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11. ACCIDENTS AND PERSONAL INJURY

The accident frequency and severity rate was considerably worse in 1943 as compared with the previous year. There was one fatality that occured on surface the details of which have been described in independent reports and in addition there were two lost time compensable accidents. There was a total of of 24,297 man days worked in 1943 as compared with 22,976 man days in 1942. The increase was due to the working schedule of six day shifts and five night shifts per week being maintained throughout the year. The number of man days lost on account of accidents was 6,387 (one fatality 6,000 days).

The following table shows a comparison of the accident frequency and severity rate.

	Frequency Rate	Severity Rate
1943	15.46	37.561
1942	-	-

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

The compensable accidents are listed in detail as follows:

Accident No. 153 - April 26, Norman Vassar, Trackman - While walking in a transfer drift on the sub he was tripped by a coil in the scraper rope and fell down against his electric cap lamp battery causing a fracture of the tenth rib posteriority. Lost time - 88 days

Accident No. 154 - July 7th, Fred Brunell, Miner - Brunell was struck by a large chunk that fell from the back near the entrance to a stope on the -150' sublevel. He had drilled a hole preparatory to blasting the loose ground down and then stepped to the side to inspect it when it suddenly came down. He suffered a fracture of a number of ribs and fratured ankle of the left foot. Lost time 249 days.

Fatality Accident No. 155 - July 30, Frank Filipczuk, U. G. Laborer - Filipczuk and Eli Pokela another employee were cutting brush from under a 2,300 volt transmission line between the engine house and the Virgil fan station. A tree was felled across the line by Pokela causing the high tension wires to be short circuited and break. The wires fell on Filipczuk who happened to be walking along the road nearby, causing death by electrocution. (6000 days)

12. NEW CONSTRUCTION AND
PROPOSED NEW CONSTRUCTION

The large construction program under E. & A. CC116 was carried out during the year to make the necessary changes toconvert from a single skip to a two skip hoisting system. The major part of the work consisted of changes in the shaft compartments and the headframe and installation of a cage hoist in the engine house. Operation of the mine was suspended and work started on the program on July 19th and the major part of the work completed so operations could be resumed on Oct. 14th. A second shutdown period from December 9th to the end of the year was necessary to complete the work.

Changes in the shaft consisted of moving the position of the runners in the cage road to the South to provide room for a new ladder road compartment along the

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12. NEW CONSTRUCTION AND PROPOSED
NEW CONSTRUCTION, CONTINUED

North side of this compartment. The old runners were removed and due to there rotted condition new runners were installed from the collar down to the Third Level elevation. A new six inch air line was installed in the new ladder compartment from the collar down to the Eighth Level. Also a new four inch water drain line was placed adjacent to the airline from about ninety-five feet below the collar down to the Eighth Level. A two inch water line from the collar down to the Eighth Level was also installed to provide water fro all underground purposes. In December about 1330 feet of ten inch counterweight pipe was installed in the ladder road after which the permanent ladderway with sollars was constructed.

The North skip-road had been used as a ladderway from the collar down to the Third Level during the life of the mine and various pipe lines and power lines were installed in this compartment. The North skip-road was cleared of the old ladders and sollars and the various pipe and power lines from the collar down to the Eighth Level. At the bottom of the shaft at the skip pit level a chute was constructed to extend under both the South and new North skip-roads. New fir runners were then installed in the North road for its entire length from the bottom of the shaft and extending above the skip dump in the headframe. At the collar of the shaft several rotted members of the timber shaft sets were replaced with new ones, and several deviders were replaced in various portions of the shaft below the collar.

Remodeling the shaft house structure to provide a two skip dump arrangement was done by a crew of steel workers that were transferred from the Marquette Range for this work. The old single skip dump and chutes were removed and a two skip dump arrangement with chutes was installed. On top of the headframe, foundation plates and pedestals were installed for the two eight foot diameter head sheaves that served the cage and counterweight ropes. New channel iron for the runners in both skip compartments were installed from the collar to an elevation above the skip dump. A casing between both skip roads and the cage road of 3/16 inch metal sheet was installed extending from the collar of the shaft up to the skip dump. During the construction work a number of steel members in the shaft house structure were found to be weakened, due to rusting and these were replaced. The major portion of the old decking on three separate landings in the headframe was replaced with new three and four inch fir. The small frame building that housed the crusher, and also the small structure housing the top tram Larry car control were removed. A portion of the headframe above the crusher landing on the West side and portions of the North and South side were enclosed, with a Truscon Ferro-Board metal covering. The top tram Larry car control system was revamped so that operation of this system can be controlled from one station instead of two.

On two of the pulley stands short extensions were made near the top of the structure and one stand required a steel work addition to increase its entire width. These changes were necessary on the pulley stand to permit the idler sheaves to be installed in line with the new position of the various hoisting ropes.

A concrete foundation was constructed in the North one-half of the Engine house on which the former Gardner-Mackinaw cage hoist was installed. A panel board for the hoist controls was set up along the North wall of the building and all the necessary wiring was placed in conduit pipe that was laid in

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION, CONTINUED

trenches in the floor. It was necessary to break up a large amount of the concrete floor to construct the foundation for the hoist and upon completing the installation a large amount of new concrete flooring was laid. The new hoist will continue to serve as the cage hoist and the original one will be used for hoisting ore.

In 1944, a second storage pocket will be constructed in the shaft house to facilitate the loading from the pockets during the shipping season. A small size shaft for ventilation purposes and also to serve as a second outlet is planned in the development of the new Spies orebody. Approximately 585 feet of combined shaft and raising will be required to provide the connection from the Fourth Level to surface in the area near the orebody in Section 24. Plans are being formulated to start work on this project from surface in 1944.

13. EQUIPMENT AND PROPOSED EQUIPMENT

There was a large amount of new equipment purchased and added to the inventory in 1943. Most of the equipment was purchased under E. & A. CC116 for use in making the changes from a single skip to a two skip hoisting system and also for the new development program on the Fourth Level. The following is a list of the most important items of plant and equipment purchased in 1943.

Item	Number of Items	Cost
Utility Air Hoist	1	603.00
Heavy Duty Car Transfer	1	600.00*
Mine Telephones	2	112.66
Fire Extinguishers	2	112.33
Hoist Control	1	150.00*
3 Column Mine Rig	1	1,500.00*
Eimco Loader Model 21	1	3,840.00*
Power Drill Machines DA 35	4	2,312.82*
Hoisting Rope (1880' - 1½)	1	709.99
Service Masks	2	70.00
Condensation Pump	1	137.32
Back-out Switch	1	38.25*
Master Controller Switch	1	98.60*
GE Resistor	1	623.05*
Transformer	1	155.10*
Pressure Regulators	5	277.57*
Unit Heaters #33LLN	2	129.58
Unit Heaters #35 N	2	153.58
5/8 Heavy Duty Drill	1	70.55
Coppus Fan	1	454.02*
Controller for Larry Car	1	148.75*
Sullivan Electric Hoist	1	1,840.00*
Disconnecting Switches D 18262	3	31.95*
100" Trumbull Switch "88323	1	18.51
Type X Signal Boxes	5	240.00*
100 Amp. Circuit Breakers	2	66.14*
1" Regulators (Pressure)	2	43.62*
Transformer	1	16.75*

* Items charged to E. & A. 116

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14. MAINTENANCE AND REPAIRS

a. Mine

The maintenance expense increased in most cases due to the general wage increase. Repairs to timbered main level dirfts and airways constituted the major repairs in the mine. Regular weekend repairs in the shaft were made and the practice of making shaft inspection at regular intervals is being continued.

Numerous repairs were made in the electrical circuits on surface and in the shaft. The electrical system is still in the process of being revamped and modernized to conform with accepted practice.

Repairs to mine buildings were only of a minor nature to maintain them in satisfactory condition.

b. Location

Considerably more repairs were made on the Location dwellings in 1943 than in the previous year and accounts for the large increase in expenditures for this account. Repairs in the previous year were kept to a minumum due to the probability of early depletion of the mine and consequently more repairs were required in 1943. The major repairs in the Location were made in the summer months during the reconstruction program as labor was available at that time. The largest items of expense was the construction of new outhouses and shed extensions in the back of the lots for most of the cottages. Also a new hot air furnace was installed in the Captains residence replacing the old one which was in very poor condition. The following table shows a comparison of Location expenditures.

			1 9 4 3 Total	1 9 4 2 Total
Spies Virgil Dwellings	Labor	Supplies	Amount	Amount
Repairs to Houses	424.70	304.44	729.14	99.33
Interior Decorating		153.34	153.34	218.69
Shed & Outhouse Reprs.	541.90	219.33	761.23	
Total Dwellings	966.60	677.11	1643.71	318.02
Location Maintenance				
Repairs to sewers	308.03	11.25	319.28	43.19
Reprs. to Street Lights	31.05	50.71	81.76	14.07
Fire Protection		1.52	1.52	477.73
New Wire Fence				114.73
Maint. of Allies				30.24
Location Garage	316.51	193.35	509.86	
Total Location Maint.	655.59	256.83	912.42	249.96
Total Amount for Location & Dwelling Exp.	1622.19	933.94	2556.13	567.98

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15. ELECTRIC POWER

Electric power, which is purchased from the Wisconsin-Michigan Power Company was entirely satisfactory throughout the year with no interruption in service. The use of the maximum demand warning signal for five-Minute meter intervals was continued throughout the year with very satisfactory results. The average maximum demand load decreased from 384 K.W.H. to 370 K.W.H. The total consumption was 1,575,040 K.W.H. at a cost of $.0135 per K.W.H. The cost per ton increased from $0.139 to $0.179 due to the decrease in tonnage on account of the mine being idle during the reconstruction period.

16. WATER SUPPLY

This property continued to obtain its water supply from the Homer Mine of the M. A. Hanna Company. This service was satisfactory with the exception of several interruptions when the water was shut off for a short time. A new four inch water main was laid from the engine house to connect to the new six inch line that was installed by the Village of Mineral Hills across the Virgil property. The new line will provide a more adequate water supply for all mine purposes.

17. CONDITION OF PREMISES

Routine and seasonal clean-ups and repairs kept the premises in good condition throughout the year. In line with the plant protection program to guard against sabotage a number of "Defense Area" signs were posted within a designated restricted area surrounding the entire surface plant and stocking grounds.

18. NATIONALITY OF EMPLOYEES

	American Born		Foreign Born			
Parentage	Number	Percent	Number	Percent	Total	Percent
American	5	6			5	6
English	8	9	11	13	19	22
Finnish	6	8	10	13	16	21
Swedish	6	8			6	8
Danish	4	5			4	5
Italian	3	5	7	8	10	13
Austrian			1	1	1	1
Polish	1	1	5	6	6	7
French	7	8			7	8
Irish	3	4			3	4
Belgian			1	1	1	1
German			2	2	2	2
Welsh	1	1			1	1
Lithuanian	1	1			1	1
Total	45	56	37	44	82	100

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1. GENERAL:

Operations, involving stripping and the mining of ore, were continuous throughout the year, on varied working schedules of five and six days per week. Employees were granted only one day off on holidays and there was an enforced layoff of eight days in November, due to adverse weather conditions.

Pit equipment was given necessary repairs, when opportunity afforded, during the stripping season; units being taken to the shop when they could be spared.

Washing plant repairs were carried on from the first of the year until the opening of the ore season and again from the close of the ore season until the end of the year.

Stripping operations, started in the fall of 1942,were continued through the winter and early spring months. Activities were confined to the South Bovey area, where ore was being uncovered for 1943 production. The two 85-B electric shovels and eight Euclid trucks were used on this work.

At the conclusion of the 1943 ore season, stripping operations were resumed. Until the end of the year, the work was largely confined to the East Bovey area; however, a start was made on the South Bovey stripping on December 20th.

Ore operations were started on May 10th and continued through October 30th. A working schedule of two 8-hour shifts, six days per week was maintained until September 4th, when it was reduced to one 8-hour shift, six days per week, in order to extend production more nearly to the end of the shipping season. Ore was mined from all three leases; however, only a very small tonnage was taken from the Hemmens.

The washing plant was operated on the same schedule as that established for the pit, with a total of 148 days worked. Considering the generally lean nature of the average crude ore treated, the season's results were quite satisfactory.

Pumping was carried on continuously throughout the year, from the pond in the east end of the pit. A revision was made in the pump and pipe line installations during the summer.

A continuous program of exploratory and sample drilling was conducted during 1943. Exploratory drill holes were put down on the South Bovey and Hemmens forties, while a limited amount of sample drilling was done on the East Snyder forty.

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2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production by Grades:

Snyder Crude,	629,689	tons
Bovey Crude,	463,324	"
Hemmens Crude,	12,702	"
TOTAL CRUDE ORE,	1,105,715	"
Snyder Non-Bessemer Concentrates,	164,939	"
Snyder Bessemer Concentrates,	163,096	"
Bovey Non-Bessemer Concentrates,	67,483	"
Bovey Bessemer Concentrates,	182,875	"
Hemmens Non-Bessemer Concentrates,	1,454	"
Hemmens Bessemer Concentrates,	5,169	"
TOTAL PRODUCTION, 1943	585,016	"

b. Shipments:

Snyder Non-Bessemer Concentrates,	123,182	"
Snyder Bessemer Concentrates,	163,096	"
Bovey Non-Bessemer Concentrates,	67,483	"
Bovey Bessemer Concentrates,	182,875	"
Hemmens Non-Bessemer Concentrates,	1,454	"
Hemmens Bessemer Concentrates,	5,169	"
TOTAL SHIPMENTS - 1943,	543,259	"

c. Stockpile Inventories:

The following statement shows the ore in stockpile as of January 1st, 1944:

Snyder Non-Bessemer Concentrates (1942 Production)	1,634	tons
Snyder Non-Bessemer Concentrates (1943 Production)	41,757	"
TOTAL IN STOCKPILE,	43,391	"

e. Production by Months:

(1) Crude Ore:

MONTH	SNYDER	BOVEY	HEMMENS	TOTAL
May,	90,104	83,902	-	174,006
June,	145,406	114,335		259,741
July,	99,748	127,481	8,215	235,444
August,	116,063	81,573	-	197,636
September,	80,878	38,854	-	119,732
October,	97,490	17,179	4,487	119,156
TOTAL,	629,689	463,324	12,702	1,105,715

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2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

e. Production by Months: (Continued)
(2) Concentrates:

MONTH	SNYDER	BOVEY	HEMMENS	TOTAL
May, ----------	48,015	45,534		93,549
June, ----------	79,640	63,610		143,250
July, ----------	53,203	69,349	4,519	127,071
August, ----------	60,537	42,588		103,125
September, --------	40,574	19,879		60,453
October, ----------	46,066	9,398	2,104	57,568
TOTAL, ----------	328,035	250,358	6,623	585,016

f. Ore Statement:

Due to a shortage of empty railway cars, it was necessary to stockpile 63,452 tons of concentrates during the ore season. Of this amount, 21,695 tons were shipped in November, leaving a balance of 41,757 tons of the 1943 production. This balance, added to the 1,634 tons remaining from 1942, makes a total of 43,391 tons in stock- as of January 1, 1944. All of the material is Snyder ore.

g. Delays:

The following delays, on a cumulative basis, were reported during the ore season:

Hours	Minutes	Cause:
1	45	Operations tied up by storms
4	15	Repair logs
1	30	Repair Hydroseal pump
-	30	Repair 5' x 12' screen
8	-	Total.

The total delays were negligible and were such as are usual in a seasons operation. The total time that the plant was out of empty railway cars was considerable, but with stockpiling facilities at hand, this did not result in a serious loss in production.

3. ANALYSIS:

a. Mine Analysis of Production:

	Tons	Iron	Phos.	Sil.	Mang.	Alu.	Moist.	Fe. Nat.
Snyder N.B. Concs.	164,939	57.39	.063	10.85	.21	.56	8.36	52.59
Snyder Bess. Concs.	163,096	56.90	.033	11.55	.25	.52	7.88	52.42
Bovey N.B. Concs.	67,483	57.27	.066	10.89	.19	.49	8.10	52.63
Bovey Bess. Concs.	182,875	56.59	.032	11.52	.31	.47	8.03	52.05

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3. ANALYSIS:
(Continued)

a. Mine Analysis of Production: (Continued)

	Tons	Iron	Phos.	Sil.	Mang.	Alu.	Moist.	Fe. Nat.
Hemmens N.B.Concs.	1,454	58.10	.086	10.81	.26	.93	8.30	53.28
Hemmens Bess.Concs.	5,169	56.58	.031	11.60	.19	.47	7.32	52.44
TOTAL,	585,016	56.98	.045	11.27	.25	.51	8.08	52.38

b. Mine Analysis of Shipments:

	Tons	Iron	Phos.	Sil.	Mang.	Alu.	Moist.	Fe. Nat.
Snyder N.B. Concs.	123,182	57.44	.069	10.75	.22	.57	8.29	52.68
Snyder Bess. Concs.	163,096	56.90	.033	11.55	.25	.52	7.88	52.42
Bovey N.B. Concs.	67,483	57.27	.066	10.89	.19	.49	8.10	52.63
Bovey Bess. Concs.	182,875	56.59	.032	11.52	.31	.47	8.03	52.05
Hemmens N.B. Concs.	1,454	58.10	.086	10.81	.26	.93	8.30	53.28
Hemmens Bess.Concs.	5,169	56.58	.031	11.60	.19	.47	7.32	52.44
TOTAL,	543,259	56.96	.045	11.28	.26	.51	8.05	52.38

c. Mine Analysis of Ore in Stockpile:

	Tons	Iron	Phos.	Sil.	Mang.	Alu.	Moist.	Fe. Nat.
Snyder Concs.	43,391	57.27	.045	11.12	.20	.53	8.57	52.36

d. Average Analysis of Crude Ore Production:

Lease	Tons	Iron	Phos.	Sil.
Snyder,	629,689	42.06	.041	34.49
Bovey,	463,324	41.95	.036	34.32
Hemmens,	12,702	41.69	.033	35.31
TOTAL,	1,105,715	42.01	.039	34.43

e. Complete Analysis of Seasons Shipments:

	Iron	Phos.	Sil.	Mang.	Alu.	Lime	Mag.	Sul.	Loss
Snyder N.B. Concs.	57.44	.069	10.75	.22	.57	.26	.16	.012	5.55
Snyder Bess. Concs.	56.90	.033	11.55	.25	.52	.28	.18	.011	5.75
Bovey N.B. Concs.	57.27	.066	10.89	.19	.49	.26	.18	.012	5.85
Bovey Bess. Concs.	56.59	.032	11.52	.31	.47	.26	.20	.010	6.20

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3. ANALYSIS:
(Continued)

e. Complete Analysis of Seasons Shipments: (Continued)

	Iron	Phos.	Sil.	Mang.	Alu.	Lime	Mag.	Sul.	Loss
Hemmens N.B. Concs.	58.10	.086	10.81	.26	.93	.30	.18	.011	4.20
Hemmens Bess. Concs.	56.58	.031	11.60	.19	.47	.26	.16	.010	6.15

4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:
Factors Used:
All Leases:

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

LEASE	RESERVE JAN.1,1943	MINED 1 9 4 3	RESERVE JAN.1,1944
Bovey:			
$S\frac{1}{2}$-$NE\frac{1}{4}$ - Sec. 30,	116,744	None	116,744
$NW\frac{1}{4}$-$SE\frac{1}{4}$ - Sec. 30,	235,100	None	235,100
$NE\frac{1}{4}$-$SE\frac{1}{4}$ - Sec. 30,	447,898	None	447,898
$NE\frac{1}{4}$-$NE\frac{1}{4}$ - Sec. 30,	1,150,893	250,358	900,535
Total Bovey,	1,950,635	250,358	1,700,277
Hemmens:			
$SW\frac{1}{4}$-$SW\frac{1}{4}$ - Sec. 29,	1,569,535	6,623	1,562,912
Snyder:			
$SE\frac{1}{4}$-$SW\frac{1}{4}$ - Sec. 30,	1,117,038	25,353	1,091,685
$SW\frac{1}{4}$-$SE\frac{1}{4}$ - Sec. 30,	450,086	45,866	404,220
$SE\frac{1}{4}$-$SE\frac{1}{4}$ - Sec. 30,	1,586,082	256,816	1,329,266
Total Snyder,	3,153,206	328,035	2,825,171
GRAND TOTAL,	6,673,376	585,016	6,088,360

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4. ESTIMATE OF ORE RESERVES: (Continued)

a. Developed Ore: (Continued)

The reserve estimate of January 1, 1944, which does not include any underground ore, is the result of deducting the tonnage of shipping grade ore produced, from the reserve estimate as of January 1, 1943. There was no new estimate made during the past year.

c. Estimated Analysis:

The following tabulation shows the estimated analysis of the reserve ore for the several parcels:

Lease	Tons	Iron	Phos.	Silica
Bovey:				
Bessemer Concentrates,	540,752	58.10	.033	9.47
Non-Bessemer Concentrates,	1,159,525	56.69	.077	11.28
Hemmens:				
Bessemer Concentrates,	644,152	58.44	.034	9.87
Non-Bessemer Concentrates,	918,760	56.78	.053	12.08
Snyder:				
Bessemer Concentrates,	1,229,315	60.57	.039	8.66
Non-Bessemer Concentrates,	1,595,856	57.91	.059	10.95
Total Bessemer Concentrates,	2,414,219	59.45	.036	9.16
Total Non-Bess.Concentrates,	3,674,141	57.24	.063	11.34
GRAND TOTAL,	6,088,360	58.16	.052	10.45

5. LABOR AND WAGES:

a. Comments:

(1) Labor:

An increase in wages of $.055 per hour was granted in March and was made retroactive to July 13, 1942. This action was taken as the result of a directive order from the Federal Government.

