

GWINN DISTRICT GENERAL
ANNUAL REPORT
YEAR 1938

19. GWINN ASSOCIATION
GWINN HOTEL (Cont.)

1. Gwinn Association (Cont.)

Assistance is also given by our Company and the Cliffs Power & Light Company.

During the past year the Company provided new toilet facilities in all lavatories and added a new hot plate with gas service for the Club kitchen.

The membership roll showed an average monthly membership of 243 of which 175 were Cleveland-Cliffs Iron Company employees and the remainder local townsmen.

Indoor activities included: bowling leagues for men and women, a 64 man cribbage league, bridge and cribbage leagues for women, a library and reading room, 2 Girl Scout and 1 Boy Scout troops, billiards and bowling for high school students "No charge"; also a recreational room equipped with pool and billiard tables, checkers, table tennis and other miscellaneous games.

The gymnasium is used by the local high school for their physical education program and offers an opportunity to members to enjoy badminton, volleyball, handball, basketball and is equipped with matts, bars and other gym apparatus for class work. The club sponsored an Independent basketball team and a 10 team junior basketball league.

The number of meetings of a social or recreational nature held at the building during the year totaled 360. Of this number 10 were considered as annual or events of special interest; church organizations used the building on 53 occasions; 3 Scout troops held 120 meetings; 24 dances were held; 16 committee meetings; 25 educational classes for mine employees; card playing leagues, women's study club, sportsmen's association and other miscellaneous groups made use of the building and its facilities on 112 occasions.

Equipment in the club kitchen was used 135 times.

The above events are exclusive of the gymnasium which was used 596 supervised periods with a total of 11,670 participants. There were 15 major basketball games and 62 junior league games which drew 3800 spectators.

A total of 24,800 spectators and participants enjoyed the club outdoor activities, which included a 6 team sneior men's softball league, a junior boys league and a women's league, all of which

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GWINN HOTEL (Cont.)

1. Association (Cont.)

played 183 games. The club also supervised the Inter-County Baseball league and the local team, which won the championship, also a tennis court, a horseshoe and loopball court, sponsored an ice skating rink and supervised Bass Lake Camp and grounds.

The local school conducted 172 all day sessions of their kindergarten in special rooms the clubhouse provided for this purpose.

Bass Lake Camp

The attendance at the grounds for the season was about the same as last year. Bathing attendance was down but local fishermen made good use of their opportunities to fish. There was "No charge" on boat rental for club members and the same rule covered the use of the cottage.

Summary

- 73 - basket picnics
- 725 - bathers
- 700 - fishermen and visitors

<u>Use of Cottage</u>	<u>Number</u>
Girl Scouts Troop #1.....	14
Girl Scouts Troop #2.....	11
Boy Scouts week-ends.....	20
6 different families used camp from	
4 to 7 days.....	42
Group older boys- 1 week.....	6
Group girls 1 week.....	6
1 - picnic Ladies Guild.....	20
1 - picnic Negaunee Band.....	40
Number using camp for dinner parties...	18
Sportsmen's Annual Rabbit Supper.....	45

Total attendance at cottage and grounds.....1,700

The Cleveland-Cliffs Iron Company arranged for payment of the caretaker.

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19. GWINN ASSOCIATION
GWINN HOTEL (Cont.)

2. Gwinn Hotel

The hotel was operated throughout the year under the same management as last year. The east store building located in the hotel block was occupied until September as a moving picture theatre. At this date it went out of business due to the fact another up-to-date theatre had been started in Gwinn.

20. GWINN DISTRICT
CRUSHER

The crusher operated only 11 days during 1938. The ore crushed was as follows:

	<u>1938</u>	<u>1937</u>
Gardner Mackinaw	14,488	152,616

The cost for the years 1938 and 1937 was as follows:

	<u>1938</u>		<u>1937</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
General Expense	22.48	.002	44.71	
Maintenance	40.00	.003	406.18	.003
Operating	861.78	.060	7,020.35	.046
Total Operating Exp.	924.26	.065	7,471.24	.049
Switching	156.47	.010	1,288.50	.008
Grand Total	1,080.73	.075	8,759.74	.057
Tons Crushed	14,488		152,616	
Decrease in tonnage	138,128			

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4. ESTIMATE OF
ORE RESERVES (Cont.)

	Prince- port	Cambridge	Sec.19 Prince- port	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
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TOTAL ORE

1,222,531

c. Estimated Analysis

<u>Grade-Princeport</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Ign.</u>	<u>Moist.</u>
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
<u>Cambridge</u>										
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.

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8. COST OF
OPERATING

a. Comparative Costs

	<u>1938</u>	<u>1937</u>	<u>Incr.</u>	<u>Decr.</u>
Underground Costs	0	7.88		7.88
Surface Costs	1,475.84	3,362.33		1,886.49
General Mine Accounts	128.59	276.41		147.82
Total	1,604.43	3,646.62		2,042.19
Loading & Shipping	42.60	1,007.79		965.19
Taxes	4,564.98	4,574.98		10.00
Supply Inventory Adjustment		188.66		188.66
TOTAL	6,212.01	9,418.05		3,206.04

The large decrease in the cost for 1938 is an account of retimbering of the collar of Princeton No. 3 Shaft, as well as the addition of a new roof on the dry house building and heating plant in 1937. There was also a wage increase on March 16, 1937.

10. TAXES

	<u>1938</u>		<u>1937</u>	
	<u>Valuation</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Taxes</u>
NE $\frac{1}{4}$ of NE $\frac{1}{4}$, Sec. 19, 45-25 (GNW)	10,000	187.35	10,000	183.93
158.27 acres in Sec. 18, 45-25	15,000	281.01	15,000	275.90
160 acres in NW $\frac{1}{4}$, Sec. 20, 45-25	100,000	1,873.40	100,000	1,839.28
NW $\frac{1}{4}$ of NE $\frac{1}{4}$, Sec. 19, 45-25 (Loc.)	420	7.87	420	7.73
S $\frac{1}{2}$ of NE $\frac{1}{4}$, Sec. 19, 45-25 (Loc.)	840	15.74	840	15.46
Personal Property	115,000	2,154.41	120,000	2,207.38
Total	241,260	4,519.78	246,260	4,529.68
Collection Fees		45.20		45.30
Total Taxes		4,564.98		4,574.98
Tax rate per \$100.00		1.87		1.839

STEPHENSON MINE
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1. GENERAL

This mine was abandoned in 1927 but the Company is still paying the taxes on the original description, the S $\frac{1}{2}$ of the SW $\frac{1}{4}$ of Section 20, 45-25, as well as the adjoining 80 acres to the south, i.e., the N $\frac{1}{2}$ of the NW $\frac{1}{4}$ of Section 29, 45-25 on account of the ore in stock. The latter description is owned by the Chicago & Northwestern Railway Company.

2. PRODUCTION
SHIPMENTS &
INVENTORIES

<u>b. Shipments</u>	<u>1938</u>	<u>1937</u>
Stephenson	-	3,476
Stephenwood	19,466	32,330
Northdale	-	-
Northwood	-	-
Total	<u>19,466</u>	<u>35,806</u>

<u>c. Stockpile Inventories</u>	<u>1938</u>	<u>1937</u>
<u>Stephenson Lease</u>		
S $\frac{1}{2}$ of SW $\frac{1}{4}$ of Sec. 20, 45-25	36,830	56,296
<u>C. & N. W. Lease</u>		
N $\frac{1}{2}$ of NW $\frac{1}{4}$ of Sec. 29, 45-25	<u>18,976</u>	<u>18,976</u>
Total	<u>55,806</u>	<u>75,272</u>

Ore Statement

	<u>Stephen-</u>	<u>Stephen-</u>	<u>North-</u>	<u>North-</u>	<u>Total</u>
	<u>son</u>	<u>wood</u>	<u>dale B</u>	<u>wood</u>	
On hand Dec. 31, 1937	171	56,125	227	18,749	75,272
On hand Dec. 31, 1938	171	36,659	227	18,749	55,806

3. ANALYSIS

b. Average Analysis on Shipments

<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moist.</u>
Stephenwood	19,466	59.90	.738	4.35	.86	1.20	2.64	.85	.018	1.89	13.50

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8. COST OF OPERATING

a. Comparative Mining Costs

	<u>1938</u>	<u>1937</u>	<u>Incr.</u>	<u>Decr.</u>
Surface Costs	1,475.84	1,436.78	39.06	
General Mine Expense	287.07	452.24		165.17
Total	1,762.91	1,889.02		126.11
Loading & Shipping	1,760.15	2,581.65		821.50
Taxes	1,742.64	2,361.00		618.36
Total Cost Sheet	5,265.70	6,831.67		1,565.97

The principal reason for the decrease is due to the fact that less ore was shipped during 1938.

In 1937 there were 35,806 tons loaded

In 1938 there were 19,466 tons loaded

10. TAXES

	<u>1938</u>		<u>1937</u>	
	<u>Valuation</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Taxes</u>
80 acres, W $\frac{1}{2}$ of SW $\frac{1}{4}$, Sec. 20, 45-25	1,000	18.73	1,000	18.39
80 acres, N $\frac{1}{2}$ of NW $\frac{1}{4}$, Sec. 29, 45-25	200	3.75	200	3.68
Personal property, ore in stock	90,000	1,686.06	125,000	2,299.00
Personal property in warehouse	900	16.85	900	16.55
Total	92,100	1,725.39	127,100	2,337.62
Collection Fees		17.25		23.38
Total Taxes		1,742.64		2,361.00

SPIES VIRGIL MINE
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1. GENERAL

The production of 89,795 tons compared with 71,255 tons in 1937. The mine operated the full year, but at a much reduced average schedule, while 7 months were worked in 1937 at a rate of nearly 5 days per week. The rapid drop in the steel operating rate left a surplus of ore at lower lake ports at the beginning of the shipping season, and as a consequence mine shipments declined from 172,498 tons in 1937 to 36,021 tons. The outlook at the end of the year, however, has improved by reason of the small shipments, and an increase to 4 days per week has already been announced to become effective Jan. 9, 1939.

The production of the above tonnage, and steady operation of the mine throughout the year in the face of ventilation difficulties has been, to say the least, a highly interesting problem. Two mine fires, caused by the oxidation of the pyritic footwall slates, were overcome by controlled ventilation and the application of a neutralizing lime solution. A third area was sealed off to prevent it from reaching this stage, and at the end of the year one of the 2 original fire areas was receiving a second application of lime to prevent the formation of additional sulphur dioxide gas. Particular care has been taken at all times for the safety of the men, and the low cost and initial success of the method used in combating the trouble is thought to have been well worth the trial.

A heavy development program has been underway throughout the year for ventilation needs, and to assure a continued ore supply from new sections of the mine. The cost of this work almost equalled the stoping cost, and was nearly double that of 1937. The major portion of the repair and rehabilitation work needed after the reopening of the mine had been completed in 1937 but additional improvements, such as the installation of the steam heating system in the headframe, were made in 1938.

No work was done on the Sherwood property for the Republic Steel Corporation, but assistance was rendered their engineers in picking some representative samples of underground ore at points in the Virgil near the Sherwood boundary. A breakdown of the timber in the 6th Level connecting drift prevented access to the Sherwood drift in 1937. The drift was later sealed on the Virgil side by the erection of a concrete brattice to hold back the foul air issuing from the stopes above.

