GWINN DISTRICT GENERAL
ANNUAL REPORT
YEAR 1937

19. GWINN ASSOCIATION
GWINN HOTEL (Cont.)

2. Gwinn Hotel

The hotel was operated throughout the year under the same management as last year. The regular small monthly rental was continued throughout the year.

The woodwork was painted during the year, also the windows were caulked. A new hot water tank was also bought and installed in the Gwinn Hotel.

20. GWINN DISTRICT
CRUSHER

The crusher operated 91 days in 1937. The ore crushed was as follows:

	1937	1936
Gardner Mackinaw	152,616	152,018
Princeton	0	0
Stephenson	0	400
Francis	0	2,072
	152,616	154,490

The cost for the year 1937 and 1936 were as follows:

	1937		1936	
	Amount	Per Ton	Amount	Per Ton
General Expense	44.71		26.50	
Maintenance	406.18	.003	202.66	.002
Operating	7,020.35	.046	4,547.48	.029
Total Operating Exp.	7,471.24	.049	4,776.64	.031
Switching	1,288.50	.008	1,505.35	.010
Grand Total	8,759.74	.057	6,281.99	.041

Tons crushed	152,616	154,490
Decrease in tonnage crushed	1,874	

PRINCETON MINE
ANNUAL REPORT
YEAR 1937

1. GENERAL

This mine has been idle since 1921. During the year 8,468 tons of Princeport and 345 tons of Cambridge ore were loaded and shipped.

During July of 1937, the old wooden headframe of the Princeton No.3 shaft was dismantled. Due to the rotted condition of the upper shaft supporting timbers, the headframe was leaning badly and beyond repair. On the north side of the shaft collar, the weight of one of the concrete headframe piers had caved the ground through the rotted shaft casing and if this were allowed to continue, the entire shaft would be lost. On surface, Douglas fir bearers were laid on either side of the shaft and from these, nine sets were hung and connected to the solid timbers below ledge. After the work was completed, mine rock was filled and washed in around the collar and the shaft covered. This expenditure appears under comparative costs.

2. PRODUCTION SHIPMENTS & INVENTORIES

b. Shipments

	1937	1936	Increase
Cambridge	345	883	
Princeport	8,468	-	7930

c. Stockpile Inventories

Cambridge	105,278	105,583
Princeport	1,750	9,160
Sec.19,Cambridge	13,673	13,713
" 19,Princeport	255	1,313
Total	120,956	129,769

During the year a transfer was made of 1,058 tons from Princeport, Sec. 19 to Princeport, as well as 40 tons from Cambridge Sec. 19 to Cambridge.

3. ANALYSIS

b. Average Analysis on Shipments

Grade	Tons	Iron	Phos.	Sil.	Mang.	Al.	Lime	Mag.	Sul.	Loss	Moist
Princeport	8,468	61.24	.273	5.76	.46	1.49	1.42	.72	.106	1.20	
Cambridge	345	60.28	.802	3.78	1.02	1.21	3.42	.89	.036	1.43	

PRINCETON MINE
ANNUAL REPORT
YEAR 1937

4. ESTIMATE OF ORE RESERVES

a. Developed Ore

Assumption: 12 cu. ft. equals one ton
10% deduction for rock
10% deduction for loss in mining
Percentage of Bessemer equals 0

	Princeport	Cambridge	Sec.19 Princeport	Sec. 19 Cambridge	Total
Ore above 2nd Level	2,552				2,552
Ore above 4th Level		78,325			78,325
Ore above 5th Level	20,000	58,778			78,778
Ore above 6th Level	60,318	445,694	9,000	57,128	572,140
Total	82,870	582,797	9,000	57,128	731,795

b. Prospective Ore

Ore below 6th Level	20,000	418,815	5,000	46,921	490,736
TOTAL ORE					1,222,531

c. Estimated Analysis

Grade-PrincepportB	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Ign.	Moist
Dried 212°	59.50	.300	7.73	.505	1.214	1.605	1.037	.023	2.235	
Natural	50.60	.256	6.57	.429	1.032	1.365	.862	.020	1.900	15.00
Cambridge										
Dried 212°	59.75	.853	4.42	1.193	.937	3.676	.840	.023	1.447	
Natural	50.80	.725	3.76	1.014	.797	3.125	.714	.020	1.230	15.00

d. Estimated Tonnage as Required by State Tax Commission

Non-Bessemer Ore			
Developed:	1. Princeport	91,870 tons	
	2. Cambridge	639,925 "	
Total Developed			731,795 tons
Prospective	1. Princeport	25,000 tons	
	2. Cambridge	465,736 "	
Total Prospective			490,736 tons
GRAND TOTAL			1,222,531 tons

The above estimates of ore in the mine were made in December, 1921.

PRINCETON MINE
ANNUAL REPORT
YEAR 1937

8. COST OF OPERATING

a. Comparative Costs

	1937	1936	Incr.	Decr.
Underground costs	7.88	-	7.88	
Surface Costs	3,362.33	1,124.28	2,238.05	
General Mine Accounts	276.41	46.40	230.01	
Total	3,646.62	1,170.68		
Loading & Shipping	1,007.79	158.56	849.23	
Taxes	4,574.98	4,416.66	158.32	
Social Security Tax	97.54	-	97.54	
Supply Inventory Adjustment	188.66	514.78		326.12
TOTAL	9,515.59	6,260.68	3,254.91	

The principal reason for the increase can be attributed to the retimbering of the Princeton #3 shaft, as well as the addition of a new roof on the dry house building and heating plant. There was also a wage increase on March 16, 1937.

10. TAXES

	1937		1936	
	Valuation	Taxes	Valuation	Taxes
NE¼ of NE¼,Sec.19,45-25 (C&NW)	10,000	183.93	10,000	185.10
158.27 acres in Sec.18,45-25	15,000	275.90	10,000	185.10
160 acres in NW¼ of Sec.20,45-25	100,000	1,839.28	100,000	1,850.92
NW¼ of NE¼,Sec.19,45-25 (Loc.)	420	7.73	420	7.77
S½ of NE¼, Sec.19,45-25 (Loc.)	840	15.46	840	15.54
Personal Property	120,000	2,207.38	115,000	2,128.50
Total	246,260	4,529.68	236,260	4,372.93
Collection Fees		45.30		43.73
Total Taxes		4,574.98		4,416.66
Tax rate per $100.00		1.839		1.861

STEPHENSON MINE
ANNUAL REPORT
YEAR 1937

1. GENERAL

This mine was abandoned in 1927 but the Company is still paying the taxes on the original description, the S½ of the SW¼ of Section 20,45-25, as well as the adjoining 80 acres to the south, i.e., the N½ of the NW¼ of Section 29,45-25, on account of the ore in stock. The latter description is owned by the Chicago & North Western Railway Company.

2. PRODUCTION SHIPMENTS & INVENTORIES

b. Shipments

	1937	1936
Stephenson	3,476	-
Stephenwood	32,330	8,995
Northdale	-	-
Northwood	-	-
	35,806	8,995

c. Stockpile Inventories

	1937	1936
Stephenson Lease		
S½ of SW¼ of Sec.20,45-25	56,296	92,102
C.& N.W.Lease		
N½ of NW¼ of Sec.29,45-25	18,976	18,976
Total	75,272	111,078

Ore Statement

	Stephen-son	Stephen-wood	North-dale	North-wood	Total
On hand Dec.31,1936	3,647	88,455	227	18,749	111,078
On hand Dec.31,1937	171	56,125	227	18,749	75,272

3. ANALYSIS

b. Average Analysis on Shipments

Grade	Tons	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
Stephenson	3,476	59.75	.297	6.72	1.05	1.42	1.80	1.05	.028	1.85	
Stephenwood	32,330	60.10	.694	4.32	.91	1.10	2.63	.95	.032	1.93	

STEPHENSON MINE
ANNUAL REPORT
YEAR 1937

8. COST OF OPERATING

a. Comparative Mining Costs

	1937	1936	Incr.	Decr.	Cost per ton 1937
Underground costs	-	-			
Surface Costs	1,436.78	1,124.28	312.50		
General Mine Expense	452.24	131.74	320.50		
Total	1,889.02	1,256.02	633.00		
Loading & shipping	2,581.65	759.96	1,821.69		.072
Taxes	2,361.00	2,375.14		14.14	
Social Security Tax	96.16		96.16		
Supply Inventory Adjustmt.	-	4,273.72		4,273.72	
TOTAL	6,927.83	8,664.84		1,737.01	

The principal reason for the decrease is due to the taking up of the supply inventory adjustment.

In 1936 there were 9,645 tons loaded
In 1937 there were 35,806 tons loaded.

10. TAXES

	1937		1936	
	Valuation	Taxes	Valuation	Taxes
80 acres-S½ of SW¼,Sec.20,45-25	1,000	18.39	1,000	18.51
80 acres-N½ of NW¼,Sec.29-45-25	200	3.68	160	2.96
Personal property,ore in stock	125,000	2,299.00	125,000	2,313.50
Personal property in warehouse	900	16.55	900	16.66
Total	127,100	2,337.62	127,060	2,351.63
Collection Fees		23.38		23.51
Total Taxes		2,361.00		2,375.14

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

1. GENERAL

Production was resumed at the Virgil Mine on May 3rd, after a lapse of 4 years. Shipments scheduled for the 1937 season would have cleaned up the stockpiles had there been no mine production during the summer months, so with this reduced inventory, the outlook in regard to the general mine situation is brighter than for some years past. The mine production in 1937 amounted to 71,255 tons, the shipments were 172,498 tons, and the ore in stockpile at the end of the year was reduced to 34,234 tons.

The reopening of the mine presented some unusual problems in ventilation of the oxygen depleted workings in addition to replacement of decayed timber and acid eaten materials. Proper ventilation was not restored until August 11th and the reopening of the full length circuit from the Spies to Virgil shafts will not be completed until early in 1938. Much credit is due the underground force for their safe and efficient work in driving the new 4th Level rock ventilation drift, a distance of 680' in seven weeks under trying conditions.

A heavy underground development program was under way at the end of the year and the extensive repair program was still being carried steadily forward. Additions and improvements to the surface plant were needed after the idle period, and early in 1938, when most of this work will be completed, the mine will again be in excellent physical shape.

No exploration or development work was done on the Sherwood property for the Republic Steel Corporation. A portion of the Virgil 6th Level connecting drift was undercut by a caving stope, and a length of some 200' to 300' of rotted timber broke down, so that access to the Sherwood drift is no longer possible. A short replacement connection can be driven however, and Republic Steel Corporation officials have been made aware of these facts through the Cleveland office.

2. PRODUCTION SHIPMENTS & INVENTORIES

a. Production by Grades

Only the Virgil grade was produced in 1937 and the output amounted to 71,255 tons. The rock hoisted was 5,406 tons.

b. Shipments

Grade	Pocket	Stockpile	Total	Total Last Year
Virgil	53,052	115,098	168,150	121,255
Virgil High Sulphur	0	4,348	4,348	0
Total	53,052	119,446	172,498	121,255
Total Last Year	0	121,255	121,255	0
Increase	53,052	1,809	51,243	

The increased shipments in 1937 amounted nearly to the ore forwarded from pocket.

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

2. PRODUCTION
SHIPMENTS &
INVENTORIES

c. Stockpile Inventories

Grade	Tons
Virgil	29,703
Virgil High Sulphur	4,531
Total	34,234

The stockpile balance has been reduced to the lowest figure since 1926, when 21,468 tons were in stock. The high point was reached in 1932 with a total of 337,563 tons.

d. Division of Product by Levels

Level	Tons
6th Level	8,750
8th Level	62,505
Total	71,255

e. Production by Months

Month	Days	Virgil Ore	Total Ore	Rock	Tons per Day Ore	Tons per Man per Day
May	21	3,249	3,249	770	154.7	2.86
June	22	6,054	6,054	700	275.1	4.08
July	None	60	60	1,552	Idle Expense Month	
August	22	7,908	7,908	496	359.5	5.44
September	22	16,323	16,323	204	741.9	10.14
October	21	13,893	13,893	284	661.6	8.12
November	22	13,314	13,314	784	605.2	7.49
December	18	10,454	10,454	616	580.8	6.97
Total	148	71,255	71,255	5,406	481.5	

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

2. PRODUCTION
SHIPMENTS &
INVENTORIES (Cont.)

f. Ore Statement

	Virgil	Virgil Hi-Sulphur	Total	Last Year
On hand January 1,1937	126,598	8,879	135,477	256,732
Output for year	71,255	-	71,255	-
Total	197,853	8,879	206,732	256,732
Shipments	168,150	4,348	172,498	121,255
Balance on hand	29,703	4,531	34,234	135,477
Increase in output			71,255	

The operating schedule follows:

Mine idle May 1, 1933 to May 3, 1937

1937 - 2-8 hr. shifts 5 days per week May 3 to June 22
Production suspended June 22 to August 11 for repairs to underground ventilation system.
2-8 hr. shifts 5 days per week August 11 to Dec. 6
2-8 hr. shifts 4 days per week Dec. 6 to Dec. 31st.

g. Delays

There were two production delays. The first and most serious was the necessity for restoring adequate ventilation soon after the property was reopened. The driving of the new 4th Level drift, to replace the caved portion, cut off production from the 6th and 8th Levels while this work was going on. Production was suspended June 21st and resumed again August 11th. The higher than normal production rate in September and October more than made up for the loss however, and the estimated figure for the year was also bettered.

The second delay occurred on December 27th. During the Christmas holiday shutdown, ice accumulated in the shaft and this forced the skip out of position so that it caught and tore out a wall plate and divider. Permanent repairs were made that day and hoisting was resumed the next morning. The loss in 1937 was one shift, and the production shortage amounted to 300 tons.

3. ANALYSIS

a. Average Mine Analysis on Output

Grade	Tons	Iron	Phos.	Sil.	Sul.
Virgil	71,255	59.33	.374	4.70	.094

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

3. ANALYSIS (Cont.)

a. Average Mine Analysis on Output (Cont.)

The restricted mining areas in 1937 caused a variation from the normal expected analysis. The unusually high iron content resulted from the high proportion of ore from the fully developed 8th Level stopes, the lower phosphorus content from the small proportion of 6th Level ore and the higher sulphur content from the caved ore from the east 8th Level stope.

b. Analysis on Straight Cargoes

There were no straight cargoes shipped to lower lake ports in 1937, but approximately one half of the ore was delivered to the M. A. Hanna and North Range Mining Companies. The average analysis of this ore was as follows:

	Mine			Lake Erie
Grade	Iron	Phos.	Sil.	
Virgil	57.57	.429	6.71	None

c. High Sulphur Ore

The caving of the east stope above the 8th Level has made available for drawing at chute Nos. 805 to 812, a large quantity of high sulphur ore. An estimate of this material might be anywhere from 10,000 to 20,000 tons and upward. The material is really a mixture of black slate and ore, and the iron content is surprisingly high, although the sulphur content varies from .100 to 3.5% and averages about .5%. The presence of this broken ore in the stope must be kept in mind for it should be trammed and hoisted before the chute timbers become rotted.

At the end of the year, the development of the southwest 8th Level drift disclosed a 20' length of high sulphur ore in the back of the drift. Additional information will be sought here early in 1938 by raising.

d. Complete Analysis of Ore Shipped in 1937

Grade	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
Virgil	57.55	.429	6.64	.21	1.55	.63	.28	.090	7.06	
Virgil Hi-Sul.	56.79	.490	5.41	.19	1.84	.60	.21	.231	7.15	

e. Analysis of Ore in Stock Dec.31,1937.

Virgil	29,703	58.14	.398	6.20	.19	1.84	.60	.21	.090	6.50	7.00
Hi-Sul.	4,531	56.79	.490	7.41	.19	1.84	.60	.21	.231	7.15	7.00

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

4. ESTIMATE OF ORE RESERVES (Cont.)

a. Developed Ore

Assumption: 12 cu. ft. equals one ton
10% deduction for rock
10% deduction for loss in mining.

Virgil Ore	Available Tons	Unavailable Tons	Total Tons
Developed ore above 6th Level	69,053	-	69,053
Developed ore between 6th and 8th Levels	141,392	-	141,392
Total developed ore Nov. 30, 1937	210,445	-	210,445
Less December production	10,454	-	10,454
Total developed ore Dec.31	199,991		199,991

b. Prospective Ore

Virgil Ore			
Between 6th and 8th Levels	409,151	278,755	687,906
TOTAL ALL ORE, DEC.31,1937	609,142	278,755	887,897

The reserve estimate reported to the Tax Commission amounted to 609,142 tons, and does not include the unavailable ore. Other unavailable ore shown above the 6th Level in last year's report amounted to 507,718 tons, but this figure was eliminated in 1937 due to existing conditions above this level. The small reduction in the available reserve indicates that development in 1937 disclosed an additional 62,920 tons of ore.

f. Estimated Reserve Analysis

	Iron	Phos.	Sil.	Mng.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
Dried	57.50	.425	7.00	.16	1.64	.60	.30	.119	7.35	
Natural	51.75	.382	6.30	.15	1.48	.55	.26	.107	6.60	10.00

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

5. LABOR AND WAGES

a. General

The employment of men, starting the latter part of April, was gradual and the full strength working force was not reached until June. The list of old employees was exhausted before men without previous service with the company were taken on. It was gratifying to see the ways in which these men showed their appreciation of being back at work again, and their later concern and interest in the difficult task of restoring proper ventilation proved their loyalty beyond question. No local or affiliated labor organization had been formed by the employees, and it is believed that because of their small number and the close contacts with Captain and Superintendent that they feel it unnecessary.

The total number of employees rose from 42 at the end of April to a maximum of 78 in November. The finishing of much of the outside work during that month reduced the total to the regular average of 76 at the end of the year.

The wage rate that was in effect since November 16, 1936 continued until March 16, 1937. At that time there was a minimum increase of 10¢ per hour or an average increase of approximately 15%. Working time was limited to eight hours per day and forty hours per week with payment of time and a half for anything over these amounts. This combination raised wages to a minimum of $5.00 per day and an average level well above that enjoyed in previous years.

b. Statement of Wages and Product

PRODUCT	71,255
NO. SHIFTS & HOURS	2 - 8
AVG. NO. OF MEN WORKING	
Surface	23
Underground	44
Total	67
AVG. WAGES PER DAY	
Surface	5.41
Underground	6.33
Total	6.00

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

5. LABOR AND WAGES (Cont.)

b. Statement of Wages & Product (Cont.)

AVG. WAGES PER MONTH OF 22 DAYS	
Surface	119.02
Underground	139.26
Total	132.00
AVG. WAGES PER MONTH OF 18 DAYS	
Surface	97.38
Underground	113.94
Total	108.00
PRODUCT PER MAN PER DAY	
Surface	18.903
Underground	10.291
Total	6.663
LABOR COST PER TON	
Surface	.2860
Underground	.6153
Total	.9013
AVG. PRODUCT BREAKING & TRAMMING	40.324
AVG. WAGE CONTRACT MINERS	7.505
TOTAL NO. OF DAYS	
Surface	3,769½
Underground	6,924¼
Total	10,693¾
AMOUNT FOR LABOR	
Surface	20,383.12
Underground	43,840.51
Total	64,223.63

PROPORTION SURFACE TO UNDERGROUND MEN

1937	-	1	to	1.92
1936	-	1	to	.50
1935	-	1	to	.88
1934	-	1	to	.99
1933	-	1	to	2.15

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

6. SURFACE

a. Buildings, Repairs

Two new buildings were erected and improvements and repairs were made on the others. One of the new structures was a fireproof heated garage built to house the Ford truck purchased in August. The location was opposite the office over the return steam line from the shop building, so the heating is a small expense which should be balanced by the saving on truck repairs.

The surface heating system was completely rearranged, and this too in time should reflect a considerable saving. The old overhead steam lines from the dry house boiler plant to the shops, office and engine house, were dismantled and replaced with new pipe lines insulated and boxed in below surface. Steam traps and a return water pump were added and they now provide a steadier pressure with less strain on the boiler. The badly corroded 2" water supply pipe from the location to the mine was cut off to prevent further waste and replaced with a new line in a ditch about 4' deep. This work was done in June and July, using the regular employees that were not needed in driving the 4th Level ventilation drift.