The balance between labor supply and operating requirements was quite closely drawn during 1943, generally with disadvantage to the side of operating requirements. Minimum crews, in the various departments, were maintained with difficulty and such new men as were available were far inferior to those employed in normal times. Prospects for 1944 are not bright, but with more men being released from work in munition plants, the situation may be somewhat improved by spring.

No serious difficulties arose between the labor union and the management during 1943. A number of petty grievances were presented by the union committee, but these were easily settled to the satisfaction of all concerned.

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5. LABOR AND WAGES:
(Continued)

b. Comparative Statement of Wages and Product:

PRODUCTION:	
Direct Shipping Ore,	-
Concentrates Shipped,	543,258 tons.
Concentrates in Stock 12-31-43	43,392 "
Concentrates in stock 12-31-42	1,634 "
Total Production,	585,016 "
Number of Days Operated,	148
Number of shifts and Hours,	101 days 2 - 8-hour shifts 47 days 1 - 8-hour shift
Average Daily Product,	3,952
Average Wages Paid Per Day,	8.24
Average Number of Men Working,	105
Amount Paid for Labor,	$ 152,119.03

6. SURFACE:

a. Buildings, Repairs:

In addition to the ordinary maintenance work on the mine buildings and dwellings, a new pit pump house was built and the old raft was enlarged to accommodate the two new 1250-gallon pumps.

c. Roads, Transmission Lines, Etc:

Approximately 1,500 feet of truck haulage road was built from the East Bovey stripping area to the new dump site, to the north.

In connection with the East Bovey stripping, it was necessary to remove 900 feet of transmission line and build a new line to take its place.

7. OPEN PIT:

a. Stripping:

Stripping operations, started in the fall of 1942, were continued in the South Bovey property. The two 3-1/4-yard electric shovels and eight Euclid trucks were used until March 8th, when one of the shovels was sent to the shop for repairs and the work was finished with one shovel and seven trucks. The area stripped extended eastward, approximately 900 feet, from the west line of the forty, and uncovered a bank of ore 175 feet wide. A layer of wet, blue clay, in the upper strata of the stripping bank, presented difficulties in maintaining haulage roads. Similar conditions were encountered in a deep trough in the bottom cretaceous material, where flows of underground water hampered operations. Outside of road conditions, the

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7. OPEN PIT:
(Continued)

a. Stripping: (Continued)

wet material was difficult to handle, in that it was necessary to place light loads in the trucks to prevent spillage over the tail end, when traveling up steep grades. A total of 478,597 cubic yards of surface and waste had been removed from the South Bovey when operations were completed on April 2nd.

With the completion of the stripping in the South Bovey, a program of clean-up work was undertaken to prepare several areas for ore loading and to hold the operating organization together until the beginning of the ore season, on May 10th.

At the end of the 1943 ore season, stripping operations were resumed. An area on the east side of the pit, in the East Bovey forty, was opened up to make part of the ore in this locality available for 1944 mining. The area in question was quite limited in extent and permitted of only a one shovel operation. A part of the material was hauled to the tailings basin for the purpose of building up the dikes and the remainder was disposed of on a nearby dump, established for the purpose. Because of the long haul to the tailings basin, there were not enough trucks available for more than the one shovel operation. As a result, no stripping was undertaken in any other part of the pit until the dike work was practically completed, the first week in December. The total stripping removed from the East Bovey, by the first of the year, amounted to 186,571 cubic yards, of which 42,459 yards were used on the dikes.

Stripping was started in the South Bovey on December 4th, when the second 3-1/2-yard shovel was moved from the stockpile into this area. Operations were slow because of a shortage of men and the crews were built up gradually. Starting with one shift during the first week, it was not until the week of December 19th that three full shifts could be worked. The shovel was cut down from surface, near the west end of the area and encountered the upper layer of wet, sticky clay, which was difficult to handle. A new road had been built, leading to the dumps to the south, which afforded a short haul for the stripping. A total of 36,265 cubic yards of material was removed by the end of the year.

The following tabulation shows the yardage and classification of material stripped from the various leases during 1943:

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7. OPEN PIT:
(Continued)

a. Stripping: (Continued)

	SURFACE (CU.YDS.)	PAINTROCK (CU.YDS.)	WASTE (CU.YDS.)	TOTAL (CU. YDS.)
Snyder,	-	9,400	-	9,400
Bovey,	606,024	-	95,409	701,433
Hemmens,	-	-	-	-
Total,	606,024	9,400	95,409	710,833

f. Explosives, Drilling and Blasting:

Statement of Explosives Used:

ORE OPERATIONS:	QUANTITY	PRICE	AMOUNT
25% duPont Special Gel. 5 x 16	75,500#	$10.00	$ 7,550.00
40% duPont R.C. Extra 5 x 14	61,750#	10.00	6,175.00
60% duPont C.S. 1 1-1/8 x 8	500#	11.50	57.50
Total and Average,	137,750#	10.005	$ 13,782.50
Plain Cord,	500'	32.00	16.00
30' duPont #6 E.B. Caps,	2,250	14.65	329.63
40' duPont #6 E.B. Caps	400	19.65	78.60
No. 20 Connecting Wire,	100#		55.00
Total Caps, Fuse, etc.			$ 479.23
TOTAL ORE OPERATIONS,			$ 14,261.73
STRIPPING OPERATIONS:			
25% duPont Quarry Gel. 3 x 10	2,500#	10.00	$ 250.00
25% duPont Special Gel.5 x 16	43,750#	10.00	4,375.00
40% duPont R.C. Extra 5 x 14	42,500#	10.00	4,250.00
40% duPont C.S. 1 1-1/4 x 8	500#	10.00	50.00
40% duPont C.S. 1 7/8 x 8	750#	10.00	75.00
60% duPont C.S. 1 1-1/8 x 8	500#	11.50	57.50
Total and Average,	90,500#	10.00	$ 9,057,50
16' duPont #6 E.B. Caps	2,500	8.65	$ 216.25
30' duPont #6 E.B. Caps	1,000	14.65	146.51
40' duPont #6 E.B. Caps	200	19.65	39.30
No. 20 Connecting Wire,	100#		55.00
No. 14 Lead Wire,	500'	18.00	9.00
Total Caps, Fuse, etc.			$ 466.06
TOTAL STRIPPING OPERATIONS,			$ 9,523.56
GRAND TOTAL EXPLOSIVES, 1943 -			$ 23,785.29

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7. OPEN PIT:
(Continued)

g. Open Pit Mining and Loading:

Mining operations were started on May 10th and continued through October 30th. A schedule of two 8-hour shifts, six days per week was followed until September 4th, when activities were reduced to one 8-hour shift, six days per week in order to extend the production of ore farther into the fall than would have been the case on a two-shift schedule. A total of 1,105,715 tons of crude ore was mined and treated, yielding 585,016 tons of concentrates. The average grade of the crude ore was comparatively low, which is reflected in the fact that a weight recovery of only 52.91% was realized. Because of the variable quality of the ore from different areas, the problem of proper grading was constantly present, which made necessary the frequent moving of the shovels. This, together with the necessity of stockpiling ore when empty railroad cars were not available, tended to slow down operations.

Mining operations were conducted in six different areas - four in the Snyder lease, one in the Hemmens and one in the Bovey. Of the 328,035 tons of Snyder concentrates produced, a small portion was taken from the west end of the West Snyder forty, a somewhat larger amount from the southeast corner of the Mid-Snyder, with the bulk of the tonnage coming from the East Snyder, on either side of the main haulage road. A limited amount of mining produced 6,623 tons of shipping grade ore from the southwest corner of the Hemmens forty. A total of 250,357 tons of ore was produced from the South Bovey, in the area stripped during the previous fall and winter.

The small tonnage in the West Snyder was cleaned up early in the season, in order to concentrate the shovel operations in the south-central part of the pit. This area produced about equal amounts of high grade, medium grade and high silica ores, practically all of low phosphorous content. Part of this ore was mixed with other ores to make the Bethlehem-Bessemer grade, while the high silica material was used in the Cleveland-Cliffs grade. The Mid-Snyder area was connected with the western part of the East Snyder, the mining of the two places being carried out as one operation. In the East Snyder, ore was mined both above and below the paint-rock; it being necessary to remove the paintrock on odd shifts during the season. The ore in the East Snyder areas varied considerably with regard to silica content and weight recovery, and mixing with other ores was required to make a proper grade.

The South Bovey operations were carried in three lifts in order to make a separation of the three classes of ore in this area. The upper lift consisted of low silica limonite of very low weight recovery. The intermediate layer was regular sand and ore which yielded a fairly good product. The lower lift, from which the bulk of the tonnage was derived, was composed of a blocky formation

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7. OPEN PIT:
(Continued)

g. Open Pit Mining and Loading: (Continued)
in which horses of rock were encountered. The ore from this lower horizon carried a high silica and fair iron and showed a good weight recovery.

Because of the variable nature of the ore in the several areas, it was necessary to shift the shovels quite frequently in order to make the required grades. Due to the fact that much of the ore carried high silica, it was necessary to use a large proportion of low silica limonite which had the result of producing a low average weight recovery.

k. Drainage:
The water level was maintained at last year's elevation, approximately forty feet above the pit bottom, in the southeast corner of the mine. Outside of two heavy rain storms, no serious drainage problems were encountered.

During the summer, part of the feed water pipe line, leading to the washing plant, was relocated and two new 1250-gallon pumps were installed in the fall, to replace the old 2000-gallon pump.

8. COST OF OPERATION:

a. Comparative Mining Costs:

	BUDGET ESTIMATE	COST PER TON 1943
PRODUCT:		
Concentrates, (tons)	600,000	585,016
Average Tons Per Shift,		2,511
Tons Per Man Per Day,		31.77
Days Operated,		148
COST:		
Open Pit Crude Ore,	$ .190	$ .196
General Pit Expense,	.098	.158
Concentrating,	.118	.122
Stocking and Loading Concentrates,	.004	.003
General Mine Expense,	.067	.081
Idle and Winter Expense,	.150	.178
Cost of Production,	$ .627	$ .738

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8. COST OF OPERATION: (Continued)

a. Comparative Mining Costs: (Continued)

	BUDGET ESTIMATE	COST PER TON 1943
Depreciation- Plant and Equipment,		$ .108
Depreciation- Motorized Equipment,		.043
Amortization- Stripping,		.250
Taxes - Ad Valorem,		.140
Taxes - Occupational,		.144
Taxes - Royalty,		.031
Total Cost at Mine,		$ 1.454
Administrative Expense,		.050
Miscellaneous Expense and Income,		.003
GRAND TOTAL,		$ 1.501

d. Detailed Cost Comparison:

(1) Product:

In view of the fact that the 1942 operations were conducted on a schedule of three 8-hour shifts, five days per week and 772,659 tons of concentrates were produced, - while in 1943, a combination of one and two shifts, six days per week was worked, with a production of - 585,016 tons, no comparison of the costs for the two years will be attempted. The only comparison being made is that between the budget estimate and the 1943 costs.

The ore mined in 1943 shows a higher cost per ton, due to the fact that large quantities of limonite ore were used to hold the average silica down to required grade. As the limonite was quite lean, it had the general effect of producing a low weight recovery.

The increase of $.055 in wages during 1943 had its influence in raising costs in all items where labor was an important consideration.

(2) Open Pit Mining:

The 1943 cost per ton (concentrated basis)- exceeded the budget by $.006. There was no appreciable spread between the budget and 1943 costs for the individual items under this caption, but the fact that a lower weight recovery was realized, than was used in preparing the estimate, accounts for the higher cost.

(3) General Pit Expense:

The estimated cost was exceeded by $.060 in 1943. Pumping and Drainage was higher by $.011, due to the fact that more extensive alterations were made in the pumping installations than were anticipated. Stocking Lean Materials shows an increase of $.019 because

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8. COST OF OPERATION: (Continued)

d. Detailed Cost Comparison: (Continued)

(3) General Pit Expense: (Continued)

of the necessity of handling a much larger tonnage of waste ore material encountered in mining, than was figured in the estimate. An unforseen heavy charge of deferred costs under Exploratory Drilling, accounts for the increase of $.027 over the budget.

(4) Concentrating:

The cost per ton for 1943 was higher by $.004 than the budget estimate. There are three principal items effecting the cost, two of which show a total increase of $.011 and the other showing a decrease of $.010. The cost per ton for Washing was lower than the budget by $.010, due to the fact that expected difficulties in handling some of the ore did not develop. Power- Pumping, was higher by $.006 as more water was required in the treatment of a crude ore which was much lower in weight recovery than that figured in the budget estimate.

The increase of $.005 under General Expense is accounted for by some unusual charges to this item, which were not anticipated when the budget was made.

(5) Stocking and Loading Concentrates:

There was only a slight difference between the budget and the 1943 costs.

(6) General Mine Expense:

The total increase of $.014 over the budget is accounted for by nominal differences in the numerous items under this caption.

(7) Idle and Winter Expense:

The 1943 cost per ton was $.028 higher than the budget. The increase is largely due to the adoption of a new policy of charging out material and supplies, rather than carrying them on inventories.

9. EXPLORATIONS AND FUTURE EXPLORATIONS:

Practically all of the exploratory drilling was done on the South Bovey; the work on the Hemmens having been just started at the end of the year. A total of 1,613 feet of drilling was completed, of which, 1,578 feet was done on the South Bovey and 35 feet on the Hemmens. In addition to the exploratory work, a total of 2,204 feet of sample drilling was done on the East Snyder, South Bovey and Hemmens forties.

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9. EXPLORATIONS AND FUTURE EXPLORATIONS: (Continued)

The exploration holes in the South Bovey proved up some additional ore in that area and some of the sample holes on the Hemmens indicated possible extensions on this property. The drilling has not been completed on either property and final limits have not been determined.

It is anticipated that the exploratory work on the South Bovey and Hemmens leases will be completed in 1944, with the drilling of six holes on the former and eight holes on the latter. In addition to the above, four holes will be drilled on the East Bovey to check the outline of the ore body on this forty.

It will be necessary to continue the program of sample drilling during the 1944 ore season, to provide the required information for ore operations.

10. TAXES:

The following statement shows the Canisteo Mine taxes and the average rates for the years 1942 and 1943:

Taxable Units	1943	1942	Increase	Decrease
Canisteo Mine,	$76,509.19	$79,573.13		3,063.94
Washing Plant Lands,	499.28	525.13		25.85
Personal Property,	2,733.09	3,437.69		704.60
Total,	$79,741.56	$83,535.95		$3,794.39
Village Lots,	$ 179.12	-	$ 179.12	-
GRAND TOTAL,	$79,920.68	$83,535.95	-	$3,615.27
Average Tax Rate,	101.12	101.87		.75

The decrease in the mine taxes was the result of deducting the 1943 shipments. The small reduction in the taxes on Washing Plant Lands was due to a reduction in the tax rate. The Personal Property taxes were less on account of a smaller tonnage of ore in stockpile.

11. ACCIDENTS AND PERSONAL INJURY:

There were three lost-time accidents at the Canisteo Mine during the year 1943. These are described as follows:

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11. ACCIDENTS AND PERSONAL INJURY: (Continued)

NAME: Peter O. Mitchell DATE: January 25th.
CAUSE: Mitchell was driving diesel truck No. 18 and when backing towards the edge of the dump, he was signaled to stop, as is the usual practice. Mitchell did not stop, nor throw the clutch, nor grab the emergency brake, but kept moving backwards until the truck went over the dump backwards with the load, taking the driver with it.

NATURE: Fracture of transverse processes 2nd., 3rd., and 4th., lumbar spine. Severe traumatism of back.

TIME LOST: Forty-one and one-half days.

COMPENSATION: $ 148.00

NAME: Wayne J. Johnson DATE: March 5TH.

CAUSE: The blasters, who had just finished using the horizontal drill, were turning it away from the bank, preparatory to blasting. It being rather heavy for the two men to handle, Johnson went over to give them a hand. When the drill swung around, it pushed Johnson to one side and pinched his left leg against a frost chunk.

NATURE: Contusion of middle third of left leg. Laceration of ventral surface.

TIME LOST: Thirty-five days.

COMPENSATION: $ 115.98.

NAME: Lauri Wirtanen DATE: March 25th.

CAUSE: The truck wheels jack-knifed, catching the driver's hand in steering wheel spoke.

NATURE: Sprain of left wrist and hand. Fracture terminus of left radius.

TIME LOST: Twenty-nine and one-half days.

COMPENSATION: $ 124.00.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION:

There was no new construction during 1943 and none is contemplated in 1944.

13. EQUIPMENT AND PROPOSED EQUIPMENT:

The following new equipment was received during 1943: Two 1250 G.P.M. Gould pumps for pit drainage to replace the old 2000 G.P.M. pump. One new Model 12 "Caterpillar" road patrol; one new 1-1/2-ton "International" service truck; one new D-8 "Caterpillar" tractor.

Scheduled for delivery during 1944 are - two 20-ton Euclid trucks and mechanical stokers for the shop and office heating plants.

14. MAINTENANCE AND REPAIRS:

The two Bucyrus-Erie 3-1/2-yard shovels were given necessary repairs, when they could be spared, one at a time, from stripping operations.

Maintenance and repair work on the Euclid truck was carried on continuously during the mining and stripping season. There was usually a spare unit when major repairs were necessary.

The churn drills and tractors were given complete overhaulings in the spring of the year.

Washing plant equipment was given a general overhauling during the fall and winter months.

18. NATIONALITY OF EMPLOYEES:

NATIONALITY:	NO. OF MEN
American,	105
Finnish,	12
Canadian,	4
Jugo-Slav,	3
Italian,	2
Swedish,	2
Norwegian,	1
Montenegrin,	1
Belgian,	1
Total,	131

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19. WASHING PLANT OPERATIONS:

Washing plant operations were conducted on a schedule which coincided with that maintained in the pit. On the varied schedule of one and two shifts, six days per week, a total of 148 days was worked. One shift each week was devoted to repairing equipment.

Operations were started on May 10th and continued through October 30th, during which time 1,105,715 tons of crude ore were treated in the production of 585,016 tons of concentrates. The percentage of weight recovery and iron units recovery, (amounting to 52.91% and 71.77%, respectively), were comparatively low, because of the necessity of treating large amounts of limonitic ore in order to keep the silica under control.

Due to an irregular boat schedule and a corresponding shortage of empty railroad cars, it was necessary to stockpile 63,452 tons of concentrates. The ore was conveyed to the stocking grounds by two Euclid trucks, which were taken out of line in the mine haul.

The amount and analysis of the plant rejects for the season were as follows:

	5 x 14 Screen Rejects			
Lease	Tons	Iron	Phos.	Silica
Snyder,	11,449	27.75	.066	56.10
Bovey,	7,754	27.95	.072	54.42
Hemmens,	189	23.08	.061	63.21
Total,	19,392	27.78	.068	55.50

	36" Belt Rejects			
	Tons	Iron	Phos.	Silica
Snyder,	3,027	23.19	.044	62.71
Bovey,	2,121	26.16	.055	55.44
Hemmens,	42	24.64	.023	62.38
Total,	5,190	24.42	.048	59.74

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

Lease	Cu.Yds.	Tons	Iron
Snyder,	5,647	8,470	34.18
Bovey,	433	650	34.79
Hemmens,	-	-	-
Total,	6,080	9,120	34.22

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19. WASHING PLANT OPERATIONS: (Continued)

The lean ore removed and stocked in the pit during mining operations, was as follows:

Lease:	Cu. Yds.	Tons	Iron
Snyder,	92,627	150,843	30.80
Bovey,	21,704	35,456	30.76
Total,	114,331	186,299	30.79

There were 58,523 cubic yards, or 87,785 tons of Snyder paint-rock - 33,483 cubic yards of Snyder surface clean-up and 13,544 cubic yards, of Bovey surface clean-up, or a total of 105,550 cubic yards, removed during mining operations.