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2. PRODUCTION
SHIPMENTS &
INVENTORIES

a. Production by Grades

	<u>Grade</u>	<u>Tons</u>
1938	Virgil	89,795
1937	"	71,255

The increase in 1938 was 18,540 tons, and the rock hoisted was 7396 tons compared to 5406 tons in 1937. No high sulphur ore has been produced since the reopening of the mine.

b. Shipments

	<u>Grade</u>	<u>Pocket</u>	<u>Stockpile</u>	<u>Total</u>	<u>Total Last Year</u>
Virgil		20,483	15,538	36,021	168,150
Virgil High Sulphur					4,348
Total		20,483	15,538	36,021	172,498
Total Last Year		53,052	119,446	172,498	
Decrease		32,569	103,908	136,477	

The 1938 shipments were roughly one-fifth of the tonnage forwarded in 1937.

c. Stockpile Inventories

	<u>Grade</u>	<u>Tons</u>
Virgil		83,477
Virgil High Sulphur		4,531
Total		88,008

The stockpile balance represented nearly the years production, and shows an increase of 53,774 tons over that of last year.

d. Division of Product by Levels

<u>Level</u>	<u>Tons</u>
6th Level	2,533
8th Level	87,262
Total	89,795

Regular production from the 6th Level was stopped in February when brattices were erected to seal the foul air in the stopes above.

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2. PRODUCTION
SHIPMENTS &
INVENTORIES

e. Production by Months

<u>Month</u>	<u>Days</u>		<u>Virgil</u> <u>Ore</u>	<u>Rock</u>	<u>Tons per</u> <u>Day Ore</u>	<u>Tons per</u> <u>Man per Day</u>
January	2-8	16	9,396	864	587	6.81
February	2-8	13	7,254	736	558	5.53
March	2-8	19	10,333	1,220	544	6.54
April	2-8	14	9,677	516	691	8.05
May	2-8	14	7,310	968	522	6.38
June	1-8	18	5,289	380	294	5.94
July	1-8	16	4,777	412	298	5.68
August	2-8	8	9,219	532	439	7.24
	1-8	13				
September	1-8	17	5,858	232	344	6.49
October	1-8	17	5,121	380	301	5.71
November	2-8	9	7,628	740	424	6.76
	1-8	9				
December	2-8	6	7,933	416	396	6.92
	1-8	14				
Total	2-8	99	89,795	7,396	442	6.55
	1-8	104				
		203				

f. Ore Statement

	<u>Virgil</u>	<u>Virgil</u> <u>Hi-Sulphur</u>	<u>Total</u>	<u>Last</u> <u>Year</u>
On Hand January 1, 1938	29,703	4531	34,234	135,477
Output for Year	89,795		89,795	71,255
Total	119,498	4531	124,029	206,732
Shipments	36,021		36,021	172,498
Balance on Hand	83,477	4531	88,008	34,234
Increase in Output			18,540	
Increase in Ore on Hand			53,774	

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 Aug. 11 to Dec. 6
2-8 hr. shifts 4 days per week Dec. 6 to Dec. 31st.

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2. PRODUCTION
SHIPMENTS &
INVENTORIES (Cont.)

f. Operating Schedule (Cont.)

1938 - 2-8 hr. shifts 4 days per week Jan. 1. to Apr. 16
2-8 hr. shifts 3 days per week Apr. 16 to June 1.
1-8 hr. shift (2 crews alternating) 4 days per
week June 1 to Oct. 31.
1-8 hr. shift (2 crews alternating) $5\frac{1}{2}$ days per
week Oct. 31 to Dec. 31.

g. Delays

There were 4 production delays. The second of these was the most serious and was caused by oxidation of the pyritic slate in the partially sealed portion of the 4th Level drift. This forced SO₂ gas into the main ventilation current on Jan. 28th. The use of the neutralizing lime solution was started a few days later, and this enabled the mine to be reopened on Feb. 7th. The only other loss of a full shift was on Jan. 25th when a heavy snowfall prevented the men from reaching the mine. The complete list follows:

Jan. 25 - 1 shift delay caused by snowstorm. Loss product 300 tons
Jan. 28 - 4 day delay caused by SO₂ gas in ventilating Current
loss in product 2400 tons
Mar. 16 - 5 hour delay caused by broken bearing in top tram car
loss in product 180 tons
Mar. 18 - 3 hour delay caused by 8th Level haulage motors disabled
loss in product 120 tons.

Several other small operating delays, which were made up on the same or succeeding shifts, were not included in this table because there was no resultant loss in production.

3. ANALYSIS

a. Average Mine Analysis on Output

<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Sul.</u>
Virgil	89,795	57.84	.384	6.12	.062

The year's output analysis was close to the expected figures, but the monthly analysis was somewhat erratic because of the restricted underground working areas. The cooperation of the Chicago and Northwestern railroad in holding cars loaded at the pocket however, allowed time for proper mixing and grading of each cargo.

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3. ANALYSIS (Cont.)

b. Average Mine Analysis on Shipments

There were no straight cargoes shipped, a mixture of Virgil, Stephenson and James ores being made up at Escanaba for each boat. The complete analysis of ore shipped was:

	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>
Virgil	58.05	.395	5.95	.19	1.18	.58	.26	.048	7.65

c. High Sulphur Ore

No high sulphur ore was produced, and there were no shipments from the 4531 ton stockpile. When mining operations were started in the southeast stope above the 8th Level in October the sulphur content of the product was increased, but by mixing with ore from the northwest stope the output was held below .095. This was further absorbed by side dumping along the main stockpile which averaged only .060 in sulphur.

The broken high sulphur ore in the caved east stope above the 8th Level was left in place, and no extensive development was carried on in high sulphur ore in other sections of the mine. Exploration of the south footwall area in 1939, however, is expected to add to underground reserves of this material.

d. Analysis of ore in Stock Dec. 31, 1938

	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moist.</u>
Virgil	57.79	.388	6.17	.19	1.84	.21	.60	.069	6.50	8.75
Hi-Sul.	56.79	.490	7.41	.19	1.84	.21	.60	.231	7.15	7.00

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

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4. ESTIMATE OF
ORE RESERVES (Cont.)

a. Developed Ore

<u>Virgil Ore</u>	<u>Tons</u>
6th Level and above	67,043
6th Level to 8th Level	
Northwest Orebody 158,423	
Southwest Orebody <u>243,844</u>	<u>402,267</u>
Total Developed Ore Nov. 30, 1938	469,310
Less December Production	<u>7,933</u>
Total Developed Ore Dec. 31, 1938	<u>461,377</u>

The southwest orebody was reported to the Tax Commission last year as prospective ore. Development in 1938 necessitated a downward revision of this estimate and a re-classification as developed ore. The comparative tonnages reported to the Tax Commission in 1937 and 1938 were 609,142 tons and 461,377 tons respectively. Excluding the 89,795 tons mined in 1938, the loss in reserves due to unfavorable development and a re-arrangement of the pillars supporting the 6th Level, amounted to 157,970 tons. There is a possibility that part of this reduction may be restored by southerly extension of supposed ore limits in 1939.

b. Estimated Reserve Analysis

	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mng.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moist</u>
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

5. LABOR

WAND
WAGES

a. General

The working force remained at practically a constant level throughout the year. The general situation was satisfactory in spite of the fact that several of the men joined the Iron River branch of the CIO with the intention of forming a group with whom direct dealing would have to be made at the mine. The local organizer paid a number of visits to the mine, and activity among the men probably reached a height about the middle of the summer when the President and 2 trustees of the Iron River local were elected from amongst the Spies-Virgil employee members. Shortly afterward a somewhat dictatorial attitude in regard to vacations was shown in direct contrast to the Company's allowing the men to do their own choosing.

SPIES VIRGIL MINE
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5. LABOR
AND
WAGES (Cont.)

a. General (Cont.)

This caused a number of desertions from the CIO ranks and since August nothing more has been heard of the unionization campaign. It was evident at all times that membership among the men was limited, the majority of older employees emphatically stating their loyalty to the Company.

The wage rate and working time limit which went into effect Mar. 16, 1937 was continued throughout the year. This schedule maintained wages at a level well above that of previous years and, because it was in effect the full year, increased the labor proportion of the cost of production.

b. Statement of Wages and Product

	<u>1938</u>	<u>1937</u>
PRODUCT	89,795	71,255
No. SHIFTS & HOURS	1-8 & 2-8	2-8
 <u>AVG. No. OF MEN WORKING</u>		
Surface	26	23
Underground	<u>47</u>	<u>44</u>
Total	73	67
 <u>AVG. WAGES PER DAY</u>		
Surface	5.42	5.41
Underground	<u>6.42</u>	<u>6.33</u>
Total	6.06	6.00
 <u>AVG. WAGES PER MONTH OF 22 DAYS</u>		
Surface		119.02
Underground		<u>139.26</u>
Total		132.00
 <u>AVG. WAGES PER MONTH OF 18 DAYS</u>		
Surface		97.38
Underground		<u>113.94</u>
Total		108.00
 <u>AVG. WAGES PER MONTH OF 14 DAYS</u>		
Surface	75.88	
Underground	<u>89.88</u>	
Total	84.84	
 <u>AVG. WAGES PER MONTH OF 9 DAYS</u>		
Surface	48.78	
Underground	<u>57.78</u>	
Total	54.54	

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5. LABOR
AND
WAGES (Cont.)

b. Statement of Wages & Product (Cont.)

PRODUCT PER MAN PER DAY

	<u>1938</u>	<u>1937</u>
Surface	18.323	18.903
Underground	10.205	10.291
Total	<u>6.555</u>	<u>6.663</u>

LABOR COST PER TON

Surface	.2957	.2860
Underground	.6289	.6153
Total	<u>.9246</u>	<u>.9013</u>

AVG. PRODUCT BREAKING & TRAMMING

45.665	40.324
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AVG. WAGE CONTRACT MINERS

7.614	7.505
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TOTAL NO. OF DAYS

Surface	4,900 $\frac{3}{4}$	3,769 $\frac{1}{2}$
Underground	8,798 $\frac{1}{4}$	6,924 $\frac{1}{4}$
Total	<u>13,699$\frac{3}{4}$</u>	<u>10,693$\frac{3}{4}$</u>

AMOUNT FOR LABOR

Surface	26,552.32	20,383.12
Underground	56,471.39	43,840.51
Total	<u>83,023.71</u>	<u>64,223.63</u>

PROPORTION SURFACE TO UNDERGROUND MEN

1938	- 1 to	1.81
1937	- 1 to	1.92
1936	- 1 to	.50
1935	- 1 to	.88
1934	- 1 to	.88

6. SURFACE

a. Buildings, Repairs

The extension of the steam heating system to the headframe was the most important alteration on surface. The old heating stoves were replaced by well insulated steam and return lines, with radiators or unit heaters on the landing and crusher floors and in the skip dump.

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6. SURFACE (Cont.)

a. Buildings, Repairs

The installation was supervised by the mechanical department and the work was done in August and September. Ample heat is supplied with less than 15 lb. pressure on the boiler, and the former hazard of stoves adjacent to the normally downcast Spies ventilation shaft was eliminated.

The second improvement to the heating system was the replacement in December of the worn out 50 H. P boiler with a second hand boiler of the same size purchased from the Hill-Trumbull Mine. The maintenance of the old one had been a constantly increasing expense during the past several years, and the replacement is expected to give service beyond the life of the mine. Fuel consumption was immediately lowered, and the addition of several traps and rearrangement of radiators in the engine house is expected to further improve the efficiency of the surface heating system.