The dry house was thoroughly cleaned and at the end of the year most of the inside had been repainted. A lighter colored ceiling and additional lights were provided in the shower and change rooms. The old first aid room in the northwest corner was partitioned off and a fuse cutting room installed, so that the dryman can now fill out his time by cutting fuse for the following shift. The mine office was completely renovated by the laying of a new hardwood floor on replaced posts and sills, the placing of sheetrock on the walls and the redecorating of the whole interior. General repairs were made on the shop building and a new composition roof laid. In the engine house, the cracked foundation under the hoist motor was removed and a heavier concrete base poured in its place. Considerable repair work and replacements were made on the switch panels in the engine house also. Repair work on the headframe included replacement of pocket lining plate, and the installation of a hand operated trap door in the skip dump slide to drop the rock hoisted from underground directly into the top tram car instead of passing it through the crusher as had been done in the past. This change eliminated the necessity of cleaning out the grizzly and crusher each time a change is made from one material to another and is bound to give a cleaner product. Four of the six cast iron idle sheaves had been replaced with the new type rubber lined sheaves at the end of the year. The rubber lining prevents the stalling of the sheaves in freezing weather and consequent wear on the hoisting ropes.

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

6. SURFACE (Cont.)

a. Buildings, Repairs

The second new structure erected was the premanent fan station at the collar of the Virgil shaft. Heavy timbers were imbedded in a concrete floor to support the two 15 H.P. fan and motor units on the north side of the shaft. A new timber set was placed at the collar of the shaft, and a double floor of matched lumber laid with a trapdoor opening over the ladder road. Pipe openings were cut and twin 16" sheet metal pipes with slotted door frames extended to the fans. Improved ventilating efficiency resulted, and complete reversal of the air current is obtainable by changing the position of the doors without stopping the fans. This arrangement has helped to reduce the freezing of the normally downcast Spies shaft, for the reversal on the night shifts during weekends sends the hot exhaust air through a hanging door in the 4th Level brattice and up the Spies shaft.

b. Stockpiles

The center and northeast stockpiles of Virgil grade ore were cleaned up and only a few thousand tons remained in the northwest pile at the end of the shipping season. About one half of the high sulphur ore pile, which had been in stock for a number of years close to the shaft, was loaded by scraper to avert constant shifting of the shovel. The shipment of part of this pile necessitated dismantling of the old rock trestle so a replacement was extended easterly from the shaft on the hillside. End dumping of rock will lengthen the new pile in this direction for several years, and it can later be joined with the old pile when the remainder of the high sulphur ore is shipped.

In the fall, a trestle of 12 bents was constructed in the center of the stocking grounds. Additional lengths will be added as needed. Stockpiling of ore was not started until November 11th, and after minor adjustments on the larry top tram cars, easily kept pace with production.

c. Roads

The rock from the 4th Level ventilation drift, instead of being placed on the rockpile, was hauled from the shaft pocket by a rented dump truck and used in making a new road and parking area west of the engine house. The construction of this road eliminated a sharp curve at the engine house corner and its width was made sufficient to allow orderly parking of employees cars at a reasonable distance from the dry house.

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

6. SURFACE (Cont.)

d. Transmission Lines

The Cliffs Power & Light Company line crew in April erected a pole line from the Spies transformer station to the Virgil shaft to supply power for the ventilation fans. The length of the line is close to 2000' and transformers at the Virgil shaft reduce the line voltage to 220 A.C.

7. UNDERGROUND

a. Shaft Sinking

There was no shaft sinking or stripping in 1937.

b. Development and Ventilation

Throughout the year development was largely for ventilation purposes so that these two sub headings have been combined and are reported together.

4th Level
When the mine was reopened early in April, considerable trouble was experienced in trying to secure proper ventilation. From time to time it was thought that some improvement had been made, only to have this condition reversed with the result that various mining areas had to be abandoned because of heat and foul air. Early in June, a crew with oxygen helmets discovered a breakdown of the 4th Level drift at a point 750' southwest of the shaft. The drift was badly caved and close inspection showed that very little air was being drawn through this cave. Since it was impossible to determine the extent of the breakdown, a small drift was first driven west a distance of 25', using a blower fan to provide fresh air at the face. Thereafter, the drift was continued parallel to and 19' north of the old 4th Level. From time to time small cross-cuts were driven toward the level and holes drilled to the opening. The result of these cross-cuts showed that the level at these points was partially or wholly caved and work was continued parallel to the old drift. After driving the drift a distance of 194' southwest to the curve of the main level, a small drift connection was made. This operation likewise showed the continuation of the cave beyond. Inasmuch as heat and foul air penetrated the new workings, it was necessary to brattice this off before continuing. Thereafter, the small drift was driven slightly south of west and parallel to and approximately 14' from the main level. Here again two small crosscuts encountered

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

7. UNDERGROUND (Cont.)

b. Development and Ventilation (Cont.)

caved ground and had to be bratticed off. At a point 255' from the bend of the small drift, a third crosscut indicated that the main level was intact and immediately on opening this passage, foul air prevented any further clean up work. With the exception of the last 20' of this drift, which was in chert, the entire progress was in a black, highly folded, pyritic slate. Long sections of the new drift had to be close timbered since the slate peeled when exposed to the air. When this operation was completed, on August 9th an air circuit from the 6th Level was re-established and with both fans running at the Virgil Shaft, the lower levels were soon cleared of foul air.

The completion of the new 4th Level ventilation drift made it possible for the fresh air coming up from the 8th Level to pass in some manner along the west hanging wall of the 6th Level stopes to the 4th Level elevation, and thereafter with the foul air through the new ventilation drift to the 3rd Level raise. The combined circuits then followed along the Spies 3rd Level to the Virgil 1st Level and up the Virgil Shaft to the suction fans. Mining operations were resumed on August 11th, but after several weeks, it was noticed there was no improvement in the oxygen analysis of the exhaust air. A helmet crew again penetrated the heat and foul air coming through the new 4th Level drift, only to discover another breakdown in the old drift 150' west of the connection. With this disappointing fact established, it was apparent that a new raise connection would have to be provided between the 6th and 4th Levels in order to complete the circuit. The heat issuing from this breakdown also indicated that the chemical action or oxygen absorption was taking place in the upper part of one of the 6th Level stopes, and not in the highly pyritic 4th Level drift, as had been hoped. It placed the action definitely out of reach at present and postponed final corrective measures until such time as the complete underground ventilation circuit is provided.

Subs Above the 6th Level

Early in September, after mining operations had been resumed, preparations were made for driving the ventilation raise from the 90' sub to connect with the 4th Level drift on the East side of the newly discovered breakdown. At a point 55' northeast of the first 6th Level cross-cut, a small raise was driven years ago to the 90' sub which connected the old workings to the north. This rock raise was stripped to double compartment size from the 90' elevation down to the 6th Level. The two compartments were necessary for storage space for broken rock and to provide entrance to the single compartment raise at this elevation. Late in September, the new raise was started on a 45° course northeast and at the

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

7. UNDERGROUND (Cont.)

b. Development and Ventilation (Cont.)

close of the year, an inclined height of 359' had been reached. At 100' intervals, small side by-passes were driven which made working conditions in this long raise considerably less hazardous. Just above the bottom sub of each by-pass, a chute was built to take care of the rock while raising was in progress, so that there was never more than 80' to 90' of open raise above. A through ventilation and traveling road was open so that blasting was possible at any time during the shift. The raise started in the characteristic black cherty slate and while swelling and peeling was experienced, this condition soon corrected itself. At a point 122' above the 90' sub, a lean iron formation was encountered, and soon after this changed to ore, which extended a distance of 25'. It seems likely that this ore is a continuation of the small body previously tested by horizontal drilling on the 4th Level. After leaving the ore, the material changed to lean ore and cherty slate formation which continued the remainder of the distance. On the completion of this ventilation raise a direct connection outside of the stope areas will be made with the 4th Level, and it is hoped that it will soon lead to a permanent solution of the ventilation problem.

During September, in preparation for mining, a double compartment cribbed raise was put up from the 6th Level crosscut into the area which formed the main pillar of the stopes above. At the 90' sub level a station was cut out and a transfer drift started in a southwesterly direction. At a point 75' from the raise, the drift intersected a caved extension of the north stope. The drift was then turned off nearer the raise and extended an additional 140' to the southwest. This extension crossed the old north-south drill station and traveling drift at the same elevation. After the completion of this transfer, small mills were driven at various intervals to the 120' sub above. These raises were connected to the old sub drift at this elevation in November and mining operations started soon after.

6th Level

There was no actual development work at this elevation during the year, although the enlargement of #10 diamond drill hole to drain or lower the water level in the old Virgil stopes may properly be described here. This work was necessary to hold the water level in these stopes below the 1st Level so that the ventilation circuit to the Virgil shaft would not be blocked. A siphon pipe to the Spies 3rd Level had been laid before the mine closed in 1933 but it had never been used. The pipe was repaired and several efforts made

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

7. UNDERGROUND (Cont.)

b. Development and Ventilation (Cont.)

to start the siphon in August, but without success. Another alternative was to clean or ream out the old #10 diamond drill hole which normally drains the Virgil stopes to the 6th Level. The work was done in September by a diamond drill and crew brought down from Ishpeming. The chopping bit and rods were pushed up to the back of the 2nd Level Virgil drift, a distance of 685'. When withdrawn there was a slight increase in the amount of water, but caving near the top of the hole had been indicated on pulling the rods. Next a special pointed and slotted steel inlet drain and casing was made from an old core barrel and pipe and placed at the collar of the hole, or a distance of 680' above the 6th Level. This time there was a notable increase in the amount of water. Finally on the 22nd, the steel inlet was pushed to the back of the drift, again increasing the discharge slightly. The final quantity seemed about double the old discharge and will probably take care of the drainage for some time in the future. Portions of the hole must cave partly every time the rods are pulled because the enormous pressure due to the 700' head has never been released at the 6th Level.

Subs Above 8th Level

Soon after the mine was reopened in the spring, it was found that stoping operations in the East and West stopes might endanger the traveling and ventilation raises which were originally put through between the 8th and 6th Levels in the pillar between these stopes. As a replacement, a series of raises and drifts were driven on the various sub levels and connected with some of the old traveling roads west of the west stope. By using these old development drifts and raises the operation did not entail a great amount of work below the -50' sub level. At this elevation, a combined exploratory-development drift was driven south into the central fold. After passing through a mixture of slate and ore seams, the drift developed 52' of ore and the south cherty slate contact was tested to a depth of 18'. The connecting raise to the 6th Level was then started in ore near the south end of this drift. The course of the raise was slightly west of south and it passed through 124' of ore before holing to the 6th Level boundary drift north of #10 diamond drill hole. This raise will serve as a ventilation and traveling road between the 6th and 8th Levels until mining operations are completed in the west stope.

Small raise and drift development was carried on ahead of mining operations in the east stope from the -50' sub level down to the -130. This work was also kept at a minimum for it had soon been

SPIES VIRGIL MINE
ANNUAL REPORT
NYEAR 1937

7. UNDERGROUND (Cont.)

b. Development & Ventilation (Cont.)

learned that slight inducement extended the cave which had started in this stope before the mine was reopened and that a very low cost operation was possible. Near the west end of the -130' sub level, raise and drift connections were completed under the west stope to within a few feet of the Sherwood boundary line. A traveling raise which provides access to the west stope on every sub level, was then extended under the jasper hanging wall to the +25' sub level and the connection to the stope at that elevation was being completed at the end of the year.

8th Level

Exclusive of the ventilation headings, the major development of the year was the resumption of drifting operations at this elevation. The need for this development is quite urgent for the west stope above the 8th Level is the only section of the mine which promises a steady ore supply over the next eight or twelve months. A scraper slide was constructed and drifting operations started on November 17th. The proposed plan extends the straight 8th Level drift southwest to within a few feet of the Sherwood boundary where crosscuts are to be turned off north and south. The south crosscut is to be completed first and raises are planned to extend into the ore body to about the -50' elevation. Transfer subs are to be advanced to the east, and this development program is to be followed by stoping operations retreating from east to west, first along the south footwall.

Good progress was being made in the drift in the hard cherty slate when, at a distance of 65', a fault was encountered and considerable trouble was experienced in spiling through the soft swelling ground. At a distance of 73' ore was disclosed in the back of the drift and this will be tested by raising early in 1938. The heading continued in highly folded ore and graphitic slate seams but at a distance of 100' this formation gave way again to the black cherty slates. The advance in 1937 was 114' or to within 200' of the Sherwood boundary.

During the last several months of 1937, a balance of 4 development and 2 mining contracts was maintained. It seems likely that this ratio will be extended through the greater part of 1938 in order to hasten the development of additional mining areas.

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

7. UNDERGROUND (Cont.)

c. Stoping

Stoping operations in 1937 were limited to three main areas. These were the central portion of the ore body above the 6th Level, and the east and west stopes on the north footwall above the 8th Level. Several other territories, one of which is partially developed, were at hand above the 6th Level but ventilation conditions made this ore, at least for the present, unavailable.

The scraper transfer system was successfully introduced in the new sub level stope which was opened under the hanging wall above the 6th Level. At the end of the year, the production rate in this stope nearly equalled that of the fully developed 8th Level stopes. A change in method was also made in the west stope above the 8th Level from the sub level drift system to the sub level bench system. In combination with jack bits and the new S-49 Ingersoll-Rand stopers, the production rate increased to such an extent that in November and December the average was above 100 tons per man per day. The caving of the east 8th Level stope, which had started when the mine was closed down, was used to excellent advantage in block crushing or caving the remaining limited amount of low sulphur ore. The hoisting of 16,323 tons in September was the result of undercutting a block of soft ore at the east end of this stope and literally running it through the grizzlies into the tram cars. A description of the caved high sulphur material left in this stope has been given under the heading "High Sulphur Ore".

The detailed description of operations follows:

Subs Above the 6th Level

No mining operations were conducted above the 120' sub level elevation but in May, broken ore, left in the east central stope when the mine closed down in 1933, was run from the 6th Level chutes in the hope that a ventilation circuit could be opened to the 4th Level. The finding of the 4th Level drift breakdown, and the closing of the mine for repairs, ended this operation in June. The drawing of additional ore has not been resumed, for indications are that the heating and oxygen absorption reaction is taken place in the upper regions of this stope or the connecting one to the northeast.

120' Sub Level

Stoping operations were started under the hanging wall in the central portion by No. 10 contract in November. The transfer drift is on the sub below, and the broken ore is scraped to the double compartment raise put up from the 6th Level. The transfer is parallel to the north side of the former pillar left to support the edge of the larger

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

7. UNDERGROUND (Cont.)

c. Stoping (Cont.)

northwest stope. This support is no longer necessary, for a wider pillar containing the concrete brattice sealing off the old #17 stope must be left over the main 6th Level drift. At the end of the year, a length of about 70' had been mined in rather lean material along the north side of the pillar, and some caved ore had been drawn from the old northwest stope. #10 contract was stoping at this elevation, and developing at the +135 elevation in December.

90' Sub Level

The transfer drift southwest of the new double compartment raise, and later mill raises to the stope, were driven by #10 contract. The single compartment rock ventilation raise was started toward the 4th Level from this elevation after #9 contract had stripped and timbered the old raise from the 6th Level to the floor of this sub.

6th Level

The weight of the caved material in the large expanse of the northwest stope had limited the 6th Level drift openings at the end of the year to the straight drift as far as #608 raise, the first main northwest crosscut to the 8th Level raises which is partly undermined by the caving east 8th Level stope, the short #610 crosscut, #620 crosscut, and a portion of the northwest boundary drift as far as the new 8th Level raise connection. The last two were retimbered in order to provide drainage from #10 drill hole and a traveling and ventilation road from the new raise. The drifts to the south of these openings are sealed with concrete brattices, and the crosscuts to the north, including the Sherwood, have collapsed because of rotted timber and are filled with lean material from the stope above.

Subs Above the 8th Level

+25', 00', and -25' Sub Levels

Stoping operations in the west stope were conducted at these elevations by No. 12 contract late in the year. The maximum advance was on the 00' and -25' subs in order to secure the set-back face required by the sub level bench system of mining which was started in September. This system allows faster drilling and better placing of holes with the stoping machines, and reduces to a large extent the preparatory sub level development drifting. The benches on each sub level are maintained at right angles to the strike of the ore formation to assure adequate support, and no difficulty was experienced in this connection. New sub drifts from

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

7. UNDERGROUND (Cont.)

c. Stoping (Cont.)

the west end hanging wall raise were provided by #11 contract, and at the end of the year, #12 stoping contract had mined the maximum north-south stoping width of 70' on the 00' sub.

-50' Sub Level

Stoping operations by #12 in the west stope added a length of about 40' at this elevation. To the southwest #11 contract drove the development drift and new raise connection to the 6th Level.

Mining operations were started in the east stope at this elevation in August. The stope outline, left when the mine closed down in 1933, had about doubled in size due to the caving of the ore under the overturned south footwall. The connecting drift at this elevation had fallen into the stope and the soft black slate was exposed for a length of about 50'. A new traveling raise was provided at the east end and mining operations were started by #8 contract, leaving a 25' pillar between the new and old stopes. This pillar was later thrust into the new stope by the pressure of the caved material on subs below, so that at the end of the year, the stope outline is believed to extend nearly to a point vertically over #803 chute. The vertical extent of the opening above this elevation is also unknown, but it probably reaches sea level elevation or a distance of about 50'.

-75' and -100' Sub Levels

These were the lowest elevations on which stoping took place in 1937. No. 12 contract used the bench system in the west stope above #816 raise, and No. 8 contract enlarged the new mill raises from #803 to #807 to undercut the ore above.

-130' Sub Level

This sub level is the mill or grizzly sub under the east stope. During the year, No. 8 contract put up 10 mill raises and one traveling raise to mine the ore in the east end of the stope. At the end of the year, a total of 24 mills leading into chute Nos. 802 to 812, were filled with the soft caved high sulphur ore and black slate mixture. An extremely low cost high sulphur product can be made here at any time within the next five years (before the chutes rot) by simply running the ore into tram cars and hoisting it.

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

7. UNDERGROUND (Cont.)

d. Timbering

The cost of timber in 1931 with a product of 93,580 tons was $1,288.01. The following figures seem favorable in comparison but it must be remembered that there was very little new development requiring timber, and that retimbering or replacement of old rotted timber accounted for most of the amount used in 1937.

Statement of Timber Used

Kind	Lineal Feet	Avg. Price Per Foot	Amount 1937
6" to 8"	1,687	.036	60.72
8" to 10"	3,520	.06646	233.93
10" to 12"	1,609	.0931	149.77
12" to 14"	567	.1325	75.14
14" to 16"	72	.1625	11.70
Total Timber 1937	7,455	.0713	531.26
Total Timber 1936 (Idle)			
5' Lagging	11,805	.075	88.53
7' Lagging	37,294	.0792	295.20
Total Lagging	49,099	.07815	383.73
Poles	16,956	.01343	227.65
Total Lagging & Poles	66,055	.09255	611.38

Product	71,255
Feet of Timber per Ton of Ore	.1046
Feet of Lagging per foot of Timber	.6586
Cost per ton for Timber	.00746
Cost per ton for Lagging	.00539
Cost per ton for Poles	.00319
Total cost per ton for Lagging, Poles & Timber	.01604
Equivalent of Stull Timber to Board Measure	13,531
Feet of Board Measure per ton of Ore	.1899
Cost of Timber, Lagging & Poles, 1937	$ 1,142.64
Cost of Timber, Lagging & Poles, 1936	Idle

e. Drifting & Raising

The following table shows the 1937 development footage classified as to size and material:

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

7. UNDERGROUND (Cont.)

e. Drifting & Raising (Cont.)

