

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1945

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.

<u>PROPERTY</u>	<u>REPORTED</u> <u>1-1-45</u>	<u>MINED</u> <u>1945</u>	<u>BALANCE</u> <u>AFTER</u> <u>MINING</u>	<u>DEVELOPED</u> <u>BY</u> <u>DRILLING</u>	<u>RESERVE</u> <u>1-1-46</u>
Bingham,	1,637,587	746,818	890,769		889,824
North Star,	668,586	-	668,586		668,586
Brown No.1,	563,128	5,426	557,702		570,387
Brown No.2,	3,902,477	90,422	3,812,055		3,984,539
Holman,	<u>2,812,725</u>	<u>37,099</u>	<u>2,775,626</u>		<u>2,573,575</u>
Total Holman- Brown,	7,278,330	132,947	7,145,383		7,128,501 ✓
Total Bingham- North Star,	<u>2,306,173</u>	<u>746,818</u>	<u>1,559,355</u>		<u>1,558,410</u>
GRAND TOTAL,	9,584,503	879,765	8,704,738		8,686,911

The reserve estimate as of January 1, 1946, is the result of a new estimate and a reclassification of the ores in the Bingham. There was no change in the North Star from the reserve as of January 1, 1945. In the case of the Holman and Brown leases, the new estimate is based on a reclassification of all of the wash and jig ores in the properties, based on our mining and beneficiation experience during the past two years.

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1945

4. ESTIMATE OF
ORE RESERVES:
(Continued)

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 reserve tonnage through additional drilling. With new developments in further concentration of lean and jig ores, the tonnage of these ores will eventually increase.

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>						
Non-Bessemer Direct,	15,977	58.60	.049	10.82	.51	1.61
Bess. Wash Concentrates,	452,085	58.58	.034	11.59	.19	.58
Non-Bess. Wash Concts.	744,262	57.26	.054	11.86	.27	.57
Bess. Jig Concentrates,	100,000	58.50	.038	10.50	.17	.45
Non-Bess. Jig Concts.	246,086	58.00	.050	11.00	.19	.42
Total,	1,558,410	57.86	.046	11.55	.23	.56
<u>Holman-Brown:</u>						
Bess. Wash Concentrates,	2,183,397	59.26	.034	9.66	.19	.44
Non-Bess. Wash Concs.	2,172,089	57.96	.057	10.22	.16	.50
Bess. Jig Concentrates,	814,069	58.50	.038	10.50	.16	.40
Non-Bess. Jig Concts.	1,958,946	58.00	.050	11.00	.16	.40
Total,	7,128,501	58.43	.046	10.30	.17	.44
Total Direct,	15,977	58.60	.049	10.82	.51	1.61
Total Bess. Wash Concs.	2,635,482	59.14	.033	9.99	.19	.48
Total Non-Bessemer Wash Concentrates,	2,916,351	57.78	.056	10.64	.19	.52
Total Wash Concts.	5,551,833	58.43	.045	10.33	.19	.50
Total Bess. Jig Concs.	914,069	58.50	.038	10.50	.16	.40
Total Non-Bessemer Jig Concts.	2,205,032	58.00	.050	11.00	.16	.40
Total Jig Concts.	3,119,101	58.18	.046	10.85	.16	.40
Total Bessemer,	3,549,551	58.97	.034	10.12	.18	.46
Total Non-Bessemer,	5,137,360	57.88	.053	10.80	.18	.47
GRAND TOTAL,	8,686,911	58.32	.045	10.52	.18	.47

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1945

5. LABOR & WAGES:

a. Comments:

(1) Labor:

The supply of labor remained unsatisfactory during 1945, and full crews were maintained with difficulty, due to labor shortage and excessive absenteeism.

Local relationship between the union and the management was satisfactory during the year, with only minor grievances, which were settled without difficulty. The latter part of the year, however, a demand for higher wages, with a threatened strike, developed. Increased vacation pay and shift differential were awarded and paid during the year.

b. Comparative Statement of Wages and Product:

<u>PRODUCTION:</u>	
Concentrates,	780,764 tons
Direct Ore,	<u>99,001 "</u>
Total,	879,765 "
Number of Days Operated,	166
Average Number of Men Working,	168
Average Wages Per Day,	\$ 8.19
Product Per Man Per Day,	30.98 tons
Labor Cost per Ton,	\$.316
Total Number of Days,	28,398
Amount Paid for Labor,	\$ 278,330.89

6. SURFACE:

a. Buildings, Repairs:

Total expenditure on repairs to rented houses in Taconite during 1945 amounted to \$7,676.37. General repairs were made on fifty-five houses. This work consisted of foundation replacements, chimney and roof repairs, plastering and interior and exterior painting.

The mine buildings received repairs to the extent of \$1,938.43. This was mainly the addition of an enclosed platform and repairs to the old oil house for storage of lubricating oils and greases for motorized equipment.

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1945

6. SURFACE:
(continued)

c. Tracks, Roads, Transmission Lines, etc:

The usual maintenance work on the crude ore line to the plant tracks was carried forward. Track layout for temporary loading ramp on the Brown No. 2 lease for the 1946 season was partially completed.

A truck haulage road to the stripping dump, north of the North Star lease, was constructed during the spring of 1945 and a road for haulage of Brown No. 2 and Holman stripping to the east, was put into use during the summer.

A drainage ditch for pit water along the north side of the Holman-Brown pit, was excavated north of the old location, to prepare an area for stocking grounds in connection with future stripping operations.

7. OPEN PIT:

a. Stripping:

Stripping operations started in the fall of 1944, in the Bingham lease, and were continued after the first of the year on a 3-shift, five day a week basis, until February 5th, at which time a 3-shift, six day a week schedule was started and continued throughout the season. When stripping was resumed at the end of the ore season, a schedule of 20-shifts per week, with a swing crew, the men getting five shifts per week, was instituted.

Operations from the first of the year to the ore season, were conducted entirely in Bingham lease, removing surface, lean ore and waste ore. This material, during January and February, was hauled to dumps south of the Bingham property, which necessitated a long, slow haul on winding roads and steep grades. Purchase was then made of eighty acres north of the North Star property, and a haul road constructed to this new dump site. For the balance of the season, all surface and waste ore materials were taken to this dump, with a much more favorable haul.

Progress, in general, in the Bingham stripping, was very slow, due to the long haul and severe frost conditions in the pit in January and February. In March and April, an early spring breakup caused roads to become almost impassable, as operations at that time were, of necessity, being conducted in paintrock. It was practically impossible to build and maintain suitable haulage roads. In the latter part of April, it was also necessary to do considerable sorting of ore in order to clean up direct shipping ore.

These conditions accounted for a stripping cost of \$.053 higher than had been estimated on E&A #MC-68.

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1945

7. OPEN PIT:
(Continued)

a. Stripping: (Continued)

Waste and lean ore was removed from the pit throughout the ore season, on the third shift, as they were encountered in mining wash ore.

An attempt was made during the summer of 1945 to set up a stripping crew for the removal of overburden from the Brown No. 2 and Holman, to avoid an over-balanced program in the fall and winter, and to take advantage of summer operating conditions. However, due to a shortage of truck drivers, it was necessary to abandon the plan. The program was resumed upon completion of the ore season, when enough men were available to operate 20 shifts per week, with a swing crew. During November and December, this operation consisted of the development of a road, cut along the south line of the Brown No. 2 and Holman, at the east end of the pit, and the taking off top cuts, all in surface. The material was deposited on the dump site to the east.

Progress was fair, although breakdowns to trucks and shovels during December slowed production. A cost of \$.186 per yard was realized for the program to December 31st, 1945, compared to an estimate of \$.185.

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

	<u>SURFACE</u> Cu. Yds.	<u>WASTE</u> Cu. Yds.	<u>LEAN ORE</u> Cu. Yds.	<u>PAINTROCK</u> Cu. Yds.	<u>JIG</u> Cu. Yds.	<u>TOTAL</u> Cu. Yrs.
Holman,	65,632					65,632
Brown,	508,731	20,356				529,087
Bingham,	<u>100,743</u>	<u>276,554</u>	<u>13,679</u>	<u>10,371</u>	<u>61,153</u>	<u>462,500</u>
Total,	675,106	296,910	13,679	10,371	61,153	1,057,219

f. Explosives, Drilling and Blasting:

Statement of Explosives Used:

	<u>QUANTITY</u>	<u>PRICE</u>	<u>AMOUNT</u>
#6, 16' Electric Exploders,	200	\$ 8.65	\$ 17.30
#6 Blasting Caps,	700	1.22	8.54
Clover Fuse,	1,000'	.605	6.05
#20 Connecting Wire,	16#	.55	8.80
#2 Cap Crimpers,	1		1.00
Plain Primacord,	31,500'	32.00	1,008.00
Reinforced Primacord,	39,500'	33.00	1,303.50
Total Caps, etc.,			\$ 2,353.19

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1945

7. OPEN PIT:
(Continued)

f. Explosives, Drilling and Blasting:

Statement of Explosives Used: (Cont'd)

	QUANTITY	PRICE	AMOUNT
7/8 x 8 - 40% Red Cross Extra,	100#	\$10.00	\$ 10.00
1-1/8 x 8 70% Hi Velocity,	454#	14.25	64.70
3 x 10 60% Spec. Gel.	31,650#	11.50	3,645.50
5 x 16 25% Quarry Gel.	122,300#	10.00	12,230.00
1 1/4 x 8 50% Deep Ditching,	300#	13.00	39.00
#4 R.C. Blasting Caps,	111,800#	10.00	11,180.00
			<hr/>
Total Powder,			\$ 27,169.20
Total Cost - All Explosives,			\$ 29,522.39

g. Open Pit Mining and Loading:

The ore loading season for 1945 was opened on April 2nd, with the mining of direct ore, wash ore operations starting on May 1st. The mining in general was conducted on a basis of two 8-hour shifts per day, six days per week, loading wash ore on the day and afternoon shifts. Intermittent mining of direct ore and the movement of waste and lean ore was carried forward on the night shift. A total of 1,236,699 tons of crude ore was mined and treated, yielding 780,764 tons of concentrates. The Bingham direct ore loaded during the season amounted to 99,001 tons, making a grand total from the pit of 1,335,700 tons.

The loading of direct shipping ore was all from the east central portion of the Bingham pit, in the paint-rock layer, and 99,001 tons were produced on 37 shifts for an average of 2,676 tons per shift. Production of this material was rather slow, due to the intermittent operation and the necessity of sorting considerable lean material from the layer to obtain a suitable grade of ore. This ore carried a fairly good iron and silica content, but the high moisture resulted in a low natural iron. The loading was done on the 11:00 - 7:00 shift as the ore was available and the grading department could handle it.

In general, wash ore operations at the Bingham entailed the use of two shovels. During the first part of the season, one shovel loaded a high grade ore from the west side of the pit bottom, which was mixed with material with high silica content taken from the upper layers on the east side. These ores were mixed in varying amounts for grading purposes. Bottom cuts were kept at a lower elevation to the south, to provide sumps for the collection of water encountered. During the early part of July, due to the fact that the upper ore contained a silica content too high to be absorbed, it was necessary to shift both shovels to

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1945

7. OPEN PIT:
(Continued)

g. Open Pit Mining and Loading:

(Continued)

the pit bottom, for grading purposes. During the balance of the season, the bulk of the crude ore taken from the Bingham, came from the pit bottom. Difficulty was experienced throughout the season in making grade, due to the fact that the ore in the upper layers is neither a true wash nor a jig, and is extremely difficult to concentrate. The drill hole analysis in this section had been concentrated in that the material was chopped much finer in the drilling process than is accomplished in the washing process.

Production from the Bingham lease fell off sharply the latter part of the operation, with a resulting increase in cost, due to several reasons. The difficulty of making grades with the high silica ores caused considerable shifting of shovels and the sorting and handling of a large tonnage of lean, blocky waste material during the mining operations. The necessity of conducting all operations in the bottom of the pit, at the south end- where the haulage conditions were extremely severe, due to wet, painty bottom, slowed down production. This condition was aggravated by an abnormal amount of rainfall and, at times, the haulage was practically impossible.

A very small amount of Brown No. 1 ore, occurring along the property line, was mined in conjunction with Bingham operations.

Operations in the Holman-Brown No. 2 pit bottom were carried on from the latter part of September to the end of the ore season. One shovel operated in the bottom of the Holman pit, in a good grade of wash ore, and the other shovel mixed in a lower grade ore from the south side of the Brown No. 2, along the east bank of the pit. Low production from this area is accounted for mainly in the fact that it was necessary to sort out and haul waste material during the mining operations and that it was difficult to maintain sufficient trucks for the long haul, due to a shortage of truck drivers.

k. Drainage:

In the Bingham lease, the top sump was maintained and water relayed from temporary sumps at mining levels. The water was discharged over the south bank.

The Holman-Brown No. 2 pumping setup was not changed during the year. When operating in this area, a small temporary sump was used and water relayed to the large sump for pumping over the north bank. The drainage ditch on the surface, along the north bank, was moved to the extreme north line of the property to release an area for a future dump site.

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1945

8. COST OF
OPERATION:

a. Comparative Mining Costs:

	<u>1945</u> <u>BUDGET</u> <u>ESTIMATE</u>	<u>1945*</u> <u>COST PER</u> <u>TON</u>	<u>1944</u> <u>COST PER</u> <u>TON</u>
<u>PRODUCT:</u>			
Concentrates (tons)	782,000	780,764	684,795
Direct Ore (tons)	<u>103,000</u>	<u>99,001</u>	<u>361,390</u>
Total (tons)	885,000	879,765	1,046,185
<u>Average Shift Production (tons)</u>			
Concentrates and Direct,		2,599	2,775
Tons Per Man Per Day,		30.98	31.03
Days Operated,		166	161
<u>COST:</u>			
Direct Ore,	\$.144	\$.145	\$.140
Open Pit Wash Ore,	.265	.227	.235
General Open Pit Expense,	.096	.111	.187
Concentrating,	.176	.172	.167
Stocking & Loading Concentrates,	.005	.004	.008
General Mine Expense,	.089	.100	.082
Idle and Winter Expense,	<u>.150</u>	<u>.180</u>	<u>.116</u>
Cost of Production,	\$.744	\$.765	\$.700
Depreciation- Plant & Equipment,		.130	.140
Depreciation- Motorized Equipment,		.061	.059
Amortization of Stripping,		.300	.300
Taxes - Ad Valorem,		.125	.109
Taxes - Occupational,		.030	.030
Taxes - Royalty,		<u>.102</u>	<u>.091</u>
Total Cost at Mine,		\$ 1.513	\$ 1.429
Administrative Expense,		.100	.100
Miscellaneous Expense and Income,		<u>.005</u>	<u>.029</u>
GRAND TOTAL,		\$ 1.618	\$ 1.500

* The 1945 cost per ton, as shown, does not include retro-active payments made for wage adjustments.

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1945

8. COST OF
OPERATION:
(Continued)

d. Detailed Cost Comparison:

(1) Product:

The average grade of concentrates shipped in 1945 was lower than that shipped in 1944. The crude ore was of poorer quality and structure, and weight of recovery dropped from 69.5% in 1944, to 63.1% in 1945. A natural iron of 53.34% was obtained in 1945, compared to a 53.10% in 1944.

The direct ore also carried a higher silica than the previous year, and the natural iron dropped from 51.54% to 49.76%.

(2) Open Pit Mining:

(a) Direct Ore:

The cost of mining direct ore in 1945 was \$.001 higher than the budget and \$.005 higher than the 1944 costs. The differences in 1945 budget and 1945 costs were only nominal. The increase of \$.005 in 1945 over 1944 was due, entirely, to the small tonnage produced in 1945, compared to the 1944 production.

(b) Crude Ore:

The 1945 cost per ton was \$.038 under the budget and \$.008 under the 1944 cost, figured on a concentrate basis.