The coal dock was repaired by the mine carpenter in the Fall by replacing a number of rotted caps⁺corbels. Additional repairs will probably be necessary in 1939 for some of the stringers are partly rotted. Another improvement to the head-frame was the installation of air cylinders to operate the loading pocket doors. This lightened and made safer the task of the pocketman when production is at the normal rate during the shipping season. A new porch and extension roof was built on the front of the office to replace a badly rotted platform step. The wood trim of all mine buildings was painted a dark red color at small expense in September. The work was arranged to give regular employees with larger families a little extra time over the 2 day per week schedule. This was appreciated, and the neater surface appearance also made the improvement worth the cost.

b. Stockpile

The shovel completed a cut in the far northwest stockpile at the beginning of the shipping season, and was then moved to the east side of the center pile from which small shipments were made at intervals. All stocking was done on the center pile, and side dumping had widened the top of this pile to about 30' at the end of the year.

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6. SURFACE (Cont.)

a. Buildings, Repairs

Early in 1939 stocking will be started under the east trestle of 15 bents which was erected in the Fall. This trestle branches off the new rock trestle, which had been extended across the high sulphur pile in May, and provides the shortest average run from the headframe. Storage of the larger quantity of rock from underground development added a layer about 10' thick to a portion of the old rock pile northeast of the shaft. The pyritic slate from the 6th Level ventilation raise had been stored on the east side of the pile and in the Spring it was noticed that this section was heating. The pile was channeled and spread with lime, and this seemed to retard the oxidation process after several rains soaked the lime into the pile.

c. Roads

Sized rock from the old Spies rock pile south of the shops was spread on the area between the mine buildings to level and improve the general appearance. Then in July the Village improved the lower road entering the mine by ditching the sides and spreading another layer of finer sized rock on the old roadbed.

d. Transmission Lines

The surface portion of the armored pump cable was struck by lightning and burned out in July. After temporary repairs were made on the old cable, the Cliffs Power and Light Co., line crew erected a permanent overhead line on poles from the engine house to the shafthouse. This was connected on the 30th., and there was no production delay from the occurrence.

e. Mine Water Discharge Ditch

The ditch was cleaned and kept free of ice during the Spring months to prevent the flooding of basements of houses in the Virgil Location. Then in the fall it was cleaned and a culvert repaired on the Burns property in Iron River on complaint from the city that the water was overflowing one of the streets.

7. UNDERGROUND

a. Shaft Sinking

There was no shaft sinking or stripping in 1938.

b. Development

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7. UNDERGROUND (Cont.)

b. Development

Drifting and raising in 1938 were largely for ore finding purposes, while in 1937 the larger share of the work was attributable to ventilation needs. The intensive development plan begun in November 1937 will be continued into 1939 with the intention of making the new mining areas completely independent of the older sections of the mine. The fire hazard which exists in each of the old stopes since the mine was reopened makes this the only safe course of action, and present development is planned so that each new stope will be a unit that can easily and effectively be sealed from the others in case of trouble. The depth of the present workings below surface prohibits the use of the sand fill method employed by other mines in the district, and leaves only the experimental lime neutralization and brattice seal method in case of trouble.

Under the present plan, and starting at the top, the Virgil shaft was reconditioned, and a pump installed to insure steady ventilation by the fans at the top of this second outlet. The permanent 6th to 4th Level rock raise independent of the old stopes was completed in January to restore the full length traveling and ventilation circuit. Two short rock drifts were driven on the 6th Level, one of which will provide access to the new south footwall mining area above the 8th Level.

The development in ore above the 8th Level was almost entirely for the extension and opening of stopes to continue regular mining operations above the north drift. About 2000' of small ore drifts and raises were necessary here. The development in rock on and above this level, however, was in preparation for future stoping operations in the former prospective ore area near the south footwall. Nearly 500' of main level rock drifting and 700' of small rock raising and drifting was done in this area in 1938. The independent ventilation and traveling connection in rock to the 6th Level will be connected early in 1939, and the south mining raise in this area entered ore at a height of 65' on Dec. 30th. A rock inclusion not indicated by previous diamond drilling, which was disclosed in the ventilation raise and drift, necessitated a downward revision of the ore estimate for this section. It is hoped future development in ore to the south in 1939 will restore at least a part of this reduction in ore reserves.

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7. UNDERGROUND (Cont.)

b. Development (Cont.)

At least 3 contracts were engaged in development work in each month of 1938. The maximum number of mining contracts in any month was 2, and this perhaps best explains the total development cost of .227 per ton in 1938 compared to .137 in 1937, and the fact that this nearly equalled the .235 cost of stoping.

c. Stoping

Mining operations above the 6th Level were discontinued after January because of air conditions above this level. The remaining ore is considered temporarily unavailable, or until the later stages of mining on the property.

The mine product was entirely dependent on the central stope above the 8th Level from February to May. The decision to leave a second supporting pillar above the north drift was reached in March, and for the balance of the year the large share of the product was from stoping operations in the northwest stope. Development of the transfer sub southeast of the caved east stope revealed ore of medium sulphur content and mining operations started here in October. The opening of this stope was fortunate in that it extended the mining period above the north drift while development is proceeding in the south footwall area, and doubly so because it furnished a suitable mixture for the leaner material from the hanging wall areas of the northwest stope.

The detailed description of operations follows:

Subs above the 6th Level

+145' Sub

During the early part of January stoping operations by No. 10 contract mined a length of about 20' of ore under the Jasper hanging wall. This mining was above the transfer drift developed by this same contract in the latter part of 1937. After the middle of the month work in this area was intermittent, and as air conditions allowed. About 2000 tons were mined, and finally, early in February, the scraper hoist was removed and the 6th Level haulage drift sealed by a concrete brattice.

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7. UNDERGROUND (Cont.)

Subs above the 8th Level

+25' Sub

No. 12 contract mined a small area under the jasper hanging wall on the east side of the pillar in January. Then in March No. 9 contract reached this elevation with the top of the west stope in which the iron content averaged about 57% to provide a good mixture for the richer material from subs below.

000' Sub

No. 12 contract mined on the south and west sides of the central stope. In April, after the decision had been made to leave a pillar between the central and west stopes, a fall of ground occurred in the center stope. The cave was from the south side and a mass of ore fell which was about 80' long and 15' thick. This broken ore was left in place on subs below to furnish additional support along the weak black slate contact. The lining up of the west face of the center stope was completed by No. 12 contract on April 17th, and mining operations after that date were in the west stope.

The stope on the west side of the new pillar at the end of the year had been enlarged to dimensions of 50' x 120'. The material along the west side of the stope was jasper, but the end of the ore had not been reached as yet on the south side.

-25' Sub

Mining operations were completed in the center stope in April. No. 12 contract in December mined on the south side of the west stope which had reached a maximum dimension of 150' in a northsouth direction at this elevation.

No. 9 contract at the end of the year had extended the new traveling road in the south footwall area to the bottom of the raise connection to the 6th Level. The drift at this elevation was 185' in length, and all but 20' near the raise was in the black slate footwall. The 100' raise connection will be completed to the south 6th Level rock drift to furnish a new travel-ventilation connection between the 8th and 6th Levels which will be completely independent of the other mining areas.

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7. UNDERGROUND (Cont.)

c. Stoping (Cont.)

-50' Sub

The west half of the center stope was mined by No. 12 contract early in the year. At this elevation a test drift was driven 40' into the south footwall which disclosed a sulphur content of .050%, so no trouble is anticipated from the cave which later occurred in this area. Numbers 9 and 12 contracts during the year enlarged the west stope to an average dimension of 70' x 130'. Mining operations at this elevation reached the 15' limit set to protect the ore on the Sherwood boundary line.

No. 11 contract started stoping operations above the southeast transfer drift at this elevation in November, and at the year end the mined area was approximately 30' x 40'.

-75' Sub

The west half of the center stope and the total area of the west stope were mined by No. 12 contract. No. 8 contract reached this elevation late in December with a new mining raise which will allow the mining of the ore under the flatly inclined south side of the west stope. This ore will be milled to the transfer drift at the -150' elevation and scraped to No. 824 chute above the north drift.

Mining operations by No. 11 contract in the high iron-medium sulphur material above the southeast transfer enlarged the stope at this elevation to approximately 30' x 50'.

-100' Sub

As on subs above, the west half of the center stope, and the full area of the northwest stope were mined by No. 12 contract.

The crosscut which guided the location of the southeast stope was driven at this elevation by No. 11 contract in September. The 30' length on the south side of the mill sub drift was in low sulphur ore until it intersected the black slate footwall.

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7. UNDERGROUND (Cont.)

c. Stoping (Cont.)

The sulphur content of the slate was 1.57%, so in mining operations on subs above, a sufficient thickness of ore was left in place to protect this contact. The north crosscut in an advance of 30' averaged .250 in sulphur. The stope dimensions at this mill sub elevation in December were approximately 30' x 40'.

-115' Sub

This sub was the lowest one on which mining operations took place in the central and northwest stopes. The angle of repose of the broken material in the northwest stope prohibited extension farther south, but the new transfer drift on the -150' sub has already been driven for this purpose in 1939.

Two transfer drifts were driven at the southeast end of the orebody for development of the southeast stope. The first of these was an extension of the old traveling drift but so much water was encountered in the drift, and in mining operations above, that a second transfer at a slightly higher elevation was driven in December. Drainage pipes were then laid in the original transfer and a plank floor in the second one so that the dry ore could be scraped directly to No. 802 chute.

d. Timbering

The total cost, and the cost per ton, were both reduced in 1938 because of the completion early in the year of the general underground repair and retimbering program needed after the reopening of the mine in 1937. The figures would have been still lower had it not been for the 8th Level drift and raise development, most of which was in the soft slate and required timbering. Repair or lining sets in the 8" to 10" size accounted for most of the stull timber in 1937, and drift sets in the 10" to 12" size and cribbing in the 6" size made up the larger proportion in 1938.

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7. UNDERGROUND (Cont.)

d. Timbering (Cont.)

The lagging length was reduced to 5' in order to lower directly on trucks in the small cage, and the number of poles was about the same in both years.

Statement of Timber Used

<u>Kind</u>	<u>Lineal Feet</u>	<u>Avg. Price Per Foot</u>	<u>Amount 1938</u>	<u>Amount 1937</u>
6" to 8"	6,905	.0373	257.32	60.72
8" to 10"	770	.0669	51.57	233.93
10" to 12"	1,633	.0933	152.28	149.77
12" to 14"	678	.1318	89.37	75.14
14" to 16"	216	.1625	35.10	11.70
Total Timber 1938	10,202	.0574	585.64	
Total Timber 1937	7,455	.0713		531.26

5' Lagging	17,175	.0075	128.84	88.53
7' Lagging	3,815	.00749	28.58	295.20
Total Lagging	20,990	.0075	157.42	383.73

Poles	16,133	.01399	225.82	227.65
Total Lagging & Poles	37,123	.01032	383.24	611.38

Product		89,795	71,255
Feet of Timber per Ton of Ore		.1136	.1046
Feet of Lagging per Foot of Timber		2.0574	6.586
Cost per Ton for Timber		.00652	.00746
Cost per Ton for Lagging		.00175	.00539
Cost per Ton for Poles		.00252	.00319
Cost per Ton for Timber, Lagging & Poles		.01079	.01604
Equivalent of Stull Timber to Board Measure		18,459	13,531
Feet of Board Measure per Ton of Ore		.2056	.1899
Cost of Timber, Lagging & Poles 1938	968.88		
Cost of Timber, Lagging & Poles 1937	1142.64		

e. Drifting & Raising

The following table shows the 1938 development footage classified as to size and material:

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7. UNDERGROUND (Cont.)

e. Drifting & Raising (Cont.)

