	24-inch belt into surge	3,100

1,117,921 tons of retreat crude ore were mined from the following areas:

Gross-Marble: southwest and northwest sides of pit.

Hill: North and south sides of pit in middle and west forties.

Shift production of retreat concentrates averaged 2224 tons at an average recovery of 25.47 per cent. Following are tonnages produced and concentrates yielded:

<u>Property</u>	<u>Tons</u>	<u>Concentrates</u>
Gross-Marble	656,514	182,832
Hill	<u>461,407</u>	<u>101,885</u>
	1,117,921	284,717

The stripping program involved removal of surface material from the following areas:

Potter: Northeast side in conjunction with Hill-Walker stripping.

Trumbull: North side in conjunction with Hill-Walker stripping.

Hill-Walker: West side of pit.

Hill: North side of pit.

Hill-Trumbull
Annual Report
Year 1959
Page 3

2. PRODUCTION-SHIPMENTS-INVENTORIES

a. Production by Grades

	<u>Retreat</u>	<u>Tons</u>
Hill		348,937
Gross-Marble		<u>556,374</u>
		905,311

<u>Concentrates</u>	<u>Wash</u>		<u>Retreat</u>		<u>Total</u>
	<u>Bessemer</u>	<u>Non-Bessemer</u>	<u>Bessemer</u>	<u>Non-Bessemer</u>	
Hill		67	52,418	52,661	105,146
Trumbull	65	66		3,839	3,970
Gross-Marble		<u>133</u>	<u>31,267</u>	<u>151,565</u>	<u>182,832</u>
	<u>65</u>		<u>83,685</u>	<u>208,065</u>	<u>291,948</u>

b. Shipments

Hill		67	54,776	53,854	108,697
Trumbull	613	66		14,887	15,566
Gross-Marble		<u>133</u>	<u>31,267</u>	<u>154,662</u>	<u>185,929</u>
	<u>613</u>		<u>86,043</u>	<u>223,403</u>	<u>310,192</u>

c. Inventories None

d. Production by Months - Retreat Crude

<u>Month</u>	<u>Hill</u>	<u>Gross-Marble</u>	<u>Total</u>
April		49,909	49,909
May		329,542	329,542
June	202,312	176,923	379,235
July	<u>146,625</u>		<u>146,625</u>
	348,937	<u>556,374</u>	905,311

Hill-Trumbull
Annual Report
Year 1959
Page 4

d. Production by Months - Concentrates

Month	Hill		Trumbull		Gross-Marble	Total
	Wash	Retreat	Wash	Retreat	Retreat	
April		649	65		14,679	15,393
May	67	2,545	66	3,839	96,243	102,760
June		52,361			64,144	116,505
July		46,115			7,766	53,881
Nov		3,409				3,409
	<u>67</u>	<u>105,079</u>	<u>131</u>	<u>3,839</u>	<u>182,832</u>	<u>291,948</u>

3. ANALYSIS

a. Crude Retreat Ore

Product	Tons	Iron	Silica
Hill	348,937	39.98	38.91
Gross-Marble	<u>556,374</u>	<u>37.21</u>	<u>42.03</u>
	905,311	38.28	40.83

b. Tonnage & Analysis of Concentrates Produced

Product	Tons	Iron	Phos	Silica	Mang	Alum	Moisture
<u>Hill</u>							
Non-Bessemer Wash	67	55.60	.046	14.05	.13	.52	6.20
Bessemer Retreat	52,418	58.70	.039	11.01	.15	.65	7.60
Non-Bessemer Retreat	52,661	58.98	.042	10.59	.15	.63	7.78
<u>Trumbull</u>							
Bessemer Wash	65	56.39	.042	12.25	.12	.58	4.90
Non-Bessemer Wash	66	57.20	.048	12.25	.14	.48	7.00
Non-Bessemer Retreat	3,839	56.33	.047	12.54	.14	.55	6.72
<u>Gross-Marble</u>							
Bessemer Retreat	31,267	57.73	.042	10.96	.17	.65	7.02
Non-Bessemer Retreat	151,565	58.12	.046	10.36	.17	.57	6.42
	<u>291,948</u>	<u>58.31</u>	<u>.044</u>	<u>10.61</u>	<u>.16</u>	<u>.60</u>	<u>6.95</u>