A comparison with the budget estimate show the items "Drilling and Blasting" \$.002 higher and "Trucks Maintenance" \$.001 higher. The former was due to the material mined being blockier and harder than anticipated, and the latter due to the severe haulage conditions. "Power Shovels Operations" and "Power Shovels Maintenance" are respectively \$.004 and \$.014 lower than the budget. The difference in operating is only nominal and the decrease in maintenance was due to operating conditions. "Locomotive and Cars Operating" was \$.003 under the budget and "Locomotive and Cars Maintenance" was \$.001 under the budget, which were only nominal differences. "Track Expense" was \$.005 lower due to tracks having been put in good shape before the opening of the season. "Trucks Operating" was \$.009 lower, due to better roads and a more favorable haul. "Pit Roads and Ramps" was down \$.005, due to less repair work than anticipated on old loading ramp in the pit.

As compared with the 1944 results, "Drilling and Blasting" was \$.008 higher, due to the blocky material requiring more drilling and blasting. "Power Shovels Operating" was up \$.001, only a nominal sum. "Power Shovels Maintenance" was down \$.014, due to operating conditions. "Locomotives and Cars Operating" was up \$.001 and "Locomotives and Cars Maintenance" down \$.001 for only nominal differences. "Track Expense" was down \$.004, due to repair work done on tracks before operating season. There was no

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1945

8. COST OF
OPERATION:
(Continued)

d. Detailed Cost Comparison:

(b) Crude Ore (Continued)

difference in the item "Trucks Operating", but an increase of \$.008 in "Trucks Maintenance", due to severe hauling conditions. "Pit Roads and Ramps" was down \$.007, due to less repair work on the old ramp in the pit.

(3) General Pit Expense:

The cost per ton under this heading was \$.015 higher than the budget and \$.076 lower than the 1944 costs.

Compared to the budget, the item "Pumping and Drainage" was \$.014 higher and was due to more water being encountered in the Bingham pit than anticipated, necessitating the purchase of two additional pumps. "Removing Lean and Waste Material" was \$.019 higher, due to the fact that concentration in drilling in the Bingham lease made it necessary to move, as lean ore during the ore season, material which was thought to be wash ore. "General Open Pit Expense" was \$.014 lower, due to better operating conditions in general. "Waste Pile Expense" and "Exploratory Drilling" were \$.002 lower, respectively, and were only nominal differences.

A comparison with the 1944 costs show "Pumping and Drainage" up \$.020, due to the addition of Bingham pumping and the purchase of two additional pumps. A decrease of \$.047 under the item "Removing Lean and Waste Material" was due to the fact that, although larger than anticipated, the amount of material necessary to move was considerably less than in 1944. "General Open Pit Expense" was lower by \$.013, due to better operating conditions in general. "Open Pit Superintendent" was up \$.002, due to an increase in rates for foremen. "Waste Pile Expense" shows a decrease of \$.002, due to a smaller amount of this material handled. "Exploratory Drilling" was lower by \$.036 than 1944, as this charge was absorbed in operating cost in 1944 and carried as a deferred charge in 1945.

(4) Concentrating:

The 1945 cost per ton under this caption was \$.004 less than the budget and \$.005 more than 1944 costs.

Compared to the budget, the items "Transportation" and "Washing" were \$.005 and \$.012 less, respectively. Less cost on tracks and derailments account for the decrease on "Transportation" and operating economies in plant are reflected in the decrease in "Washing". An increase of \$.003, \$.001 and \$.009 in the items "Power", "General Expense" and "Maintenance", Building

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1945

8. COST OF
OPERATION:
(Continued)

d. Detailed Cost Comparison:

(4) Concentrating: (continued)

and Machinery", respectively was due to absorbing the cost of installation and operating fine ore plant.

A comparison with 1944 costs shows a decrease in the items "Transportation" and "Washing" of \$.003 and \$.007, respectively. In the first item this was due to less cost for derailments and repairs to tracks, and the latter, to operating economies in the plant. The items "Power", "General Expense", and "Maintenance, Building and Machinery" are higher than the 1944 costs by \$.055, \$.001 and \$.010, respectively, due to the absorption of costs of installing and operating fine ore plant in 1945, which was not the case in 1944.

(5) General Mine Expense:

The cost per ton under this caption for 1945 was \$.011 higher than the budget and \$.018 higher than the 1944 costs. These increases are an accumulation of nominal differences in the various items and the major increases are due to retroactive wage adjustments.

(6) Winter and Idle Expense:

The 1945 cost per ton was \$.030 higher than the budget and \$.064 higher than the 1944 costs. Abnormal repairs to equipment, especially shovels, during the winter and spring, account for the increase over the budget and absorption of cost of fine ore machines in this account in 1945 account for the increase over the 1944 costs.

9. EXPLORATIONS AND
FUTURE
EXPLORATIONS:

During the year, the J. S. Schultze Drilling Company drilled twelve sample holes and twenty-two exploratory drill holes in the Holman-Cliffs Mine. The former totaled 1,513 feet and the latter 3,323 feet, for a grand total of 4,836 feet. The sample drilling was conducted in the Bingham pit bottom for mining and grading information for the current production. The exploratory drilling was in the following areas: Three holes, totaling 400 feet-outlining the Bingham ore body to the south and east of the present pit; four holes, totaling 687 feet, in the Brown No. 1, to check the location for the proposed pit conveyor; three holes, totaling 825 feet, along the south side of the Holman pit, to outline the south limits of the ore body. The balance of twelve holes, totaling 1,411 feet, were drilled to outline the upper ore in the Brown No. 2 at the east end of the pit.

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1945

9. EXPLORATIONS AND
FUTURE
EXPLORATIONS:
(Continued)

During 1946, it is planned to drill exploratory holes along the south line of the Brown No. 2 and Holman properties, through the top ore, for determination of the ore involved in a possible cross-mining agreement with the Oliver Iron Mining Company. Four or five holes will also be necessary to outline limits to the east and north of the Brown No. 2.

10. TAXES:

The following statement shows the Holman-Cliffs Mine taxes and the average rates for the years 1944 and 1945:

	1945	1944	Increase	Decrease
Holman-Brown Mine,	\$76,331.84	\$67,740.10	8,591.74	
Bingham Mine,	28,401.35	24,632.63	3,768.72	
North Star Mine,	6,762.85	7,700.76		937.91
Holman-Cliffs Aux.Lands, Bingham-North Star Wash.	2,498.49	2,138.81	359.68	
Plant and Dump Lands,	114.18	61.79	52.39	
Holman-Brown Lands,	28.10	24.06	4.04	
Holman-Cliffs Shops and Office,	1,274.83	1,099.95	174.88	
Holman-Cliffs Personal Property,	6,830.29	7,024.68	-	194.39
Total,	\$122,241.93	110,422.78	11,819.15	
Rented Buildings,	\$ 1,027.76	893.62	134.14	
Grand Total,	\$123,269.69	\$111,316.40	\$11,953.29	
Average Tax Rate,	113.61	98.97	14.64	

The increase in taxes is due entirely to a higher rate of taxation in 1945.

The decrease in the North Star account of a substantial tonnage of ore mined from the property.

11. ACCIDENTS
AND
PERSONAL
INJURY:

There were no lost-time accidents at the Holman-Cliffs Mine during the year 1945.

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1945

12. NEW CONSTRUCTION
AND PROPOSED
NEW CONSTRUCTION:

An experimental fine ore treatment plant was constructed and put into operation during the year, at the washing plant.

Storage tanks for fuel oil were moved to a new location, near the mine buildings, and railroad tracks and a third tank added, together with remodeling the old oil house for the bulk storage and distribution of fuel oil, lubricating oil and greases to all three mines. This permitted buying in carload lots.

During 1946, a temporary ore-loading ramp will be constructed on the north side of the Brown No. 2, for the loading of upper ore from this property. It is expected that the major part of the installation of the pit screening plant and conveyors, together with moving the plant to a new site on the south bank of the pit, will be carried forward during the summer and fall of 1946.

13. EQUIPMENT AND
PROPOSED
EQUIPMENT:

The following new equipment was purchased for the Holman-Cliffs Mine in 1945:

- 1 - Parmanco Vertical Drill
- 1 - 27T Bucyrus Blast Drill
- 1 - Hydroseparator Unit
- 1 - Hydrotator Unit
- 1 - 1/2-ton Ford Pickup Truck
- 1 - G.M.C. Fuel Delivery Truck
- 1 - 15,000-gallon Fuel Tank
- 2 - 6" x 8" Allis-Chalmers Slurry Pumps
- 1 - Set Dragline Attachments for 120-B Electric Shovel

The purchase of the following equipment is anticipated for 1946: 2 - 20-ton dump trucks; a pickup truck; one jeep and two double-deck screens.

14. MAINTENANCE
AND REPAIRS:

The locomotives and 30-yard cars received a general overhauling at the Hill-Trumbull shops. All shovels and blast drills were given necessary repairs during the fall and winter months. Repairs to the trucks, tractors and motor patrol were carried on during the entire year, as the need arose.

During the fall and winter season, all machines in the washing plant were dismantled, inspected and given necessary repairs.

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1945

19. WASHING PLANT
OPERATIONS:

The washing plant operated on the same schedule as the wash ore loading in the pit, two shifts per day, six days per week, from May 1st to October 27th. A total of 1,236,699 tons of crude ore was treated, producing 780,764 tons of concentrates. The average production per shift amounted to 2,589 tons. The rate per shift is lower than that in 1944, due to a much lower weight recovery.

Operating conditions at the plant, on the whole, were satisfactory for the year. A shortage of Great Northern railway cars, from time to time, made it necessary to stockpile concentrates and a total of 71,468 tons of Bingham concentrates was accumulated in stock during the season.

The work of assembling the experimental fine ore plant was delayed, due to non-delivery of materials until June, at which time work was started. Progress was slow, due to a shortage of men. The hydrotator side was completed in the middle of July, and the Dorr hydroseparator and hydrosizer, the latter part of August. This installation was operated experimentally on the day shift only, and the test runs indicate that the hydro-sizer equipment on this type of ore was much superior to that of the hydrotator. The tonnage recovered by both machines was small, due to the extremely low grade tailing being treated. A total of approximately 1,072 tons of fine ore concentrates was placed in stock.

The tonnage and analysis of the plant rejects for 1945 were as follows:

5 x 14 Screen Rejects

<u>Lease</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Holman,	2,215	35.10	.030	44.32
Brown,	5,910	33.89	.032	46.13
Bingham,	31,610	31.08	.030	50.19
Total,	39,735	31.72	.030	49.26

36" Belt Rejects

<u>Lease</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Holman,	40	35.13	.035	44.30
Brown,	219	31.93	.032	48.58
Bingham,	10,501	37.45	.026	41.32
Total,	10,760	37.33	.026	41.48

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1945

19. WASHING PLANT
OPERATIONS:
(Continued)

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

<u>Lease</u>	<u>Tons</u>	<u>Iron</u>
Holman,	106	29.15
Brown,	420	30.54
Bingham,	6,678	32.11
Total,	7,204	31.97

The following material was removed during mining operations:

<u>Lease</u>	<u>Clean-Up</u>	<u>Lean Ore</u>	<u>Paintrock Lean Ore</u>	<u>Waste</u>	<u>Surface</u>	<u>Total Cu. Yds.</u>
Holman,	1,747			389		2,136
Brown,	16,111	5,981		13,168		35,260
Bingham,	-	67,162	6,719	76,752		150,633
Total,	17,858	73,143	6,719	90,309		188,029

The analysis of the product from the various machines for the year 1945 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>
Holman,	57.75	.041	11.75	58.13	.039	11.77	20.95
Brown,	56.75	.039	14.15	57.76	.037	13.24	19.30
Bingham,	57.48	.037	13.20	57.89	.037	13.00	22.69

The concentration data for the Holman-Cliffs Mine for the year 1945 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,	1,283,638	100.00	44.64		
Less: Rock re- moved in Mining,	7,204	.56	31.97		
Crude ore trans- ported to mill	1,276,434	99.44	44.71		
Less: rock re- jects in Crusher House,	39,735	3.10	31.72		
Crude ore enter- ing mill,	1,236,699	96.34	45.12		

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1945

19. WASHING PLANT
OPERATIONS:
(Continued)

Concentration Data (continued)

	<u>Tonnage</u>	<u>Percentage of Total Mined</u>	<u>Per Cent. Iron Dried</u>	<u>Tonnage Recovery</u>	<u>Iron Unit Recovery</u>
Concentrates Produced,	780,764	60.82	57.92	63.13	81.05
Rock rejects on mill picking belt,	10,760	.84	37.33		
Tailings, (by deduction)	445,175	34.68	22.87		
Total heads, as above,	1,236,699	96.34	45.13		

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1945

1. GENERAL:

At the mine shops and beneficiation plants, the usual winter repair program was continued from the 2nd of January, until the 23rd of April. This work was conducted on a one shift per day, six days per week schedule. During the period, the Holman steam locomotives, the Nos. 34 and 35 electric shovels and the Holman and Hill-Trumbull dump cars were given a general inspection and overhaul. Plant motors were cleaned and overhauled, and the equipment used in the current stripping program was maintained.

At the concentrating plants, repair work of a general nature was conducted on the conveyors, crushers, logs and classifiers. The 5' x 14' double-deck Allis-Chalmers screen was installed as the primary screen in the washing plant, replacing an undersize Robins unit, and a second Hydroseal slurry pump was placed in service on tailings disposal. In addition to the usual reconditioning and repairs at the retreat plant, two selective media concentrators were installed to replace double classification. The 60" Akins classifier, which had been in use in the latter process, was sent to the Holman Mine for the fine ore plant. At the settling basin, the tailings disposal line was shifted, raised, and bleeder holes cut at the fee owners' request, to effect some concentration in the upper basin.

The pit screening plant and the conveyor system were given the necessary repairs. A deep ditch along the south side of the loading tracks, at the upper pocket was completed to give more effective drainage in this area.

The 1945 mining operations were started on April 23rd and conducted on a three 8-hour shift per day, six days per week basis until July 16th, when the pit operations were cut to a two shift basis, until October 31st. This step was necessary, for, during the balance of the season, the pit and washing plant could produce what wash ore concentrates were available and sufficient washed retreat feed for a three-shift operation at the high density plant. Lean ore and waste encountered in mining was removed on the Monday day shift each week, while the pit was on a three-shift basis, and on the night shift, when necessary, while working two shifts. Operations were shifted from wash to retreat ores often enough to afford efficient handling of retreat feed at the concentrating plant. In all, a total of 1,825,551 tons of crude ore was mined and sent to the concentrators, and the efficiency of the latter during the year was due, almost entirely, to an adequate supply of crude ore at all times. Due to a labor shortage, there was very little scam work in the direct ore area, in the East Hill, during the year.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1945

1. GENERAL:
(Continued)

The washing plant was operated on the same schedule as the pit, producing 477,389 tons of washed concentrates and 539,739 tons of washed retreat feed. The production was quite consistent throughout the year, averaging 2,562 tons per shift, or 7,686 tons per day.

The retreat plant was not ready for production until May 2nd, and was operated on a three-shift per day, six days per week schedule throughout the season. The Monday day shift was utilized for plant repairs. Operating 154 days, the plant produced 359,296 tons of concentrates, with an output of 2,333 tons per day. A shortage of railway cars and grading problems made it necessary to stock 83,764 tons of concentrates during the season. This, with the 24,466 tons in stock at the first of the year, made a total of 108,230 tons of stockpile concentrates available for the 1945 season. A total of 94,717 tons was shipped, leaving a balance of 13,513 tons in stock at the end of the shipping season.

The stripping operations, which had been started in the late fall, were carried forward from the first of the year until the beginning of the ore season. The work was conducted in the southeast Trumbull lease and involved the removal of surface, lean ore and waste material, in an extension of the pit limits to the south and east. At the close of the ore season, a new stripping program was started on the north bank of the pit, in the Hill lease, extending the pit limits to the north to provide some additional wash ore for the 1946 season. A small amount of rock stripping was conducted in the Hill pit bottom during this period, but was discontinued in December.

A structure drilling program was carried forward under contract during the entire year, conducting sample drilling in the pit area from January to May, and exploratory work on the north bank of the pit during the balance of the year.