	Drifting			Raising			Combined
	Ore	Rock	Total	Ore	Rock	Total	Total
Full Size	272	132	404	25	0	25	429
Small size	754	753	1,507	1,119	273	1,392	2,899
Total	1,026	885	1,911	1,144	273	1,417	3,328

The small size rock drift and raise was largely for ventilation purposes, and the amounts should show a decrease in 1938. The remaining footage was development in advance of regular mining operations. The introduction of the scraper transfer system above the 6th Level, and the bench system in the west stope above the 8th Level, effected a reduction in the development footage which is best shown in the following comparison:

	Tons Produced	Total Develop. Footage	Tons of ore per foot of develop.
1931	93,581	6,462	14.1
1937	71,255	3,328	21.4
Increase			7.3

f. Explosives, Drilling & Blasting

The caved ore from the east 8th Level stope furnished a good share of the product for several months, but this did not entirely account for the lower powder consumption per ton of ore produced. The last figures for true comparison are those of 1931 when 93,581 tons were produced and 6,462' of development work was done. The powder consumption then was .68 lbs. per ton and the cost was $.084. The 1937 respective figures were 71,255 tons, 3,328' of development and .39 lbs of powder per ton and a cost of $ .056.

Statement of Explosives Used

Ore Development & Stoping	Quantity	Average Price	Amount 1937
#1 Gelamite, 60%	11,492	.1225	1,409.00
#2 Gelamite, 40%	16,490	.1225	2,019.90
Total Powder	27,982	.1225	3,428.90

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

7. UNDERGROUND (Cont.)

f. Explosives, Drilling & Blasting (Cont.)

	Quantity	Average Price	Amount 1937
Fuse	70,690	5.711	403.69
#6 Caps	10,648	12.00	127.75
Fuse & Cap Seal	1		.60
Cap Crimper	1		22.00
Powder Bags	9	1.15	10.35
Safety Fuse Lighters	1,287	.86	11.16
Total Fuse, Caps, etc.			575.55
Total Explosives, Ore Develp.& Stoping			4,004.45
Production - tons			71,255
Pounds of Powder per ton of ore			.3927
Cost per ton for Powder			.0481
Cost per ton for above explosives			.0562
Rock Development			
#1 Gelamite, 60%	5,045	.1225	618.01
#2 Gelamite, 40%	1,878	.1225	230.06
ELF Gelatin, 60%	200	.1300	26.00
Total Powder	7,123	.1227	874.07
Fuse	24,680	5.656	139.61
#6 Caps	3,382	12.00	41.11
Powder Bags	1		1.15
Fuse Lighters	400	.90	3.60
Total Explosives, rock development			1,059.54
Total All Explosives Used in Mine			5,063.99
Average price per pound for powder		.12257	

8. COST OF OPERATING

a. Comparative Mining Costs

	1937	Cost Per Ton	1936
Product, Tons	71,255		Idle
Underground costs	71,467.48	1.003	
Surface Costs	18,568.74	.261	
General Mine Expense	16,629.45	.233	
Cost of Production	106,665.67	1.497	

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

8. COST OF OPERATING (Cont.)

	1937	Cost Per Ton	1936
Depreciation, Plant & Equipt.	2,705.39	.038	
" Development	15,591.72	.219	
Taxes	2,134.25	.030	
Loading & Shipping (plus 1936 analysis)	8,096.41	.114	6,551.10
Total Cost at Mine	135,193.44	1.898	
Supply Inv. Adjustment	804.14	.011	6.84
Idle Expense	33,646.74	.472	34,397.82
Total Cost	169,644.32	2.381	40,955.76

There was no production from the mine in 1936. The idle expense in 1937 amounted to $19,492.03 for the first four months and $14,154.71 in July when the mine was closed down for repairs to the underground ventilation system,

b. Detailed Cost Comparison

Although no comparison is possible, the detailed accounts are shown as a matter of interest, and for the purpose of commenting on some of the extraordinary items.

Underground Costs	1937 Amount	Per Ton
1. Exploring in Mine	30.10	.000
3. Development in Rock	1,301.30	.018
4. Development in Ore	8,441.45	.119
5. Stoping	15,778.86	.222
6. Timbering	7,389.17	.104
7. Tramming	8,976.48	.126
8. Ventilation	8,847.05	.124
9. Pumping	5,621.12	.079
10. Compressors & Air Pipes	7,216.65	.101
12. Underground Superintendence	3,614.88	.051
14. Maint: Compressors & Power Drills	303.07	.004
15. Maint: Hand Tramming Equipt	46.95	.001
16. Maint: Electric Tram Equipt.	2,515.63	.035
17. Maint: Pumping Machinery	1,384.77	.019
Total Underground Costs	71,467.48	1.003

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

8. COST OF OPERATING (Cont.)

b. Detailed Cost Comparison (Cont.)

	1937 Amount	Per Ton
Surface Costs		
18. Hoisting	4,777.29	.068
19. Stocking Ore	2,015.53	.028
20. Screening - Crushing at Mine	1,740.15	.024
21. Dry House	2,288.72	.032
22. General Surface Expense	2,700.13	.038
23. Maint: Hoisting Equipt.	1,497.10	.021
24. Maint: Shaft	456.67	.006
25. Top Tram Equipt.	666.58	.009
26. Docks, Trestles & Pockets	897.62	.013
27. Mine Buildings	1,528.95	.022
Total Surface Costs	18,568.74	.261
General Mine Expenses		
Vacation Pay	40.29	.001
28. Insurance	663.81	.009
29. Mining Engineering	609.25	.008
30. Mechanical & Elec. Engineering	43.12	.001
31. Analysis & Grading	1,967.39	.028
32. Personal Injury	2,672.17	.037
33. Safety Department	287.33	.004
34. Telephones & Safety Devices	655.89	.009
35. Local & General Welfare	642.00	.009
36. Special Expense, Pensions & All.	1,502.16	.021
37. Ishpeming Office	1,971.00	.028
38. Social Security Tax	2,115.06	.030
39. Mine Office	3,459.98	.048
Total General Mine Expense	16,629.45	.233
COST OF PRODUCTION	106,665.67	1.497
40. Taxes	2,134.25	.030
TOTAL COST	108,799.92	1.527
41. General Supplies	5,285.00	.074
42. Iron & Steel	1,559.96	.022
43. Oil & Grease	432.04	.006
44. Machinery Supplies	3,992.25	.056
45. Explosives	4,711.00	.066
46. Lumber and Timber	4,212.20	.059
47. Fuel	2,072.73	.029
48. Electric Power	12,156.44	.172
49. Sundries	1,802.06	.025
50. Other mines and accounts	2,253.45	.032
Supply Inventory Adjustment	804.14	.011
Total Per Cost Sheet	34,774.39	.488

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

8. COST OF OPERATING (Cont.)

b. Detailed Cost Comparison (Cont.)

3. Development in Rock
The 8th Level rock drift and raises will continue underway in 1938, and while the expenditure will be larger, the cost per ton is not expected to increase materially.

6. Timbering
The near completion of the heavy repair program in 1937 should reduce this cost in 1938.

8. Ventilation
To this amount might properly be added a large part of the July idle expense, for production was suspended that month in order to drive the replacement 4th Level ventilation drift. The expense incurred under this heading in 1937 was widely at variance with that of the past, and that which may be expected in the future.

10. Compressors & Air Pipes
The replacement of acid eaten pipe added greatly to the expense in 1937.

16. Maint. of Electric Tram Equipt.
The extra expense of conditioning motors, cars and haulage tracks is expected to show a considerable reduction in 1938.

The remaining costs, including surface and general mine expenses, are expected to show the normal increase based on the change in working schedule from five to four days per week. It is hoped that the reduction in the accounts described above will offset this increase in 1938.

9. EXPLORATIONS AND FUTURE EXPLORATIONS

There was no diamond drill work at the property in 1937. The 6th to 4th Level ventilation raise, however, disclosed some unlooked for ore which is probably the downward extension of a small 4th Level deposit previously tested horizontally by drilling. When a permanent ventilation system for the upper section of the mine has been established, the limits of this ore will be explored.

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

10. TAXES

The following tabulation is a comparative statement of the taxes paid by the Company in Iron County for the years 1937 and 1936:

Description	1937 Valuation	1937 Taxes	1936 Valuation	1936 Taxes
Village of Mineral Hills				
Spies Lease				
SE¼ of NW¼,Sec.24,43-35, 40 acres)				
NE¼ of NW¼,Sec.24,43-35, 40 acres)	5,000	13.25	5,000	13.32
Spies Dwellings.....)				
Spies Virgil (a)				
E½ of NW¼ of Sec.24,43-35, (Spies))				
SW¼ of NW¼ ofSec.24,43-35 (Virgil))	100,000	265.25	100,000	266.40
Stockpile,Supplies & Equipment....	170,000	450.90	310,000	825.80
Total Operating Spies Virgil....	270,000	716.15	410,000	1,092.20
Total Mineral Hills.....	275,000	729.40	415,000	1,105.52
Rate.....		.2650		.2665
Iron River Township				
Spies Lease				
NE¼ of NW¼,Sec.24,43-35, 40 Acres)				
SE¼ of NW¼,Sec.24,43-35, 40 acres)	5,000	90.15	5,000	96.15
Spies Dwellings.....)				
Spies Virgil (a)				
E½ of NW¼ of Sec.24,43-35 (Spies))				
SW¼ of NW¼,Sec.24,43-35 (Virgil))	100,000	1,803.00	100,000	1,923.00
Stockpile, Supplies & Equipt.....	170,000	3,065.10	310,000	5,961.30
Total SpiesVirgil.....	270,000	4,868.10	410,000	7,884.30
Total Iron River Township.....	275,000	4,958.25	415,000	7,980.45
Rate.....		1.803		1.923

(a) The Village of Mineral Hills is in Iron River Township. The valuations shown above are the same. The mineral valuation is not divided between the Spies and Virgil, and the surface of the Spies is included in the mineral assessment of the Virgil.

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

10. TAXES (Cont.)

The Ravenna Prickett property in Crystal Falls Township was leased to the Inland Steel Company in October, 1936. The taxes in 1937 were paid by Inland and the two year comparison follows:

	1937		1936	
Ravenna Prickett	Valuation	Taxes	Valuation	Taxes
Crystal Falls City				
W½ of SE¼ of Sec.19,43-32.....	1,100	27.92	1,100	29.09
Rate.....		2.538		2.645
Ravenna Prickett				
Crystal Falls Township				
SW¼ of Sec.19,43-32 and NE¼ of SE¼ Sec.24,43-33 for '35.....	68,000	1,248.48	65,500	1,309.35
SW¼ of NE¼,Sec.19,43-32.....	200	3.68	200	4.00
SE¼ of NE¼,Sec.19,43-32.....	200	3.68	200	4.00
SW¼ of NW¼,Sec.19,43-32.....	200	3.68	200	4.00
SE¼ of NW¼,Sec.19,43-32.....	200	3.68	200	4.00
SE¼ of NE¼,Sec.24,43-33.....	200	3.68		
NW¼ of SE¼,Sec.24,43-33.....	200	3.68		
NE¼ of SW¼,Sec.24,43-33.....	200	3.68		
Total Crystal Falls Twp.....	69,400	1,274.24	66,300	1,325.35
TOTAL RAVENNA PRICKETT.....	70,500	1,551.16	67,400	1,354.44
Rate Crystal Falls Twp.....		1.84		2.00
Distribution of Charges				
C.C.I.Co.Proportion.....	Paid by		51,025	1,027.10
Michigan Mineral Lands,25% of SW¼, 19,43-32.	Inland Steel Co.		16,375	327.34

11. ACCIDENTS AND PERSONAL INJURY

Extremely hazardous work such as the driving of the 4th Level ventilation drift under high temperatures, spiling through the rotted timber breakdown on the 8th Level, and driving the single compartment 400' rock raise from the 6th to 4th Levels were accomplished in 1937 without a minor injury. The men were justly proud and were expecting to be the recipients of the Company safety banner when their record was spoiled on Dec. 30 by a haulage accident. This accident occurred in the 8th Level rock development heading when John Frantti pinched his thumb between two motor car couplings in the act of making up a train of cars to be taken to the shaft. The injury resulted in Frantti's losing the 1st and the end of the 2nd joint of his left thumb and requires the payment of 60 weeks compensation in the amount of $1080.00.

This one injury, resulting from a moment's thoughtlessness, dropped the mine from first place in the comparative safety record standings to a position not far from the bottom of the list because of the relatively small number of man days worked. It well illustrates the constant vigilance needed and the value of the monthly prize drawing plan in keeping this fact before the employees eyes.

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

12. NEW CONSTRUCTION
AND PROPOSED
NEW CONSTRUCTION

The most important additions to the surface plant were the new garage and the fan station at the Virgil shaft. The need for and the construction of both of these buildings has been described under the "Surface" heading. The pole line from the Spies transformer station to the Virgil fan station was erected in April to provide power for the ventilation fans. The first aid room in the dry house was partitioned off and a fuse cutting room added. The construction of the butterfly valve in the skip dump slide to pass rock directly into the top tram cars without crushing has also been described under the "Surface" heading.

The driving of the 4th Level rock drift to replace the caved portion, and the 6th to 4th Level rock raise, may be classified as the most important construction jobs underground. Both were necessary to re-establish the ventilation circuit and provide a second outlet. Four timber and ore clay brattices were constructed above the 6th Level to control the movement of the foul air in this portion of the mine.

Under the heading of proposed new construction sho ld be listed a permanent heating installation for the headframe. At the present time three iron stoves are in use on the different floors, and they constitute a definite fire hazard. The size of the dry house boiler is ample to take care of additional steam unit heaters and two have already been ordered for connection to a temporary steam line which is exhausting into the shaft to prevent ice formation. In the spring, the system should be rearranged to provide steam heat throughout the headframe.

13. EQUIPMENT AND
PROPOSED EQUIPMENT

The following additions to the mine equipment were made in 1937:

	Cost
6 - S-49 Ingersoll-Rand Drilling Machines	$ 1,297.02
4 - BCRW 430 " " " "	823.93
2 - 20 H.P. " " Scraper Hoists	2,937.00
2 - 48" Holcomb-Westeeco Scrapers	367.00
1 - J2 Jackbit Grinder	285.00
3400 - Jackbits	954.79

The purchase of the above material was included in E&A #751 - Reopening of mine.

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

13. EQUIPMENT AND
PROPOSED EQUIPMENT (Cont.)

1 - S-49 Ingersoll Rand Stoper	$ 367.00
2 - Chunk breakers, 1 Ingersoll-Rand and 1 Chicago Pneumatic each	195.00
1 - Ford stake body 131" wheelbase truck, E&A 763	894.00
1 - Repaired cage from Central Shops, Ishpeming	
1 - Repaired skip " " " "	
4 - Repaired 2 ton rocker dump cars.	
1 - G.E. trolley locomotive from Mackinaw-Gardner Mine	
6 - Rubber lined idler sheaves.	
1 - Plow Steel cage rope 1930' length has also been ordered at a cost of	764.23

14. MAINTENANCE
AND REPAIRS

a. Mine

Equipment repairs were naturally more extensive than usual after the four year idle period. They are listed below and are followed by a description of the underground repairs.

Compressor
The compressor operated 24 hours per day during the rock drifting period on the 4th Level in June and July. Near the end of this period, the main bearings burned out and replacement was necessary. As a safety measure 2" holes were drilled in the high and low pressure cylinder heads and lead plugs inserted. A thermostat control was also installed to trip the motor switch if excessive cylinder temperatures are reached. The carbon deposit was cleaned out of the air receiver.

Hoist
The new foundation under the motor and relining of hoist and motor has been described under "Surface". The air brake assembly was rebuilt, and a set of shims removed from the main hoist bearings.

Electrical Equipment
The entire surface wiring system was revamped to meet present day approved specifications. Both of the motor generator sets were conditioned for full time use. One larry top tram car was completely overhauled and new contactor boards installed.

Extensive repairs were made on the 6th and 8th Level trolley wires and distribution systems as well as the three underground haulage locomotives.

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

14. MAINTENANCE AND REPAIRS (Cont.)

Steam Shovel

Minor shovel repairs included replacement of the swing cables, the rolling of flues, and general repairs on the boiler during the operating season. In November, the shovel was moved into the mine shops, the boom lowered, dipper sticks removed and a more extensive overhauling started.

Pumps

The bearings on the 8th Level Prescott pumps were recast in May. The 3rd Level Dean pump was out of service in April by reason of a broken crank shaft, which was sent to Chicago for welding and replaced at the end of the month. During this interval 450' of 8" discharge column was replaced in the shaft. The pumping charges were excessive during that month since all water was pumped from the 8th Level. The welded crank shaft lasted only until August when it was replaced with a new one which had arrived from the manufacturers only a few weeks before, at a cost of $612.00.

Underground

Repair work on the 4th Level consisted only of placing the tracks in shape as far west as the start of the new ventilation drift.

Sixth Level repairs were started immediately on reopening the mine. By the end of the year, about 200' of the main drift had been retimbered, and another 200' cleared of rotted timber and the back and sides trimmed. The acid eaten 4" air line was patched to within 500' of the ore body and from this point west, a new 2" pipe installed. Track repairs were of a minor nature, including only replacement of acid eaten rails and rebonding where necessary.

The 8th Level drift was found to be in fair shape as far as #807 raise. The drift was collapsed west of this point and it was necessary to spile through the soft mixture of caved ore and graphitic slate a distance of about 300'. The treacherous ground and rotted timber made this a difficult job and the end of the breakdown at #816 chute was not reached until the latter part of August. Beyond this chute, lining sets and props were placed to hold the drift open until mining operations are completed in the west stope above. When production from this stope had been secured, retimbering of portions of the main drift was started and at the end of the year this work was nearing completion. Sections of the 4" air line on this level were replaced and about 200' of new 2" water line installed. The

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

14. MAINTENANCE
AND REPAIRS (Cont.)

track on the 8th Level was about one half 30 lb. rail and the remainder 40 lb. Replacement of the worn and acid eaten 30 lb. rail with the heavier section is going forward gradually, and by the middle of 1938 the main line track is expected to be placed in shape for the traffic it bears.

b. Location

The Spies location dwellings, after the four year idle period, were in a very poor state of repair. Foundations were rotted, floors heaved, plaster cracked in many of the rooms and the outsides of the houses were badly in need of paint. An inspection in the spring of 1937 revealed that a thorough job would have to be done to halt further deterioration, so an estimate was prepared on this basis and work started in June with a force of two carpenters and two painters.

Foundation repairs included excavating where necessary, jacking up the houses and replacing rotted cedar posts and sills. Outside house repairs consisted of replacement of rotten siding and skirting, windows and frames, and floors and steps of porches. Inside repairs cov ered cracked plaster walls and ceilings with sheetrock in all houses except #9 which was not completed. The inside papering and kalsomining was done by the tenants, the Company furnishing the materials.

The outside painting included scraping off old paint and scale, replacing putty in windows and nail holes, and the application of shellac on knots. Two coats of paint were applied, except on cottages, 1, 2 and 3, which were not completed, and received only a priming coat.

Repairs to the Captain's and Clerk's dwellings were more extensive. A larger basement was excavated and a concrete floor poured in the former and a kitchen was added and another room converted into a bathroom in the latter.

The location sewer line was cleaned out, repaired and extended an additional 400' east to discharge into a new cesspool. The extension pipe was salvaged material from the old mine discharge column. The new cesspool was covered with increasingly coarse layers of gravel and rock, and a small septic tank was installed in the bathroom outlet of the clerk's house.

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

14. MAINTENANCE AND REPAIRS (Cont.)

The following tabulation shows the cost of this work:

Spies Virgil Dwellings	Labor	Supplies	Total
Foundation Repairs	1,386.65	171.06	1,557.71
House Repairs	927.91	1,344.76	2,272.67
Interior Decorating	36.45	118.98	155.43
Outside Painting	721.10	340.01	1,061.11
Shed Repairs	31.24	31.00	62.24
Total Amount for Dwellings	3,103.35	2,005.81	5,109.16
Location Maintenance			
Maintaining Sewer	237.45	234.80	472.25
Total Location Expense,1937	3,340.80	2,240.61	5,581.41

17. CONDITION OF PREMISES

The appearance of the mine surface was improved by the repair work and the new construction done during the summer months. The removal of the overhead steam lines, repairs to the office and shop buildings, and the addition of the new garage were contributing factors. The stockpile grounds and pocket track were cleaned up and the timber yard was cleared of rotted material. The entrance to the mine was much improved by the widening of the new road for the orderly parking of employees cars outside of the building area. Flowers or shrubbery adjacent to some of the buildings will add much to the appearance of the central mine surface, and it is hoped that some of this planting can be started in the spring.

