

SPIES-VIRGIL MINE
ANNUAL REPORT
YEAR 1946

7. UNDERGROUND (Cont.)

c. Stoping

Mining was continued in the first stope at the north end of the deposit throughout the year and the second was brought into production in the second half of the year. A total of eight sub levels was developed for each stope to reach a vertical height of 225' but mining will extend about 25' above the top sub level so the ultimate height will approach 250' with an average width of 45' of ore. Bench stoping is being employed but some experimenting has been done with the radial deep hole method. A gopher diamond drill was tried in drilling blast holes but it was found that the high cost of the bits outweighs the advantages this unit has over the percussion machine. Preliminary results using the conventional drifting machine and sectional drill rods, have been quite satisfactory so it is planned to use this equipment in more conclusive trials. A third stope will be brought into production early in 1947 and the south extension of the deposit offers possibilities for developing additional stopes to supplement the production from the 4th Level. The following is a detail description of the mining operations on the various sub levels:

1270' Sub Level

Mining in No. 2 Stope had reached this sub level which is the top elevation of mining and an area 50' x 30' was mined. The jasper hanging had been exposed on the west side and mining was being conducted to the east toward the footwall slate.

1240' Sub Level

An area 50' x 33' was mined in No. 2 Stope extending the full width of the ore between the slate footwall and jasper hanging. This is the highest elevation to which mining in No. 1 Stope had reached and an area 70' x 50' was mined at the north end of the deposit. The jasper hanging was exposed along the west and north sides and mining extended east to a mining limit.

1210' Sub Level

In No. 1 Stope a triangular shaped area was mined beginning at a narrow point at the extreme north end of the deposit and retreating south to disclose a width of 60' of ore. The slate footwall was exposed along the east side and mining extended to the jasper hanging along the north and west sides. In No. 2 Stope an area 50' x 35' was mined extending to the full width of the ore. A width of 35' of ore was disclosed between slate and jasper.

1180' Sub Level

In No. 1 Stope a triangular shaped area was mined starting in a narrow part of the deposit near the north end and retreating south where the deposit widened to about 55'. At the close of the year benching was being conducted along the south and west face of the stope. In No. 2 Stope an area 40' x 20' was mined exposing the jasper hanging on the west side. A width of only 30' of ore is indicated at this elevation but a slightly more favorable width has been disclosed both above and below.

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1946

7. UNDERGROUND (Cont.)

c. Stoping (Cont.)

1150' Sub Level

An area 80' x 35' was mined in No. 1 Stope extending the full width of the orebody. In No. 2 Stope an area 50' x 40' was mined extending from the slate footwall on the east side to the jasper hanging to the west. The north face of the stope has been mined to the pillar line and operations are confined to the south face retreating it towards another pillar line.

1125' Sub Level

An area 70' x 40' was mined in No. 1 Stope retreating south towards the travel raise. Mining extends to the full width of the ore which has proven up narrower than on subs above. In No. 2 Stope an area 40' x 35' was mined extending to the full width of the deposit.

1100' Sub Level

In No. 1 Stope an area 50' x 30' was mined extending to the full width of the orebody. In No. 2 Stope an area 40' x 30' was mined extending the north face of the stope to the pillar line and the south face was being retreated toward the travel raise.

1075' Sub Level

This is the bottom elevation of mining in both stopes. In No. 1 Stope an area 60' x 30' was mined, starting at the north end of the orebody and retreating south. In No. 2 Stope an area 55' x 35' was mined extending the full width of the orebody between the slate footwall and jasper hanging.

d. Timbering

There was a large decrease in the amount of timber, poles and lagging used due to the small amount of timbering required in the development headings. No main level drifting was done that required timbering and on the sub levels only portions of the transfer drifts for each of the stopes were timbered. The raising program was confined almost entirely to stope development and none of this required timber for support. A small amount of cribbing was used in repairing the chute compartment of the short raises for both stopes. A small inventory of timber supplies was left over from the previous year and this was more than adequate to supply the needs for 1946. Substantial increase have been made in the prices of timber, poles and lagging but due to no purchases of these supplies subsequent to the price increase, the higher price is not reflected in the timber cost for the year.

SPIES-VIRGIL MINE
ANNUAL REPORT
YEAR 1946

7. UNDERGROUND (Cont.)

d. Timbering (Cont.)

The following is a comparative timber statement:

<u>Kind</u>	<u>Lineal Feet</u>	<u>Avg. Price Per Foot</u>	<u>Amount 1946</u>	<u>Amount 1945</u>
6" to 8" Cribbing	1,500	.0615	92.32	117.89
8" to 10" Stull Timber	-	-	-	136.87
10" to 12" Stull Timber	-	-	-	129.41
Total Timber	1,500	.0615	92.32	384.17
Lagging	3,000	.0135	40.50	269.41
Poles	12,800	.0213	272.67	297.86
Total Lagging & Poles			313.17	567.27
Product			46,737	29,371
Feet of Timber Per Ton of Ore			.3116	.1505
Feet of Lagging Per Foot of Timber			2.0000	4.5061
Cost Per Ton for Timber			.0019	.0131
Cost Per Ton for Lagging			.0009	.0092
Cost Per Ton for Poles			.0058	.0101
Cost Per Ton for Timber, Poles & Lagging			.0086	.0324
Equivalent of Stull Timber to Board Measure			1,950	6,484
Cost of Timber, Lagging & Poles			405.49	951.44

f. Explosives, Drilling and Blasting

The price of explosives was increased during the year and this accounts for the higher cost per ton for these supplies. Electric blasting has been continued in the development and mining and only in block holing large chunks in the stopes has blasting been done with the conventional fuse and caps. Satisfactory results have been obtained and in the extremely wet headings particularly, the frequency of misfires has been negligible. Another important reason for continuing the electric blasting is because of the smaller amount of smoke and gases produced. The workings in the east deposit have been ventilated by a small volume of air and will continue to be until the new ventilation connection is completed. Gelamite No. 1 Powder has been used exclusively in all the work in ore and rock. In the deep blast hole method of mining, larger size sticks of powder will be tried to speed the loading and detonation will be effected with Primacord.

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1946

7. UNDERGROUND (Cont.)f. Explosives, Drilling and Blasting (Cont.)Statement of Explosives Used

<u>Ore Development & Stopping</u>	<u>Quantity</u>	<u>Average Price</u>	<u>Amount 1946</u>	<u>Amount 1945</u>
No. 1 Gelamite 60%	23,645	.1229 Lb.	2,953.39	1,785.73
Electric Caps	8,254	12.835 C	1,059.45	-
Connecting Wire	586	.683 Lb.	400.00	-
Fuse (Feet)	334	5.140 M	1.71	173.41
No. 6 Blasting Caps	-	-	-	59.16
Lighters	-	-	-	13.15
Powder Bags	15	1.40 Ea.	21.00	17.54
Total Expense			4,435.55	2,048.99
Production, Tons			46,737	29,371
Lbs. Powder Per Ton of Ore			.5059	.5287
Cost Per Ton for Powder			.0632	.0608
Cost Per Ton for all Explosives			.0949	.0697

Rock Development

	<u>Quantity</u>	<u>Average Price</u>	<u>Amount 1946</u>	<u>Amount 1945</u>
No. 1 Gelamite 60%	469	.1229 Lb.	56.33	77.40
Electric Caps	144	12.835 C	17.62	-
Connecting Wire	16	.683 Lb.	9.80	-
Fuse (Feet)	250	5.140 M	1.28	14.67
No. 6 Blasting Caps	16	12.200 M	.20	5.40
Total Expense			85.23	97.47

E&A Development

	<u>Quantity</u>	<u>Average Price</u>	<u>Amount 1946</u>	<u>Amount 1945</u>
No. 1 Gelamite 60%	22,436	.1229 Lb.	2,711.26	4,940.24
Electric Caps	10,231	12.835 C	1,309.00	1,917.31
Connecting Wire	471	.683 Lb.	311.59	605.00
Fuse (Feet)	1,700	5.140 M	8.73	155.69
Lighters	100	6.70 M	.67	5.06
Powder Bags	7	1.40 Ea.	9.80	18.20
Tamping Shells	3,540	6.00 M	21.24	6.95
Total Expense			4,375.34	7,698.08
Total Expense All Explosives			8,896.12	9,844.54

SPIES-VIRGIL MINE
ANNUAL REPORT
YEAR 1946

7. UNDERGROUND (Cont.)

g. Ventilation

The development headings and the stopes in the east deposit have continued to be ventilated by the 25 h.p. Sturtevant fan on the 4th Level that is exhausting through metal pipe into the skip roads. During the past two years the skip roads have served as an up-cast and the cage road as a down-cast into the mine and this has proved very satisfactory for ventilation purposes. A volume of approximately 3,000 c.f.m. is delivered by the fan which has metal pipe intakes extended to each of the stope transfer drifts and the main level headings when work in them is underway. This volume is not large enough to provide good ventilation in all the headings, particularly since the underground workings have been extended.

Late in the year work was underway driving the ventilation connection above the 4th Level between the new air shaft and the orebody. When the connection is completed the Aerodyne fan that was used to ventilate the Virgil workings will be installed at the collar of the new air shaft so a larger volume of air will be provided to ventilate the mine. This fan can be reversed so the direction of the ventilating air can be changed and this is very desirable in the winter months in preventing icing conditions in the hoisting shaft.

Each of the levels leading to the Virgil Lease workings were sealed in the previous year when operations were completed in this property. There has been no trouble from foul air leaking through the seals into the present workings and it is quite evident that the fire in this part of the mine is lying dormant. An inspection of one of the old upper levels will be made early in 1947 to determine the conditions in this part of the mine.

8. COST OF OPERATING

a. Comparative Mining Costs

	<u>1946</u>	<u>1945</u>
Product	46,737	29,371
Underground Costs	2,540	2,112
Surface Costs	.610	.648
General Mine Expense	.606	.814
Cost of Production	<u>3.756</u>	<u>3.574</u>
Depreciation & Depletion	1.148	.912
Taxes	.256	.167
Loading & Shipping	.068	.245
Total Cost at Mine	<u>5.228</u>	<u>4.898</u>
Budget Estimated Cost at Mine	4.65	4.281
Number of Operating Days	152	215
Number of Shifts and Hours	32 1-8 Hr. 120 2-8 Hr.	215 2-8 Hr.
Average Daily Product	344	136

SPIES-VIRGIL MINE
ANNUAL REPORT
YEAR 1946

8. COST OF OPERATING (Cont.)

b. Detailed Cost Comparison

	1946		1945	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
<u>Underground Costs</u>				
1. Exploring in Mine	578.40	.012	3665.99	.125
3. Development in Rock	396.03	.008	495.81	.017
4. Development in Ore	7208.61	.155	5053.48	.172
5. Stopping	29926.69	.640	17995.90	.612
6. Timbering	4434.14	.095	6259.59	.213
7. Trammig	23412.58	.502	7745.97	.264
8. Ventilation	99.11	.002	2776.17	.095
9. Pumping	19642.89	.421	4495.71	.153
10. Compressors and Air Pipes	5040.70	.108	4799.67	.163
12. Underground Superintendence	5651.58	.121	4482.18	.152
14. Compressors and Power Drills	482.10	.010	362.61	.012
15. Scrapers	1691.37	.036	815.80	.038
16. Electric Tram Equipment	8133.50	.174	903.12	.031
17. Pumping Machinery	11982.52	.256	2188.23	.075
Total Underground Costs	118680.22	2.540	62040.23	2.112
<u>Surface Costs</u>				
18. Hoisting	6963.03	.149	5135.57	.175
19. Stocking Ore	3793.58	.081	1819.97	.062
20. Screening-Crushing at Mine	2702.48	.058	1532.67	.052
21. Dry House	3628.43	.078	3578.02	.122
22. General Surface Expense	2653.71	.057	3066.04	.104
23. Hoisting Equipment	3712.68	.079	509.36	.017
24. Shaft	2470.06	.053	1584.06	.054
25. Top Tram Equipment	244.43	.005	677.56	.023
26. Docks, Trestles & Pockets	1663.80	.035	107.24	.004
27. Mine Buildings	684.86	.015	1027.39	.035
Total Surface Costs	28517.06	.610	19037.88	.648
<u>General Mine Expense</u>				
28. Insurance	670.33	.014	888.85	.030
29. Mining Engineering	2048.30	.044	927.29	.032
30. Mechanical & Electrical Engr.	176.15	.004	130.78	.004
31. Analysis and Grading	1914.96	.041	1657.25	.056
32. Personal Injury	715.38	.015	841.59	.028
33. Safety Department	553.86	.012	389.91	.013
34. Telephones and Safety Devices	430.11	.009	531.03	.018
35. Local and General Welfare	768.14	.016	653.91	.022
36. Special Exp., Pensions & Allow.	1599.47	.034	1600.91	.055
37. Ishpeming Office	3916.62	.084	1926.24	.066
38. Social Security Tax	4741.88	.102	1582.52	.054
Employees Vacation Pay	4788.41	.102	6339.26	.216
Group Annuity Premiums	213.80	.005	579.72	.019
39. Mine Office	5795.81	.124	7569.55	.257
Total General Mine Expense	28333.22	.606	23915.63	.814
 COST OF PRODUCTION	 175530.50	 3.756	 104993.74	 3.574

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1946

8. COST OF OPERATING (Cont.)

b. Detailed Cost Comparison (Cont.)

	<u>1946</u>		<u>1945</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
41. General Supplies	7836.00	.167	2546.84	.087
42. Iron & Steel	1317.19	.028	375.00	.013
43. Oil & Grease	857.67	.018	705.39	.024
44. Machinery Supplies	9577.62	.205	812.02	.028
45. Explosives	3157.38	.068	2189.03	.075
46. Lumber & Timber	2293.85	.049	1788.46	.061
47. Fuel	1492.50	.032	3486.50	.119
48. Electric Power	15630.96	.335	15186.67	.517
49. Sundries			13699.91	.466
50. Other Items of Expense	56.45	.001	11.37	.000
Supply Inv. Adjustment			<u>9722.79</u>	<u>.331</u>
Total per Cost Sheet	<u>42219.62</u>	<u>.903</u>	<u>31078.40</u>	<u>1.059</u>

The maintenance expense during the idle period because of the strike was charged to E&A CC-138. The major portion of the underground work, during the first half of the year, was also charged to this account.

The following table shows the total cost of the development in the Johnson Lease that was charged to the M. A. Hanna Company:

Rock Development	\$ 18,824.80
Proportion of overhead charged to drilling	<u>1,524.65</u>
	\$ 20,349.45

A detail explanation of the variation in costs is omitted because of the difference in the nature of the operations in 1946 and 1945. In 1945 operations were conducted in the Virgil property until the mineable reserves were depleted and in 1946 the mine was only on an operating basis in the second half of the year and production was obtained from the initial mining and development in the east deposit. The high cost of mining in both years is due to the limited production that could be obtained from small stope operations. The increase in wages in 1946 is also reflected in the costs for the year. Explanations of the following cost accounts are given because of their significance.

9. Pumping

The high cost of pumping was due to the increase in mine water which reached a total of 785 g.p.m. at the close of the year. On this account, a pumping schedule of 3-8 hour shifts per day for each day of the week was maintained throughout the year. Due to the accumulation of mud in the sumps, frequent cleaning was necessary to maintain storage capacity for water.

SPIES-VIRGIL MINE
ANNUAL REPORT
YEAR 1946

8. COST OF OPERATING (Cont.)

12. Underground Superintendence

Substantial increases were granted in the bosses salaries and a \$150.00 bonus was paid each boss at the close of the year.

16. Electric Tram Equipment

Two haulage locomotives that had been in service for many years were completely overhauled at the General Shops and put into good condition. One of the locomotives was purchased from the Lloyd Mine.

17. Pumping Machinery

Maintenance of the pumps was high because of the large amount of solids carried by the water. A large repair expense was incurred when a drive gear on the 3rd Level pump was stripped, necessitating the purchase of a new gear and pinion. To improve the pumping conditions, 400' of 6" discharge line was installed from the 3rd Level to surface to provide an independent discharge line for this pump.

9. EXPLORATION AND FUTURE EXPLORATION

a. Underground

The underground exploration consisted of drilling one angle hole from the 4th Level to determine the vertical extent of the deposit. This drilling was done under contract with the E. J. Longyear Company similarly as all the previous exploration work. The hole proved ore extending to the 6th Level elevation where a width of 45' was disclosed and nearly a vertical dip to the deposit was indicated. No additional underground drilling is planned in the near future but it is very likely more drilling will be done after the 6th Level heading is driven to the east deposit. Exploration to determine the ore outline on the 4th Level and above will be done by the development for mining and the south extension of the deposit was being explored by a new heading that was being driven at the close of the year. The following is a log of the underground drilling:

D. D. H. No. 20
4th Level - Dip 65° - Due East

0'	-	91'	Cherty Slate
91'	-	162'	Slate & Cherty Iron Carb.
162'	-	207'	S. O. J. & Slate
207'	-	223'	Lean Ore
223'	-	240'	Jasper
240'	-	244'	Lean Ore
244'	-	245'	Ore
245'	-	345'	S. O. J. & Slate
345'	-	440'	Ore
440'	-	493'	Dark Grey Slate

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1946

9. EXPLORATIONS AND FUTURE EXPLORATION (Cont.)

b. Surface

A surface drilling program was continued under contract with E. J. Longyear Company in Section 24. Two holes were drilled to explore an area a considerable distance to the southeast from the present workings and ore was encountered in one of the holes near the 6th Level elevation and below. The surface drilling was abandoned due to failure of disclosing ore extensions immediately adjacent to the east deposit but it is apparent that further exploration will have to be conducted either from the proposed 6th Level or from surface to determine the extent of the concentration disclosed. The following is a log of the surface drilling:

D. D. H. No. 78
SE $\frac{1}{4}$ Sec. 24 - Dip -70° - South

0'	-	278'	Surface Material
278'	-	1157'	Greywacke
1157'	-	1198'	Slate

D. D. H. No. 79
SE $\frac{1}{4}$ Sec. 24 - Dip -70° - South

0'	-	292'	Surface Material
292'	-	555'	Greywacke
555'	-	567'	Cherty Iron Carb.
567'	-	614'	Greywacke
614'	-	621'	Cherty Iron Carb.
621'	-	689'	Cherty Broccia
689'	-	922'	Sl. & Cherty I. Carb.
922'	-	1003'	Sl. & Iron Carb.
1003'	-	1205'	Cherty Iron Form.
1205'	-	1234'	Ore
1234'	-	1250'	Jasper
1250'	-	1254'	Lean Ore
1254'	-	1325'	Jas. & L.O. Seams
1325'	-	1345'	Lean Ore
1345'	-	1350'	Jasper I. Form
1350'	-	1365'	Lean Ore
1365'	-	1406'	Ore
1406'	-	1430'	Lean Ore
1430'	-	1445'	Ore
1445'	-	1474'	Hi-Sul. Ore
1474'	-	1484'	Jasper I. Form
1484'	-	1497'	Black Slate

SPIES-VIRGIL MINE
ANNUAL REPORT
YEAR 1946

10. TAXES

The following shows a comparison of taxes paid in 1946 and 1945 in Iron County:

<u>Description</u>	<u>1946</u>		<u>1945</u>	
	<u>Valuation</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Taxes</u>
<u>Iron County</u>				
<u>Iron River Township</u>				
NE $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 24, 43-35 40A)				
SE $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 24, 43-35 40A)				
<u>Virgil Lease</u>				
SW $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 24, 43-35 40A)	75,000	1,672.43	110,000	2,452.88
Stockpile, Supplies & Equipment	50,000	1,114.95	90,000	2,006.91
Total Spies Virgil	125,000	2,787.38	200,000	4,459.79
Spies Dwelling	1,250	27.88	3,000	66.90
Total Iron River Township	126,250	2,815.26	203,000	4,526.69
Rate		2.230		
<u>Village of Mineral Hills</u>				
<u>Spies Lease</u>				
NE $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 24, 43-35 40A)				
SE $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 24, 43-35 40A)				
<u>Virgil Lease</u>				
SW $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 24, 43-35 40A)	75,000	376.00	110,000	481.07
Stockpile, Supplies & Equipment	50,000	250.67	90,000	393.60
Total Spies Virgil	125,000	626.67	200,000	874.67
Spies Dwellings	1,250	6.27	3,000	13.12
Total Village of Mineral Hills	126,250	632.94	203,000	887.79
Rate		5.01335		4.373305
<u>City of Iron River</u>				
<u>Spies-Johnson (East Deposit)</u>				
SE $\frac{1}{4}$ of NE $\frac{1}{4}$ of Sec. 24, 43-35 40A)	107,500	3,848.50	107,500	3,848.50
NE $\frac{1}{4}$ of SE $\frac{1}{4}$ of Sec. 24, 43-35 40A)	107,500	3,848.50	107,500	3,848.50
<u>Mineral Lands</u>				
NE $\frac{1}{4}$ of NE $\frac{1}{4}$ of Sec. 24, 43-35 40A	2,000	71.60	2,000	71.60
NW $\frac{1}{4}$ of NE $\frac{1}{4}$ of Sec. 24, 43-35 40A	1,600	57.28	1,600	57.28
NW $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 24, 43-35 40A	2,000	71.60	2,000	71.60
NW $\frac{1}{4}$ of SE $\frac{1}{4}$ of Sec. 24, 43-35 40A	1,600	57.28	1,600	57.28
NE $\frac{1}{4}$ of SW $\frac{1}{4}$ of Sec. 24, 43-35 25A	1,400	50.12	1,400	50.12
(Except Carlson's Maple Valley Add.)				
Lots in Carlson's Maple Valley Add.	1,025	36.92	1,025	36.90
Total	224,625	8,041.80	224,625	8,041.78
Collection fees		80.40		80.40
Total City of Iron River		8,122.20		8,122.18
Paid in August 1946		4,537.43		4,537.43
Paid in January 1947		3,584.77		3,584.75
Total		8,122.20		8,122.18
Tax Rate		3.580		3.580
<u>Bates Township</u>				
<u>Spies East Deposit</u>				
<u>Mineral rights only:</u>				
SW $\frac{1}{2}$ of Sec. 19, 43-34, 1255 Acres	25,000	750.00	35,000	1,155.00
Collection Fees		7.50		11.55
Total		757.50		1,166.55
Rate		3.00		3.30

Note: Iron River Township & Village of Mineral Hills taxes are assessed on the same valuation.