	<u>Drifting</u>			<u>Raising</u>			<u>Combined</u>
	<u>Ore</u>	<u>Rock</u>	<u>Total</u>	<u>Ore</u>	<u>Rock</u>	<u>Total</u>	<u>Total</u>
Full Size	83	665	748	0	0	0	748
Small Size	1391	433	1824	648	422	1070	2894
Total	1474	1098	2572	648	422	1070	3642

The combined total of 3642' compared with 3328' in 1937. Most of the small size raising and drifting in rock that year, however, was for ventilation purposes. The net gain in development for regular mining operations in 1938 was therefore about 1400', and this was responsible for the large increase in the development cost.

The continuation of the sub level bench mining method in the stopes above the 8th Level again increased the ore produced per foot of development from 21.4 in 1937 to 24.7 in 1938.

f. Explosives, Drilling & Blasting

The opening of 2 stopes would normally have caused an increase in the cost of breaking ore, but the standardization in 1938 in the use of No. 1 Gelamite powder for all purposes increased blasting efficiency to the point where this was counteracted, and the blasting cost was actually reduced from .0562 in 1937 to .0556. The larger amount of rock development footage increased the amount and cost of explosives used for this purpose by 50%, so the total cost per ton for all explosives was .073 compared to .071 per ton in 1937.

Statement of Explosives Used

<u>Ore Development & Stopping</u>	<u>Quantity</u>	<u>Average Price</u>	<u>Amount 1938</u>	<u>Amount 1937</u>
#1 Gelamite, 60%	36,270	.1225	4,443.10	1,409.00
#2 Gelamite, 40%				2,019.90
Total Powder	36,270	.1225	4,443.10	3,428.90
Fuse	76,333	5.0595	386.21	403.69
#6 Caps	11,424	12.20	139.36	127.75
Fuse & Cap Seal				.60
Cap Crimpers				22.00
Powder Bags	10	1.15	11.50	10.35
Safety Fuse Lighters	1,625	.90	14.62	11.16
Total Fuse, Caps etc.			551.69	575.55
Total Explosives, Ore Devel. & Stopping			4,994.79	4,004.45

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7. UNDERGROUND (Cont.)

f. Explosives, Drilling & Blasting (Cont.)

	<u>Quantity</u>	<u>Average Price</u>	<u>Amount 1938</u>	<u>Amount 1937</u>
Production - tons			89,795	71,255
Pounds of Powder per ton of ore			.4039	.3927
Cost per ton for Powder			.0495	.0481
Cost per Ton for Breaking Ore			.0556	.0562
<u>Rock Development</u>				
#1 Gelamite, 60%	10,334	.1225	1,265.92	618.01
#2 Gelamite, 40%				230.06
ELF Gelatin, 60%				26.00
Total Powder	10,334	.1225	1,265.92	874.07
Fuse	37,867	5.0664	191.85	139.61
#6 Caps	5,621	12.20	68.59	41.11
Powder Bags	2	1.15	2.30	1.15
Fuse Lighters	675	.90	6.08	3.60
Total Explosives, Rock Development			1534.74	1059.54
Total All Explosives Used in Mine			6529.53	5063.99
Average price per pound for powder			.1225	.12257
Total Cost per Ton All Explosives			.073	.071

g. Ventilation

The ventilation of the mine again provided the most serious operating problem, as in 1937. The supply of an adequate amount of fresh air to the working places, the control of 2 mine fires, and the attendant difficulties arising from sulphur dioxide gas and sulphuric acid, were all overcome except for a 4 day delay at the end of January. The lessened development expense for ventilation purposes reduced the cost per ton considerably in 1938, but the total expense was still far in excess of a normal figure.

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7. UNDERGROUND (Cont.)

g. Ventilation (Cont.)

A review of the year's happenings in connection with ventilation is perhaps the best way of presentation, and the first thing of importance was the completion on Jan. 12th of the 420' ventilation raise in rock from the 6th to the 4th Levels. A 6 x 6 drift was then driven north a distance of 27' and connected to the old 4th Level drift a few days later. This drift and raise provided a complete open ventilation circuit for the first time since the mine had been reopened in 1937.

No. 9 development contract then dropped to the -305' sub level where a small drift was extended 23' in ore toward the old workings. The drift was intended to tap the foul air above No. 10 6th Level stope so that air conditions could be improved in this area. But while this was going on, the presence of sulphur dioxide gas was noticed in the 4th Level exhaust air. Inspection revealed that the gas came from the section of the old 4th Level drift that had been by-passed by the new connection driven during the Summer of 1937. The action was caused, no doubt, by the increased oxygen content of the air entering the drift, the completion of the new raise adding pure air to the circuit.

The expulsion of the SO^2 gas from the caved old 4th Level drift meant that the pyritic slate in some area had reached a temperature of over 300° F. The simplest way of combating the reaction was to lower the temperature and admit at the same time a neutralizing agent such as lime. This plan was put into effect by mixing the lime in the third level sump and piping it directly under pressure into the old drift after a dam had been constructed at the east end. The results of this experiment were such that the mine was reopened on the 8th of February. It is a real pleasure to be able to record the cooling of this area within a few months, for the lime injections evidently completely neutralized the oxidation process.

While the lime injections were being made in the caved drift it had been necessary to hold back at least a portion of the heat and CO^2 gas issuing from the old stopes above the 6th Level by building a temporary brattice at the west end of the 4th Level. Since this step had been taken and proof was at hand as to what occurred when fresh air was introduced in the 4th Level circuit, it was decided to seal off all stopes between the 6th and 4th Levels.

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7. UNDERGROUND (Cont.)

g. Ventilation (Cont.)

The reasons for this step, and a description of the methods used and the areas affected, were listed in a special report to the Manager dated Feb. 26, 1938.

Immediately after the report was forwarded it was learned that the east stope above the 8th Level had caved through to a crosscut on the 6th Level, and that SO_2 gas was forcing its way through this opening. The fire or oxidation process in this section was of greater extent than that on the 4th Level, and at the end of the year the action was still not completely under control. The fire in this section meant the construction of 12 brattices to prevent the entrance of oxygen and to seal the SO_2 gas from the main ventilation circuit. It was also necessary to drive a small drift connection on the 6th Level for the purpose of forcing lime into the east end of the caved section. The rapid building up of the oxidation process was especially discouraging after the results which had just been obtained on the 4th Level. The area was flooded with lime water which, in passing through the caved material reached the 8th Level as dilute sulphuric acid. Tests in March showed that 85 lb. of sulphuric acid per hour was reaching the 8th Level in the waste water. Here again the addition of lime was the saving factor which minimized the damage to the pumping equipment. Dilute acid from the 4th Level however had earlier unknowingly been pumped to surface. This caused four leaks in the upper section of the discharge column which were repaired in March by the insertion of 4 lengths, totaling 62' of extra heavy 8" pipe, and 3 pairs of new flanges.

The continued introduction of decreasing amounts of lime solution from three points above the caved stope virtually eliminated the SO_2 gas in this section in April. About the middle of the Summer, the pressure of the gas increased and since then only enough lime has been added to reduce the pressure inside the bratticed area in order to hold the quantity of waste sulphuric acid at a minimum.

The eight brattices sealing the old stopes above the 6th Level were built on this level in March. The final concrete brattice which sealed the upper section, or chimney, of these stopes was built at the west end of the 4th Level in July.

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YEAR 1938

7. UNDERGROUND (Cont.)

g. Ventilation (Cont.)

This brattice improved the air circuit to the second outlet Virgil shaft to such an extent that the full ventilation circuit could be traveled in air with close to normal oxygen content. Two, three inch exhaust pipes were set in the 4th Level concrete brattice and no pressure has been allowed to build up in the old stope. Analysis of the exhaust from these pipes show a depleted oxygen content of about 1% and a CO² average of about 10%.

On the whole air conditions at the end of the year were better than at any time since the mine was reopened, and the only possibility of future trouble is apparently in the caved east stope above the 8th Level where a small amount of SO² gas is still being generated in spite of sealing and the addition of lime. It is believed however that this area can be held under control, and also that at some future time the fully developed #10 stope above the 6th Level can be re-entered for the short period that will be necessary to mine the remaining ore. The quantity of lime used during the year was 71.3 tons and the cost was \$1155.68. It seems certain that the labor and supply cost of the lime neutralization method used in combating the fires was much lower than that which would have been necessary under the sand fill method.

Extensive repairs to the Virgil ventilation shaft were also necessary to maintain this opening. The casing plank 30' below surface had rotted and allowed the sand to run out of this section. Cedar lagging in 5' lengths was used as blocking out side the shaft timbers and nearly 1,000 pieces were used in April to fill the opening. New casing and 2 new lining sets were installed, and the ladder road was repaired by replacing 150' of ladders and adding sollar plank where needed. At the same time a new plank sidewalk 150' long across water filled depressions on the first Level was constructed to complete a safe traveling road from the top of the raise from the Spies Third Level. Then in July, heavy rains caused a continual increase in the elevation of the water level in the Virgil First Level stopes. In order to hold the water below the back of the First Level (and thus maintain mine ventilation) it was necessary to provide a 50 gal. per minute centrifugal pump at a cost of \$274.60.

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7. UNDERGROUND (Cont.)

g. Ventilation (Cont.)

The pump, after first lowering the water in the shaft, was set up as a permanent automatic installation over a small sump on the First Level. A ditch was dug to conduct the Spies water to this sump, and in October by using a raft a 2" pipe line was hung across the 90' stope span to drain the water from the old surface raise on the other side of the stope. At the end of the year the water had been lowered about 5' of the 100' depth from the first to the Second Levels. The estimated quantity in these old stopes is about ten million gal., so it will take some time to drain this water through the partly blocked drainage drill hole to the 6th Level.

8. COST OF OPERATING

<u>a. Comparative Mining Costs</u>	<u>Amount</u>	<u>1938 Cost</u> <u>per Ton</u>	<u>Amount</u>	<u>1937 Cost</u> <u>per Ton</u>
Production, Tons	89,795		71,255	
Underground Cost	96,775.85	1.078	71,467.48	1.003
Surface Cost	27,432.07	.305	18,568.74	.261
General Mine Expense	25,963.64	.289	16,629.45	.233
Cost of Production	<u>150,171.56</u>	<u>1.672</u>	<u>106,665.67</u>	<u>1.497</u>
Depreciation, Plant & Equip.	808.16	.009	2,705.39	.038
" Development	26,309.94	.293	15,591.72	.219
Taxes	5,994.74	.067	2,134.25	.030
Loading & Shipping	2,388.82	.027	8,096.41	.114
Total Cost at Mine	<u>185,673.22</u>	<u>2.068</u>	<u>135,193.44</u>	<u>1.898</u>
Budget Est. Cost at Mine		1.996		
Supply Inv. Adjustment	45.56	.000	804.14	.011
Idle Expense *			<u>33,646.74</u>	<u>.472</u>
Total Cost	<u>185,718.78</u>	<u>2.068</u>	<u>169,644.32</u>	<u>2.381</u>
Number of Shifts & Hours	2-8 Hr. 99		2-8 Hr.	
	1-8 Hr. <u>104</u>			
Number of Days Operating	<u>203</u>		148	
Average Daily Product	442		481½	

*Mine Operated 8 months in 1937, starting in May.