The condition of the location premises in the fall was quite different from that in the spring of theyear. The fresh, clean appearance of the newly painted dwellings in their varied colors changed the location into an asset which again befits the Company's standard.

SPIES VIRGIL MINE
ANNUAL REPORT
YEAR 1937

18. NATIONALITY OF EMPLOYEES

Classification	American born Number	%	Foreign Born Number	%	Percent of Total
English	4	6	10	15	21
American	13	20			20
Finnish	6	9	7	11	20
Scandinavian	8	12			12
German	1	1	3	5	6
Irish	2	3			3
French	1	1	1	1	2
Polish			3	5	5
Italian			5	7	7
Slavic			3	4	4
Total	35	52%	32	48%	100%

CANISTEO MINE
ANNUAL REPORT
YEAR 1937.

1. GENERAL:

The winter repair work was resumed in the shops on January 4th, following the customary two weeks layoff. The repair crew worked five days per week of one 8-hour shift each until April 1st, when it was necessary to speed up the work and seven 8-hour shifts per week were put into effect. This extra work was required in order to put the equipment in shape to start ore operations on April 12th, almost a month earlier than usual.

Blast-hole drilling was started in March and one structure drill outfit was engaged in testing for a water supply to serve the mine location, shops and locomotives. A considerable amount of pit drilling and blasting was accomplished prior to the beginning of ore operations on April 12th.

A small crew of men were employed on the tracks during the last week of March. This force was increased April 1st and even then it was necessary to resort to some overtime during that month, due to the heavy rains washing surface material on to the tracks and delaying the work.

Mining activities were started April 12th and were conducted to October 8th, when the season's requirements were secured. Two 8-hour shifts were worked, five days per week for the most part.

A total of 606,041 tons of concentrates were produced at the washing plant, which was operated 127 days, with an average output of 4,772 tons per day. Two 8-hour shifts were worked per day and, with a few exceptions, the operation was conducted five days per week. During the ore season of 1936, three 8-hour shifts were worked, six days per week, both at the mine and washing plant.

The concentrating results were quite satisfactory as regards tonnage and grade. The ratio of delays to total working time showed considerable improvement, as compared with 1936. Naturally the delays were more frequent when the mill was operated 24 hours per day and six days per week.

The structural drilling program undertaken during 1937 was very much less extensive than in 1936. Two rigs were engaged during the months of September and October, 1937, in outlining deep troughs of ore, extending Southward of the area mined out by the conveyor system in the North Bovey deposit. Five holes, with a total of 224 feet, was the 1937 program, compared with thirty-eight holes, showing 4,106 feet of drilling in 1936. Very little structural drilling will be necessary in connection with the mining operations for 1938.

CANISTEO MINE
ANNUAL REPORT
YEAR 1937

1. GENERAL:
(Continued)

The employment of the structure outfits at the Canisteo Mine in 1938 would be for the purpose of determining mining activities beyond 1938 and naturally this work would depend upon an extension of the Canisteo lease being secured.

Stripping operations during the past year were conducted on a reduced basis. While ore mining was in progress, the remaining yardage of the 1936 program was removed and in addition, a substantial amount of silt and painty material was handled in connection with the pit drainage and pump sump. The cost of doing the drainage and sump work was charged directly to ore operations.

From October 25th to November 18th, regular stripping operations were carried forward four days per week of three 8-hour shifts each. The ore area uncovered was in the vicinity of the Hemmens-Snyder boundary, the stripping cuts being fanned out so as to make available a maximum tonnage of Hemmens ore for 1938 extraction.

The customary amount of repair work was undertaken during the winter and early spring months and the usual track cleaning jobs and track conditioning was undertaken. The water supply from the pit, for washing operations, was utilized during the ore season. This facility was installed during the summer of 1936.

2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production by Grades:

Snyder Crude,	649,780	tons.
Bovey Crude,	171,998	"
Hemmens Crude,	162,871	"
Total Crude Ore,	984,649	"
Snyder Non-Bessemer Concentrates,	219,539	"
Snyder Bessemer Concentrates,	165,514	"
Bovey Non-Bessemer Concentrates,	115,477	"
Bovey Bessemer Concentrates,	1,703	"
Hemmens Non-Bessemer Concentrates,	80,711	"
Hemmens Bessemer Concentrates,	23,097	"
TOTAL CANISTEO MINE,	606,041	"

Ore operations started on April 12th and were completed on October 8th.

b. Shipments:

The shipments from the Canisteo Mine during 1937 were the same tonnages as shown under the production statement, as all ore mined was forwarded to lower lake ports.

c. Stockpile Inventories:

No merchantable ore, either concentrates or direct shipping was stocked at the Canisteo property during 1937.

CANISTEO MINE
ANNUAL REPORT
YEAR 1937

2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

e. Production by Months:

(1) Crude Ore:

	SNYDER	BOVEY	HEMMENS	TOTAL
April,	110,314	-	-	110,314
May,	143,438	35,215	5,449	184,102
June,	80,435	53,613	15,287	149,335
July,	127,993	51,737	-	179,730
August,	112,039	31,433	35,985	179,457
September,	57,038	-	77,477	134,515
October,	18,523	-	28,673	47,196
TOTAL 1937,	649,780	171,998	162,871	984,649

(2) Concentrates:

	SNYDER	BOVEY	HEMMENS	TOTAL
April,	60,444	-	-	60,444
May,	78,767	21,708	3,466	103,941
June,	50,461	37,006	9,787	97,254
July,	77,869	36,234	-	114,103
August,	65,890	22,232	21,285	109,407
September,	40,171	-	52,005	92,176
October,	11,451	-	17,265	28,716
TOTAL 1937, c	385,053	117,180	103,808	606,041

f. Ore Statement:

All material considered as ore, that was mined during 1937, was shipped from the property.

g. Delays:

The following delays were reported during the year 1937:

Date:	Time Lost Hours	Minutes	Cause:
April 13th,	3	-	Power failure.
	5	-	Derailment at top switch.
15th,	1	30	Rheostat on shovel out of order.
	6	-	Broken shaft on shovel.
16th,	2	-	Waiting for Great Northern empties.
	5	-	Repairing trip motor on #32 shovel.
19th,		30	Power trouble at plant.
22nd,	1	30	Pit tracks covered by slide in the approach.
	1	-	Handling frost chunks.
23rd,	1	-	No power account electrical storm.
	2	50	Jaw crusher plugged.
27th,		40	Power off in pit and mill, account electric storm.
	2	-	Waiting for ore, due to slide in pit.
29th,	1	-	Repairing drive belt on pan conveyor.

CANISTEO MINE
ANNUAL REPORT
YEAR 1937

2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

g. Delays: (Continued)

Date:	Time Lost Hours	Minutes	Cause:
May 3rd,	1	-	Repairing cross conveyor and cleaning plugged chute.
5th,		30	Broken journal on locomotive.
		30	Flues leaking on locomotive.
		30	Repairing washer.
11th,	1		Derailment in pit.
15th,	3	30	Shovel tied up because of water in pit.
18th,		55	Waiting for Great Northern empties.
19th,	3	30	Chute under 8-ft. pan conveyor plugged.
20th,	1		Ore sticking in chute under grizzly.
21st,	1	20	Loaded car off track on switch in lower yard.
	1		Trouble with bell system in mill.
	2		Chute plugged under grizzly.
22nd,	2		Moving and connecting tracks.
23rd,	1	30	Moving shovel.
	3		Putting pontoons under shovel.
	3		Installing pump.
	3		Pumping water and casting.
25th,	2		Waiting for ore, but one shovel loading.
26th,	1	50	Adjusting pit conveyor.
	3		Broken bearing on pit conveyor.
27th,	1		Chute plugged under grizzly.
		30	Repairing log washer switch.
	3	30	Waiting for ore - changing dipper and casting.
28th,	1	30	Receiving bin plugged with wood chunks.
31st,	2		Slow loading - wash-out in Bovey area.
June 3rd,	2		Chute plugged under grizzly.
5th,	1		Moving shovel.
8th,	1		Chute plugged under grizzly.
9th,	1	15	Moving shovel.
10th,	1		Waiting for Great Northern empties.
11th,		35	Waiting for Great Northern empties.
15th,	2	10	Derailment in pit.
16th,	2	15	Waiting for Great Northern empties.
19th,	1		Broken journal on dump-car on main line.
	1		Waiting for Great Northern empties.
22nd,		30	Waiting for Great Northern empties.
23rd,		45	Waiting for Great Northern empties.
24th,	1		Waiting for Great Northern empties.
28th,	2		Burned-out coil on East log switch panel.
30th,		30	Waiting for Great Northern empties.
July 2nd,	3	30	Waiting for Great Northern empties.
9th,		30	Waiting for Great Northern empties.
12th,	1		Waiting for Great Northern empties.
		55	Repairing log washer motor.
13th,	2	35	Derailment in pit.
16th,	1	10	Derailment in pit.
	2	50	Repairing electric cable to washing plant pump.

CANISTEO MINE
ANNUAL REPORT
YEAR 1937

2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

g. Delays: (Continued)

Date:	Time Lost: Hours	Minutes	Cause:
July 17th,		35	Waiting for Great Northern empties.
23rd,	1	20	Derailment in pit.
24th,	1	30	Waiting for ore - Bovey shovel casting.
	2		Cross conveyor broken.
25th,		30	Power off.
26th,		45	Snyder shovel moving back.
		45	Derailment in pit.
		45	Piece of tramp iron caught in crusher.
27th,	3	25	Moving pit conveyor and shovel, in Snyder.
29th,	3	35	Waiting for Great Northern empties.
30th,		40	Waiting for Great Northern empties.
August 3rd,	1	55	Waiting for Great Northern Empties.
	1	45	Motor burned out on big screen.
4th,		45	Waiting for Great Northern empties.
6th,	2		Waiting for Great Northern empties.
11th,		45	Waiting for Great Northern empties.
12th,	1	25	Waiting for Great Northern empties.
13th,	3	20	Waiting for Great Northern empties.
18th,		45	Broken journal on locomotive.
20th,	3		Slow pit loading while digging grade.
23rd,	2		Waiting for ore - trouble with pumps, in sinking cuts.
24th,	1	10	Waiting for Great Northern empties.
27th,	5		Waiting for Great Northern empties.
30th,	1		Waiting for Great Northern empties.
	1		Broken side rod on locomotive.
31st,	2	40	Waiting for Great Northern empties.
Sept. 1st,	2	45	Waiting for Great Northern empties.
2nd to 8th, incl.	80		Flooding of pit.
10th,	1	45	Derailment.
	1	30	Slow loading.
14th,	3		Repairing brake bands on electric shovel.
15th,		40	Waiting for Great Northern empties.
16th,	4	40	Waiting for Great Northern empties.
17th,	1		Waiting for Great Northern empties.
23rd,	3		Slow loading, sorting rock in pit.
24th,	1	45	Removing loaded car with broken journal off main switch.
27th,	2		Shifting tracks in pit.
Oct. 8th,	3	30	Removing dump car from receiving bin at plant.
Total Delays, 258		--	

CANISTEO MINE
ANNUAL REPORT
YEAR 1937

2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

g. Delays: (Continued)

Of the total delays, 49 hours and 25 minutes were on account of the Great Northern car supply. This compares with 27 hours and 20 minutes during 1936, when over 1,000,000 tons of ore was forwarded. This shows that the Great Northern Railway did not have sufficient facilities to handle the increased tonnage in 1937, with the result that the car supply for the mines was at times decidedly inadequate.

The total hours of delay in 1937 would have been reduced to 178, if it were not for the shut-down, resulting from the flooding of the pit during the fore part of September.

3. ANALYSIS:

a. Mine Analysis of Production & Shipments:

	Tons	Iron	Phos.	Sil.	Mang.	Alu.	Moist.	Iron Nat.
Snyder Non-Bess.Concts.	219,539	57.72	.060	10.98	.30	.48	7.71	53.27
Snyder Bess. Concts.	165,514	58.42	.037	10.15	.27	.44	7.76	53.88
Bovey Non-Bess.Concts.	115,477	57.34	.078	10.90	.36	.56	7.55	53.01
Bovey Bess. Concts.	1,703	58.29	.042	9.30	.45	.69	7.89	53.69
Hemmens Non-Bess.Concs.	80,711	57.75	.071	11.06	.25	.57	7.45	53.45
Hemmens Bess. Concts.	23,097	59.02	.034	10.03	.21	.54	7.32	54.70
TOTAL 1937,	606,041	57.90	.057	10.70	.29	.50	7.64	53.48

d. Average Analysis of Crude Ore Production:

	Tons	Iron	Phos.	Silica
Snyder Crude,	649,780	42.78	.040	33.41
Bovey Crude,	171,998	47.55	.087	25.10
Hemmens Crude,	162,871	44.25	.048	30.85
Total Crude Ore,	984,649	43.86	.050	31.53

e. Composite Analysis of Season's Shipments:

	Iron	Phos.	Sil.	Mang.	Alu.	Lime	Mag.	Sul.	Loss
Snyder Non-Bess.Concts.	57.70	.062	10.95	.28	.46	.18	.10	.010	5.20
Snyder Bess. Concts.	58.40	.036	10.20	.25	.40	.14	.12	.010	5.20
Bovey Non.-Bess.Concts.	57.30	.079	10.84	.38	.60	.20	.10	.014	5.50
Bovey Bess. Concts.	58.40	.043	9.40	.48	.74	.26	.16	.014	5.40
Hemmens Non.-Bess.Concts.	57.70	.074	11.05	.23	.56	.16	.12	.009	5.10
Hemmens Bess. Concts.	58.90	.034	10.10	.18	.54	.14	.16	.012	4.50

CANISTEO MINE
ANNUAL REPORT
YEAR 1937

4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:

Factors Used:

	Rock Deduction	Cu. Ft. Per Ton	% Recovery
N. Bovey:			
Wash,	10%	14	60%
Log Grade Wash,	10%	15	60%
Rocky Wash,	20%	14	60%
S. Bovey:			
Wash,	10%	14	60%
Lean Wash,	10%	14	50%
Log Grade Wash,	10%	15	60%
Lean Low Grade Wash,	10%	15	50%
Hemmens:			
Wash,	10%	14	60%
Log Grade Wash,	10%	15	60%
Lean Low Grade Wash,	10%	15	50%
Rocky Wash,	20%	14	60%
Snyder:			
Wash,	10%	14	60%
Lean Wash,	10%	14	50%
Low Grade Wash,	10%	15	60%
Lean Low Grade Wash,	10%	15	50%
Rocky Wash,	20%	14	60%

Snyder:		
$SE\frac{1}{4}$-$SE\frac{1}{4}$ - Sec. 30,	2,020,492	tons.
$SW\frac{1}{4}$-$SE\frac{1}{4}$ - Sec. 30,	611,966	"
$SE\frac{1}{4}$-$SW\frac{1}{4}$ - Sec. 30,	163,519	"
Total Snyder,	2,795,977	"
Bovey:		
$SW\frac{1}{4}$-$NE\frac{1}{4}$ - Sec. 30,	144,485	"
$SE\frac{1}{4}$-$NE\frac{1}{4}$ - Sec. 30,	99,040	"
$NW\frac{1}{4}$-$SE\frac{1}{4}$ - Sec. 30,	297,549	"
$NE\frac{1}{4}$-$SE\frac{1}{4}$ - Sec. 30,	187,644	"
$NE\frac{1}{4}$-$NE\frac{1}{4}$ - Sec. 31,	781,110	"
Total Bovey,	1,509,828	"
Hemmens:		
$SW\frac{1}{4}$-$SW\frac{1}{4}$ - Sec. 29,	1,007,149	"
Grand Total, Canisteo Mine,	5,312,954	"

CANISTEO MINE
ANNUAL REPORT
YEAR 1937

4. ESTIMATE OF ORE RESERVES: (Continued)

a. Developed Ore: (Continued)

Exploratory work undertaken during 1937 was quite meagre and mining activities during the year did not disclose any discrepancies in our previous estimates, either as to tonnage or grade. The ore reserves set up as of January 1st, 1938 are, therefore, arrived at by deducting the shipments during 1937 from the estimates of January 1st, of that year.

5. LABOR & WAGES:

a. Comments:

(1) Labor:

While there was more or less labor agitation in this district, especially during the spring and early summer months, no union demands were made on the officials of The Mesaba-Cliffs Mining Company and no labor unrest was noticeable among the men at the Canisteo Mine. Labor, both common and skilled, was ample at all times during the operating year. The employees at the Canisteo Mine organized the Western Mesaba Independent Union - Local No. 1, which has functioned and is now active.

b. Comparative Statement of Wages & Product:

Production:	
Direct,	None
Concentrates,	606,041 tons
Total Production,	606,041 tons.
Number of Days Operated, 2, 8-hour shifts per day:	127
Average Daily Product,	4,772
Average number of men working,	208
Average wages per day,	$ 6.40
Amount paid for labor,	$ 189,577.60

6. SURFACE:

a. Buildings, Repairs:

Only nominal repairs were made to the mine buildings and company dwellings at the Canisteo Mine during 1937.

It was not necessary to build any new structures, but the pumphouses were overhauled and the customary amount of general cleaning work was undertaken.

c. Tracks, Roads, Transmission Lines, etc:

The highways in and about the mine were given the usual attention, such as grading and dragging.

CANISTEO MINE
ANNUAL REPORT
YEAR 1937

6. SURFACE:
(Continued)

c. Tracks, Roads, Transmission Lines, etc: (Continued)

As the transmission line changes were completed during 1936, no work, other than maintenance was necessary here during 1937.

7. OPEN PIT:

a. Stripping:

Starting in the month of May and continuing through August, 59,478 cubic yards of silt, surface slough and painty material were removed during the process of mining from the area adjacent to the Snyder-Hemmens boundary and in the vicinity of the pump sump. Of this material removed, 33,168 yards were charged to the stripping account and 26,310 yards were absorbed in the direct mining cost. The 33,168 yards remained from the 1936 stripping program, while the 26,310 yards were handled in connection with pit drainage and were properly chargeable into mining operations. A part of this stripping job was accomplished week-ends and during shifts when ore operations were not in progress.

The regular fall stripping program was started October 25th and was conducted three 8-hour shifts, four days per week, until November 18th. A total of 114,783 yards of painty waste material was removed, the daily average being 6,685 yards. In preparing the estimate, a daily output of 6,000 yards was anticipated. The area stripped was along the South side of the pit, extending from Co-ordinate 2400-W to 3700-W. One cut was sufficient to remove the material from the West end, but the width was increased to the East in order to make available the maximum amount of Hemmens ore. The stripping area had been isolated by the 1937 ore operations and it was necessary to do considerable preliminary filling and grading across the pit bottom before stripping operations could be started. In addition to this preliminary work, the sump pumps had to be shifted in to the Hemmens pit bottom and the pipe lines re-arranged. All of this preliminary work was charged against the fall stripping and absorbed in the costs without raising them above the estimate.

The following tabulation shows the classification of material stripped during the year 1937:

Lease	Waste Material Cubic Yards	Lean Ore Cubic Yards	Surface Cubic Yards	Total Cubic Yards
Snyder,	102,563	-	-	102,563
Bovey,	-	2,760	4,075	6,835
Hemmens,	34,803	-	3,750	38,553
Total,	137,366	2,760	7,825	147,951

Of this material, 33,168 yards were removed in May, June and July and 114,783 yards during October and November.