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1946

11. ACCIDENTS AND PERSONAL INJURY

The accident frequency and severity rate was not as good as in the previous year. There were two lost time accidents, both of which however were minor in nature and these resulted in 61 days lost time. There was a total of 22,081 man days worked and the total days lost including noncompensable accidents was 68 compared with 59 days in the previous year. The record, though not quite as good as in the previous year, put the mine in first place again among the Company's underground properties and the mine was awarded the Safety Banner for the second consecutive year. The following table shows a comparison of the accident severity and frequency rates:

	<u>Frequency Rate</u>	<u>Severity Rate</u>
1946	28.328	0.385
1945	5.570	0.329

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

The following is a detailed description of the compensable accidents:

Accident No. 165, December 7, 1946, John Kondrotavich, Scraper Operator. While breaking chunks with a pavement breaker on the grizzly over No. 410 Raise, he slipped and lost his balance, causing the machine to fall on his left foot. - Laceration and contusion of Dorsum of left foot. Lost time - 25 days.

Accident No. 166, December 16, 1946, Emil Nicolle, Surface Laborer. A new disc for a chute was hoisted to the landing using a rope and block. A 1/2" hemp rope was tied to the hook on the block for a hand line and Nicolle was standing on a coil of the hand line when another worker started to pull the block down. He was tripped and fell to the ground and twisted his wrist. - Colles fracture right wrist. Lost time - 54 days.

12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

There was no new building construction or additions erected to existing buildings. The most important new construction was the installation of a discharge line for the water that will be pumped from the underground drainage project to surface through the air shaft. About 320' of 8" pipe was installed in the air shaft extending from the collar down to the pumping plant on the 1330' sub level and this line was connected to a 6" line that extends for a distance of 1,600' on surface following the transmission line route. This line was installed with welded connections throughout its length. About 2,000' of shallow ditch was excavated extending from the end of the line to the Spies shaft to connect with the regular mine discharge ditch. This project was completed and was ready for handling a part of the mine water when work on the drainage project had progressed so that it could be diverted in this direction.

SPIES-VIRGIL MINE
ANNUAL REPORT
YEAR 1946

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

Three heavier copper lines were installed replacing the original ones on the transmission line extending from the Spies shaft east to the new ventilation shaft. Due to the pumping equipment that will be used with the underground drainage project and the fan that will be installed at the collar of the shaft, it became necessary to install wire with more current carrying capacity. The transmission line is approximately 3,500' in length and the work in changing the line was let on contract to a local power company line crew.

New construction that will be undertaken in the coming year consists of installing the aerodyne fan at the collar of the new air shaft and erecting a sheet metal housing to enclose the fan over the top of the shaft. Three large size transformers are on order for installation at the end of the transmission line and when these are received they will be installed on concrete foundations and enclosed with woven wire fencing.

13. EQUIPMENT AND PROPOSED EQUIPMENT

There was a large amount of new equipment purchased and most of it is for use on the drainage project. There has been considerable delay in delivery of three centrifugal pumps but shipment is expected early in 1947. Other accessories such as electrical starting equipment and transformers are also on order for use on the drainage project. There is a substantial amount of new equipment on order for stoping operations such as scraper hoists, drill machines, jacklegs and scrapers but delivery of nearly all new equipment has been very slow and on this account, costly delays have only been averted several times by borrowing equipment from other mines.

The following is a list of the important items of new equipment added to the inventory:

<u>Item</u>	<u>Number of Items</u>	<u>Cost</u>	
10 KVA Transformers	3	\$ 79.80	(1)
6" Extra Heavy Black Pipe	513' 5"	674.89	
Air Grease Gun	1	244.35	
8' Sheave Wheels	2	1,811.96	
Air Cylinder Car Dumpers	2	1,400.00	
Welding Machine	1	390.00	
4" Standard Black Pipe	407' 5"	195.83	(2)
8" Standard Black Pipe	395' 7"	478.93	(2)
4" Gate Valves	6	153.96	(2)
4" Gate Valves	2	51.32	(2)
8" Gate Valves	2	131.40	(2)
4" Check Valves	4	67.09	(2)
25 h.p. Electric Hoist	1	1,904.40	(1)
Dugas No. 30 Fire Extinguishers	2	126.00	
Anhydrex Cable 4/0, 3 Cond.	400'	872.47	(2)
25 h.p. Electric Hoist	1	1,904.40	(2)
6" Victaulic Pipe	686'	434.38	(2)
Steel Rails	29	392.64	(3)
Motor Generator Set	1	392.00	

- (1) New Equipment charged to E&A CC-116-A
- (2) New Equipment charged to E&A CC-165
- (3) New Equipment charged to Johnson Lease Drift

377

SPIES-VIRGIL MINE
ANNUAL REPORT
YEAR 1946

13. EQUIPMENT AND PROPOSED EQUIPMENT (Cont.)

A motor generator set for the underground haulage system was purchased from the Princeton Mine and installed in the engine house to supplement a small convertor that has been in service many years.

14. MAINTENANCE AND REPAIRS

The maintenance expense was abnormally high and the major part of it was expended on pumping machinery. The large volume of mine water has necessitated a heavy pumping schedule and this has resulted in a higher maintenance expense. To keep the pumps in good working order a considerable amount of work was required and there were times when the maintenance men employed on this work had difficulty in keeping up with the repairs because of the abrasive action of the gritty water. The discharge line in the shaft broke out in leaks at various points, several of which were serious enough to cause a shutdown, and a welding crew was required in nearly every instance to repair the line. The drive pulley on the motor for the 6th Level pump began to break apart and a new one was purchased to replace it. The drive belt on this pump was also difficult to maintain and not until a heavy conveyor belt was installed was the trouble from this source eliminated.

Shaft repairs consisted of replacing some worn out runners in both skip roads and fastening hardwood wearing strips to the sides of the runners when needed. Mid-week and weekend inspections have been continued and late in the year plans were made to start repairing the south skip road below the 4th Level. A number of 8" x 10" fir dividers are showing signs of rotting and have also been weakened by wear and these members will be replaced with new ones. A large amount of the plank casing between the cage and skip roads below the 4th Level will also be replaced when the shaft repair program is started.

Two 8' diameter head sheaves with 7" axles were installed for each of the skip ropes, replacing sheaves with 6" diameter axles. The sheaves with the larger size axles were installed to provide a larger safety factor against breakage and damage to hoisting equipment.

New steam and return lines were laid from the heating plant to the shop, office and shaft house. In previous years the shaft house has been heated in the winter months with the steam shovel which was parked nearby and a fire maintained in the boiler for this purpose but the need of the shovel has been eliminated by piping directly to the central heating plant.

b. Location

The maintenance on location dwellings was considerably less because all the houses excepting two were sold in the previous year. One cottage type house and the captain's residence are the only two houses that were not sold. Both of these were repaired and given two coats of paint in the previous year to put them in good condition and the only expense in 1946 was for some interior decorating that was done in both houses. The house and barn that were acquired in the purchase of the Carlson Farm were sold to the tenant for \$300.00. These buildings were in a very bad state of disrepair and no repairs were made on them since ownership was acquired two years ago.

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1946

14. MAINTENANCE AND REPAIRS (Cont.)

b. Location (Cont.)

	<u>MAINTENANCE EXPENSE</u>		<u>AMOUNT</u>		1945 <u>Total</u>
			<u>1946</u>	<u>Total</u>	
	<u>Labor</u>		<u>Supplies</u>		
Interior Decorating & Repairs	36.25		146.60	182.85	733.84

15. ELECTRIC POWER

There were no delays to operations during the year due to the lack of electric power which is purchased from the Wisconsin, Michigan Power Company. There was a slight decrease in the average maximum demand but total power consumed increased due to the larger volume of water pumped.

<u>Year</u>	<u>Average Maximum Demand</u>	<u>Rate Per K. W. H.</u>	<u>Total K. W. H.</u>	<u>Cost Per Ton</u>
1946	480	\$.0127	2,492,444	\$.335
1945	498	.0130	2,349,980	.517

16. WATER SUPPLY

The water supply that is furnished by the Homer Mine for the Village and mine has been satisfactory throughout the year. There were no extensions to existing water mains laid during the year.

17. CONDITION OF PREMISES

It has been difficult to maintain the premises around the office and shop building in neat condition due to the spillage from hoisting the wet ore. Spillage of the wet ore from the stocking area also spreads out to cover the pocket tracks and surrounding area necessitating frequent cleaning.

The premises around the location have been maintained in neat condition by the village.

18. NATIONALITY OF EMPLOYEES

	<u>American Born</u>	<u>Foreign Born</u>	<u>Total</u>	<u>Percent</u>
English	12	8	20	21
Finnish	12	5	17	18
Italian	6	5	11	11
Polish	7	4	11	11
French	10	0	10	10
Swedish	8	1	9	9
Danish	5	0	5	5
Irish	5	0	5	5
German	2	2	4	4
Austrian	0	2	2	2
Lithuanian	2	0	2	2
Belgian	1	0	1	1
Welsh	1	0	1	1
Total	71	27	98	100

ATKINS MINE
ANNUAL REPORT
YEAR, 1946.

GENERAL:

Following various studies in regard to the opening of the extension of the Atkins Mine, a tentative agreement between the Inland Steel Company and The Cleveland-Cliffs Iron Company was reached early in March. In the meantime, orders had been placed for the necessary stripping equipment and the drilling program, which had been started by Inland, was continued. This exploratory work was completed in July.

Preparations for the opening and equipping of the property were started early in June, building transmission lines, installing pumps and pipe lines, and repairing the truck garage which had been purchased from the former operators. Pumping operations got underway early in July and by the end of August, the former Atkins pit was practically pumped out.

Deliveries on equipment were extremely slow and four of the Euclid trucks, which had been ordered, were not received until August. Using the latter, and a rented 2-1/2-yard Diesel shovel, tractor and grader, a small stockpile of lean ore was loaded out for Inland. This work was completed early in September.

Stripping operations were started on September 5th, on a single shift basis. This was stepped up to three 8-hour shifts per day and five days per week by the middle of September, and again stepped up to a 20-shift per week basis early in November. By the end of the year, a total of 348,881 cubic yards of waste material had been removed.

ESTIMATE OF
ORE RESERVES:

With the completion of the exploratory drilling program in July, it was estimated that the reserves in the Wade extension of the Atkins Mine were as follows:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alu.</u>	<u>Moist.</u>	<u>Fe. Nat.</u>
No.1 Ore,	674,023	57.19	.093	7.50	1.10	2.23	15.50	48.33
No.2 Ore,	<u>870,048</u>	47.78	.146	11.10	2.08	7.17	19.00	38.70
Total,	1,544,071							

The factors used in the reserve estimate were 13 cubic feet per ton on the No. 1 ore and 15 cubic feet per ton on the No. 2, or alumiferous ore. A 10% reduction was made for rock and waste material in the ore body.

ATKINS MINE
ANNUAL REPORT
YEAR, 1946.

ESTIMATE OF
ORE RESERVES:
(Continued)

In addition to the above reserve, there is a small tonnage of ore in the Merritt lease on the pit bottom, and tied up in slopes along the East end.

SURFACE:

An office, a laboratory and a loading pocket were taken over from Inland and a truck and repair shop was purchased from the Maturi Construction Company. The latter was a large frame building and was given certain repairs, consisting of new roofing, doors and windows. This building was destroyed by fire of unknown origin early in October. It was then replaced with a smaller concrete block building. The work on the latter was rushed as much as possible, to provide shelter for the repairing and servicing of stripping equipment and was practically completed by the end of the year.

Transmission lines, telephone lines and the road into the mine were shifted to conform with the new pit outline.

STRIPPING:

A stripping program, which would open up about one-half of the area of the ultimate pit and which would involve the stripping of 460,000 cubic yards of surface material and 40,000 cubic yards of rock, was planned early in the year. Operations were to have started early in July, after the receipt of the shovel, trucks and other equipment which had been ordered in February and March. With deliveries being continually postponed, the program did not get underway until September, after the receipt of the Euclid trucks. It was then necessary to rent a 2-1/2-yard Diesel shovel, a D-8 tractor and a Diesel road patrol, in order to start the stripping work. Actual stripping operations were finally started on September 5th, working on a single shift, five days per week basis, and the program was gradually stepped up as men could be secured and truck drivers trained. By September 16th, the crew had been filled out sufficiently to operate on a 3-shift, 5-day per week basis, which was continued until November 11th, when the stripping operations were placed on a 20-shift per week basis. Under the latter plan, four complete crews were used, each crew working five 8-hour shifts per week and the Sunday day shift was used for repairs. This was necessitated by the advent of cold weather and by the fact that there was no storage facilities for trucks over the week-ends. It was likewise decided to step the operations up at this time in order to get as much stripping completed as possible before the advent of the extremely cold winter weather.

Progress during September and October was fair and reasonable costs were secured, and by the end of October, a total of 153,473 cubic yards of waste material had been removed at an average cost of \$.248 per cubic yard. The work was delayed considerably in November

ATKINS MINE
ANNUAL REPORT
YEAR 1946

STRIPPING:
(Continued)

and December by numerous breakdowns in the rented shovel, by bad weather, with alternate thawing and freezing, wet snows and rain, and by poor haulage conditions. In addition, it was necessary to interrupt the stripping program at times to clean up the old approach area in the vicinity of the proposed conveyor system. Moving in and out of the latter area likewise occasioned long delays. Poor facilities for servicing and repairing trucks during the month of November, while the service garage was being built, likewise tended to hamper the work. As a result, the cost continued to climb to \$.315 per yard in November and \$.357 in December. By the end of the year, the average cost of the 348,881 cubic yards, which had been removed, was \$.283, as compared with an estimated cost of \$.250 per cubic yard. The stripping cost included all overhead, pumping, rental on a shovel and other equipment and, in addition, it included the cost of dismantling and moving a 3-yard electric shovel in preparation for the winter stripping. Thus, the delay in the receipt of the equipment resulted in carrying the stripping over into the high cost winter period and an over-expenditure in the stripping program.

MISCELLANEOUS:

The fire, which destroyed the frame truck garage and shop building, apparently started in a small office where truck drivers, servicing, and other production reports were made out. The fire spread so rapidly that there was no time to save any of the contents. One new Euclid truck, several tires, a Sullivan air compressor, a 500-gallon pump, some impact troughing rollers for the conveyor and miscellaneous small shop equipment and tools were lost. The building and contents were covered by insurance and a very satisfactory settlement was made.

During August and September, the five Euclid trucks were received and, in order to expedite delivery, it was necessary to purchase the trucks and five Buda Diesel motors separately and to install the motors in the Mesaba-Cliffs shops. The truck which was lost in the fire was not replaced until February, 1947. During September, a TD-18 tractor and dozer, an Austin-Western road grader, and a 27-T blast hole drill were received. Miscellaneous other equipment was received up to the end of the year, but the delivery of the new 2-1/2-yard shovel was put back to May or June, 1947. It will be necessary to complete the stripping and start the mining season with rented shovels.

It is proposed to operate the Atkins Mine with a combination of truck haulage in the pit and conveyor belt delivery from the pit to a loading pocket. The conveyor system will consist of two flights, with a total of approximately 800 feet of 30 inch conveyor leading from the pit screening plant to the rail loading pocket on surface.

ATKINS MINE
ANNUAL REPORT
YEAR 1946

MISCELLANEOUS:
(Continued)

The pocket was purchased from Inland and an order was placed for the conveying equipment early in the year. By the end of the year, the conveyor trusses had been received and the greater part of the conveying equipment was on the ground, ready for assembly. However, the latter work and the preparation for the installation will be delayed until early spring, due to the fact that equipment had not been received for the excavation work. It will be necessary, on that account, to start the ore operations in the spring, hauling by truck to the former loading ramp, until the conveyor system is completely installed. The ore season will call for a production of approximately 400,000 tons.

CANISTEO MINE
ANNUAL REPORT
YEAR 1946

i. GENERAL:

Stripping and ore operations were carried forward continuously throughout the year, with the exception of the fifteen week strike period from February 8th to May 21st, inclusive. The work was conducted as closely as possible on a 40-hour per week basis, operating five to six days on ore and seven days per week on stripping. In the latter, swing crews were used and the Sunday day shift was set aside for repairs.

Running repairs were made on all of the equipment when necessary and units were completely overhauled when they could be spared.

Washing plant repairs, which were in progress at the first of the year, were continued until February 8th and resumed again after the strike period, the work being completed and the plant ready for operation on June 24th. At the end of the ore season, general repairs on the concentrating machinery were again resumed.

The stripping program, which had been in progress at the beginning of the year in the South Bovey forty, was practically completed, when interrupted by the strike. The work in this area was completed in late May and early June, and the general plans for stripping were then changed in order to remove paintrock and slough material in the bottom of the pit which would quickly release ores for the 1946 ore program. The north side stripping, which should have been completed prior to the operating season, was not started until the ore operations commenced on June 24th. This work was conducted concurrent with the ore operations and narrow cuts and steep grades were developed in order to open up the ore areas as fast as possible during the ore season.

The stripping in the North Snyder was continued after the end of the ore season on November 6th, while, simultaneously, a new program was being started in the South Bovey to extend the pit limits to the south and east. As soon as operations in the latter area were well underway, the entire stripping equipment was shifted to the south side in order to make better progress and to do away with any inefficiencies entailed by split operations.

Mining and concentrating were started on June 24th and continued through November 6th. A working schedule of two 8-hour shifts per day and five days per week was maintained until September 15th, when the operations were stepped up to a two-shift, five days per week schedule. Ore was mined from the South Bovey and all three Snyder forties. However, the material taken from the West Snyder consisted of but a small amount of ore cleaned up from the bottom taconite. The concentrating plant was operated on the same schedule as the pit. In view of the low weight recovery which was secured throughout the season, the plant production and operations were quite satisfactory. However, near the end of the season, equipment failures became rather frequent, due to the hasty overhauling entailed by the strike delay

CANISTEO MINE
ANNUAL REPORT
YEAR 1946

1. GENERAL:
(Continued)

and to the heavy demand on the machines in a 24-hour operation, with no time for preventative maintenance between shifts.

Pumping was carried on continuously throughout the year from the sump in the east end of the pit, the water being pumped either to the reservoir at the concentrating plant or over the south bank to the drainage ditch toward Trout Lake.

A program of structure drilling was carried forward throughout the year, with exploration holes being drilled in the East and South Bovey and the Hemmens forties, mainly to guide the ore operations. In addition, sample drill holes were put down in the Snyder and Bovey ore areas in the pit bottom.

2. PRODUCTION,
SHIPMENTS &
INVENTORIES:

a. Production by Grades:

Snyder Crude, -----	692,746 tons
Bovey Crude, -----	<u>347,149 "</u>
 Total Crude Ore, -----	 1,039,895 "
 Snyder Non-Bessemer Concentrates, -----	 199,273 "
Snyder Bessemer Concentrates, -----	170,967 "
Bovey Non-Bessemer Concentrates, -----	119,809 "
Bovey Bessemer Concentrates, -----	<u>57,349 "</u>
 Total Production, -----	 547,398 "

b. Shipments:

Snyder Non-Bessemer Concentrates, -----	186,554 "
Snyder Bessemer Concentrates, -----	171,830 "
Bovey Non-Bessemer Concentrates, -----	119,809 "
Bovey Bessemer Concentrates, -----	<u>57,349 "</u>
 Total Shipments, -----	 535,542 "

c. Stockpile Inventories:

Snyder Concentrate Stockpile, -----	80,814 "
-------------------------------------	----------

e. Production by Months:

	<u>SNYDER</u>	<u>BOVEY</u>	<u>TOTAL</u>
(1) <u>Crude Ore:</u>			
June, -----	15,454	26,030	41,484
July, -----	124,582	105,542	230,124
August, -----	57,171	133,840	191,011
September, -----	179,333	57,880	237,213
October, -----	272,246	20,738	292,984
November, -----	43,960	<u>3,119</u>	<u>47,079</u>
 Total, -----	 692,746	 347,149	 1,039,895

CANISTEO MINE
ANNUAL REPORT
YEAR 1946

2. PRODUCTION,
SHIPMENTS &
INVENTORIES:
(Continued)

e. Production By Months: (Cont'd.)

(2) Concentrates:

	<u>SNYDER</u>	<u>BOVEY</u>	<u>TOTAL</u>
June, -----	16,907	14,034	30,941
July, -----	64,120	54,755	118,875
August, -----	29,387	65,495	94,882
September, -----	93,751	30,008	123,759
October, -----	144,233	10,997	155,230
November, -----	21,842	1,869	23,711
Total, -----	370,240	177,158	547,398

f. Ore Statement:

As of January 1, 1946 there was a balance of 68,958 tons of Snyder concentrates in stockpile. This entire pile was shipped prior to the ore season and an overrun of 8,750 tons brought the actual weight of the stockpile up to 77,708 tons. During the 1946 season, 105,976 tons of Snyder concentrates were stocked during periods of car shortage; 25,162 tons of this material were loaded and shipped after the ore season, leaving 80,814 tons in stockpile as of January 1, 1947.

g. Delays:

An accumulation of delays reported during the ore season amounted to 55 hours and 30 minutes, of which 5 hours were due to periods of power shortages. Mechanical and electrical failures on the shovels amounted to 13 hours. Delays at the washing plant totaled 37 hours and 30 minutes, of which about one-half were due to mechanical and electrical failures of the machinery, the remainder being entailed by plugged chutes of either oversized rock or wet ore, yards plugged with loads or other minor delays.