The analysis of the product from the various machines for the year 1943, was as follows:

	Iron	Phos.	Silica
SNYDER MILL MACHINES:			
Log Washer,	56.75	.053	11.55
Classifier,	57.47	.044	11.08
Tailings,	21.44	-	-
BOVEY MILL MACHINES:			
Log Washer,	56.55	.045	11.64
Classifier,	57.42	.039	11.06
Tailings,	21.24	-	-
HEMMENS MILL MACHINES:			
Log Washer,	56.71	.050	11.76
Classifier,	57.58	.037	10.93
Tailings,	21.39	-	-

The concentrating data for the Canisteo Mine, for the year 1943, was as follows:

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19. WASHING PLANT OPERATIONS: (Continued)

	Tonnage	% of Total Mined	% Dried Iron	Tonnage Recovery	Iron Unit Recovery
Material Removed in Mining Operations (Exclusive of Surface)	1,320,526	100.00	40.16		
Less; Lean Ore Stocked in Mining,	186,299	14.11	30.79		
	1,134,227	85.89	41.70		
Less: Pit Rock Wasted,	9,120	.69	34.22		
Total Transported to Mill,	1,125,107	85.20	41.76		
Less: Rock Rejects in Screening Plant,	19,392	1.47	27.78		
Crude Ore Entering Mill,	1,105,715	83.73	42.01		
Concentrates Produced,	585,016	44.30	56.99	52.91	71.77
Rock Rejects on Mill Picking Belt,	5,190	.39	24.42		
Tailings (By Deduction)	515,509	39.04	25.19		
Total Heads, As Above (Entering Mill),	1,105,715	83.73	42.01		
Total Pit Rock, Screening Plant Rejects and Lean Ore,	214,811	16.27	30.66		
Total,	1,320,526	100.00	40.16		

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1. GENERAL:

Repair work at the shops and washing plant was carried on during the first four months of the year and was resumed early in November, after the ore season had been completed.

The months of January, February and the first week in March were devoted to the general reconditioning of the 30-yard cars. With the completion of this work, attention was turned to the three locomotives, which received a general overhauling. The principal item of repairs on these machines was the installation of new flue sheets. At the end of the 1943 ore season, early in November, the repairing of the 30-yard cars and locomotive No. 101 was started at the Holman shops and the other two locomotives were sent to the Hill-Trumbull for overhauling.

The Marion 3-1/4-yard electric shovel was taken to the shops the first week in March, to receive a general overhauling. The major job on this machine was the rebuilding of the boom, which developed a serious break while engaged in stripping operations.

When the work on the Marion shovel had been completed on March 23rd, this machine was returned to the pit and the 120-B Bucyrus - 4-yard shovel was taken in for repairs. In connection with the general overhauling of this piece of equipment, the dipper sticks were rebuilt and a complete new set of crawler track pads were installed.

At the washing plant, the repair work, started in the fall, was continued until the first week in May. All of the equipment from the feed end through the main building, was thoroughly overhauled and put in condition for a season's operation. At the end of the 1943 ore season, the various machines were opened up and worn and broken parts are being replaced and general repairs made.

Stripping operations were conducted in three principal areas during 1943, viz: the Bingham, the North Star and Brown #2. An area, approximately 500 feet long, was stripped at the north end of the Bingham property to make ore available for the 1943 ore season. The ultimate limits of the western part of the North Star ore body, in the Mt. Griffin area, had been determined by several drill holes and this section of the mine was stripped during the fall and winter months. The stripping in the Brown No. 2 consisted in the removal of layers of paintrock and taconite, east of the western limits of this property. In addition to the above, there was some clean-up work done on the south side of the Holman and in the south end of the Brown No. 1.

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1. GENERAL:
(Continued)

The 1943 ore season was opened with the loading of stockpiled concentrates on April 12th. Regular mining operations were started on May 10th and continued until November 3rd. An operating schedule of three - 8-hour shifts, six days per week was adopted and maintained throughout the season.

Ore was mined from all of the properties comprising the Holman-Cliffs group. The Holman forty produced practically one-half of the season's tonnage and the North Star, Brown No. 2, Bingham and Brown No. 1 follow in the order named.

Operating conditions in the Holman and Brown No. 2 properties were practically the same as for the previous year, excepting that the haul was somewhat longer and the mining has been carried to greater depths, which necessitates travel on steeper grades. The North Star area was somewhat restricted in size and shovel operation was hampered by rock. The Bingham operations consisted in the mining of a layer of direct ore. This deposit presented a very irregular surface to work on and considerable maneuvering of shovels was necessary. Only a small tonnage of Brown No. 1 ore was handled.

The washing plant season extended over a period of 152 days, - from May 10th to November 3rd. The same working schedule was in force here, as at the pit. Operating conditions were generally satisfactory, with an average daily production of 6,758 tons. Due to a shortage of empty railroad cars, it was necessary to stockpile 131,928 tons of concentrates.

Exploratory and sample drilling was carried on throughout the year, although activities were light during the first two months, due to the necessity of using the crews on blast hole drills. In the Bingham property, considerable sample drilling was done to gain information for mining operations and a number of exploration holes were put down to determine the limits of the ore body. In the east end of the Brown #2 pit bottom, a program of drilling was undertaken to outline the trend of the deep ore in this property. When this work had been completed, the equipment was moved to the surface, at the east end of the pit, to ascertain whether or not the ore body extended in this direction. At the request of the fee owners, several holes were put down on the Brown #2 forty, to the east, to prove this area barren of ore deposits, so that it may be used for dumping purposes. Several holes were drilled in the track bench, on the north side of the east North Star forty, to explore the possibility of ore existing in this area.

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2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production by Grades:

Holman Crude,	810,161	tons.
Brown Crude,	375,463	"
North Star Crude,	338,355	"
TOTAL CRUDE,	1,523,979	"
Holman Non-Bessemer Concentrates,	325,127	"
Holman Bessemer Concentrates,	200,907	"
Brown Non-Bessemer Concentrates,	144,334	"
Brown Bessemer Concentrates,	104,774	"
North Star Non-Bessemer Concentrates,	65,951	"
North Star Bessemer Concentrates,	186,185	"
Bingham Non-Bessemer Direct,	36,144	"
Bingham Bessemer Direct,	22,266	"
TOTAL PRODUCTION,	1,085,688	"

b. Shipments:

Holman Non-Bessemer Concentrates,	303,594	"
Holman Bessemer Concentrates,	221,417	"
Brown Non-Bessemer Concentrates,	118,494	"
Brown Bessemer Concentrates,	104,774	"
North Star Non-Bessemer Concentrates,	65,951	"
North Star Bessemer Concentrates,	186,185	"
Bingham Non-Bessemer Direct,	36,144	"
Bingham Bessemer Direct,	22,266	"
TOTAL SHIPMENTS 1943 (INCLUDING 1942 STOCKPILE)---	1,058,825	"

c. Stockpile Inventories:

Brown Non-Bessemer Concentrates (1942 production)-	10,980	"
Brown Non-Bessemer Concentrates (1943 production)-	25,840	"
Holman Non-Bessemer Concentrates (1942 production)	10,477	"
Holman Non-Bessemer Concentrates (1943 production)	106,088	"
TOTAL IN STOCKPILE,	153,385	"

The following is a statement of the lean material now in stock:

Concentrating Material Above 25%:

	Tons	Iron	Phos.	Silica
North Star,	20,658	26.29	.046	49.24

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2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

c. Stockpile Inventories: (Continued)

Coarse Non-Concentrating Material Above 40%:

	Tons	Iron	Phos.	Silica
North Star,	585	48.89	.044	24.50

e. Production by Months:

(1) Crude Ore:

	HOLMAN	BROWN	NORTH STAR	TOTAL
May, ----------	54,640	60,878	40,031	155,549
June, ----------	85,321	58,520	137,480	281,321
July, ----------	136,219	42,862	125,000	304,081
August, ----------	159,345	68,010	35,844	263,199
September, -------	182,785	73,462	-	256,247
October, ---------	175,811	71,093	-	246,904
November, --------	16,040	638	-	16,678
TOTAL, ----------	810,161	375,463	338,355	1,523,979

(2) Concentrates & Direct:

	HOLMAN CONCTS.	BROWN CONCS.	NORTH STAR CONCTS.	BINGHAM DIRECT	TOTAL
May,	36,488	40,355	31,304	-	108,147
June,	52,801	36,845	104,505	-	194,151
July,	84,069	27,077	91,390	-	202,536
August,	99,369	41,977	24,938	-	166,284
September,	130,661	51,827	-	31,569	214,057
October,	113,031	50,607	-	26,841	190,479
November,	9,615	420	-	-	10,035
TOTAL,	526,034	249,108	252,137	58,410	1,085,689

f. Ore Statement:

On January 1st, 1943, there remained in stockpile 10,980 tons of Brown concentrates and 115,542 tons of Holman concentrates. Prior to the opening of the regular ore season, 105,065 tons of Holman ore was shipped from the stockpile, leaving a balance of 10,980 tons of Brown concentrates and 10,477 tons of Holman, or a total of 21,457 tons. During the operating season, 25,840 tons of Brown and 106,088 tons of Holman concentrates were stocked, making a grand total of 153,385 tons in stockpile, as of December 31st, 1943.

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2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

g. Delays:

The following is a statement, on a cumulative basis, of the delays reported during the year 1943:

Time Lost		
Hours	Minutes	Cause:
68	35	Washing plant out of ore
45	30	No Great Northern empty cars
2	-	8-ft. pan plugged
2	-	Clean up under 8-ft. pan
4	30	Power trouble
3	-	Repair cone crusher
2	-	Repair pipe line
-	30	Motor trouble
2	-	Load track plugged
3	10	Screen repairs
10	15	Log repairs
1	-	Conveyor repairs
2	-	Clean up- spilled ore on loading track under chute
146	30	Total-

The total time lost under the item "Washing Plant out of ore" is the result of a number of delays in the pit and on the railway haulage lines. Pit delays were caused by moving shovels, power trouble, breakdowns on shovels, unfavorable loading conditions and trouble at the ramp. Railway haulage delays were caused by breakdowns on equipment, derailments and washouts on the tracks.

The delays due to a shortage of Great Northern empty cars are uncontrollable factors, as far as mine operators are concerned. This condition has been more serious during the past several years, when the movement of ore has been excessive.

The other items, listed above, are about normal for a season's operation.

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3. ANALYSIS:

a. Mine Analysis of Production:

	Tons	Iron	Phos.	Sil.	Mang.	Alu.	Moist.	Fe.Nat.
Holman N.B. Concs.	325,127	57.12	.047	11.72	.25	.68	6.72	53.28
Holman Bess. Concs.	200,907	57.83	.037	11.38	.19	.54	6.33	54.17
Brown N.B. Concs.	144,334	57.11	.046	12.01	.23	.51	6.77	53.24
Brown Bess. Concs.	104,774	57.61	.037	11.79	.21	.51	6.44	53.90
North Star N.B.Concs.	65,951	58.33	.042	12.21	.20	.52	6.46	54.56
North Star Bess.Concs.	186,185	58.70	.035	11.77	.22	.47	6.46	54.91
Bingham N.B. Direct Shipping,	36,144	57.77	.059	10.99	.22	2.50	12.47	50.57
Bingham Bess. Direct Shipping,	22,266	59.32	.045	9.82	.18	2.31	12.10	52.14
TOTAL,	1,085,688	57.71	.042	11.68	.22	.66	6.87	53.75

b. Mine Analysis of Shipments:

	Tons	Iron	Phos.	Sil.	Mang.	Alu.	Moist.	Fe.Nat.
Holman N.B. Concs.	303,594	56.64	.050	11.93	.31	.72	7.01	52.67
Holman Bess. Concs.	221,417	57.65	.037	11.49	.21	.56	6.37	53.98
Brown N.B. Concs.	118,494	57.14	.048	11.92	.24	.60	6.80	53.25
Brown Bess. Concs.	104,774	57.61	.037	11.79	.21	.51	6.44	53.90
North Star N.B.Concs.	65,951	58.33	.042	12.21	.20	.52	6.46	54.56
North Star Bess.Concs.	186,185	58.70	.035	11.77	.22	.47	6.46	54.91
Bingham N.B. Direct Shipping,	36,144	57.77	.059	10.99	.22	2.50	12.47	50.57
Bingham Bess. Direct Shipping,	22,266	59.32	.045	9.82	.18	2.31	12.10	52.14
TOTAL,	1,058,825	57.57	.043	11.74	.24	.69	6.96	53.56

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3. ANALYSIS:
(Continued)

a. Mine Analysis of Ore in Stockpile:

	Tons	Iron	Phos.	Sil.	Mang.	Alu.	Moist.	Fe.Nat.
Holman N.B. Concs.	116,565	57.30	.043	11.54	.25	.60	6.45	53.60
Brown N.B. Concs.	36,820	56.83	.040	12.52	.18	.62	7.28	52.69
TOTAL,	153,385	57.19	.042	11.78	.23	.60	6.65	53.39

d. Average Analysis of Crude Ore Production:

	Tons	Iron	Phos.	Silica
Holman,	810,161	45.60	.036	28.95
Brown,	375,463	45.61	.037	29.28
North Star,	338,355	49.63	.031	25.03
Total,	1,523,979	46.50	.035	28.16

e. Complete Analyses of Season's Shipments:

	Iron	Phos.	Sil.	Mang.	Alu.	Lime	Mag.	Sul.	Loss
Holman N.B. Concs.	56.64	.050	11.93	.31	.72	.24	.16	.011	5.35
Holman Bess. Concs.	57.65	.037	11.49	.21	.56	.28	.14	.010	4.75
Brown Non-Bess.Concs.	57.14	.048	11.92	.24	.60	.24	.18	.011	5.00
Brown Bess. Concs.	57.61	.037	11.79	.21	.51	.30	.16	.010	4.50
North Star N.B.Concs.	58.33	.042	12.21	.20	.52	.28	.14	.010	3.15
North Star Bess.Concs.	58.70	.035	11.77	.22	.47	.32	.16	.011	2.85
Bingham N.B. Direct,	57.77	.059	10.99	.22	2.50	.34	.20	.012	2.70
Bingham Bess. Direct,	59.32	.045	9.82	.18	2.31	.32	.18	.010	2.25

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4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:
Factors Used:
All Leases:

	CU. FT. PER TON	RECOVERY
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 percentages of recovery shown in the above table are based on the results of actual hand-wash tests made on drill hole samples.

A 10% rock reduction 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 the hand-wash tests.

PROPERTY	REPORTED 1-1-43	MINED 1943	BALANCE AFTER MINING	DEVELOPED BY DRILLING	RESERVE 1-1-44
Bingham,	2,387,853	58,410	2,329,443	-	2,329,443
North Star,	797,249	252,136	545,113	235,232	780,345
Brown No. 1,	674,212	81,993	592,219	6,391	585,828
Brown No. 2,	2,828,400	167,115	2,661,285	1,260,087	3,921,372
Holman,	3,248,491	526,034	2,722,457	116,154	2,838,611
Total Holman-Brown,	6,751,103	775,142	5,975,961	1,369,850	7,345,811
Total Bingham-North Star,	3,185,102	310,546	2,874,556	235,232	3,109,788
GRAND TOTAL,	9,936,205	1,085,688	8,850,517	1,605,082	10,455,599

The reserve estimate, as of January 1, 1944, is greater by 519,394 tons than that for January 1, 1943. This increase prevails after deducting the 1,085,688 tons of ore produced in 1943 from the reserve estimate, as of January 1, 1943. It is accounted for by the fact that 1,369,850 tons of additional ore was brought into the picture, as a result of recent drilling.

1,605,082

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4. ESTIMATE OF ORE RESERVES: (Continued)

a. Developed Ore: (Continued)

All of the parcels of land comprising the Holman-Cliffs Mine show additional ore as the result of new drilling, excepting the Bingham, which shows no change, other than the deductions of the ore mined in 1943, and the Brown #1, which shows a decrease of 6,391 tons, as the result of reestimating.

b. Prospective Ore:

Drilling from surface, at the east end of the Brown #2, demonstrates that the deep ore trough extends in that direction.

Several holes are to be put down on the north side of the Brown #2 pit in expectation of finding additional ore in this locality.

A small area on the North Star, on the east side of Mt. Griffin, is to be drilled to check the possibility of ore in this area.

It is very probable that the above outlined drilling will result in a substantial addition to the ore reserve for the Holman-Cliffs Mine.

c. Estimated Analyses:

	Tons	Iron	Phos.	Silica
North-Star Bingham:				
Bessemer Direct,	247,398	58.12	.031	8.91
Non-Bessemer Direct,	293,466	59.11	.056	9.55
Bessemer Concentrates,	1,412,188	59.86	.033	10.06
Non-Bessemer Concentrates,	1,156,756	58.34	.056	9.96
Holman-Brown:				
Bessemer Concentrates,	2,611,229	59.15	.034	9.83
Non-Bessemer Concentrates,	4,734,582	57.12	.052	11.81
Total Bessemer Direct,	247,398	58.12	.031	8.91
Total Non-Bess. Direct,	293,466	59.11	.056	9.55
Total Direct,	540,864	58.66	.045	9.26
Total Bessemer Concentrates,	4,023,417	59.40	.034	9.91
Total Non-Bess.Concentrates,	5,891,338	57.36	.053	11.45
Total Concentrates,	9,914,755	58.19	.045	10.83
Total Bessemer,	4,270,815	59.32	.034	9.85
Total Non-Bessemer,	6,184,784	57.44	.053	11.36
Grand Total,	10,455,599	58.20	.045	10.74

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5. LABOR & WAGES:

a. Comments:

(1) Labor:

The balance between labor supply and operating requirements was quite closely drawn during 1943, generally with disadvantage to the side of operating requirements. Minimum crews, in the various departments, were maintained with difficulty and such new men as were available were far inferior to those employed in normal times. Prospects for 1944 are not bright, but with more men being released from work in munition plants, the situation may be somewhat improved by spring.

No serious difficulties arose between the labor union and the management during 1943. A number of petty grievances were presented by the union committee, but these were easily settled to the satisfaction of all concerned.

Wages were increased to the extent of $.055 per hour by a directive order from the Federal Government. This raise was retroactive to July 13th, 1942.

b. Comparative Statement of Wages & Product:

PRODUCTION:		
Concentrates,	1,027,279	tons
Direct Ore,	58,410	tons
Total,	1,085,689	tons
Number of Days Operated, (Three 8-hour shifts)	149	
Average Number of Men Working,	236	
Average Wages Per Day,	$ 8.43	
Product Per Man Per Day,	25.72	tons
Labor Cost Per Ton,	$ .328	
Total Number of Days,	42,205	
Amount Paid for Labor,	$ 355,670.36	

6. SURFACE:

a. Buildings, Repairs:

General repairs were made on the houses in Taconite and the mine buildings received such attention as was necessary. An addition was built onto the north end of the machine shop, to serve as electricians' quarters.

The work done on the houses consisted of plastering and interior decorating; chimney and roof repairs; exterior painting; foundation replacements and plumbing installations.