In the first part of the year, the following stripping operation was in progress:

CANISTEO MINE
ANNUAL REPORT
YEAR 1937

7. OPEN PIT:
(Continued)

a. Stripping: (Continued)

	Hemmens Waste	Snyder Waste	Total	
May, ----------	8,578	-	8,578	Cu. Yds.
June, ----------	11,084	7,056	18,140	"
July, ----------	6,450	-	6,450	"
Total, --------	26,112	7,056	33,168	"

The fall stripping operations were started on October 10th and continued until November 18th, with the following results:

Lease	Clean-Up Cubic Yards	Waste Cubic Yards	Lean Ore Cubic Yards	Total Cubic Yards
Snyder,	-	95,507	-	95,507
Bovey,	4,075	-	2,760	6,835
Hemmens,	3,750	8,691	-	12,441
Total,	7,825	104,198	2,760	114,783

d. Timbering:

Statement of Ties Used:	Price	Amount
1,437 No. 1 Standard Green Tamarack Ties,	.90	$1,293.30
139 No. 2 Standard Dry Tamarack Ties,	.80	111.20
1,688 Undersize Green Tamarack Ties,	.5525	932.57
1,516 Standard Green Jack Pine Ties,	.8388	1,271.66
20 Standard White Oak Ties,	1.15	23.00
183 Standard Hemlock Ties,	1.00	183.00
4,983 Total and Average,	.7655	3,814.73
2 Standard Elm Switch Sets,	100.00	200.00
2 Total and Average,	100.00	$ 200.00
TOTAL ALL TIES, ----------		$ 4,014.73

f. Explosives, Drilling & Blasting:

Statement of Explosives Used:

KIND:	QUANTITY	PRICE	AMOUNT
60% DuPont Special Gel. 7/8 x 8	250 Lbs.	12.75	31.75
60% DuPont Special Gel. 3 x 10	27,250 Lbs.	13.00	3,542.50
60% DuPont Special Gel.1-1/8 x 8	100 Lbs.	11.50	11.50
25% DuPont Quarry Gel. 3 x 10	106,750 Lbs.	10.67	11,388.13
TOTAL AND AVERAGE,	134,350 Lbs.	11.14	$14,973.88

CANISTEO MINE
ANNUAL REPORT
YEAR 1937

7. OPEN PIT:
(Continued)

f. Explosives, Drilling & Blasting: (Continued)

Statement of Explosives Used:

KIND:	QUANTITY	PRICE	AMOUNT
30' No. 6 E.W. Caps,	1,850	.1208	223.55
40' No. 6 E.W. Caps,	600	.159	95.40
DuPont No. 6 E.B. Caps,	1,000	.0112	11.20
TOTAL AND AVERAGE,	3,450	.0957	$ 330.15
Connecting Wire No. 20,	50 Lbs.	.40	20.00
DuPlex Lead Wire,	250 Ft.	1.40	3.50
			23.50
TOTAL COST ALL EXPLOSIVES, ---------			$15,327.53

CHARGED TO DRILLING AND BLASTING: ORE OPERATIONS:

KIND:	QUANTITY	AMOUNT
60% DuPont Special Gel. 7/8 x 8,	250 Lbs.	$ 31.75
60% DuPont Special Gel. 3 x 10,	27,250 Lbs.	3,542.50
60% DuPont Special Gel. 1-1/8 x 8,	100 Lbs.	11.50
25% DuPont Quarry Gel. 3 x 10,	105,250 Lbs.	11,226.88
30' No. 6 E.W. Caps,	1,750	211.40
40' No. 6 E.W. Caps,	600	95.40
DuPont No. 6 E.B. Caps,	1,000	11.20
Connecting Wire,	50	20.00
DuPlex Lead Wire,	250	3.50
TOTAL CHARGES TO ORE OPERATIONS, ----------		$ 15,154.13

CHARGE TO DRILLING AND BLASTING - STRIPPING:

25% DuPont Special Gel. 3 x 10,	1,500 Lbs.	161.25
30' No. 6 E.W. Caps,	100	12.15
TOTAL CHARGES TO STRIPPING, ----------		$ 173.40

g. Open Pit Mining & Loading:

At the beginning of the ore operating season on the 12th of April, the No. 35 electric shovel was operated along the North side of the Snyder island in the mid-Snyder forty. The cuts ran Southwestward across the forty, mining to the South that area which had been stripped during the 1936 ore season. Loading at elevation 533 (Lake Superior datum), the cuts along the bank varied from 25 to 45 feet in height. During April and the first part of May, two full cuts were made along the entire area, mining to the stripping limits in the easterly part of the forty and leaving two full cuts along the

CANISTEO MINE
ANNUAL REPORT
YEAR 1937

7. OPEN PIT:
(Continued)

g. Open Pit Mining & Loading: (Continued)

high bank in the western half. The ore in this area was a very good Bessemer grade, with little rock, making an ideal operation as to mining and grading.

The No. 32 shovel was operated in the Snyder area, alternating between the low grade area of the island in the west end of the east Snyder forty and in the bottom area north of the island in the east end of the mid-Snyder forty during April and May. The mining along the island extended eastward about 500 feet from the forty line. Mining to elevation 532 (Lake Superior datum), the bank was about 30 feet in height. Two cuts were made along this area, working southward to the stripping limits, and mining a block of ore, which had been left from the previous season operations. The ore in this bank was a lean grade wash, with a low iron, high silica, low phosphorous content and a low weight recovery. There were several heavy rock layers which had to be cast aside and loaded out either on the night shift or on week-ends. To grade this ore it was necessary to mix it with that from the No. 35 shovel and also to shift the No. 32 shovel occasionally into a high grade area in the Snyder bottom to the north of the island. Operating at elevation 532 (Lake Superior datum), and with a 10 to 12 foot bank, an area about 400 feet long, east and west, and 150 feet wide, was mined out. This high grade ore was used for "sweetening" and was mined only as grading conditions required.

The No. 32 shovel was moved up to the North Bovey May 15th and mined out a deposit between the approach and the Bovey run-down. This area, about 500 feet by 250 feet, had been mined the previous year to a permissible depth, limited by a 3% track grade, which is the maximum over which heavy equipment could be operated. In order to mine the area to depth it was necessary either to construct a long, costly switch-back in to the rock horse, (involving approximately 40,000 yards of rock excavating), or find some other means of loading. A system of belt conveying was decided upon. A 200-foot stationary conveyor, with a 36" belt, a 65-foot portable conveyor, with the same size belt; a small steel loading bin and a 5-foot steel apron feed were used. The ore was loaded by the 4-yard shovel directly into the steel bin at the end of the portable conveyor, carried through the feeder onto the main conveyor and thence into the 30-yard dump cars spotted on the run-down. A grizzly was placed on top of the bin to scalp off the large rock chunks, which were later cast aside by the shovel. The bin feeder and small conveyor were shifted by the shovel, as the mining in the area progressed. This particular system being new in open pit mining, there were several minor changes and adjustments necessary during the first few weeks of operation. With these kinks ironed out, and considering the rocky nature of the ore handled, the system worked quite satisfactorily. The deposit was mined from 15 to 40 feet below the loading track, the ore body dipping to the Southeast. The deepest part was mined down to elevation 650 feet, (Lake Superior datum). The ore formation was very irregular,

CANISTEO MINE
ANNUAL REPORT
YEAR 1937

7. OPEN PIT:
(Continued)

g. Open Pit Mining & Loading: (Continued)

with numerous layers and chimneys of rock, which had to be cast aside and re-handled. The ore was a good grade non-Bessemer wash, with a good weight recovery. Due to the excessive amount of rock, the tonnage recovery from the area was disappointing, only 117,180 of the expected 125,000 tons being procured. The work in this area was completed early in August and the shovel moved to the bottom in the east end of the Snyder-Hemmens pit. The conveying system will again be used during the latter part of the 1938 ore season to mine the deeper layer of ore in the Hemmens deposit. With little or no rock to handle, this system can be used here to good advantage. There will also be numerous other places where the conveyor layout can be used to advantage at the Canisteo Mine in case the lease is renewed and operations conducted beyond 1938.

During the latter part of May and the first two weeks in June, the No. 35 shovel was moved to the east end of the pit to mine a deposit of wash ore overlying the paint rock along the Snyder-Hemmens boundary. This area was about 200 feet wide and extended 200 feet east and 400 feet west of the boundary. The ore varied in depth from 5 feet along the north side to 12 feet at the south. The mining was carried down to elevation 524 (Lake Superior datum). The ore was very wet and sticky and difficult to handle at the mill. The weight recovery was low. An excessive amount of track work was required, due to the short shallow cuts, and, as the deposit did not drain to the sump, special pumps were required to handle the water seeping in from the south banks. This operation was expensive for the tonnage secured, but it was necessary that this ore be removed ahead of the 1937 fall stripping, which made available additional Hemmens ore for 1938 extraction.

The No. 35 shovel was moved to the west half of the mid-Snyder forty the middle of June and mined the island area to the stripping limits. The ore was similar to that mined in this section at the beginning of the season. On completion of this work early in August, the machine was moved to the east end of the pit, where both the shovels were used in making a series of sinking cuts to provide a run-down across the North side of the east Snyder forty and bring the track grade down to an elevation of 519 feet (Lake Superior datum) at the Snyder-Hemmens boundary. A tail track at this elevation extended 300 feet west of the switch along the North bank of the island. Working eastward from the switch, another series of sinking cuts carried the track grade down to an elevation of 502 feet.

At the start of the second series of sinking cuts early in September, a cloud burst and an electrical storm occurred, cutting off the power and drowning the No. 35 shovel. The latter was in a small, deep sinking cut in the east end of the pit where the water rose 12 feet in a few hours. The shovel repairs made necessary by the flood were not completed until after the ore season, so it was necessary to operate with one electric shovel, augmented by such tonnage as the small gasoline shovel could load. In order to insure a crude ore supply

CANISTEO MINE
ANNUAL REPORT
YEAR 1937

7. OPEN PIT:
(Continued)

g. Open Pit Mining & Loading: (Continued)
under this arrangement, the afternoon shift at the mill was changed from the regular 3:00 to 11:00 shift to one running from 6:00 P.M., to 2:00 A.M., allowing a few hours between shifts for filling all the cars and the pocket with crude ore. This arrangement worked out in a satisfactory manner and the work went forward, the run-downs were completed and the small area in the Hemmens, at the east end of the pit, was mined down to elevation 490 feet (Lake Superior datum). The ore handled during the last two months was all a high grade wash, with a satisfactory weight recovery. There was considerable rock work in connection with the deep mining and for the most part, the rock was handled between shifts or during week-ends.

During the operating season 59,478 yards of paint rock, silt and waste ore were removed from the area adjacent to the Snyder-Hemmens boundary, 33,168 yards of which had been left from the 1936 fall stripping program. The remaining yardage was moved in connection with a new sump after the upper wash ore from this area had been mined. The greater part of the work was done with the gasoline shovel on the night shift, when ore activities were not carried forward.

k. Drainage:
During the fore part of the ore season the deeper cuts from the 1935 operations afforded sump capacity, but after the upper wash ore was removed from the South side of the pit in July, this area was deepened and a new sump provided. The pumps were shifted here temporarily and the deep ore was taken under the old sump. The pumps and pipe lines were then transferred to the old sump (now deepened). It should not be necessary to shift the pumps further until near the end of the 1938 ore season.

8. COST OF OPERATION:

a. Comparative Mining Costs:

	1937	1936
PRODUCT:	606,041 tons	1,009,880 tons
Average Daily Production,	4,772 tons	7,829 tons
Tons Per Man Per Day,	20.46 tons	24.98 tons
Days Operated,	127	129
COST:		
Open Pit Wash Ore,	$ .332	.216
General Pit Expense,	.081	.053
Concentrating,	.243	.141
General Mine Expense,	.111	.075
Cost of Production,	.767	.487

CANISTEO MINE
ANNUAL REPORT
YEAR 1937

8. COST OF OPERATION:

a. Comparative Mining Costs: (Continued)

	1937	1936
COST: (Continued)		
Depreciation, Plant and Equipment,	$ .304	$ .344
Amortization Stripping,	.259	.250
Taxes - Ad Valorem,	.119	.084
Taxes - Occupational,	.091	.070
Taxes - Royalty,	.068	.021
Total Cost at Mine,	1.608	1.256
Administrative & Miscellaneous Expense,	.112	.109
GRAND TOTAL, ----------	$ 1.720	$ 1.365
Budget Estimated Cost,	1.741	1.322
Increase over Budget,	.021	.043
Decrease,	.021	

The final figures have not been furnished by the Cleveland office and there may be some small adjustments to the above tabulation, but the costs per ton would only be effected to a slight degree.

d. Detailed Cost Comparison:

(1) Product:

In comparing the cost of operation for 1937 with that of 1936, the wage increases effecting the 1937 expenses are of prime importance. There was an increase of approximately 10% in wages, effective November 16th, 1936 and a second boost of approximately 15% put into effect March 16th, 1937. Further than this the payment of 50% increase in wages for all overtime (over eight hours in any twenty-four, or forty hours in any one week), resulted in increasing the average hourly rate at the Canisteo Mine by $.039 during the year 1937. The cost per ton for 1937 was increased by $.0203, as the result of overtime payments.

The character of the ore mined and treated during 1937 was about the same as for 1936, but mining conditions were less favorable and the output was lower by approximately 400,000 tons. Progress with the conveyor system of mining in the deep North Bovey deposit and the difficulties encountered with the mining of the wet ore and drainage problems in the vicinity of the Snyder-Hemmens boundary workings effected the 1937 costs adversely from a comparative standpoint.

The total cost at the mine, including Administrative and Miscellaneous Expense, was $.355 per ton over that for the previous year, but was $.021 under the revised budget. This decrease from the budget figure, however, was the result of a lowering of the cost per ton for Taxes of over $.04.

CANISTEO MINE
ANNUAL REPORT
YEAR 1937

8. COST OF OPERATION: (Continued)

d. Detailed Cost Comparison: (Continued)

(2) Open Pit Mining:

There was an increase of $.116 per ton in the 1937 costs under this caption, as compared to 1936.

All items under the heading showed an increase, due to the large bump-up in wages for 1937 and the less advantageous mining conditions prevailing. The 1937 cost per ton was $.014 over the budget and this was the result of extraordinary expenses incurred in connection with the pit flooding the fore part of September.

The decrease of approximately 400,000 tons in the 1937 production, as compared with 1936, also effected the 1937 costs adversely. Such items as Pumping and Track Work are decidedly effected by the total tonnage produced, as also our repair charges and General Winter Expense.

The higher cost in connection with the mining of the deep ore with the conveyor system and the Snyder pit drainage problems also were important factors in effecting an increase in the 1937 costs over those for the previous year.

(3) General Pit Expense:

There was an increase of $.004 per ton in 1937, as compared with 1936, for this heading, the reduced tonnage being largely responsible for the condition.

Pumping and Drainage showed an increased cost of $.015 per ton; General Open Pit Expense $.004; Open Pit Superintendence $.003 and Stockpiling Lean Ore $.002, due mostly to the reduced 1937 tonnage. These higher costs were partly off-set by the reduction of $.021 per ton in Structural Drilling. The anticipated drilling for 1938, to be charged against the ore production, should be about in line with that for 1937.

(4) Concentrating:

The 1937 increased cost of $.072 to this caption was due largely to the higher wages effective throughout that year; the interrupted car service at the washer and the overtime payments. The Concentrating Cost was very close to the budget, however, being $.002 per ton under the estimate.

Transportation to Mill was $.03 per ton higher in 1937, the result of increase in wages.

The 1937 Washing Expense was $.015 per ton over that for 1936 and the higher rate of wages was responsible for this situation.

The advance of $.008 in the Power cost per ton, as compared with 1936, was due to the less favorable load factor, the mill being operated three 8-hour shifts, six days per week in 1936, whereas only two 8-hour shifts, five days per week were worked during 1937.

CANISTEO MINE
ANNUAL REPORT
YEAR 1937

8. COST OF OPERATION: (Continued)

d. Detailed Cost Comparison: (Continued)

(4) Concentrating: (Continued)

The charges to General Maintenance of Buildings; Pumps and Pipe Line and Tailings Basin Dyke were all nominal each year, but Maintenance of Machinery showed an increased cost of $.015 for 1937. The repairs were somewhat more extensive in 1937 and wages were considerable higher.

(5) General Mine Expense:

General Mine Expense for 1937 was $.036 per ton above that for 1936, but it was within $.007 per ton of the budget.

The increase in wages during 1937 and the proportionately higher charges to the lower output for such items as Ishpeming, District and Mine Offices, together with the additional expense of Social Security payments - was responsible for the increased cost. The expense of a Safety Department was also added during 1937.

9. EXPLORATIONS AND FUTURE EXPLORATIONS:

The structure drilling program undertaken in 1937 was very much less extensive than during the past several years.

Two drill rigs were engaged for a period of about eight weeks, during the months of September and October, in outlining the Southerly extension of the North Bovey ore channel. Only five holes were put down for a total of 224 feet, as compared with thirty-eight holes, showing 4,106 feet in 1936.

With the possible exception of some sample hole drilling for grading purposes, no structural drill work is contemplated in 1938.

10. TAXES:

The following statement shows the Canisteo Mine taxes and average rates for the years 1936 and 1937:

Statement of Taxes:	1937	1936	Increase	Decrease
Canisteo Mine,	$ 66,811.80	$79,227.21	-	12,415.41
Washing Plant Lands,	2,875.05	2,792.70	82.35	-
Personal Property,	2,760.71	2,044.41	716.30	-
Total,	$ 72,447.56	$84,064.32	-	11,616.76
Village Lots,	205.22	199.95	5.27	-
GRAND TOTAL,	$ 72,652.78	$84,264.27		$11,611.49
Average Tax Rate,	.869	.846	.023	

The increase in the Personal Property account was due to the transfer of equipment from the Holman-Cliffs Mine to the Canisteo.

While the tax rate in this district was increased by $.023, the mine tax showed a decrease in the amount of $12,415.41, as the result of deducting shipments for the year 1936 and no increase in the ore reserves on the part of the State Tax Commission.

CANISTEO MINE
ANNUAL REPORT
YEAR 1937

11. ACCIDENTS AND PERSONAL INJURY:

There was but one lost-time accident during 1937, a very good record. There were seven lost-time accidents in 1936, one of which was a fatality.

A description of the 1937 accident follows:

NAME: Ambrose Hoey DATE: November 11,1937.
CAUSE: Hoey, together with the brakeman on Locomotive No. 104 were in the act of putting the locomotive back on the track by means of using camel-backs. The locomotive was off the track in a mud hole, the tracks being cribbed up in this particular spot. There being about three feet of mud on either side of the track, the men were attempting to bring the camel-back around the opposite side of the locomotive by way of the locomotive running board, thence across the pilot beam and around the other side to a point just ahead of the ash pit. It was the plan to take the camel under the locomotive and place it on the ties, preparatory to pulling the machine back on. The camel-back was placed on the pilot beam temporarily and in some way fell off onto Hoey's foot.

NATURE: Fracture simple of second phalanx left great toe. Contusion and hematoma present.

TIME LOST: Not returned to work as of December 31st, 1937.
COMPENSATION: $ 140.00.

12. NEW CONSTRUCTION: AND PROPOSED NEW CONSTRUCTION:

There was no new construction undertaken at the Canisteo Mine during 1937 and none is contemplated for 1938.

13. EQUIPMENT AND PROPOSED EQUIPMENT:

A belt conveyor system was installed during April and May in the North Bovey pit for use in connection with the mining of a deep pot-hole of ore. This outlay consisted of a main conveyor, 200 feet long, with a 36" belt and a cross-conveyor, 65 feet in length, with a 36" belt. The cross belt is shifted as loading conditions require. A steel bin, equipped with an apron feeder for handling the ore from the shovel to the bin, on to the cross conveyor constitutes the balance of the equipment used in this installation. The ore is fed into the 30-yard cars directly from the 200 foot conveyor. The equipment was dismantled when the North Bovey deposit was mined out. It is stored in the pit and will be re-assembled and utilized in connection with the Hemmens ore operation during the latter part of the season of 1938.

CANISTEO MINE
ANNUAL REPORT
YEAR 1937

14. MAINTENANCE AND REPAIRS:

As the result of the heavy ore schedule during the year 1936, the pit and washing plant equipment required more than the ordinary repairs and the winter program was consequently more extensive than usual.

Locomotives Nos. 104 and 105 were thoroughly overhauled, while Nos. 17, 105, 148, 152 and 156 were put through the shops and all worn parts repaired and adjusted. Work on the locomotives consisted of inspecting boilers; re-jacketing and renewing stay bolts where necessary; rattling and re-tipping flues; repairing fire boxes; replacing worn-out driver tires; renewing hub liners and crown brasses and overhauling spring rigging - also the running gear.