3. ANALYSIS:

a. Mine Analysis of Production:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alu.</u>	<u>Moist.</u>	<u>Fe. Nat.</u>
Snyder N. B. Concts.	199,273	56.86	.067	11.20	.49	.50	7.64	52.52
Snyder Bess. Concts.	170,967	58.19	.038	10.34	.29	.49	7.45	53.86
Bovey N. B. Concts.	119,809	56.59	.065	11.58	.64	.72	7.94	52.10
Bovey Bess. Concts.	57,349	57.51	.037	11.31	.31	.57	7.31	53.31
Total,	547,398	57.28	.054	10.82	.44	.55	7.61	52.92

CANISTEO MINE
ANNUAL REPORT
YEAR 1946

3. ANALYSIS:
(Continued)

b. Mine Analysis of Shipments:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alu.</u>	<u>Moist.</u>	<u>Fe.Nat.</u>
Snyder N.B. Concts.	186,554	56.96	.061	10.72	.46	.53	7.34	52.78
Snyder Bess. Concts.	171,830	58.18	.038	10.34	.29	.49	7.45	53.85
Bovey N.B. Concts.	119,809	56.59	.065	11.58	.64	.72	7.94	52.10
Bovey Bess. Concts.	57,349	57.51	.037	11.31	.31	.57	7.31	53.31
Total,	535,542	57.33	.052	10.85	.43	.56	7.51	53.03

c. Analysis of Ore in Stockpile:

Snyder Concs.	80,814	56.55	.085	11.72	.47	.49	7.93	52.07
---------------	--------	-------	------	-------	-----	-----	------	-------

d. Analysis of Crude Ore Production:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>
Snyder,	692,746	42.59	.052	33.31
Bovey,	347,149	41.39	.046	35.22
Total,	1,039,895	42.19	.050	33.95

e. Complete Analysis of Season's Shipments:

	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alu.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>
Snyder N.B. Concts.	56.95	.061	10.72	.46	.53	.27	.19	.012	6.04
Snyder Bess. Concts.	58.18	.038	10.34	.29	.49	.28	.19	.011	5.00
Bovey N.B. Concts.	56.59	.065	11.58	.64	.72	.26	.19	.011	5.26
Bovey Bess. Concts.	57.51	.037	11.31	.31	.57	.28	.18	.011	4.89

4. ESTIMATE OF
ORE RESERVES:

a. Developed Ore:

Factors Used:

All Leases:

<u>Class of Material</u>	<u>Rock Deduction</u>	<u>Cu. Ft. Per Ton</u>	<u>% Recovery</u>
Wash Ore, -----	10%	14	60%
Lean Wash Ore, -----	10%	14	50%
Low Grade Wash Ore, -----	10%	15	60%
Lean Low Grade Wash Ore, -----	10%	15	50%
Rocky Wash Ore, -----	20%	14	60%

CANISTEO MINE
ANNUAL REPORT
YEAR 1946

4. ESTIMATE OF
ORE RESERVES:
(Continued)

a. Developed Ore: (Cont'd.)

	<u>RESERVE</u> <u>1-1-46</u>	<u>MINED</u> <u>1946</u>	<u>BALANCE</u>	<u>CHANGED</u> <u>BY DRILLING</u>	<u>RESERVE</u> <u>JAN.1,1947</u>
<u>Bovey:</u>					
S $\frac{1}{2}$ -NE Sec.30,	116,744	-	116,744	- 55,639	61,105
NW-SE Sec.30,	235,100		235,100	- 43,689	191,411
NE-SE Sec.30,	447,898	-	447,898	- 88,740	359,158
NE-NE Sec.31,	420,712	177,158	243,554	920,601	1,164,155
NW-NW Sec.32,	-	-	-	157,536	157,536
Total Bovey,	1,220,454	177,158	1,043,296	890,069	1,933,365
<u>Hemmens:</u>					
SW-SW Sec.29,	1,538,153	-	1,538,153	1,249,959	2,788,112
<u>Snyder:</u>					
SE-SW Sec.30,	1,091,685	-	1,091,685	- 70,310	1,021,375
SW-SE Sec.30,	666,925	253,563	413,362	132,256	545,618
SE-SE Sec.30,	1,018,497	116,677	901,820	- 266,577	635,243
Total Snyder,	2,777,107	370,240	2,406,867	- 204,631	2,202,236
GRAND TOTAL,	5,535,714	547,398	4,988,316	1,935,397	6,923,713

e. Estimated Analyses:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>	<u>Alu.</u>
<u>Bovey:</u>						
Bessemer Concentrates,	718,098	57.30	.031	10.80	.30	.48
Non-Bess. Concts.	1,215,267	57.40	.079	10.70	.30	.50
<u>Hemmens:</u>						
Bess. Concentrates,	996,582	57.07	.029	11.43	.23	.55
Non-Bess. Concts.	1,791,530	56.16	.044	11.27	.28	.55
<u>Snyder:</u>						
Bess. Concentrates,	592,199	60.98	.038	8.43	.17	.32
Non-Bess. Concts.	1,610,037	58.76	.063	9.50	.32	.38
Total Bess. Concts.	2,306,879	58.14	.032	10.46	.24	.47
Total Non-Bess. Concts.	4,616,834	57.39	.060	10.50	.30	.48
Grand Total,	6,923,713	57.64	.051	10.49	.28	.48

CANISTEO MINE
ANNUAL REPORT
YEAR 1946

5. LABOR AND WAGES:

a. Comments:

The supply of labor picked up somewhat during the year, although the average class of labor was still below standard. This improved, however, when the increase of \$.185 per hour became effective and with the settlement of the strike.

b. Comparative Statement of Wages and Product:

PRODUCTION:

Direct Shipping,	-
Concentrates Shipped,	466,584 tons
Concentrates in Stock 12-31-46	80,814 "
Concentrates in Stock 12-31-45	65,229 "
Total Production,	547,398 "

Number of Days Operated,	98
(42 days three 8-hour shifts)	
(54 days two 8-hour shifts)	
(2 days one 8-hour shift)	

Average Daily Product,	5,586 tons
Average Wages Paid Per Day,	9.856
Amount Paid for Labor,	\$ 136,460.95

6. SURFACE:

a. Buildings, Repairs:

Exclusive of a small shack built for shelter of dumpmen, nothing but ordinary maintenance work on mine buildings and dwellings took place during the year.

c. Roads, Transmission Lines, etc:

About 4,400 feet of winter road was built around the west end of the pit for servicing the South Bovey stripping, to replace the pit service road which was rendered unsafe for travel by the slough of frost chunks and boulders from the high bank operations.

Outside of shifting several poles to facilitate pit operations, or replacing a pole for more clearance for the 120-B shovel, no addition to transmission lines took place during the year.

7. SURFACE:
OPEN PIT:

a. Stripping:

The stripping operations during 1946 were carried forward by extending the pit limits southward in the South Bovey forty, removing lean formation and slough in the pit bottom adjacent to the South Bovey and East Snyder line and along the toe of the north side high bank of the Mid-Snyder, and extending surface limits northward again

CANISTEO MINE
ANNUAL REPORT
YEAR 1946

7. OPEN PIT:
(Continued)

a. Stripping: (Continued)

in the Mid-Snyder forty. Two 3-1/4-yard electric shovels were used until the strike, after which, one was in operation while the other was overhauled prior to the ore season. During ore operations, the 120-B, 5-yard shovel was used for stripping, and after the ore season one five-yard and one 3-1/2-yard machine were in use. As many trucks as could be maintained, serviced the shovels; however, a truck shortage prevailed throughout the year, especially during the ore season, when ore production was given preference over stripping operations. The year was started on the three-shift, five day per week schedule, which was carried, exclusive of the strike period, to the beginning of the ore season on June 24th. Subsequently, swing crews were used on six, 20-shift per week schedule, with ten shifts on ore and ten on stripping, until September 16th, when three shifts per day on ore was adopted, leaving week-ends for stripping operations. Post-season stripping was conducted on the five-day per week basis for a couple of weeks, while breaking in additional truck operators for a 20-shift per week operation which was in effect from November 24th to the close of the year. A total of 888,881 cubic yards of surface and lean formation was removed in 423 shifts of stripping operations, during the year. Notwithstanding the truck shortages and labor inconveniences, satisfactory stripping costs were maintained.

The South Bovey extension, in progress at the beginning of the year, was within a week of completion when the strike started on February 8th. With the resumption of work after the strike, on May 22nd, the first two days were devoted to casting the shovels out of the slough and preparing equipment, after which, stripping was resumed to complete the program on May 31st. Two 85-B shovels were used until after the strike, when one was brought to the shop for repairs and the work was completed with one shovel. The deepest point of stripping was about 150 feet from the original surface, and, with the disposal being made on the high dump on the south side, a long, steep haul was entailed. Several snow storms in January retarded truck haulage over the steep grades, but the main delaying feature was the wet material, encountered in the trough at ledge, which froze to shovel dippers and truck boxes. A total of 230,849 cubic yards of material was taken from this area, consisting of 97,154 yards of surface, 125,849 of waste and 7,846 yards of lean ore, encountered at ledge and hauled to the lean ore dump in the pit.

The planned sequence of operations was to strip the north side of the Mid-Snyder after South Bovey, but the delay created by the strike necessitated a revision of plans. For faster release of ores, operations involving the removal and clean-up of paintrock and slough in scattered areas on the pit bottom were conducted until the ore season.

CANISTEO MINE
ANNUAL REPORT
YEAR 1946

7. OPEN PIT:
(Continued)

a. Stripping: (Continued)

On June 3rd, the pit bottom program was started and, by June 21st, a total of 87,674 cubic yards of waste and lean material was removed from various ore areas and hauled to the respective dumps in the pit. About one-half of the time was spent in waste paintrock and clean-up operations in the vicinity of the secondary Sump area involving both the South Bovey and East Snyder forties; the remainder, in slough removal along the toe of the north high bank of the Mid-Snyder forty. With the 85-B under repairs at the shop and the new 120-B at the concentrate stockpile, single 85-B shovel operations were conducted during this period.

With the start of ore season and the completion of stockpile loading, the 120-B shovel started the north side Snyder stripping on June 24th. While ore operations were on a two-shift, five-day week basis, swing crews were used and the mine operated seven days a week of ten shifts on ore and ten on stripping, until September 9th, when a three-shift ore operation became necessary. Thereafter, until the close of the ore season on November 6th, stripping operations were conducted on week-ends. To facilitate the release of ore, narrow stripping cuts were taken down steep grades to uncover the west end of the area which permitted ore operations, by the middle of September, without jeopardizing subsequent stripping plans. The warm weather presented ideal shovel excavating conditions; however, the steep grades over the clay and paintrock handicapped truck haulage during the rains and the stripping operations were frequently short of trucks in favor of ore production. With the close of the ore season on November 6th, a total of 261,440 cubic yards of surface and lean formation had been removed; however, all the yardage was not from the Mid-Snyder since, occasionally it was more advantageous to strip waste or clean-up in other parts of the pit for more immediate release of ore. All the surface and waste from the Mid-Snyder was hauled to the dump north of the pit, while the small amounts of waste and lean ore encountered in the ore areas were hauled to their respective dumps in the pit.

Upon completion of the ore season, one 85-B shovel was moved up to the South Bovey area for further extensions southward of the pit limits. The other 85-B carried forward the Mid-Snyder stripping, while the 120-B shovel was used in intermittent stockpile loading. After the stockpile requirements were filled, the northside 85-B was prepared for shipment to the Atkins Mine and the 120-B was moved to the South Bovey stripping area on November 24th, where two shovel operations were conducted through the close of the year. Operations at the start were conducted on a 3-shift per day, five day per week basis and were stepped up to 20 shifts per week, when both shovels were shifted to the south side. An unseasonal thaw, early in December, which ruined the haulage roads and an excessive amount of truck maintenance, slowed down the production. Some trouble was also encountered in late December in handling wet blue clay in freezing weather.

CANISTEO MINE
ANNUAL REPORT
YEAR 1946

7. OPEN PIT:
(Continued)

a. Stripping: (Continued)

After the ore season, a total of 308,918 cubic yards were stripped, this consisted of 36,319 yards of surface and 1,276 of waste from the Mid-Snyder, and 271,323 yards of surface from the South Bovey forty.

The following tabulation shows the yardages by leases of the various materials stripped during 1946 at the Canisteeo Mine:

<u>Lease</u>	<u>Surface</u>	<u>Waste</u>	<u>Lean Ore</u>	<u>Total</u>
Snyder,	190,967	147,630	511	339,108
Bovey,	368,477	172,034	9,262	549,773
Total,	559,444	319,664	9,773	888,881

f. Explosives, Drilling and Blasting:

Statement of Explosives Used:

	<u>Quantity</u>	<u>Price</u>	<u>Amount</u>
<u>Ore Operations:</u>			
25% duPont Quarry Gel. 5 x 16	46,750#	11.502 C	5,377.50
40% duPont R.C. Extra 5 x 14	45,750	10.940	5,005.50
R.C. Blasting #4 Bag	15,000	11.00	1,650.00
40% R.C. Extra 3- $\frac{1}{2}$ x 10	1,250	11.00	137.50
50% Ditching 1- $\frac{1}{2}$ x 8	300	17.333	52.00
Gelex No. 1	7,500	13.50	1,012.50
Nitramon A	288	13.00	37.44
Nitramon C	2,944	13.00	382.72
Nitramon #2	1,300	12.00	156.00
Total and Average,	121,082	11.406	\$ 13,811.16
Plain Primacord,	30,000'	32.00	960.00
Reinforced Primacord,	7,000'	33.00	231.00
Total and Average,	37,000'	32.189	\$ 1,191.00
TOTAL ORE OPERATIONS,			\$ 15,002.16
<u>Stripping Operations:</u>			
25% duPont Quarry Gel. 5 x 16	28,500#	10.692	\$ 3,047.50
40% duPont R.C. Extra 5 x 14	30,500	10.704	3,265.00
40% duPont R.C. Extra 7/8 x 8	50	10.00	5.00
Nitramon A	9,435	13.396	1,263.99
Nitramon C	736	13.00	95.68
Total and Average,	69,221	11.09	\$ 7,677.17
Plain Primacord,	29,000'	32.00	928.00
Reinforced Primacord,	5,000	33.00	165.00
Total and Average,	34,000'	32.147	1,093.00
TOTAL STRIPPING OPERATIONS,			\$ 8,770.17
GRAND TOTAL ALL EXPLOSIVES,			\$ 23,772.33

CANISTEO MINE
ANNUAL REPORT
YEAR 1946

7. OPEN PIT:
(Continued)

g. Open Pit Mining and Loading:

Ore production was started in the pit on June 24th and continued to November 6th. The operations were conducted on a five day per week basis and two 8-hour shifts per day until September 9th, when the three shifts per day became effective. A total of 1,039,895 tons of crude ore was mined and treated, to produce 547,398 tons of concentrates, showing an average weight recovery of 52.64%. The resultant low recovery was due to the large proportions of low-recovery limonites mixed in the crude ore to counteract the high silica tendencies of the hematites. Two shovels were operated simultaneously for mixing ores at varying proportions to meet the grading requirements. With the 120-B tied up in stripping, the two 85-B shovels were used mainly in ore production and frequent shovel moves were made for changing grades. As the stripping advanced, however, occasionally the large shovel was moved into ore banks more economically where long moves of one of the small shovels would otherwise have been made.

Mining operations were conducted in the South Bovey forty, in the south side of the East Snyder, north side of the Mid-Snyder, and a little in the northeast corner of the West Snyder forty. The 370,240 tons of Snyder concentrates produced during the season consisted of 116,677 from the east forty, 248,563 from the middle and about 5,000 tons from the west forty. The entire Bovey production of 177,158 tons was mined in the south forty.

In the Snyder operations, mediocre limonitic ores were mined in the sump regions below the paintrock horizon of the east forty. A contamination layer of extremely high phosphorous, which had to be used sparingly in grading, retarded the development of the underlying better grade hematites which were cleaned off to the bottom taconite wherever a break through the high phos. was made. The bulk of the sweetener ore for the entire mine came from the north bank of the Mid-Snyder, and, at times, was required faster than the stripping shovel could release it. The small amount from the northwest bottom of the West forty, consisted of a few old furrows which were cleaned off to taconite in an effort to secure some low phosphorous grades. Equal portions of the Bessemer and Non-Bessemer were produced in the Mid-Snyder, while the East forty leaned heavily toward Non-Bessemer production, due largely to the contamination layer.

The newly-stripped, upper layers of the South Bovey forty did not materialize, as a large source of ore, due to a spotty manganese content. The situation was alleviated somewhat by the production of 4% manganese ores for special grades, but the slow absorption of intermediate manganese delayed the development of the underlying, better iron grades. Because of the delayed upper movement, most of the South Bovey production was from the sump region below the paintrock horizon where, largely, mediocre limonitic ores were mined. Both low and high phosphorous grades were produced in all horizons.

CANISTEO MINE
ANNUAL REPORT
YEAR 1946

7. OPEN PIT:
(Continued)

k. Drainage:

The water level of the main sump in the east end of the pit was maintained at about the 490-foot elevation, similar to the previous year. Considerable mining was conducted in the secondary sump region where, at times, the water was pumped to about 25 feet lower than the main sump level to facilitate bottom clean-up in the vicinity.

8. COST OF
OPERATION:

a. Comparative Mining Costs:

	<u>BUDGET</u> <u>ESTIMATE</u>	<u>COST PER</u> <u>TON 1946</u>	<u>COST PER</u> <u>TON 1945</u>
<u>PRODUCT:</u>			
Concentrates, (tons)	540,000	547,398	659,836
Average Tons Per Shift		2,339	2,528
Tons Per Man Per Day		39.53	38.49
Days Operated		98	134
<u>COST:</u>			
Open Pit Mining,	\$.203	\$.234	\$.182
General Pit Expense,	.082	.064	.112
Concentrating,	.140	.118	.135
Stocking & Loading Concentrates,	.002	.007	.002
General Mine Expense,	.095	.096	.077
Idle and Winter Expense,	.171	.141	.154
Cost of Production,	\$.693	\$.660	\$.662
(Amortization of Leasehold)		.172	
Depreciation- Plant & Equipment,	.115	.038	.115
Depreciation-Motorized Equipment,	.066	.063	.066
Amortization- Stripping,	.260	.260	.260
Taxes - Ad Valorem,	.147	.156	.132
Taxes - Occupational,	.066	.121	.076
Taxes - Royalty,	.037	.032	.037
Total Cost at Mine,	\$ 1.384	\$ 1.502	\$ 1.348
Administrative Expense,		-	.050
Miscellaneous Expense & Income,		-	.003
GRAND TOTAL,		\$ 1.502	\$ 1.395

CANISTEO MINE
ANNUAL REPORT
YEAR 1946

8. COST OF
OPERATION:
(Continued)

d. Detailed Cost Comparison:

(1) Product:

The annual production figures for 1946 and 1945 afforded very little similarity for comparative costs with the 1945 season having the advantage of greater production. The budget estimate for 1946 showed anticipated increases over the previous year's costs, due to wage increases and the lesser production; however, the actual total cost of production indicated a slight saving as compared with the 1945 figure. The substantial net difference below the budget cost was largely due to the leasehold transaction whereby the Canisteo Mining Company assumed a portion of the Idle and Winter Expense.

(2) Open Pit Mining:

In mining crude ore, the budget was set up nine mills in excess of the 1945 costs, due to anticipated slight increases in Drilling, Blasting and Truck Operations. The actual costs showed an increase in the above captions, however, the excess was greater, amounting to seventeen mills over the budget. Due to the delayed stripping it was necessary to mine scattered patches of ore along the bottom taconite where Drilling and Blasting costs ran high. A collision of two new 20-ton Euclid trucks in July crippled the fleet, considerably for the remainder of the season, entailing increased truck costs. Due to the low weight recovery of the ore, the cost increase was greatly magnified further in the conversion of the crude ore to the concentrate basis, resulting in an actual cost of \$.234, as compared with the \$.203 of the budget and the \$.182 per ton of concentrates for 1945.

(3) General Pit Expense:

Under this heading, the budget of \$.082 was estimated below the 1945 figure of \$.112 per ton. Nominal increases were budgetted along the various captions to compensate for wage increases, but, due to the expectations of lesser Exploratory Drilling and the elimination of spring clean-up expenses of 1945, a resultant net saving was anticipated. The 1946 costs were \$.064 per ton, indicating a further saving of seventeen mills which was due mainly to the absorption of Stocking Lean Materials expenses by concurrent stripping operations.

(4) Concentrating:

The 1945 concentrating cost of \$.135 was proportionately increased throughout the various sub-headings, due to increasing wages and prices, to a total of \$.140 per ton in the budget estimate. The actual cost of \$.118 showed a substantial saving of twenty-two mills per ton, as compared with the budget. The saving was realized equivalently in the final sub-heading costs of Washing and Maintenance, due partly to the efficiency of three-shift operations at the end of the season, but, mainly, to the elimination of the selective media concentrating experiments which burdened, somewhat, the 1945 concentrating costs.

CANISTEO MINE
ANNUAL REPORT
YEAR 1946

8. COST OF
OPERATION:
(Continued)

d. Detailed Cost Comparison: (Continued)

(5) Stocking and Loading Concentrates:

In the past several years, either Stocking or Loading costs, individually, has resulted in about \$.002 per ton of a comparatively large annual production. The 1946 cost was \$.007, as prorated on a small annual production, from expenses incurred by both Stocking and Loading large stockpile tonnages.

(6) General Mine Expense:

Under this heading, the 1945 cost of \$.077 was raised to compensate for higher wages and lower production, arriving at a budget figure of \$.095 per ton. With nominal variations through the long list of captions, the actual net total of \$.096 checked closely the anticipated cost.

(7) Winter and Idle Expense:

The 1945 cost of \$.154 per ton was budgeted at \$.171 to offset the substantial decrease in production. The estimate was close until the absorption of some Winter and Idle expense by the Canisteco Mining Company, which resulted in a low actual cost of \$.141 per ton.