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8. COST OF
OPERATING (Cont.)

b. Detailed Cost Comparison

	<u>1938</u>		<u>1937</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
1. Exploring in Mine	291.45	.003	50.10	.000
3. Development in Rock	11,873.37	.132	1,301.30	.018
4. Development in Ore	8,496.83	.095	8,441.45	.119
5. Stoping	21,062.17	.235	15,778.86	.222
6. Timbering	5,457.47	.061	7,389.17	.104
7. Traming	10,351.43	.115	8,976.48	.126
8. Ventilation	7,769.81	.087	8,847.05	.124
9. Pumping	10,746.46	.120	5,621.12	.079
10. Compressors & Air Pipes	7,913.96	.088	7,216.65	.101
12. Undg. Superintendence	5,637.90	.063	3,614.88	.051
14. Maint: Comp. & Pow. Drills	207.16	.002	303.07	.004
15. Scrapers & Mech. Loaders	104.83	.001	46.95	.001
16. Maint: Elec. Tram Equip.	5,030.34	.056	2,515.63	.035
17. Maint: Pumping Machy.	1,832.67	.020	1,384.77	.019
Total Undg. Costs	96,775.85	1.078	71,467.48	1.003
<u>Surface Costs</u>				
18. Hoisting	7,025.18	.078	4,777.29	.068
19. Stocking Ore	6,079.46	.068	2,015.53	.028
20. Screening, Crush. at Mine	2,533.62	.028	1,740.15	.024
21. Dry House	3,663.81	.041	2,288.72	.032
22. General Surface Exp.	2,108.46	.023	2,700.13	.038
23. Maint: Hoisting Equip.	2,690.25	.030	1,497.10	.021
24. Maint: Shaft	737.71	.008	456.67	.006
25. Maint: Top Tram Equip.	1,122.50	.013	666.58	.009
26. Docks, Trestles & Pockets	656.05	.007	897.62	.013
27. Mine Buildings	815.03	.009	1,528.95	.022
Total Surface Costs	27,432.07	.305	18,568.74	.261
<u>General Mine Expense</u>				
28. Insurance	823.92	.009	663.81	.009
29. Mining Engineering	1,263.54	.014	609.25	.008
30. Mech. & Elect. Engineering	113.77	.001	43.12	.001
31. Analysis & Grading	1,791.00	.020	1,967.39	.028
32. Personal Injury	2,679.50	.030	2,672.17	.037
33. Safety Department	514.97	.006	287.33	.004
34. Telephone, Safety Devices	568.28	.006	655.89	.009
35. Local & Gen. Welfare	1,415.18	.016	642.00	.009
36. Special Exp. Pensions etc.	2,587.21	.029	1,502.16	.021
37. Ishpeming Office	3,763.86	.042	1,971.00	.028
38. Social Security Taxes	3,624.40	.040	2,115.06	.030
39. Mine Office	6,800.75	.076	3,459.98	.048
40. Employees Vac. Pay	17.26	.000	40.29	.001
Total Gen. Mine Exp.	25,963.64	.289	16,629.45	.233
COST OF PRODUCTION	150,171.56	1.672	106,665.67	1.497
40. Taxes	5,994.74	.067	2,134.25	.030
TOTAL COST	156,166.30	1.739	108,799.92	1.527

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8. COST OF
OPERATING (Cont.)

b. Detailed Cost Comparison (Cont.)

	<u>1938</u>		<u>1937</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
41. General Supplies	10,120.49	.113	5,285.00	.074
42. Iron & Steel	2,409.73	.027	1,559.96	.022
43. Oil & Grease	444.44	.005	432.04	.006
44. Machinery Supplies	3,593.75	.040	3,992.25	.056
45. Explosives	6,523.61	.073	4,711.00	.066
46. Lumber & Timber	3,452.57	.038	4,212.20	.059
47. Fuel	2,400.56	.027	2,072.73	.029
48. Electric Power	18,204.97	.203	12,156.44	.172
49. Sundries	2,150.54	.024	1,802.06	.025
50. Other Mines & Acct.	957.58	.011	2,253.43	.032
Supply Inv. Adj.	45.56	.000	804.14	.011
Total, Cost Sheet	48,388.44	.539	34,774.39	.488

The explanation and comparison of the above accounts follows in detail:

1. Exploring in Mine

The amount in 1938 was higher because of the mapping by the geological department of the new development in the south footwall territory above the 8th Level.

3. Development in Rock

The largest single increase in any account was under this heading. The extension of the southwest 6th and 8th Level drifts, and the new single compartment raises above the 8th Level in the footwall rock, were all for the purpose of developing the former prospective ore reserve in this section of the mine. This program was probably the last intensive rock development campaign in the Virgil Mine and in some measure should be replaced by development in ore in 1939. Had this expense been distributed evenly in 1937 and 1938 the underground costs in each year would have been about the same. The large increase is best shown by means of the following table:

	<u>1938</u>	<u>1937</u>	<u>Increase</u>
Cost of Rock Development	11,875.37	1,301.30	10,572.07
Cost per Ton	.132	.018	.114
Rock Development Footage	1,414	116	1,298
Cost per Foot	8.40	11.22	2.82

SPIES VIRGIL MINE
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YEAR 1938

8. COST OF OPERATING (Cont.)

b. Detailed Cost Comparison (Cont.)

4. Development in Ore

The development of the 2 stopes above the northwest 8th Level drift accounted for all but a few feet of the total of 2122' of ore development. The footage and amount was about the same as last year, so the cost per ton declined.

	<u>1938</u>	<u>1937</u>	<u>Incr.</u>	<u>Decr.</u>
Cost of Ore Development	8,496.83	8,441.45	55.38	
Cost Per Ton	.095	.119		.024
Ore Development Footage	2122	2170		48'

5. Stoping

The stoping cost per ton was slightly higher than last year because two new stopes were started, and the initial product was considerably below the average in each. The smaller product during the starting periods, and the added number of drill holes and quantity of powder necessary to break the ore, made the cost of .235 seem very favorable as compared with 1937.

6. Timbering

The lessened timber repair program in 1938 reduced the amount nearly \$2000, and the cost per ton therefore dropped from .104 to .061.

7. Tramming

This charge was about proportionate to the tons produced.

8. Ventilation

The reduced amount of development work in connection with ventilation lowered this cost from .124 to .087. The charge would have been still lower had it not been for the 2 mine fires, and it is believed that the work done in 1938 will result in a lower cost next year. A good indication of this is the 1938 November-December average of .029 per ton.

9. Pumping

The 1937 January to April pumping costs were charged to idle expense. This explains the increase from \$5621.12 to \$10,746.46 in 1938. The increased cost per ton, from .079 to .120, was because of the lower average monthly production in 1938.

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8. COST OF
OPERATING (Cont.)

b. Detailed Cost Comparison (Cont.)

12. Underground Superintendence

The reduction in salaries of the captain and bosses was not in proportion to the lowered production, so the cost per ton increased from .051 to .063.

16. Maint. of Electric Tram Equipt.

The repair of underground cars and locomotives nearly doubled this expense in 1938 so the cost per ton was .056 compared to .035 in 1937.

18. Hoisting

The increased amount and cost per ton for hoisting was due almost entirely to the higher average electric power rate in 1938.

19. Stocking Ore

The large increase (from .028 to .068 per ton) was due to the fact that 66,317 tons were stocked in 1938 compared to 18,203 tons in 1937. Construction of the trestle in the central area was started in the Fall of 1937 and completed in the Spring of 1938. Then a second trestle was built on the east stockpile grounds to provide room for the early 1939 production, so the cost of stocking capacity for a year and a half was applied on the 1938 production. This increased the amount from \$2015.53 in 1937 to \$6079.46 in 1938.

20. Screening- Crushing at Mine

The increased amount was due in part to a proportion of the cost of extending the steam heating system to the headframe. The remainder of this expense was apportioned between the hoisting and stocking accounts.

21. Dry House

The usual heating and overhead expense and the lower average monthly production in 1938 increased the cost per ton from .032 to .041. Additional repairs on the old heating plant boiler were also partly responsible for the increase.

SPIES VIRGIL MINE
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YEAR 1938

8. COST OF
OPERATING (CONT.)

b. Detailed Cost Comparison (Cont.)

22. General Surface Expense

The cost of the new water line from the location to the mine increased this expense in 1937. The lower 1938 cost of \$2108.46 reduced the amount per ton from .038 to .023.

23. Maint. of Hoisting Equipt.

The purchase of 2 new hoisting ropes nearly doubled this amount in 1938. The cost per ton however, because of the larger total production, increased only from .021 to .030.

25. Maint. Top Tram Equipt.

The maintenance expense of the larry car top tram system in 1938 was \$1122.50 for stocking 66,317 tons of ore, and in 1937 was \$666.58 for stocking 18,203 tons. Late in 1938 a complete set of car door catches was purchased as a spare so that repairs could be made on the regular set and the system continue in operation meanwhile.

26. Maint. Docks, Trestles, & Pockets

There was less repair work on the permanent trestles in 1938 so the cost per ton declined from .013 to .007.

27. Mine Buildings

The construction of a heated garage for the new Ford truck in 1937 increased this expense to \$1528.95 that year. Less repairs and no new construction in 1938 reduced the cost to \$815.03, and the amount per ton from .022 to .009.

29. Mining Engineering

The large increase in the amount of new development work was largely responsible for the increased cost per ton. The expense for the full year, and the lower average monthly production in 1938, made up the remainder of the increase.

31. Analysis and Grading

The reduced number of stockpile shipment samples, and the elimination of the silica determination from the daily samples, were largely responsible for reducing the amount and cost per ton from .028 to .020. The silica determination was continued on the weekly composite sample, and this was sufficient for control of production.

SPIES VIRGIL MINE
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YEAR 1938

8. COST OF
OPERATING (Cont.)

b. Detailed Cost Comparison (Cont.)

32. Personal Injury

The doctor and compensation charge increased about \$400 in 1938, but the proportion of the hospital loss was lower. The total amounts being about the same in each year, the cost per ton decreased from .037 to .030. The compensation payments for the injury which occurred Dec. 30, 1937 will be completed in 1939, so it is earnestly hoped that this cost may be reduced still further in 1939.

35. Local and General Welfare

The local welfare charge increased from \$169.00 to \$300.65, and the general from \$473.00 to \$1114.53. This combination increased the cost per ton from .009 in 1937 to .016 in 1938.

36. Special Expense, Pensions & Allowances

The increase of \$453.42 for pensions and \$291.48 for the Saranac Investigation expense, for the full year in 1938, increased the cost per ton from .021 to .029.

38. Social Security Taxes

The unemployment insurance tax increased from \$1430.24 in 1937 to \$2814.15 in 1938. This increased the cost per ton from .030 to .040.

40. Taxes

There was little difference in the amounts paid for taxes in the years 1937 and 1938. The proportion that was charged to idle expense in 1937 however, reduced the operating cost per ton in that year to .030 in comparison to the cost of .067 in 1938.

9. EXPLORATIONS
AND FUTURE
EXPLORATIONS

There was no diamond drilling in 1938, and development was inside the limits of previously explored areas. Raising and drifting near the south footwall above the 8th Level will be in the nature of exploration which, it is hoped, will restore at least a part of the 1938 reduction in ore reserves.