A total of 23 cars were put through the shops during the winter months of 1937. The trucks were checked over and all worn journal boxes and brasses were replaced; broken springs and center castings removed; the air dumping equipment checked over and also damaged parts, such as dump boxes, grab irons and steps, straightened and repaired.

The two structural and two blast hole drills were overhauled and the necessary repairs made, including the straightening of the hinge pins, replacing worn bushings and replacing worn-out parts of the crawler mechanism. One of the structural outfits was transferred to the Hill-Trumbull Mine.

The track shifter and locomotive crane were checked over and given the necessary light repairs.

The two electric shovels, Nos. 32 and 35 - were given a complete overhauling and the necessary repairs made. The crawling mechanism was built up and re-bushed; the hoisting and swing equipment adjusted; the booms and dipper sticks checked over and repaired; all motors inspected, repaired and worn bushings, pins and gears replaced. The crawler pads were built up and the link pin holes were rebored and fitted with larger sized pins.

The gasoline shovel was overhauled, with general repairs to the engine and the drums.

Two flat cars were put through the shops and the necessary light repairs made.

In the electric shop, the shovel cables were carefully inspected and vulcanized where excessive wear made it necessary. All motors from the electric shovels, power drills, haulage locomotives and washing plant were inspected and repaired. The pump and shop motors were also overhauled.

CANISTEO MINE
ANNUAL REPORT
YEAR 1937

14. MAINTENANCE AND REPAIRS: (Continued)

Washing Plant Repairs:

The repair work at the washer, which had been started during the fall months of 1936, was continued throughout January, February and March.

The rollers on the 36" conveyor were cleaned, greased and a few replacements made.

The 8-ft. pan conveyor was practically rebuilt; new wearing plates were put in place; the pins removed, new hinges welded on and new hinge pins and caps provided.

The log paddle shanks were built up; shafts reassembled and riveted; the head ends were machined and installed; reinforcing plates welded to the head castings, which had been drilled for lubrication and straps were riveted on to the paddle shafts for reinforcing purposes.

A new deck and screen cloth was installed on the 5' x 14' screen.

The 10" pipe line, leading from the dewatering log screens to the classifiers was lined with chilled steel castings.

To lighten the load on the log washers, by-passes from the lower deck of the 5' x 14' Screen and the 4' x 6' Screens, were installed.

New bearings were provided for the 42" jaw crusher and the secondary crushers were rebabbitted and repaired.

The various pockets and chutes, including the crude ore pocket, were relined with new plate where necessary.

18. NATIONALITY OF EMPLOYEES:

NATIONALITY:	NO. MEN 1937	NO. MEN 1936
American,	161	245
Jugo-Slav,	14	28
Finnish,	16	22
Italian,	7	9
Swedish,	5	6
Bulgarian,	2	6
Austrian,	5	4
Canadian,	3	4
Norwegian,	3	4
French-Canadian,	1	4
Irish,	-	2
Dane,	2	2
Montenegrin,	2	2
English,	-	1
Macedonian,	-	1
Belgian,	1	1
German,	1	1
Russian,	1	1
TOTAL,	224	343

CANISTEO MINE
ANNUAL REPORT
YEAR 1937

19. WASHING PLANT OPERATIONS:

The Canisteo washer was operated 127 days during the season of 1937, which extended from April 12th to October 8th. For the most part the schedule carried forward was two 8-hour shifts, five days per week. Depending on the boat requirements, the operations in some instances were conducted four days per week and on others - six days per week. This situation was exceptional, however.

The operation at the mill was quite satisfactory on the whole, although during the early part of the season difficulty was encountered with frozen chunks and wet ore, the sticky material from the bottom of the Snyder pit slowed down the permissible feed during September and October and the shortage of Great Northern cars effected the output at times.

The washing machinery held up well during the season, most of the serious delays resulting from clogged feeds; inadequate car supply and power failure.

The anticipated output for each two 8-hour periods was 5,000 tons of concentrates, which compared with 4,772 tons realized.

The amount and analysis of the plant rejects for 1937 were as follows:

	5-FT. PAN REJECTS			
Lease	Tons	Iron	Phos.	Silica
Snyder,	22,740	29.70	.038	51.73
Bovey,	11,127	30.48	.130	50.37
Hemmens,	5,286	30.87	.057	49.62
Total,	39,153	30.08	.067	51.06
	36" BELT REJECTS			
Snyder,	2,608	25.79	.036	57.07
Bovey,	1,326	25.46	.117	57.18
Hemmens,	603	25.41	.048	57.57
Total,	4,537	25.64	.061	57.17

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

Lease	Cu. Yds.	Tons	Iron
Snyder,	16,710	25,065	31.86
Bovey,	1,980	2,970	32.18
Hemmens,	17,130	25,695	31.37
Total,	35,820	53,730	31.64

CANISTEO MINE
ANNUAL REPORT
YEAR 1937

19. WASHING PLANT OPERATIONS: (Continued)

During mining operations, 1,780 cubic yards of Snyder; 1,310 cubic yards of Bovey and 1,626 cubic yards of Hemmens surface clean-up were handled and placed on the waste dump.

The tonnage and iron unit recovery realized in the treatment of Canisteo ore during 1937, was as follows:

Lease	Tonnage	Iron Unit
Snyder,	59.26%	80.37%
Bovey,	68.13%	82.13%
Hemmens,	63.74%	83.60%
Total,	61.55%	81.25%

The analyses of the product from the several machines for the year 1937 was:

SNYDER MILL MACHINES:

	Iron	Phos.	Silica
Log Washer, ----------	58.55	.056	9.59
Classifier, ----------	56.82	.047	12.26
Tailings, ----------	20.53		

BOVEY MILL MACHINES:

Log Washer, ----------	57.98	.089	9.87
Classifier, ----------	56.33	.077	12.29
Tailings, ----------	22.55		

HEMMENS MILL MACHINES:

Log Washer, ----------	58.53	.071	9.68
Classifier, ----------	57.23	.060	11.50
Tailings, ----------	21.42		

The following is the concentrating data for the Canisteo Mine during the year 1937:

	Cu.Yds.	Tons	Percentage of Total Mined	Analysis Iron Dried	Concentrate Recoveries Made From Tons	Concentrate Recoveries Made % Iron
Material removed in mining operations, (exclusive of surface)	579,579	1,077,532	100.00	42.48		
Less lean ore stocked (in mining)	-	-	-	-		
	579,579	1,077,532	100.00	42.48		
Less pit rock wasted, -	35,820	53,730	6.18	31.64		
Total transported to mill, -	543,759	1,023,802	93.82	43.33		

CANISTEO MINE
ANNUAL REPORT
YEAR 1937

19. WASHING PLANT OPERATIONS: (Continued)

	Cu. Yds.	Tons	Percentage of Total Mined	Analysis Iron Dried	Concentrate Recoveries Made From Tons	Concentrate Recoveries Made % Iron
Total transported to mill - forward,	543,759	1,023,802	93.82	43.33		
Less rock rejects (crusher house) -	26,102	39,153	4.50	30.08	____	____
Total Crude Ore to washing plant, -	517,657	984,649	89.32	43.86 *	____	____
Concentrates,		606,041	56.24	57.90	61.55	81.25
Mill rejects on mill picking belts,	3,025	4,537	.42	25.64		
Tailings (by deduction) -		374,071	34.72	20.56		
Total rock and lean ore from above,		92,883	8.62	30.98		

(*) Actual survey after all removals and shipments were completed. Quarterly reports are estimated.

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1937.

1. GENERAL:

During the first four months of the year the watchmen were engaged on a part-time basis, so as to care for the maximum number of old employees. From May 1st, until the end of the year, the regular watchmen were employed on a full-time basis, as the Canisteo and Hill-Trumbull were active in mining and stripping operations.

The A. Guthrie Company scrapped and removed their track shifter during the month of May.

There were no brush fires of moment during 1937 and the watchmen did not report any irregularities of consequence.

The Oliver Iron Mining Company did not dispose of any dwellings in Taconite during the past year and there are still fifty-seven houses, which we are maintaining according to agreement.

As a result of the more than usual precipitation in 1937, the water level in the pit was raised several feet during the summer months. With normal conditions prevailing during 1938, this water level should be somewhat reduced as the result of seepage and evaporation.

4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:

Assumption: 16 Cubic Feet per ton for Wash Ore.

A rock deduction of 10% was made generally and in estimating a part of the deposit the deduction was increased to 20%, due to the exceptionally rocky condition of this ore.

No exploratory work was undertaken at the Holman-Cliffs group of properties during the past year and there was, therefore, no occasion for making any re-estimates.

The tonnage listed below is on a concentrated basis and is figured on a 60% gross recovery:

Brown No. 1:		
Non-Bessemer Concentrates, ----------	1,126,196	tons.
Holman:		
Non-Bessemer Concentrates, ----------	2,798,873	"
Brown No. 2:		
Non-Bessemer Concentrates, ----------	1,891,533	"
TOTAL HOLMAN-BROWN, ----------	5,816,602	"
North Star:		
Non-Bessemer Direct, ----------	80,103	"
Bessemer Concentrates, ----------	538,083	"
Non-Bessemer Concentrates, ----------	101,891	"
TOTAL NORTH STAR, ----------	720,077	"

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1937

4. ESTIMATE OF ORE RESERVES: (Continued)

a. Developed Ore: (Continued)

Bingham:

Bessemer Direct,	269,664	tons.
Non-Bessemer Direct,	329,590	"
Bessemer Concentrates,	1,198,361	"
Non-Bessemer Concentrates,	590,238	"
TOTAL BINGHAM,	2,387,853	"
TOTAL BINGHAM-NORTH STAR,	3,107,930	"
GRAND TOTAL HOLMAN-CLIFFS MINE,	8,924,532	"

b. Prospective Ore:

Additional drilling in the Southerly and Southeasterly portions of the Holman forty is quite likely to result in proving up additional deep ore of treatable character. The possibilities of additional ore in the Brown-North Star or Bingham lands is rather remote, as the ore bodies in these properties have been pretty well outlined.

6. SURFACE:

a. Buildings, Repairs:

A joint inspection was made with the Oliver Iron Mining Company officials during the month of July and the necessary up-keep work on the Taconite houses was decided upon for the year 1937.

The annual repairing and painting jobs were started the last week in August. A force of four painters and a carpenter crew of from four to seven men were employed, working somewhat intermittently, until the latter part of October, when weather conditions became somewhat trying for outside work. Two painters spent the balance of the year on interior work. The carpenter crew was engaged at the Hill-Trumbull Mine during November, but spent ten days in December at Taconite, finishing outside foundation jobs and repairing windows, doors and porches.

The following statement shows the houses by number; the occupants, together with the nature and cost of repairs in each case. The mine buildings were put in shape during 1936 and did not require repairs in 1937:

Ho.No.	Name of Occupant:	Repair work done:	Cost
11	Peter Baril,	Plumbing, new flush tank, etc.,	$ 31.73
14	George Dunstan, Sr.,	Plumbing, new water line to house,	155.52
16	Hughbert Leitch,	Repairs to foundations, windows, sink, plumbing, exterior painting, plastering,	251.16
17	Allen Shegrud,	Repairs to windows - plastering,	25.45

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1937

6. SURFACE:
(Continued)

a. Buildings, Repairs: (Continued)

Ho.No.	Name of Occupant:	Repair work done:	Cost
39	A. W. Jenkins,	Repair windows, doors, screens,	$ 21.36
40	T. J. O'Brien,	Exterior painting, porch,	16.14
41	Mrs. A. L. Sundquist,	Plumbing repairs,	6.21
43	Lee Poore,	Exterior painting, new window; interior painting, new floors; plumbing repairs, plastering, new upstairs floors,	134.77
44	B. P. Axford,	Plastering,	19.20
45	Edwin Gustason,	Plastering,	23.36
46	Russell Wivell,	Plastering; interior painting and papering,	97.92
48	William Hanson,	Interior painting; roof repairs,	207.13
50	Mrs. Dan McKinnon,	Plastering,roof repairs,	20.52
51	Oscar Engstrom,	Repairing outside water line, plastering,	140.32
53	Claude Winkleblack,	Repair foundations; porch; siding;cellar;exterior painting;plumbing repairs; chimney repairs; new roof material,	619.97
55	Raymond DeShaw,	Plumbing repairs,plastering; repairs to windows; interior painting;electric wiring,	197.86
56	Grant Hess,	Plumbing; plastering -	17.39
57	August Mergle,	Plumbing;plastering; new floors upstairs;interior painting,	327.64
58	Russell Barkla,	Exterior painting;screen porch,	2.29
59	George Beasley,	Exterior painting;storm windows; plastering,	58.44
60	W. F. LeClair,	Plastering;interior painting; roof repairs,	164.52

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1937.

6. SURFACE:
(Continued)

a. Buildings, Repairs: (Continued)

Ho.No.	Name of Occupant:	Repair work done:	Cost
61	John Laine,	Repair doors; storm windows; plastering,	$ 48.62
63	Matt Dosser,	Plumbing, repairs to doors, windows;interior painting,	27.58
64	Vincent Soleture,	Repair rear house shed, and doors;exterior painting,	62.87
65	Edwin Johnson,	New roof;repairs; new kitchen floor;doors,sink, interior painting, new floor,	127.13
67	Pat Maney,	Repairs to plumbing, plastering,	19.75
68	George Lee,	Plastering;interior painting,	95.20
69	Arnold Lawson,	Plastering; interior painting,	184.00
70	Ambrose Hoey,	Cellar door;window repairs; plastering;interior painting,	130.43
72	Martin Fleisher,	Plank,	6.27
73	George Dunstan, Jr.,	Repair steps;floors;plastering;interior painting,	108.11
78	Mrs. James McNeven,	Repair foundations;porch; floors;doors, etc. Exterior painting;plumbing,	443.26
79	John Winkleblack,	Repairs to windows;doors; interior painting;plastering,	131.53
81	Lloyd Wetherell,	Roof repairs,	5.76
97	William Saw,	Plumbing, new flush tank,	18.23
102	Myron Youngberg,	Exterior painting; second coat; repairs to windows; new screen porch,	110.40
105	Dan Chamberlain,	Plumbing,	6.36

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1937

6. SURFACE:
(Continued)

a. Buildings, Repairs: (Continued)

Ho.No.	Name of Occupant:	Repair work done:	Cost
106	William Ryser,	Repairs to windows - plastering,	$ 38.08
107	Albert Embury,	Repair foundations;siding; windows;doors;new roof; plumbing;exterior painting-interior painting;plastering,	742.36
116	Carl Eggebraaten,	Repair foundation;windows; doors;exterior painting; second coat;	335.35
155	George Sullivan,	Plastering;interior painting, one room,	33.04
156	Lee Farr,	Repair windows; new storm doors,	20.94
157	J. W. Mattson,	Heating plant, new furnace,	306.00
158	W. S. McComber,	Plumbing and furnace repairs; plastering;interior painting, two rooms and woodwork,	90.35
5	Harry Hart,	Electric wiring,	2.33
10	Harley Point,	New outside upstairs; porch and stairs; window and door repairs,	208.77
		Carpenter labor - estimating cost of repairs,	33.58
		Carpenter foreman - traveling expense,	22.92
		Painter labor - Estimating cost of repairs,	19.08
		Mason labor - Estimating cost of repairs,	3.04
		GRAND TOTAL COST OF REPAIRS, YEAR 1937, -	$ 5,920.24

The following statement shows the rent collections made from the occupants of the Taconite houses for the year 1937:

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1937.

6. SURFACE:
(Continued)

a. Buildings, Repairs: (Continued)

MONTH	HOLMAN-CLIFFS PAYROLL	CANISTEO PAYROLL	HILL-TRUMBULL PAYROLL	GENERAL ROLL	CASH REMIT.	TOTAL
January,	51.50	266.50	130.50	27.00	92.00	567.50
February,	51.50	266.50	130.50	27.00	111.00	586.50
March,	51.50	266.50	116.00	27.00	91.00	552.00
April,	33.00	325.00	203.00	27.00	120.50	708.50
		54.00	83.00			137.00
May,	40.00	303.00	343.00	53.00	141.50	880.50
June,	40.00	295.00	343.00	53.00	175.50	906.50
July,	40.00	266.00	324.00	53.00	94.50	777.50
August,	40.00	268.50	280.00	53.00	134.75	776.25
September,	30.00	264.00	267.00	63.00	130.50	754.50
October,	30.00	261.17	254.00	63.00	139.50	747.67
November,	30.00	259.50	254.00	63.00	76.00	682.50
December,	30.00	49.00	228.00	63.00	120.00	490.00
TOTAL,	$ 467.50	3,144.67	2,956.00	572.00	1,426.75	8,566.92

Less rent from washing plant caretaker's house - (owned by The Mesaba-Cliffs Mining Company) - - - - - $ 120.00

GRAND TOTAL COLLECTIONS, YEAR, 1937 - - - - - - - - - - $8,446.92

With the rental collections of $8,446.92 for the year 1937, the repair cost of $5,920.24; taxes $1,081.34 and the estimated insurance - $270.00, there would be revenue in excess of expenses amounting to $ 1,175.34. This compares with a $528.42 excess for the year 1936. The Oliver Iron Mining Company rental for the year 1937 amounts to $ 4,000.00, whereas such rental was waived in the year 1936.

10. TAXES:

The following statement shows the taxes and average rate for the Holman-Brown, Bingham and North Star Mines, together with the Holman-Cliffs auxiliary lands; Bingham-North Star washing plant lands; Holman-Brown lands; Holman-Cliffs shops and Holman-Cliffs personal property for the years 1936 and 1937:

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1937

10. TAXES:
(Continued)

Statement of Taxes:

	1937	1936	Increase	Decrease
Holman-Brown Mine,	$ 39,840.85	38,235.06	1,605.79	
Bingham Mine,	15,644.22	15,013.68	630.54	
North Star Mine,	8,330.30	7,994.55	335.75	
Holman-Cliffs Aux.Lands,	2,673.00	2,474.70	198.30	
Bingham-North Star Washing Plant Lands,	42.71	39.53	3.18	
Holman-Brown Lands,	21.81	20.18	1.63	
Holman-Cliffs Shops,	221.68	217.39	4.29	
Holman-Cliffs Personal Property,	570.55	1,809.34	-	1,238.79
TOTAL, ----------	$ 67,345.12	65,804.43	1,540.69	-
Rented Buildings,	811.34	778.64	32.70	-
GRAND TOTAL, ---------	$ 68,156.46	66,583.07	1,573.39	-
Average Tax Rate,	.867	.831	.036	

While the personal tax item shows a decrease of $1,238.79, due to the transfer of equipment to the Canisteo Mine, the Ad Valorem taxes were increased to an extent more than offsetting this, resulting from the increase in the tax rate for the Taconite District.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1937

1. GENERAL:

The work of preparing this property for a resumption of mining activities, which had been started in the fall of 1936, was continued intensively until May 3rd. Less essential repair jobs were completed during the balance of the year as they could be worked in with the regular force.

The shop men were engaged on equipment repairs from January 4th to May 3rd; the washing plant overhauling was started March 1st and track conditioning got underway March 26th.

The structure drilling campaign was started on April 7th and clean-up work in the pit - April 28th.

Direct ore operations were inaugurated in the Hill pit on April 26th, four shifts being worked during that month. Wash ore activities were begun May 3rd in the Trumbull pit, the regular working schedule consisting of two 8-hour shifts, five days per week. Ore operations were completed on October 15th, with the exception of stockpile loading.

The direct ore produced during 1937 amounted to 201,982 tons and the 606,143 tons of concentrates were secured from a treatment of 952,417 tons of crude ore. The ratio of direct to concentrates produced was very close to the estimates set up at the beginning of the ore season.

Stripping activities during the year were confined to the fall months and extended from October 18th to December 4th. The 120 electric shovel was engaged in loading out the lean waste material to the West of the approach and the cretaceous substances at the East end of the Hill pit, while the 350-ton steam shovel was employed in removing the lean waste ore from the area just East of the main approach. Two 8-hour shifts, five days per week were in effect during the stripping program.