9. EXPLORATIONS
AND FUTURE
EXPLORATIONS:

A total of 2,629-1/2 feet of structural drilling was completed during the year, consisting of 2,408-1/2 feet of exploratory work and 221 feet of sample drilling.

In the East Bovey explorations, amounting to 591 feet, the marginal ores were confirmed to the Walker Mine with no appreciable changes in available tonnage. In probing the possibilities of south pit extensions, 1,210-1/2 feet of exploration in the South Bovey showed marginal ores in the upper horizons, with some slight advantages due to better grades disclosed at depth. The 607 feet drilled in the Hemmens was a continuation of the south side exploration east of the Bovey forty. Similar to the Bovey, Hemmens showed little possibilities to the south, but, with the constantly lowering of the marginal cutoff, future probing of east extensions in the Hemmens might prove advantageous.

The sample drilling was merely to guide shovel movements for grading purposes during the season's operations.

CANISTEO MINE
ANNUAL REPORT
YEAR 1946

10. TAXES:

The following statement shows the Canisteco Mine taxes and the average annual rates for 1946 and 1945:

	<u>1 9 4 6</u>	<u>1 9 4 5</u>	<u>Increase</u>	<u>Decrease</u>
Canisteco Mine	\$ 76,696.00	\$ 82,868.60		\$6,172.60
Washing Plant Lands	879.83	595.60	\$ 284.23	
Personal Property	<u>7,924.54</u>	<u>3,211.29</u>	<u>4,713.25</u>	
Total,	\$ 85,500.37	\$ 86,675.49		\$ 1,175.12
Village Lots,	<u>221.57</u>	<u>216.54</u>	<u>5.03</u>	
Grand Total,	\$ 85,721.94 v	\$ 86,892.03		\$ 1,170.09
Average Tax Rate	125.06	122.23	2.83	

The decrease in Canisteco Mine taxes account of shipments from the property in 1946.

The increase in washing plant lands is due to having included in the 1946 taxes, property on which taxes had formerly been paid by Canisteco Mining Company.

Increase in Personal Property taxes is caused by having a stockpile of iron ore to include of 65,000 tons more than for the previous year.

11. ACCIDENTS
AND
PERSONAL
INJURY:

There were two lost-time accidents at the Canisteco Mine during the year. These are described as follows:

NAME: Oscar Hietala Date: August 31st.

CAUSE: The shovel was moving to make a wider cut and had to back up a few feet. Hietala, the oiler, was behind the shovel, watching the cable, when the shovel moved back and caught him between the shovel and the cable boat.

NATURE: Contusion of middle area of portion right thigh. Two puncture wounds, middle third, portion right thigh.

TIME LOST: Fifty-seven days.

COMPENSATION: \$ 236.34.

CANISTEO MINE
ANNUAL REPORT
YEAR 1946

11. ACCIDENTS
AND
PERSONAL
INJURY:
(Continued)

NAME: Wesley Zuehlke Date: September 9th.
CAUSE: While walking to his place of work, he stepped over an 18 inch drainage ditch and in so doing, he turned high right ankle, sustaining a severe sprain.

NATURE: Severe sprain of right ankle.

TIME LOST: Twelve days.

COMPENSATION: \$ 24.00.

12. NEW CONSTRUCTION
AND PROPOSED
NEW CONSTRUCTION:

No new construction took place during the year, however, the installation of a new stocking conveyor is planned for 1947. There will be a short 30 inch conveyor under the concentrate bins to feed a 190 foot, 24 inch conveyor inclined to a height of 40 feet over the stockpile grounds. Two 60-foot portable stackers will be used to distribute the discharge of the inclined conveyor. This investment will readily be realized since stocking with trucks involves inefficiencies, entailing two-thirds normal production.

13. EQUIPMENT AND
PROPOSED
EQUIPMENT:

New equipment received during 1946 consisted of three 20-ton Euclid trucks; two Walter trucks; a P. & H., 4-yard electric shovel to replace the 85-B sent to the Atkins Mine; a TD-18 International tractor; a KS-10 International dump truck for washing plant rock disposal; a Universal jeep for pit transportation; a 2-ton Ford V-8 service truck; a 500-gallon Carver pump, gasoline driven, to replace the smaller one sold to the Atkins Mine, and a 1,000-gallon Carver, self-priming electric pump to hold the water down in the secondary sump regions. Deliveries of most equipment was quite slow during the year, some delays affecting production considerably, as in the case of trucks, most of which were received late in the year.

Proposed equipment for 1947 delivery are two Walter and two 20-ton Euclid trucks; a D-8 tractor; a road patrol; a 20-ton Mobile Crane with small dragline attachments; a 27-T drill; and two 60-ft. portable stackers for stockpiling concentrates.

CANISTEO MINE
ANNUAL REPORT
YEAR 1946

14. MAINTENANCE
AND REPAIRS:

One 85-B shovel was overhauled during the five-week period after the strike and the beginning of ore operations. The other was repaired during the period of dismantling for shipment and assembling at the Atkins Mine.

Maintenance and repairs on all motorized equipment was carried on continuously during operations; however, the inferior grade of material in replacement parts created considerable, unnecessary duplication of work and delays to operations. The walter trucks performed well under ideal conditions but, during the rougher operations of winter stripping, spent more time in the repair shop than operating due, mainly, to failures of the Heil hoist equipment.

The churn drills were overhauled completely after the ore season.

The pre-ore season overhauling of the washing plant equipment was stinted somewhat by the strike, but held together quite well for the reduced production of the season. Post-season repairs were again started in the fall.

19. WASHING PLANT
OPERATIONS:

Coinciding with schedules of ore activities in the pit, the washing plant was operated on two and three shift basis of five days per week for a total of 234 shifts, from June 24th to November 6th, inclusive. During a boat shortage on Friday, September 13th, the entire day was spent on necessary plant repairs while pit operations were devoted to advancing the delayed stripping.

A total of 1,039,895 tons of crude ore was washed during the year, to produce 547,398 tons of concentrates, showing an average weight recovery of 52.64%. The low recovery was reflected in plant production, and the large proportion of wet, bottom ores necessarily handled, due to the delayed stripping, retarded plant operations somewhat, but the main retarding feature was reflected by the large amount of stockpiling when plant production is only about two-thirds of normal, because of a stinted feed to the plant created when two trucks are taken off the pit ore haul for stockpiling. Under the circumstances, the plant operated quite satisfactorily during the season.

To hold delays to a minimum, concentrates were stocked during periods of empty car shortages. A total of 105,976 tons of Snyder concentrates was stockpiled during the season, of which 25,162 tons were loaded and shipped after plant production.

The tonnage and analyses of plant rejects for the season are compiled below:

CANISTEO MINE
ANNUAL REPORT
YEAR 1946

19. WASHING PLANT
OPERATIONS:
(Continued)

<u>Lease:</u>	5 x 14 Screen Rejects			
	Tons	Iron	Phos.	Silica
Snyder,	15,194	23.60	.024	64.71
Bovey,	5,276	24.62	.026	63.25
Total,	20,470	23.86	.025	64.33

<u>Lease</u>	36" Belt Rejects			
	Tons	Iron	Phos.	Silica
Snyder,	1,428	24.50	.024	63.58
Bovey,	2,730	23.96	.024	64.16
Total,	4,158	24.15	.024	63.89

The pit rejects removed during mining operations were as follows:

<u>Lease</u>	<u>Cu. Yds.</u>	<u>Tons</u>	<u>Iron</u>
Snyder,	6,926	12,120	29.63
Bovey,	4,751	8,314	28.59
Total,	11,677	20,434	29.21

The lean ore removed during mining operations was as follows:

<u>Lease</u>	<u>Cu. Yds.</u>	<u>Tons</u>	<u>Iron</u>
Snyder	-	-	-
Bovey,	1,259	2,203	33.40
Total,	1,259	2,203	33.40

Other material removed during mining operations:

<u>Lease</u>	<u>Surface Cu. Yds.</u>	<u>Waste Ore Cu. Yds.</u>	<u>Total Cu. Yds.</u>
Snyder,	-	940	940
Bovey,	-	1,701	1,701
Total,	-	2,641	2,641

CANISTEO MINE
ANNUAL REPORT
YEAR 1946

19. WASHING PLANT
OPERATIONS:
(Continued)

The analysis of the product from the various machines for the year was as follows:

Snyder Mill Machines:

	Iron	Phos.	Silica
Log Washer,	56.04	.067	12.08
Classifier,	57.02	.056	11.12
Tailings,	20.66	-	-

Bovey Mill Machines:

Log Washer,	55.97	.072	12.07
Classifier,	56.89	.060	11.17
Tailings,	20.98	-	-

The concentrating data for the year was as follows:

	<u>Tonnage</u>	<u>% of Total Mined</u>	<u>% Dried Iron</u>	<u>Recoveries</u>	
				<u>Tonnage Recovery</u>	<u>Iron Unit Recovery</u>
Material removed in mining,	1,083,002	100.00	41.58		
Less: Lean ore Stocked in Mining,	2,203	.20	33.40		*
	1,080,799	99.80	41.60		
Less: Pit Rock Wasted,	20,434	1.89	29.21		
Total Transported to Mill,	1,060,365	97.91	41.84		
Less: Rock Rejects in Screening Plant,	20,470	1.89	23.86		
Crude Ore Entering Mill	1,039,895	96.02	42.19		
Concentrates Produced,	547,398	50.54	57.25	52.64	71.43
Rock Rejects on Mill Picking Belt,	4,158	.38	24.15		
Tailings (by deduction)	488,339	45.09	25.46		
Total Heads, as above (Entering Mill)	1,039,895	96.02	42.19		
Total pit rock, screening plant rejects and lean ore,	43,107	3.98	26.88		
Total,	1,083,002	100.00	41.58		

* 12,612 tons Bovey and 1,045 tons Snyder lean ore was loaded out of the pile as wash ore during 1946. A total of 18,410 tons of Bovey and 894 tons of Snyder lean ore was put on the stockpile in 1946, or a final actual stockpile tonnage of 5,647 tons.

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1946

1. GENERAL:

The regular cycle of operations at this property during the year 1946 was set out of balance, due to the strike which extended from February 7th, to May 22nd. Mining, concentrating and stripping seasons, of necessity, overlapped.

The 1946 ore season started with the loading of Bingham concentrates from the stockpile, on June 3rd. This loading was completed on June 21st.

Mining and concentrating of ore was started on June 24th, on a two-shift, five days a week basis and continued until August 19th, at which time, mining was stepped up to a three-shift, five days a week schedule, until the end of the ore season on November 7th. The bulk of production was from the Brown No. 2 lease, although for grading purposes, a small tonnage was produced the first and last part of the season from the Bingham lease. A small tonnage of direct ore was also obtained from the Bingham lease the last of the season.

Mill operations were carried forward on the same basis as ore loading in the pit. As has been the case in previous years, due to inadequate railroad service, it was necessary to stockpile concentrates at various times.

Stripping of surface and waste from the Brown No. 2 lease was carried forward from the 1945 season, on a twenty-shift a week basis; was suspended during the strike and resumed on the same basis after the strike, until June 24th, when, due to the start of the ore season, the schedule was cut back to 10-shift per week. From August 19th, to the end of the ore season, on November 7th, the stripping was carried on concurrently with ore operation, three shifts per day, five days a week, as trucks were available. On November 11th, stripping on a twenty-shift a week basis was resumed in the Brown No. 2 for the balance of the year.

Exploratory drilling was carried on during the entire year, under contract, entirely on Brown No. 2 lease.

Pit and washing plant equipment was completely overhauled during the year.

Construction on E&A's #88-89, moving washing plant, was started on July 15th, and carried on the balance of the year as equipment was available.

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1946

2. PRODUCTION,
SHIPMENTS &
INVENTORIES:

a. Production by Grades:

Brown Crude, -----	714,226	tons
Bingham Crude, -----	132,358	"
TOTAL CRUDE, -----	846,584	"
Brown Non-Bessemer Concentrates, -----	264,425	"
Brown Bessemer Concentrates, -----	170,110	"
Bingham Non-Bessemer Concentrates, -----	50,226	"
Bingham Bessemer Concentrates, -----	44,309	"
Bingham Non-Bessemer Direct, -----	1,912	"
Bingham Bessemer Direct, -----	3,521	"
TOTAL PRODUCTION, -----	534,503	"

b. Shipments:

Brown Non-Bessemer Concentrates, -----	150,819	"
Brown Bessemer Concentrates, -----	170,110	"
Bingham Non-Bessemer Concentrates, -----	50,226	"
Bingham Bessemer Concentrates, -----	115,777	"
Bingham Non-Bessemer Direct, -----	1,912	"
Bingham Bessemer Direct, -----	3,521	"
TOTAL SHIPMENTS, -----	492,365	"

c. Stockpile Inventories:

Brown Stockpile Concentrates, -----	113,606	"
-------------------------------------	---------	---

d. Lean Material in Stock:

Concentrating Material Above 25%

<u>Lease</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Holman,	26,896	32.16		
Brown,	266,263	30.85		
North Star,	20,658	26.29	.046	49.24
Bingham,	234,390	31.66	.036	49.11

Coarse Non-Concentrating Material Above 40%

<u>Lease</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
North Star,	585	48.89	.044	24.50

Paint Rock Above 45%

<u>Lease</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Bingham,	52,797	47.22	.042	25.87

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1946

2. PRODUCTION,
SHIPMENTS &
INVENTORIES:

e. Production by Months:

(1) Crude Ore:

	<u>BROWN</u>	<u>BINGHAM</u>	<u>TOTAL</u>
June,		37,270	37,270
July,	80,144	74,845	154,989
August,	181,072		181,072
September,	214,994		214,994
October,	211,549	13,996	225,545
November,	26,467	6,247	32,714
TOTAL,	714,226	132,358	846,584

(2) Concentrates & Direct Ore:

	<u>BROWN</u>	<u>BINGHAM</u>	<u>BINGHAM</u> <u>DIRECT</u>	<u>TOTAL</u>
June,		34,937		34,937
July,	52,248	48,906		101,154
August,	112,132			112,132
September,	129,556			129,556
October,	125,331	7,616		132,947
November,	15,268	3,076	5,433	23,777
TOTAL,	434,535	94,535	5,433	534,503

f. Ore Statement:

On January 1, 1946, there were 71,468 tons of Bingham concentrates remaining in stockpile. These were loaded out in June and 113,606 tons of Brown No. 2 concentrates were placed in stock during the 1946 season, making a stockpile balance on December 31st, of 113,606 tons of Brown No. 2 concentrates.

g. Delays:

The following is a statement, on a cumulative basis, of the delays affecting ore operations during the 1946 season:

<u>Hours</u>	<u>Time Lost</u> <u>Minutes</u>	<u>Cause</u>
11	15	Inadequate railroad service on empty cars and loads.
8	30	Transportation troubles, derailments, track and locomotive repairs.
10	40	Power failure, due to storms and mechanical trouble.
4	-	Pit Ramp, repairs and track clean-up.
38	55	Repairing washing plant equipment
8	-	Washing plant operating delays
4	30	Pit operation delays
<u>85</u>	<u>50</u>	

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1946

2. PRODUCTION,
SHIPMENTS &
INVENTORIES:
(Continued)

g. Delays: (Continued)

Note: Repairing washing plant equipment delays are approximately seventy per cent (70%) due to repairs on old Robins 5 x 14 screen. The replacement for this screen was tied up by the Allis-Chalmers strike and it was necessary to complete the season with the old screen. All the other delays are self-explanatory.

3. ANALYSIS:

a. Mine Analysis of Production:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alu.</u>	<u>Moist.</u>	<u>Fe.Nat.</u>
Brown N.B. Concts.	264,425	55.34	.048	11.06	1.29	.57	8.04	50.89
Brown Bess. Concts.	170,110	57.24	.028	8.51	.63	.59	8.51	52.37
Bingham N.B. Concts.	50,226	55.41	.050	13.93	.36	.57	7.64	51.18
Bingham Bess. Concts.	44,309	57.26	.037	14.08	.20	.70	7.49	52.97
Bingham N.B. Direct,	1,912	55.61	.052	12.00	.31	3.57	13.86	47.91
Bingham Bess. Direct,	3,521	56.95	.040	11.06	.32	3.24	13.05	49.52
TOTAL,	534,503	56.13	.041	10.77	.89	.61	8.16	51.55

b. Mine Analysis of Shipments:

Brown N.B. Concts.	150,819	55.87	.049	10.39	1.23	.59	8.42	51.17
Brown Bess. Concts.	170,110	57.24	.028	8.51	.63	.59	8.51	52.37
Bingham N.B. Concts.	50,226	55.41	.050	13.93	.36	.57	7.64	51.18
Bingham Bess. Concts.	115,777	57.57	.036	13.46	.18	.62	6.96	53.56
Bingham N.B. Direct,	1,912	55.61	.052	12.00	.31	3.57	13.86	47.90
Bingham Bess. Direct,	3,521	56.95	.040	11.06	.32	3.24	13.05	49.52
TOTAL,	492,365	56.70	.039	10.83	.68	.63	8.08	52.12

c. Mine Analysis of Ore in Stockpile:

Brown Concts..	113,606	54.68	.046	11.96	1.37	.55	7.54	50.56
-------------------	---------	-------	------	-------	------	-----	------	-------

d. Average Analysis of Crude Ore Production:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Brown,	714,226	44.95	.036	28.19
Bingham,	132,358	42.05	.038	34.98
Total,	846,584	44.50	.036	29.25

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1946

3. ANALYSIS:
(Continued)

e. Complete Analysis of Season's Shipments:

	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alu.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>
Brown N.B.									
Concts.	55.87	.049	10.39	1.23	.59	.29	.16	.011	6.80
Brown Bess.									
Concts.	57.24	.028	8.51	.63	.59	.28	.16	.011	7.64
Bingham N.B.									
Concts.	55.41	.050	13.93	.36	.57	.30	.19	.010	5.14
Bingham Bess.									
Concts.	57.57	.036	13.46	.18	.62	.31	.18	.010	2.77
Bingham N.B.									
Direct,	55.61	.052	12.00	.31	3.57	.34	.19	.012	3.81
Bingham Bess.									
Direct,	56.95	.040	11.06	.32	3.24	.32	.19	.011	3.34

4. ESTIMATE OF
ORE RESERVES:

a. Developed Ore:
Factors Used:
All Leases:

	<u>CU. FT.</u> <u>PER TON</u>	<u>RECOVERY</u>
Wash Ore, -----	14	60.21
Lean Wash, -----	15	47.25
Low Grade Wash, -----	14	58.28
Lean Low Grade Wash, -----	15	44.66
Rocky Wash, -----	14	58.50
Retreat, -----	14	39.20
Direct Ore, -----	13	-

The percentage of recovery shown in the above table is based on the results of actual hand-wash tests made on drill hole samples.

A 10% rock deduction was made for direct ore and rocky wash ore. In all other cases, the rock deduction is reflected in the percentage of tonnage recovery.

Retreat ore was estimated at 14 cubic feet per ton and the tonnage of concentrates was arrived at by taking 70% of the recovery realized from hand-wash tests.

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1946

4. ESTIMATE OF
ORE RESERVES:
(Continued)

a. Developed Ore: (Continued)

	RESERVE 1-1-46	MINED 1946	BALANCE AFTER MINING	CHANGED BY DRILLING	RESERVE 1-1-47
North Star,	668,586	-	668,586	- 2,022	666,564
Bingham Mine,	889,824	99,968	789,856	121,908	911,764
Brown No.1,	570,387	-	570,387	5,422	575,829
Brown No.2,	3,984,539	434,535	3,550,004	- 41,006	3,508,998
Holman,	<u>2,573,575</u>	-	<u>2,573,575</u>	<u>57,551</u>	<u>2,631,126</u>
Total Holman- Brown,	7,128,501	434,535	6,693,966	21,987	6,715,953
Total Bingham- North Star,	<u>1,558,410</u>	<u>99,968</u>	<u>1,458,442</u>	<u>119,886</u>	<u>1,578,328</u>
GRAND TOTAL,	8,686,911	534,503	8,152,408	141,873	8,294,281

After January 1st, 1946, a new estimate was made in which some low grade wash, lean low grade wash and rocky wash was re-classified as jig ore, which accounts for the figures in column "Changed by Drilling".

b. Prospective Ore:

Although exploratory drilling has not been completed at this property, it is not expected that there will be any appreciable increase in the reserve tonnage through additional drilling, but, with new developments in further concentration of re-treat ores, the tonnage of these ores will eventually increase.

c. Estimated Analyses:

(continued)

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1946

4. ESTIMATE OF
ORE RESERVES:
(Continued)

c. Estimated Analyses:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alu.</u>
<u>North Star-Bingham:</u>						
Bess. Direct,	3,125	57.73	.032	13.36	.32	3.20
Non-Bess. Direct,	30,322	57.84	.050	12.42	.30	3.50
Bess. Wash Concts.	529,677	58.86	.032	10.14	.17	.51
Non-Bess. Wash Concts.	629,686	57.59	.057	10.82	.28	.54
Bess. Retreat Concts.	131,586	58.50	.040	10.50	.16	.40
Non-Bess. Retreat Concs.	253,932	58.00	.050	11.00	.24	.41
Total,	1,578,328	58.20	.046	10.63	.23	.56
<u>Holman-Brown:</u>						
Bess. Wash Concts.	2,130,761	59.21	.030	9.52	.19	.41
Non-Bess. Wash Concs.	1,869,360	57.87	.058	9.95	.15	.53
Bess. Retreat Concts.	817,665	58.50	.038	10.50	.16	.40
Non-Bess. Retreat Concts.	1,898,167	58.00	.050	11.00	.16	.40
Total,	6,715,953	58.41	.044	10.18	.17	.44
Total Direct,	33,447	57.83	.048	12.51	.30	3.47
Total Bess. Wash Concs.	2,660,438	59.16	.030	9.64	.18	.42
Total N. " Wash Concs.	2,499,046	57.80	.058	10.17	.18	.53
Total Wash Concts.	5,159,484	58.50	.044	9.90	.18	.47
Total Bess. Retreat Concs.	949,251	58.50	.038	10.50	.16	.40
Total Non-Bessemer Retreat Concts.	2,152,099	58.00	.050	11.00	.24	.41
Total Retreat Concs.	3,101,350	58.15	.046	10.85	.21	.41
Total Bessemer,	3,612,814	58.98	.032	9.88	.18	.42
Total Non-Bessemer,	4,681,467	57.89	.054	10.56	.18	.48
GRAND TOTAL,	8,294,281	58.37	.044	10.27	.18	.46

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1946

5. LABOR & WAGES:

a. Comments:

(1) Labor:

The supply of labor barely kept pace with requirements during 1946, and a general falling off of labor efficiency was noted.