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6. SURFACE:
(Continued)

a. Buildings, Repairs: (Continued)

The following statement shows the houses, by number, the name of the occupants and the nature and cost of repairs:

No. Occupant	Description of work done	Amount
11 - Peter Baril,	Kitchen floor, doors, interior painting; electric wiring,	$124.75
12 - Malkolm Olson,	Interior painting; interior carpentry; doors, etc., plastering,	126.82
13 - Frank Deaton,	Repair windows and doors; plastering; interior painting; plumbing,	99.49
14 - William Ansley,	Interior repairs; plumbing;porch,	125.95
15 - Thomas Wivell,	Plumbing; interior carpentry; rear porch and steps; exterior painting; roof repairs,	67.03
16 - William LeClair,	Electric wiring,	5.04
17 - Gordon Forbes,	Carpentry, general overhauling, new roof; foundation; doors; plastering and new chimney; electric wiring; interior painting; plumbing; exterior painting,	2,468.63
37 - William Wirtanen,	Window and door repairs; plumbing repairs -	55.44
38 - Martin Fleisher,	Interior carpentry; doors; interior painting; plastering; roof repairs; chimney repairs,	233.23
40 - T. J. O'Brien,	Electric wiring; carpentry-new window and door repairs; plastering; exterior painting; plumbing,	145.69
41 - Geo. H. Beasley,	Plumbing; foundation; doors; registers; interior painting; plastering,	921.49
42 - Mike Shipka,	Door repairs; plumbing repairs; interior painting,	67.00
43 - Frank Nikich,	Interior painting; screens and doors; interior carpentry,	106.12
44 - B. P. Axford,	Plumbing,	94.49

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6. SURFACE:
(Continued)

a. Buildings, Repairs: (Continued)

No.	Occupant	Description of work done	Amount
45	- Edwin Gustason,	Interior changes and repairs;doors; new roof; plumbing; interior painting; plastering; electric wiring; chimney,	$1,080.54
46	- Russell Wivell,	Doors; plumbing; roof repairs and carpentry,	21.09
47	- Emil Camilli,	Plumbing; interior painting; door repairs,	36.35
48	- William Hanson,	Plumbing; interior painting; carpentry - stairs,	16.68
50	- Linas Berg,	Plumbing repairs; door repairs and plastering,	44.32
51	- Oscar Engstrom,	Carpentry- doors; ventilators, plumbing,	11.13
53	- Claude Winkleblack,	Plastering; electric wiring; casings and windows; carpentry,floor; interior painting; exterior painting; plumbing,	730.26
55	- Raymond DeShaw,	Windows and Doors,	47.91
56	- Grant Hess,	Foundation; doors; windows; plastering; electric wiring; interior painting; plumbing (water line),	1,180.44
57	- August Mergele,	Exterior painting,	7.40
58	- Felix Cartier,	Plumbing; screen doors; doors; steps; windows; interior painting,	114.74
59	- Russell Barkla,	Interior repairs; doors; interior painting; plastering,	106.40
60	- W. F. LeClair,	Interior carpentry; floors; coal bin; cellar steps; interior painting; electric wiring,	81.39
61	- John Laine,	Electric wiring; door and window repairs,	24.85
62	- Joseph Dolezel,	Plumbing; carpentry-foors,	55.90

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6. SURFACE:
(Continued)

a. Buildings, Repairs: (Continued)

No. Occupant	Description of work done	Amount
63 - Edwin Johnson,	Interior woodwork; plumbing; interior painting; electrical work, carpentry-doors;	$ 84.66
64 - Vincent Soleture,	Shelving; doors; interior painting,	52.25
65 - Alvon Hart,	Interior carpentry; floors; doors; electric wiring; interior painting; garbage stand; storm shed repairs,	230.26
67 - Pat Maney,	Doors; interior painting; electric wiring; plumbing repairs; foundation,	113.60
68 - Tom McKusick,	Plumbing; electric wiring; foundation and front porch; doors; interior carpentry; plastering; exterior painting; interior painting; general overhauling, exterior and interior carpentry; chimney repairs,	2,325.95
69 - Arnold Lawson,	Doors,	64.65
71 - Otto Mangseth,	Interior woodwork; doors; screens; chimney repairs; plumbing repairs,	59.94
72 - Frank Dionne,	Doors - plumbing,	13.87
78 - Lucien Decoster,	Floors; doors; windows; plastering; plumbing; interior painting,	897.58
79 - John Winkleblack,	Front porch,	14.45
80 - H. J. Stephens,	Plumbing,	16.27
81 - Matthew Dosser,	Plumbing; electric wiring; basement repairs; doors,	197.47
97 - William Saw,	Plumbing; porch, windows; exterior painting,	32.10
98 - Dan Fitzhenry,	Foundation repairs; carpentry; cellar repairs; doors,	75.68

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6. SURFACE:
(Continued)

a. Buildings, Repairs: (Continued)

No.	Occupant	Description of work done	Amount
101	Loy Kolar,	Interior carpentry; doors; screens, cellar repairs; cellar door,	$ 35.64
102	Myron Youngberg,	Doors; screens; porch; windows; interior carpentry; plumbing; garage repairs,	90.90
105	Dennis Chamberlain,	Carpentry; doors; chimney repairs,	32.60
106	William Ryser,	Interior carpentry; doors; plastering; electric wiring; plumbing repairs; roof repairs; interior painting; exterior painting,	1,296.57
107	G. R. Whittington,	Interior carpentry and rear porch; interior painting; plumbing; electric wiring; exterior painting; chimney repairs; foundation,	324.12
116	Carl Eggebraaten,	Plumbing,	2.66
155	G. M. Sullivan,	Plumbing - coal bin,	66.12
156	Lee Farr,	Plumbing - exterior painting,	5.23
157	C. D. Anderson,	Plumbing, doors,	14.32
158	W. S. McComber,	Screen doors,	22.26
4	Charles Flynn,	Door repairs,	2.80
5	Harry Hart,	Door and window repairs,	70.84
7	Sam Kerkes,	Interior painting, plumbing,	26.38
10	Harley Point,	Carpentry; doors; windows, plumbing,	45.63
		TOTAL COST OF REPAIR WORK - YEAR 1943, ----------	$ 14,415.37

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6. SURFACE:
(Continued)

c. Tracks, Roads, Transmission Lines, etc:

General maintenance work was carried on throughout the operating season, in connection with the main line tracks from the pit to the washing plant. There was no new construction.

A truck haulage road was established from the loading ramp to the Bingham property. Other than this, the road construction consisted in making necessary extensions to follow the progress of mining operations.

A section of the 22,000-volt washing plant feeder line was relocated and rebuilt. Power lines, serving the shovels, were extended in the west end of the pit. Several of the pit lines were raised to afford greater clearance over roadways.

7. OPEN PIT:

a. Stripping:

Stripping operations, started in the fall of 1942, were continued through the winter and spring months until May 8th. An operating schedule of three, 8-hour shifts, seven days per week, was maintained until April 10th and from this time, to the opening of the ore season, the schedule was reduced to six days per week. With the resumption of stripping in the fall of 1943, the seven-day schedule was again put into effect.

Stripping was carried on in three principal areas in the Holman-Cliffs Mine during 1943, viz: the north end of the Bingham, the west side of Mt. Griffin, on the North Star and along the west side of the Brown #2 property.

The second lift of surface material had been removed from the Bingham early in February and the shovel was cut down to the top of ore to take off the third and bottom layer. The top of ore was very irregular and caused considerable inconvenience to the operations. Generally speaking, progress was slow with the Bingham stripping, due to heavy frost conditions and constant trouble with the boom and dipper sticks on the Marion 3-1/4-yard shovel. A serious break developed in the boom during the first week in March. As the repair job would require considerable time, it was decided to move the machine to the shops and give it a complete overhauling.

In order to continue the Bingham stripping, the Marion 2-yard shovel, from the Hill-Trumbull Mine, was moved to the property. Progress with this machine was much slower because of it's smaller capacity and it's inability to handle large frost chunks. Operations were continued until March 25th, when spring thaws made the roads impassable and operations were suspended. There remained approximately 50,000 yards of surface and clean-up material to be removed and it was decided to do this work later in the spring, if the stripping program in other parts of the mine would permit, or to handle the yardage during the early months of the ore season.

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7. OPEN PIT:
(Continued)

a. Stripping: (Continued)

The condition of the haulage road leading south from the Bingham was such that trucks could not be operated on it and, in order to be prepared to move the stripping, when opportunity offered itself, a road was built from the north end of the property, across the Brown #1 forty, to the North Star dumps, on the north side of the pit. This road was to serve the twofold purpose of handling the remaining 1943 stripping and providing a haulage way for the Bingham direct ore, to a ramp located on the railroad tracks, in the main approach. When the road was completed the shovel used on this job moved into the Bingham and loaded out a small yardage of stripping. This work was discontinued with the opening of the ore season on May 10th.

No more work was done on the Bingham stripping until the first week in August, when the No. 55 shovel and some rented trucks resumed the operation. This job was carried on, somewhat intermittently, until the fore part of September, when a sufficient area had been cleaned up to permit the loading of direct ore. From this time on, the general policy was to load direct ore on the day shift and handle the stripping on the afternoon and night shifts.

The North Star stripping, started in the fall of 1943, was continued with the 120-B, 4-yard shovel and four to six Euclid trucks. Operating conditions were generally favorable, although heavy layers of boulders sometimes impeded the progress. With the exception of a small amount of clean-up, the work was completed in this area on March 24th. The clean-up job was undertaken during the latter part of April and the bulk of the material was used to build up a barrier at the toe of the stripping bank to prevent boulders from rolling down into the pit.

Stripping operations in the Brown #2 property were started on March 23rd and continued until May 7th, when all stripping was stopped in order to move the equipment into position for the opening of the ore season. The activities in this area consisted in removing a layer of paintrock and taconite, which overlies the wash ore. Considerable trouble was experienced with the haulage roads, due to the spring breakup, and it was necessary to resurface a section of the road in order to make it passable. A small yardage of Holman material was moved in connection with the Brown #2 operation.

The following table shows the yardages of material stripped under the several classifications, for the various leases:

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7. OPEN PIT:
(Continued)

a. Stripping: (Continued)

	SURFACE MATERIAL (CU. YDS.)	WASTE ORE (CU.YDS.)	TOTAL (CU.YDS.)
Holman,		7,078	7,078
Brown No. 2,		123,813	123,813
North Star,	418,027	-	418,027
Bingham,	752,260	-	752,260
TOTAL,	1,170,287	130,891	1,301,178

d. Timbering:

Statement of Railroad Ties Used:

	QUANTITY	PRICE	AMOUNT
Standard No. 1 Tamarack Ties,	926	$ .95	$ 879.70
Standard White Oak Ties,	149	1.11	165.39
Total Cost of Ties Used,			$1,045.09

f. Explosives, Drilling & Blasting:

Statement of Explosives Used:

		QUANTITY	PRICE	AMOUNT
#6, 16' Electric Exploders,		200	$ 8.65	$ 17.30
#6, 30' Electric Exploders,		125	14.65	18.32
#6, 12' Electric Exploders,		300	7.65	22.96
#6, 24' Electric Exploders,		2,600	10.65	276.91
#6, 40' Electric Exploders,		1,500	19.65	294.75
12' Electric Exploders 1st Del.		100	10.95	10.95
#14 Duplex Lead Wire,	ft.	500	1.80	9.00
#6 Blasting Caps,		900	1.22	10.98
Clover Fuse,	ft.	1,200	6.05	7.26
#20 Connecting Wire,	lbs.	98	.55	53.90
#2 Cap Crimpers,		1	1.00	1.00
Plain Primacord,	ft.	6,500	32.00	208.00
Reinforced Primacord,	ft.	6,000	33.00	198.00
Circuit Tester,		1	15.00	15.00
Total Caps, etc.				$ 1,144.33
7/8 x 8- 40% Red Cross Extra,	lbs.	58	10.86	6.30
1-1/8 x 8- 70% Hi Velocity,	lbs.	356	14.25	50.73
3 x 10- 25% Quarry Gel.	lbs.	23,200	10.00	2,320.00
3 x 10- 60% Spec. Gel.	lbs.	24,932	11.50	2,867.18
5 x 16- 25% Quarry Gel.	lbs.	172,350	10.00	17,235.00
#4 R.C. Blasting Caps,	lbs.	201,150	10.00	20,115.00
Total Powder,				$42,594.21
TOTAL COST -ALL EXPLOSIVES,				$43,738.54

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7. OPEN PIT:
(Continued)

g. Open Pit Mining and Loading:

The 1943 ore season was started on May 10th, and continued through November 2nd, on a three, 8-hour shift, six days per week basis. A total of 1,523,979 tons of crude ore was mined and treated, yielding 1,027,279 tons of concentrates. In addition to the crude ore, 58,410 tons of Bingham direct ore was loaded out. The grand total from the pit amounted to 1,582,389 tons.

Operating conditions were quite similar to those experienced in 1942 and although the estimate of 1,060,606 tons (shipping grade) was exceeded by 25,082 tons, the operations were adversely effected by several unfavorable factors. Water in the bottom of the Holman-Brown #2 pit was the source of considerable trouble. This was further aggravated by frequent rainfall and especially by two severe storms in August. The wet ore mined from the pit bottoms was difficult to handle, both in the trucks and at the washing plant - and was mixed with dry material from other parts of the pit whenever possible. Roadways across the wet ground were very difficult to maintain. Grading requirements necessitated the frequent moving of the shovels with a resultant delay whenever this was done.

Mining was carried on in four principal areas, viz: the Holman-Brown #2, the south bank of the Holman, the North Star and the Bingham.

Operations in the Holman-Brown #2 area were quite varied, due to the necessity of moving about the pit to make a proper mixture of the several classes of ore for grading purposes. The ore mined from the east bank was difficult to handle, because of the overlying layer of waste remaining from the stripping operations. This material was removed, in part, by sorting, which slowed down production; but the majority of it was stripped in June and July. The stripping was carried on during North Star operations, when the shorter haul released some of the trucks for this purpose. It was necessary to rent a number of small trucks in July, to complete the removal of the waste. The upper layer of ore, in the east bank, was lean and sandy and had to be mixed with higher grade material from the bottom of the pit. Shovel and truck operations in the pit bottom, during the first three months, were handicapped by the heavy flow of water, but the new sump was dug in August and the water was brought under control.

The ore in the south bank was generally lean and sandy, and required sweetening to make a desirable grade. This necessitated a somewhat intermittent operation, as the material could be handled only when other higher grade ore was available for mixing.

During the first two weeks of the ore season, an approach, leading from the Brown #1 property, was developed into the east side of the North Star mining area. The cut was taken through material which was too lean to treat in the washing plant and was cast down

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7. OPEN PIT:
(Continued)

g. Open Pit Mining and Loading: (Continued)

into the excavation made in 1942. By the end of May, the shovel had reached the North Star wash ore and had opened up an area of sufficient extent to permit the operation of two shovels. It was necessary to maintain total production from the North Star, as this ore could not be mixed with material from the Holman-Brown leases and could not be stockpiled, when empty cars were not available for loading at the washing plant. The first bench was mined out by the end of June and the second lift was developed by cutting down to the north and west. As mining progressed, horses of rock were encountered on the north and west sides of the pit and by the end of July, the area became so restricted that only one shovel could be operated. After nine shifts of production, early in August, mining in the North Star was discontinued for the season, as further development work was necessary to reach the remaining ore and equipment could not be spared from other operations, at this time. Generally speaking, the ore produced from the North Star carried a comparatively high silica, but the natural iron was very good and the weight recovery was high.

Operations were started in the Bingham property on August 1st, when the 2-1/2-yard diesel shovel and the rented trucks were moved to this section of the pit to remove the stripping which remained from the winter program. Progress was somewhat slow, due to the small capacity of the equipment and adverse operating conditions, caused by frequent rains. By the end of the month, approximately one-half of the direct ore in the area had been cleaned up and a schedule of one shift on ore loading and two shifts for stripping was put into effect. This schedule was continued until October 9th, when the surface clean-up was completed and the available direct ore was exhausted by October 15th. The ore was transported, by truck, to a loading ramp, located on the railroad tracks in the main approach, on the north side of the pit. With the removal of the direct ore, a layer of waste paintrock was exposed, which will be removed during stripping operations in the spring of 1944. The paintrock overlies the high grade wash ore in the Bingham Mine.

The direct ore loaded amounted to 58,410 tons, which exceeded the original estimate by 23,410 tons. This increase is accounted for by the fact that there were mounds of ore between the drill holes and the average thickness of the layer was greater than shown by the exploration data. The ore was of a uniformly good grade.

k. Drainage:

Pumping operations were maintained on a 24-hour schedule throughout the year. During the first several months the equipment consisted of one 2,000-gallon pump on regular duty and one 800-gallon pump for relief. These machines were located on the edge of the old sump, on stationary foundations. Later in the year it became necessary to provide lower drainage for the pit and the pumping

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7. OPEN PIT:
(Continued)

k. Drainage: (Continued)
installation was rearranged. The old sump was cleaned out and a dike built around its perimeter, to increase the capacity of the basin. Here, two 2,000-gallon pumps were installed, - one in regular service and one to handle surplus water. A new sump was dug to the south of the old one and the water from here is delivered to the old sump by one 2,000-gallon pump, mounted on a raft. A 600-gallon pump has been provided for emergency use. This arrangement has proven very satisfactory.

8. COST OF OPERATION:

a. Comparative Mining Costs:

	1943 BUDGET ESTIMATE	1943 COST PER TON	1942 COST PER TON
PRODUCT:			
Concentrates, (Tons)	1,030,303	1,027,278	1,092,950
Direct Ore, (Tons)	30,303	58,410	11,993
Total, (Tons)	1,060,606	1,085,688	1,104,943
Average Shift Production (Tons)	-	2,314	2,331
Tons Per Man Per Day,		25.72	27.01
Days Operated,		149	158
COST:			
Direct Ore,	-	$ .240	-
Open Pit Wash Ore,	$.284	.297	$.230
General Pit Expense,	.085	.096	.074
Concentrating,	.168	.178	.162
Stocking and Loading Concentrates,	.014	.014	.012
General Mine Expense,	.077	.094	.066
Idle and Winter Expense,	.104	.145	.114
Cost of Production,	$.732	$.811	$.658
Depreciation - Plant and Equipment,	--	.140	.150
Depreciation - Motorized Equipment,		.048	.013
Amortization of Stripping,		.230	.224
Taxes - Ad Valorem,		.115	.089
Taxes - Occupational,		.056	.100
Taxes - Royalty,		.073	.055
Total Cost at Mine,		$.662 (.473)	$1.289
Administrative Expense,		.100	.098
Miscellaneous Expense and Income,		.009	.004
GRAND TOTAL,		$ 1.582	$ 1.391

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8. COST OF OPERATION: (Continued)

d. Detailed Cost Comparison:

(1) Product:

The merchantable product shipped from the Holman-Cliffs Mine in 1943 was somewhat poorer than the average of the reserve ore in the property, but compared quite favorably with the ore produced the previous year, it being slightly lower in iron and a fraction of a point higher in silica. On the basis of analysis, the crude ore handled in 1942 and 1943 was practically the same, but the average structure for the two years was quite different. The 1943 crude ore was a better concentrating material, due to the fact that three times as much high recovery North Star ore was used and a smaller proportion of the lean, sandy ore from the south side of the Holman pit was included in the mixture. The direct shipping ore from the Bingham had a beneficial effect on the total product.

(2) Open Pit Mining:

(a) Direct Ore:

A mining cost for direct ore is shown only for 1943, as there was no previous production upon which either estimated or comparative figures could be based. The cost is high on account of the necessity of using hired trucks, of small capacity, to handle the material and the construction of roads and a ramp was charged to a relatively small tonnage. Some of the cleanup work was also charged to this ore.

(b) Crude Ore:

The 1943 cost per ton was $.013 higher than the budget and $.067 higher than the 1942 cost, figured on a concentrated basis. The increase over the budget is accounted for by a less efficient operation of the haulage trucks than was anticipated. The higher cost for 1943, as compared to 1942, is reflected in several items under this caption. Drilling and Blasting shows an increase because more hard ground was encountered in mining operations. The higher costs for Power Shovels-Operating and Power Shovels-Maintenance is accounted for by the fact that three shovels were generally used in 1943, while two were employed in 1942. Practically one-half of the increase is reflected in the items Trucks-Operating and Truck-Maintenance. More trucks were repaired on the longer haul in 1943 and the older machines required more repairs. The increase for Pit Roads and Ramps is accounted for by the smaller tonnage handled in 1943. The increase of $.055 in wages in 1943 had the general effect of raising the costs.

(3) General Pit Expense:

The 1943 cost per ton shows an increase of $.011 and $.022 over the budget and the 1942 cost, respectively. The increase over the budget is practically all accounted for in the handling of waste paintrock and taconite. There was a considerable yardage of this material remaining from the winter stripping program and it was necessary to hire trucks for its removal during the ore season.

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8. COST OF OPERATION: (Continued)

d. Detailed Cost Comparison: (Continued)

(3) General Pit Expense: (Continued)

This work was not anticipated when the budget estimate was made. The increase of $.022 over the 1942 figure is partly accounted for by the necessity of moving the excessive amount of waste material, as explained above, and by extraordinary charges under the item- General Open Pit Expense.

(4) Concentrating:

Compared with the budget and the 1942 costs, the figures for 1943 are higher by $.010 and $.016, respectively. The increase over the budget is accounted for by the $.055 per hour raise in wages and unanticipated difficulty in handling wet ore. The increase over the 1942 costs is reflected in the two items - "Transportation" - and "Washing". Transportation is higher by $.007 and is accounted for, in part, by the increase in wages and also by an increase in the price of coal. The average daily tonnage transported, by the same amount of equipment, was less in 1943 than in 1942, which directly contributes to the higher cost.

Washing is higher by $.010 in 1943, due to the fact that a larger proportion of wet, sticky ore was handled, which slowed down operations. The production of better than three times as much North Star ore in 1943, as compared to 1942, had a decided effect in raising the costs, There are no provisions for stockpiling North Star concentrates and when empty railway cars were not available for loading, while running North Star ore, the plant operation was stopped. Serious delays in the pit and at the washing plant and the increase in wages also had their effect.

(5) General Mine Expense:

The 1943 cost exceeded that of 1942 by $.028 and the budget estimate by $.017. In general, the increase in both cases is the result of nominal differences in the numerous items under this heading. The item, "Minnesota War Risk Contribution", amounting to $.009, appears only in the 1943 figures, while "Employees' Vacation Pay", in the amount of $.007, for 1943 shows no charge on the cost sheet used for 1942.