2. PRODUCTION,
SHIPMENTS &
INVENTORIES:

a. Production by Grades:

Hill Crude, -----	80,872 tons
Trumbull Crude, -----	800,902 "
Hill Retreat Crude, -----	74,310 "
Trumbull Retreat Crude, -----	<u>844,792 "</u>
 TOTAL CRUDE ORE, -----	 1,800,876 "

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1945

2. PRODUCTION,
SHIPMENTS &
INVENTORIES:
(Continued)

a. Production by Grades: (continued)

Hill Non-Bessemer Concentrates, -----	15,425 tons
Hill Bessemer Concentrates, -----	31,589 "
Hill Non-Bessemer Cone Concentrates, -----	17,204 "
Hill Bessemer Cone Concentrates, -----	14,307 "
Trumbull Non-Bessemer Concentrates, -----	330,339 "
Trumbull Bessemer Concentrates, -----	100,036 "
Trumbull Non-Bessemer Cone Concentrates, -----	218,134 "
Trumbull Bessemer Cone Concentrates, -----	<u>109,651 "</u>
 TOTAL PRODUCTION, -----	 836,685 "

b. Shipments:

Hill Non-Bessemer Concentrates, -----	25,688 "
Hill Bessemer Concentrates, -----	33,254 "
Hill Non-Bessemer Cone Concentrates, -----	17,204 "
Hill Bessemer Cone Concentrates, -----	14,307 "
Trumbull Non-Bessemer Concentrates, -----	326,647 "
Trumbull Bessemer Concentrates, -----	102,753 "
Trumbull Non-Bessemer Cone Concentrates, -----	218,134 "
Trumbull Bessemer Cone Concentrates, -----	<u>109,651 "</u>
 TOTAL SHIPMENTS, -----	 847,638 "

c. Stockpile Inventories:

Stockpiled wash concentrates on January 1, 1945, amounted to 24,466 tons. Most of this was shipped in April and ore was again stockpiled during the 1945 season. At the close of the year, 13,513 tons remained in stock.

The following amount of lean material is now in stock:

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
 Total,	 581,491	 29.50	 .034	 52.42

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

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1945

2. PRODUCTION,
SHIPMENTS &
INVENTORIES:
(Continued)

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>
April,			60,777	14,922	75,699
May,			186,174	134,402	320,576
June,			186,224	169,487	355,711
July,			153,292	154,561	307,853
August,			78,944	184,457	263,401
September,			116,803	121,154	237,957
October,	80,872	74,310	18,688	65,809	239,679
TOTAL,	80,872	74,310	800,902	844,792	1,800,876

(2) Concentrates:

<u>MONTH</u>	<u>HILL</u> <u>CONCTS.</u>	<u>HILL</u> <u>CONE CONCTS.</u>	<u>TRUMBULL</u> <u>CONCTS.</u>	<u>TRUMBULL</u> <u>CONE CONCTS.</u>	<u>TOTAL</u>
April,			28,826		28,826
May,			101,380	43,361	144,741
June,			96,572	59,409	155,981
July,			87,431	65,037	152,468
August,			44,061	70,096	114,157
September,			62,383	62,898	125,281
October,	47,014	31,511	9,722	25,615	113,862
November,				1,369	1,369
TOTAL,	47,014	31,511	430,375	327,785	836,685

f. Ore Statement:

As of December 31, 1945, there is in stockpile 1,339 tons of Hill and 12,174 tons of Trumbull washed concentrates, for a total of 13,513 tons.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1945

2. PRODUCTION,
SHIPMENTS &
INVENTORIES:
(Continued)

g. Delays:

The following delays were reported for the 1945 season:

Pit Delays (No crude Ore)

<u>Hours</u>	<u>Minutes</u>	<u>Cause</u>
3	-	Moving shovel for grading
7	30	Slow loading, frost chunks and wet ore
9	30	Repairs to pit conveyor system
9	30	Repairs to pit screening plant feeder
4	-	Pit conveyor plugged
3	30	Power off, storms
2	-	Repairs to shovels
<hr/>	<hr/>	
39	-	

Haulage Delays

18	30	Power failure on electric locomotives
2	-	Broken axle on locomotive
5	-	Electrical repairs to locomotives
1	15	Track repairs
<hr/>	<hr/>	
26	45	

Washing Plant Delays

4	30	Repairs to 5' x 14' screen
8	30	Repairs to conveyors
1	-	Crushers plugged
1	30	Power failure, storms
1	-	Delays on loading track
1	-	Repairs to classifiers
1	-	Repairs to tailings line
<hr/>	<hr/>	
18	30	

Retreat Plant Delays

87	-	No feed, tractor repairs
53	-	Cone plugged, cleaning and recharging
11	30	Repairs to selective media concentrator
50	-	Repairs to screens
33	-	Feed conveyor plugged
16	-	Chutes and launders plugged
26	30	Repairs to pumps
5	30	Repairs to magnetic separators
23	-	Out of ore
10	-	No railroad cars
2	-	Power failure
4	-	Feeder plugged
<hr/>	<hr/>	
321	30	

HILL--TRUMBULL MINE
ANNUAL REPORT
YEAR 1945

2. PRODUCTION,
SHIPMENTS &
INVENTORIES:
(Continued)

g. Delays: (continued)

Pit Delays:

Lost time involved in repairs to pit conveyor was due to failure of bearings in the top gear reducer and repairs to belt holdbacks which were inadequate for the belt load.

Plugging of the conveyor system was due, entirely, to failure of the holdbacks on the middle belt. This condition will be remedied in 1946 by installing heavier equipment.

Other items are self-explanatory.

Haulage Delays:

Power failures on locomotives is by far the largest item here and was due to inability of the converters to take a heavy overload. A high-speed circuit breaker, installed late in the season, eliminated this trouble almost entirely.

Washing Plant Delays:

Repairs in this category were minor and about normal for a season's operation.

Retreat Plant Delays:

The two largest causes of retreat plant delays were tractor repairs and cone plugging. These will be eliminated entirely in 1946 by feeding ore direct to the plant and by replacing the cone with Akins classifiers. Repairs to screens was largely due to loose bolts on the screen mechanisms and can be corrected. Plugging of feeder, conveyors and chutes and launders was due to over-loading in attempts at greater production. Pump delays were also due mainly to over-loading. All these items should be reduced considerably by changes in the plant for the 1946 season. Delays due to being out of ore were caused by lack of a large stockpile of retreat feed when there was a heavy demand for washed concentrates. Other delays are normal and self-explanatory.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1945

3. ANALYSIS:a. Mine Analysis of Production:

	Tons	Iron	Phos.	Sil.	Mang.	Alu.	Moist.	Fe. Nat.
Hill Non-Bess. Concs.	15,425	58.07	.049	12.35	.12	.50	6.64	54.21
Hill Bess. Concs.	31,589	59.29	.038	11.07	.12	.50	7.52	54.83
Hill N.B.Cone Concs.	17,204	57.03	.046	13.80	.12	.48	5.65	53.81
Hill Bess.Cone Concs.	14,307	57.61	.039	12.83	.11	.48	5.92	54.20
Trumbull N.B.Concs.	330,339	57.02	.050	10.55	.14	.52	8.76	52.02
Trumbull Bess. Concs.	100,036	57.75	.043	9.19	.14	.52	8.55	52.81
Trumbull NB Cone Concs.	218,134	56.31	.046	11.63	.14	.49	7.09	52.32
Trumbull Bess. Cone Concs.	109,651	56.89	.042	10.80	.14	.49	7.26	52.76
Total,	836,685	57.02	.046	10.86	.14	.51	7.90	52.52

b. Mine Analysis of Shipments:

	Tons	Iron	Phos.	Sil.	Mang.	Alu.	Moist.	Fe. Nat.
Hill Non-Bess. Concs.	25,688	57.04	.047	12.61	.13	.53	7.28	52.89
Hill Bess. Concs.	33,254	59.18	.038	11.08	.12	.51	7.49	54.75
Hill N.B.Cone Concs.	17,204	57.03	.046	13.80	.12	.48	5.65	53.81
Hill Bess.Cone Concs.	14,307	57.61	.039	12.83	.11	.48	5.92	54.20
Trumbull N.B.Concs.	326,647	57.02	.050	10.58	.14	.52	8.73	52.04
Trumbull Bess. Concs.	102,753	57.70	.043	9.30	.14	.51	8.53	52.78
Trumbull N. B. Cone Concs.	218,134	56.31	.046	11.63	.14	.49	7.09	52.32
Trumbull Bess. Cone Concs.	109,651	56.89	.042	10.80	.14	.49	7.26	52.76
Total,	847,638	57.00	.046	10.91	.14	.51	7.89	52.50

c. Mine Analysis of Ore in Stockpile December 31, 1945:

	Tons	Iron	Phos.	Sil.	Mang.	Alu.	Moist.	Fe. Nat.
Hill Concs.	1,339	58.49	.049	11.59	.13	.59	6.32	54.79
Trumbull Concs.	12,174	56.66	.048	10.89	.13	.49	8.66	51.75
Total,	13,513	56.84	.048	10.96	.13	.50	8.43	52.05

d. Average Analysis of Crude Ore Production:

	Tons	Iron	Phos.	Silica
Hill Crude,	80,872	43.76	.032	33.72
Trumbull Crude,	800,902	40.86	.038	35.52
Total Crude,	881,774	41.13	.037	35.35
Hill Retreat Crude,	74,310	38.72	.029	41.27
Trumbull Retreat Crude,	844,792	35.95	.031	43.23
Total Retreat Crude,	919,102	36.17	.031	43.07
Total Crude,	1,800,876	38.60	.034	39.29

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1945

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>
Hill Non-Bess. Concts.	57.74	.047	12.61	.13	.53	.26	.17	.010	3.77
Hill Bess.Concs.	59.18	.038	11.08	.12	.51	.27	.18	.010	2.98
Hill Non-Bess. Cone Concts.	57.03	.046	13.80	.12	.48	.28	.16	.010	3.46
Hill Bessemer Cone Concts.	57.61	.039	12.83	.11	.48	.27	.18	.010	3.62
Trumbull Non-Bess. Concts.	57.02	.050	10.58	.14	.52	.26	.15	.010	6.65
Trumbull Bess. Concts.	57.70	.043	9.30	.14	.51	.23	.16	.011	7.00
Trumbull Non-Bess. Cone Concts.	56.31	.046	11.63	.14	.49	.25	.16	.010	6.65
Trumbull Bess. Cone Concts.	56.89	.042	10.80	.14	.49	.24	.17	.010	6.66

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%

These 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 drill samples. Rock reductions on wash and jig ores are included in calculating the percentage of recovery.

The following tabulation shows the estimate of January 1, 1945, the ore mined during 1945 and the ore reserve estimate as of January 1, 1946:

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1945

4. ESTIMATE OF
ORE RESERVES:

a. Developed Ore: (continued)

	<u>RESERVE</u> <u>1-1-45</u>	<u>MINED</u> <u>1945</u>	<u>BALANCE</u> <u>AFTER</u> <u>MINING</u>	<u>DEVELOPED</u> <u>BY</u> <u>DRILLING</u>	<u>RESERVE</u> <u>1-1-46</u>
<u>Trumbull Mine:</u>					
NE-SE- Sec. 18,	10,893		10,893		5,966
NW-SW- Sec. 17,	372,157	121,743	250,414		638,529
NE-SW- Sec. 17,	1,422,051	636,417	785,634		1,260,044
Total Trumbull,	1,805,101	758,160	1,046,941		1,904,539
<u>Hill Mine:</u>					
SE-NW- Sec. 17,	316,986	52,349	264,637		304,239
SW-NE- Sec. 17,	446,232	26,176	420,056		336,492
SE-NE- Sec. 17,	472,901	-	472,901		258,606
Total Hill,	1,236,119	78,525	1,157,594		899,337
<u>GRAND TOTAL -</u> <u>HILL-TRUMBULL MINE</u>	3,041,220	836,685	2,204,535		2,803,876

The ore reserves as of January 1, 1946, are the result of a new estimate on the Hill and Trumbull leases, and a reclassification of all of the wash and jig ores in this property. The latter is based on our mining experience and our beneficiation results at both the washing and cone plants during the past two years.

b. Prospective Ore:

Beyond the stripping limits, as now proposed for the Trumbull forties, there is almost no possibility of any further development. There may be a thin layer of jig ore on the north side, but the stripping ratio appears to be prohibitive. However, a review of the original drilling on the north side of the Hill forties shows a strong possibility of a trough of ore extending northeast from the Hill to the Hill-Barbara pit. This area will require further exploration before any development is possible.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1945

4. ESTIMATE OF
ORE RESERVES:
(Continued)

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,		286,955	58.02	.040	11.75	.11	.47
Non-Bessemer Concentrates,		445,674	57.98	.049	11.62	.11	.45
Total Hill,		899,337	57.69	.049	11.51	.12	.55
<u>Trumbull:</u>							
Bessemer Concentrates,		550,565	57.48	.041	9.98	.14	.49
Non-Bess. Concentrates,		1,353,974	57.28	.049	10.15	.13	.49
Total Trumbull,		1,904,539	57.34	.047	10.10	.13	.49
TOTAL DIRECT,		166,708	56.36	.063	10.78	.17	.97
Total Bess. Concentrates,		837,520	57.67	.041	10.59	.13	.48
Total Non-Bess. Concts.		1,799,648	57.45	.049	10.51	.12	.48
TOTAL CONCENTRATES,		2,637,168	57.52	.046	10.54	.12	.48
Total Bessemer,		837,520	57.67	.041	10.59	.13	.48
Total Non-Bessemer,		1,966,356	57.36	.050	10.54	.13	.52
GRAND TOTAL,		2,803,876	57.45	.047	10.55	.13	.51

5. LABOR & WAGES:

a. Comments:

(1) Labor:

During the entire year, and particularly during the ore season, the supply of labor was inadequate and of generally low quality. Because of this situation and the high rate of absenteeism, much more overtime was paid than would otherwise have been necessary. The reduction of crews at the end of the ore season, coupled with the return of service men, has eliminated the labor problem and no difficulty in securing men is foreseen for the future.

Labor-management relations remained good during the entire year.

(2) Wages:

In response to union demands, the War Labor Board issued a directive, requiring the company to make an adjustment in wages, retroactive to January 1, 1944, of \$.05 per hour for all work performed on afternoon and night shifts. Further, it was directed that the Company give one weeks vacation with pay to all employees with one year's service and two weeks vacation with pay to all employees with three years service.

Wages otherwise were held in line with the wage schedule as approved on May 1, 1943.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1945

5. LABOR & WAGES:
(Continued)

b. Comparative Statement of Wages and Product:

PRODUCT, -----	836,685 tons
Number of Shifts and Hours, -----	3- 8-hr. - 2 - 8-hr.
Average Number of Men Working, -----	169
Average Wage Per Day, -----	\$9.60
Product Per Man Per Day, -----	30.25 tons
Labor Cost Per Ton, -----	\$.317
Total Number of Days, -----	27,656
Amount Paid for Labor, -----	\$265,509.00

6. SURFACE:

a. Buildings, Repairs:

Only minor, necessary repairs were made to buildings during the year.

c. Tracks, Roads, Transmission Lines, etc:

The usual maintenance work on these items was carried on during the year. Due to stripping operations, a few additions to transmission lines were required on the north side of the pit.

7. OPEN PIT:

a. Stripping:

Stripping operations, which were in progress at the close of the year, were carried forward from January 2nd until February 5th, on a three-shift per day, five days per week basis, when the schedule was stepped up to six days per week. This operation was continued until April 23rd, the start of the ore season. The work was conducted with one 4-1/2-yard electric shovel, serviced by six to seven trucks, removing surface, waste and lean ore from the Southeast Trumbull forty. The surface and waste materials were disposed on dumps located on the Oliver Iron Mining Company's lands to the south of the Hill-Trumbull pit, while the lean ore was stocked on an approved area in the East Trumbull forty. Good progress was made throughout the entire program and good costs were secured.

Upon completion of the ore season, a new stripping program was started on the north side of the pit, which would involve pushing the pit limits to the northward in both the Trumbull and Hill leases, to make available some additional wash ore for the 1946 operations. The north bank of the pit would be pushed to the ultimate pit limits over the greater part of the area. However, there is a possibility of an extension to the northeast at the extreme east end of the stripping area in the Hill. Operations were conducted with one 4-1/2-yard shovel and six to seven trucks, the surface material being hauled to a new dump located north of the pit on land recently purchased for this purpose from The Red River Lumber Company. No waste

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1945

7. OPEN PIT:
(Continued)

a. Stripping: (continued)

nor lean ore was removed from the area. During the balance of 1945, the work was all confined to the Hill lease. Due to cramped working conditions and considerable wet weather, which made hauling difficult, the progress was slow and the costs slightly above the budget estimate.