2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production by Grades:

Hill Crude, ----------	10,999	tons
Trumbull Crude, ----------	941,418	"
TOTAL CRUDE, ----------	952,417	"
Hill-Bessemer Direct Shipping Ore, ----------	6,331	"
Hill-Non Bessemer Direct Shipping, ----------	151,055	"
Hill-Non-Bessemer Concentrates, ----------	7,885	"
Trumbull Bessemer Direct Shipping, ----------	2,121	"
Trumbull Non-Bessemer Direct Shipping, ----------	42,475	"
Trumbull Bessemer Concentrates, ----------	113,186	"
Trumbull Non-Bessemer Concentrates, ----------	485,072	"
TOTAL SHIPPING GRADE, ----------	808,125	"

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1937

2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

b. Shipments:

The shipments from the Hill-Trumbull Mine during 1937 was the tonnage shown under the production statement, as all ore mined was forwarded to Lake Erie ports.

c. Stockpile Inventories:

There were 59,766 tons of Trumbull Non-Bessemer Concentrates placed in stock during 1937, but this tonnage was all shipped to dock before the end of the season; therefore, no tonnage of merchantable ore was left in stock December 31st, 1937. The following amount of lean material is now in stock:

Concentrating material above 25%:

	Tons	Iron	Phos.	Silica
Hill,	30,961	29.64	.038	51.36
Trumbull,	169,135	27.56	.032	54.88
Total,	200,096	27.88	.033	54.34

Non-Concentrating Material above 35%:

	Tons	Iron	Phos.	Silica
Hill,	86,350	48.55	.087	21.53

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	TRUMBULL	TOTAL
May,	753	153,607	154,360
June,	3,294	149,321	152,615
July,	2,292	181,919	184,211
August,	2,123	176,940	179,063
September,	2,537	192,546	195,083
October,	-	87,085	87,085
TOTAL 1937,	10,999	941,418	952,417

(2) Concentrates & Direct Ore:

MONTH	HILL DIRECT	TRUMBULL DIRECT	HILL CONCTS.	TRUMBULL CONCTS.	GRAND TOTAL
April,	4,303	-	-	-	4,303
May,	17,788	16,860	461	98,630	133,739
June,	12,228	6,078	2,218	95,704	116,228
July,	30,432	9,573	1,764	114,808	156,577
August,	45,597	2,905	1,576	113,581	163,659
September,	35,510	9,180	1,866	123,098	169,654
October,	11,528	-	-	52,218	63,746
November,	-	-	-	219	219
TOTAL 1937,	157,386	44,596	7,885	598,258	808,125

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1937

2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

f. Ore Statement:

All material considered as ore that was mined during 1937, was shipped from the property.

g. Delays:

Date:	Time Lost Hours	Minutes	Cause:
May 4th,	2		Tar and rust in spray pipes and valves - clogging.
5th,	2		Secondary crusher classifier plugged.
10th,	1		Revolving screen water line plugged.
24th,	4		Derailment in pit.
25th,	3	30	Plant working one side only, account broken log bearing.
June 10th,	2		Derailment on main line.
28th,	1	30	One log plugged.
July 28th,	1	30	Short circuit in compensator of pump motor.
Aug. 6th,	1	30	Repairing log washer.
16th,	3		Broken arm on classifier.
23rd,	3		Main water pipe line to plant broken.
28th,	1	40	Power off - due to electric storm.
29th,	2		Brake rigging of hoist drum stuck.
30th,	1	45	Power off.
Sept.13th,	1		Broken roller on 8-ft. conveyor and moving shovel.
30th,	4		Derailment in pit.
Oct. 5th,	4		Derailment in pit.
7th,	2		Belt slipping on stacker - repairing log-chute under vibrating screen plugged.
8th,	1	30	Broken hoist cable on shovel.
13th,	1	30	Power off.
28th,	1	55	Power off.
Total,	46	20	

Delays Account no Cars:

There was a total delay of 34 hours and 15 minutes on account of inadequate car supply. This delay covers the period from May 3rd to June 23rd, inclusive, as on June 24th the stacker was placed in operation. If the stacker had not been provided there would have been further delays account of car service during the balance of the season of 186 hours .05 minutes, which would have affected costs and operating plans to a decided extent.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1937

3. ANALYSIS:

a. Mine Analysis of Production & Shipments:

	Tons	Iron	Phos.	Sil.	Mang.	Alu.	Moist.	Fe. Nat.
Hill Bess.Direct,	6,331	60.85	.044	9.53	.18	.93	8.87	55.45
Hill Non-Bess.Direct,	151,055	59.51	.057	9.58	.11	.85	8.29	54.58
Hill Non-Bess.Concts.	7,885	60.30	.061	6.02	.16	.60	7.89	55.54
Trumbull Bess.Direct,	2,121	56.35	.041	13.19	.11	.49	9.60	50.94
Trumbull Non-Bess.Direct,	42,475	56.82	.054	11.76	.11	.63	8.94	51.74
Trumbull Bess.Concts.	113,186	59.14	.040	6.98	.12	.41	7.71	54.58
Trumbull Non-Bess.Concs.	485,072	59.24	.050	6.88	.11	.43	7.10	55.03
TOTAL 1937,	808,125	59.17	.050	7.69	.11	.52	7.53	54.71

d. Average Analysis of Crude Ore Production:

	Tons	Iron	Phos.	Silica
Hill Crude,	10,999	49.97	.054	21.58
Trumbull Crude,	941,418	41.25	.037	35.19
TOTAL 1937,	952,417	41.35	.037	35.03

e. Composite Analysis of Season's Shipments:

	Iron	Phos.	Sil.	Mang.	Alu.	Lime	Mag.	Sul.	Loss
Hill Bess.Direct,	60.80	.043	9.55	.18	.88	.12	.10	.008	2.15
Hill Non-Bess. Direct, -	59.50	.056	9.60	.10	.82	.16	.12	.008	4.00
Hill Non-Bess. Concts. -	60.30	.061	6.00	.14	.58	.12	.10	.008	6.70
Trumbull Bess. Direct, -	56.30	.042	13.10	.11	.48	.14	.14	.011	5.35
Trumbull Non-Bess.Direct,	56.80	.054	11.70	.10	.60	.14	.10	.010	6.00
Trumbull Bess. Concts. -	59.10	.041	7.05	.12	.40	.16	.14	.011	7.35
Trumbull Non-Bess.Concts.	59.20	.049	6.80	.09	.42	.12	.14	.014	7.70

4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:

Hill Mine:

Assumption: 13 Cu. Ft. per ton for Direct Ore.
17 Cu. Ft. per ton for Wash Ore.
A rock deduction of 10% was made in the case of the Direct Ore and Wash Ore and 35% for the Rocky Wash. Concentrates are figured on 65 per cent gross recovery. No exploratory or development activities were undertaken during the year 1937 and the reserve estimates are the same as reported a year ago; less shipments made during 1937:

Hill Bessemer Direct Shipping, ----------	626,118	tons.
Hill Non-Bessemer Direct Shipping, ----------	981,145	"
Hill Bessemer Concentrates, ----------	291,226	"
Hill Non-Bessemer Concentrates, ----------	381,438	"
TOTAL HILL ORE, ----------	2,279,927	"

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1937

4. ESTIMATE OF ORE RESERVES: (Continued)

a. Developed Ore: (Continued)

Trumbull Mine:

Assumption: Grade	Rock Deduction	Cu.Ft. Per Ton	Recovery
Merchantable Ore,	10%	13	-
Wash Ore,	10%	14	62%
Lean Wash,	10%	14	50%
Low Grade Wash,	10%	15	60%
Lean Low Grade Wash,	10%	15	50%
Rocky Wash,	20%	14	62%

Trumbull Bessemer Direct Shipping, ----------	62,252	tons.
Trumbull Non-Bessemer Direct Shipping, ----------	111,988	"
Trumbull Bessemer Concentrates, ----------	907,958	"
Trumbull Non-Bessemer Concentrates,----------	2,626,470	"
TOTAL TRUMBULL ORE, ----------	3,708,668	"
GRAND TOTAL HILL AND TRUMBULL ORE, ----------	5,988,595	"

The structural drilling campaign, conducted during the year, disclosed considerable wash ore in the Trumbull Mine below what had previously been considered the bottom of the ore treatable by washing. An important tonnage of jig ore is also being developed, but further explorations and expedient methods of treatment will have to be determined before an estimate of the tonnage and recoveries can be ascertained. A year hence this tonnage of jig material will be included in the reserves at this property.

During 1937, seventy-seven structural holes were drilled in the Trumbull pit, seventy-four to the West and three to the East of the approach. The result of this drilling has been to increase the tonnage (concentrated basis) of the Trumbull reserves by 1,164,431 tons.

b. Prospective Ore:

Some additional structural drilling will be necessary during 1938 to outline the Southerly limits of the Trumbull wash ore body and to determine the extent of the jig material already uncovered by stripping.

The drilling of the land to the North of the Hill pit, in the vicinity of the taconite island, will no doubt show up an additional tonnage of concentrating ore and undoubtedly some jig ore. Test-pits put down along the ore limits of the pit in 1925 indicated that the ore makes back beyond the stripping banks and a few old scattered drill holes confirm this. From the standpoint of taxes, it has not been advisable to conduct any drilling in this locality, but the time is approaching when we should ascertain the possible extension of our open pit limits and the character of the ore, so that plans can be made to work in this ore to obtain a satisfactory mixture in our grades from year to year.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1937

4. ESTIMATE OF ORE RESERVES: (Continued)

c. Estimated Analyses:

Hill Mine:

	Tons	Iron	Phos.	Sil.	Fe.Nat.
Bessemer Direct Shipping,	626,118	58.00	.040	13.00	52.78
Non-Bess.Direct Shipping,	981,145	58.00	.055	13.00	52.78
Bessemer Concentrates,	291,226	59.50	.040	8.50	54.74
Non-Bessemer Concentrates,	381,438	60.00	.059	7.50	55.20
TOTAL HILL ORE,	2,279,927	58.52	.050	11.50	53.43
Trumbull Mine:					
Bessemer Direct Shipping,	62,252	56.61	.035	9.85	51.51
Non-Bess.Direct Shipping,	111,988	57.70	.054	8.66	52.51
Bessemer Concentrates,	907,958	58.14	.038	9.01	54.07
Non-Bess.Concentrates,	2,626,470	59.21	.057	7.86	55.06
TOTAL TRUMBULL ORE,	3,708,668	58.98	.052	8.22	54.79
GRAND TOTAL HILL-TRUMBULL,	5,988,595	58.80	.051	9.47	54.27

5. LABOR & WAGES:

a. Comments:

(1) Labor:

Common labor was plentiful, especially early in the season. A considerable number of men came to the West end of the Mesaba Range from farming sections of the State. The supply of skilled labor was adequate, but not over-plentiful at any time.

There was considerable apprehension throughout the operating season over the possibility of organizing the mine workers by outside unions. Some progress was made by C.I.O. organizers, but their efforts were not successful.

A local union was organized by the Hill-Trumbull employees, known as the Western Messabe Independent Union - Local No. 2. This employees' organization continues to function.

On March 16th a new wage schedule was put into effect, with a base rate of $.625 per hour for common labor.

There were no labor disturbances at the Hill-Trumbull Mine during 1937 and no demands were made on the management.

(2) New Construction:

A pumphouse of sectional steel construction was erected by the Truscon Steel Company at the washing plant. The work was started May 20th and finished June 1st. The old pump shelter was in such bad state of repair that a new structure was necessary.

A concrete drainage dam was constructed on the North side of the Hill pit during the latter part of June and the first two weeks in July. The old dam was inadequate to hold back flood waters during the spring

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1937

5. LABOR & WAGES:
(Continued)

a. Comments: (Continued)
(2) New Construction: (Continued)
freshet and at times of heavy rains.

The water supply tank was erected during April to serve the locomotives, crane and track shifter.

The railway bridge over the highway in the vicinity of the washing plant was rebuilt during the months of March and april, the force engaged here being employed rather intermittently.

b. Comparative Statement of Wages & Product:

PRODUCT,	808,125 tons.
Number Shifts and Hours,	2, 8-hour.
Average Number of Men Working,	187
Average Wages per Day,	$ 6.53
Product Per Man Per Day,	31.29
Labor Cost Per Ton,	.208
Total Number of Days,	25,829
Amount Paid for Labor,	$168,606.43

6. SURFACE:

a. Buildings, Repairs:

A shelter house was built for the use of the men working on the dumps and several small switch shanties were provided.

It was expedient to construct a new sample crusher house at the washing plant to be utilized in connection with analytical work.

The following repairs were made to rented houses, mine buildings and washing plant structures:

House No. 1 - furnace repaired. Some interior painting.
House No. 2 - the exterior was painted, the skirting and general repairs of a minor nature made.
House No. 3 - the electric wiring was overhauled; windows repaired; plaster patched and both interior and exterior painted.
House No. 4 - Bathroom repaired; plaster patched and interior painted.
House No. 5 - Windows and water pipes were repaired.
House No. 6 - Doors and siding were repaired and the exterior was painted.
House No. 7 - The porch was repaired and the furnace overhauled.
House No. 8 - The porch and doors were repaired and some interior painting was done.
House No. 9 - The furnace was repaired.
House No.10 - Windows and doors were repaired and some water pipes were replaced.
House No.11 - Besides window and skirting repairs, a new roof was furnished.
House No.12 - The skirting was repaired; the exterior painted and a new roof provided.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1937

6. SURFACE:
(Continued)

a. Buildings, Repairs: (Continued)

Mine Office - The porches and siding were repaired; a new roof put on; the interior and exterior painted and a furnace installed.

Classification Laboratory - The foundation was repaired and exterior painted.

Garages - The walls were repaired and exteriors painted.

Shop Building - Roofs and floors repaired.

Warehouse - Roof repaired.

Washing Plant Office - repaired and painted.

Washing Plant laboratory - Exterior and interior were painted.

c. Tracks, Roads, Transmission Lines:

The locomotive crane, equipped with a clam-shell bucket, was used during the last half of March to remove snow from the tracks. The accumulation of snow was of such an extent that track work would have been seriously delayed if thawing had been depended on for its removal.

Ties were distributed along the approach track the latter part of March and regular track work was started on March 29th. Part of the main line had new ties placed during the fall of 1936 and the balance of the job was undertaken during April, 1937. The Trumbull run-down track was rebuilt and load lines in the Trumbull pit were put in shape for operation. A track was laid for direct ore operations at the East end of the Hill pit and the coal dock tracks were reconditioned. On account of frost conditions it was practical to provide but a single line of track from the pit to the washing plant. This track was ballasted, tamped and ready for use at the beginning of ore operations on May 3rd. The entire track system was not available for use until the middle of May.

During the latter part of the summer and early fall the dump tracks were retied and put in shape for use and lines leading into areas to be stripped were conditioned. All other track work undertaken during the year was incidental to mining and stripping operations.

The transmission line from the washing plant to connect with that purchased from the Minnesota Power & Light Company, was completed February 13th. This construction work had been started in December, 1936.

Concrete foundations were provided for the new location of the transformer station near the washing plant and the equipment was installed during March.

Concrete foundations were provided at the pit transformer station in March to accommodate the larger transformers which were brought over from the Holman-Cliffs Mine.

During the month of April, heavy wire was installed on the power line leading from the pit transformer station, located near the shops,

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1937

6. SURFACE:
(Continued)

c. Tracks, Roads, Transmission Lines: (Continued)
to the vicinity of the coal dock. This was done to accommodate the heavier load to be carried because of additional electrical equipment in use. The power line was extended from the coal dock to the East end of the pit to furnish power for the new electric shovel.

7. OPEN PIT:

a. Stripping:

During the latter part of April and early May, surface material was cleaned from the tracks on the upper North bench of the Trumbull pit. This work was done by the tractor and dragline.

During the month of May and at various times during the summer - the tractor, dragline, locomotive crane and electric shovel were utilized to clean up the bottom of the Trumbull pit. Surface material, varying from a few inches to 3 feet in depth, had been washed over the entire pit bottom during the five years that the mine was idle. This material was removed ahead of mining operations, as progress necessitated.

Three areas were set up for stripping during the fall of 1937. Trumbull Area "A", just West of the main approach, was estimated to contain 50,000 cubic yards; Trumbull Area "B", to the East of the approach, was figured at 218,100 cubic yards and Hill Area "C", at the extreme East end of the Hill pit, was estimated at 75,000 cubic yards. This total of 343,100 yards was reduced to 191,970 yards, postponing the balance until 1938. The estimated cost per yard for the 1938 stripping program was set up at $.36.

The work in Trumbull Area "A" was completed early in the fall, the material handled being as follows:

Wash Ore,	2,655	cubic yards.
Lean Ore,	10,622	" "
Waste Material,	19,916	" "
Total,	33,193	" "

The total quantity of material handled here was less than the original estimate, as some lean wash ore was removed during the ore season, treated at the mill and absorbed by the high grade ore.

Trumbull Area "B" was not completely stripped, it being the intention to finish the job in the spring. The material handled here consisted of the following:

Wash Ore,	7,413	cubic yards
Lean Ore,	17,333	" "
Waste material,	66,741	" "
Total,	91,487	" "

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1937

7. OPEN PIT:
(Continued)

a. Stripping: (Continued)

The work in Hill Area "C" was not completed. There remains approximately a week's operation here to be accomplished before mining in this area is begun. The following material was stripped:

Wash Ore,	5,165	cubic	yards
Lean Ore,	2,645	"	"
Cretaceous Ore,	33,154	"	"
Waste material,	30,230	"	"
Total,	71,194	"	"

The total stripping for the season was 195,874 cubic yards.

Stripping operations were started on October 18th in Trumbull Areas "A" and "B". The 120 Bucyrus shovel worked in Area "A" until October 29th, when this job was completed. The wash ore was dumped back into the pit; the lean ore was stockpiled and the waste material was put on the dumps. Upon the conclusion of operations in Trumbull Area "A", the shovel was moved to the East end of the Hill pit, where it started stripping in Area "C" on November 1st. The upper layer of material handled here consisted of cretaceous ore, varying in thickness from 5 feet at the West to 15 feet at the East end. It was placed on a special cretaceous stockpile, located on top of one of the old waste dumps. The removal of the cretaceous ore uncovered a wash ore in the Easterly 300 feet, the Western section being largely waste, with a comparatively small amount of treatable material. The shovel worked in the Westerly section from November 17th until operations were concluded on December 4th.

During the course of stripping operations a track grade was established along the South side in connection with future ore activities.

The 350-ton Marion steam shovel took two cuts in the Trumbull Area "B" during the stripping season. These cuts were taken at an elevation that would approximately effect a split between the overlying waste material and a lean ore seam. The material handled here consisted of wash ore, lean ore and waste material.

The stripping handled was disposed of on three waste dumps, as well as three lean ore stockpiles. One waste dump is located on the South side of Mud Lake, while the other two are to the East and West of the main dump grounds. The original lean ore stockpile, now practically filled, is located on top of the North section of the old dump to the South of Mud Lake. New stockpiles were provided for lean and cretaceous ores on the top of the main dump to the South.

Due to very foggy conditions, locomotive No. 101 collided with a loaded stripping train on November 8th. This collision occurred on the single line track leading to the main dump. Fortunately no one was injured seriously, but there was a four-hour delay to operations and the engine was put out of service during the balance of the season.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1937

7. OPEN PIT:
(Continued)

a. Stripping: (Continued)

On November 24th, a slide on the West dump carried down two 30-yard cars. The cars were not damaged to any extent and were picked up and returned to service on the following week-end.