(6) Idle and Winter Expense:

The cost per ton in 1943 was $.041 higher than the budget and $.031 higher than in 1942. The increase over the 1942 cost is accounted for in five items: Pumping and Drainage shows heavier charges, due to the fact that new pump-houses were built and the pump and pipe line installations were rearranged. Special Expense carried an extraordinary large amount on account of special payrolls covering back pay. Social Security is higher, due to the increased payrolls. District Office carried some extra Cleveland charges. Maintenance - Building and Machinery, under Concentrating, was considerably higher

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8. COST OF OPERATION: (Continued)

d. Detailed Cost Comparison: (Continued)

(6) Idle and Winter Expense: (Continued)

in 1943 because of excessive charges for new supplies and equipment which carried over from 1942 and part of which should be handled in 1944.

The increase of $.041 over the budget is accounted for by the fact that the unusual charges, as explained above, were not anticipated.

9. EXPLORATIONS AND FUTURE EXPLORATIONS:

During the year, thirty-one drill holes were put down in the Holman-Cliffs Mine, totaling 5,612 feet. The drilling was divided among the several parcels as follows: On the Brown #2 - 14 holes were drilled, totaling 3,415 feet; on the North Star - 6 holes totaled 535 feet; on the Bingham 11 holes were put down, totaling 1,662 feet.

On the Brown #2 property, 10 holes were drilled in the bottom of the pit, at the east end, and 2 holes were drilled from the surface, east of the open pit limits. This drilling discloses the fact that the Brown #2 ore body continues to the east and that additional stripping will be necessary in this section of the mine. Two check holes were drilled on one of the more easterly of the Brown #2 forties, to determine whether or not it might be used for dumping grounds. The area proved to be barren.

The six North Star holes were drilled in the approach track bench, on the north side of the pit, to check some old information. No additional ore was found here.

On the Bingham forty, two exploration holes were put down to determine ultimate stripping limits. The other 9 holes were for the purpose of filling in information between some of the widely-spaced old drill holes.

In 1944, it is proposed to drill 38 holes, totaling approximately 7,080 feet. Four of these holes will be put down east of the Brown #2 pit limits, to complete the outlining of the ore body in this vicinity. It is intended to locate five of the holes north of the Brown #2 pit limits to check the possibility of an extension of the ore body in this direction. A total of five holes are laid out on the North Star property, on the east side of Mt. Griffin, and the remaining 24 holes are intended for the Bingham property, to be drilled after the stripping has been completed.

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10. TAXES:

The following statement shows the Holman-Cliffs Mine taxes and the average rates for the years 1942 and 1943:

	1943	1942	Increase	Decrease
Holman-Brown Mine,	$76,738.85	72,468.62	4,270.23	
Bingham Mine,	16,870.96	17,239.53	-	368.57
North Star Mine,	11,560.44	1,666.80	9,893.64	
Holman-Cliffs Aux.Lands,	1,958.44	2,091,39	-	132.94
Bingham-North Star Wash. Plant Lands, -	62.84	48.64	14.20	-
Holman-Brown Lands,	23.26	24.84	-	1.58
Holman-Cliffs Shops and Office,	246.80	252.20	-	5.40
Holman-Cliffs Personal Property,	5,022.33	3,894.21	1,128.12	-
Total,	$112,483.92	$97,686.22	14,797.70	-
Rented Buildings,	857.34	875.99	-	18.65
GRAND TOTAL,	$113,341.26	$98,562.21	14,779.05	-
Average Tax Rate,	93.46	95.55	-	2.09

The Holman-Brown and North Star properties show higher taxes on account of an increase in reserve tonnage, developed by drilling.

The Bingham Mine, Holman-Cliffs Auxiliary Lands, Holman-Brown Lands and the Holman-Cliffs Shops and Office are lower in 1943 because of a decrease in tax rate.

The Bingham-North Star Washing Plant Lands show an increase in 1943 due to the addition of the forty upon which the Bingham stripping dump is located.

11. ACCIDENTS AND PERSONAL INJURY:

The following is a list of the lost-time accidents which occurred during 1943:

NAME: John Hecomovich DATE: January 8th.
CAUSE: He was standing up against the shovel stripping bank, when the bulldozer was pushing dirt spill into the shovel. The bulldozer man swung the bulldozer over unexpectedly and struck his right leg with the bulldozer track.
NATURE: Bruise and swelling of outer side of right leg.
TIME LOST: Injured January 8th; returned to work January 13th.
COMPENSATION: None

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11. ACCIDENTS AND PERSONAL INJURY: (Continued)

NAME: Frank Marcella DATE: March 23rd.
CAUSE: Injured slipped on frost chunk while pulling shovel cable.
NATURE: Sprain of right foot instep.
TIME LOST: Injured March 23rd; returned to work March 29th.
COMPENSATION: None.

NAME: Oliver W. Foster DATE: March 25th.
CAUSE: Injured was dealing out electric cable from truck, when moving shovel. Cable caught around right leg, below knee, and he fell out from back of the Euclid truck, twisting right knee.
NATURE: Sprained medial ligaments of right knee.
TIME LOST: Injured March 25th; returned to work at Hill-Trumbull Mine on April 19th.
COMPENSATION: $ 48.33.

NAME: Sam Dimich DATE: April 6th.
NATURE: Contusion of left knee. Small laceration of thigh. Neg. for fracture.
CAUSE: Cable that the trucks were pulling the shovel with, snapped and hit his left knee.
TIME LOST: Injured April 6th; returned to work April 26th.
COMPENSATION: $ 33.33.

NAME: Raymond D. Scott DATE: September 3rd.
CAUSE: While helping to carry 8" x 8" x 24' timbers through shop doors, Scott stumbled and put his hand on planer. (It was necessary to remove guide and guard as the timbers were being pushed through planer at an angle).
NATURE: Laceration of palm of left hand.
TIME LOST: Injured September 3rd; released by Doctor September 22nd.
COMPENSATION: $33.33.

NAME: Alfred E. Legore DATE: September 2nd.
CAUSE: Truck backed over a 9-foot bank and as Legore jumped from the cab to clear himself, he lost his footing and fell against the truck and rolled under the truck bumper.
NATURE: Crushing injury to chest, with pulmonary bleeding and deep shock.
TIME LOST: Injured September 2nd; returned to work November 4th.
COMPENSATION: $200.00.

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11. ACCIDENTS AND PERSONAL INJURY: (Continued)

NAME: Herbert Beer DATE: September 14th.
CAUSE: While Herbert Beer was driving truck No. 35, loaded with ore up a steep grade, in the Holman pit, he attempted to shift into a lower gear. He was unable to do so, and was unable to hold the truck with the load on so steep a grade. As the truck was slowly backing down the grade, he steered it so that it would back into the bank along side the road. As the truck struck the bank, it turned over on its side.
NATURE: Contusion to right shoulder and lower back. Hospitalized-X-rays negative as to fracture.
TIME LOST: Injured September 14th; returned to work September 15th.
COMPENSATION: None.

NAME: Henry J. Stephens DATE: September 14th.
CAUSE: Stephens was the pumpman on the 11:00 to 7:00 shift - (night shift). He was walking from the pumphouse to a raft in the sump and was carrying a bar in one hand and an electric lantern in his other hand. On the way to the raft he had to cross a two-foot depression in the ground over which a plank had been placed. While walking the plank, he lost his footing and slipped off the plank. As he fell, he struck his chest against a protruding railroad tie which was partially buried in the nearby bank.
NATURE: Contusion of anterior chest.
TIME LOST: Injured September 14th; returned to work the next day as office janitor. He was transferred to office janitor on the advice of the doctor that he could do light work. This work proved an aggravation of the chest injury and made it necessary for him to stay home after September 25th, for a week or ten days. Returned to work on October 13th.
COMPENSATION: $ 26.67.

NAME: Charles M. Bernard DATE: November 28th.
CAUSE: While working at the emery wheel, grinding a bolt for a truck box, a piece of hot scale flew into his left eye.
NATURE: Foreign body embedded in left eye.
TIME LOST: Injured November 28th; returned to work November 30th.
COMPENSATION: None.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION:

An extension, 30' x 40', was built on the north end of the machine shop, to serve as electricians' quarters. All facilities for repairing electrical equipment have been moved into this building, where they can be used to better advantage than in the old shop.

Construction of a repair shop for motorized equipment was started in October and, because of a shortage of men, only fair progress had been made by the first of the year. The dimensions of this building are 40' x 80'. The material used for the walls is cement blocks.

The foundations for a research laboratory, 30' x 80' in dimensions, were laid in October, but no further construction was accomplished before the first of January.

Both of the last-mentioned buildings are located east of the Holman-Cliffs shops, on a piece of land purchased for this particular use.

It is proposed to erect a small office building to accommodate the Safety and Personnel Departments.

13. EQUIPMENT AND PROPOSED EQUIPMENT:

The following equipment was purchased for the Holman-Cliffs Mine in 1943: one Parmanco Horizontal Drill; one Portable Welding Machine; one 54-B Diesel Bucyrus-Erie Shovel; one 120-B Bucyrus-Erie Electric Shovel and one RD-8 "Caterpillar" Tractor.

As replacements for worn-out machines, it is intended to purchase seven 20-ton Euclid trucks in 1944.

The purchase of a T-29 Bucyrus-Erie Blast Hole Drill is proposed for 1944.

14. MAINTENANCE AND REPAIRS:

The general overhauling of the Holman-Cliffs locomotives was done at the Hill-Trumbull shops, while the 30-yard cars were given necessary repairs at the Holman-Cliffs shops.

The Euclid truck repairs are carried on continuously through the operating seasons, as there is no tie-up for this equipment.

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14. MAINTENANCE AND REPAIRS: (Continued)

The No. 51 Marion 3-1/4-yard shovel and the No. 32, 120-B Bucyrus were repaired during March and April. The No. 51 Marion shovel received a complete overhauling and, in addition, the boom was rebuilt and the dipper sticks were reinforced. A general repair job was done on the No. 32 Bucyrus shovel and a new set of "caterpillar" pads was installed on this machine.

During the winter and spring, and again in the fall, the equipment at the washing plant was given a general overhauling. Worn and broken parts on the machines were replaced, or repaired, and the chutes, pockets and launders received such attention as was necessary.

18. NATIONALITY OF EMPLOYEES:

Nationality:	Number of Men
American,	191
Finnish,	8
Jugo-Slav,	7
Italian,	5
Austrian,	5
Canadian,	5
Swedish,	4
Norwegian,	4
Croatian,	2
Bulgarian,	1
Greek,	1
Montenegran,	1
Belgian,	1
Polish,	1
Total,	236

19. WASHING PLANT OPERATIONS:

The Holman-Cliffs washing plant was operated from May 10th, through November 2nd, on a schedule of three shifts, six days per week. A total of 1,523,979 tons of crude ore was treated, producing 1,027,279 tons of concentrates. The average daily production amounted to 6,758 tons and the per shift rate was 2,314 tons. This compares quite favorably with the production rate in 1942.

Operating conditions at the plant were generally satisfactory, the production varying with the class of crude ore and difficulties effecting loading in the pit. When treating the wet, sticky ore from the bottom of the Holman and Brown #2 properties, the production

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19. WASHING PLANT OPERATIONS: (Continued)

was below average because of trouble in handling this material. On the other hand, the dry North Star ore was put through on a full load and yielded a high tonnage recovery. Wet conditions in the bottom of the pit, moving shovels, rain storms and breakdowns often left the plant without an adequate ore supply, which adversely effected production.

During such times as there were no Great Northern empty cars for loading, it was necessary to stockpile the Holman and Brown concentrates. There have been no provisions made for stocking North Star ore. The concentrates are conveyed from the mill pocket to the stockpile grounds by means of trucks and it is sometimes necessary to use some of the pit equipment for this purpose. During the season, 131,928 tons of concentrates were placed in stockpile, which, added to the 126,522 tons remaining from the previous year, made a total of 258,450 tons. Early in the 1943 ore season, 105,065 tons of ore were shipped, leaving a balance of 153,385 tons in stock as of December 31st, 1943.

The tonnage and analysis of the plant rejects for 1943 were as follows:

5 x 14 Screen Rejects:

Lease	Tons	Iron	Phos.	Silica
Holman,	39,892	31.40	.037	48.65
Brown,	20,533	31.19	.036	48.74
North Star,	19,835	31.21	.029	49.20
Total,	80,260	31.30	.035	48.81

36" Belt Rejects

Lease	Tons	Iron	Phos.	Silica
Holman,	2,754	29.68	.036	50.87
Brown,	1,393	29.07	.035	52.22
North Star,	1,227	30.44	.029	50.22
Total,	5,374	29.70	.034	51.07

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

	Tons	Iron
Holman,	17,046	31.58
Brown,	23,597	32.53
North Star,	12,034	32.82
Total,	52,677	32.29

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19. WASHING PLANT OPERATIONS: (Continued)

The following material was removed during the shipping season and charged to mining operations:

LEASE	SURFACE CU.YDS.	WASTE CU.YDS.	TOTAL CU.YDS.
Holman,	-	104,045	104,045
Brown No. 2,	1,261	34,299	35,560
North Star,	600	972	1,572
Bingham,	59,947	1,533	61,480
Total,	61,808	140,849	202,657

The analysis of the product from the various machines for the year 1943 were as follows:

	Iron	Phos.	Silica
HOLMAN MILL MACHINES:			
Log Washer,	57.06	.047	11.69
Classifier,	57.17	.042	12.29
Tailings,	21.83	-	-
BROWN MILL MACHINES:			
Log Washer,	57.30	.046	11.95
Classifier,	57.29	.041	12.34
Tailings,	21.90	-	-
NORTH STAR MILL MACHINES:			
Log Washer,	57.66	.039	12.34
Classifier,	58.80	.036	11.90
Tailings,	22.04	-	-

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19. WASHING PLANT OPERATIONS: (Continued)

The concentrating data for the Holman-Cliffs Mine for the year 1943, was as follows:

	Tonnage	Percentage of Total Mined	Per Cent. Iron Dried	Tonnage Recovery	Iron Unit Recovery
Crude Ore and Rock Mined,	1,656,916	100.00	45.29		
Less: Rock removed in Mining	52,677	3.18	32.29		
Crude Ore transported to Mill	1,604,239	96.82	45.71		
Less Rock rejects in Crusher House,	80,260	4.84	31.30		
Crude Ore Entering Mill,	1,523,979	91.98	46.47		
Concentrates Produced,	1,027,279	62.00	57.67	67.41	83.65
Rock Rejects on Mill Picking Belt,	5,374	.32	29.70		
Tailings (By Deduction)	491,326	29.66	23.24		
Total Heads - as Above,	1,523,979	91.98	46.47		

HILL-TRUMBULL MINE
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1. GENERAL:

A program of repair work was carried on in the shops and at the washing plant from the first of the year until the first of May. A schedule of one shift per day, five days per week was maintained.

Necessary repairs were made on the locomotives and cars and the two 120-B electric shovels, Nos. 34 and 35, were given general overhaulings.

The usual repairs, incidental to the previous season's operation, were made at the washing plant and heavy density plant. The 8' pan conveyor was shortened for more efficient operation and the 36" belt conveyor was extended to accommodate the new arrangement.

In the heavy density plant, the 30" Akins classifier, used as a densifier for the medium, was removed and sold and the 48" Akins classifier, from the double classification circuit, was installed in its place. A new 60" Akins classifier was purchased to replace the 48" machine.

The electrification of the railway haulage, from the pit conveyor loading pocket to the washing plant, was started in March and completed the first week in September. The progress on this construction was slow, due to a shortage of men and difficulty in securing the necessary material.

The 1943 ore shipments were started on April 12th, with the loading of concentrates from the washing plant stockpile. This material was from the 1942 washing operations. A total of 71,252 tons was shipped during April.

Actual mining operations were started on May 6th, and continued through November 2nd. A basic schedule of three 8-hour shifts, six days per week was adopted and maintained throughout the season. The loading of wash ore and retreat ore was varied to accommodate the requirements of the washing plant and the heavy density plant. A very small tonnage of direct shipping ore was handled during the season, as only a limited amount of this material was readily available.

The washing plant operated 158 days, producing 585,494 tons of concentrates and 400,202 tons of cone plant feed. This was accomplished through the treatment of 1,035,342 tons of crude wash ore and 669,633 tons of retreat crude. The cone plant was operated 141 days, producing 281,467 tons of concentrates, the average daily production being 1,996 tons. The total concentrates produced during the 1943 season amounted to 866,961 tons.

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1. GENERAL: (Continued)

Of the 158 days during which the washing plant was in operation, 97 days were devoted to the production of 585,494 tons of concentrates and 61 days in preparing 400,202 tons of cone plant feed. The average daily production of concentrates was 6,036 tons and that of the cone plant feed was 6,561 tons.

An adequate supply of empty railroad cars was not available at all times, which lead to the necessity of placing in stockpile a total of 109,249 tons of concentrates. There remained in stock, from the 1942 season, 196,437 tons of ore which made a total of - 305,686 tons available for shipment during the 1943 season. Of this total amount, 228,101 tons were shipped, leaving a balance of 77,585 tons.

Stripping operations were continued from January 1st until the end of April and then were resumed on November 3rd, after the completion of the ore season. During the winter and spring months the major activities were conducted in the area on the East Trumbull forty, in the vicinity of the old coal dock. In addition to this, some taconite was removed from the bottom of the Hill pit. In November, stripping was started in the north bank of the Hill pit, but was discontinued because of the soft nature of the ground. Operations were transferred to the East Trumbull forty and continued there until the end of December. Work in the Hill north bank will be resumed when the surface stripping on the East Trumbull forty has been completed, at which time the frozen ground will better support the heavy truck traffic.

The exploration program during 1943 consosted in the drilling of twelve holes, one of which was put down on the East Trumbull forty and eleven in the area on the north side of the most westerly part of the active Hill forties. The drilling was carried on for practically eight months, the equipment having been transferred to the Holman-Cliffs Mine during the other four months of the year.

2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production by Grades:

Hill Crude,	113,790	tons
Trumbull Crude,	921,552	"
TOTAL CRUDE ORE,	1,035,342	"
Hill Retreat Crude,	48,236	"
Trumbull Retreat Crude,	621,163	"
TOTAL RETREAT CRUDE,	669,399	"

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2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production by Grades: (Continued)

Hill Non-Bessemer Direct Shipping Ore, ----------	4,268	tons
Hill Non-Bessemer Concentrates, ----------	27,693	"
Hill Bessemer Concentrates, ----------	37,901	"
Hill Non-Bessemer Cone Concentrates, ----------	13,840	"
Hill Bessemer Cone Concentrates, ----------	8,856	"
Trumbull Non-Bessemer Concentrates, ----------	329,669	"
Trumbull Bessemer concentrates, ----------	190,231	"
Trumbull Non-Bessemer Cone Concentrates, --------	109,671	"
Trumbull Bessemer Cone Concentrates, ----------	149,100	"
TOTAL 1943 PRODUCTION, ----------	871,229	"

b. Shipments:

The shipments from the Hill-Trumbull Mine during 1943 were as follows:

Hill Non-Bessemer Direct Shipping Ore, ----------	4,268	"
Hill Non-Bessemer Concentrates, ----------	73,881	"
Hill Bessemer Concentrates, ----------	59,201	"
Hill Non-Bessemer Cone Concentrates, ----------	13,840	"
Hill Bessemer Cone Concentrates, ----------	8,856	"
Trumbull Non-Bessemer Concentrates, ----------	346,334	"
Trumbull Bessemer Concentrates, ----------	224,930	"
Trumbull Non-Bessemer Cone Concentrates, --------	109,671	"
Trumbull Bessemer Cone Concentrates, ----------	149,100	"
TOTAL 1943 SHIPMENTS, ----------	990,081	"

c. Stockpile Inventories:

During the 1943 operating season there were placed in stockpile 1,049 tons of Hill Concentrates and 108,200 tons of Trumbull Concentrates, making a total of 109,249 tons. As of January 1, 1943, there remained in stock 68,304 tons of Hill Concentrates and 128,133 tons of Trumbull Concentrates, or a total of 196,437 tons, from the 1942 operations. The combined tonnage of ore remaining from 1942 and that stocked in 1943 shows a total of 69,353 tons of Hill Concentrates and 236,333 tons of Trumbull Concentrates, or a grand total of - 305,686 tons. During the 1943 shipping season there was loaded out 68,537 tons of Hill ore and 159,564 tons of Trumbull ore, making a total of 228,101 tons. The material remaining in stock on December 31, 1943, consisted of 816 tons of Hill Concentrates and 76,769 tons of Trumbull Concentrates, or a total of 77,585 tons.