A small amount of rock was removed from the Hill bottom during November, in sorting rock and ore, but it was necessary to discontinue this work early in December, due to the fact that it was impossible to separate the rock from the frozen ore.

The following tabulation shows the stripping material removed from the various leases during 1945:

<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,	108,453	383,240	85,109	576,802
Hill,	231,688	4,436	-	236,124
Total,	340,141	387,676	85,109	812,926

f. Explosives, Drilling and Blasting:

	<u>Quantity</u>	<u>Amount</u>
#4 Red Cross Dynamite,	167,250#	\$ 16,725.00
5 x 16 60% Special Del.	57,750#	6,643.75
5 x 16 25% Quarry Gel.	39,750#	3,975.00
3 x 10 25% Quarry Gel.	8,000#	800.00
1-1/4 x 8 40% Red Cross Exp.	250	25.00
Primacord Plain,	57,000 ft.	1,824.00
Primacord Reinforced,	16,500 ft.	544.50
#6 Blasting Caps,	1,000	12.20
Clover Fuse,	1,400 ft.	8.47
#20 Connecting Wire,	10 lbs.	5.50
#4 Cap Crimpers,	1	1.50
TOTAL,		\$ 30,564.92

g. Open Pit Mining and Loading:

The 1945 ore season was begun April 23rd, on a 3-shift, 6 day per week basis and was carried forward on this schedule until July 16th, when pit operations were reduced to a 2 shift, 6 day week basis. This schedule was continued through the balance of the ore season, which ended October 31st. Two shovels, serviced by six trucks, were used to mix ore for grading.

While on a 3 shift schedule, one day shift each week was used, if necessary, to move lean ore or waste encountered in mining, while repairs were being made at the pit screening plant, conveyor system,

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1945

7. OPEN PIT:
(Continued)

- g. Open Pit Mining and Loading: (Continued)
and wash and retreat plants. On a two shift schedule, this work was done on the night shift whenever necessary.

A total of 1,825,551 tons of crude ore was mined during the season, all of which required beneficiation. Of this, 890,619 tons were concentrated by washing only and 934,932 tons were washed and further concentrated in the retreat plant. Washed concentrates amounted to 477,389 tons, and retreat concentrates, 359,296 tons, for a total concentrate production of 836,685 tons for the season. No direct ore was produced during 1945.

Wash ore was produced from both the Hill and Trumbull leases, with about 90% of the crude produced from the Trumbull. Trumbull crude ore was produced from the center and East forties, split about 84% and 16%, respectively. Normal operations in this area involved the use of one 4-yard shovel in the pit bottom, adjacent to the Trumbull south line, while the other shovel was used in the region west of the conveyor tunnel. Ore from both shovels was mixed at the screening plant, in varying proportions, for grading purposes. A large amount of high moisture ore was encountered in both areas, particularly in the upper, limonitic layers. This ore concentrated nicely, but gave a low natural iron product. However, as this material overlaid most of the mining area, it could not be mixed, and required almost complete removal before the low moisture ores could be attacked.

It was found, in both areas, that as the limits of the wash ore areas were approached, the ore became very spotty and tended to grade off into retreat. Therefore, in order to maintain a proper grade of concentrate, much of the ore originally estimated as lean and low grade wash had to be handled as retreat ore.

Hill wash ore was produced mainly from two areas. The first was on the north side of the West Hill forty (SE-NW), from which was obtained a high grade of wash ore. The second area centered about on the line between the middle and East Hill forties. Ore from this area was obtained from channels in the bottom rock, was spotty and generally lower in grade than the other. Operations consisted of mining both areas and mixing ores for the desired grade. A small amount of ore was obtained from scam work in the East Hill forty. This area was worked by hand and with a 5/8-yard dragline, and operations consisted of cleaning off rock areas and excavating narrow channels. A sizable operation had been planned in this area, but, due to the acute manpower shortage, this work had to be abandoned shortly after it was begun. For the same reason, no work was attempted in the direct ore areas.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1945

7. OPEN PIT:
(Continued)

g. Open Pit Mining and Loading: (continued)

A considerable amount of ore, both wash and retreat, remains in the Hill scam areas, but, due to the nature of the deposits, in pockets and narrow channels, it is becoming increasingly difficult and expensive to recover. However, in anticipation of relief in the manpower problem, a large scam program is being planned for 1946, and it is expected that much of this area can be mined out during the coming season.

Retreat ores were mined from both the Trumbull and Hill leases, with about 92% of the total production of crude coming from the Trumbull. Trumbull production came from approximately the same areas as the Trumbull wash ore and operations were practically identical.

Hill retreat ores were mined from the same general areas as the Hill wash. It was found that much of the Hill ore classified as lean and low grade wash, and jig, could be concentrated successfully in the cone plants, and the outlook for Hill jig ores is considerably brighter.

During the last three days of the 1945 season, experiments were run on some low grade ores in the west end of the Trumbull. This material had been classified as lean ore, or low grade jig ore. It was found that these ores could be concentrated successfully, although recovery was low. However, the experiments indicated that much ore in the pit area previously thought to be too low in grade for concentrating, could be handled successfully in the cone plant. In view of the expected improvement in operations, due to redesign of the plant for the 1946 season, it is felt that much of this material can be used profitably, particularly true if some reduction in royalty on low-recovery retreat ore could be obtained from the fee interests.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1945

8. COST OF OPERATION:

a. Comparative Mining Costs:

	1945 Budget	1945 COST PER TON	1944 COST PER TON
<u>PRODUCT:</u>			
Direct Shipping Ore, tons	10,000		5,897
Concentrates, tons	765,000	836,685	781,253
Total Production, tons	775,000	836,685	787,150
Average Daily Product, Tons Per Man Per Day,	-	5,133	5,663
Days Operated,	-	30.25	26.08
		163	139
<u>COST:</u>			
Open Pit Direct Ore,	\$.120	-	\$.120
Open Pit Crude Ore,	.233	\$.210	.231
General Pit Expense, Concentrating,	.043	.050	.043
Stocking Concentrates,	.263	.272	.265
General Mine Expense,	.007	.006	.010
Idle and Winter Expense,	.099	.108	.096
	.185	.173	.165
Cost of Production,	\$.826	\$.819	\$.807
Amortization - Defense Facilities,	-	-	.036
Depreciation- Plant & Equipment,	-	.120	.120
Depreciation- Motorized Equipment,	-	.042	.025
Amortization- Stripping,	-	.250	.250
Taxes - Ad Valorem,	-	.089	.108
Taxes - Occupational,	-	.025	.020
Taxes - Royalty,	-	.086	.083
Total Cost at Mine,	-	\$ 1.425	\$ 1.421
Administrative Expense,	-	.100	.100
Miscellaneous Expense & Income,	-	.003	.014
Grand Total,	-	\$ 1.528	\$ 1.535

The increased costs were due to retroactive wage adjustments for both 1944 and 1945, which were absorbed in the 1945 costs.

The figures for 1944 and 1945 were taken from the December cost sheets of each year. These were prepared before final charges were received from Cleveland.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1945

8. COST OF
OPERATION:
(Continued)

d. Detailed Cost Comparison:

(1) Product:

The proposed ore schedule for 1945 required production of 10,101 tons of direct ore and 772,726 tons of washed and retreat concentrates, for a total of 782,827 tons at the mine. The actual production for the season of 836,685 tons went over the estimate by 53,858 tons. No direct ore was produced, but this tonnage was made up by the over-production of concentrates.

The shortage of labor and consequent impossibility of maintaining a scrambling crew, accounts for the inability to produce any direct ore from the Hill scam area. No direct was encountered elsewhere in the Hill or Trumbull pits.

(2) Open Pit Mining:

Because no direct shipping ore was produced in 1945, no cost comparison is possible. The crude ore costs, as shown, are on a concentrate basis, and show a decrease of \$.023 under the budget and \$.021 under the 1944 figure.

Actual mining costs on a crude ore basis were \$.097 in 1945, compared with \$.119 for 1944, and \$.120 for the budget. Costs in 1945 were \$.022 under 1944 and \$.023 under the budget. The decrease in drilling and blasting costs of \$.003 and \$.004, respectively, was due to the decreased blasting necessary in the areas worked in the Trumbull. Shovel operating costs were reduced \$.004 under 1944 and the budget, due, largely, to increased production per shift. Truck operation and maintenance was reduced a total of \$.013 under 1944 costs and \$.012 under the budget. This was due to increased production and to the use of 20-ton trucks, which improved operations materially.

(3) General Pit Expense:

In this category, costs for 1945 were \$.007 over both 1944 costs and the budget estimate. This increase was due, mainly, to increased pumping costs, because the Trumbull pit bottom was worked heavily, and to increased structural drilling costs, because of a more extended drilling program. Cost differences in other items were minor.

(4) Concentrating:

Concentrating cost was \$.009 over 1944 and \$.007 over the budget. This occurred despite a retreat cost reduction of \$.012 below 1944 costs and \$.010 below the budget. Transportation costs increased \$.010 and \$.009, respectively, due, mainly, to extensive repairs to tracks and locomotives. Maintenance to buildings and machinery went up \$.008 over 1944 and the budget, due to extensive building repairs and to the purchase of additional plant equipment during the season. There were only minor differences in other items.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1945

8. COST OF
OPERATION:
(Continued)

d. Detailed Cost Comparison:

(4) Concentrating: (Continued)

Stocking concentrates showed a reduction of \$.001 under the budget and \$.004 under the 1944 costs. This reduction was due to generally improved conditions for both stocking and loading of this ore.

(5) General Mine Expense:

The 1945 cost was \$.012 over 1944 and \$.009 over the budget. The analysis and grading item accounts for practically all of this, being \$.012 over 1944 and the budget. This increase was due to the increased amount of experimental and research work being done at our testing laboratory.

Other expenses in this category showed only minor differences.

(6) Idle and Winter Expense:

In 1945, this cost was \$.008 over 1944, but \$.012 under the budget. The increase over 1944 was due, mainly, to extra work in the retreat plant, which, however, did not run as high as was anticipated.

9. EXPLORATIONS:

The drilling program at the Hill-Trumbull Mine was continued under contract during the entire year. Thirty-one holes were put down for a total of 2,585 feet. Three holes, totaling 365 feet, were put down through surface on the north side of the Hill pit, checking extensions of the ore body. Nine exploratory holes, totaling 1,021 feet, were drilled on the north side of the Trumbull, checking possible ore areas. One hole was drilled to a depth of 360 feet in the southeast corner of the Trumbull, checking the ore extension in that area. Of the remaining eighteen holes, eleven were drilled in the Hill pit and seven in the Trumbull. These were sample holes, checking the structure and analysis of the ore, and totaled 839 feet; 440 feet were drilled in the Hill pit and 399 feet in the Trumbull.

10. TAXES:

The following table shows a comparative statement of the taxes and average rate at the Hill-Trumbull Mine for the years 1944 and 1945:

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1945

10. TAXES:
(Continued)

	<u>1945</u>	<u>1944</u>	<u>Increase</u>	<u>Decrease</u>
Hill Mine,	\$18,449.25	\$24,390.55		5,941.30
Trumbull Mine,	40,323.72	30,164.01	\$10,159.71	
Hill-Trumbull Shops,	1,186.00	979.63	206.37	
Hill-Trumbull W.P.Lands,	8,431.60	7,118.29	1,313.31	
Personal Property,	6,352.49	4,025.99	2,326.50	
Total,	\$74,743.06	\$66,678.47	\$ 8,064.59	
Village Lots,	442.26	365.28	76.98	
Grand Total,	\$75,185.32	\$67,043.75	\$ 8,141.57	
Average Tax Rate,	127.56	105.53	22.03	

The decrease in the Hill Mine is due to the tonnage of ore mined from the property.

In the Trumbull Mine, the State Tax Department estimated a greater tonnage of ore in the property. This, in addition to the higher tax rate, is the reason for the increase.

The increase in the taxes for shops, lands, etc., is due to the higher tax rate.

11. ACCIDENTS
AND
PERSONAL
INJURY:

There were three lost-time accidents at the Hill-Trumbull Mine during the year, which are described as follows:

NAME:	Esther Leino	DATE:	June 20th.
CAUSE:	By using a scraper to remove chunk while rolls were moving, rolls caught scraper and pulled her hand against the grid.		
NATURE:	"Fracture of terminal phalanx right ring finger and a comminuted fracture of the right little head of carpal bone".		
COMPENSATION:	\$520.00.		
NAME:	Joe Karan	DATE:	October 24th.
CAUSE:	He was carrying a 12-foot rail, with three other men, when his foot slipped and he injured his back.		
NATURE:	"Lumbo sacral sprain".		
TIME LOST:	One week		
COMPENSATION:	\$24.00.		

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1945

11. ACCIDENTS
AND
PERSONAL
INJURY:
(Continued)

NAME: Patrick A. Kavanaugh DATE: November 27th.
CAUSE: He twisted his back while pulling power cable for the
 No. 34 shovel.
NATURE: "Back strain".
TIME LOST: Two days
COMPENSATION: \$8.00.

12. NEW CONSTRUCTION
AND PROPOSED
NEW CONSTRUCTION:

At the close of the 1945 ore season, work was begun on the re-design of the retreat plant. This work involved additions to the present structure, relocation of the present equipment and the installation of new concentrating machinery.

13. EQUIPMENT AND
PROPOSED
EQUIPMENT:

During 1945, two 20-ton Euclid trucks, a D-8 "Caterpillar" tractor, a Ford pickup truck and a Hydroseal pump were added to the equipment, and a coal stoker was purchased for the shop heating system. New equipment which will be added during 1946 will include a jeep for pit service, a Ford 3-ton dump truck for picking rock disposal at the mill and two 20-ton ore haulage trucks. In addition, the high density cone at the concentrating plant is being replaced with two Akins classifiers and the necessary screens, magnetic separators, pumps and conveying equipment, to double the capacity of the high density plant. A second 5' x 14' double-deck screen is being installed in the washing plant to improve the metallurgy in this plant.

19. WASHING PLANT
OPERATIONS:

Operations at the washing plant were started on April 23rd, on a 3-shift, six days per week basis, which was maintained until July 16th, when the schedule was reduced to two shifts, six days per week for the balance of the season. The mill was closed down October 31st, after a total operating period of 162 days. On the 3-shift schedule, necessary repairs were made on the day shift on Monday of each week and on the night shift, on the latter schedule.

Plant operating time was split about equally between washing straight wash ore and preparing feed for the retreat plant.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1945

19. WASHING PLANT
OPERATIONS:
(Continued)

During the 1945 season, 890,619 tons of straight wash ore crude and 934,932 tons of retreat crude were handled, for a total of 1,825,551 tons. From this was recovered 477,389 tons of washed concentrates and 539,739 tons of retreat plant feed. Total production was 1,017,128 tons, with a shift average of 2,562 tons, or 7,686 tons for a 3-shift day. Recovery averaged 55.7%. This compares with an average daily production of 6,613 tons and a recovery of 58.5% for the 1944 season. Washing plant operations were, in general, very satisfactory.

Due to a shortage of railroad cars, it was necessary to stockpile 83,764 tons of washed concentrates. Late season shipments required loading 70,146 tons from this stockpile.