Hill-Trumbull
Annual Report
Year 1959
Page 5

c. Tonnage & Complete Analysis of Concentrates Shipped

<u>Product</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag</u>	<u>Sulf</u>	<u>Ign Loss</u>	<u>Moist</u>
<u>Hill</u>											
Non-Bessemer Wash	67	55.60	.046	14.05	.13	.52	.10	.25	.010	5.28	6.20
Bessemer Retreat	54,776	58.61	.040	11.06	.15	.68	.10	.25	.010	3.79	7.49
Non-Bessemer Retreat	53,854	58.94	.042	10.61	.15	.64	.10	.25	.010	3.81	7.72
<u>Trumbull</u>											
Bessemer Wash	613	56.39	.042	12.25	.12	.58	.10	.15	.007	6.02	4.90
Non-Bessemer Wash	66	57.20	.048	12.25	.14	.48	.10	.15	.007	4.92	7.00
Non-Bessemer Retreat	14,887	56.71	.046	12.12	.15	.55	.10	.15	.007	5.67	6.74
<u>Gross-Marble</u>											
Bessemer Retreat	31,267	57.70	.042	10.96	.17	.65	.20	.15	.008	5.19	7.02
Non-Bessemer Retreat	154,662	58.13	.046	10.35	.17	.57	.20	.15	.008	5.26	6.41
	<u>310,192</u>	<u>58.24</u>	<u>.044</u>	<u>10.67</u>	<u>.16</u>	<u>.61</u>	<u>.16</u>	<u>.19</u>	<u>.009</u>	<u>4.76</u>	<u>6.90</u>

d. Mine Analysis of Ore in Stockpile

None

4. ESTIMATE OF ORE RESERVES

a. Developed Ore - Factors Used

<u>Material</u>	<u>Cubic Feet per Ton</u>	<u>Rock Deduction</u>	<u>Per Cent Recovery</u>
<u>Hill-Trumbull & Hill-Walker</u>			
Merch	14	0	100
Wash	14	0	54
Retreat	14	0	30
<u>Gross Marble & Potter</u>			
Wash	14	0	54
Retreat	14	0	25

Hill-Trumbull
Annual Report
Year 1959
Page 6

b. Ore Reserves Estimated as of December 31, 1959

<u>Lease</u>	<u>Reserve</u>
Trumbull	1,265,216
Hill	697,227
Hill-Walker	601,257
Potter	74,100
Gross-Marble	461,439
	<u>3,099,239</u>

c. Estimated Analyses of Ore Reserves

<u>Material</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>
<u>Trumbull Concentrates</u>						
Bessemer Wash	17,093	57.61	.037	9.63	.10	.39
Non-Bessemer Wash	139,002	58.73	.053	8.70	.11	.54
Bessemer Retreat	171,219	58.46	.037	9.58		
Non-Bessemer Retreat	937,902	58.40	.055	9.61		
	<u>1,265,216</u>	<u>58.43</u>	<u>.052</u>	<u>9.51</u>	<u>.11</u>	<u>.52</u>
<u>Hill</u>						
Non-Bessemer Direct	63,317	60.05	.063	8.82		
Bessemer Wash Concentrates	264,072	62.38	.028	9.24	.11	.48
Non-Bessemer Wash Concentrates	75,197	60.62	.053	9.76	.12	.36
Bessemer Retreat Concentrates	227,980	61.13	.027	10.35		
Non-Bessemer Retreat Concentrates	66,663	60.14	.042	10.34		
	<u>697,227</u>	<u>61.36</u>	<u>.035</u>	<u>9.73</u>	<u>.11</u>	<u>.45</u>
<u>Hill-Walker Concentrates</u>						
Non-Bessemer Retreat	601,257	60.36	.050	8.75		
<u>Potter Concentrates</u>						
Non-Bessemer Retreat	74,100	58.00	.045	11.50		
<u>Gross-Marble Concentrates</u>						
Non-Bessemer Wash	160,915	58.25	.054	9.35		
Bessemer Retreat	62,089	57.59	.031	10.79		
Non-Bessemer Retreat	238,435	58.37	.051	8.87		
	<u>461,439</u>	<u>58.22</u>	<u>.049</u>	<u>9.30</u>		