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10. TAXES

The following tabulation is a complete statement of valuations and taxes paid for the years 1937 and 1938:

<u>Description</u>	<u>1938</u>		<u>1937</u>	
	<u>Valuation</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Taxes</u>
<u>Iron River Township, Iron County</u>				
<u>Spies Lease</u>				
NE $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 24, 43-35)				
SE $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 24, 43-35)				
<u>Virgil Lease</u>				
SW $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 24, 43-35).....	140,000	2,500.40	100,000	1,803.00
Stockpile Supplies & Equipt.....	150,000	2,679.00	170,000	3,065.10
Total Spies-Virgil*.....	290,000	5,179.40	270,000	4,868.10
Spies Dwellings.....	5,000	89.30	5,000	90.15
Total Iron River Township.....	295,000	5,268.70	275,000	4,958.25
<u>Village of Mineral Hills</u>				
<u>Spies Lease</u>				
NE $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 24, 43-35)				
SE $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 24, 43-35)				
<u>Virgil Lease</u>				
SW $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 24, 43-35)...	140,000	393.61	100,000	265.25
Stockpile supplies & Equipt.)...	150,000	421.73	170,000	450.90
Total Spies Virgil*.....	290,000	815.34	270,000	716.15
Spies Dwellings.....	5,000	14.06	5,000	13.25
Total Mineral Hills.....	295,000	829.40	275,000	729.40
Total Taxes.....		6,098.10		5,687.65
Tax per ton produced.....		.068		.08
Tax per ton shipped.....		.169		.033

*The village of Mineral Hills is in Iron River Township and the valuations are the same for each. The realty valuations placed by Tax Commission includes both Spies and Virgil descriptions, and are not divided by the appraiser.

11. ACCIDENTS AND PERSONAL INJURY

The ordinary hazards of underground mining were augmented by the work necessary in combating the two mine fires and the resulting gas. The working force have reason to be justly proud of the record in 1938, for the full year was worked without a lost time accident underground.

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11. ACCIDENTS AND
PERSONAL INJURY (Cont.)

One slight accident occurred on surface on June 15th. when the blacksmith's ankle was bruised by the head of the riveting hammer. The piece was expelled when the machine turned over and the trigger touched the floor. Eighteen days were lost on account of this accident out of a total of 13,937 days worked for the year. The frequency rate, or number of accidents per 1000 days worked was .072, and the severity rate, which is the number of days lost per 1000 worked, was only 1.29. The excellent showing resulted in the Spies-Virgil taking front rank among the Company's underground mines, and the consequent award of the safety banner which, it is hoped, may be flown throughout 1939.

12. NEW CONSTRUCTION
AND PROPOSED
NEW CONSTRUCTION

This work in 1938 included:

Extension of steam heating system to headframe
Erection of 15 bent ore trestle and 6 bent rock trestle
New porch and extension roof on office building
Erection of pole line for pump circuit from engine house to headframe
Installation of automatic centrifugal pump 1st Level Virgil shaft
Building of 10 concrete and 16 frame brattices underground to control ventilation

The description of the first four construction jobs will be found under the "Surface" heading. The only one of these that was not absolutely necessary was the headframe heating system, but the elimination of the former fire hazard of the old heating stoves should weigh largely in the \$705.08 cost of making this improvement. The Virgil shaft pump installation and the construction of brattices have also been described in detail under the heading of "Ventilation."

No new construction is at this time contemplated for 1939.

13. EQUIPMENT AND
PROPOSED EQUIPMENT

The following additions to equipment were made in 1938.

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13. EQUIPMENT AND
PROPOSED EQUIPMENT (Cont.)

	<u>Cost</u>
1 - Model A 3/4 Ton Coffing Ratchet Hoist	33.00
1 - Loco. Type Heating Plant Boiler (Transferred from Hill-Trumbull Mine)	315.50
1 - 1 $\frac{1}{2}$ RVP No. 7 Ingersol-Rand Pump with 220-3-60 Motor	274.60
4.- 220 Volt, 60 Cycle, 1 Phase, Thermoiler Heaters	250.74
55 - Electric Cap Lamps (Transferred from Lloyd Mine)	
5 - Electric Trip Lamps " " " "	
1800 Ft. 1 $\frac{1}{4}$ Plow Steel Rope	665.23
1930 Ft. 1 $\frac{1}{4}$ Plow Steel Rope	764.23

Despite the fact that new equipment purchases held to a minimum, each of the above were necessary additions or replacements. The electric cap and trip lamps were transferred from surplus at the Lloyd Mine in July, the Spies-Virgil assuming the rental charge from that time on. One of the hoisting rope replacements made in January, and the other in October. The replacement of the dry house central heating plant boiler was made in December, the installation cost amounting to \$189.65.

14. MAINTENANCE
AND
REPAIRS

a. Mine

The more extensive overhauling or repair work in addition to regular maintenance included steam shovel, top tram larry car, underground haulage cars and pump repairs. The most complete perhaps, was the thorough overhauling of the steam shovel, the work being done intermittently from January to April. The boom was lowered and taken into the shops where loose rivets were replaced and the boom engine overhauled. Other bearings were checked and tightened and assembly of the shovel was made just in time for the loading of the first cargo of the season from the Michigan Ranges on April 14th.

New contactor boards were installed in the second larry car in February. Other electrical work on surface included the rewiring of the crusher motor panel in the headframe and the replacement of several other switches with the approved type in the shops and dry house.

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14. MAINTENANCE
AND REPAIRS (Cont.)

b. Mine (Cont.)

The 2 ton underground haulage cars were brought to surface one at a time and given a general overhauling which included in most cases straightening and bracing of the dump body, tightening of rivets in the frame, and in some cases replacement of wheel bearings or wheels. The repairing of all of the 21 cars had not been completed at the end of the year and will be continued in 1939 as time allows.

Another thorough overhauling job was the refacing of pot seats and covers, and the installation of the lead-rubber combination packing and 2 brass valve seats in the 8th Level Prescott plunger pumps at a cost of a little over \$200. This again placed the pumps in good condition in spite of the acid water which at times was pumped from this level. This trouble also made necessary the replacement of 110' of 8" extra heavy pipe in the upper section of the discharge column at a total cost of \$461.85. The pipe in every case was eaten away at the threads in the couplings and 6 pairs of 8" flanges were also replaced. The work was done in March and one length was changed in December. Strain in the Pipe from frost heave was eliminated in March by adding a tee and raising and boxing in the horizontal discharge at the collar of the shaft.

Extensive repairs were also necessary on the old dry house boiler to continue operation until it was replaced by the boiler from the Hill-Trumbull Mine. The boiler injector pump was also overhauled, and the belt drive of this unit will be replaced by a chain and sprocket drive early in 1939 to save the expense of frequent belt replacements.

The repairing and painting of the trim of the mine buildings, the repairs to the Virgil Shaft, and the replacement of 30 with 40 lb. rail in the 8th Level haulage drift are described elsewhere in this report.

b. Location

The placing of the Spies location houses in good condition was completed in 1937 except for the second coat of paint on 3 of the cottages. This work was done in June, and the supplying of kalsomine to the tenants and repairing of cracked plaster in several of the houses brought the total rented building expense to \$356.45.

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14. MAINTENANCE
AND REPAIRS (Cont.)

b. Location (Cont.)

The location maintenance expense was also less than last year, sewer repairs costing only \$77.18, so the total expenditure was little more than one-tenth that of last year, as shown in the following comparison:

			1938	1937
<u>Spies Virgil Dwellings</u>	<u>Labor</u>	<u>Supplies</u>	<u>Amount</u>	<u>Amount</u>
Foundation Repairs				1,557.71
Repairs to Houses	118.03	68.12	186.15	2,272.67
Interior Decorating		68.35	68.35	155.43
Outside Painting		101.95	101.95	1,061.11
Shed Repairs				62.24
Total Amt. for Dwellings	118.03	238.42	356.45	5,109.16
<u>Location Maintenance</u>				
Repairs to Sewer	63.79	13.39	77.18	
Wiring & Light Repairs	30.44	52.08	82.52	
Fire Protection & Water	1.93	63.97	65.90	
Total Location Maint.	96.16	129.44	225.60	472.25
Total Rented Building & Location Maint.	214.19	367.86	582.05	5,581.41

15. POWER

The Wisconsin-Michigan Power Co. service was again uninterrupted during the year. When the electric pump was installed in the Virgil Shaft in August it was noticed that the voltage was low, so the power company raised the voltage taps about 10% at the Spies transformer station, and this benefited the rest of the electrical equipment to that extent.

17. CONDITION
OF
PREMISES

The additional repairing and painting of structures on the mine surface and rented buildings in the Spies Location, while not expensive, placed the premises in better condition than for some years past. The extensive repairing of the location houses in 1937 placed them in good condition, and it is hoped this expenditure will not have to be repeated during the remaining life of the mine.

SPIES VIRGIL MINE
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17. CONDITION
OF
PREMISES (Cont.)

The grading and repairing of the lower road to the mine and the prompt cleaning of the location alley by the Village were other aids in the care of the premises.

18. NATIONALITY
OF EMPLOYEES

<u>Parentage</u>	<u>American Born</u>		<u>Foreign Born</u>		<u>Per Cent of Total</u>
	<u>Number</u>	<u>%</u>	<u>Number</u>	<u>%</u>	
English	7	10	9	12	22
Finnish	5	7	9	12	19
American	13	19			19
Scandinavian	10	14	1	1	15
Italian			6	8	8
Austrian			3	4	4
Polish			3	4	4
French	2	3	1	1	4
German	1	1	2	3	4
Irish	1	1			1
Total	39	55	34	45	100

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1. GENERAL:

Following the customary shutdown for the Christmas holidays, winter repair work was resumed on January 3rd. This work was conducted on a five day basis and the men were so rotated that all but the office force; the foremen and a few special mechanics were employed three days per week. The repair schedule was curtailed early in March, when it was ascertained that the ore season would not start until late in May..

During the latter part of April, a small track gang was employed in preparing the main lines for the spring clean-up. A few additional men started clearing, ditching and preparing a site for a concentrate stockpile.

The 1938 mining program was started on May 25th, and conducted until October 22nd. During the fore part of the season the mine was operated four days of three eight-hour shifts per week, but this was stepped up to five days as a result of increased requirements, later in the year. All of the old employees from the Hill-Trumbull and Canisteco Mines were taken care of with an average of from three to four days per week work.

The washing plant was operated 107 days, producing 777,881 tons of concentrates, - 252,560 tons of which were placed in stockpile. The average daily output of 7,270 tons was an improvement over that for the year 1937. The plant results were satisfactory, both as to tonnage and grade and the ratio of delays to the total working time fell from 8.67 per cent in 1937 to 5.93 per cent for the year 1938.

There was no stripping program for the year, aside from the usual spring clean-up in the pit bottom and a small yardage of taconite and waste material which was taken out to make available an additional 100,000 tons of concentrates from the lower part of the Snyder pit.

Upon the completion of the ore season, a small track and surface gang was employed in taking up all the tracks and track materials from the pit bottom up to the switch-back in the west end of the Snyder. All pumps and pipe lines were disconnected and the pipe lines taken up to elevation 600, (Lake Superior datum). Pumping was discontinued and the water will rise to this elevation before it will be necessary to resume operations. The reclaiming work was completed on the 18th of November.