The following table shows in detail the material handled at the Hill-Trumbull Mine in the stripping program of 1937:

	WASTE ORE		
MONTH	SHOVEL #34 CU.YDS.	SHOVEL #28 CU.YDS.	TOTAL CU. YDS.
October,	20,056	5,151	25,207
November,	25,342	50,043	75,385
December,	5,235	9,015	14,250
Total,	50,633	64,209	114,842

	LEAN ORE		
	SHOVEL #34 CU.YDS.	SHOVEL #28 CU.YDS.	TOTAL CU. YDS.
October,	10,777	7,935	18,712
November,	-	9,265	9,265
December,	2,298	-	2,298
Total,	13,075	17,200	30,275

	WASH ORE DUMPED IN PIT		
	SHOVEL #34 CU.YDS.	SHOVEL #28 CU.YDS.	TOTAL CU. YDS.
October,	2,675	9,327	12,002
November,	261	436	697
December,	4,904	-	4,904
Total,	7,840	9,763	17,603

	CRETACEOUS MATERIAL		
	SHOVEL #34 CU.YDS.	SHOVEL #28 CU.YDS.	TOTAL CU. YDS.
October,	33,154	-	33,154
GRAND TOTAL,	104,702	91,172	195,874

d. Timbering:
Statement of Railroad Ties Used:

Year 1937, ---------- 22,459

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1937

7. OPEN PIT:
(Continued)

d. Timbering: (Continued)

Statement of Timber Used:

	PRICE	AMOUNT
353 - Pcs. Tamarack Cribbing,	.48	$169.44
38 - Pcs. 25' 10" Top Cedar Piling,	15.00	570.00
2 - Pcs. 30' 10" Top Cedar Piling,	15.00	30.00
510 - Ft. 10" Top Trestle Timber,		97.20
188 - Ft. 10" Top Trestle Timber,		36.40
20 - Pcs. 20' Tamarack Poles,		20.00
TOTAL TIMBER, YEAR 1937, --------		$923.04

f. Explosives, Drilling & Blasting:

	QUANTITY	AVERAGE PRICE	AMOUNT
No.4 R.C. Blasting, ----------	71,900 Lbs.	10.50	7,823.50
25% 3 x 10 Quarry Gelatine, ----	25,500 Lbs.	10.75	2,738.80
60% 3 x 10 DuPont Spec.Gelatine-	15,350 Lbs.	13.00	1,996.00
60% 1-1/8 x 8 DuPont Spec.Gelatine	500 Lbs.	13.00	64.80
40% 1-1/8 x 8 R. C. Extra, -----	1,000 Lbs.	10.50	99.50
TOTAL POWDER, ---------	114,250 Lbs.		$ 12,722.60
No. 20 Connecting Wire, --------	105 Lbs.	.40	43.07
No. 14 Duplex Lead Wire,--------	500 Ft. C.	1.40	7.00
No. 6 Blasting Caps, ----------	900 C.	1.22	10.76
No. 6, 8-ft. Dup. E.B. Caps, ---	350 C.	6.65	23.31
No. 6,16-ft. Dup. E.B. Caps, ---	3,400 C.	12.15	410.37
Clover Fuse, ----------	1,200 Ft.	.60	7.20
Cap Crimper, ----------	1		.75
TOTAL CAPS, ETC. ------			502.46
TOTAL ALL EXPLOSIVES,--			$ 13,225.06

	1937 CRUDE & DIRECT	1937 CONCTS. & DIRECT
Product, ----------	1,154,399	808,125
Lbs. Powder Per Ton of Ore, ----	.09896	.1413
Cost Per Ton for Powder, -------	.01102	.01574
Cost Per Ton for Caps, etc. ----	.00044	.00062
Cost Per Ton for All Explosives,	.01146	.01636
Avg. Cost Per Lb. For Powder,---	.11135	.11135

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1937

7. OPEN PIT:
(Continued)

g. Open Pit Mining & Loading:

Wash Ore:

Mining operations were started May 3rd, one 8-hour shift being worked the first two days, with the second shift added May 5th. Five days were worked the first week and six days per week during the remainder of the month. The basic working schedule was five days per week of two 8-hour shifts, but this was modified as boat dispatch required.

The Model 120 electric shovel started the first cut along the upper bench on the North side of the Trumbull pit. For several shifts the material was of low grade and somewhat rocky, but the bank developed into a high grade ore as the shovel progressed Westward. Direct ore was encountered at about the middle of the cut. The first cut was extended Westward until jig material was encountered. The second cut along the same bench was somewhat shorter and encountered practically the same class of material. The two cuts exhausted the available ore in the upper bench and the shovel was moved down to a lower level on May 20th. The machine completed two full cuts and part of the third in this bench. In these cuts high grade wash ore, low grade material and direct ore was encountered. The lean ore was at the two extreme ends of the cuts and the direct ore near the center.

On June 29th, the 120 electric shovel was moved to the bottom of the pit and a sinking cut was started approximately in the center. This move was made as the ore in the North bank was falling below grade and also to develop the large body of high grade ore below the pit bottom. Alternate sinking cuts were taken until the shovel had reached the predetermined level at which mining operations were to be carried on for the production of 1937 ore. Subsequent cuts were taken to the North and South at this level and the operations were carried on from the extreme Northerly limits in the approach to the West end of the pit. The ore at the East end of these cuts was somewhat rocky and rather low grade, yielding a low recovery. As the cuts approached the West end the grade again became lean and finally verged into jig material. The bulk of the product from the Trumbull pit bottom, however, was a high grade wash ore, with a satisfactory recovery and a small tonnage of direct ore.

In October, shovel No. 34 loaded some lean wash ore from the Southeast corner of the pit. This was removed from Area "A" which was to be stripped in the fall.

Steam shovel No. 26 was taken into the pit on May 8th and dug into a bank of wash ore on the South side of the Trumbull pit. This machine was placed in service as auxiliary equipment, to be available for operations when the electric shovel was handling direct, very lean ore, or had to be shut down for repairs. The wash ore in Area "A" was mined by June 8th and the machine was moved back to the East end of the pit, where a sinking cut was taken along the South side of the Trumbull pit bottom. This cut was finished by the end of June and the shovel was then moved to the North side, where it remained during

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1937

7. OPEN PIT:
(Continued)

g. Open Pit Mining & Loading: (Continued)

Wash Ore: (Continued)

the balance of the season. A cut, which was left by shovel No. 34, was finished and the machine otherwise worked only when grading conditions required.

A small tonnage of Hill wash ore was loaded in connection with the direct ore operations at the East end of the Hill pit.

Direct Ore:

Due to a delay in the delivery of the new electric two-yard shovel, an old Model "60" steam shovel was utilized in loading Hill direct ore during the early part of the season. This machine worked on a single shift for four days in April, starting on the 26th. This machine continued to operate until May 28th, when the new 481 Marion electric shovel was received and put in service.

Direct ore loading was rather intermittent throughout the season, the operation being conducted in line with grading requirements and as and when the Great Northern car supply would permit. The area set up for the production of Hill direct ore was mined back to the limits and down to the proposed level. The analyses of the ore was up to expectations. A horse of rock, running in an East-West direction, was encountered at about the center of the area. This rock horse proved somewhat of a hindrance while taking the deeper cuts. Some of the rock was removed to allow for track grading, but most of it was left in place. If feasible plans can be worked out, the bulk of this rock will not be handled in connection with the mining out of the ore deposit.

Trumbull direct ore was loaded from time to time as it was encountered in the wash ore cuts. The rather narrow lens of direct ore extended across the center part of the pit, in a North-South direction, and was intercepted by practically all of the wash ore cuts taken during the season.

Lean & Waste Ore:

Lean ore was handled in connection with the development of a switch-back at the West end of the Trumbull pit. Several short cuts were taken here in order to bring the grade down so as to accommodate a switch-back leading to the deeper Trumbull ore. The material handled in these cuts was largely of jig character and was placed in stockpile. A small amount of waste material was removed.

k. Water Level in the Pit:

The water level in the Trumbull pit stood about 3 feet over the deeper part. The Layne & Bowler pump was started on March 22nd and the water level immediately began to drop. There was no difficulty in holding the water below the depth of mining throughout the year. During the fall and winter months, the pump has been operated intermittently so as to hold the present level.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1937

8. COST OF OPERATION:

a. Comparative Mining Costs:

		1937	BUDGET ESTIMATE FOR 1937	1930
PRODUCT:				
Direct Shipping Ore,	Tons	201,982		67,591
Concentrates,	Tons	606,143		335,007
Total Production,	Tons	808,125		402,598
Average Daily Product,	Tons	5,772		3,121
Tons Per Man Per Day,		31.29		22.20
Days Operated,		140		129
COST:				
Open Pit Direct Shipping Ore,		$ .141	$ .125	$ .133
Open Pit Wash Ore,		.223	.240	.348
General Pit Expense,		.048	.052	.061
Concentrating,		.189	.190	.203
Stocking Concentrates (59,765 tons)		.020	.040	-
General Mine Expense,		.091	.090	.164
Cost of Production,		.486	.498	.696
Depreciation, Plant & Equipment,		.200	.200	.200
Depreciation, Movable Equipment,		-	-	.001
Amortization Stripping,		.250	.250	.350
Taxes - Ad Valorem,		.115	.115	.240
Taxes - Occupational,		.156	.156	.045
Taxes - Royalty,		.073	.072	.056
Total Cost at Mine,		1.280	1.291	1.588
Administrative & Misc. Expense,		.105	.105	.100
GRAND TOTAL,		$ 1.385	$ 1.396	$ 1.688
Budget Estimated Cost,		1.396	1.396	1.474
Increase over Budget,				.214
Cost under Budget,		.011		

The final figures have not been furnished by the Cleveland office and there may be some small adjustments to the above tabulation, but the cost would only be effected to a slight extent.

The Hill-Trumbull Mine was not operated during the year 1936, and for purposes of analyses, the 1937 costs are compared with the budget figures and the costs secured during the year 1930, the last year that the property was operated on what might be considered a normal basis.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1937

8. COST OF OPERATION:

a. Comparative Mining Costs: (Continued)

It should be pointed out that the large increase in the 1930 costs over the budget is explained by the fact that a considerably larger tonnage was anticipated when the 1930 budget figures were prepared.

d. Detailed Cost Comparison:

(1) Product:

The general character of the ore mined and treated during 1937 was more favorable than any year that this company has operated the property. This favorable condition was taken into consideration when the budget figures were prepared and the costs secured approximated our anticipations very closely, being $.011 under the budget.

A comparison of the 1937 costs with those of 1930 is rather farfetched. Mining conditions were much more favorable in 1937, as we operated, for the most part in high grade ore and did not have an excessive amount of rock to handle. Further than this the amount of direct ore mined in 1937 was almost three times the tonnage of this character of ore secured in 1930 and the total tonnage shipped from the property was over twice the 1930 output.

(2) Open Pit Mining:

The decrease in the cost of production, as compared with the budget, amounted to $.012 per ton, all items under the heading contributing to this betterment in cost, with the exception of Open Pit Direct Ore Mining and General Mine Expense.

The reason for the increase of $.016 per ton in the cost of mining direct ore was occasioned by the large amount of track work necessary for the tonnage secured and to the fact that during the early part of the season it was necessary to utilize an old steam shovel, whereas the budget figures were based on the loading of direct ore with the new electric shovel. The delivery of the electric shovel was delayed approximately six weeks.

The cost per ton for mining the wash ore (concentrated basis) was $.017 under the budget and this is explained by the fact that there were fewer delays and less rock encountered, than had been anticipated.

(3) General Pit Expense:

General Pit Expense was $.004 under the budget. There were the expected nominal charges under this caption, with the outlay for Waste Pile Expense, Test-pitting and Exploring and Structure Drilling being somewhat below our expectations.

(4) Concentrating:

The concentrating cost was very close to the budget, being $.001 per ton below the estimated figure. We anticipated a very favorable operation so far as the washing plant was concerned and this was realized throughout the season. The providing of the stacker eliminated delays

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1937

8. COST OF OPERATION:

d. Detailed Cost Comparison: (Continued)

from car service and there were few serious interruptions from plant machinery failures.

The cost of stockpiling concentrates was $.02 per ton under our estimate. The actual cost of placing the concentrates was about one-half what we had anticipated and the conditions for loading out the ore were very much more favorable than we had expected, the Great Northern Railway allowing us an expense charge of $6.50 per hour for the use of the switching locomotive. This allowance went a long way toward paying the cost of loading out the concentrates.

(5) General Mine Expense:

General Mine Expense was very close to our estimate, being $.001 over the budget. All of the items under this caption were either about in line, or under our anticipations, with the exception of Analyses and Grading. The charges in connection with the exploratory campaign undertaken in 1937 were higher than expected and was responsible for the increase for this heading over the budget figure.

9. EXPLORATIONS AND FUTURE EXPLORATIONS:

A structure drilling program was planned to cover the Trumbull pit, West of the approach and the Area "B", immediately to the East of the approach. The somewhat meagre information available was not adequate for either operating purposes or accurate tonnage estimating. The original idea was to put the holes down to a sufficient depth to demonstrate the proper operations for the year, but when it became apparent that the drilling could not be pushed ahead of ore operations, it was decided advisable to put down the holes to the bottom of the ore body.

One structure drill was moved in to the West Trumbull on April 7th. The machine worked in this area throughout the season, drilling seventy-four holes, which showed a total of 5,990.5 feet. A second structure drill was moved to Trumbull Area "B" on October 21st and three holes were put down, totaling 596.6 feet. Drill work was suspended on December 9th. The program was not completed in either area and the work will be continued during the season of 1938.

In addition to the exploratory work remaining in the Trumbull pit, some drilling should be undertaken at the East end of the Hill property.

The drilling to the North of the Hill pit has been commented on and sooner or later explorations will be required along the South side of the Hill pit.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1937

10. TAXES:

The following statement shows the taxes and average rate at the Hill-Trumbull Mine for the years 1937 and 1936:

	1937	1936	Increase	Decrease
Hill Mine, ----------	$39,973.88	39,665.83	308.05	
Trumbull Mine, --------	47,896.33	47,457.02	439.31	
Hill-Trumbull Shops,---	834.31	826.66	7.65	
Hill-Trumbull W.P.Lands,	2,802.81	2,835.60		32.79
Personal Property,	1,696.10	1,525.26	170.84	-
TOTAL, ----------	$93,203,43	92,310.37	893.06	
Village Lots, ---------	547.36	542.32	5.04	
GRAND TOTAL, ---------	$93,750.79	92,852.69	898.10	
Average Tax Rate, -----	.812	.805	.007	

The small increase in the 1937 taxes, as compared with those of 1936, resulted from the slightly higher tax rate. The decrease in Washing Plant Lands was due to our turning back to the Great Northern Iron Ore Company the W½-NE¼, Sec. 22, 56-23, as we had no further use for this eighty acre tract.

11. ACCIDENTS AND PERSONAL INJURY:

There were three lost-time accidents at the Hill-Trumbull Mine during 1937, which are described as follows:

NAME: Paul Huhtala DATE: June 16th.
CAUSE: In sampling, he jumped from one car to another and injured his right ankle.
NATURE: "Fracture of Medial malleolus and lower one third of right tibia".
TIME LOST: June 16th, to August 9th, 1937.
COMPENSATION: $150.00.

NAME: Pat Kavanagh DATE: August 14th.
CAUSE: Kavanagh was unloading tractor from flat car in the pit, when the crane tipped over; he jumped and injured his ankle.
NATURE: "Fracture of lateral part of astragulus in left ankle".
TIME LOST: August 14th to October 11th, 1937.
COMPENSATION: $160.00.

NAME: Mike Shipka DATE: November 8th.
CAUSE: Poor visibility, due to a heavy snow storm, caused a loaded train to collide with an empty train coming down from dump. The impact drove the tender of Locomotive #101 up into its cab, and catapulted Mike Shipka out of the cab to the ground, knocking him unconscious and injuring his left leg.
NATURE: "Contusion and abrasion to cheek. Abrasion to left leg".
TIME LOST: November 8th to November 15th, 1937.
COMPENSATION: None.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1937

12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION:

It will be necessary to provide a change house for the washing plant employees during the year 1938.

13. EQUIPMENT AND PROPOSED EQUIPMENT:

An ore stacker was provided for the stockpiling of concentrates at the washing plant. The Link-Belt Company of Chicago furnished this equipment and under the supervision of an engineer from this concern, we did the erecting. Work on the foundations was started April 20th; the erection job began May 17th and the equipment was put into service on the 24th of June.

An International 2-ton truck was purchased January 29th and a Ford Pick-Up truck on October 7th.

In order to expedite our track work, a 10-ton caterpillar Diesel tractor was purchased on February 9th.

A new heating boiler for the shops was received and installed during the month of December. A furnace to heat the office was placed in commission during January.

The Model 481 Marion electric shovel was received and placed in service on June 24th.

A new 14,000-gallon water tank was received February 25th; two Allis-Chalmers 4' x 6' vibrating screens during April; one Westinghouse electric welding machine in May; one Armstrong structure drill from the Canisteo Mine, March 29th; a drill sharpener from the Tilden Mine in December; two 40 H.P. Allis-Chalmers motors to operate the logs, in June and several thousand feet of power cable for the electric shovels and drills during March.

The transformer station from the Holman Mine was moved to the Hill-Trumbull and put in service during March.

The old 20-yard cars were disposed of to the Snyder Mining Company and eleven of the 30-yard cars from the Holman Mine were transferred to the Hill-Trumbull.

14. MAINTENANCE AND REPAIRS:

Repair work in the shops was resumed on January 4th, 1937, following a 10-day lay-off.

The overhauling of Locomotive No. 19, started prior to the shutdown on January 8th, 1932, was completed on January 26th. Most of the work on this engine was in machining and re-assemblying parts.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1937.

14. MAINTENANCE AND REPAIRS: (Continued)

The repair work on Locomotive No. 101 was completed during January and consisted of repairs to the spring hangers, brake rigging; air equipment; the fire door; hub liners; crown brasses and driving boxes and bushings for various parts. The tires were removed from the drivers and turned down; the tender was repaired and painted.

Repairs on Locomotive No. 102 were started February 17th and completed March 22nd; new pins and bushings were furnished where needed; the driving boxes and journals machined; the drivers were equipped with new hub liners and tires; the spring equipment and brake rigging were overhauled; a new door sheet for the boiler was installed and the front end was repaired.

The overhauling of Locomotive No. 103 was started March 22nd and finished by the middle of April. The drivers were fitted with new tires; the driving boxes were machined and supplied with pins and bushings; pistons were repaired; the spring equipment and brake rigging overhauled and the tender was repaired and painted.

Locomotive No. 2 was taken into the shop on April 12th. The air pump was overhauled; the tires on the drivers were changed and some general repairs of a minor nature were made.

The Armstrong and Cyclone drills were given a general overhauling.

A total of sixteen 30-yard cars were put through the shops during the months of January, February and March. The trucks were checked over and all worn journal boxes and brasses were replaced; broken springs and center castings renewed; the air and dumping equipment checked and all damaged parts, such as dump rigging, grab irons and steps straightened and repaired.

Washing Plant Repairs:

General repair work started on March 1st.

The Hummer vibrating screens were removed from the head-end of the logs, being replaced by new Allis-Chalmers machines, in April.

The old 36" conveyor belt was removed in March and replaced, as were the 18" conveyor belts. The rollers of the 36" belt conveying system were cleaned and greased.

A new chute was built under the grizzly and the logs and classifiers were overhauled.

The revolving screen was repaired and a new chute was built at the discharge end of the 36" conveyor.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1937

14. MAINTENANCE AND REPAIRS: (Continued)

Washing Plant Repairs: (Continued)

The rock chutes were repaired and the hoppers under the Symons crusher were renewed.

The air compressor was overhauled and a new loading floor was laid. Hoppers were built under the new vibrating screens.

Ten inch feed pipes were installed from the vibrating screen to the classifiers.

The bearings on both pan conveyors were cleaned and greased and new rock chute fingers were made and installed.

During the fall of 1937, the following work was undertaken:

The mill generally was drained and cleaned; the dam at the lower end of Little Penacie Lake was built up; the pumps were dismantled; the 8-ft. pan conveyors were opened up and the 15" return rollers were removed and repaired. The logs and classifiers were overhauled. The rollers on the 36" belt conveyors cleaned and greased and the 4' x 6' vibrating screens were taken down for inspection and repairs.

The crew spent considerable time placing brush on the tailings basin to prevent dust being raised by heavy winds and blown into Calumet.

18. NATIONALITY OF EMPLOYEES:

NATIONALITY:	NO. OF MEN
Finnish,	35
Swedish,	35
Jugo-Slav,	29
German,	27
English,	18
Irish,	11
Norwegian,	8
Croatian,	7
Italian,	5
French,	4
Polish,	1
Bulgarian,	4
Scotch,	1
Welch,	1
Bohemian,	1
TOTAL,	187