Hill-Trumbull
Annual Report
Year 1959
Page 7

c. Estimated Analyses of Ore Reserves

<u>Material</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>
<u>Total Direct</u>	63,317	60.05	.063	8.82		
<u>Total Wash Concentrates</u>						
Bessemer	281,165	62.09	.029	9.26	.11	.47
Non-Bessemer	<u>375,114</u>	<u>58.90</u>	<u>.053</u>	<u>9.19</u>	<u>.11</u>	<u>.48</u>
	656,279	60.27	.043	9.22	.11	.48
<u>Total Retreat Concentrates</u>						
Bessemer	461,288	59.66	.031	10.12		
Non-Bessemer	<u>1,918,355</u>	<u>59.06</u>	<u>.052</u>	<u>9.35</u>		
	2,379,643	59.18	.048	9.50		
<u>Total Concentrates</u>						
Bessemer	742,453	60.58	.030	9.79	.11	.47
Non-Bessemer	<u>2,356,786</u>	<u>59.06</u>	<u>.052</u>	<u>9.31</u>	<u>.11</u>	<u>.48</u>
	3,099,239	59.42	.047	9.19	.11	.48

5. LABOR & WAGES

a. Comments

Men not returning to work and retirements were replaced by college men home for the summer. All Wanless mine men were contacted for preferential hiring in the Western district.

A general steel strike began on July 14, 1959, and continued until the Taft-Hartley act was invoked on November 7, 1959.

During the year a cost-of-living increase of \$0.01 was granted to the hourly employees effective January 1, 1959.

b. Comparative Statement of Production & Wages

Product	291,948
Average number of 8-hour shifts	2
Average number of men working	151
Average wages per day	25.31

b. Comparative Statement of Production & Wages

Product per man per day	28.10
Labor cost per ton	\$0.901
Total number of days worked	64
Amount Paid for labor	\$262,994.03

6. GENERAL SURFACE

a. Buildings & Repairs

There were no major building or repair programs undertaken during the year. All minor repairs were made as required.

b. Roads-Transmission Lines-Tracks-Construction

No major road or transmission line changes were made during the year. The normal track repair program was carried on throughout the ore season.

7. OPEN PIT

a. Stripping

No stripping was done prior to the start of the 1959 ore season except a small amount of cleanup along the Trumbull road leading to the Hill-Walker.

The fall stripping program under E&A No. MC-368 began on November 15, 1959. Four crews worked on a 40-hour, 20-shift-a-week schedule throughout the stripping program. Two shovels and ten trucks were used per shift.

Stripping removed during 1959 is as follows:

<u>Lease</u>	<u>Cubic Yards Surface</u>
Hill-Walker	318,388
Hill	387,464
Trumbull	28,911
Potter	11,741
	<u>746,504</u>

Hill-Trumbull
Annual Report
Year 1959
Page 9

b. Open Pit Mining

The 1959 ore season started April 27 on a 2-shift, 5-day schedule. Operations were increased to a 2-shift, 6-day schedule during the last half of May and continued on this basis until the general steel strike on July 14. Two shovels and nine trucks were used per shift while mining in the Gross lease. Three shovels and ten trucks were used per shift mining in the Hill lease.

1,117,921 tons of crude ore were produced in 128 shifts at an average rate of 8,599 tons a shift. From this crude ore, 149,220 tons of 7/4" screen rock and 63,390 tons of pit rock were removed in the pit and the balance of 905,311 tons sent to the plant for an average rate of plant feed of 7,073 tons a shift.

Screen rock made up 13.35 per cent of the total crude ore mined in 1959. The slight decrease in screen rock for 1959 over 1957 is due primarily to a larger proportion of Gross-Marble material mined.