Complete concentrating data for 1945 is as follows:

Screening Plant Rejects

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Hill,	2,320	23.75	.030	61.56
Trumbull,	5,250	25.26	.036	58.00
Total,	7,570	24.80	.034	59.09

36" Belt Rejects

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Hill,	-	-	-	-
Trumbull,	18	25.00	.041	57.60
Total,	18	25.00	.041	57.60

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

	<u>Tons</u>	<u>Iron</u>
Hill,	630	29.96
Trumbull,	645	20.53
Total,	1,275	25.19

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1945

19. WASHING PLANT
OPERATIONS:
(Continued)

Other removals during mining operations were:

	<u>Surface</u> <u>Cleanup</u>	<u>Lean</u> <u>Ore</u>	<u>Waste</u>	<u>Total</u> <u>Cu. Yds.</u>
Hill Lease,	11,806	-	-	11,806
Trumbull "	-	9,800	7,606	17,406
Total,	11,806	9,800	7,606	29,212

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

Hill Mill Machines:

	<u>Iron</u>	<u>Iron</u>	<u>Silica</u>
Log Washer,	58.41	.043	11.92
Classifier,	57.08	.040	14.25
Tailings,	15.29	-	-

Trumbull Mill Machines:

Log Washer,	57.55	.049	9.76
Classifier,	55.99	.045	12.44
Tailings,	12.44	-	-

The complete concentrating data for the year 1945 was as follows:

	<u>Tonnage</u>	<u>% of Total</u> <u>Mined</u>	<u>% Dried</u> <u>Iron</u>	<u>Tonnage</u> <u>Recovery</u>	<u>Iron Unit</u> <u>Recovery</u>
Crude Ore and Rock Mined,	890,619	100.00	40.96		
Less: Rock Removed in Mining,	1,275	.14	25.19		
Crude Ore Transported to Mill,	889,344	99.86	40.99		
Less: Rock Rejects in Screening Plant,	7,570	.85	24.80		
Crude Ore Entering Mill,	881,774	99.01	41.13		
Concentrates Produced,	477,389	53.61	57.36	54.14	75.50
Rock Rejects on Mill Picking Belt,	18	.00	25.00		
Tailings (by Deduction,)	404,367	45.40	21.96		
Total Heads, as above,	881,774	99.01	41.13		

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1945

20. HEAVY DENSITY
PLANT
OPERATIONS:

Operations of the heavy density, or retreat plant, were begun May 2nd, on a 3-shift, six days per week schedule and were continued on that basis through the season of 154 days, which closed on October 31st. A total of 539,739 tons of retreat feed was handled, from which 359,296 tons of concentrate were produced. The average daily production was 2,333 tons and the net recovery for the season, 38.4%.

Mill operations during the season were up to expectation on production, but were a little disappointing as to grade, due to trouble encountered in concentrating the fines. This trouble is common to all retreat plants in the area and experiments are being continually conducted for some definite improvement in this process. While the selective media concentrators were not entirely satisfactory, they were a big improvement over the double-classification process, and it was possible to handle ores which could not be used in former years. It is expected there will be some definite improvement in the entire process during 1946, through sizing, and further experimental work will be carried forward.

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

	<u>Tonnage</u>	<u>% of Total</u> <u>Mined</u>	<u>% Dried</u> <u>Iron</u>	<u>Tonnage</u> <u>Recovery</u>	<u>Iron Unit</u> <u>Recovery</u>
Crude Ore and Rock Removed,	934,932	100.00	35.98		
Less: Rock Removed in Mining,	-	-	-		
Crude Ore Transported to Mill,	934,932	100.00	35.98		
Less: Rock Rejects in Screening Plant,	15,830	1.69	24.42		
Crude Ore Entering Mill,	919,102	98.31	36.17		
Cone Plant Feed Produced,	539,739	57.73	50.81	58.72	82.49
Tailings (by deduction)	379,363	40.58	15.35		
Cone Concentrates Produced,	359,296	38.43	56.57	39.09	61.14
Cone Rejects,	29,588	3.16	23.82		
Tailings (by deduction)	150,855	16.14	42.38		

Safety Department

Annual Report

Year 1945

ACCIDENTS AND PERSONAL INJURYINDEX

<u>Title</u>	<u>Page</u>
a. Description of Fatal Accidents.....	1 - 2
b. Non-Fatal Accidents.....	3 - 24
Table I - Fatal Accident Record 1898 - 1945, inclusive.....	8 - 9
Table II - Classification of Fatal Accidents & Causes Dec. 1, 1898 - Dec. 31, 1945.....	10
Table III- Classification of Fatal Accidents 1911 - 1945 by the Central Safety Committee.....	11
Table III-A- Classification of Compensable Accidents.....	12 - 13
Table IV - Number of Man Shifts Worked and Tons of Ore Produced Per Fatality.....	14
Table V - Number of Accidents of All Kinds.....	15
Table VI - Causes of Compensable Accidents, Including Fatalities Underground.....	16
Surface, Open Pit Mines, Other Operations.....	17
Table VII- Frequency Rates, All Compensable Accidents.....	18
Table VIII Severity Rates, " " " ".....	18
Table VIII-A- Compensable Accidents, Including Fatalities by Mines...	19
Table VIII-B- Compensable Accidents, Including Fatalities.....	20
Table VIII-BB- All Accidents, Including Fatalities.....	21
Table VIII-C- Frequency - Severity Ratings, Taken from Available Statistics, N.S.C.	22
Table IX - Showing Group Ages of Injured Workers.....	23
Table XI - Showing Occupation of Injured Workers.....	24
c. Safety Inspection.....	25 - 42
Fire Patrol Inspection Underground.....	26
Idle Properties.....	26
Blasting Inspections.....	26 - 27
Table XII - Number of Safety Recommendations and Suggestions.....	28
Table XIII- " " " " " " " ".....	28
Table XIV - Number of Inspections Made During the Blasting Procedure in Various Mining Contracts.....	29
Rules and Regulations.....	30
Table XV - Number and Kind of Safety Inspections Reports Made by Mine and Plant Foremen and Checked by this Department....	31
Table XVI - Number of Fire Extinguishers Inspected.....	32
Table XVII- Rule Books Distributed at Michigan Mines and Plants New Combined Surface Rule Books.....	33
Table XVII- New Combined Underground Rule Books.....	33
Disciplinary Action.....	34
Table XVIII-Causes and Number of Disciplinary Action.....	34
Central Safety Committee.....	35 - 37

Safety Department

Annual Report

Year 1945

INDEX (Cont'd.)

<u>Title</u>	<u>Page</u>
General Foremens' Conference.....	37
Mining Club.....	37
Lake Superior Mining Section, National Safety Council.....	38 - 39
National Safety Council.....	39
Safety Banner Flags.....	39
Miners' Safety Bulletin.....	40
Foremens' Safety Bonuses.....	40
Table XIX - Safety Bonuses Paid to Foremen.....	41
Table XX - Occupations of Men Participating in Bonus.....	42
d. Ventilation.....	43 - 53
Summary of Ventilation at Each Mine.....	43 - 46
Dust Elimination and Analysis.....	46 - 47
Table XXI - Dust Samples Collected in Rock and Ore.....	48
Table XXII- Various Occupations Where Dust Samples Were Collected....	49
Table XXIII-Average Light Field Count of All Samples Taken.....	50
Table XXIV -Comparison of Dust Counts in Raising to Drifting.....	51
Table XXV - Averages in Ore Compared to Averages in Rock.....	52
Table XXV-A-Comparison of Average Dust Counts in Various Operations..	53
e. Mine Safety and Mine Rescue Courses.....	54 - 58
Mine Rescue Training.....	54
Table XXVI- Men Trained by the Safety Department and Examined by U. S. Bureau of Mines 1945.....	55
Table XXVII-First Aid Supplies Distributed.....	56
Metal Mine Accident Prevention Course.....	57 - 58
f. Miscellaneous.....	59 - 66
Incipient Mine Fires.....	59 - 61
Spies-Virgil Mine Fire Bulkheads.....	62
Lake Superior Mine.....	62
Ishpeming Hospital.....	62 - 63
Reports on Accident Statistics.....	63
Republic Mine.....	63
Ishpeming High School Exhibit.....	63
Mine Rescue Station.....	63
Summary.....	63 - 64
Frequency and Severity Ratings Over a Period of Years.....	65 - 66
Expenses for Year 1945.....	67

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURYa. Fatal Accidents

During the calendar year of 1945 one fatal accident occurred at the company's properties. This again was a fall of ground accident and one which apparently could easily have been avoided.

Falls of ground still continue as the most serious hazard in underground mining and probably will continue so in the future mainly because many human beings will not be governed by good common sense. In the company's underground operations there are very few hazards which we do not recognize. If every employee would do his work as he knows best and as he has been instructed, accidents would be few and far between, but there still is the tendency to flirt with danger and take a chance which happened to be the case in our fatal accident during the past year.

Description of Fatal AccidentMaas Mine

Richard Thomas Oates, Sr., miner, was instantly killed at approximately 5:30 P.M., March 26, 1945, by a fall of ground in number 27 contract, 130' sub-level above 4th level.

Number 27 contract was located 20 feet above the 4th level in 300 cross-cut using 306 raise. The slices in this contract were driven off 306 raise to the north east, swung to the left until finally the slice was parallel to 300 cross-cut. The ground had been fairly hard up to this time.

On Saturday morning, March 24th, the miners had drilled through the hard ground and driven into soft ground which was full of wet slips. The day shift (8 to 4) had blasted a round and scraped the ore into the chute with the exception of approximately 10 tons, which was still left in the breast of the slice. This shift had not placed in the necessary forepoles in the back as is required by company rules, nor had they used any sort of side support on the pillar side (left side) of the slice. The gob side was well filled with old timber and lagging.

The breast of the slice was $37\frac{1}{2}$ feet from 306 raise, almost directly over an abandoned cross-cut which had been used as a dining room, which left but very little pillar between the floor of the slice and the back of the cross-cut. The lifter hole on the left of the slice had broken into a void over the top of the dining room and weakened the forward half of the left side of the slice.

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURYa. Fatal Accidents (Continued)

When the afternoon shift of contract #27, composed of Richard Oates and his son Thomas, came to the contract they first scraped about two cars of ore and failed to make the place safe by forepoling. Next they trimmed the left side, shoveled the timber leg hitches and took down the rope sheave. Because timbermen were not handy they hoisted their own timber and lagging from the main level. The timber legs were put in place and the stage was built. Here again a mistake was made by using spruce poles for stage poles and stuttles. Spruce is a very weak wood and should never be used. Also the diameter of the stage poles was $2\frac{1}{2}$ inches at the small end and 3 inches at the large end, which would be considered too small if they were made of tamarack.

After the stage was completed the younger man measured the distance between the top of the timber legs and found they should be let in some, which Richard Oates proceeded to do by crouching under the stage intending to pound the stuttle, which was supporting the left leg, back far enough so the timber cap would fit. It was at this time that the fall of ground occurred from the upper left side. This piece of ground could not measure more than 18 inches x 4 feet x 6 feet and it is highly probable that some of this ore fell out after the accident. At any rate the weight of the falling ore, plus the weight of Thomas Oates on the stage was enough to break the weak stage poles, causing the stage planks (Size 3" x 12" x 13') to strike Richard Oates across the head and neck causing death instantly.

Richard Thomas Oates, Sr. was 55 years of age and is survived by his widow Martha, 54; two daughters, Beatrice 13 and Elizabeth Jane 21, and two sons, Thomas Henry, 29 and Richard Jr. 31.

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURYb. Non-Fatal Accidents

The year of 1945 gave the company one of the best, if not the best accident severity rating in it's history. Our fatality rate of .32, based on "Per Thousand Employees", is the lowest of any year with the exception of 1932, when the average number of employees was 630 and there were no fatalities. The average fatality rate for the five year period 1941 - 1945 inclusive is the lowest in the history of the company. This rating is .86.

Our 1945 severity rating for all compensable accidents including fatalities is probably the lowest of all time with the possible exception of 1932.

We cannot make a complete comparison of accidents which have occurred since 1898 because of the different methods used to determine frequency and severity. One method used in the past was to determine frequency by the number of accidents for every 1000 days worked. A fatal accident was listed as 1800 days lost time. The severity rate was determined by the number of days lost per 1000 man shifts worked. Since 1942 we have used the National Safety Council and U. S. Bureau of Mines methods which determine the ratings as follows - Frequency Rate - Number of accidents for every 1,000,000 man hours. Severity Rate - Number of days lost per 1,000 man hours. A fatal accident is classed as 6,000 days lost and each permanent injury is listed, such as loss of one eye 1,800 days. This method is standard and of course increases greatly the number of days lost from injury, but it gives us a chance to compare our accident rates with all companies in the nation so we know if our accident prevention work is effective.

Our frequency rate on compensable accidents is 14.74, which is approximately one point lower than 1944.

Including all accidents with lost time from one day and on up our frequency rating is considerably below the nations average for metal mining, but as in past years it will be a little above the larger mining companies of the Lake Superior District. Although we do not have any statistics for 1945 of the Lake Superior District, I am sure our severity rating will be one of the lowest. I am judging this from "Accident Exchange Data" and information gathered from Safety Engineers of the District.

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURY

b. Non-Fatal Accidents (Continued)

There were 87 compensable accidents underground which caused injury. Of this total 58 of the injured were miners and the other 29 were distributed among nearly all other classifications of jobs. Falls of ground caused 26 of all underground accidents and by far the greatest amount of lost time mainly because 6000 days lost time is credited to the one fatal accident which occurred at the Maas Mine. With a total of 13,624 days lost due to accidents it can be easily seen that most other accidents did not cause such a great loss of time. It is believed that because of better timbering and especially the new rule which requires side support for all drifts and slices in ore that falls of ground accidents have been less severe. I am firmly convinced that if miners will forepole both back and sides of a drift or slice and supervisors will insist on good timbering, our falls of ground accidents will not be more of a bad problem than any other type of hazard we have in the mines.

A stumbling block in all mining has been to furnish workmen with necessary supplies so there would be no delay in normal work to keep up production, efficiency and safety. It is human nature for a person to try to use substitute material when the proper material is not on hand and in many cases there is no substitute which can be used, such as proper sized timber, lagging, poles, etc.. A miner for example when without timber or other supplies may try to drill a round of holes without the proper protection overhead or on the sides of his drift or slice. Because of the noise made by the drill machine he cannot hear any movement of ground and sometimes his vision is obstructed because of fog and oil from the machine. This man places himself in real danger when he takes a chance of this kind. This is only one example of how hazards build up and the answer to this type of hazard is to get supplies to him in time and insist that he uses them properly. I am well acquainted with the supply problem and know that it is a hard one to overcome, but only this if it can be overcome, will greatly reduce our accident rates and our production and efficiency will be greatly improved. I believe this problem should be given real serious consideration at everyone of our properties.

Falling material, other than falls of ground, and moving machinery underground caused 15 lost time accidents. I believe we have the answer to the falling material problem. Nearly all these accidents were caused by material and chunks falling down raises. The Central Safety Comm-

Safety Department

Annual Report

Year 1945

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

It was agreed that by placing fine mesh, metal gates in the raises this type of accident would seldom occur. It will take some time before all installations are made so we can check on the value of this agreement. Injuries caused by moving machinery have been mainly the fault of the injured or one of his partners, because of a lack of good judgment, or plain carelessness.

Loading at chutes caused 10 injuries involving lost time. Most of the injuries were caused by chunks which have rolled over the edge of the haulage car and have fallen on the foot or leg of the chuteman. This type of accident has been classed as a trade risk up to this time as we have no satisfactory solution to the problem. Many different methods of prevention have been tried and none too successfully, but we are still experimenting and hopeful of a solution.

Falls of persons caused 9 compensable accidents and a noticeable amount of lost time and demands considerable attention. Good housekeeping is one of the preventive measures and is a major safety measure in the prevention of all accidents, but some of the accidents have been caused by stumbling when the persons foot or toe has struck an object. Good travel-ways are provided in most of our mines and when that is done it would seem that each employee should take care of himself. In the Cliffs Shaft Mine a person must be on the alert at all times when travelling over broken rough ore for there is nothing much we can do to eliminate that particular hazard as it is one of the necessary evils in a hard ore mine. Falls of persons down raises is another contributor to injury. The great majority of our travel raises are in good condition for travel. Usually the injured person does not know exactly why he fell. We have tried to lessen the injury from falls in raises by placing safety gates at specified intervals so any fall would be short, but we still feel that the employee must also try to keep hold on the ladder at all times.