A strike, which was general in the industry, prevailed from February 7th to May 22nd.

b. Comparative Statement of Wages and Product:

PRODUCTION

Concentrates	529,070 tons
Direct Ore	5,433 tons
Total,	<u>534,503 tons</u>
Number of Days Operated	100
Average Number of Men Working	188
Average Wages per Day	\$ 10.34
Product per man per day	22.10 tons
Labor Cost per Ton	\$.364
Total Number of Days	18,810
Amount Paid for Labor	\$ 194,399.10

6. SURFACE:

a. Buildings, Repairs:

Total expenditures on repairs to rented houses in Taconite during 1946 amounted to \$ 7,938.25. Necessary repairs were made on fifty-one (51) houses. These repairs were mainly foundation replacements and exterior painting, together with normal maintenance work.

c. Tracks, Roads, Transmission Lines, etc:

The usual maintenance work on the crude ore line and plant tracks was carried forward. The track to the new plant site was constructed during the fall to facilitate the plant moving.

Construction of the truck haulage road to the dump site, north of the pit, was started in December. Extension of the drainage ditch along the north side of the pit was completed and the discharge line for pit drainage extended in order to discharge water away from swampy area on the north bank of the pit.

Considerable relocating of transmission lines, both on the surface and in the pit, was necessary during the year, due to plant moving and installation of conveyor system, together with the construction of screening and crushing plant in pit.

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1946

7. OPEN PIT:

a. Stripping:

Stripping operations to remove surface and waste from the Brown No. 2, were continued from 1945 on a twenty-shift a week basis, with swing crew. This continued with good progress, until the strike was called on February 7th. The program was resumed upon suspension of the strike on May 22nd, on the same schedule, and continued until June 24th, when the schedule was reduced to ten-shifts per week to accommodate the ore schedule. This continued until August 19th, when the stripping was carried on concurrently with ore operations on fifteen-shifts per week until the completion of the ore loading; at which time, the twenty-shifts per week schedule was resumed, until completion of this program on November 30, 1946. A total of 1,472,953 cubic yards, at a cost of \$.218 per yard, completed this work on E&A #MC-78. This compares to an estimated cost of \$.185. However, approximately forty-five per cent (45%) of this yardage was moved after the strike, with a resultant higher cost for labor and supplies. All of the material on this program was deposited on the dumps to the East. On December 1st, work was started on E&A #MC-107, which program calls for the removal of an estimated 100,000 cubic yards of surface from the southwest corner of the Holman-Cliffs lease; 110,000 cubic yards of surface in an approach on the north side of the pit; 130,000 cubic yards on Brown No. 2 surface; 450,000 cubic yards on Brown No. 2 taconite; 465,000 cubic yards on Brown No. 2 paintrock and, 245,000 cubic yards of Brown No. 2 lean ore and waste material, or a total of 1,500,000 cubic yards. This will uncover a portion of the lower ore body in the Holman and Brown No. 2 leases. The work of cutting a new approach road to the dump area to the north, which was started in December, caused considerable difficulty, due to the fact that the road had to be cut through a muskeg and blue clay area, which was saturated with water. Bad slides twice partially buried the shovel and the material, being wet and sticky, caused considerable delay in sticking to the truck boxes and the shovel dipper.

The following table shows the classes and quantities of material stripped from the several leases during the year:

<u>Lease</u>	<u>Surface</u>	<u>Waste</u>	<u>Lean Ore</u>	<u>Taconite</u>	<u>Total</u>
Brown,	805,840	124,676	5,345	134,829	1,070,690 cu.yds.

f. Explosives, Drilling & Blasting:

<u>Statement of Explosives Used:</u>	<u>Quantity</u>	<u>Price</u>	<u>Amount</u>
Plain Primacord	29,000'	\$32.00	\$ 928.00
Reinforced Primacord	31,500'	33.00	1,039.50
No. 6 Blasting Caps	500	1.22	6.10
Clover Fuse	800'	.605	4.84
No. 20 Connecting Wire	16#	.5875	9.40
No. 2 Cap Crimpers	2	1.25	2.50
5 x 24 Nitramon Primers	268	4.00	1,072.00
Total Caps, etc.,			\$3,062.34

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1946

7. OPEN PIT:
(Continued)

f. Explosives, Drilling & Blasting:
(Continued)

	<u>Quantity</u>	<u>Price</u>	<u>Amount</u>
1-1/8 x 8 70% Hi Velocity	128#	\$ 14.25	\$ 18.23
5 x 16 60% Spec. Gel.	31,000#	13.06	4,050.00
3 x 10 60% Spec. Gel.	16,800#	12.25	2,059.00
5 x 16 25% Quarry Gel.	64,050#	10.62	6,802.50
No. 4 Bag	22,150#	10.32	2,286.25
1 1/4 x 8 50% Deep Ditching	100#	11.00	11.00
5 1/2 x 10 Nitramon A	33,134#	13.00	4,307.42
5 1/2 x 24 Nitramon C	22,402#	13.00	2,912.26
Total Powder,			\$22,446.66
<u>Grand Total- All Explosives,</u>			<u>\$25,509.00</u>

g. Open Pit Mining and Loading:

The ore loading season for 1946 was started on June 24th, on a basis of two-shifts per day, and five days a week. This schedule was continued until August 19th, when operations were increased to three-shifts a day, and five days per week, until the end of the ore season on November 7th. A total of 846,584 tons of crude ore was mined and treated, yielding 529,070 tons of concentrates. Direct ore was loaded on three shifts at the end of the season from the Bingham and 5,433 tons were produced for a grand total from the pit of 852,017 tons.

Owing to the fact that stripping had been delayed in the Brown No. 2, due to the strike, ore operations were started in the Bingham lease and carried on from this lease during June and the early part of July. One shovel was operated in a channel of borderline ore, with high silica, but fair natural iron. This ore immediately overlaid the paint rock layer, which caused considerable difficulty in maintaining truck roads. It was necessary, at times, to sort and haul layers of jig ore, which was intermingled with the wash ore. For grading purposes, Bingham ore was also mined the last few days in October, and the first part of November.

The bulk of the production for 1946 was obtained from the Brown No. 2 upper ore layer, which had been uncovered by previous stripping program. Although the grade of this ore was good, except for high manganese content, a considerable flow of water developed, which, due to the nature of the ground, would not soak through to the lower part of the pit, where sumps are located, but had to be carried in ditches through the narrow area, where operations were in progress. This caused the ore to be very wet and sticky, and limited the production to the amount of ore that could be run through the crude ore bin at the washing plant. Here, the wet, sticky material hung up on sides of the crude ore bin and formed a heavy mat on the scalping screen, with the result that it was necessary to slow down the feed, to prevent

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1946

7. OPEN PIT:
(Continued)

g. Open Pit Mining and Loading:
(Continued)

the ore from being carried over into the rock chute. As a result, it was only possible to maintain an average shift production of 3,333 tons.

k. Drainage:

As all the operations were maintained at higher levels, no pumping was necessary in the Bingham lease during 1946.

The Holman-Brown pumping set-up in the pit was not changed, as water encountered at the higher mining level was ditched by gravity to the existing sumps. The discharge from these pumps was extended approximately 500 feet east of the old discharge, into the ditch, which had previously been evacuated in order to carry water beyond a swamp located on the north bank of the pit. In addition, a ditch was dug across O.I.M. Co. NW-NW Section 22 to intercept run-off water from the north and the west and to divert this water away from this same swampy area.

8. COST OF OPERATION:

a. Comparative Mining Costs:

	1946 BUDGET ESTIMATE	1946 COST PER TON	1945 COST PER TON
<u>PRODUCT:</u>			
Concentrates (tons)	535,000	529,070	780,764
Direct Ore (tons)	5,000	5,433	99,001
Total,	540,000	534,503	879,765
<u>Average Shift Production (tons)</u>			
Concentrates and Direct, -		2,104	2,599
Tons Per Man Per Day		28.42	30.98
Days operated		100	166
<u>COST:</u>			
Direct Ore	\$.173	\$.208	\$.145
Open Pit Wash Ore	.243	.293	.227
General Open Pit Expense	.132	.085	.111
Concentrating	.185	.221	.172
Stocking & Loading Concentrates	.004	.016	.004
General Mine Expense	.123	.129	.100
Idle and Winter Expense	.288	.307	.180
Cost of Production	\$.973	\$ 1.047	\$.765

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1946

8. COST OF
OPERATION
(Continued)

a. Comparative Mining Costs:
(continued)

<u>COST: (Continued)</u>	<u>1946</u> <u>BUDGET</u> <u>ESTIMATE</u>	<u>1946</u> <u>COST PER</u> <u>TON</u>	<u>1945</u> <u>COST PER</u> <u>TON</u>
Depreciation- Plant & Equipment		\$.101	\$.130
Depreciation- Motorized Equipment		.040	.061
Amortization of Stripping		.348	.300
Taxes - Ad Valorem		.220	.125
Taxes - Occupational		.030	.030
Taxes - Royalty		.016	.102
Amortization of Leasehold		.178	-
Total Cost at Mine		\$ 1.980	\$ 1.513
Administrative Expense		.100	.100
Miscellaneous Expense and Income		.000	.005
GRAND TOTAL		\$ 2.080	\$ 1.618

Note: The above figures are from the December cost sheet for comparison only, and are subject to revision when final figures are obtained from Cleveland.

d. Detailed Cost Comparison:

(1) Product:

The average grade of the concentrates produced from the Holman-Cliffs Mine in 1946 was lower in quality than in 1945. A natural iron of 51.47% was obtained in 1946, compared to 53.31% in 1945, with the tonnage recovery dropping from 63.10% in 1945 to 61.10% in 1946.

The small amount of direct ore mined from the Bingham lease was also of slightly lower grade than in 1945.

(2) Open Pit Mining:

(a) Direct Ore:

The cost of mining direct ore in 1946 was \$.035 higher than the budget estimate and higher by \$.063 than the 1945 cost. Owing to the small tonnage moved in 1946, no comparison can be made to 1945 cost. More sorting of the lean and waste material in direct ore area than was anticipated accounted for the increase in cost over the budget estimate.

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1946

8. COST OF
OPERATION:
(Continued)

d. Detailed Cost Comparison: (Cont'd)

(2) Open Pit Mining: (Cont'd)

(b) Crude Ore:

The 1946 cost per ton was \$.050 higher than the budget and \$.066 higher than 1945 cost, figured on a concentrate basis.

A comparison with the budget estimate shows items "Locomotive and Cars Maintenance" and "Pit Roads and Ramps" having only nominal differences. All other items were higher, which was due, in a great part, to the low production. The item "Drilling and Blasting" was \$.002 higher, due to the necessity of moving unexpected taconite "horses" to obtain ore tonnage. "Power Shovels Operating" was \$.005 higher, as two shovels were operated for grading purposes. A new bucket was purchased and absorbed in operating costs, accounting for "Power Shovels Maintenance" being \$.004 above the budget. The nominal differences in "Locomotive and Cars Operating and Maintenance" and "Track Expense" were due entirely to low production. "Trucks Operating" and "Trucks Maintenance" were \$.019 and \$.008 higher, respectively, and was due to the low production and necessity of using old trucks.

The increase in cost in 1946 over 1945 of \$.066 per ton was distributed through all items, and was due to the increase in the cost of labor and supplies in 1946, after settlement of strikes.

(3) General Pit Expense:

The cost per ton under this heading was \$.047 lower than the budget and \$.026 lower than the 1945 costs.

Compared to the budget, "Pumping and Drainage" was \$.039 lower, as it had been planned to excavate a new sump in the pit bottom, but, due to the delay in stripping, - caused by the strike, equipment was not available and the work was not done. Expected lean and waste material was not encountered; therefore, no charges accumulated against this item.

"General Open Pit", "Open Pit Superintendent", and "Waste Pile Expense" have only nominal differences. The rate for deferred charge per ton under the item "Exploratory Drilling" was raised \$.022 per ton over the budget.

A comparison with the 1945 cost under "Pumping and Drainage" shows a decrease from 1945 cost of \$.019, due to the fact that no pumping was done from the Bingham lease in 1946. "Water Supply", "Open Pit Superintendent" and "Waste Pile Expense" show none, or only nominal differences. The rate per ton for deferred charges account for the increase of \$.030 in "Exploratory Drilling" over the 1945 costs.

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1946

8. COST OF
OPERATION:
(Continued)

d. Detailed Cost Comparison: (Cont'd)

(4) Concentrating:

The 1946 cost per ton under this caption was \$.036 higher than the budget and \$.049 higher than the 1945 costs.

Compared to the budget, "Transportation" was \$.016 higher, due to the low production. Also, "Washing", which was higher by \$.026, suffered from low production. "Power-Mill Machinery" and "General Expense" had only nominal differences. "Maintenance-Building and Machinery" was \$.005 lower, due to the maintenance being kept to a minimum, as the plant was to be dismantled and moved.

The greater part of the increase over the 1945 cost is due to the increased costs as a result of the wage increases after the strike and the balance, because of low production.

(5) General Mining Expense:

The cost per ton under this caption was \$.006 higher than the budget and \$.029 higher than the 1945 costs.

Compared to the budget, the increases are an accumulation of small differences in the individual items.

The increased cost over 1945 was due to an increase in costs, as a result of strike settlement.

(6) Idle and Winter Expense:

The 1946 cost per ton was \$.019 over the budget and \$.127 over the 1945 costs.

Compared to the 1946 budget, the increase was due entirely to the charging of watchmen at the mine and the mill during the strike period to this item.

The increased cost over 1945 is accounted for by the absorption of some \$58,000.00 from E&A #MC-88 in this item, and the extra expense of watchmen during the strike in 1946.

9. EXPLORATIONS
AND FUTURE
EXPLORATIONS:

During the year 1946, the J. S. Schultze Drilling Company drilled thirteen (13) exploratory holes, totaling 2,739 feet-8". Six of these holes, totaling 1,136'-0", were drilled on the north side of the Brown No. 2 lease, to determine ore limits in this area. The drill rig was then moved to the south side of the Brown No. 2 lease, across the line on O.I.M.Co. NW-SW to check ore along this line for possible negotiations with the Oliver Iron Mining Company for line ore. During January, the J. S. Schultze Drilling Company

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1946

9. EXPLORATIONS
AND FUTURE
EXPLORATIONS:
(Continued)

drilled thirty-three (33) holes, averaging 15' to 30' in depth in the tailings pond, to determine the area of tailings which can be concentrated by the fine ore plant.

During 1947, it is planned to complete sample drilling in the Brown No. 2 pit bottom, to obtain complete information on lower ore body in this area.

10. TAXES:

The following is a statement of the taxes for the years 1946 and 1945:

	1946	1945	Increase	Decrease
Holman Brown Mine,	\$78,708.87	\$76,331.84	\$2,377.03	
Bingham Mine,	15,897.86	28,401.35		\$12,503.49
North Star Mine,	7,080.26	6,762.85	317.41	
Holman-Cliffs Aux.Lands,	2,707.80	2,498.49	209.31	
Bingham-North Star Wash.				
Plant & Dump Lands,	126.02	114.18	11.84	
Holman-Brown Lands,	31.36	28.10	3.26	
Holman-Cliffs Shops and Office,	1,339.44	1,274.83	64.61	
Holman-Cliffs Personal Property,	8,439.17	6,830.29	1,608.88	
Total,	\$114,330.78	122,241.93		\$ 7,911.15
Rented Buildings,	1,076.03	1,027.76	48.27	
Grand Total,	\$115,406.81	\$123,269.69		\$ 7,862.88
Average Tax Rate,	118.87	113.61	5.26	

In all instances, excepting Personal Property, the increases are occasioned by increases in tax rates. Personal Property includes a stockpile of ore of 71,468 tons, whereas we had no ore in stock in 1945.

The decrease in Bingham Mine caused by shipments in 1945 from this property.

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1946

11. ACCIDENTS
AND
PERSONAL
INJURY:

8

There were/lost-time accidents at the Holman-Cliffs Mine during the year 1946: These are described as follows:

Name: Horace C. Riddell Date: June 20, 1946
Cause: Mr. Riddell was moving the shovel power cable away from the side of the truck, which was being loaded at the shovel, when a chunk of ore fell off the truck and hit his left leg.

Nature: Bruises over medial aspect of calf and ankle, with skin abrasions left leg. X-ray reveals fracture line through left medial malleolus, with no displacement of fragments.

Time Lost: Injured June 20th., - returned to work July 24th.
Compensation: \$ 116.00.

Name: George Newbauer Date: July 1st.
Cause: Mr. Newbauer was driving a Euclid truck down grade with a load, when something went wrong with the steering mechanism, causing the truck to leave the road and go over the bank, because brakes would not stop the truck.

Nature: Contusion of lower back and left gluteal area.
X-ray - negative.

Time Lost: Injured July 1st, - returned to work July 9th.
Compensation \$4.00.

Name: John Laine Date: October 24th.
Cause: Top of the bank came down and struck the corner of the shovel, as Mr. Laine was walking in the gangway. The roof and side of the shovel was caved in.

Nature: Laceration scalp, approximately 4 inches, laceration left thigh 4 to 5 inches deep and spreading with laceration offascia and muscle below.

Time Lost: Injured October 24th, - returned to work Dec. 4th.
Compensation: \$ 100.00.

Name: Carl Medalen Date: October 24th.
Cause: The top of the bank came down and struck the corner of the shovel #32.

Nature: Sprained back.

Time Lost: Injured October 24th. Paid for 4 hours Shovel Oiler at \$1.10 per hour on October 24th. Absent October 25th. Regular days off - Saturday and Sunday, October 26th and 27th. Worked October 28th, 29th and 30th as Oiler, \$1.10 per hour. Absent October 31st and November 1st. Regular days off - Saturday and Sunday, November 2nd and 3rd. Absent November 4th (but worked the following Saturday to make up this absence). Worked November 5-6-7-8-9 as Laborer at \$.96½ per hour. Regular days off, Sunday November 10th. Returned to Oiling at \$1.10 per hour on Monday, November 11th.

Compensation: \$ 19.00

412

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1946

11. ACCIDENTS
AND
PERSONAL
INJURY:
(Continued)

Name: Harold L. Bundy Date: November 20th.
Cause: Mr. Bundy and Mr. A. Mattfield threw an 8-ft. pan on a pile of pans; it bounced back and fell on Mr. Bundy's right foot. The pan struck edgewise, just back of the cap of his hard-toe shoe.
Nature: Contusion and laceration of left fourth toe.
Time Lost: Injured November 20th. Had not returned to work as of December 31st, 1946.

Name: Charles Hecomovich Date: November 20th.
Cause: Assumed that Mr. Hecomovich threw a shovel over side and into a 30-yard dump car from the ground; climbed into the car from end; stooped over to pick up the shovel, while clamshell was over coal hopper. When operator of crane swung over Hecomovich for another load, he did not see Mr. Hecomovich in the car and clamshell dropped on Mr. Hecomovich, who was in the end of the car.
Nature: (1) contusion and laceration middle occiput; (2) severe crushing of right shoulder with fracture of scapula-clavicle and upper 1/3 of right humerus; (3) crushing of right foot - extreme shock.

Time Lost: Injured November 20th. - had not returned to work as of December 31st, 1946.

Name: James A. Ondrasek Date: December 2nd.
Cause: Mr. Ondrasek drove the truck to Brown #1 dump and backed the truck over the edge of the dump. As the truck was sliding down the side of the dump, on all four wheels, he jumped from the cab and landed on a level part of the dump, about 5 feet from edge.
Nature: Fractured pelvis, injury to both hips and bruised head.
Time Lost: Injured December 2nd, - had not returned to work as of December 31, 1946.

Name: Russell Wivell Date: December 24th.
Cause: Mr. Wivell was helping to install a differential in a truck, when the hook on the chain of the hoist broke and the differential dropped, striking Mr. Wivell on his right leg.
Nature: Sprained right ankle and superficial lacerations anterior surface of leg.
Time Lost: Injured December 24th; returned to work January 6, 1947.
Compensation: \$ 20.00.

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1946

12. NEW CONSTRUCTION
AND PROPOSED
NEW CONSTRUCTION:

During 1946, a temporary ore-loading ramp was constructed on the north side of the Brown No. 2. A start was made on construction of a truck washroom, attached to the new truck shop, but the work was suspended, due to the shortage of cement. Starting late in the summer and through the fall, to the first of the year, work was pushed on dismantling and moving the plant, construction of screening and crushing plant in the pit, and a conveyor system from the pit to the plant, together with all auxiliary installations.

13. EQUIPMENT AND
PROPOSED
EQUIPMENT:

The following new equipment was purchased for the Holman-Cliffs Mine in 1946:

- 2 - 20-ton Euclid trucks
- 1 - TD18 International Tractor with bulldozer
- 1 - 4-ft. Radial drill
- 1 - 5-cubic yard dipper for No. 57 shovel
- 1 - Monarch lathe
- 1 - Ford pick-up truck
- 1 - Willys Jeep

14. MAINTENANCE
AND REPAIRS:

The repairs to locomotives, cars and washing plant were completed in the late spring and early summer, after the strike. No repairs were made to the locomotives and cars after the ore season, as their use will be discontinued. The washing plant machines were given necessary repairs as they were removed from the plant. Shovels and blast drills were given overhauling during the spring and fall months. Repairs to trucks, tractors and graders were carried on as the need arose, all during the year.