Retreat tonnage produced from the various leases is as follows:

<u>Lease</u>	<u>Retreat Ore</u>	<u>Area from Which Mined</u>
Gross-Marble	656,514	Southwest & northwest sides.
Hill	<u>461,407</u>	North & south sides of the
	<u>1,117,921</u>	middle & west forties.

Rock too large to pass through the screening plant was sorted and loaded out at the shovel during the mining operations. This pit rock amounted to 63,390 tons which combined with 8,159 tons of sand and waste cleanup gave a total of 71,549 tons of waste material removed during the operating season.

c. Pumping & Drainage

The main pit pumping was carried on during the season from the Trumbull pit bottom. Oliver continued pumping from the Gross-Marble pit throughout the ore season. Pumping from the Trumbull began on May 4 and continued until the general steel strike on July 14.

Hill-Trumbull
Annual Report
Year 1959
Page 10

d. General Pit Activity

Pit activity consisted of mining, surface, stripping, and some scrambling. No waste or lean ore was moved except for some pit rock and sand cleanup.

8. BENEFICIATION

a. Washing Plant

The washing plant was started April 27 on a 5-day, 2-shift operation and increased to a 6-day, 2-shift schedule during the last half of May. 284,717 tons of concentrates were produced when the general steel strike began on July 14. The washing plant operated 128 shifts and treated 905,311 tons of retreat crude ore to produce 431,447 tons of heavy-media feed at an average recovery of 47.66 per cent.

The $\frac{1}{2}$ " scalping material was 9.63 per cent of the total retreat crude.

Net crude to the washing plant averaged 910.09 tons an hour of actual operation or a 6.78 per cent increase over 1957. *Rec*

A summary of delay time to the washing plant follows:

<u>Source of Delay</u>	<u>Hours</u>	<u>Per cent</u>	<u>% of 1024 Working Hours</u>
Out of Ore	23.08	78.91	2.26
Crude Conveyor	1.50	5.12	0.15
5x14 Secondary Screen	0.50	1.71	0.05
Wash Plant Classifier	1.75	5.98	0.17
Cyclone Plant Concentrator Class.	0.75	2.57	0.07
Rock Truck	0.50	1.71	0.05
Tailings Line	0.75	2.56	0.07
Electric Power	<u>0.42</u>	<u>1.44</u>	<u>0.04</u>
	<u>29.25</u>	<u>100.00</u>	<u>2.86</u>
<u>Recapitulation</u>			
Ore to Head of Mill	24.58	84.03	2.41
Ore Processing Delays	<u>4.67</u>	<u>15.97</u>	<u>0.45</u>
	<u>29.25</u>	<u>100.00</u>	<u>2.86</u>

Hill-Trumbull
Annual Report
Year 1959
Page 11

b. Heavy-Media Plant

From 905,311 tons of retreat crude ore delivered to the washing plant, 284,717 tons of retreat concentrates were produced at an average recovery of 31.45 per cent.

A considerable tonnage of ore was shipped on a split basis during the past operating season--66 per cent of the total concentrates being shipped as a split product.

Actual grade of concentrates exceeded the estimated grade with the plant producing an iron natural of over 54 per cent.

A change was noted in the feed rates to the various plants. An increase in crude consumption of 6.78 per cent was accompanied by a decrease of 12.51 per cent in consumption of heavy-media feed and an increase of 21.55 per cent in consumption of cyclone feed over the 1957 feed rates.

If the new charge of medium purchased to start the 1959 season were not included, the ferrosilicon losses would compare favorably with 1957 losses. Medium left over from the 1957 season was used at other plants in 1958 to avoid decomposition losses.