Most other accidents which occurred during the year are the type which our rules cover pretty well and are not very serious with the exception of "Flying Particles." Nearly all flying particle injuries have been to the eyes. Our rules call for the wearing of safety glasses or gogg-

Safety Department

Annual Report

Year 1945

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

les at any time when there is danger of flying particles. This rule is not satisfactory and should be revised so that the wearing of eye protection would be compulsory with a few exceptions. The Negaunee Mine had one eye injury which caused the loss of the eye (1800 days). This man was standing close to the raise while timber was being hoisted. The steel rope broke and struck the man over the face and eye. The eye was later removed when it could not be saved. Technically this man was not violating any rule. It is quite certain his eye would not have been injured had he been wearing safety glasses. I have been reluctant about recommending a rule for the compulsory wearing of eye protection during the entire work shift mainly because of our difficult ventilation problems and because some of our supervisors do not yet see all the advantages of ventilation. With good ventilation in all work places safety glasses or goggles could be used at all times. From observation we know that over 90% of the employees could wear eye protection without trouble (from fogging, misting and water) and many men do wear safety glasses at all times. Mr. H. F. Rogers, Mr. Tom Hill and myself wear safety glasses at all times while underground. We do have to wipe off the fog or mist at times, but this trouble is not serious and the fact is that those of us who travel in and out of the air currents at all times do have more trouble than any employee who is in one work place during the entire shift where the temperature of the eye glasses and the body may become equalized.

Falls of persons caused approximately 60% of all surface and open pit accidents. None of the surface accidents were of the unusual type, but rather those which are quite common, with proper rules covering all of them.

Best accident records, including all types of lost time accidents for individual mines and other properties were as follows -

Cliffs Power & Light Co. -	Frequency	0.00	Severity	0.00
Holman Cliffs Mine	"	2.27	"	0.005
Spies-Virgil Mine	"	38.98	"	0.379

The above properties are the winners of the Banner Safety Flags for their respective types of operations.

Safety Department

Annual Report

Year 1945

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

The following properties improved their ratings over 1944. Spies-Virgil, Mather, Lloyd, Athens, Princeton, Hill Trumbull, and Holman Cliffs. The Cliffs Power & Light Company, Miscellaneous and General Roll went through the year without any compensable accidents which is a duplicate of 1944.

The ratings of all properties are listed under two headings this year - one to cover only compensable accidents and the other covering all accidents which caused loss of one day or more, including fatalities.

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURY

TABLE I

FATAL ACCIDENT RECORDCleveland Cliffs Iron Co. and Cliffs Power & Light Co.
1898 - 1945, 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
	3,666	14	3.79
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
	7,729	41	5.30
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
	13,028	66	5.06
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
	13,332	35	2.70
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
	18,348	43	2.36

Safety Department

Annual Report

Year 1945

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
	<u>12,282</u>	<u>20</u>	<u>1.61</u>
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
	<u>10,438</u>	<u>72</u>	<u>6.90</u>
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
	<u>5,298</u>	<u>11</u>	<u>2.05</u>
1936	2125	2	.94
1937	2763	1	.36
1938	2590	3	1.17
1939	2457	1	.41
1940	2756	5	1.88
	<u>12,691</u>	<u>12</u>	<u>.94</u>
1941	3570	5	1.40
1942	3562	2	.56
1943	3609	4	1.11
1944	3584	3	.84
1945	3078	1	.32
	<u>17,403</u>	<u>15</u>	<u>.86</u>
1911 - 1945	89,792	208	2.32

Based on per thousand employees

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURY

TABLE II

Classification of Causes of Fatal Accidents
From December 1, 1898 to December 31, 1945

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.....	<u>4</u>	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.....	<u>1</u>	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.....	<u>2</u>	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.....	<u>1</u>	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.....	<u>3</u>	43
	Total.....		329

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURY

TABLE III

Classification of Fatal Accidents 1911 to 1945, 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. <u>Negligence of Workmen:</u>		
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	C.S.	Lloyd	Tilden	Spies	Mather	Princeton	Cambria	Canisteeo	H. Cliffs	H. Trumbull	Shops	Sthse.	C.P.&L. Co.	Totals
I. Trade Risk, (Incidental & Non-preventable)	1	9	2	4	3		1	1	3	3	1		2				30
II. Negligence of Company																	
4. Improper Act or Selection of Doing Work - (By Foreman)																	
5. Failure to Instruct Men as to Method of Doing & Hazards Incident Thereto.																	
6. Failure to Provide Safety Devices	1	2	1		1	1											6
7. Failure to Provide Proper Tools, Appliances or Place to Work	1		1	2				1	1								6
III. Negligence of Workmen:																	
A. 1. Failed to Use Safety Devices Provided							1										1
2. Failed to Use Proper Appliances or Tools Provided																	
3. Violation of Rules		1	2	1	1					3							8
4. Improper Act or Selection of Improper Method of Doing Work (by Workmen) (B - Other Workmen)	11	7	8	4	4	1		1	2								38
3. Violation of Rules				1													1

(Cont'd. - Next Page)

(Continued)

TABLE III-A

CLASSIFICATION OF COMPENSABLE ACCIDENTS

	Athens	Maas	Negaunee	C.S.	Lloyd	Tilden	Spies	Mather	Princeton	Cambria	Canisteeo	H. Cliffs	H. Trumbull	Shops	Sthse.	C.P.&L. Co.	Totals
II - 4 and II - 7														1			1
III - A and II - 6							1										1
III - A - 1 and III - A - 4				1													1
III - A - 3 and III - A - 4				1					1				1				3
III - A - 2 and II - 5				1													1
III - A - 4 and III - B - 4			3								1						4
III - A - 4 and III - B - 3					1												1
III - A - 4 and II - 7										2							2
III - A - 4 and II - B										1							1
Totals	14	21	17	16	10	2	1	5	7	9	2		3	1			108

11. ACCIDENTS AND PERSONAL INJURY

(Continued)

Year 1945

Annual Report

Safety Department

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURY

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	<u>1</u>	<u>915,666</u>	<u>5,970,577</u>
Total	38	9,614,932	59,775,233
15 yr. Average	2.53	253,025	1,573,033

* Man-shifts worked

** Amount of Ore mined

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURYb. 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	49	14	14		77
Maas	76	25	20	1	122
Negaunee	57	20	17		94
Cliffs Shaft	68	12	16		96
Lloyd	56	14	10		80
Tilden	5	1	2		8
Spies-Virgil	15	6	1		22
Mather	75	11	5		91
Princeton	23	8	7		38
Cambria-Jackson	26	12	9		47
Canistec	42	2	2		46
Holman Cliffs	36	1	0		37
Hill Trumbull	24	6	3		33
General Shops	17	2	1		20
Garage & Storehouse	2	0	0		2
C. P. & L. Co.	0	0	0		0
Laboratory	1	0	0		1
Ishpeming Hospital	6	0	0		6
Engineering Dept.	<u>2</u>	<u>0</u>	<u>0</u>		<u>2</u>
Totals	581	134	107	1	823

Safety Department

Annual Report

Year 1945

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

TABLE VI

CAUSES OF COMPENSABLE ACCIDENTS,
INCLUDING FATALITIESUNDERGROUND

<u>Cause</u>	<u>Spies Camb.</u>								<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>
Falls of ground	4	7	7	1	4			2	1	26
Falling material or moving machinery	1	3	2	3	1		3		2	15
Falls of persons slipping & stumbling	3	1		3	1		1			9
Loading at chutes		1	1	4	4					10
Bumping against objects				1				1		2
Using or handling tools, machinery or materials	2	3		1		1				7
Blasting				1						1
Dumping at shaft			1				1			2
Wire ropes		1	1							2
Run of ore			1							1
Chunks rolling down pile	1		1				1		1	4
Haulage	1	1						1		3
From flying particles		1					2	2		5
Totals	12	18	14	14	10	1	8	6	4	87

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURY

b. Non-Fatal Accidents (Continued)

TABLE VI (Cont'd.)

SURFACE

<u>Cause</u>	<u>Athens</u>	<u>Maas</u>	<u>Neg.</u>	<u>C.S.</u>	<u>Lloyd</u>	<u>Spies</u>	<u>Camb.</u>	<u>Princeton</u>	<u>Mather</u>	<u>Total</u>
Falling material or moving machinery	1		1	1						3
Falls of persons slipping or stumbling	1	2	2	1			1	1	1	9
Using or handling tools, machinery or materials		1								1
Totals	2	3	3	2			1	1	1	13

OPEN PIT MINES

<u>Cause</u>	<u>Canisteeo</u>	<u>Hill</u>	<u>Trumbull</u>	<u>Holman</u>	<u>Cliffs</u>	<u>Tilden</u>	<u>Total</u>
Falling material or moving machinery	1		1				2
Falls of persons slipping or stumbling	1		1			1	3
Using or handling tools, machinery or materials			1			1	2
Totals	2		3		0	2	7

OTHER OPERATIONS

<u>Cause</u>	<u>General Shops</u>	<u>Total</u>
Falling material	1	1
Total	1	1

Safety Department

Annual Report

Year 1945

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

TABLE VII

FREQUENCY RATES

All Compensable Accidents

Year	Total Man Days Worked	Number of Compensable Accidents		Frequency** Rate
		Non-Fatal	Fatal	
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 $\frac{1}{2}$	121	3	15.61
1945	915,665 $\frac{3}{4}$	107	1	14.74

** Based on 1 million man-hours of labor

TABLE VIII

SEVERITY RATES

All Compensable Accidents

Year	Non-Fatal		Fatal		All Accidents	
	Days Lost	Rate	Days Lost	Rate	Days Lost	Rate
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

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

Safety Department

Annual Report

Year 1945

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

TABLE VIII-A

COMPENSABLE ACCIDENTS, INCLUDING FATALITIESBY MINES

<u>Mine or Plant</u>	<u>Frequency</u>	<u>Severity</u>
Athens	19.04	.596
Cliffs Shaft	16.27	1.526
Canisteeo	7.11	.387
C. P. & L. Co.	0.00	0.000
Sthse. & Shops	4.90	.588
Hill Trumbull	7.58	.071
Holman Cliffs	0.00	.000
Lloyd	20.07	1.154
Maas	24.51	8.220
Miscellaneous	0.00	.000
Negaunee	24.58	3.557
Princeton	19.61	.891
Spies-Virgil	5.59	.329
Tilden	29.20	.394
Mather	10.39	.670
Cambria-Jackson	20.99	1.455
General	0.00	.000
All Properties	14.74	1.860

11. ACCIDENTS
AND
PERSONAL
INJURY

TABLE VIII-B
COMPENSABLE ACCIDENTS, INCLUDING FATALITIES

<u>Mine or Plant</u>	<u>Days of Labor</u>	<u>Hours of Labor</u>	<u>Tons of Ore Mined</u>	<u>Number of Compensable Accidents</u>	<u>Fatalities</u>	<u>Days Lost</u>	<u>Frequency Rates</u>	<u>Severity Rates</u>
Maas	10710 $\frac{3}{4}$	856838	563288	20	1	7043	24.51	8.220
Negaunee	86459	691672	654447	17		2460	24.58	3.557
Cliffs Shaft	122895	983160	558836	16		1500	16.27	1.526
Camb. Jackson	53571	428568	315514	9		624	20.99	1.455
Lloyd	62270 $\frac{1}{4}$	498262	326633	10		575	20.07	1.154
Princeton	44614 $\frac{1}{4}$	356916	269041	7		318	19.61	.891
Mather	60110 $\frac{3}{4}$	480886	203091	5		322	10.39	.670
Athens	91900 $\frac{1}{2}$	735204	438427	14		439	19.04	.596
Sthse. & Shops	25495	203960		1		120	4.90	.588
Tilden	8563 $\frac{3}{4}$	68510	197476	2		27	29.20	.394
Canisteo	35137	281096	659836	2		109	7.11	.387
Spies-Virgil	22446 $\frac{1}{2}$	179570	67538	1		59	5.57	.329
Hill Trumbull	49445	395560	836685	3		28	7.58	.071
Holman Cliffs	55194	441552	879765	0		0	0.00	.000
C. P. & L. Co.	13126 $\frac{1}{4}$	105010		0		0	0.00	.000
Miscellaneous	15859 $\frac{1}{2}$	126876		0		0	0.00	.000
General Roll	61474	491792		0		0	0.00	.000
TOTALS	915665$\frac{3}{4}$	7325432	5980577	107	1	13624	14.74	1.860

Safety Department
Annual Report
Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURY

TABLE VIII-BB

ALL ACCIDENTS INCLUDING FATALITIES

<u>Mine or Plant</u>	<u>Days of Labor</u>	<u>Hours of Labor</u>	<u>Number of Compensable Accidents</u>	<u>Fatalities</u>	<u>No. of Accidents 1 - 7 Days</u>	<u>Comp. Days Lost</u>	<u>Non-Comp. Days Lost</u>	<u>Total No. of Accidents</u>	<u>Total Days Lost</u>	<u>Frequency</u>	<u>Severity</u>
Maas	107104 $\frac{3}{4}$	856838	20	1	25	7043	64	46	7107	53.69	8.295
Negaunee	86459	691672	17		20	2460	61	37	2521	53.49	3.645
Cliffs Shaft	122895	983160	16		12	1500	39	28	1539	28.48	1.565
Camb. Jackson	53571	428568	9		12	624	26	21	650	49.00	1.517
Lloyd	62270 $\frac{1}{4}$	498262	10		14	575	45	24	620	48.17	1.244
Princeton	44614 $\frac{1}{2}$	356916	7		8	318	28	15	346	42.03	.970
Mather	60110 $\frac{3}{4}$	480886	5		11	322	25	16	347	33.27	.722
Athens	91900 $\frac{1}{2}$	735204	14		14	439	24	28	463	38.08	.630
Sthse. & Shops	25495	203960	1		2	120	3	3	123	14.71	.603
Canisteco	35137	281096	2		2	109	8	4	126	14.23	.448
Tilden	8563 $\frac{3}{4}$	68510	2		1	27	2	3	29	43.80	.423
Spies-Virgil	22446 $\frac{1}{2}$	179570	1		6	59	9	7	68	38.98	.379
Hill Trumbull	49445	395560	3		6	28	16	9	44	22.75	.111
Holman Cliffs	55194	441552	0		1	0	2	1	2	2.27	.005
C. P. & L. Co.	13126 $\frac{1}{4}$	105010	0		0	0	0	0	0	0.00	.000
Miscellaneous	15859 $\frac{1}{2}$	126876	0		0	0	0	0	0	0.00	.000
General Roll	61474	491792	0		0	0	0	0	0	0.00	.000
TOTALS	915665$\frac{3}{4}$	7325432	107	1	134	13624	352	242	13976	33.04	1.908

Safety Department

Annual Report

Year 1945

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

TABLE VIII-C

FREQUENCY - SEVERITY RATINGSTaken from Available Statistics, N.S.C.

	<u>Frequency</u>	<u>Severity</u>
1944 National Ratings, all mining	50.53	8.46
1944 " " Metal Mining	25.39	5.91
1944 " " Open Cut Mining	13.06	2.14
1945 Cleveland Cliffs Iron Company, Compensable Accidents	14.74	1.860
1945 " " " " All Accidents	33.04	1.908
1945 " " " " Open Cut Mining	14.33	.161
1945 " " " " Top Slicing	47.94	3.282
1945 " " " " Stopping	30.10	1.382
1945 " " " " Sub Level Caving	33.26	.721
1945 " " " " General Shops	14.71	.601
1945 " " " " General Roll	0.00	.000
1945 " " " " Miscellaneous	0.00	.000
1945 Cliffs Power & Light Company	0.00	.000

Safety Department

Annual Report

Year 1945

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

TABLE IX

SHOWING GROUP AGES OF INJURED WORKERS
(Compensable Accidents)

<u>Age</u>	<u>Number Injured</u>
16 to 25 years of age.....	5
26 to 30 years of age.....	10
31 to 35 years of age.....	13
36 to 40 years of age.....	13
41 to 45 years of age.....	9
46 to 50 years of age.....	9
51 to 55 years of age.....	17
56 to 60 years of age.....	18
61 to 65 years of age.....	11
66 to 70 years of age.....	1
71 to 75 years of age.....	1
*Not stated.....	<u>1</u>
	108

* Ralph Brown - Hill Trumbull - June 23rd - not stated.