The following statement shows the quantities of lean material in stock as of December 31st, 1943:

Concentrating Material Above 25%

	Tons	Iron	Phos.	Silica
Hill,	55,439	29.37	.037	52.71
Trumbull,	286,310	28.23	.032	54.34
Total,	341,749	28.41	.033	54.08

HILL-TRUMBULL MINE
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2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

c. Stockpile Inventories: (Continued)

Non-Concentrating Material Above 35%:

	Tons	Iron	Phos.	Silica
Hill,	142,833	48.50	.081	21.90

Coarse Non-Concentrating Material Above 40%:

	Tons	Iron	Phos.	Silica
Hill,	7,527	33.23	.028	43.33

e. Production by Months:

(1) Crude Ore:

MONTH	HILL	HILL RETREAT	TRUMBULL	TRUMBULL RETREAT	TOTAL
May,	13,935	-	210,753	26,159	250,847
June,			219,370	97,376	316,746
July,	39,234	27,381	152,925	81,827	301,367
August,	41,405	2,301	101,340	113,196	258,242
September,	19,216	18,554	93,172	139,021	269,963
October,			143,992	145,432	289,424
November,				18,152	18,152
TOTAL,	113,790	48,236	921,552	621,163	1,704,741

(2) Concentrates and Direct Ore:

	HILL DIRECT	HILL CONCTS.	HILL CONE CONCTS.	TRUMBULL CONCTS.	TRUMBULL CONE CONCTS.	TOTAL
May,		8,304		129,778	9,897	147,979
June,				119,337	42,743	162,080
July,	4,239	23,260	12,807	83,644	32,229	156,179
August,	29	23,422	604	52,743	47,378	124,176
September,		10,608	9,285	53,508	58,632	132,033
October,				80,890	54,990	135,880
November,					12,902	12,902
TOTAL,	4,268	65,594	22,696	519,900	258,771	871,229

f. Ore Statement:

There was in stockpile, December 31, 1943, 816 tons of Hill Concentrates and 76,769 tons of Trumbull Concentrates, making a total of 77,585 tons.

g. Delays:

The following delays, as effecting production, are shown on a cumulative basis for the season and are placed under four classifications, viz: Pit Delays, Railway Haulage Delays, Washing Plant Delays and Retreat Plant Delays:

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2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

g. Delays: (Continued)

Pit Delays

Hours	Minutes	Cause
2	15	Change hoisting cables on shovels
1	55	Electrical trouble
10	-	Operations tied up by heavy storms
1	15	Shovel repairs
15	25	

Railway Haulage Delays

3	-	Electrical trouble
2	-	Broken axle on engine tender
4	45	Derailment on main line to washing plant
9	45	

Washing Plant Delays

3	-	Repairs on vibrating screens
22	50	Out of ore
1	45	Logs plugged
1	-	Crusher plugged
1	30	Classifier plugged
4	30	Repairing pumps
3	30	Electrical trouble
12	50	Log repairs
-	45	Repair air line
3	45	Repair main water line
2	40	Trouble at stockpile
9	45	Conveyor repairs
67	50	

Retreat Plant Delays

15	-	Repair surge pump
8	15	Repair Fairbanks-Morse scales
39	50	Cone plugged
8	25	Feeder repairs
27	15	Power trouble
27	55	Repairs on vibrating screens
5	15	Feeder plugged - wet ore
2	-	Plugged pipe lines
8	55	No empty cars
30	25	Circulating pump plugged
12	-	Repairs on cone
18	15	Out of ore
2	30	Repair scraper
4	15	Repair wash water pump
8	-	Feeder station flooded
19	30	Conveyor trouble

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2. PRODUCTION, SHIPMENTS & INVENTORIES:

g. Delays: (Continued)

Retreat Plant Delays (Continued)

Hours	Minutes	Cause
23	50	Repair tugger
3	30	Charging medium
6	30	Repair tugger cables
8	-	Water line repairs
6	-	Tractor repairs
2	-	Great Northern car derailment
287	35	

Pit Delays:

The cumulative time of ten hours lost in one item, under this caption, was due to two severe rain storms, one week apart, which occurred in August. The heavy flow of water caused serious washouts in the truck haulage roads, as well as flooding certain areas in the pit. Operations were suspended while repairs were made.

The other items are self-explanatory.

Railway Haulage Delays:

The descriptions of the cause of the delays cover the items under this heading.

Washing Plant Delays:

The loss of time shown in the item "out of ore", is directly related to the delays shown under "Pit Delays" and "Railway Haulage Delays".

The item "log repairs", was largely due to trouble with bearings.

Under "conveyor repairs", a total of 5 hours and 30 minutes is accounted for in a single job of replacing a damaged idler pulley on the 36" conveyor belt.

The other items listed under this heading are about normal for a season's operation.

Retreat Plant Delays:

The total time lost in the retreat plant was large, but the fact that this was the first full season's operation for this equipment, has a direct bearing on the case. It is always necessary to make alterations and adjustments, as a result of experience gained under regular operating conditions.

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2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

g. Delays: (Continued)

Retreat Plant Delays: (Continued)

The time lost in "repairing surge pump" and in the "plugging of circulating pump", was due to faulty installations and the necessity of making some mechanical adjustments. The difficulties with these machines were overcome before the end of the season.

The plugging of the cone occurred, almost entirely, during the treatment of one class of ore. When limonitic ore was fed to this machine, the concentrates had a tendency to accumulate in the upper section and form a block. When this happens it is necessary to shut off the feed until the mass disintegrates, as bars must be used to break it up. Alterations are being made in the mechanism of the cone to eliminate this trouble in the future.

"Power trouble" was due, not only to storms and other sources beyond control, but also to conditions in the control mechanisms and under powered motors. These causes of trouble have been eliminated.

The vibrating screens, with two exceptions, are suspended on cables and considerable time was lost due to these cables breaking. Other mechanical troubles were experienced which were directly related to the cable suspension. The screens are being placed on floor mountings and much of the trouble will be avoided in the future. Two of the screens are of the hummer type and they caused trouble, due to elements burning out. These machines are being taken out of the circuit.

The time lost because of the plant being "out of ore" was related to delays in the pit and on the haulage lines.

The delays due to "conveyor trouble" are accounted for, in part, by breakdowns and also by the ore sliding back down the belt when wet feed material was being handled. In order to avoid this trouble in the future, the stockpile will be so arranged that one section may be draining while the other is being used.

Considerable trouble was had with the tugger used to operate the scraper, which conveys the feed to the conveyor belt. A different machine is being installed to handle this work, in the future.

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3. ANALYSIS:

a. Mine Analysis of Production:

	Tons	Iron	Phos.	Sil.	Mang.	Alu.	Moist.	Fe. Nat.
Hill Non-Bess.Direct,	4,268	57.09	.073	12.93	.18	.94	8.00	52.53
Hill Non-Bess.Concts.	27,693	57.66	.041	14.34	.10	.46	6.40	53.97
Hill Bessemer Concts.	37,901	58.01	.033	13.91	.11	.45	6.20	54.41
Hill Non-Bess.Cone Concs.	13,840	57.28	.046	11.03	.10	.45	4.07	54.95
Hill Bess.Cone Concts.	8,856	57.44	.042	11.30	.14	.45	4.38	54.92
Trumbull Non-Bess.Concs.	329,669	57.11	.045	10.55	.15	.48	8.73	52.12
Trumbull Bess. Concs.	190,231	57.26	.042	10.29	.15	.47	9.04	52.08
Trumbull Non-Bess. Cone Concts.	109,671	56.83	.044	11.17	.12	.44	5.52	53.69
Trumbull Bess.Cone Concs.	149,100	57.37	.041	10.39	.13	.44	6.45	53.67
Total,	871,229	57.21	.043	10.84	.14	.47	7.70	52.80

b. Mine Analysis of Shipments:

Hill Non-Bess.Direct,	4,268	57.09	.073	12.93	.18	.94	8.00	52.53
Hill Non-Bess. Concs.	73,881	57.72	.043	11.75	.11	.46	7.04	53.66
Hill Bessemer Concs.	59,201	57.93	.035	12.87	.11	.46	6.30	54.28
Hill Non-Bess.Cone Concs.	13,840	57.28	.046	11.03	.10	.45	4.07	54.95
Hill Bess.Cone Concs.	8,856	57.44	.042	11.30	.14	.45	4.38	54.92
Trumbull Non-Bess.Concs.	346,334	57.29	.045	10.47	.14	.47	8.23	52.58
Trumbull Bess. Concts.	224,930	57.36	.042	10.43	.15	.47	8.50	52.48
Trumbull Non-Bess. Cone Concts.	109,671	56.83	.044	11.17	.12	.44	5.52	53.69
Trumbull Bess.Cone Concs.	149,100	57.37	.041	10.39	.13	.44	6.45	53.67
Total,	990,081	57.34	.043	10.79	.14	.46	7.43	53.08

c. Mine Analysis of Ore in Stockpile December 31, 1943:

Hill Concentrates,	816	56.87	.031	16.32	.11	.52	6.85	52.97
Trumbull Concentrates,	76,769	56.82	.042	10.88	.13	.46	7.84	52.37
Total,	77,585	56.82	.042	10.94	.13	.46	7.83	52.37

d. Average Analysis of Crude Ore Production:

Hill Crude,	113,790	43.05	.031	34.96
Trumbull Crude,	921,552	37.94	.034	40.23
Total Crude,	1,035,342	38.50	.034	39.65
Hill Retreat Crude,	48,236	35.78	.032	44.31
Trumbull Retreat Crude,	621,163	35.23	.029	44.33
Total Retreat Crude,	669,399	35.27	.029	44.33

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3. ANALYSIS:
(Continued)

e. Composite Analysis of Season's Shipments:

	Iron	Phos.	Sil.	Mang.	Alu.	Lime	Mag.	Sul.	Loss
Hill Non-Bess. Concts.	57.72	.043	11.75	.11	.46	.30	.18	.010	4.60
Hill Bess.Concs.	57.93	.035	12.87	.11	.46	.26	.16	.010	3.20
Hill Non-Bess. Cone Concts.	57.28	.046	11.03	.10	.45	.28	.16	.010	5.95
Hill Bess. Cone Concts.	57.44	.042	11.30	.14	.45	.28	.14	.010	5.45
Hill Non-Bess. Direct,	57.09	.073	12.93	.18	.94	.32	.18	.010	3.60
Trumbull Non-Bess. Concts.	57.32	.044	10.45	.14	.47	.26	.16	.010	6.40
Trumbull Bess. Concts.	57.36	.041	10.43	.15	.47	.24	.16	.010	6.40
Trumbull Non-Bess. Cone Concts.	56.83	.044	11.17	.12	.44	.24	.18	.011	6.30
Trumbull Bess. Cone Concts.	57.37	.041	10.39	.13	.43	.30	.14	.011	6.45

4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:
Assumption:

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

The above factors were used in the preparation of the revised estimate. They are based on actual experience in mining and on data secured from hand-wash tests of drill samples. Rock deductions on the wash and jig ores have been taken into account in the calculation of the percentage of recovery.

The following tabulation shows the estimate of January 1st,1943, the ore mined during 1943 and the ore reserve estimate as of January 1st, 1944:

	REPORTED JAN.1, 1943	MINED 1943	RESERVE JAN.1, 1944
Trumbull Mine:			
NE¼-SE¼, Sec. 18,	12,779	55,730	10,893
NW¼-SW¼, Sec. 17,	1,112,391	279,355	669,315
NE¼-SW¼, Sec. 17,	1,872,853	443,586	1,722,956
TOTAL TRUMBULL,	2,998,023	778,671	2,403,164

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4. ESTIMATE OF ORE RESERVES: (Continued)

a. Developed Ore: (Continued)

	REPORTED JAN. 1, 1943	MINED 1943	RESERVE JAN. 1, 1944
Hill Mine:			
SE¼-NW¼, Sec. 17,	499,089	26,785	447,370
SW¼-NE¼, Sec. 17,	573,257	20,393	464,875
SE¼-NE¼- Sec. 17,	618,573	45,380	512,961
TOTAL HILL,	1,690,919	92,558	1,425,206
GRAND TOTAL - HILL-TRUMBULL MINE,	4,688,942	871,229	3,828,370

The ore reserve figures for January 1st, 1944, are based on a new estimate and are not the result of deducting the tonnage mined during 1943 from the reserve estimate of January 1st, 1943.

When the reserve estimate for January 1st, 1943 was made, it was believed that there would be a substantial increase shown in the estimate for January 1st, 1944, but this has not proven to be the case. As was expected, there was an increase of 293,689 tons in the Trumbull NE¼-SW¼ of Section 17, but as a result of last season's mining experience, there have been reductions in the other principal Trumbull forty and in all of the Hill forties, which have practically offset the above-mentioned increase.

It will be noted that for the Trumbull NE¼-SE¼ of Section 18, there was shown in the January 1st, 1943 reserve estimate a total of 12,779 tons of ore; whereas, there was actually mined 55,730 tons. This large discrepancy is accounted for by the fact that exploration data in this area was somewhat meagre and material which was thought to be of no value, was found to be treatable, when it was encountered in mining. The 10,893 tons of reserve ore shown as remaining in this forty is along the south line and is tied up in a haulage road.

There is one factor, seriously effecting the available reserve tonnage in the Hill-Trumbull Mine, which should be kept in mind when considering the future of this property. This is the ore tied up in the slopes of the banks around the limits of the pit. The fee owners have insisted upon the maintenance of a four-tenths to one slope along the entire south bank and also leaving benches in certain places. The estimated quantity of ore (shipping basis) tied up in the slopes is 561,942 tons, which, by deduction, leaves an effective total reserve of 3,266,428 tons, as of January 1st, 1944. This slope ore is some of the best remaining in the mine and will be inaccessible until adjoining properties are opened up and the ore is taken in conjunction with their operations.

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4. ESTIMATE OF ORE RESERVES: (Continued)

b. Prospective Ore:

There is not much likelihood that there will be any future extensions of the Hill-Trumbull ore body, either on the margins or at depth. Several drill holes are to be put down on the north side of the Hill pit, to satisfy the fee owners, but it is very doubtful that any mineable ore will be found.

c. Estimated Analysis:

Lease Grade	Tons	Iron	Phos.	Silica
Hill:				
Non-Bessemer Direct,	245,134	59.68	.061	9.41
Bessemer Concentrates,	469,076	60.31	.036	9.21
Non-Bessemer Concentrates,	710,996	58.86	.042	11.12
Trumbull:				
Bessemer Concentrates,	648,938	58.13	.040	9.04
Non-Bessemer Concentrates,	1,754,226	57.80	.050	9.55
TOTAL DIRECT,	245,134	59.68	.061	9.41
Total Bessemer Concentrates,	1,118,014	59.04	.038	9.11
Total Non-Bess. Concentrates,	2,465,222	58.11	.048	10.00
TOTAL CONCENTRATES,	3,583,236	58.40	.045	9,72
Total Bessemer,	1,118,014	59.04	.038	9.11
Total Non-Bessemer,	2,710,356	58.24	.049	9.95
GRAND TOTAL,	3,828,370	58.48	.046	9.70

The estimated average analysis of the reserve tonnage, as of January 1st, 1944, shows a lower iron and a higher silica, when compared with the figures for the previous year, but the grade indicated is still better than can be realized in actual mining operations. Experience during the past several years has shown that the concentrates produced are generally a point lower in iron and a point higher in silica than shown in the estimated figures, as of January 1, 1944.

5. LABOR & WAGES:

a. Comments:

(1) Labor:

The balance between labor supply and operating requirements was quite closely drawn during 1943, generally with disadvantage to the side of operating requirements. Minimum crews, in the various departments, were maintained with difficulty and such new men as were available were far inferior to those employed in normal times. Prospects for 1944 are not bright, but with more men being released from work in munition plants, the situation may be somewhat improved by spring.

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5. LABOR & WAGES:
(Continued)

a. Comments: (Continued)

(1) Labor: (Continued)

No serious difficulties arose between the labor union and the management during 1943. A number of petty grievances were presented by the union committee, but these were easily settled to the satisfaction of all concerned.

b. Comparative Statement of Wages & Product:

PRODUCT, ----------	871,229 Tons
Number of Shifts and Hours,	3 - 8-hour
Average Number of Men Working,	242
Average Wages Per Day,	$8.35
Product Per Man Per Day,	22.23
Labor Cost Per Ton,	$.376
Total Number of Days,	158
Amount Paid for Labor,	$327,316.49

6. SURFACE:

a. Buildings, Repairs:

During 1943, four of the houses in Marble were insulated, one received a new basement floor and a bathroom was installed in the watchman's house at the washing plant. The above constituted the major repairs and in addition to these, there were the usual minor repairs incidental to a year's operation.

c. Tracks, Roads, Transmission Lines, etc:

The usual maintenance work was carried on in connection with the tracks from the pit conveyor loading pocket to the washing plant. No new track was built.

Road building was confined to the pit, with the extension of truck roads, as operations required.

7. OPEN PIT:

a. Stripping:

Stripping operations were continued from the first of the year until the end of April. The major portion of the program was carried out in the East Trumbull forty, where work had been started in November, 1942. Cuts were carried down, in surface, in the designated area, until the top of the ore formation was reached, after which a heavy layer of waste and lean ore was removed. The material removed from the East Trumbull forty consisted of 383,928 cubic yards of surface, 157,695 cubic yards of waste and 31,161 cubic yards of lean ore, making a total of 572,784 cubic yards. The surface and waste were deposited on dumping grounds, located south and east of the stripping area, which had been acquired from the Oliver Iron Mining Company. The lean ore was stockpiled on the eastern half of the East Trumbull forty, which area is barren of ore.

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7. OPEN PIT:
(Continued)

a. Stripping: (Continued)

Other stripping operations were in the nature of rock removal from the bottom and north side of the Hill pit. This work was started in January, but, due to a shortage of trucks and a major breakdown on one of the shovels, it was discontinued after a short period of activity. Operations were resumed the last week in March and continued to the end of April. The rock removal was related to the cleaning up of ore pockets. Such wash ore as was encountered was placed in a stockpile and the rock was sorted out and hauled to the rock dump. A total of 20,205 cubic yards of rock was handled and approximately 60,000 tons of wash ore was stockpiled.

The following table shows the result of the 1943 stripping operations:

	SURFACE CU. YDS.	WASTE CU. YDS.	TACONITE CU. YDS.	LEAN ORE CU. YDS.	TOTAL CU.YRDS.
Hill,			20,205		20,205
Trumbull,	383,928	157,695	-	31,161	572,784
Total,	383,928	157,695	20,205	31,161	592,989

d. Timbering:

	QUANTITY	AMOUNT
Tamarack Ties,	462	$ 623.70
White Oak Ties,	177	292.05
Total,	639	$ 915.75

f. Explosives, Drilling and Blasting:

	QUANTITY	AMOUNT
No. 4 Bag Blasting Powder,	81,600#	8,160.00
3 X 10 - 25%,	55,100#	5,510.00
3 X 10 - 60%,	35,500#	4,081.75
5 X 16 - 25%,	16,200#	1,620.00
5 X 16 - 60%,	14,415#	1,638.98
5 X 14 - 40%,	27,300#	2,715.03
1 1/8 x 8 - 40%,	700	72.50
1 1/4 x 8 - 40%,	375	39.50
24' Electric Exploders,	10	26.62
12' Electric Exploders,	9	33.47
20' Electric Exploders,	54	130.62
30' Electric Exploders,	30	109.89
40' Electric Exploders,	23	90.39
No. 6 Blasting Caps,	900	11.00
Fuse Wire, (Rolls)	11	6.30
No. 20 Connecting Wire,	122#	76.21
Lead Wire, (Rolls)	2	9.00
Plain Primacord,	10,500	336.00
Reinforced Primacord,	10,000	330.00
Silver Chloride Cell,	2	4.00
No. 2 Cap Crimpers,	2	2.00
Cap Sealing Compound,	1	3.20
Circuit Tester,	1	15.00
Total,		$25,021.46

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7. OPEN PIT:
(Continued)

g. Open Pit Mining and Loading:

The 1943 ore season was started on May 6th, on a three shift, six days per week basis and was continued through November 2nd. Operations were suspended one shift, each week, for necessary repair work. A total of 1,709,009 tons of ore material was mined from the pit, of which 1,035,342 tons were wash ore, 669,399 tons were retreat ore and 4,268 tons were direct shipping ore. The concentrates produced from the treatment of the straight wash ore amounted to - 585,494 tons and those from the retreat ore amounted to 281,467 tons, making a total of 866,961 tons for the season.

Wash ore was mined from both the Hill and Trumbull properties, the major portion coming from the Trumbull, as rocky conditions in the Hill pit adversely effected production.

The principal producing area in the Trumbull was in the vicinity of the old approach, which was stripped during the previous fall and winter. Conditions in this area were spotty and frequent moving of the shovel was necessary. Generally speaking, this ore yielded a low-recovery, but the average grade of the concentrates produced was fairly good. One four-yard shovel operated in this area from the beginning of the season until the first week in August, when the available ore was practically exhausted.

A four-yard machine was moved into the small area at the extreme west end of the Trumbull during the last week in May and had cleaned out this deposit early in July. The ore from this part of the mine was of comparatively low grade and it was necessary to mix it with other ore to make a desirable product.