No major mechanical delays occurred in the heavy-media plant during the season. A brief summary of delay time follows:

<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent</u>	<u>% of 1057 Working Hours</u>
Out of Ore	5.50	30.85	0.53
Heavy-Media Feed Conveyor	1.83	10.26	0.17
Circulating Media Pump	5.00	28.04	0.47
Magnetic Separator	5.00	28.04	0.47
Rock Truck	0.50	2.81	0.05
	<u>17.83</u>	<u>100.00</u>	<u>1.69</u>

Recapitulation

Ore to Head of Mill	7.33	41.11	0.70
Ore Processing Delays	<u>10.50</u>	<u>58.89</u>	<u>0.99</u>
	<u>17.83</u>	<u>100.00</u>	<u>1.69</u>

Concentrating data for the heavy-media plant follows:

<u>Retreat Plant Product</u>	<u>Tons</u>	<u>% Weight</u>		<u>Per Cent</u>			
		<u>Plant</u>	<u>Pit</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Iron Units</u>
Crude to Plant	905,311	100.00	80.98	38.28		40.83	
Pit Rock	63,390		5.67	21.62		65.10	
Screen Plant Rock	149,220		13.35	22.21		64.10	
Pit Crude	1,117,921		100.00	35.19		45.31	
Total Concentrates Produced	284,717	31.45	25.47	58.45	.044	10.47	48.01
Unsize Concentrates Produced	90,702	10.02	8.11	58.30	.044	10.63	
Coarse Concentrates Produced	141,345	15.61	12.64	58.56	.043	10.14	
Fine Concentrates Produced	52,670	5.82	4.72	58.37	.043	11.09	
1957 Stockpile Overrun	7,033	0.78	0.63				
1959 Stockpile Overrun	11,175*						
Total Concts Produced & Shipped	291,750	32.22	26.10	58.45	.044	10.47	49.19
Heavy-Media Concentrates	215,384	23.79	19.27	58.19		10.39	
Heavy-Media Rejects	216,063	23.87	19.33	22.08		65.15	
Heavy-Media Feed	431,447	47.66	38.60	39.17		39.24	
Cyclone Concentrates	69,457	7.67	6.21	58.31		11.25	
Cyclone Rejects	59,703	6.59	5.34	34.06		47.61	
Cyclone Feed	129,160	14.27	11.55	47.10		38.05	
2" Wash Plant Rejects	87,189	9.63	7.80	22.23		64.89	
Total Fine Tailings (by difference)	256,606	27.69	22.41	35.36		45.21	

*1959 stockpile overrun included in 1959 concentrate figures.

c. Cyclone Plant

The cyclone plant operated on the same schedule as the other two plants. An increase of 21.55 per cent in consumption of cyclone feed was made over 1957 rates. The grade of the cyclone concentrates is very close to that of the heavy-media concentrates.

69,457 tons of cyclone plant concentrates produced from 129,160 tons of feed gave an average weight recovery of 53.78 per cent.

There were no cyclone plant delays.

Hill-Trumbull
Annual Report
Year 1959
Page 13

9. MAINTENANCE & REPAIRS

After being shut down for the 1958 ore season, the Hill-Trumbull repair program was carried on from March 30 to April 27, 1959, to reactivate the mine for the 1959 ore season. Minor plant repairs were carried on throughout the ore season on the third shift.

10. COST OF OPERATIONS

a. Comparative Mining Costs

<u>Product</u>	<u>1959</u>		<u>1957</u>
	<u>Budget</u>	<u>Year</u>	
Wash Plant Concentrates	10,000	198	30,208
Retreat Plant Concentrates	565,000	291,750	619,069
Overrun			<u>9,801</u>
	<u>575,000</u>	<u>291,948</u>	<u>659,078</u>
Per Cent Recovery	23.33	32.25	23.84
Average Daily Output		4,562	5,031
Tons per Man per Day		27.92	24.85
Days Operated		64	135
<u>Costs</u>			
Pit Operating	\$0.246	\$0.255	\$0.235
Concentrating	0.271	0.323	0.256
Loading Stockpile Ore	0.015	0.022	0.014
General Mine Expense	0.224	0.260	0.220
Winter & Idle	<u>0.391</u>	<u>0.243</u>	<u>0.268</u>
Cost of Production	<u>\$2.823</u>	<u>\$2.699</u>	<u>\$2.886</u>
<u>Equipment Depreciation</u>			
Plant & Equipment		0.127	0.098
Motorized		0.112	0.140
Movable		0.006	0.006
<u>Amortization - Defense Facilities</u>			0.099