The winter repair work on the mine and mill equipment was started immediately following the ore season and carried forward until the 23rd of December.

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2. PRODUCTION,
SHIPMENTS &
INVENTORIES:

a. Production by Grades:

Snyder Crude, -----	736,921 tons.
Bovey Crude, -----	162,355 "
Hemmens Crude, -----	<u>266,390 "</u>
 TOTAL CRUDE ORE, -----	 1,165,666 "
 Snyder Non-Bessemer Concentrates, -----	 264,663 "
Snyder Bessemer Concentrates, -----	222,805 "
Bovey Non-Bessemer Concentrates, -----	104,795 "
Bovey Bessemer Concentrates, -----	11,129 "
Hemmens Non-Bessemer Concentrates, -----	105,017 "
Hemmens Bessemer Concentrates, -----	<u>69,472 "</u>
 TOTAL CANISTEO MINE, -----	 777,881 "

The ore operations were started on May 25th, and completed on October 22nd.

b. Shipments:

Snyder Non-Bessemer Concentrates from Mill, -----	166,260 tons
Snyder Non-Bessemer Concentrates from stockpile, --	29,873 "
Snyder Bessemer Concentrates from Mill, -----	68,648 "
Bovey Non-Bessemer Concentrates from Mill, -----	104,795 "
Bovey Bessemer Concentrates from Mill, -----	11,129 "
Hemmens Non-Bessemer Concentrates from Mill, -----	105,017 "
Hemmens Bessemer Concentrates from Mill, -----	<u>69,472 "</u>
 TOTAL FROM CANISTEO MINE, -----	 555,194 "

c. Stockpile Inventories:

Snyder Non-Bessemer Concentrates in stockpile, ---	68,530 "
Snyder Bessemer Concentrates in stockpile, -----	<u>154,157 "</u>
 TOTAL CONCENTRATES IN STOCK, -----	 222,687 "

e. Production by Months:

(1) Crude Ore:

	<u>SNYDER</u>	<u>BOVEY</u>	<u>HEMMENS</u>	<u>TOTAL</u>
May, -----	28,250	-	11,612	39,862
June, -----	168,256	-	67,329	235,585
July, -----	176,838	10,283	50,164	237,285
August, -----	88,266	94,135	71,095	253,496
September, -----	134,649	55,093	44,488	234,230
October, -----	<u>140,662</u>	<u>2,844</u>	<u>21,702</u>	<u>165,208</u>
 TOTAL 1938, -----	 736,921	162,355	266,390	1,165,666

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2. PRODUCTION,
SHIPMENTS &
INVENTORIES:
(Continued)

e. Production by Months: (Continued)

(2) Concentrates:

	<u>SNYDER</u>	<u>BOVEY</u>	<u>HEMMENS</u>	<u>TOTAL</u>
May, -----	17,001	-	6,959	23,960
June, -----	94,996	-	41,443	136,439
July, -----	115,531	7,415	31,249	154,195
August, -----	61,314	65,364	46,600	173,278
September, -----	98,707	41,180	33,109	172,996
October, -----	99,919	1,965	15,129	117,013
TOTAL 1938, -----	487,468	115,924	174,489	777,881

f. Ore Statement:

Production for Year 1938, -----	777,881 tons
Shipments for Year 1938, -----	555,194 "
In Stockpile, January 1st, 1939, -----	222,687 "

g. Delays:

The following delays were reported during the year 1938:

<u>Date</u>	<u>Time Lost</u>		<u>Cause:</u>
	<u>Hours</u>	<u>Minutes</u>	
May 25th,	1	30	Broken rail on Great Northern loading track.
26th,	1	35	No crude ore - derailment on high line near the mill.
26th,		20	Hopper under 4' x 6' screen became plugged.
27th,		45	Repairing plate in crude ore pocket.
31st,	5	10	No crude ore - loaded train derailed at dump crossover.
31st,	1		Delayed by Great Northern not removing loads to release trackage for stocking.
31st,		30	40" x 42" Jaw crusher plugged.
June 1st,		30	Tracks blocked by Great Northern.
1st,		30	No crude ore - broken car journal.
1st,		20	Repairing 4' x 6' Vibrating screen.
2nd,	1		No crude ore - delay moving shovels account of high water in sinking cuts.
2nd,		45	Repairing jaw crusher.
2nd,		30	Repairing rock gun.
9th,	3	20	No crude ore - sinking cuts flooded when pump broke down.
13th,	1	37	Running one side 3 hours 15 minutes, due to burned out classifier motor.
13th,		45	No power - changing classifier motor.
13th,		30	East classifier overloaded and plugged.
14th,		25	Changing guide iron on 8' pan conveyor.
20th,		45	No crude ore - derailment in pit.
22nd,		55	Loading tracks tied up by Great Northern train.
22nd,		55	No crude ore - derailment in pit.

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2. PRODUCTION,
SHIPMENTS &
INVENTORIES:
(Continued)

g. Delays: (Continued)

Date:	Time Lost		Cause:
	Hours	Minutes	
June 23rd,	6		No crude ore - entire train derailed and car journal broken when two rails overturned.
24th,	4	25	No crude ore - derailment at switch in Hemmens corner, when load rail overturned.
27th,	2	15	No crude ore - broken car journal on loaded train.
30th,	12		Replacing two broken 14" x 8' rollers under 8' pan conveyor. Pit operations shut down, during this time.
30th,	1	8	Running one side 2 hours 15 minutes, replacing a burned out cross conveyor motor.
July 5th,	1		36" Belt conveyor plugged.
5th,		30	No crude ore - broken hoist cable on shovel.
7th,		30	Waiting for Great Northern empties.
8th,	1	15	Great Northern load track plugged with loads.
12th,		35	Repairing 4' x 6' Vibrating screen.
13th,	1		Aligning 36" conveyor belt.
13th,	2		No crude ore - excess rock in shovel cuts.
15th,	1	20	36" Belt conveyor stalled by surge of wet ore.
20th,	2	30	Electric trouble with log washer drive.
25th,	2	10	Repairing electric switch and control on west log washer.
27th,		50	No crude ore - broken car journal.
29th,	3	30	No crude ore - trouble with pumps and shifting shovels.
Aug. 1st,	2		No crude ore - wreck in pit.
1st,		40	36" Belt conveyor plugged.
2nd,		30	No crude ore - broken trip motor cable on shovel.
3rd,		45	Repairing 36" Belt conveyor.
3rd,		45	Removing plate from cone crusher hopper.
Sept. 1st,	1		No crude ore - repairing pitch braces on #32 shovel bucket.
4th,	1		Repairing 36" Belt conveyor.
4th,		40	No crude ore - broken beam on loaded car of crude ore.
5th,	4		No crude ore - accumulated delay - Bovey shovel in rock.

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2. PRODUCTION,
SHIPMENTS &
INVENTORIES:
(Continued)

g. Delays: (Continued)

Date:	Time Lost		Cause:
	Hours	Minutes	
Aug. 8th,	1	20	No crude ore - broken hoist cable on No. 32 shovel.
8th,	2	30	No crude ore - shovel cable struck by lightning.
10th,	3		No crude ore - rail turned over at Hemmens switch-back, derailling loaded train.
10th,	1		No crude ore - derailment in Snyder bottom.
12th,	1	30	Starting coil on east log washer burned out.
12th,	2		Electrical trouble with west classifier motor.
13th,	4		Broken drive shaft on west classifier - mill running on one side for eight hours.
13th,		45	No power, due to electric storm.
13th,		35	Changing connecting rods on classifier.
15th,	2	25	Repairing 8' pan conveyor.
18th,	4	50	No crude ore - two broken car journals.
18th,	1		Power off, due to lightning.
18th,	1		Repairing rock gun and 5' pan conveyor.
19th,	1		Power off, due to lightning.
23rd,	1		No crude ore - derailment.
25th,	2	35	Welding hinges on 8' pan conveyor.
30th,	1		Welding hinges on 8' pan conveyor.
30th,	3	30	No crude ore - pit flooded by heavy downpour and shovels moved to avoid drowning out. Electric cable blown out by lightning.
Sept. 6th,	1	20	No crude ore - rail turned over, derailling a loaded train.
6th,	1		No crude ore - pump discharge blew out, flooding the shovel cut.
6th,	1		Welding hinges on 8' pan conveyor.
8th,	2	36	Power off at mill and pit. Minnesota Power & Light Co. line out.
9th,		40	Repairing 8' pan conveyor.
10th,	1		No crude ore - broken hoist cable on shovel.
15th,	1	15	Power cut off, plugging classifiers.
22nd,	7		Plant pump suction plugged, due to an upheaval of tailings and muskeg.
23rd,		50	Welding hinges on 8' pan conveyor.

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2. PRODUCTION,
SHIPMENTS &
INVENTORIES:
(Continued)

g. Delays: (Continued)

Date	Time Lost		Cause:
	Hours	Minutes	
Oct. 4th,	1		No crude ore - broken brake band on No.35 shovel.
7th,	3		Welding hinges on 8' pan conveyor.
11th,	2		Welding hinges on 8' pan conveyor.
13th,		45	Repairing 5' x 14' Vibrating screen.
14th,	1	30	East cone crusher plugged.
14th,	2	30	Welding hinges on 8' pan conveyor.
17th,	7		No crude ore - rails overturned on bridge at washing plant.
18th,	1	30	Repairing track on bridge at washing plant.
19th,	3	30	No crude ore - broken car wheel on loaded train.
Total delays,			
	152	- 21	

The total delays of 152 hours - 21 minutes amounted to 5.93 per cent of the total working time. Of these delays, five hours 40 minutes were due to the Great Northern Railway, 72 hours - 55 minutes due to pit interruptions and 72 hours - 46 minutes, to the failure of mill machinery. The latter being only 2.87 per cent of the total working time. The pit operating delays were due mostly to derailments and to the flooding of shovel cuts, caused by severe rain storms or pump failure.