19. WASHING PLANT
OPERATIONS:

The mill operated on the same schedule as the pit, treating 846,584 tons of crude ore, producing 529,070 tons of concentrates for a net tonnage recovery of 61.10%. The average production per shift was 2,083 tons, compared to 2,589 tons in 1945.

This low production was caused throughout the entire season by the nature of the ore. Water seepage in the pit made the ore very wet and sticky, limiting the amount of ore put through the plant. This sticky material hung up on the sloping sides of the crude ore pocket, making it necessary to poke the ore down, and also formed a heavy mat on the scalping screen, so that it was necessary to slow

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1946

19. WASHING PLANT
OPERATIONS:
(Continued)

down the feed to prevent the ore from being carried over into the rock bin. Considerable delay toward the latter part of the season was also caused by breakdowns on the old 5' x 14' Robins screen. Replacement screen had been ordered, but not delivered, due to the strike at the Allis-Chalmers plant.

The fine ore plant was operated steadily throughout the season, but the tonnage recovered was small, due to the low grade tailings being treated.

A shortage of Great Northern Railway cars from time to time made it necessary to stockpile concentrates, by truck, and 113,606 tons were placed in stock.

The tonnage and analysis of the plant rejects for 1946 were as follows:

5 x 14 Screen Rejects

<u>Lease</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Brown	51,461	28.87	.029	52.73
Bingham	6,835	28.77	.029	54.82
Total,	58,296	28.86	.029	52.98

36" Belt Rejects

Belt rejects were not taken during 1946.

The rock removed from the pit and placed on the waste dump, was as follows:

<u>Lease</u>	<u>Tons</u>	<u>Iron</u>
Brown	3,196	30.61
Bingham	36	31.15
Total,	3,232	30.62

The following material was removed during mining operations:

<u>Lease</u>	<u>Clean-Up</u>	<u>Lean Ore</u>	<u>Paintrock</u> <u>Lean Ore</u>	<u>Waste</u>	<u>Surface</u>	<u>Total</u> <u>Cu. Yds.</u>
Bingham,	-	2,749 *	-	-	-	2,749

(* Figure shown is lean ore jig)

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1946

19. WASHING PLANT
OPERATIONS:
(Continued)

The analysis of the product from the various machines for the year 1946 was as follows:

<u>Lease</u>	<u>Log Washer</u>			<u>Classifier</u>			<u>Tailings</u>
	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Iron</u>
Brown	56.30	.037	9.50	55.78	.037	10.77	24.71
Bingham	55.38	.043	15.27	56.46	.043	13.48	20.86

The concentration data for the Holman-Cliffs Mine for the year 1946 was as follows:

	<u>Tonnage</u>	<u>Percentage of Total Mined</u>	<u>Per Cent. Iron Dried</u>	<u>Tonnage Recovery</u>	<u>Iron Unit Recovery</u>
Crude Ore and Rock Mined,	908,112	100.00	43.44		
Less: Rock removed in Mining	3,232	.36	30.31		
Crude Ore transported to mill	904,880	99.64	43.49		
Less: Rock rejects in Screen Plant	58,296	6.42	28.86		
Crude Ore entering Mill	846,584	93.22	44.50		
Concentrates Produced	529,070	58.26	56.03	62.49	78.69
Rock rejects mill picking belt,	-	-	-		
Tailings (by deduction)	317,514	34.96	25.27		
Total heads, as above,	846,584	93.22	44.50		

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1946

1. GENERAL:

The normal winter stripping and repair work, begun at the close of the 1945 ore season, was continued from January 2nd, until February 7th, when all operations were discontinued because of the steelworkers' strike. The strike was terminated May 22nd, and repair work was immediately resumed at the plants and shop. Because of soft roads and power line relocation, resumption of stripping operations was delayed until May 27th.

Repair work at the mine shops was conducted on a one-shift per day, 5-day week basis until after the strike, when a six-day schedule was required. The Holman steam locomotives and 30-yard cars were repaired and returned. The three electric locomotives and Hill-Trumbull cars were given a general overhaul and prepared for ore service. The 2-yard Marion shovel, used for stockpile loading, was given a general overhaul. In addition, general running repairs were made on all operating equipment used in the stripping program.

At the plants, repair and construction work was continued on a one-shift, 5 day basis until after the strike when, in order to complete repairs to the washing plant by July, the schedule of repair was increased to 2 shifts, 6 days per week. General repairs were conducted on logs, classifiers, screens, belts, etc., in both the wash and retreat plants. Because of delays in receiving retreat plant machinery, repair work was concentrated in the wash plant and it was placed in operation July 1st, as scheduled. Repair and construction work in the retreat plant was completed on August 12th.

The pit screening plant and conveyor system were given necessary repairs, including repairs to belts, electrical equipment, feeders, screens, and relining of chutes and hoppers.

Ore operations for the 1946 season, originally scheduled to begin about May 15th, were started on July 1st, on a 10-shift per week basis, which was increased on July 15th, to a 15-shift operation. Until September 1st, the pit work was continued on a 20-shift per week basis and, when not loading ore, the time was utilized to complete the stripping program which was set back by the strike. From September 1st to October 31st, the pit operated on a 3-shift, 5-day week basis.

From July 1st until August 12th, wash ore only was loaded. From August 12th, when the retreat plant was started, until the end of the ore season, both wash and retreat ores were loaded, operations being shifted from one to the other as plant operations required. A total of 1,050,359 tons of crude ore was produced for concentration.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1946

1. GENERAL:
(Continued)

A scam crew, consisting of a 3-yard shovel and 2-3 trucks, worked from July 15th until November 1st, cleaning out ore pockets in the East and Middle Hill scam areas. Although production was very slow, due to the nature of the remaining ore bodies, approximately 30,000 tons of concentrates were produced from this area.

No direct ore was produced from the Hill-Trumbull Mine during 1946.

Washing plant operations were conducted on the same schedule as ore operations in the pit, producing 436,022 tons of wash concentrates and 168,684 tons of retreat feed. Production through the season averaged 2,429 tons per shift, and was considerably reduced by numerous delays, due to breakdowns in the plant.

The retreat plant went into operation on August 12th, working one shift per day until September 3rd, when a 3-shift, 5-day week schedule was adopted. Because of lack of medium washing screens, only half of this plant could be operated and, consequently, it was necessary to again stock the washed retreat ore and feed it into the mill with a tractor. The plant produced 154,018 tons of retreat concentrate. Because of the method of operation, no accurate figure for production per shift could be computed.

Because of a shortage of shipping cars and occasional grading problems, 101,369 tons of washed concentrates were placed in stockpile during the 1946 season. From the 1945 season, 13,513 tons remained in stock in the spring, giving a total available stockpile for the year of 114,882 tons. Of this, 78,364 tons were shipped, leaving 36,518 tons in stockpile at the end of the shipping season.

The stripping program along the north bank of the Hill and Trumbull leases, begun at the close of the 1945 season, was carried on until February 7th, stopped by the strike, resumed May 27th, and completed August 31st. This work involved removal of surface material from the shallow body remaining on the north edge of the Hill and Trumbull forties, and should complete the development in that area.

At the close of the 1946 ore season, a new stripping program was started, removing surface and waste material from the Oliver lands along the south line of the East and Middle Hill forties. This stripping will make available the Hill slope ore along this line. Oliver ore, which must necessarily be removed to accomplish this, will be mined for their account.

The structure drilling program carried on under contract, was discontinued in February, when the Trumbull exploratory work was completed. Upon completion of plans for drilling on the north side of the Hill lands, the work was resumed in November.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1946

2. PRODUCTION,
SHIPMENTS &
INVENTORIES:

a. Production by Grades:

Hill Crude, -----	299,162 tons
Trumbull Crude, -----	427,867 "
Hill Retreat Crude, -----	172,282 "
Trumbull Retreat Crude, -----	151,048 "
<hr/>	
TOTAL CRUDE ORE, -----	1,050,359 "
Hill Non-Bessemer Concentrates, -----	100,877 "
Hill Bessemer Concentrates, -----	74,043 "
Hill Non-Bessemer Retreat Concentrates, -----	11,473 "
Hill Bessemer Retreat Concentrates, -----	66,612 "
Trumbull Non-Bessemer Concentrates, -----	165,400 "
Trumbull Bessemer Concentrates, -----	95,702 "
Trumbull Non-Bessemer Retreat Concentrates, -----	13,338 "
Trumbull Bessemer Retreat Concentrates, -----	62,190 "
<hr/>	
TOTAL PRODUCTION, -----	589,635 "

b. Shipments:

Hill Non-Bessemer Concentrates, -----	78,551 "
Hill Bessemer Concentrates, -----	74,043 "
Hill Non-Bessemer Retreat Concentrates, -----	11,473 "
Hill Bessemer Retreat Concentrates, -----	66,612 "
Trumbull Non-Bessemer Concentrates, -----	164,721 "
Trumbull Bessemer Concentrates, -----	95,702 "
Trumbull Non-Bessemer Retreat Concentrates, -----	13,338 "
Trumbull Bessemer Retreat Concentrates, -----	62,190 "
<hr/>	
TOTAL SHIPMENTS, -----	566,630 "

c. Stockpile Inventories:

Washed concentrates in stockpile, January 1st, 1946, amounted to 13,513 tons. This was loaded out early in June, and ore again stockpiled during the 1946 season. A large portion of this was loaded out in November, leaving a stockpile balance, on December 31, 1946, of 36,518 tons.

The following amount of lean material is now in stockpile:

Concentrating Material Above 25%.

<u>Lease</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Hill,	55,439	29.37	.037	52.71
Trumbull,	526,052	29.51	.034	52.39
<hr/>				
Total,	581,491	29.50	.034	52.42

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1946

2. PRODUCTION,
SHIPMENTS &
INVENTORIES:
(Continued)

Non-Concentrating Material Above 35%

<u>Lease</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Hill,	142,833	48.50	.081	21.90

Coarse Non-Concentrating Material Above 40%

<u>Lease</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Hill,	7,527	33.23	.028	43.33

e. Production by Months:

(1) Crude Ore:

<u>MONTH</u>	<u>HILL</u> <u>WASH</u>	<u>HILL</u> <u>RETREAT</u>	<u>TRUMBULL</u> <u>WASH</u>	<u>TRUMBULL</u> <u>RETREAT</u>	<u>TOTAL</u>
July,	164,733	-	94,058		258,791
August,	85,173	15,833	202,711	13,508	317,225
September,	27,465	61,765	113,824	74,737	277,791
October,	21,791	94,684	17,274	62,803	196,552
TOTAL,	299,162	172,282	427,867	151,048	1,050,359

(2) Concentrates:

	<u>HILL</u> <u>CONCTS.</u>	<u>HILL</u> <u>RETREAT</u> <u>CONCTS.</u>	<u>TRUMBULL</u> <u>CONCTS.</u>	<u>TRUMBULL</u> <u>RETREAT</u> <u>CONCS.</u>	<u>TOTAL</u>
June,	2,494		7,442		9,936
July,	96,752		59,657		156,409
August,	47,291	5,424	118,866	7,508	179,089
September,	15,634	29,486	65,584	33,472	144,176
October,	12,586	43,175	9,553	27,789	93,103
November,	163	-	-	6,759	6,922
TOTAL,	174,920	78,085	261,102	75,528	589,635

f. Ore Statement:

As of December 31, 1946, there is in stockpile 23,665 tons of Hill and 12,853 tons of Trumbull washed concentrates, for a total of 36,518 tons.

g. Delays:

The following delays were reported for the 1946 season:

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1946

2. PRODUCTION,
SHIPMENTS &
INVENTORIES:

(Continued) g. Delays: (Continued)

Pit Delays (no crude ore)

<u>Hours</u>	<u>Minutes</u>	<u>Cause</u>
10	-	Moving shovel for grading
4	-	Repairs to pit conveyor system
6	30	Repairs to pit screening plant
3	45	Power off, storms
1	30	Repairs to shovels
<u>25</u>	<u>45</u>	

Haulage Delays

2	30	Power failure on electric locomotives
	45	Track repairs
3	-	Derailments
4	15	Repairs to locomotives
1	45	Setting out B.O. cars
<u>12</u>	<u>15</u>	

Washing Plant Delays

67	45	Repairs to 5 x 14 screens
20	15	Repairs to conveyors
7	15	Plugged chutes
2	-	Repairs to log screens
3	45	Repairs to logs
5		Plugged crushers
2		Plugged tailings lines
4	30	Repairs to classifiers
17	30	Repairs to S.M.C. machines
1		Pumps and water lines
1		Power failures, storms
<u>133</u>	<u>-</u>	

Retreat Plant Delays

4	-	Repairs to wash screens
10	30	Repairs to heavy density classifier
1	45	Repairs to feeder
2	15	Plugged chutes
3		Repairs to pumps
16		Tractor repairs
2	20	Repairs to 5 x 14 screen
9		Repairs to feed conveyor
3		No railroad cars
<u>52</u>	<u>-</u>	

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1946

2. PRODUCTION,
SHIPMENTS &
INVENTORIES:
(Continued)

g. Delays: (Continued)

Pit Delays:

Lost time on the pit screening plant was due to a bearing failure on the 5 x 14 screen and repairs to the feeder drive.

On the conveyor system, repairs to a belt holdback and a gear reducer account for the lost time.

Other items are self-explanatory.

Haulage Delays:

Locomotive repairs include a burned-out motor and a broken motor mounting. Lost time due to power failure on the locomotives was greatly reduced from previous years, due to installation of an automatic hi-speed circuit breaker in the line.

Other delays are self-explanatory.

Washing Plant Delays:

Because repair and re-assembly of the washing plant was so hurried, following the strike, its general condition was rather poor throughout the season. This was particularly true during the last month of operation. Lost time on the 5 x 14 screens was due almost entirely to their poor condition, particularly so in the case of the Robins screen, installed in place of a new Allis-Chalmers which was not received. Conveyor repairs were centered mainly on the crude conveyor and its drive which, because of the necessarily make-shift screen mounting, suffered from excessive vibration. The S.M.C. machines required numerous repairs to the drag chains which were of very poor quality and broke repeatedly.

During the winter repair season of 1946-1947, the plant will be properly overhauled and new equipment installed to insure a much better operating performance in 1947.

Retreat Plant Delays:

The three largest items of delay in this category, repairs to heavy density classifier, feeder and tractor were due also to the make-shift nature of repairs and plant arrangement made necessary by lack of equipment, ordered, but not received. The plant machines were generally overloaded with resultant failures. This plant will also receive a thorough repair job and with installation of more equipment, should show a great improvement in operation during the 1947 season.

It should be noted that plugging of the heavy density circuit, formerly the largest cause of delay, has been entirely eliminated with the installation of an Akins classifier to replace the cone.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1946

3. ANALYSIS:

a. Mine Analysis of Production:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Man.</u>	<u>Alum.</u>	<u>Moist.</u>	<u>Iron Nat'l.</u>
Hill N.B. Concts.	100,877	57.67	.052	11.36	.11	.41	5.31	54.60
Hill Bess. Concts.	74,043	55.83	.040	13.44	.12	.37	6.98	51.93
Hill N.B. Retreat Concts.	11,473	55.19	.041	15.82	.13	.40	5.92	51.92
Hill Bess. Re- treat Concs.	66,612	56.21	.039	14.01	.12	.38	5.88	52.91
Trumbull Non- Bess. Concs.	165,400	57.90	.056	9.93	.12	.39	5.77	54.56
Trumbull Bess. Concs.	95,702	57.65	.045	10.08	.13	.35	6.11	54.12
Trumbull N.B. Retreat Concs.	13,338	57.44	.050	10.05	.12	.36	4.63	54.78
Trumbull Bess. Retreat Concts.	62,190	55.21	.043	13.85	.11	.31	5.25	52.31
Total,	589,635	57.02	.048	11.63	.12	.37	5.83	53.70

b. Mine Analysis of Shipments:

Hill N.B. Concts.	78,551	57.77	.052	11.36	.11	.42	5.33	54.69
Hill Bess. Concts.	74,043	55.83	.040	13.44	.12	.37	6.98	51.93
Hill N.B. Re- treat Concs.	11,473	55.19	.041	15.82	.13	.40	5.92	51.92
Hill Bess. Retreat Concts.	66,612	56.21	.039	14.01	.12	.38	5.88	52.91
Trumbull NB Concts.	164,721	57.76	.055	10.11	.12	.39	5.98	54.31
Trumbull Bess. Concts.	95,702	57.65	.045	10.08	.13	.35	6.11	54.12
Trumbull NB Retreat Concs.	13,338	57.44	.050	10.05	.12	.36	4.63	54.78
Trumbull Bess. Re- treat Concs.	62,190	55.21	.043	13.85	.11	.31	5.25	52.31
Total,	566,630	56.95	.047	11.70	.12	.37	5.92	53.58

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1946

3. ANALYSIS:
(Continued)

c. Mine Analysis of Ore in Stockpile, Dec.31,1946:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Man.</u>	<u>Alu.</u>	<u>Moist.</u>	<u>Fe.Nat.</u>
Hill Concts.	23,665	57.24	.051	11.44	.11	.38	5.40	54.15
Trumbull Concts.	12,853	57.32	.052	10.30	.12	.33	5.62	54.10
Total,	36,518	57.27	.051	11.04	.11	.36	5.48	54.13

d. Average Analysis of Crude Ore Production:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Hill Crude	299,162	39.76	.035	38.88
Trumbull Crude,	427,867	40.60	.038	36.90
Total Crude,	727,029	40.26	.037	37.71
Hill Retreat Crude,	172,282	37.13	.030	43.48
Trumbull " Crude,	151,048	36.59	.032	42.69
Total Retreat Crude,	323,330	36.88	.031	43.11

e. Complete Analysis of Season's Shipments:

	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alu.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>
Hill Non-Bess. Concts.	57.77	.052	11.36	.11	.42	.27	.17	.010	4.89
Hill Bess.Concs.	55.83	.040	13.44	.12	.37	.29	.17	.010	5.63
Hill N.B.Retreat Concts.	55.19	.041	15.82	.13	.40	.28	.16	.010	4.14
Hill Bess. Re- treat Concts.	56.21	.039	14.01	.12	.38	.27	.18	.011	4.52
Trumbull Non- Bess.Concts.	57.76	.055	10.11	.12	.39	.25	.16	.010	6.20
Trumbull Bess. Concts.	57.65	.045	10.08	.13	.35	.25	.17	.010	6.42
Trumbull N.B. Re- treat Concts.	57.44	.050	10.05	.12	.36	.26	.17	.011	6.73
Trumbull Bess. Retreat Concs.	55.21	.043	13.85	.11	.31	.24	.15	.011	6.24

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1946

4. ESTIMATE OF
ORE RESERVES:

a. Developed Ore:
Assumption:

<u>Class of Material</u>	<u>Per Ton</u> <u>Cu. Ft.</u>	<u>Rock</u> <u>Deduction</u>	<u>Recovery</u>
Merchantable Ore	13	10%	100.00%
Wash Ore	14	-	60.81%
Lean Wash Ore	15	-	45.15%
Low Grade Wash Ore	14	-	59.80%
Lean Low Grade Wash Ore	15	-	42.60%
Rocky Wash Ore	14	-	54.85%
Jig Ore	14	-	38.84%

The above factors have been used in the preparation of the following estimate. They are based on actual experience in mining and on data secured from hand-wash tests of structure drill samples. Rock reduction on wash and jig ores are included in the calculation of the percentage of recovery.

The following tabulation shows the estimate of January 1, 1946, the ore mined during 1946 and the ore reserve estimate as of January 1, 1947:

	<u>RESERVE</u> <u>1-1-'46</u>	<u>MINED</u> <u>1946-</u>	<u>BALANCE</u> <u>AFTER</u> <u>MINING</u>	<u>DEVELOPED</u> <u>BY</u> <u>DRILLING</u>	<u>RESERVE</u> <u>1-1-'47</u>
<u>Trumbull Mine:</u>					
NE-SE- Sec. 18	5,966	6,194	228	228	-
NW-SW- Sec. 17	638,529	143,847	494,682	35,910	530,592
NE-SW- Sec. 17	1,260,044	186,589	1,073,455	155,739	1,229,194
Total Trumbull,	1,904,539	336,630	1,567,909	191,877	1,759,786
<u>Hill Mine:</u>					
SE-NW- Sec. 17	304,239	220,261	83,978	33,412	117,390
SW-NE- Sec. 17	336,492	8,114	328,378	10,007	338,385
SE-NE- Sec. 17	258,606	24,630	233,976	9,074	224,902
Total Hill,	899,337	253,005	646,332	34,345	680,677
GRAND TOTAL -					
HILL-TRUMBULL MINE	2,803,876	589,635	2,214,241	226,222	2,440,463

The ore reserves as of January 1, 1947, are the result of a new estimate on the Hill and Trumbull leases, and reclassification of wash and jig ores, based on mining experience and beneficiation results at both the wash and retreat plants.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1946

4. ESTIMATE OF
ORE RESERVES:
(Continued)

b. Prospective Ore:

With the completion of the stripping program along the north side of the Middle and East Trumbull forties, it seems evident that no further development is possible in that area. Some possibility exists of further development near the west line of the Middle Trumbull forty, if a low recovery jig ore in that area could be economically mined. A royalty reduction on ores of this nature might make their extraction feasible. This area, with that in the Southeast corner of the Trumbull pit, appear to be the only possibilities for further stripping of the Trumbull forties.