During the remainder of the season, operations in the Trumbull pit were largely confined to the north benches and bottom of that portion of the mine, just west of the old approach. Because of two heavy rain storms, in August, the bottom of this area was flooded and ore was mined from the banks on the north side, but later in the season, when pumping had lowered the water, operations were carried across the bottom, to the south. The wash ore from the north banks was of fairly good grade, but conditions here were spotty, as retreat ore was encountered both at depth and as operations were carried to the north. The ore from the bottom of the area was high grade material.

Some wash ore was mined in the northeasterly section of the Hill pit during the first three weeks in May, but, due to the slowness of the operation and the poor quality of the ore, the shovel was moved to the Trumbull. Work was suspended in the Hill pit until the first week in July.

With the resumption of activities in the Hill pit, one of the four-yard shovels was used on the north side and the two-yard Marion

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7. OPEN PIT:
(Continued)

g. Open Pit Mining and Loading: (Continued)

loaded from the southeast corner. The high grade ore from the small shovel and the high silica material from the four-yard machine, were mixed to produce a suitable grade and the combined operation maintained a good rate of production. When the four-yard shovel had cleaned up the ore on the north side, it was moved down into the south-central section of the pit bottom, where the operation consisted in cleaning out pockets among the numerous rock horses. The work here was necessarily slow, as large quantities of rock were handled in sorting out the ore. Activities in the Hill pit were discontinued at the end of September.

The mining of retreat ore was made incidental to the regular wash ore operations. No regular schedule was followed in producing this class of material, but shovels were moved to retreat areas whenever it was necessary to replenish the supply of cone plant feed.

During May and June, retreat ore was mined from the northwest corner of the Trumbull pit and from the upper benches, on the north side.

Starting in July, and continuing to the end of the season, a considerable quantity of this class of material was taken from the approach area in order to release wash ore, which it covered. Retreat ore was also loaded from the west central part of the Trumbull, where a good grade of ore was available.

A comparatively small tonnage of Hill retreat ore was mined from the area north and west of the screening plant. Due to the extreme difficulties under which direct ore could be mined and the necessity of keeping equipment on the production of wash and retreat ore, only two shifts, during the season, were devoted to loading this class of material. All of the direct ore remaining in the pit is located in fissures in the rock and these are being cleaned out by dragline operation and hand labor and the material placed in piles for later loading. The volume of ore accumulated by this method is small and production suffers accordingly. The direct ore loaded during 1943 amounted to 4,268 tons.

All of the ore handled in the pit was transported by fifteen-ton Euclid trucks. These units received the ore at the shovels and delivered it to the screening plant. Here it was fed onto the thirty-six inch conveyor, which carried it to the surface for loading into railroad cars. The conveyor system worked in a very satisfactory manner throughout the season.

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8. COST OF OPERATION:

a. Comparative Mining Cost:

	1943 BUDGET	1 9 4 3 COST PER TON	1 9 4 2 COST PER TON
PRODUCT:			
Direct Shipping Ore, Tons	50,505	4,268	80,070
Concentrates, Tons	909,090	866,961	1,143,043
Total Production, Tons	959,595	871,229	1,223,113
Average Daily Product "	-	5,514	6,720
Tons Per Man Per Day,	-	22.24	30.93
Days Operated,	-	158	182
COST:			
Open Pit Direct Ore,	$ .152	$.139	$.145
Open Pit Crude Ore,	.230	.219	.177
General Pit Expense,	.057	.058	.045
Concentrating,	.254	.292	.156
Stocking Concentrates,	.014	.012	.004
General Mine Expense,	.092	.107	.066
Winter and Idle Expense,	.130	.227	.105
Cost of Production,	$ .760	$ .913	$ .544
Amortization- Defense Project,	-	$ .098	$ .013
Depreciation - Plant and Equipment -	-	.100	.100
Depreciation- Motorized Equipment,	-	. 028	.012
Amortization - Stripping,	-	.127	.130
Taxes - Ad Valorem,	-	.103	.096
Taxes - Occupational,	-	.057	.080
Taxes - Royalty,	-	.088	.094
Total Cost at Mine,	-	$ 1.513	$1.069
Administrative Expense,	-	.100	.100
Miscellaneous Expense and Income,	-	.008	.005
Grand Total,	-	$ 1.621	$ 1.174

The figures for 1942 and 1943 were taken from the December cost sheets which were prepared before the final charges were received from the Cleveland office and, therefore, are comparable. Charges made by the inclusion of the Cleveland figures would not materially effect the cost per ton used in the above table.

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8. COST OF OPERATION: (Continued)

d. Detailed Cost Comparison:

(1) Product:

The estimated ore schedule for 1943 provided for the production of 50,505 tons of direct shipping ore and 909,090 tons of concentrates, making a total of 959,595 tons. The actual results realized in the season's operations fell short of the above total by 88,366 tons. This deficit is made up of 46,237 tons of direct ore and 42,129 tons of concentrates.

When the estimate for the production of direct ore was made, it was believed that scramming operations in the east end of the Hill pit would yield a fair tonnage of this class of material. However, the pockets of ore were not as extensive as expected, and there being very little labor available for this kind of work, not very much was accomplished in this part of the operations. As a result, direct ore was loaded on only two shifts during the 1943 season.

The concentrates produced from straight wash ore exceeded the estimate by 29,939 tons. The possibility of over production with this class of material is better than with the others, due to the presence of greater flexibility in operation. If it had been possible to start the season as early as had been planned, the total estimated tonnage probably would have been realized.

The production of concentrates from the cone plant was under the estimate of 353,535 tons by 72,068 tons. The estimated tonnage was based upon the possibility of a long operating season and represented the maximum capacity of the plant. Due to the many delays incidental to the operation of new equipment and the inefficient performance of some of the machines, the average daily tonnage was considerably below expectations. Alterations and adjustments are being made to overcome much of this trouble.

(2) Open Pit Mining:

No cost comparison is being made for the production of direct ore, as the tonnage for 1943 is too small to use as a basis for accurate figures.

The open pit crude ore costs per ton, as set forth in the above table, are on a concentrated basis and show a decrease of $.011 under the budget, and $.042 over the 1942 cost. These variations are due, almost entirely, to the difference in the percentages of tonnage recovery realized in 1942 and 1943 and the estimated factor used in preparing the budget.

The actual costs for the crude ore were $.109 for 1942, $.113 for the budget and $.111 for 1943. These figures show the 1943 cost per ton to be higher than the 1942 cost by $.002 and under the budget by $.002. However, there are two items which appear in the 1942 costs and in the budget estimate, totaling $.007 and $.006, respectively,

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8. COST OF OPERATION: (Continued)

d. Detailed Cost Comparison: (Continued)

(2) Open Pit Mining: (Continued)

which are not included in the figures for 1943, viz: Locomotives and Cars Operating and Track Expense. Railway haulage was discontinued in the pit when the conveyor was placed in service during the 1942 season. Eliminating the two items mentioned above from the 1942 costs and the budget estimate, for the purpose of more accurate comparisons, it would show the 1943 cost per ton $.009 above the 1942 figure and $.004 over the budget estimate. The item, Trucks Operating, was $.009 higher in 1943, as compared with 1942, due to a longer average haul throughout the season. Conveyors Operating was higher by $.008, because the equipment was new in 1942, having operated only one-half of the season in that year, and more maintenance work was required in 1943. Truck Maintenance was $.003 under the 1942 cost and Pits, Roads and Ramps was $.005 under that figure. The truck haulage roads had been pretty well established in 1942 and less construction and maintenance were required in 1943. The increase of $.004 over the budget is an accumulation of small amounts over several items on the cost sheet.

(3) General Pit Expense:

The cost per ton under this caption was $.001 and $.013 higher than the budget and the 1942 costs, respectively. The increase of $.001 over the budget is the residue of compensating nominal differences in the several items of unit cost under this caption. The increase of $.013 over the 1942 cost is reflected in three items, viz: Pumping and Drainage, Open Pit Superintendence and Exploratory Drilling. Pumping and Drainage was $.004 higher, due to the fact that extra pumping was necessary to handle flood water from heavy rain storms and extra expense in connection with drilling a new well. The item, "Open Pit Superintendence" shows an increase of $.004 because an assistant pit foreman was added to the force in 1943. The smaller tonnage also has a direct bearing. The increase of $.005 in Exploratory Drilling is accounted for, in part, by the smaller tonnage and also some deferred charges were placed in this account.

(4) Concentrating:

The Concentrating cost for 1943 was higher by $.136 than for 1942 and exceeded the budget by $.048. Generally speaking, it is impossible to compare the 1942 figures with those of 1943, as the costs for the cone plant and the washing plant are combined for the latter year and there was practically no operation of the cone plant in 1942. There is only one item, not effected by the combined operation, which requires explanation. Transportation is higher by $.012 in 1943 than in 1942, due to the fact that, in anticipation of electrifying the railway haulage system from the pit conveyor loading pocket to the washing plant, the facilities for coaling and watering the steam locomotives had been dismantled in the fall of 1942. The electric haulage was not placed in service until late in the season of 1943

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8. COST OF OPERATION: (Continued)

d. Detailed Cost Comparison: (Continued)

(4) Concentrating: (Continued)

and it was necessary to set up a temporary water tank and coal was served to the locomotives by the locomotive crane. All of this involved extra cost not encountered in 1942.

There was no previous experience, in the combined operation of the cone plant and washing plant, upon which to base estimated costs when the budget for 1943 was prepared. As a result, many of the difficulties encountered were not anticipated and this, largely, accounts for the 1943 increase of $.048 over the budget. The item Transportation is $.011 over the budget and the same explanation applies here as for the increase over the 1942 cost.

The item "Stocking and Loading Concentrates", was higher by $.010 in 1943 than in 1942, for the reason that a rented 3/4-yard gasoline shovel was used for loading from the stockpile in 1943, whereas, a 2-1/4-yard electric shovel was used the previous year.

(5) General Mine Expenses:

The 1943 cost per ton was higher than the budget by $.015 and over the 1942 cost by $.041. In the item, "Analysis and Grading", $.010 of the increase over the budget is accounted for and this is due to the fact that more special sampling was done at the concentrating plants and in the pit, than was anticipated. The balance of the increase is made up of an accumulation of nominal differences in the numerous items under this caption.

In all but one of the items, which enter into the total cost per ton under General Mine Expense, practically all of the increase in 1943, over the cost in 1942, is accounted for by the much smaller tonnage produced in 1943. The item, "Analysis and Grading" is higher in 1943 by $.014 on account of the necessity of doing considerably more special sampling in the pit and at the concentrating plants than was required in 1942. The item, "Contribution - Minnesota War Risk", amounting to $.003, appears only in the 1943 costs.

(6) Idle and Winter Expense:

In 1943, the cost per ton under this caption was $.097 higher than the budget and $.122 over the 1942 cost. The budget estimate did not anticipate extraordinary repairs to the electric shovels; the construction of a new bridge for the railroad to the washing plant; repairs to steam locomotives, which were expected to be out of service in 1943; the payment of the 5-1/2 cent increase in wages, retroactive to April, 1942 and unusually heavy repairs and alterations at the concentrating plants. These five items are largely responsible for the increase noted above. The increase in the 1943 cost, as compared to that for 1942, is covered by the same items as used in the explanation for the increase over the budget estimate.

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9. EXPLORATIONS:

The drilling program for 1943 was not as extensive as those for the past several years. Only twelve holes were put down, totaling 1,588 feet, and these were confined to two areas in the pit.

One deep hole (348 feet), was drilled on the East Trumbull forty to fill in information for establishing stripping limits in this area.

The remaining eleven holes are located on the north bank of the pit, in the most westerly of the active Hill forties. An extension of the ore body, into this area, was indicated by old information and the new holes were put down to check this possibility. The results of this drilling disclosed the existance of a deposit of wash ore which will yield from 160,000 to 180,000 tons of fairly high grade concentrates. This area will be stripped during the winter of 1944.

10. TAXES:

The following table shows a comparative statement of the taxes and average rate at the Hill-Trumbull Mine for the years 1943 and 1942:

	1943	1942	Increase	Decrease
Hill Mine,	$30,444.89 *	39,377.26		8,932.37
Trumbull Mine,	42,407.69	49,980.94		7,573.25
Hill-Trumbull Shops,	941.39	943.17		1.78
Hill-Trumbull W.P.Lands,	7,939.67	3,780.95	4,158.72	
Personal Property,	7,846.20	3,953.78	3,892.42	
TOTAL, ----------	$89,579.84 //	98,036.10		8,456.26
Village Lots,	265.67	347.28		81.61
GRAND TOTAL, ----------	$89,845.51 #	98,383.38		8,537.87
Average Tax Rate,	103.64	101.35	2.29	

The decrease in mine taxes for 1943 is due to depletion of reserve ore, by the tonnage mined during this year.

The increase for washing plant lands in 1943 is accounted for by the taxes levied on the new retreat plant.

The personal property tax was increased in 1943 to cover the new pit conveyor equipment and the ore in stockpile at the washing plant.

The ore in stockpile, at the washing plant, in the Village of Calumet, accounts for the higher rate in 1943.

* Should be 24.390.35
// " " 84.434.99
" " 84,700.66

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11. ACCIDENTS AND PERSONAL INJURY:

There were seven lost time accidents in 1943, which are described as follows:

NAME: Lorance Beer DATE: January 19th.
CAUSE: A broken 3/4/plate, 10" x 3½', was being pried off the frame of one of the Euclid trucks with a bar. The plate sprang from its fastenings so suddenly that Beer could not get out of the way, and was struck on the left foot by the plate, injuring the instep.
NATURE: Contusion of instep.
TIME LOST: 5 Days
COMPENSATION: None

NAME: Edward Drayton DATE: May 4th.
CAUSE: Truck was being loaded at shovel and he was standing in front of truck. The rock fell off dipper teeth onto truck and bounced from there on to his foot. He was lacing his shoe at the time, so he did not see the rock fall, injuring right foot.
NATURE: Contusion, with laceration of second toe.
TIME LOST: 2 Days
COMPENSATION: None

NAME: George W. Tobeck DATE: August 10th.
CAUSE: While he was moving diesel motor block in desired position on bench, one end of motor slipped off the end of the bench. That end dropped six inches, catching his hand between block and bench.
NATURE: Possible partial loss of use of third finger, left hand; unable to estimate percentage at this time.
TIME LOST: 20 Weeks
COMPENSATION: $416.67.

NAME:. Henry C. Behrends DATE: August 13th.
CAUSE: Rolling rocks from underneath rock chute at screening plant in pit.
NATURE: Pain in right inguinal region, with walnut sized protrusion-(inguinal right hernia).
TIME LOST:
COMPENSATION PAID. (Will be paid compensation in 1944)

NAME: Donald Rich DATE: August 20th.
CAUSE: He was picking rock off the 36" picking belt at washing plant and caught his arm between the load rollers and belt.
NATURE: Probable fracture of left forearm, severe contusion of soft parts of forearm. X-rayed - no fracture.
TIME LOST: 2 Days
COMPENSATION: None

NAME: William S. Loeffert DATE: October 26th.
CAUSE: While attempting to loosen iron ore at the top of cone in cone plant, with a 4' bar, the bar caught in the agitator, pinching his fingers against chute.
NATURE: Amputation of fleshy portion of terminal phalanges of middle and ring fingers of right hand.
TIME LOST:
COMPENSATION: (On compensation at end of year)

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11. ACCIDENTS AND PERSONAL INJURY: (Continued)

NAME: Alex Gray DATE: November 21st.
CAUSE: While attempting to clean flues on boiler, with the fire going quite strong, he opened up flue door and flames burst out, burning him about the face.
NATURE: Second and probably some third degree burns of forehead, ears, nose, cheeks and chin.
TIME LOST: 1 Week
COMPENSATION: $20.00

12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION:

In connection with the electric haulage, a short piece of power line was built; a sub-station and converter house was erected and trolley lines were constructed along the railroad tracks.

A new railroad bridge, started in the fall of 1942, was constructed over the township highway, west of the washing plant.

A new deep-well, to accommodate the Layne-Bowler pump, was drilled just south of the Trumbull south line and on the west side of the old approach. The old well, located in the approach, near the coal dock, had to be abandoned because this part of the East Trumbull forty was included in the area which was stripped during the winter of 1942-1943.

The tailings basin, which has been in use for the past several years, has become filled to capacity and it would require a great deal of work to raise dikes to provide sufficient storage space for future operations. In view of this fact, a new storage basin was located at the south end of the old Oliver Iron Mining Company's dumps and the necessary dikes were built to enclose the area. It will be necessary to pump the tailings to this new basin and pumps and a twelve-inch pipe line are being installed for this purpose.

13. EQUIPMENT AND PROPOSED EQUIPMENT:

The following equipment was received in 1943:

3 - Electric locomotives and auxiliary equipment (second-hand)
1 - Pioneer portable conveyor
1 - 27-T Blast hole drill
1 - No. 12 "Caterpillar" motor grader
1 - Fairbanks-Morse scale

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13. EQUIPMENT AND PROPOSED EQUIPMENT: (Continued)

1 - Tailings pump (second-hand)
600 - feet 24" conveyor (second-hand)

It is proposed that the following new equipment be purchased in 1944:

4 - Euclid trucks
1 - 4½ cubic yard Bucyrus-Electric Shovel
1 - D8 "Caterpillar" tractor and dozer
1 - Hydroseal tailings pump

18. NATIONALITY OF EMPLOYEES:

Nationality:	Number of Men
American,	72
Finnish,	32
Swedish,	25
Jugo-Slav,	24
Norwegian,	18
Croatian,	13
Czecho-Slav,	10
German,	9
Serbian,	9
Canadian,	7
English,	6
Austrian,	5
Italian,	4
Bulgarian,	4
Irish,	1
Polish,	1
Bohemian,	1
Macadonian,	1
Total,	242

19. WASHING PLANT OPERATIONS:

Washing operations were started on May 6th and completed on November 2nd, covering a period of 158 days. A basic working schedule of three, 8-hour shifts, six days per week was adopted and maintained throughout the season.

Operating time, during the 1943 season, was divided between the production of wash ore concentrates and the preparation of feed for the cone plant. Crude retreat ore is run through the washing plant to remove the fine waste material and the washed product is delivered to a stockpile, from which it is fed to the cone plant for further concentration. This mixed operation materially reduces the total

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19. WASHING PLANT OPERATIONS: (Continued)

season's tonnage of washed concentrates, but the deficiency is partly compensated for by the production from the cone plant.

Washing plant operations were generally quite satisfactory, with an average daily production, based on the total tonnage of washed concentrates and cone plant feed, of 6,239 tons. This is a considerably lower rate than was maintained during last year, but there was no mixed operation in 1942 and the percentage of tonnage recovery for 1943 was 56.55%, as compared with 61.96% for 1942.

The crude ore treated in the washing plant during 1943 consisted of 1,035,342 tons of wash ore and 669,633 tons of retreat ore, making a total of 1,704,975 tons. There was produced from this total tonnage of crude ore, 585,494 tons of washed concentrates and 400,202 tons of cone plant feed, or a total of 985,696 tons.

An adequate supply of railroad cars was not available at all times, which lead to the necessity of placing 109,249 tons of ore in stockpile.

The complete concentrating data on wash ore, for 1943, is as follows:

Screening Plant Rejects

	Tons	Iron	Phos.	Silica
Hill,	9,890	28.34	.028	53.75
Trumbull,	14,262	25.37	.032	56.82
Total,	24,152	26.59	.030	55.56

36" Belt Rejects

Hill,	6,554	26.44	.029	55.97
Trumbull,	4,407	24.64	.031	57.85
Total,	10,961	25.72	.030	56.73

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

	Tons	Iron
Hill,	7,700	29.53
Trumbull,	808	28.68
Total,	8,508	29.45

A total of 4,017 cubic yards of Trumbull surface was removed and charged to mining operations.

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19. WASHING PLANT OPERATIONS: (Continued)

The analysis of the product from the various machines for the year 1943, was:

	Iron	Phos.	Silica
HILL MILL MACHINES:			
Log Washer,	58.12	.037	13.39
Classifier,	57.14	.034	15.05
Tailings,	15.21	-	-
TRUMBULL MILL MACHINES:			
Log Washer,	57.74	.046	9.62
Classifier,	55.42	.042	12.39
Tailings,	11.80	-	-

The complete concentrating data for the year 1943 was as follows:

	Tonnage	% of Total Mined	% Dried Iron	Tonnage Recovery	Iron Unit Recovery
Crude Ore and Rock Mined,	1,068,002	100.00	38.36		
Less: Rock Removed in Mining,	8,508	.80	29.45		
Crude Ore Transported to Mill,	1,059,494	99.20	38.43		
Less: Rock Rejects in Screening Plant,	24,152	2.26	26.59		
Crude Ore Entering Mill,	1,035,342	96.94	38.71		
Concentrates Produced,	585,494	54.82	57.25	56.55	83.64
Rock Rejects on Mill Picking Belt,	10,961	1.03	25.72		
Tailings (By Deduction)	438,887	41.09	14.28		
Total Heads, as Above,	1,035,342	96.94	38.71		

The weight recovery for 1943 was 56.55%, as compared to 61.96% for 1942. The average grade of crude wash ore handled in 1943 was much lower than for 1942, there being a difference of 9.68% in the iron content. This substantial difference in the grade of material handled in the two years is accounted for by the fact that more than half of the 1943 wash ore was mined from the Trumbull

19. WASHING PLANT OPERATIONS (Continued)

approach area and this deposit consisted of a high percentage of lean, sandy ore.