Safety Department

Annual Report

Year 1945

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

TABLE XI

SHOWING OCCUPATION OF INJURED WORKERS
(Compensable Accidents)
(Including Fatality)

<u>Underground</u>	<u>Surface</u>
Miner.....58	Shovel Oiler..... 3
Motor Brakemen..... 6	Truck Driver..... 3
Chutemen..... 5	Laborers..... 3
Motormen..... 3	Drill Operators..... 2
Foremen..... 4	Stationary Engineers 2
Timbermen..... 2	Crusher Engineer.... 1
Laborers..... 2	Welder..... 1
Trammers..... 1	Timber Frammer..... 1
Scraper Operator... 1	Motor Brakeman..... 1
Pumpman..... 1	Fireman..... 1
Timber Hoister..... 1	Miner..... 3
Timber Trammer..... 1	21
Repairman-Scraper.. 1	
Trackman..... 1	
87	

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURYc. Safety Inspection (Continued)

TABLE XII

<u>Mine or Plant</u>	<u>Violations of Standards</u>	<u>Safety Suggestions</u>	<u>Recommendations</u>	<u>Fire Hazard</u>	<u>Total</u>
Cliffs Shaft	11	13	5	6	35
Princeton	24	13	3	0	40
Spies-Virgil	6	7	3	1	17
Maas Mine	22	19	4	5	50
Negaunee	19	23	3	3	48
Athens	33	21	4	3	61
Cambria-Jackson	31	11	4	1	47
Lloyd	15	13	3	0	31
Mather	7	8	6	2	23
Shops & Sthse.	1	5	1		7
Diamond Drills		1	1		2
Republic Test		1	1		2
Power Plants			1		1
Ishpeming Hospital	<u>2</u>	<u>2</u>	<u>4</u>	<u>2</u>	<u>10</u>
TOTALS	171	137	43	23	374

TABLE XIII

Mesaba Range

<u>No. of Inspections</u>	<u>No. of Recommendations</u>	<u>No. of Suggestions</u>
200	42	154

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURYc. Safety Inspection (Continued)

Mr. H. F. Rogers, Safety Inspector, averaged one complete inspection per month of all underground and surface properties. I was unable to inspect properties as often because of the many other duties and because of illness which kept me out of the mines for about five weeks. Our inspection trips of all operating properties were made with either superintendent, mining captain, or shift boss. As usual we paid more attention to loose and heavy ground than any other hazard and when loose ground was found we stayed in the place until the hazard was corrected. The use of side spiling in all ore drifts and slices no doubt prevented many injuries. In some mines this rule was followed 100%, but in other mines because of a lack of material and also because of misinterpretation of the rule the side support was not used 100% until the interpretation was made at a Central Safety Committee Meeting.

As a whole cooperation on the part of all supervisors was good. Outside of a few minor safety recommendations made by the Safety Department they were all carried out almost immediately.

The writer made four inspections of Mesaba Range Mines in the company of George Whittington, Safety Inspector. The Mesaba Range Mines were found in very good condition with the greatest improvement at the Holman Cliffs Mine.

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURYc. Safety InspectionFire Patrol Inspection Underground

Inspection of all parts of underground mines at the beginning of idle periods and every 24 hours thereafter was continued during the year. The purpose of these inspections is to make certain that all electric power has been turned off and to locate any fires in the incipient stage. In my opinion this inspection is one of the most valuable, if not the most valuable of all inspections because if an underground fire gets a start into the gob it is next to impossible to get at it.

Idle Properties

These properties are inspected each spring and fall season. Considerable repair work is necessary each spring to repair fences which have been broken by heavy snow and also by persons cutting trees and keeping paths open for short-cuts through properties. Two old test pits in the Iron Plat location of Negaunee were filled during the summer to prevent children from falling into them. The timber covering over two old shafts in the Negaunee City limits were also repaired. At the Old Michigamme Mine, old hoisting cable was used to fence an opening to the pit where people take out ice for home consumption. "No Trespassing" signs have been placed at all strategic points. In some places these signs have been chopped down.

Blasting Inspections

These inspections are required at least two times annually of each mining contract. The shift boss makes the observation and report and many are made in the presence of either Mr. Rogers or myself. Of a total of 1332 inspections made there were 130 violations of blasting rules. Most of the violations were minor ones, but a few were serious, which proves that the blasting inspections are of real value and corrections can usually be made before an accident happens. Only one lost time accident happened because of failure on the part of men blasting in a chute to warn other employees and prevent others from walking into the blast. In this case the miner had walked by the chute where the blasting was being done and the blast went off

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURYc. Safety Inspection (Continued)

when the miner was only a short distance away. There was no physical injury, but shock caused the man to lose time. Reports of inspections made in each contract will be sent to each mine showing any violation of rules.

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURYc. Safety Inspection (Continued)

TABLE XIV

NUMBER OF INSPECTIONS MADE DURING THE BLASTINGPROCEDURE IN VARIOUS MINING CONTRACTS

<u>Mine</u>	<u>Number of Inspections</u>	<u>Number of Violations Reported</u>
Athens	100	15
Cambria-Jackson	127	13
Cliffs Shaft	446	12
Lloyd	75	3
Maas	248	26
Mather	58	1
Negaunee	208	52
Princeton	68	8
Spies-Virgil	2	0
	<hr/>	<hr/>
Totals	1,332	130

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURYc. Safety Inspection (Continued)Rules and Regulations

A total of 76 rule books were distributed to surface employees during the year and 250 to underground employees. The employee signs a receipt for his rule book and the receipt is filed by the Safety Department.

Because of the fact many of our rules are now obsolete a new set of rules will have to be made during 1946. Many of these rules have already been agreed upon by the Central Safety Committee. Members of the Safety Department will start revision of the rule books as soon as time permits and changes will be passed on by the Central Safety Committee.

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURYc. Safety Inspection (Continued)

Following are tables showing the kind and number of safety inspection reports made by the mine and plant foremen, which were received and checked by this department.

TABLE XV

Type of Inspection	Ath.	C.S.	Lloyd	Maas	Neg.	Spies	Prince-ton	Math.	Tild.	Camb. Jack.	Can.	Hill Trumb.	Holman Cliffs	Total
Hoisting Rope Skip and Cage Roads	274	305	252	280	295	248	184	279		298				2,415
Ladder Roads	108	106	66	92	54	42	74	52		84				678
Safety Catches	56	103	31	47	53	38	22	52		3				405
Fire Doors(U.G.)	13	26	9	12	12	15	12	11		9				119
Slack Rope Device				7										7
Hoist Inspection	12	8		7	11	13	19	11		2				83
Fire Extinguishers	18	18	16	17	18	18	18	18		18				159
Fire Equipment	2	1		1	2	2	1	1	2	2	2	2	2	20
Fire Prevention	1		1	3	3	2		1		3	4	4	4	26
TOTALS	20	19		16	21	11	17	4	14		8	16	14	160
	504	586	375	482	469	389	347	429	16	419	14	22	20	4,072

Office

	Hibbing Dist.	Negaunee Dispensary	Storehouse and Shops	Rented Bldgs.	Ishpeming Hospital	General Office	C. P. & L. Co. Ishpeming	Totals
Fire Extinguishers	2			2	2	2		10
Fire Prevention	2	2			2	2	9	17
TOTALS	4	2		2	4	4	9	27

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURYc. Safety Inspection (Continued)

TABLE XVI

NUMBER OF FIRE EXTINGUISHERS INSPECTED

<u>Mine or Plant</u>	<u>Soda Acid</u>	<u>Foam</u>	<u>1 - 1½ Quart Vaporizing</u>	<u>3 Gallon Vaporizing</u>	<u>Non Freezing</u>	<u>Dry Powder Small</u>	<u>Dry Powder Medium</u>	<u>D. P. Engine</u>
Cliffs Shaft	10	3	33	2		2		
Athens	5		16	2		4		
Negaunee	6		17	3		6		
Maas	7		24	5		5		
Cambria-Jackson	11		15	1		5		
Mather	4		28				18	
Lloyd	4	1	26	4		2		
Spies-Virgil	3		36	4		6	3	
Princeton	4		24	3		3		
Tilden	1		36	1	4	3		
Hill Trumbull			13	2		14	11	
Holman Cliffs			16			9	12	
Canisteo	6	1	14			9	8	
Gen. Shops & Sthse.	14		37		11			
C. P. & L. Co.	4		13	14	2	11		1
General Office	5	1	6					
Ishpeming Hospital	9		11					
Negaunee Dispensary	3		4					
Dist. Office Hibbing	3			1				
Gwinn District			7					
Rented Buildings	—	—	16	—	—	—	—	—
TOTALS	99	6	392	42	17	79	52	1

All Carbon Tetrachloride Type fire extinguishers are tested and inspected twice annually.

Soda Acid Type, discharged and recharged once annually.

All other types inspected once annually.

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURYc. Safety Inspection (Continued)

TABLE XVII

RULE BOOKS DISTRIBUTED AT MICHIGAN MINES & PLANTSNew Combined Surface Rule Books

<u>Mine or Plant</u>	<u>For Foremen</u>	<u>Surface Employees</u>	<u>Totals</u>
Cambria-Jackson		1	
Princeton		6	
Lloyd		8	
Negaunee		5	
Spies-Virgil		0	
Cliffs Shaft		2	
Athens		2	
Maas		3	
Tilden		10	
Mather		6	
General Shops		4	
Storehouse		12	
Miscellaneous		6	
Engineering Department		1	
Laboratory		5	
Cliffs Power & Light Co.		5	
		<u>5</u>	
Totals		76	76

New Combined Underground Rule Books

<u>Mine or Plant</u>	<u>For Foremen</u>	<u>Employees</u>	<u>Totals</u>
Cambria-Jackson		21	21
Princeton		9	9
Lloyd		11	11
Negaunee		12	12
Spies-Virgil		16	16
Cliffs Shaft		38	38
Athens		44	44
Maas		17	17
Mather	2	78	80
Engineering Department	1		1
Miscellaneous	<u>1</u>		<u>1</u>
Totals	4	246	250

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURYc. Safety Inspection (Continued)Disciplinary Action

There were only 36 cases of disciplinary action taken during the year compared to 38 during 1944. It is realized that disciplinary measures were not used as they would be during normal times.

Table Number XVIII gives causes and places where action was taken.

TABLE XVIII

CAUSES AND NUMBER OF DISCIPLINARY ACTION

<u>Cause</u>	<u>Cliffs</u>						<u>Total</u>	
	<u>Maas</u>	<u>Lloyd</u>	<u>Shaft</u>	<u>Neg.</u>	<u>Mather</u>	<u>Athens</u>		<u>Spies-Virgil</u>
Losing time				5		5	1	11
Infraction of rules	4	6	1	2	3	2		18
Reporting to work in an intoxicated condition	1			1	3			5
Insubordination			2					2
Totals	5	6	3	8	6	7	1	36

The "No Smoking Underground Rule" was made more effective by making the penalty discharge after a five day lay-off period. This is a real step forward in the prevention of mine fires. Signs reading "Smoking Prohibited Underground - Penalty Discharge - January 1945" were posted in all entrances to the mines. There were only 3 discharges because of violation of this rule.

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURYc. Safety Inspection (Continued)Central Safety Committee

This committee met eight times during the year with Mr. H. O. Moulton as chairman. All accidents were classified and where it was found necessary new rules or safe practices were passed on, or committees were made up to investigate problems.

Following are important subjects discussed during Central Safety Committee meetings.

Use of wire mesh safety gates to be used in raises when raise is being driven or repaired to prevent any material from accidentally falling to the level or sub-level below.

All mines to use not less than 1000 c.c. of Ethyl Mercaptan in Stench Warning devises. Extra bottles of Ethyl Mercaptan to be stored at the Laboratory in charge of Charles Hawes.

Report any incipient fires which occur to the Safety Department for investigation.

Report to Safety Department all water pressures in various parts of the mine. This information to be used in determining kind of fire fighting equipment which can be used in combating fire.

Aluminum Ladders to be tried out in the Cliffs Shaft Mine when barring loose ground. Mr. L. C. Moore to get information on aluminum bars to be used in barring loose ground when working on high ladders.

Check conditions which caused 23 incipient fires on surface including those in clothes lockers at mines.

Industrial Hygiene Report with all bosses, mining captains and foremen present.

Rule which requires at least two sound forepoles to support sides of drifts or slices which are being driven in ore. Use of side support for rock drifts to be left to discretion of the supervisors after examining the rock heading.

Agreed by all present that bridle poles and stuttles used in making stages in underground work, shall be of sound poles, preferably green tamarack, otherwise dry tamarack, not less than 3 inches in diameter, that stuttles shall be so cut as

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURYc. Safety Inspection (Continued)Central Safety Committee (Cont'd.)

to give maximum support to the bridle pole and that stuttles shall be so used to support bridle poles at both ends and in the middle.

Recommended that some superintendents experiment with steel angle irons in place of wood poles.

Agreed that every attempt will be made to keep dust counts below 10,000,000 particles per cubic foot in ore and 5,000,000 particles per cubic foot in rock. This is to be entered into the new rule books as one of the safe practices.

Superintendents to contact Dr. Waldie when they desire to use at any occupation, an employee who is convalescing from an injury.

Committee agreed that all members of the supervisory force wear safety glasses at all times during work period to set an example for their men.

Committee appointed to investigate use of cameras to photograph work places after an accident, such photograph to be used by Central Safety Committee in determining classification and also to be used in safety bulletins to promote safe practices. Cameras could also be used to photograph safe and unsafe practices and safety devices. Committee will report to manager before reporting back to Safety Committee.

Recommended uniform penalties be followed at all mines when administering lay-offs as a disciplinary measure.

Occupational injuries to be reported on regular accident form but do not give report a number.

To prevent instep and ankle injuries when loading from chutes, Cliffs Shaft Mine will experiment with shin guards now in stock at the warehouse.

Recommended that supply clerks at mines be trained to adjust safety glasses to fit employees. Also train a man to repair safety glasses and replace pitted lenses. This would effect quite a saving.

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURY

c. Safety Inspection (Continued)

Central Safety Committee (Cont'd.)

Discussed patented trolley pole which carries power wire thru center of a non-conducting trolley pole.

Safety Department to revise safety rule books during 1946 to include new and revised rules.

D.D.T. to be used in change houses and other buildings. Writer to get information on use and hazards. Probably train one man to use D.D.T. at all properties where needed.

Storehouse truck crews to contact surface foreman before loading heavy material or equipment at mines so foreman may supervise loading.

Many other less important subjects were discussed during these meetings. In the future meetings will be held every month, regardless of the number of members who cannot be present. An attempt will be made to hold the meetings near the middle of the month preferably on Monday afternoons.

General Foremen's Conference.

The regular conferences were not held during the year because of other meetings held at each individual mine and because of the "Metal Mine Accident Prevention Course" which required considerable of the foremens time after regular work. Also the subjects usually discussed at regular safety meetings were discussed during accident prevention classes.

The meetings at the mines which were initiated during 1944, were continued thru 1945 at most of the mines. These were combined safety and operation meetings and were conducted usually by the superintendent.

The General Foremen's Meetings will continue again in 1946 to cover general subjects of interest to all foremen and bosses.

Mining Club

This annual was cancelled because of lack of accomodations brought on by war time shortages.

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURY

c. Safety Inspection (Continued)

Lake Superior Mining Section, National Safety Council

The annual meeting of this section was cancelled because of government restrictions on meetings and conferences which brought large numbers of people to the meetings who would have to travel either by automobile or train.

The section did schedule and meet at the following places during the year. January 25, Duluth, Minnesota, February 20, Duluth, Minnesota, March 28, Hibbing, Minnesota, April 27, Ironwood, Michigan, May 18, Ironton, Minnesota, June 8, Duluth, Minnesota, September 13, Duluth, Minnesota, October 11, Ely Minnesota, November 8, Duluth, Minnesota, and December 11, Caspian, Michigan.

Except for the June 8th meeting at Duluth, I attended and took active part in all Duluth meetings. These meetings are attended by nearly all Safety men in the Lake Superior District. I also attended the meetings at Caspian and Ironwood, Michigan. I was appointed chairman of the Exhibits Committee again for the year 1946 and also appointed to the executive board.

Mr. George Whittington, Safety Inspector, Mesaba Range, represented our company at meetings held in Minnesota cities.

At Ironwood, Michigan the company was represented by L. C. Moore, Searle Bath, Arthur Olson and myself. This meeting included a trip thru the new surface plant of the Pickands - Mather & Co., Cary Mine at Hurley, Wisconsin.

At the Caspian, Michigan meeting the company was represented by William Atkins, Harry Rogers, O. Marjama, Richard Catron, Alex Bain, Harry Scarffe, Arthur Pascoe and myself.