The drilling program, exploring a possible ore trough from the Hill to the Hill-Barbara pit, was begun in November. No positive statement can be made concerning this area until further drilling is done.

c. Estimated Analysis:

<u>Lease</u>	<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alu.</u>
<u>Hill:</u>							
Non-Bessemer Direct,		166,708	56.36	.063	10.78	.17	.97
Bessemer Concentrates,		239,712	59.50	.033	11.24	.10	.47
Non-Bessemer Concentrates,		274,257	59.06	.045	11.99	.11	.45
Total Hill,		680,677	58.55	.045	11.43	.12	.58
<u>Trumbull:</u>							
Bessemer Concentrates,		577,824	57.26	.042	10.23	.14	.49
Non-Bessemer Concentrates,		1,181,962	57.07	.049	10.54	.13	.48
Total Trumbull,		1,759,786	57.13	.047	10.44	.13	.48
TOTAL DIRECT,		166,708	56.36	.063	10.78	.17	.97
Total Bessemer Concts.		817,536	57.92	.038	10.52	.13	.49
Total Non-Bess. Concts.		1,456,219	57.44	.048	10.81	.13	.47
TOTAL CONCENTRATES,		2,273,755	57.61	.044	10.71	.13	.48
Total Bessemer,		817,536	57.92	.038	10.52	.13	.49
Total Non-Bessemer,		1,622,927	57.33	.050	10.74	.13	.53
GRAND TOTAL,		2,440,463	57.53	.046	10.67	.13	.52

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1946

5. LABOR & WAGES:

a. Comments:

(1) Labor:

A strike, called by the CIO Steelworkers, tied up all mine operations from February 7th to May 22nd. The supply of labor during the ore season was again very inadequate and, with a high absentee rate, resulted in excessive overtime payments. This situation was alleviated with the reduction of working forces of all mines in this region, and by December, the supply of labor was again plentiful. However, if production in 1947 proceeds at the anticipated high level, there probably will be a labor shortage during the coming ore season.

Labor-management relations, which deteriorated during and immediately following the strike, improved steadily and, at the year's end, were normal.

(2) Wages:

Under the terms of the strike settlement, a general increase of \$.185 per hour was granted to the entire force. Since so-called wage inequities have not yet been settled, no other changes in the wage schedule have been made.

b. Comparative Statement of Wages and Product:

PRODUCT, -----	590,040 Tons
Number of Shifts and Hours, -----	3 - 8-hr.
Average Number of Men Working, -----	143-1/2
Average Wage Per Hour, -----	\$1.256
Tons Per Man Per Hour, -----	2.99
Labor Cost Per Ton, -----	.424
Total Number of Hours, -----	288,590-1/2
Amount Paid for Labor, -----	\$362,343.03

6. SURFACE:

a. Buildings, Repairs:

An addition to the heavy density plant, to enclose additional machinery, was partially completed during the year. Other than this, only minor and necessary repairs were made to the mine buildings.

c. Tracks, Roads, Transmission Lines, etc:

The usual and ordinary maintenance work on these items was carried on through the year. Minor changes were made to transmission lines on the south side of the Hill lease, as required by stripping operations.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1946

7. OPEN PIT:

a. Stripping:

Stripping operations, in progress at the first of the year, were carried forward until February 7th, when halted by the strike. Work was resumed on a 7-day per week basis on May 27th and continued steadily until July 1st, when the washing plant was started. Stripping work was carried on from this date on shifts when no ore was loaded, until September 1st, when the project was completed.

Most of this work was accomplished with one 4-1/2-yard shovel, although a second shovel was used whenever possible. Trucks in use varied from 6 to 8, depending on haulage conditions and equipment available.

This work involved removal of surface material along the north bank of the West Hill and the East and Middle Trumbull forties. Surface material was disposed of on dumps to the north of the stripping area. Despite narrow cuts and poor working conditions, fair progress was made and costs obtained were near the budget estimate.

Upon completion of the ore season, a new stripping program was begun along the south line of the East and middle Hill forties. This work involved removal of surface and waste material on the Oliver Iron Mining Company lands to make available ore now tied up in slopes along the line. Operations were conducted with one 4-1/2-yard shovel, serviced by 6-8 trucks. Material removed was dumped on Oliver dump lands provided for this purpose. Production on this project was also hampered by narrow cuts, making for poor loading conditions; however, costs are, as yet, within the budget estimate.

The following tabulation shows the stripping material removed from the various leases in 1946:

<u>Lease:</u>	<u>Surface</u> <u>Cu.Yds.</u>	<u>Waste Ore</u> <u>Cu.Yds.</u>	<u>Lean Ore</u> <u>Cu. Yds.</u>	<u>Total</u> <u>Cu. Yds.</u>
Trumbull,	390,021	-	-	390,021
Hill,	341,725	-	-	341,725
Total,	731,746	-	-	731,746

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1946

7. OPEN PIT:
(Continued)

f. Explosives, Drilling and Blasting:

		<u>Quantity</u>	<u>Amount</u>
#4 Blasting Powder,	(lbs.)	113,000	\$12,530.00
3 x 10 - 25%,	"	18,700	2,095.00
5 x 16 - 60%,	"	13,000	1,678.50
40% R. C. Ex.,	"	100	11.00
60% R. C. Ex.,	"	1,000	130.00
#6 Blasting Caps,	C.	800	10.81
6' #6 CW EB Caps,	C.	50	4.33
Clover Fuse Wire,	Roll	900	6.80
Plain Primacord,	Ft.	46,000	1,472.00
Reinforced Primacord,	Ft.	1,000	33.00
Nitramon #2,	Lbs.	3,250	390.00
Nitramon A,	"	9,159	1,190.67
Nitramon Primers,	Ea.	160	640.00
#4 Cap Crimpers,	Ea.	1	1.50
TOTAL,			<u>\$20,193.61</u>

g. Open Pit Mining and Loading:

The 1946 ore season was begun on July 1st, the delay being due to uncompleted stripping and plant repairs. Because of uncompleted stripping work, the ore schedule was started on a two-shift, 5-day per week basis, and changed July 15th to a 3-shift, 5-day basis and carried through until October 30th, when ore loading ceased. One shovel, serviced by six trucks, was used through most of the season. A second shovel was used as conditions of grading or production required.

A total of 1,050,359 tons of crude ore was mined, of which 727,029 tons was wash and 323,330 tons retreat ore. Washed concentrates amounted to 436,022 tons and retreat concentrates 154,018 tons, giving a combined concentrate production of 590,040 tons. No direct ore was mined during the 1946 season.

Wash ore was mined from both Hill and Trumbull forties, with approximately 60% of the crude wash coming from the Trumbull. The Trumbull crude was split about evenly between the West and middle Trumbull forties. All Trumbull wash ore came from the north side of the pit, in the area stripped during the 1945-46 season. Ore from this region was loaded by one shovel and hauled to the screening plant without mixing, as there was no other area in the Trumbull which could produce material other than a lean jig ore to mix with it. This ore generally was of good grade, with about a 58% recovery and a fairly low moisture, which gave both a better production and a higher natural iron than had been anticipated. However, the wash ore areas were narrow and shallow and the 1946 operations completely exhausted the reserves in this region of the pit.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1946

7. OPEN PIT:
(Continued)

g. Open Pit Mining and Loading: (Cont'd)

Hill wash ore came almost entirely from the north bank of the West Hill in the newly-stripped area. From the East Hill scam area, a small amount of wash ore was produced which was mixed with the former.

The north bank ore produced a wash grade very similar to the Trumbull, although the silica was generally somewhat higher. Wash ore in this area is also exhausted.

The small amount of wash ore obtained from the East Hill was produced by a scrambling crew, consisting of a 3-yard shovel, serviced by two or three trucks. This ore was mined from narrow channels in the bottom rock and was stockpiled and later loaded out when it could be mixed with ores of higher grade. Most of the ore produced in this area was classified as retreat ore and was loaded out as such.

It now appears that considerably more ore can be recovered from the Hill scam area than was formerly thought possible. Much of the ore shown as wash is in reality retreat ore, but much of the rocky, lean areas can also be loaded out as retreat. With the liberalized attitude of the fee interests, who have allowed mixing lean wash with retreat ores in this area, a larger tonnage can now be recovered. However, because of the difficulties involved in mining these small channels and ore pockets, production from this region will be slow and it is still a question whether or not this operation will be a profitable one.

Retreat ores were mined from both the Hill and Trumbull forties, being about equally split between them. The major part of this ore was produced from the newly-stripped area along the north bank, although some retreat ore was produced from the Hill scam area and the Southeast Trumbull, just west of the conveyor tunnel.

In September, a special test run was made on retreat crude from the Hill-Annex lean ore stockpile. A concentrate, averaging 55.90% iron was obtained, with a recovery of about 36%. This pile of about 1,500,000 tons of crude, is available and the possibility of its use for the 1948 season is being investigated.

Upon completion of the ore season, a special test was again run on lean retreat ores. From results of these tests, future plant operating plans have been made which include the possible use of low-recovery retreat ores now exposed or in the margins of the present pit. Again, it might be indicated that a royalty reduction on these ores, possibly based on a sliding scale governed by recovery, would do much to make concentration of these ores economically attractive.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1946

8. COST OF
OPERATION:

a. Comparative Mining Costs:

<u>PRODUCT</u>	<u>1946</u> <u>BUDGET</u>	<u>1 9 4 6</u> <u>COST PER TON</u>	<u>1 9 4 5</u> <u>COST PER TON</u>
Wash Concentrates, (tons)	155,000	436,022	477,389
Retreat Concentrates, (tons)	418,000	154,018	359,296
 Total Production, (tons)	 573,000	 590,040	 836,685
 Average Daily Product, Tons Per Man Per Day, Days Operated,		 6,345 23.92 93	 5,133 30.25 163
 <u>COST:</u>			
Open Pit Crude Ore,	\$.247	\$.217	\$.210
General Pit Expense,	.068	.043	.050
Concentrating,	.284	.253	.272
Stocking Concentrates,	.004	.006	.006
General Mine Expense,	.121	.115	.108
Winter and Idle Expense,	.241	.234	.173
 Cost of Production,	 \$.965	 \$.868	 \$.819
Amortization- Defense Facilities,	-	-	-
Depreciation- Plant & Equipment,	-	.084	.120
Depreciation- Motorized Equipment,	-	.030	.042
Amortization- Stripping,	-	.370	.250
Taxes - Ad Valorem,	-	.123	.089
Taxes - Occupational,	-	.020	.025
Taxes - Royalty,	-	.079	.086
 Total Cost at Mine,		 \$1.574	 \$1.431
Administrative Expense,	-	.100	.100
Miscellaneous Expense & Income,		<u>.003</u>	<u>.003</u>
 Grand Total,		 \$1.671	 \$1.528

Because final charges have not yet been received from the Cleveland office, the figures for 1945 and 1946 were obtained from the December cost sheets and are, therefore, comparable.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1946

8. COST OF OPERATION:
(Continued)

d. Detailed Cost Comparison:

(1) Product:

The proposed ore schedule anticipated a production of 155,000 tons of washed concentrates and 418,000 tons of retreat concentrates, for a total of 573,000 tons. The delayed start of the ore season and lack of retreat plant equipment and capacity, forced a revision of these figures and the actual mine production was 436,022 tons of wash and 154,018 tons of retreat concentrates, for a total of 590,040 tons.

(2) Open Pit Mining:

The crude ore costs as shown are on a concentrate basis and show a decrease of \$.030 under the budget and an increase of \$.007 over 1945. Actual mining costs per ton of crude ore were \$.122 in 1946, \$.097 in 1945, with a budget estimate of \$.105. The increase over 1945 and the budget was due to increases in drilling and blasting costs and in truck operation and repair. This increased cost can be laid to reduced production occasioned by excessive plant delays and to increased costs of labor and supplies. Shovel loading and maintenance costs for 1946 and 1945 were identical. The decrease in costs on a concentrate basis, under the budget, and only slight increase over 1945, was due to a higher concentrate recovery than had been anticipated, caused, mainly, by the reduction in the retreat fraction of the product.

(3) General Pit Expense:

Reduction in costs in this category under 1945 figures was due mainly to a reduced pumping charge. No work was done in the pit bottom and it was unnecessary to keep this area drained. Reduction of \$.025 under the budget was due to the change in operating plans, as explained under Mining.

(4) Concentrating:

Concentrating cost was \$.019 under 1945 and \$.031 under the budget. This saving was due, almost entirely, to the increased mill recovery, due to the large proportion of wash ore treated. The only items showing an increase in 1946 over 1945, were Pumping, due to a larger amount of water used in the S.M.C. machines and Maintenance, due to the construction and repair work continued throughout the season.

Stocking of concentrates was \$.002 over the budget and the same as 1945. This was due to the stocking of more concentrate than had been originally intended.

(5) General Mine Expense:

Costs here showed an increase of \$.007 over 1945 and a decrease of \$.005 under the budget. Increase over 1945 of \$.007 was shown in Vacation Pay. Other items were about equal. Small reductions in various items accounted for the 1946 cost being under the budget estimate.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1946

8. COST OF OPERATION:
(Continued)

d. Detailed Cost Comparison:
(Continued)

(6) Idle and Winter Expense:

In 1946, this cost was \$.007 over 1945 and \$.068 over the budget. This large increase was due mainly to the strike which delayed repairs and necessitated many changes that proved costly.

9. EXPLORATIONS:

The structure drilling program continued on the north bank of the Trumbull until terminated by the strike. Since all information necessary in this area had been obtained by then, the drilling was stopped. Work was resumed in November, on the north side of the Hill pit, checking a possible limb of the Hill ore body extending Northeast from the Hill to the Hill-Barbara pit.

Three exploratory holes were completed for a total of 289 feet. Two holes, totaling 265 feet, were drilled on the West Hill forty and one drilled 24 feet to completion at 150' on the Trumbull.

Sample drilling with a vertical auger type drill, was started in December along the South Hill line. A total of 166 feet was drilled by December 31st.

10. TAXES:

The following table shows a comparative statement of the taxes and average rate at the Hill-Trumbull Mine for the years 1945 and 1946:

	1946	1945	Increase	Decrease
Hill Mine,	\$19,675.08	\$18,449.25	\$1,225.83	
Trumbull Mine,	30,209.74	40,323.72		\$10,113.98
Hill-Trumbull Shops,	1,238.15	1,186.00	52.15	
Hill-Trumbull W.P.Lands,	8,694.65	8,431.60	263.05	
Personal Property,	7,816.29	6,352.49	1,463.80	
Total,	\$67,633.91	\$74,743.06		\$ 7,109.15
Village Lots,	461.69	442.26	19.43	
Grand Total,	\$68,095.60	\$75,185.32		\$ 7,089.72
Average Tax Rate,	133.11	127.56	5.55	

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1946

10. TAXES:
(Continued)

The increase in the Hill Mine, is due to reclassification of 132,000 tons of ore from undeveloped to developed status.

Reduction on Trumbull property account of 1945 shipments from the property.

Shops, washing plant lands and Village lots are increased, due to higher tax rate.

Personal Property includes 13,513 tons washed ore in stock May 1st, 1946. None in stock May 1st, 1945.

11. ACCIDENTS
AND
PERSONAL
INJURY:

There were four lost-time accidents during 1946, which are described as follows:

Name: Claude Lipe Date: January 14th.
Cause: He tripped on a frost chunk or rock and fell against truck wheel.
Nature: "Contusion of eleventh rib- right".
Time Lost: January 17, 1946 to January 23, 1946, inclusive.

Name: Luka Uzelac Date: June 13th.
Cause: He was standing in log while hooking chain block, when his foot slipped and he bumped his right shin on paddle.
Nature: "Injured rt. lower leg; severe bruising and abrasion of rt. anterior- mid-tibial area with large hematoma formation. Walking very painful".
Time Lost: June 14, 1946 to July 15, 1946, inclusive.
Compensation: \$108.00.

Name: Lawrence Snow Date: August 5th.
Cause: Drilling holes overhead with a small portable electric drill, to clean up cable, when particles of rust and metal fell into left eye.
Nature: "Removal of two foreign bodies imbedded in the cornea of his left eye".
Time Lost: August 6, 1946 to August 18, 1946, inclusive.

Name: Louis Jelicich Date: Oct. 25, 1945.
Cause: There was a broken camel-back on the locomotive and they stopped at the switch leading to the shop where there was a good one. They took the poor camel-back off the locomotive and put the good one on, and it was in lifting the good one on the locomotive that he injured his right arm.
Nature: "Deformity of biceps muscle on right arm; rupture of biceps muscle".
Compensation: \$ 1,676.00.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1946

12. NEW CONSTRUCTION
AND PROPOSED
NEW CONSTRUCTION:

The work of re-designing the cone plant was continued from the first of the year until the ore season. Because equipment ordered was not received, this work was resumed at the close of the 1946 ore season, and will be completed by the start of the 1947 ore season.

13. EQUIPMENT AND
PROPOSED
EQUIPMENT:

During the year 1946, the following equipment was received at the property:

- 2 - Euclid trucks
- 1 - Willys Jeep
- 1 - 3-yd. Ford truck
- 1 - Buda-Diesel Truck Motor
- 1 - 4-yd. Heavy-duty International dump truck
- 1 - 3 in. Wemco sand pump
- 1 - 4 in. pump
- 1 - 78 in. Akins Separator
- 1 - 48 in. Akins Densifier
- 1 - 48 in. Crockett Magnetic Separator
- 1 - 5' x 14' Style "B" Vibrating screen
- 1 - 5' x 6' Head screen
- 1 - 3' x 6' Single-deck Vibrating screen

19. WASHING PLANT
OPERATIONS:

The washing plant was put into operation July 1st, on a 2-shift, 5-days per week basis. This schedule was increased on July 15th to 3-shifts, 5-days per week and maintained as such until October 30th. The total operating period was 85 days. While on a 2-shift schedule, necessary repairs were made, whenever possible, on the night shift, while repairs were conducted over the week-end, when on a 3-shift operation.

Because of a delay in starting the retreat plant and its lowered capacity, much more washed concentrate was produced than had been originally intended.

During the 1946 season, 727,029 tons of wash ore crude and 323,330 tons of retreat ore crude were washed, giving a total crude wash plant feed of 1,050,359 tons. From this was recovered 436,022 tons of washed concentrates and 168,684 tons of retreat plant feed, making a total wash

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1946

19. WASHING PLANT
OPERATIONS:
(Continued)

plant production of 604,706 tons. Average production was 2,429 tons per shift, or 7,287 tons per 3-shift day. Weight recovery averaged 57.6%. This can be compared with the 1945 season's figures of 7,686 tons average daily production and weight recovery of 55.7%.

Loss of production in 1946 was due, almost entirely, to breakdowns in the plant, caused by lack of proper repairs. Had the plant operated through the season in normal fashion, the 1946 season's production figures would have shown considerable improvement over 1945.

Due mainly to a shortage of railroad shipping cars, 101,369 tons of washed concentrates were stockpiled. Of this, 64,851 tons were loaded out in November.

Complete concentrating data for 1946 is as follows:

Screening Plant Rejects

<u>Lease</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Hill,	4,760	25.71	.027	58.78
Trumbull,	6,210	26.35	.026	56.83
Total,	10,970	26.07	.027	57.68

36" Belt Rejects

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Hill)				
Trumbull) (Picking belt not used during 1946)				

The rock removed from the pit and placed on the waste dump, was as follows:

<u>Lease</u>	<u>Tons</u>	<u>Iron</u>
Hill,	3,140	30.50
Trumbull,	890	28.19
Total,	4,030	29.99

Other removals during mining operations were:

<u>Lease</u>	<u>Surface Cleanup</u>	<u>Lean Ore (Tons)</u>	<u>Waste</u>	<u>Total Cu. Yds.</u>
Hill,	10,831	-	-	10,831
Trumbull,	17,523	-	-	17,523
Total,	28,354	-	-	28,354

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1946

19. WASHING PLANT
OPERATIONS:
(Continued)

The analysis of the product from the various machines for the year 1946 was as follows:

Hill Mill Machines:

	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Log Washer,	57.65	.048	10.96
Classifier,	53.62	.044	17.66
Tailings,	13.95		

Trumbull Mill Machines:

Log Washer,	57.74	.051	9.33
Classifier,	54.01	.047	16.10
Tailings,	14.28		

The complete concentrating data for the year 1946 was as follows:

	<u>Tonnage</u>	<u>% of Total Mined</u>	<u>% Dried Iron</u>	<u>Tonnage Recovery</u>	<u>Iron Unit Recovery</u>
Crude Ore and Rock Mined,	742,029	100.00	39.98		
Less: Rock Removed in Mining,	4,030	.54	30.05		
Crude Ore Transported to Mill,	737,999	99.46	40.04		
Less: Rock Rejects in Screening Plant,	10,970	1.48	26.07		
Crude Ore Entering Mill,	727,029	97.98	40.25		
Concentrates Produced,	436,022	58.76	57.39	59.97	85.51
Rock Rejects on Mill Picking Belt,	-	-	-		
Tailings (by deduction)	291,007	39.22	14.57		
Total Heads, as above,	727,029	100.00	40.25		

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1946

20. HEAVY DENSITY
PLANT
OPERATIONS:

Plans for the heavy density plant for 1946 called for removal of the cone, revision of the flowsheet and installation of two Akins classifiers as heavy media separators to replace the cone. This plant was designed to take retreat feed direct from the wash plant, with capacity to handle the entire wash plant product.

Due to a strike at the Allis-Chalmers plant, screens, vital to this operation, were not received, with the result that the capacity of this unit was reduced by approximately one-half. Retreat feed was again stockpiled and fed to the plant by tractor.

Installation of machinery will be completed during this winter repair season and the mill will be ready for operation at full capacity for the 1947 ore season.

Operation of the heavy density section of the retreat plant was begun August 12th on a 1-shift, 5-day week basis. Because of delayed shipments of equipment for the Selective Media Concentrators, the fine ore section was not put into operation until September 3rd. From this date, until November 6th, the retreat plant operated on a 3-shift, 5-day week schedule.