The iron unit recovery for 1943 was 83.64%, as compared to 81.54% for 1942. The crude ore treated in 1942 carried a high percentage of decomposed taconite and the washing of this material results in a high loss of iron in the tailings. The 1943 crude ore, although of lower grade, was free-milling, with a lower resultant loss. The iron content of the tailings in 1943 was 14.28%, as compared to 22.18% in 1942.

20. HEAVY DENSITY PLANT OPERATIONS:

Operations were started on May 21st and continued until November 6th. During the first week, only one shift was worked but, thereafter, a three shift schedule was maintained to the end of the season. The actual season extended over a period of 141 days, during which time 400,202 tons of feed material were treated, yielding 281,467 tons of concentrates. The average daily output was 1,996 tons.

The average rate of production, during the first four months of the season, was considerably below expectation but, through alterations and adjustments, was very much improved in September and October.

One of the sources of trouble was in handling the feed to the plant. The material was delivered to the belt conveyor by means of a triple-drum tugger and scraper, and a great deal of difficulty was experienced with this equipment. The tugger was under-powered and had a tendency to run hot, which was the cause of considerable delay. The cables which operated the scraper were subjected to excessive wear and broke quite frequently. In order to eliminate most of this trouble, the machinery from a discarded dragline is being installed in place of the tugger. This will provide more power and greater flexibility of operation.

The fact that it was often necessary to use the feed material before it had time to drain, was a source of trouble, as the wet ore had a tendency to slide back down the conveyor belt and pile up at the lower end. Arrangements are being made to stockpile the feed in such a way as to always have dry material for the plant.

In the plant proper the cone, the screens, some of the pumps and the two units in the double classification circuit were the cause of frequent interruptions in the operation. Adjustments and alterations are being made to eliminate much of the trouble from this source.

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20. HEAVY DENSITY PLANT OPERATIONS:

The general layout and the process of concentration employed in the cone plant are basically sound and with the changes being made, much better results should be realized in the future.

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

	Tonnage	% of Total Mined	% Dried Iron	Tonnage Recovery	Iron Unit Recovery
Crude Ore and Rock Mined,	682,312	100.00	35.07		
Less Rock Removed in Mining,	-	-	-		
Crude Ore Transported to Mill,	682,312	100.00	35.07		
Less: Rock Rejects in Screening Plant,	12,913	1.89	25.06		
Crude Ore Entering Mill,	669,399	98.11	35.27		
Cone Plant Feed Produced,	400,202	58.65	50.20	59.79	85.09
Tailings (By Deduction)	269,197	39.46	13.07		
Cone Concentrates Produced,	281,467	41.25	57.16	42.05	68.14
Cone Rejects,	41,212	6.04	28.02		
Tailings (By Deduction)	77,523	11.36	36.72		

The over-all weight recovery realized from crude ore to concentrates was 42.05%. This is based on a 59.79% recovery of cone feed from the washing of the original crude ore and a subsequent recovery of 70.00% of concentrates from the feed.

The ultimate iron units recovery was 68.14%, based on 85.09% recovery in the initial treatment and 80.08% recovery in the final concentration.

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In order to clean up a small tonnage of retreat ore remaining in the Hill-Barbara pit, located in the northeast quarter of the northeast quarter ($NE\frac{1}{4}$-$NE\frac{1}{4}$) of Section 17, 56-23, arrangements were again made with Butler Brothers to mine and treat this ore in connection with the operations at their Barbara Mine. A high density plant had been installed in the Barbara concentrator during the past winter and they agreed to mine and treat the remaining ore in the Hill-Barbara pit and a small tonnage of lean ore, which had been mined and stocked on a lean ore pile, immediately west of the Hill-Barbara pit, during the 1942 ore season.

Actual mining operations in the Hill-Barbara were started on October 5th, after the Barbara mining was completed, and were continued through the 27th, exhausting all of the available Hill-Barbara retreat ore. After cleaning up 2,682 cubic yards of surface material, a total of 125,789 tons of crude material was mined; 730 tons of pit rock were removed in the mining and 125,059 tons of crude material were transported to the screening plant. This consisted of 97,639 tons from the pit and 27,420 tons from the lean ore stockpile. After scalping 10,512 tons of rock rejects at the screening and crushing plant, a total of 114,540 net tons were treated in the concentrator. A total of 45,684 tons of retreat concentrates were secured, - 21,987 tons of non-Bessemer and 23,697 tons of Bessemer ore. The silica content of the concentrates was rather high, but they had a good Natural Iron.

The washing and cone plant operations were conducted during the same period as the mining, and were completed on October 27th. The product was all shipped as it was produced and the tailings were disposed of in the Barbara tailings pond through an arrangement among the various fee interests.

The following tables show the statistical data on production and shipments:

a. Production by Grades:

Hill-Barbara Crude Ore,	114,547 tons *
Hill-Barbara Non-Bessemer Cone Concentrates,	21,987 tons
Hill-Barbara Bessemer Cone Concentrates,	23,697 "
TOTAL 1943 PRODUCTION,	45,684 "

(* includes 27,420 tons lean ore from lean ore stockpile).

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b. Shipments:

Hill-Barbara Non-Bessemer Cone Concentrates,	21,987 tons
Hill-Barbara Bessemer Cone Concentrates,	23,697 "
TOTAL 1943 SHIPMENTS,	45,684 "

c. Stockpile Inventories:

None.

The following waste material was stocked during the year:

	Tons	Iron
Pit Rock,	730	25.04
Grizzly Rock,	10,512	23.53

ANALYSIS:

a. Mine Analysis of Production and Shipments:

	Tons	Iron	Phos.	Sil.	Mang.	Alu.	Moist.	Fe. Nat.
Hill-Barbara N.B. Cone Concts.	21,987	57.94	.041	13.71	.16	.83	7.23	53.75
Hill-Barbara Bess. Cone Concentrates,	23,697	59.70	.041	11.09	.15	.91	7.70	55.11
Total,	45,684	58.85	.041	12.35	.16	.87	7.47	54.45

d. Mine Analysis of Crude Ore:

	Tons	Iron	Phos.	Silica
Hill-Barbara Crude,	114,547	39.27	.032	40.66

STRIPPING:

	Cubic Yards	Tons
Surface Material,	2,682	
Pit Rock,		730

The complete washing plant data for the year was as follows:

	Tonnage	% Of Total Mined	% Iron Dried:	Tonnage Recovery	Iron Unit Recovery
Crude Ore and Rock Mined,	125,789	100.00	37.87		
Less: Rock Removed in Mining,	730	.58	25.04		
Crude Ore Transported to Mill,	125,059	99.42	37.95		
Less: Rock Rejects in Crusher House,	10,512	8.36	23.53		
Crude Ore Entering Mill,	114,547*	91.06	39.27		

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	Tonnage	% Of Total Mined	% Iron Dried:	Tonnage Recovery	Iron Unit Recovery
Cone Concentrates Produced,	45,684	36.32	58.85		
Cone Rejects,	23,142	18.40	36.68		
Tailings, (By Deduction)	45,721	36.34	21.02		

* Includes 27,420 tons lean ore from lean ore stockpile:

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ACCIDENTS AND PERSONAL INJURY

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11. ACCIDENTS AND PERSONAL INJURY

a. Fatal Accidents

During the year four fatal accidents occurred, three of them on the Marquette Range and one on the Menomenee Range. Three of these fatal accidents occurred within an eleven day period starting July 20th. The second on July 26th and the third one on July 30th. A fourth fatal accident occurred September 3rd.

Description of Fatal Accidents

Fatal Accident No. I

Cliffs Shaft Mine

Creszenzo Sauro, a miner, was fatally injured by a fall of ground on July 20, 1943. He died in the hospital a short time after arrival there.

Sauro was barring , following blasting of a "pop" in the back. His bar loosened a big chunk (5' long, 2½' wide, and 1½' thick) that extended to the right and back toward a point that may have been over his head. Partner Polomaki states that chunk struck Sauro's head forward and threw him backward. The doctor believes that the man was not struck directly by the chunk but was hit by the bar or hurled to the ground by the bar hard enough to damage his left side to such an extent that death resulted. This suggestion seems more applicable because had the large chunk struck Sauro it seems he would have been very badly crushed. Sauro was known as a very good miner and had worked in this kind of ground for many years so was familiar with conditions. It is generally believed that Sauro loosened a key piece of ore connected to the large one and had not been able to sound the large piece and did not know it was loose.

Sauro was 49 years of age, had worked in the Cliffs Shaft Mine since 1926 and had mined most of the 17 years he was employed there. He leaves a wife, (in Italy), a son, 22 years of age and a daughter, 20 years of age.

Accident was classed No. I - Trade Risk.

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11. ACCIDENTS AND PERSONAL INJURY

a. Fatal Accidents (Continued)

Fatal Accident No. II

Negaunee Mine

John G. Solka, miner, was fatally injured in a blast in #38 contract, #1003 raide, 596 sub. level on July 26, 1943 and died from his injury on July 28. Solka and his partner, Joseph Paris, had drilled a round of 18 holes in the breast of the slice probably 20 feet from the raise. After charging the holes a hot wire fuse lighter was lit and after lighting one fuse the lighter went out. Instead of leaving as the company rules call for, Paris lit another lighter and continued lighting the fuses. After 15 of the 18 holes had been lit, Paris called to his partner that it was time to get out. Paris climbed the raise to the next sub and safety but Solka was caught in the blast as he reached the raise. There were many lacerated and puncture wounds from flying chunks of ore. Foreign bodies penetrated the brain and caused a fracture of the first cervical with damage to the spinal cord.

Accident classified as 111 A 111 and 111 B 111. Violation of rules by injured workman and other workman.

Solka was 29 years of age and is survived by his wife Anna A. Solka, Ishpeming.

Fatal Accident No. III

Spies-Virgil Mine

Frank John Filipczuk, underground laborer, temporaraly employed on surface during reconstruction and repair work in the Spies Shaft, was electrocuted on July 30, 1943.

Filipczuk and Eli Pokela were instructed by the Surface Foreman to cut brush under the 2300 volt line between the Engine House and the Virgil Fan house. Among other instructions he gave them was, not to cut any brush or trees which were as high as the power line and later block and rope would be used to handle larger trees when cut to prevent them from falling on the power line. Pokela, disregarding these orders, felled a

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11. ACCIDENTS AND PERSONAL INJURY

a. Fatal Accidents (Continued)

tree which extended above the wires, the tree fell on the wires causing a short circuit and the wires burned thru and fell on Filipczuk who was walking on the road just below and to one side of the power line and was pronounced dead by the doctor a short time later.

The accident was classified 3B4 Improper act or Selection of Improper Method of doing work by other workman.

Filipczuk was married but had no children and lived at Caspian, Michigan.

Fatal Accident No. IV

Lloyd Mine

Peter Enoch Lehto, miner, was instsntly killed by a fall of ground on the 8th level, development heading, September 3, 1943.

The miners were just completing mucking out a cut of ore blasted by the previous day shift. Forepoles and two H-Beams had been placed ahead and above the last timbered set and a covering of lagging was tight to the back. Both sides also were forepoled. The breast and sides had been picked, sounded and barred for loose ground during the shift before the fall of ground. A sprag had been placed against a overhanging piece of ore in the left hand breast. Lehto was shoveling ore away from the breast when a large piece of ore on the right side of the breast let loose and slid to the floor, a piece about 24" by 14" fell off the top of the large piece and struck Lehto in the back of the head, neck and shoulders killing him instantly.

The accident was classified as I - Trade Risk.

Peter Enoch Lehto was 41 years of age and is survived by his wife Jennie, 41; Daughters Ruth, 16 and Jeanette, 2; 3 sons Carl, 12, James, 7, Richard, 3. He had been employed about 2 years.

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11. ACCIDENTS AND PERSONAL INJURY

b. Non-Fatal Accidents

1943 sent accident records skyrocketing in all industry and metal mining was not excepted. The Cleveland Cliffs Iron Company's accident record is considerably higher than 1942 but still less than half of the national average of 1942. It is expected that the national average for 1943 will be much greater than that of 1942.

In a study of accident causes for the year, we find many different possibilities. The labor problem is one. Every property has been short of labor and the type of labor has been below average. Labor shortage has caused poorer housekeeping and this in turn had caused many accidents. In underground mines most of the housekeeping work has been done on the week ends and there has been difficulty in getting men to work that overtime. Apparently most of the men do not desire overtime work and the extra pay does not entice them. Many of the new employees are former service station attendents, school teachers, store clerks, etc., who have never done physical work and some of them to avoid being drafted into military service have now attempted to become miners and are not fitted for the work. Many have taken the attitude that if they can get by for the duration, they will have accomplished their purpose. This attitude has pushed the burden of the work on those men who are sincere in their work and had been decidedly bad for the moral of all employees.

Our fast mining program has also contributed to accidents. In the top slicing system of mining, the gob has not had a chance to settle as it should causing a poorer covering over the miner. Some blame here must also be placed on the individual for failure to block the back tightly in his haste to get out more tonage.

There are many other causes of accidents too numerous to mention and I believe our supervisory force should be commended for their excellant work in accident prevention and production under the many difficult and trying conditions.

During the year, we had a total of 1052 injuries of which 877 were slight. Sixteen caused less than 7 days lost time and 155 were compensable accidents.

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11. ACCIDENTS AND PERSONAL INJURY

TABLE I

FATAL ACCIDENT RECORD
Cleveland Cliffs Iron Co. and Cliffs Power & Light Co.
1898--1943, inclusive

YEAR	NO. MEN EMPLOYED	NUMBER FATALITIES	FATALITY RATE
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	2621	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

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11. ACCIDENTS AND PERSONAL INJURY

TABLE I (Continued)

YEAR	NO. MEN EMPLOYED	NUMBER FATALITIES	FATALITY RATE
1921	2309	6	2.60
1922	2301	1	.43
1923	2728	6	2.20
1924	2472	5	2.02
1925	2472	2	.81
	12,282	20	1.61
1926	2119	55	25.96
1927	1969	4	2.03
1928	1784	4	2.25
1929	2000	4	2.00
1930	2566	5	1.95
	10,438	72	6.90
1931	1651	3	1.82
1932	630	0	0.00
1933	631	2	3.17
1934	1073	4	3.74
1935	1313	2	1.53
	5,298	11	2.05
1936	2125	2	.94
1937	2763	1	.36
1938	2590	3	1.17
1939	2457	1	.41
1940	2756	5	1.88
	12,691	12	.94
1941	3570	5	1.40
1942	3562	2	.56
1943	3609	4	1.11
1911 - 1943		204	2.45

Based on per thousand employees.

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11. ACCIDENTS AND PERSONAL INJURY

TABLE II

Classification of Causes of Fatal Accidents
From December 1, 1898 to December 31, 1943

A.	Fall of Ground	103	
	Run of Mud or Sand	60	
	Fall of Chunk of Ore from Chute	2	
	Stray Chunk or Stick Down Raise or Stope	3	168
B.	Shaft Accidents:		
	Falling down Shaft	14	
	Rock or Timber Falling down Shaft	3	
	Struck or Caught by Cage, Skip, Bucket, Tool	8	
	Falling from Cage, Skip, or Bucket	11	
	Falling from Ladder in Shaft	5	
	Carried or Pushed into Shaft by Car	3	
	Jumping On or Off Cage, Skip, or Bucket	3	
	Struck by Crosshead	5	
	Struck by Falling Material	1	53
C.	Use of Explosives:		
	Explosion of Powder	16	
	Premature Blast	3	
	Fall of Ground or Timber Due to a Blast	4	
	Overcome by Gas	3	
	Miscellaneous Causes	2	28
D.	Mine and Railroad Cars:		
	Caught by Haulage Cars	13	
	Riding or Attempting to Ride Cars	6	
	Falling with Car from Trestle	4	
	Run over by Railroad Car	8	
	Struck by Locomotive	1	
	Miscellaneous Causes	1	33
E.	Miscellaneous Causes:		
	Falling in Raise, Stope or Pocket	9	
	Electric Shock	11	
	Falling from Ladder, Stage, Trestle, etc	8	
	By Moving Machinery	6	
	Mine Fires	3	
	Stockpile Slide	3	
	Miscellaneous Causes	3	43
	Total		325

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11. ACCIDENTS AND PERSONAL INJURY

TABLE III

Classification of Fatal Accidents 1911 to 1943, inclusive, by the Central Safety Committee

I. Trade Risks		113
II. Negligence of the Company		
Violation of Rules	5	
Failure to Provide Safety Devices	6	
Improper Method of Doing Work	12	
Failure to Porvide Tools or Safe Place to Work	5	
Failure to Instruct Men	4	32
III. Negligence of Workmen:		
A. Injured Men:		
Improper Method of Work	21	
Violation of Rules	10	
Failure to Use Tools or Appliances Provided	4	
Failure to Use Safety Devices	3	38
B. Other Workmen:		
Improper Method of Doing Work	14	
Violation of Rules	4	
Failure to Use Tools or Appliances Provided	1	19
Total		204

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11. ACCIDENTS AND PERSONAL INJURY

TABLE IV

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

Year	Number of Fatalities	Number of man-days Worked per fatality	Number of tons of Ore mined per fatality
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
Average	2.6	226,352	1,409,335

* Man-shifts worked

** Amount of ore mined

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11. ACCIDENTS AND PERSONAL INJURY

b. Non-Fatal Accidents (Continued)

TABLE V

NUMBER OF ACCIDENTS OF ALL KINDS

Mine or Plant	Slight	Lost-time Less than 7 Days	Lost-time 7 days or more	Fatal	Total
Athens	106	1	24	0	131
Maas	161	0	18	0	179
Negaunee	136	2	32	1	171
Cliffs Shaft	91	0	20	1	112
Lloyd	102	3	7	1	113
Tilden	1	0	1	0	2
Spies Virgil	25	0	2	1	28
Mather	38	0	1	0	39
Princeton	34	6	19	0	57
Cambria Jackson	35	0	12	0	47
Canisteo	28	0	4	0	32
Holman Cliffs	54	2	5	0	61
Hill Trumbull	30	2	3	0	35
General Shops	14	0	4	0	18
General Storehouse	8	0	1	0	9
Cliffs Power & Light	8	0	2	0	10
Laboratory	0	0	0	0	0
Ishpeming Hospital	4	0	0	0	4
Engineering Dept.	2	0	0	0	2
	877	16	155	4	1052

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11. ACCIDENTS AND PERSONAL INJURY

b. Non-Fatal Accidents (Continued)

TABLE VI

CAUSES OF COMPENSABLE ACCIDENTS, INCLUDING FATALITIES

UNDERGROUND

Cause	Athens	Maas	Negaunee	C.S.	Lloyd	Spies Virgil	Cambria Jackson	Princeton	Mather	Total
Falls of ground	10	3	7	3	4	1	1	12		41
Chunks rolling down pile	1		2	3				2		8
Handling timber and other materials					1			1		2
Loading at chutes			2	1						3
Falls of persons & slipping or stumbling	2	4	6	8	2		2	4		28
Falling or moving material- machinery	7	5	7	1	2	1	1	3		27
Handling or using machinery	1	1	1				1			4
Flying or bounding objects	1		2				1			4
Bumping against objects			1							1
When using tools	2	1	2	1			2	1		9
Blasting			1	1						2
Insecure staging or platform				1						1
Handling wire ropes				1						1
Haulage motors and cars					2		1	2		5
Total	24	14	31	20	11	2	9	25	0	136

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11. ACCIDENTS AND PERSONAL INJURY

b. Non-Fatal Accidents (Continued)

TABLE VI (Continued)

SURFACE

Cause	Athens	Maas	Neg.	C.S.	Lloyd	Spies Virgil	Camb. Jack.	Princeton	Mather	Total
Falling or moving material or machinery	1	2	2				2			7
When using tools, machinery		1	1							2
Falls of persons slipping or stumbling		1	1							2
Electric power						1				1
Insecure scaffolding							1			1
Scalded				1						1
Haulage Truck									1	1
Totals	1	4	4	1	0	1	3	0	1	15

OPEN-PIT MINES

Causes	Canisteo	Hill Trumbull	Holman-Cliff	Tilden	Total
Falling or moving material or machinery	1	4	2	1	8
Slipping or stumbling			3		3
Haulage Truck	2		1		3
Cable breaking			1		1
Burns		1			1
Falling ground	1				1
Totals	4	5	7	1	17

OTHER OPERATIONS

Cause	C. P. &L. Co.	General Storehouse	General Shops	Hospital	Total
Falling or moving materials, machinery	2	5	0	0	7