The above meetings have been instructive and educational. Through the organization we have an accident exchange whereby a number of companies write up their accidents in detail, send them to the secretary who mimeographs them after which he sends copies to only those companies who participate. Only a very brief account of the accidents are partly used in the minutes of the meetings. No company names are attached to the reports. Any accidents which are reported can be discussed at the meetings for what value there is in the report to further accident

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURY

c. Safety Inspection (Continued)

Central Safety Committee (Cont'd.)

prevention.

Many valuable suggestions and safe practices have been brought out and would be too numerous to list in this report. The Lake Superior Mining Section of the National Safety Council has developed into one of the best and largest safety organizations in the country.

National Safety Council

The annual meeting which is usually held in Chicago each year was cancelled because of war time restrictions on travel and hotel accommodations.

Safety Banner Flags

The company's safety Banner Flags were won by the Holman Cliffs Mine, the Spies-Virgil Mine, and the Cliffs Power & Light Co.. This is the third year in succession that the Cliffs Power & Light Co. has won the Banner Flag.

Below are listed the Banner Flag winners and their severity ratings, by which the contest is judged.

Independent Unit - Cliffs Power & Light Co. -	Severity Rate	0.00
Underground Mine - Spies-Virgil Mine -----	" "	0.379
Open Cut Mine - Holman Cliffs Mine -----	" "	0.005

The Cliffs Power & Light Co. had no lost time accidents of any kind.

The Spies-Virgil had one compensable accident with 59 days lost and 6 non-compensable accidents with 9 days lost time.

The Holman Cliffs Mine had one non-compensable accident and the accident cost 2 days lost time.

These are enviable accident records when compared to industry as a whole.

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURYc. Safety Inspection (Continued)Miners' Safety Bulletin

The bulletin was issued only three times during the year, but were of eight pages instead of the usual four. Because of the great amount of work and shortage of help at the print shop it was impossible to have the Bulletin printed on time and therefore the number of usual issues was cut down.

An attempt has been made to make the Bulletin a little more attractive by use of pictures taken in and around the mines. We feel that by giving it a more personal touch more employees will read those articles which we feel are important messages to further our safety and welfare work. Since mentioning the names of a few employees and printing a few pictures of men at work we have heard a number of favorable comments on the Bulletin so we hope to continue along the same lines to create more interest.

Foreman's Safety Bonuses

A total of \$5,717.17 was paid to 82 foremen as a safety bonus during the year. Because of failure to maintain the company's safety standards these foremen lost a total of \$103.35.

In my opinion our Foreman's Bonus set-up is not entirely what it should be. The idea is correct and has a lot of value, but it doesn't seem that penalties at the various mines are as uniform as they should be. Although I'm not too sure of it, I believe some superintendents are just a little more lenient than others which has a tendency to make a boss less alert on the job. The following tables give a distribution of bonuses and positions of those participating.

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURYc. Safety Inspection (Continued)

TABLE XIX

SAFETY BONUSES PAID TO FOREMEN

<u>Mine or Plant</u>	<u>Amount</u>	<u>Men Participating</u>	<u>Amount of Penalties Imposed</u>
Athens	\$ 829.52	14	20.65
Cliffs Shaft	1,091.24	14	20.23
Lloyd	522.87	9	15.98
Maas	921.06	12	7.05
Mather	449.83	6	12.23
Negaunee	820.05	10	17.03
Spies-Virgil	216.50	5	-----
Princeton	355.23	3	-----
Cambria-Jackson	449.19	7	10.18
General Storehouse	-----	-	-----
C. P. & L. Co.	<u>61.68</u>	<u>2</u>	<u>-----</u>
Totals	\$ 5,717.17	82	103.35

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURYc. Safety Inspection (Cont'd,)

TABLE XX

OCCUPATIONS OF MEN PARTICIPATING IN BONUS

<u>Title</u>	<u>Athens</u>	<u>C.S.</u>	<u>Lloyd</u>	<u>Maas</u>	<u>Mather</u>	<u>Neg.</u>	<u>Spies</u> <u>Virgil</u>	<u>Princeton</u>	<u>Camb.</u> <u>Jack.</u>	<u>C.P.&L.Co.</u>	<u>Total</u>
Shift Boss	11	10	6	9	4	7	2	2	4		55
Mechanic Foreman	1	1	1	1	1	1	1	1	1		9
Surface "	1	1	1	1	1	1	1		1		8
Timber "	1	1	1	1		1	1		1		7
Scraper "		1									1
Line "										2	2
Totals	14	14	9	12	6	10	5	3	7	2	82

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURYd. Ventilation

Ventilation has come in for more attention during the year than at any other time. Average temperatures in work places have been lowered and I believe it has increased the efficiency in most cases of our employees. Much has to be done yet to give us greater efficiency in ventilation, but this is mostly education of some supervisory personnel so that planning of production will always include ventilation. Auxillary fan installation and maintenance also require more attention so as to get greater efficiency from the equipment. It can be noted from recent ventilation surveys that all main mine fans are operating at almost peak efficiency but that auxillary fans in many cases are operating at as low as 15 and 20 per cent of efficiency. This is due mainly to poor installation and up-keep. Carelessness on the part of some miners and timber hoisters is responsible for considerable damage to vent-tubing which permits air to escape before it reaches the working face. In some mines certain men have been made responsible for the maintenance of auxillary fans and vent-tube but these men have been unable to keep up the efficiency of the installations mainly because carelessness on the part of others has caused too much damage to the vent-tube. In the top-slicing method of mining, ventilation presents a difficult problem which requires constant care and maintenance. In sub-level caving and stoping the ventilation work is comparatively easy. I believe we have made real progress in our ventilation work, but in some of our large soft ore bodies we shall always experience difficulties because it is next to impossible to maintain large airways because of heavy ground. In these heavy areas we shall have to use auxillary fans to provide ventilation to the working faces.

The following is a brief summary of ventilation at the various mines.

Athens Mine

Main fan delivery 82,300 c.f.m. against 5" W.G.-49,000 c.f.m. recirculated because of failure to keep air doors on various levels in good condition and because of high resistance in mine. With intake and return air passing through same shaft and many main levels operating it is difficult to keep ventilation system in good operating condition. A check is being made of the air condition to determine if air is contaminated to a harmful degree. Recommendations

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURYd. Ventilation

(Continued)

have been made to improve conditions. Distribution of air is good with the exception of a few contracts.

Gambria-Jackson

Main fan delivers 36,000 c.f.m. at 1.9" W.G.. Some recirculation around fan brattices and to shaft probably a total of 7,000 c.f.m.. Recommendations made for improvement. Distribution of air good.

Cliffs Shaft

Natural ventilation approximately 55,000 c.f.m. during cold weather. Distribution good with a few exceptions. New mine fan now on hand to install.

Lloyd Mine

Fan delivers 18,600 c.f.m. through Section Six air shaft but a total of 31,000 c.f.m. enters the mine and approximately 12,500 leaves the mine through caved areas to surface. This is due to weather conditions and heat in old gob. When weather is warm fan delivery is the same, but air is drawn into mine through old caved areas. Fan should deliver greater quantity of air but restrictions between 4th level and workings on 7th level prevent efficient operation. Recommendations made for larger airways. If profitable ore body is found below 8th level a larger fan to operate against higher pressures is recommended. Distribution of air to contracts is good.

Negaunee Mine

Mine fan delivery to 9th level is 89,000 c.f.m. against 5.3" inches water gage. This reading taken 12/3/45 and it was not known at the time that there was considerable ice in air shaft. Another pressure reading will be taken now that there is little ice in shaft and reading should show a lower pressure.

Mining areas very much concentrated between

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURYd. Ventilation

(Continued)

13th and 14th levels, but sincere efforts have been made to keep ventilation in good order. Only when final mining is being done on sub-levels is there any lack of ventilation and this is only temporary. Because a majority of Negaunee Mine air is delivered to the Maas Mine water sprays are maintained in airways. Also the Maas Mine airways are quite small and this helps to build up resistance to the Negaunee fan. Distribution of air is good.

Maas Mine

From Negaunee Mine 65,400 c.f.m.. Ventilation set-up only fair. Seventeen auxiliary fans used to ventilate contracts. Ore body so wide it is difficult to maintain airways. If air could be brought down to 6th level and then through workings to discharge on 4th and 3rd levels the heat from the gob would assist ventilation.

Mather Mine

Fan delivers 29,200 c.f.m. to ventilate 2nd and 5th levels. Because this fan installation is a temporary job the fan brattice was made of boards which were not fully seasoned. Boards have dried out causing considerable leakage. Recommendations to stop leaks probably has been carried out by this time which should boost c.f.m. to about 34,000 which is sufficient for work now being done. Air well distributed throughout all work places.

Auxiliary fan on 6th level for development work delivers 5,000 c.f.m. and is working at full efficiency. Supervisory force ventilation conscious and on alert to keep ventilation in good order.

Princeton Mine

Fan output 24,100 c.f.m.. Because of mining methods used years ago it is difficult to control air flow to all parts of the mine. Much air is recirculated through old stopes but is not contaminated. Air cool at all times. To keep #3 Shaft upcast a low pressure fan of from 10,000 to 12,000 c.f.m. should be installed near the shaft in a brattice. Cost of installation and maintenance would be less than present heating system.

Air distribution good with the exception of one or two contracts.

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURYd. Ventilation (Continued)Spies-Virgil

Only temporary ventilation set-up at the present time by use of an auxillary fan delivering 2,500 c.f.m. for development of stope and stope contract.

Heavy flow of water keeps an air current moving in stope area.

Auxillary fan delivers air to contract stripping air shaft. When air shaft is finished the ventilation of the new ore body should be excellent.

Dust Elimination and Analysis

The elimination of dust in industrial plants and mines is in it's infancy and the hope of present day Safety Engineers and Industrial Hygienests is that new production methods of the future will not cause harmful dusts.

At the present time our method of dust elimination is simply through the use of water and air dilution. During the year the Central Safety Committee agreed that we should use every effort to keep our dust from ore below 10 million particles per cubic foot and all rock dust below 5 million particles per cubic foot. We have not done quite that during the year, but many mines have shown great improvement. All dust samples taken in our mines have been taken under actual working conditions. We have taken samples in rock headings, drift or raising, when miners have been drilling, mucking, (usually mechanical mucking) and right after blastings when the miners have reentered the heading. These three samples represent the worst conditions under which any man works and yet most of our rock samples have been good. In the future we will add another sample to the cycle which will take in either laying of track, timbering or any other work which may be in progress. At no time have we picked or prepared any particular place in which to take our regular dust samples unless it was an experimental test, a new water blast, water mist or some other such device of which the value was not known. Our tests now include samples

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURYd. Ventilation (Continued)

of raising in rock and ore, drifting in ore and rock, using chunk breakers on grizzlies, blowing out cars when cleaning them, blowing out chutes, blowing out pockets at shaft stations, crushers, open pit work work, etc.

Respirators are used by all employees in rock work and much of the ore work. I believe we have educated a fairly large percentage of the men as to the dangers of dust and more and more of the men use the respirators without being told to do so. It is very gratifying to know that many of our men do cooperate in this particular type of work because in underground mining many employees are on their own for the greater part of the shift and could violate rules as they pleased. According to Dr. Mc L. Waldie, Director of Industrial Hygiene, we have had no new cases of silicosis during the past two years and not many increases in cases of old standing. If this is true, and there is every reason to believe it is, then our dust allaying methods have been effective.

We have had the help of Mr. Edward Urban, Field Representative of Saranac Laboratory, in the dust elimination work. His willingness, experience and ability has been of great help to us. From him we learn of methods used by other companies and can put them to use if they are better than ours. Also he has assisted in ventilation surveys and has made some real good suggestions and recommendations. I recommend that his services be kept available to us.

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURYd. Ventilation (Continued)

The following tables give location and various occupations where dust counts were taken, also total averages of counts since 1933 when the first counts were made.

TABLE XXI

Dust Samples Collected in Rock and Ore Work

<u>Mine or Plant</u>	<u>1945</u>		<u>Total</u>	<u>Total</u>
	<u>In Ore</u>	<u>In Rock</u>	<u>1945</u>	<u>1933 -- 1945</u>
Athens	27	17	44	480
Cliffs Shaft	73	32	105	1,398
Cambria-Jackson	9	3	12	58
Lloyd	23	12	35	475
Maas	21	9	30	490
Mather	18	64	82	291
Negaunee	34	9	43	673
Princeton	10	16	26	85
Spies-Virgil	--	10	10	70
Tilden	12	--	12	33
Miscellaneous	--	--	--	111
Totals	227	172	399	4,164

Safety Department

Annual Report

Year 1945

11. ACCIDENTS
AND
PERSONAL
INJURYd. Ventilation (Cont'd.)

TABLE XXII

VARIOUS OCCUPATIONS WHERE DUST SAMPLES WERE COLLECTED

<u>Occupation</u>	<u>Cliffs Camb.</u>							<u>Prince-</u>	<u>Spies-</u>	<u>Totals</u>	
	<u>Athens</u>	<u>Shaft</u>	<u>Jack.</u>	<u>Lloyd</u>	<u>Maas</u>	<u>Mather</u>	<u>Neg.</u>	<u>ton</u>	<u>Virgil</u>		<u>Tilden</u>
Drilling	12	64	8	15	7	38	15	12	8	--	179
Scraping	17	25	2	7	9	10	8	12	2	--	92
Using loader to fill cars	--	2	-	3	--	22	4	--	--	--	31
Blasting	1	2	1	1	--	4	2	1	--	--	12
Timbering	3	--	--	--	2	5	3	--	--	--	13
Hand Shoveling	2	1	--	1	--	--	--	--	--	--	4
Barring back	1	5	--	--	--	--	--	--	--	--	6
Blowing cars	2	--	--	4	3	--	4	1	--	--	14
Loading cars at chute	5	--	--	3	1	1	3	--	--	--	13
General mine air	1	--	--	--	5	--	--	--	--	--	6
Charging holes	--	1	--	1	--	--	--	--	--	--	2
Rigging machine	--	1	--	--	--	--	--	--	--	--	1
Crushing ore sample	-	1	--	--	--	--	--	--	--	--	1
Crushing ore	--	2	--	--	--	--	--	--	--	12	14
Pulverising ore sample	--	1	--	--	--	--	--	--	--	--	1
Breaking Chunks	--	--	1	--	--	--	--	--	--	--	1
Change house	--	--	--	--	3	--	--	--	--	--	3
Using blow torch	--	--	--	--	--	1	--	--	--	--	1
Shaping augur drills	-	--	--	--	--	1	--	--	--	--	1
Loading skip	--	--	--	--	--	--	4	--	--	--	4
Totals	44	105	12	35	30	82	43	26	10	12	399

TABLE XXIII

AVERAGE LIGHT FIELD COUNT OF ALL SAMPLES TAKEN

<u>Mine or Plant</u>	<u>1933</u>	<u>1934</u>	<u>1935</u>	<u>1936</u>	<u>1937</u>	<u>1938</u>	<u>1939</u>	<u>1940</u>	<u>1941</u>	<u>1942</u>	<u>1943</u>	<u>1944</u>	<u>1945</u>
Athens		32.90	14.12	28.32	26.69	12.85	12.59	9.89	7.28	25.80	4.90	8.33	6.64
Cliffs Shaft	17.94	14.56	8.29	8.98	15.53	9.86	10.36	7.77	8.18	7.55	5.99	6.23	8.18
Cambria											12.10	6.21	17.05
Lloyd		9.90	12.42	39.25	20.25	10.84	13.47	11.73	8.05	6.95	5.01	14.45	6.49
Maas		7.46	27.55	35.75	150.98	11.24	36.90	8.71	17.29	8.46	12.48	8.78	8.17
Mather									2.42	5.58	6.64	7.57	8.39
Negaunee		53.80	17.77	33.25	59.06	56.26	25.49	10.79	14.02	17.02	4.65	11.81	11.92
Princeton											10.59	6.32	8.48
Spies-Virgil					70.61	26.99	1.80	8.40	6.97			5.59	14.22
Tilden				67.52	285.27	74.60	60.40		49.60				24.18
Gardner Mackinaw		27.77	---	8.61	48.53								
Miscellaneous			8.66	3.00	6.80	14.73				3.00			

d. Ventilation

(Continued)

11. ACCIDENTS
AND
PERSONAL
INJURY

Year 1945

Annual Report

Safety Department