Retreat feed totaled 168,684 tons, from which 154,018 tons of concentrates were produced. The plant operated approximately 50 3-shift days, giving a daily average production of 3,080 tons. Net weight recovery was 47.6%.

In the heavy density section, a 66" Akins classifier replaced the cone and in operation, proved to be not only more trouble-free, but gave better metallurgical results, as well. Breakdowns of this unit were due, almost entirely, to overloading in efforts to increase production, and with the addition of a 78" Akins to the heavy density circuit, this problem should be eliminated.

Concentration of the -1/8 inch plus 60-mesh fraction of the ore was again the major problem encountered in the retreat plant. In a further effort to correct this situation, experiments were conducted on grinding this material before final concentration in the Selective Media Concentrators. Test results proved very encouraging and a ball mill will be installed in the fine ore circuit for the 1947 season. Experimental work on concentrating fine ore with a hydrotator, begun late in 1946, will be continued in 1947.

The following is complete concentrating data for the heavy density plant:

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1946

20. HEAVY DENSITY
PLANT
OPERATIONS:
(Continued)

	<u>Tonnage</u>	<u>% of Total Mined</u>	<u>% Dried Iron</u>	<u>Tonnage Recovery</u>	<u>Iron Unit Recovery</u>
Crude Ore & Rock Mined, Less: Rock Removed in Mining,	333,260 -	100.00 -	36.50 -		
Crude Ore Transported to Mill,	333,260	100.00	36.50		
Less: Rock Rejects in Screening Plant,	9,930	2.98	24.33		
Crude Ore Entering Mill,	323,330	97.02	36.88		
Retreat Plant Feed Produced,	219,295	65.80	50.23	67.82	92.38
Tailings (by deduction)	104,035	31.22	12.97		
Retreat Concentrates Produced,	153,613	46.09	55.86	47.51	71.96
Retreat Rejects,	18,850	5.66	22.30		
Tailings (by deduction)	46,832	14.05	43.01		

Safety Department

Annual Report

Year 1946

11. ACCIDENTS
AND
PERSONAL
INJURY

a. Fatal Accidents

It is with the greatest satisfaction that I can report that no fatal accidents occurred during the calendar year of 1946 at any of the Company's properties and we now have operated twenty one months without a fatal accident. The last fatal occurred at the Maas Mine, March 26, 1945.

I believe it is the desire of all mine operators to prevent injury to employees but his greatest desire is to prevent fatal accidents. In figuring accident statistics for the metal mining industry as a whole the averages show that for each 300 slight accidents and 70 lost time accidents a fatal accident will occur. This triangle, as it is known, has not applied to our operations during the past several years and we are trying to do better safety work to prevent it. Our frequency of accidents are all out of proportion to our severity if we are to judge by averages shown by the National Safety Council and the U. S. Bureau of Mines. Our frequency ratings have been about average for the industry, but our severity ratings have been much lower, which indicates that we are giving our employees more protection than the average employer. In the past several years I have heard some safety men say that severity ratings did not indicate safety work being done at any plant or mine and that only frequency should be considered in accident statistics. This statement cannot hold true in the mining industry because underground mining has the hazards present at all times and it depends on work done from day to day as to how many accidents will occur and how severe they may be. I do not believe all accidents can be prevented in underground mining but we can reduce the number and lessen their severity by doing the right kind of safety planning.

Safety Department

Annual Report

Year 1946

11. ACCIDENTS
AND
PERSONAL
INJURYb. Non-Fatal Injuries

Lost time injuries for the year amounted to 226 compared to 242 for the year 1945. These injuries include every injury causing loss of one day or more. This is not a great decrease in the number of injuries, but most encouraging is the fact that they are not of the severe type with but a few exceptions. The loss of time was 8,295 days compared to 13,976 days in 1945. The most severe accident was the loss of a foot, which occurred at the Holman Cliffs Mine when a clam shell used with a power crane was dropped on an employee's foot. Another apparently avoidable accident causing considerable lost time which occurred at the Hill Trumbull Mine caused partial loss of use of arm.

Falling material caused the greatest number of injuries underground, there being 17 of this type. Most of these accidents are preventable thru good housekeeping alone. During the past few years the shortage of labor and demand for production has caused our supervisors to neglect good housekeeping, but now that these restrictions are removed and there are enough men, the housekeeping is improved and the Safety Department will not be lenient during inspections. Falls of employees caused 16 injuries and this type of accident is hard to classify. For example, six men pushed an empty haulage car over a repair pit and then started back toward the shaft. One man of the six fell while walking on dry planks and broke his arm. Investigation of the accident showed no hazard; his boots were in good condition. His own story was that he probably was clumsy. Many of these injuries can be attributed to the same cause, but some have been because of insecure footing while falls in raises have mostly been carelessness. Again, good housekeeping is necessary for at least part of the prevention, and strict supervision on the part of supervisors to keep work places in a safe condition. Falls of ground caused 13 injuries. Better control of this hazard, no doubt, is responsible for our fine severity rating. The 13 injuries caused only a very small proportion of the lost time. Most of these accidents were caused by very small pieces of ore coming thru the back lagging in the working contracts. Our new rules on timbering are almost fool-proof. If they are followed faithfully we should not have severe injuries from falls of ground. Because of the amount of stoping we are now doing in the mines, Mr. Harry Rogers, Safety Inspector, and myself are meeting with all underground supervisors to instruct them in safe methods while working in fairly soft ore. This type of mining can be done safely, and it is our idea to prevent inexperienced supervisors from taking chances with their men. To date, the response to these meetings has been very favorable. The sub-level caving method is a good production method and when properly supervised will pay dividends in safety as well as iron ore.

Safety Department

Annual Report

Year 1946

11. ACCIDENTS
AND
PERSONAL
INJURY

b. Non-Fatal Injuries

Loading at chutes and handling tools, material, and machinery, caused 7 injuries each. Loading at chutes in most mines cannot be classed as very hazardous, but in hard ore mines, and handling wet ore in chutes, is definitely a hazard. A compressed-air operated chute door is being built for handling the hard ore. Wet ore is usually scraped direct into the haulage cars, but at times, dry ore has been scraped into a chute and stored for some time and water has drained into the ore. It is then where the utmost care must be used. Handling various kinds of materials has always been of real concern. Because of the limited amount of room underground, men must be careful at all times. Equipment is usually provided for the handling of heavy material but it is human nature to abuse this equipment, and failure or accidents result.

Of 25 injuries which occurred on surface and in open pits, they are pretty well divided among a few causes. Again, falls of persons and handling or moving material take the lead in causes of injury. The prevention of these accidents is mainly supervision and good housekeeping.

In the accident statistics which follow, there are some very interesting facts. Our severity rating of 1.388 is the best in the history of the company. Our frequency rating is slightly above average for the Lake Superior District. We know these two ratings include every injury which has occurred and have been reported to the Safety Department. Although the frequency rate seems high compared to reports by some companies, we are puzzled at times by their reports. We usually have more injuries causing loss of from one to seven days than those from seven days and on up. Yet, a 1946 report by a major mining company of the district shows only 10 per cent of their injuries caused loss of from one to seven days. This report shows a very low frequency, but their severity rating is much higher than ours. We are always trying to cut down the frequency of accidents, but the main part of our work is to cut down the severity; that is, prevent those major injuries which cause permanent disability or death.

In table VIII-C we show a comparison of frequency and severity rates, using the available statistics as issued by the National Safety Council, and the Lake Superior Mining Section of the council. It can be noted here that our severity is again very favorable.

Safety Department

Annual Report

Year 1946

11. ACCIDENTS
AND
PERSONAL
INJURY

TABLE I

FATAL ACCIDENT RECORD

Cleveland Cliffs Iron Co. and Cliffs Power & Light Co.
1898 - 1946, inclusive

<u>YEAR</u>	<u>NO. MEN EMPLOYED</u>	<u>NUMBER FATALITIES</u>	<u>FATALITY RATE</u>
1898	1065	6	5.63
1899	1174	4	3.41
1900	1427	4	2.80
	<u>3,666</u>	<u>14</u>	<u>3.79</u>
1901	1317	9	6.83
1902	1485	8	5.38
1903	1551	8	5.15
1904	1338	4	2.97
1905	2038	12	6.54
	<u>7,729</u>	<u>41</u>	<u>5.30</u>
1906	2418	10	4.13
1907	2843	17	6.00
1908	2340	6	2.52
1909	2520	13	5.15
1910	2907	20	6.88
	<u>13,028</u>	<u>66</u>	<u>5.06</u>
1898 - 1910		121	4.99
1911	2633	5	1.90
1912	2335	4	1.71
1913	2521	11	4.19
1914	2435	10	4.10
1915	3308	5	1.51
	<u>13,332</u>	<u>35</u>	<u>2.70</u>
1916	3063	8	2.61
1917	3457	6	1.73
1918	3765	13	3.45
1919	3938	11	2.79
1920	4125	5	1.21
	<u>18,348</u>	<u>43</u>	<u>2.36</u>

Safety Department

Annual Report

Year 1946

11. ACCIDENTS
AND
PERSONAL
INJURY

TABLE I (Cont'd.)

<u>YEAR</u>	<u>NO. MEN EMPLOYED</u>	<u>NUMBER FATALITIES</u>	<u>FATALITY RATE</u>
1921	2309	6	2.60
1922	2301	1	.43
1923	2728	6	2.20
1924	2472	5	2.02
1925	2472	2	.81
<hr/>			
	12,282	20	1.61
1926	2119	55	25.96
1927	1969	4	2.03
1928	1784	4	2.25
1929	2000	4	2.00
1930	2566	5	1.95
<hr/>			
	10,438	72	6.90
1931	1651	3	1.82
1932	630	0	0.00
1933	631	2	3.17
1934	1073	4	3.74
1935	1313	2	1.53
<hr/>			
	5,298	11	2.05
1936	2125	2	.94
1937	2763	1	.36
1938	2590	3	1.17
1939	2457	1	.41
1940	2756	5	1.88
<hr/>			
	12,691	12	.94
1941	3570	5	1.40
1942	3562	2	.56
1943	3609	4	1.11
1944	3584	3	.84
1945	3078	1	.32
<hr/>			
	17,403	15	.86
1946	2791	0	0.00
1911 - 1946	92,583	208	2.25

Based on per thousand employees

Safety Department

Annual Report

Year 1946

11. ACCIDENTS
AND
PERSONAL
INJURY

TABLE II

Classification of Causes of Fatal Accidents
From December 1, 1898 to December 31, 1946

A.	Fall of Ground.....	106	
	Run of Mud or Sand.....	60	
	Fall of Chunk of Ore from Chute.....	2	
	Stray Chunk or Stick Down Raise or Stope.....	4	172
B.	<u>Shaft Accidents:</u>		
	Falling Down Shaft.....	14	
	Rock or Timber Falling Down Shaft.....	3	
	Struck or Caught by Cage, Skip, Bucket, Tool....	8	
	Falling from Cage, Skip, or Bucket.....	11	
	Falling from Ladder in Shaft.....	5	
	Carried or Pushed into Shaft by Car.....	3	
	Jumping on or Off Cage, Skip, or Bucket.....	3	
	Struck by Crosshead.....	5	
	Struck by Falling Material.....	1	53
C.	<u>Use of Explosives:</u>		
	Explosion of Powder.....	16	
	Premature Blast.....	3	
	Fall of Ground or Timber Due to a Blast.....	4	
	Overcome by Gas.....	3	
	Miscellaneous Causes.....	2	28
D.	<u>Mine and Railroad Cars:</u>		
	Caught by Haulage Cars.....	13	
	Riding or Attempting to Ride Cars.....	6	
	Falling with Car from Trestle.....	4	
	Run Over by Railroad Car.....	8	
	Struck by Locomotive.....	1	
	Miscellaneous Causes.....	1	33
E.	<u>Miscellaneous Causes:</u>		
	Falling in Raise, Stope, or Pocket.....	9	
	Electric Shock.....	11	
	Falling from Ladder, Stage, Trestle, etc.....	8	
	By Moving Machinery.....	6	
	Mine Fires.....	3	
	Stockpile Slide.....	3	
	Miscellaneous Causes.....	3	43
	Total.....		329

Safety Department

Annual Report

Year 1946

11. ACCIDENTS
AND
PERSONAL
INJURY

TABLE III

Classification of Fatal Accidents 1911 to 1946, inclusive,
by the Central Safety Committee

I. Trade Risks.....		115
II. <u>Negligence of the Company</u>		
Violation of Rules.....	5	
Failure to Provide Safety Devices.....	6	
Improper Method of Doing Work.....	12	
Failure to Provide Tools or Safe Places to Work.	5	
Failure to Instruct Men.....	<u>5</u>	33
III. Negligence of Workmen:		
A. Injured Men:		
Improper Method of Work.....	22	
Violation of Rules.....	10	
Failure to Use Tools or Appliances Provided.....	4	
Failure to Use Safety Devices.....	<u>3</u>	39
B. Other Workmen:		
Improper Method of Doing Work.....	14	
Violation of Rules.....	4	
Failure to Use Tools or Appliances Provided.....	<u>1</u>	<u>19</u>
Total.....		208

TABLE III-A

CLASSIFICATION OF COMPENSABLE ACCIDENTS

	Athens	Maas	Negaunee	Cliffs Shaft	Lloyd	Spies	Mather	Princeton	Camb. Jack.	Canisteeo	H. Cliffs	H. Trumbull	Atkins	Storehouse	Totals
I. Trade Risk, Incidental & Non-Preventable	3	5	4	6	6		4	1	3	1	3	1		1	38
II. Negligence of Company															
4. Improper Act or Selection of Doing Work - (By Foreman)			1						1						2
5. Failure to Instruct Men as to Method of Doing & Hazards Incident Thereto.							1								1
6. Failure to Provide Safety Devices			1			1									2
7. Failure to Provide Proper Tools, Appliances or Place to Work	1	1		1								1	1		5
III. Negligence of Workmen:															
A. 1. Failed to Use Safety Devices Provided		1										1			2
2. Failure to Use Proper Appliances or Tools Provided										1					1
3. Violation of Rules		1			1		1								3
4. Improper Act or Improper Method of Doing Work (by Workmen) (B-Other Workmen)	6	3	2	7			5		4					1	28
3. Violation of Rules					1										1

(Cont'd. - Next Page)

11. ACCIDENTS
AND
PERSONAL
INJURY

Year 1946

Annual Report

Safety Department

TABLE III-A

CLASSIFICATION OF COMPENSABLE ACCIDENTS

	Athens	Maas	Negaunee	Cliffs Shaft	Lloyd	Spies	Mather	Princeton	Camb. Jack.	Canisteeo	H. Cliffs	H. Trumbull	Atkins	Storehouse	Totals
III.-B-4. Improper act or Method by Other Workmen							1		1						2
III.-A-4 - III.-A-1				1											1
III.-A-4 - III.-B-4		1	1	1	1	1	1			1	3				10
III.-A-3 - III.-B-3	1		1		1										3
III.-A-4 - II.-7							1								1
Unclassified			1												1
Totals	11	12	11	16	10	2	14	1	9	2	7	3	1	2	101

11. ACCIDENTS
AND
PERSONAL
INJURY

Safety Department
Annual Report
Year 1946

Safety Department

Annual Report

Year 1946

11. ACCIDENTS
AND
PERSONAL
INJURYb. Non-Fatal Accidents (Continued)

TABLE IV

NUMBER OF MAN-SHIFTS WORKED
AND TONS OF ORE PRODUCED PER FATALITY

<u>Year</u>	<u>Number of Fatalities</u>	<u>Number of man-days worked per fatality</u>	<u>Number of tons of ore mined per fatality</u>
1931	3	165,137	529,680
1932	0	189,000*	486,750**
1933	2	94,689	398,357
1934	4	80,477	451,046
1935	2	196,883	1,136,215
1936	2	283,945	1,850,898
1937	1	765,702	5,216,879
1938	3	163,434	385,954
1939	1	564,433	3,713,389
1940	5	142,878	1,156,387
1941	5	182,340	1,456,528
1942	2	512,356	3,808,258
1943	4	269,351	1,624,315
1944	3	331,090	1,995,787
1945	1	915,666	5,970,577
1946	0	747,079*	4,416,253**
Total	38	10,362,031	64,191,486
16 year Average	2.375	272,685	1,689,249

* Man-shifts worked

** Amount of Ore mined

Safety Department

Annual Report

Year 1946

11. ACCIDENTS
AND
PERSONAL
INJURY

b. Non-Fatal Accidents (Cont'd.)

TABLE V

RESUME OF ALL ACCIDENTS

<u>Mine or Plant</u>	<u>Slight</u>	<u>Less than 7 days</u>	<u>7 days or more</u>	<u>Fatal</u>	<u>Total</u>
Athens	53	11	11		75
Maas	71	27	12		110
Negaunee	39	15	11		65
Cliffs Shaft	43	18	16		77
Lloyd	47	9	10		66
Tilden	1	1	0		2
Spies-Virgil	23	3	2		28
Mather	69	13	14		96
Princeton	10	6	1		17
Cambria-Jackson	18	11	9		38
Canisteo	30	0	2		32
Holman Cliffs	35	7	7		49
Hill Trumbull	31	4	3		38
General Shops	5	0	1		6
Garage & Storehouse	12	0	1		13
C. P. & L. Co.	3	0	0		3
Laboratory	2	0	0		2
Ishpeming Hospital	9	0	0		9
Engineering Dept.	1	0	0		1
Atkins	<u>13</u>	<u>0</u>	<u>1</u>		<u>14</u>
TOTALS	515	125	101	0	741

Safety Department

Annual Report

Year 1946

11. ACCIDENTS
AND
PERSONAL
INJURYb. Non-Fatal Accidents (Continued)

TABLE VI

CAUSES OF COMPENSABLE ACCIDENTS,UNDERGROUND

Cause	Spies Camb. Prince-								Total
	Athens	Maas	Neg.	C.S.	Lloyd	Virgil	Jack.	ton Mather	
Falls of ground	1	3	2	1	2		1	3	13
Falling material or moving or bounding objects	4	2	1	2	2		2	4	17
Falls of persons slipping & stumbling	4	4	1	3		1	1	1	16
Loading at chutes	1	1	1	3	1				7
Bumping against objects	1		1		1				3
Using or handling tools, materials, or machinery			2				4	1	7
From wire ropes								2	2
Chunks rolling down pile				3					3
Flying particles			1	2					3
Haulage		1		1				3	5
Totals	11	11	9	15	6	1	8	1	76

Safety Department

Annual Report

Year 1946

11. ACCIDENTS
AND
PERSONAL
INJURYb. Non-Fatal Accidents (Continued)

TABLE VI (Cont'd)

SURFACE

<u>Cause</u>	Spies- Camb.							<u>Total</u>		
	<u>Athens</u>	<u>Maas</u>	<u>Neg.</u>	<u>C.S.</u>	<u>Lloyd</u>	<u>Virgil</u>	<u>Jack.</u>		<u>Princeton</u>	<u>Mather</u>
Using or handling tools, materials, or machinery		1		1	1					3
Falls of persons slipping or stumbling					1	1	1			3
Falling or moving mater- ial or bounding objects			2		1					3
Bumping against objects					1					1
Totals	0	1	2	1	4	1	1	0	0	10

OPEN PIT MINES

<u>Cause</u>	<u>Canisteco</u>	<u>Hill</u>	<u>Trumbull</u>	<u>Holman</u>	<u>Cliffs</u>	<u>Atkins</u>	<u>Tilden</u>	<u>Total</u>
Falls of persons Slipping or stumbling	1		1					2
Using or handling tools, materials, or machinery			1					1
From flying particles			1					1
Falling or moving mach- inery, material, or bounding objects	1				5	1		7
Trucks					2			2
Totals	2		3		7	1	0	13

OTHER OPERATIONS

<u>Cause</u>	<u>General Shops and Storehouse</u>	<u>Total</u>
Using or handling machinery or materials	1	1
Falling or moving material or bounding objects	1	1
Totals	2	2

Safety Department

Annual Report

Year 1946

11. ACCIDENTS AND PERSONAL INJURY

b. Non-Fatal Accidents (Continued)

TABLE VII

FREQUENCY RATES

All Compensable Accidents

<u>Year</u>	<u>Total Man Days Worked</u>	<u>Number of Compensable Accidents</u>		<u>Frequency** Rate</u>
		<u>Non-Fatal</u>	<u>Fatal</u>	
1935	393,967	35	2	11.74
1936	567,891	33	2	7.70
1937	765,701	58	1	9.65
1938	491,303	46	3	12.49
1939	564,542	44	1	9.96
1940	714,391	59	5	11.19
1941	918,300	79	5	11.43
1942	1,024,713	75	2	9.39
1943	1,077,402 $\frac{1}{4}$	171	4	20.30
1944	993,272 $\frac{3}{8}$	121	3	15.61
1945	915,665 $\frac{3}{4}$	107	1	14.74
1946	747,079	101	0	16.899

** Based on 1 million man-hours of labor

TABLE VIII

SEVERITY RATES

All Compensable Accidents

<u>Year</u>	<u>Non-Fatal</u>		<u>Fatal</u>		<u>All Accidents</u>	
	<u>Days Lost</u>	<u>Rate</u>	<u>Days Lost</u>	<u>Days Lost</u>	<u>Rate</u>	
1935	3,225	1.023	12,000	15,225	4.830	
1936	3,509	.772	12,000	15,509	3.413	
1937	7,881	1.286	6,000	13,881	2.266	
1938	6,290	1.600	18,000	24,290	6.181	
1939	3,264	.723	6,000	9,264	2.051	
1940	3,442	.602	30,000	33,442	5.852	
1941	5,403	.735	30,000	35,403	4.819	
1942	5,851	.500	12,000	17,851	2.177	
1943	10,355	1.201	24,000	34,355	3.986	
1944	7,759	.976	18,000	25,759	3.242	
1945	7,624	1.041	6,000	13,624	1.860	
1946	7,994	1.337	0	7,994	1.337	

Based on days lost by accidents per 1,000 man-hours of labor