3. ANALYSIS:

a. Mine Analysis of Production:

	Tons	Iron	Phos.	Sil.	Mang.	Alu.	Moist.	Fe. Nat.
Snyder Non-Bess.Concs.	264,663	57.96	.059	10.73	.29	.48	7.53	53.60
Snyder Bess. Concs.	222,805	58.75	.037	10.38	.25	.46	7.49	54.35
Bovey Non-Bess.Concs.	104,795	58.44	.060	10.90	.21	.46	7.41	54.11
Bovey Bessemer Concs.	11,129	59.19	.039	10.23	.15	.47	7.28	54.88
Hemmens Non-Bess.Concs.	105,017	58.00	.062	10.55	.27	.48	7.38	53.72
Hemmens Bess.Concs.	69,472	58.33	.035	10.47	.24	.50	7.54	53.93
TOTAL 1938,	777,881	58.31	.051	10.60	.26	.48	7.47	53.95

b. Mine Analysis of Shipments:

Snyder Non-Bess.Concs.	196,133	58.23	.057	10.68	.30	.47	7.32	53.97
Snyder Bess.Concs.	68,648	59.13	.035	10.48	.27	.47	7.19	54.88
Bovey Non-Bess.Concs.	104,795	58.44	.060	10.90	.21	.46	7.41	54.11
Bovey Bess.Concs.	11,129	59.19	.039	10.23	.15	.47	7.28	54.88
Hemmens Non-Bess.Concs.	105,017	58.00	.062	10.55	.27	.48	7.38	53.72
Hemmens Bess.Concs.	69,472	58.33	.035	10.47	.24	.50	7.54	53.93
TOTAL 1938,	555,194	58.37	.053	10.64	.26	.47	7.36	54.07

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3. ANALYSIS:
(Continued)

c. Analysis of Ore in Stockpile:

	Tons	Iron	Phos.	Sil.	Mang.	Alu.	Moist.	Fe. Nat.
Snyder Non-Bess.Concs.	68,530	57.38	.066	10.79	.27	.48	7.85	52.88
Snyder Bess.Concs.	154,157	58.58	.038	10.34	.24	.46	7.62	54.12
TOTAL ORE IN STOCKPILE, - -	222,687	58.21	.047	10.48	.25	.47	7.69	53.73

d. Analysis of Crude Ore Production:

Snyder Crude,	736,921	43.53	.045	32.49
Bovey Crude,	162,355	46.30	.056	28.92
Hemmens Crude,	266,390	43.28	.046	33.05
Total,	1,165,666	43.86	.047	32.12

e. Composite Analysis of Season's Shipments:

	Iron	Phos.	Sil.	Mang.	Alu.	Lime	Mag.	Sul.	Loss
Snyder Non-Bess.Concs.	58.20	.059	10.75	.30	.44	.20	.14	.012	4.70
Snyder Bess.Concs.	59.10	.034	10.50	.28	.46	.16	.10	.010	3.80
Bovey Non-Bess.Concs.	58.50	.058	10.80	.24	.46	.18	.12	.014	4.30
Bovey Bess.Concs.	59.20	.038	10.30	.17	.48	.20	.16	.011	3.90
Hemmens Non-Bess.Concs.	58.00	.060	10.50	.25	.46	.22	.14	.012	5.25
Hemmens Bess.Concs.	58.40	.036	10.40	.25	.48	.18	.16	.010	4.80

4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:
Factors Used:

	Rock Deduction	Cu. Ft. Per Ton	% Recovery
<u>North Bovey:</u>			
Wash, -----	10%	14	60%
Low Grade Wash, -----	10%	15	60%
Rocky Wash, -----	20%	14	60%
<u>South Bovey:</u>			
Wash, -----	10%	14	60%
Lean Wash, -----	10%	14	50%
Low Grade Wash, -----	10%	15	60%
Lean Low Grade Wash, -----	10%	15	50%
<u>Hemmens:</u>			
Wash, -----	10%	14	60%
Low Grade Wash, -----	10%	15	60%
Lean Low Grade Wash, -----	10%	15	50%
Rocky Wash, -----	20%	14	60%

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4. ESTIMATE OF
ORE RESERVES:
(Continued)

a. Developed Ore: (Continued)

Factors Used:

	Rock Deduction	Cu. Ft. Per Ton	% Recovery
<u>Snyder:</u>			
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, -----	1,817,423 tons.
SW $\frac{1}{4}$ -SE $\frac{1}{4}$ - Sec. 30, -----	704,985 "
SE $\frac{1}{4}$ -SW $\frac{1}{4}$ - Sec. 30, -----	216,203 "

Total Snyder, ----- 2,738,611 "

Bovey:

SW $\frac{1}{4}$ -NE $\frac{1}{4}$ - Sec. 30,) -----	273,071 "
SE $\frac{1}{4}$ -NE $\frac{1}{4}$ - Sec. 30,) -----	313,522 "
NW $\frac{1}{4}$ -SE $\frac{1}{4}$ - Sec. 30, -----	155,543 "
NE $\frac{1}{4}$ -SE $\frac{1}{4}$ - Sec. 30, -----	799,642 "
NE $\frac{1}{4}$ -NE $\frac{1}{4}$ - Sec. 31, -----	-----

Total Bovey, ----- 1,541,778 "

Hemmens:

SW $\frac{1}{4}$ -SW $\frac{1}{4}$ - Sec. 29, -----	921,556 "
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Grand Total, Canisteco Mine, ----- 5,201,945

The estimated tonnage of reserve ore in the Canisteco Mine, as of January 1st, 1939, shows an increase of 666,822 tons, compared with the estimate of the previous year and, taking into account the 777,881 tons produced from the property during the year 1938.

The increase is 430,102 tons in the case of the Snyder lands, 147,874 for the Bovey and 88,896 for the Hemmens. The explanation of the larger tonnage for the Snyder and Hemmens is on account of operations during 1938 disclosing the satisfactory treatment of a sizeable tonnage of ore within the pit limits, which had been previously considered as of undesirable grade and the development of wash ore, below a rock seam assumed heretofore as the lower limits of the deposit. Further than this, the factors used in estimating the ore body were somewhat conservative and the correction was not apparent until the deposit was about mined out.

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4. ESTIMATE OF ORE RESERVES:
(Continued)

a. Developed Ore: (Continued)

The increase in the Bovey estimate was the result of adding to the north deposit a considerable tonnage, which had previously been considered as of doubtful character. This ore is outside the present pit limits.

5. LABOR & WAGES:

a. Comments:

(1) Labor:

With an abundance of both skilled and common labor in the district, there was no difficulty in maintaining a full crew of experienced men at all times. No labor union activity was noticeable and the local union of employees were only semi-active.

b. Comparative Statement of Wages & Product:

Production:

Direct Shipping Ore,	None
Concentrates Shipped,	555,194 tons
Concentrates in Stock,	<u>222,687 "</u>
Total Production,	777,881 "
Number of Days Operated,	107
3, 8-hour shifts per day:	
Average Daily Product,	7,270 tons.
Average number of men working,	275
Average wages per day,	\$ 6.01
Amount paid for labor,	\$ 177,497.76

6. SURFACE:

a. Buildings, Repairs:

Only the necessary minor repairs were made to the mine buildings and the Company dwellings at the Canisteco Mine during 1938.

c. Tracks, Roads, Transmission Lines, etc:

The maintenance work here was kept to an absolute minimum.

7. OPEN PIT:

a. Stripping:

During the second and third weeks in May - 14,940 yards of waste material was removed from the pit. This consisted of 4,140 yards of mixed paintrock and slough material which was left in the pit bottom from the fall stripping program and 10,800 yards of lean ore and paintrock which was taken from the south side of the Snyder pit. Three thousand yards of the latter was clean-up, remaining from the fall stripping and 7,800 yards were removed to make available approximately 40,000 additional tons of ore. In addition to the above, 5,520 yards of rock were stripped during the ore season in a cut

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7. OPEN PIT:
(Continued)

a. Stripping: (Continued)

through a rock horse in the west end of the pit, making available an additional 60,000 tons of very good wash ore in the bottom of this area.

There was no fall stripping program.

The following tabulation shows the classification of the material stripped during the year 1938:

<u>Lease</u>	<u>Waste Material Cubic Yards</u>	<u>Rock Cubic Yards</u>	<u>Total Cubic Yards</u>
Snyder,	10,800	5,520	16,320
Hemmens,	4,140	-	4,140
Total,	14,940	5,520	20,460

The waste material was all removed during the month of May and the 5,520 yards of rock during July.

d. Timbering:

<u>Statement of Ties Used:</u>	<u>Quantity</u>	<u>Price</u>	<u>Amount</u>
No.1 Standard Green Tamarack Ties,	3,564	\$1.00	\$ 3,564.00
No.1 Standard Hemlock Ties,	347	1.00	347.00
Undersized Green Tamarack Ties,	545	.539	293.92
No.1 Standard Green Jackpine,	534	.819	437.55
Total, -----	4,990	.93	\$ 4,642.47

Note:

No switch sets used during 1938.

Ties on hand:

No.1 Standard Green Tamarack Ties,	502	1.00	502.00
No.1 Standard White Oak Ties,	56	1.15	64.40
Total, -----	558		\$ 566.40

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7. OPEN PIT:
(Continued)

f. Explosives, Drilling & Blasting:

Statement of Explosives Used:

<u>KIND:</u>	<u>QUANTITY</u>	<u>PRICE</u>	<u>AMOUNT</u>
60% DuPont Special Gel. 5 x 24,	46,700#	13.00	\$ 6,071.00
40% R.C. Extra - 1-1/4 x 8,	200#	10.50	21.00
40% R.C. Extra - 7/8 x 8,	100#	10.50	10.50
40% DuPont Special Gel. 5 x 16,	50#	11.50	5.75
R.C. Blasting - No. 4 Bag,	4,350#	10.50	456.75
25% Gelatin, 5 x 16,	83,950#	10.75	9,024.63
25% Gelatin, 3 x 10,	7,800#	10.75	838.50
Total and Average,	143,150#	11.47	\$ 16,428.13
30' DuPont #6 E.B. Caps,	2,575	12.59C	324.16
40' DuPont #6 E.B. Caps,	600	17.65	105.90
Total and Average,	3,175	13.55	430.06
No. 20 Connecting Wire,	109#	.40	43.60
DuPlex Lead Wire,	750'	1.40C'	10.50
#2 DuPont Cap Crimpers,	6	1.00 Ea.	6.00
TOTAL COST, ALL EXPLOSIVES, -----			\$ 16,918.29

All of the above explosives used and charged to "Drilling and Blasting" - Canisteco Mine ore operations, 1938.

g. Open pit Mining and Loading:

The 1938 ore season presented the problem of mining all the Bovey and Hemmens ore possible, on account of prepaid royalties, and cleaning up all of the readily available ore in the pit. There were four isolated areas to mine, about 100,000 tons in the north Bovey; 50,000 tons in the pit bottom at the extreme west end of the Snyder; 50,000 to 60,000 tons in a small area along the line between the east and mid-Snyder forties, and the balance, or the bulk of the tonnage, in the bottom at the east end of the pit. About 300,000 tons of Snyder concentrates were to be placed in stockpile. Therefore, there was considerable shifting of shovels to change ores when shipping and stocking - and to grade each cargo, as this was the only Mesaba-Cliffs property operating. There was a large amount of track work required in keeping the several working places available at all times for grading and in constantly shifting loading tracks in the cleanup cuts.

At the beginning of the ore season on May 25th, both shovels were moved in to the pit bottom and a sinking cut was started along

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7. OPEN PIT:
(Continued)

g. Open Pit Mining and Loading:

the track running down to the pit sump near the Snyder-Hemmens line. The No. 35 electric shovel was cut in near the boundary and moved westward, so that it could be shifted into the Hemmens area when that ore was to be shipped, and the No. 32 machine started a sinking cut at the west end of the area, progressing eastward on a two and a half per cent grade. A series of sinking cuts along the south and east sides of the sump carried the mining operations to the south bank and the ore limits in the Hemmens. Sinking deeper with each successive cut, the final operation along the south bank was down to elevation 465, (Lake Superior datum), with the loading track coming in on a three and a half per cent grade. The sump was then shifted to the south bank and clean-up work was carried northward at the level of this rundown, until it hit rock. The rock was followed northward and the entire area was mined. Both shovels loaded here until the last of July. The No. 35 machine, working in the east end and bottom, shifted back and forth across the Hemmens-Snyder line as requirements dictated. The No. 32 machine was operated at the west end of the area and was moved from the south side to a high grade dry ore area north of the original track running down into the sump. This area was mined out above the level of the north sump, elevation 495, (Lake Superior datum), and the ore was dry at all times. Late in July, the No. 32 machine was moved into the north Bovey, but the No. 35 machine remained in the Snyder until the last two weeks of the ore season.

The ore mined from the south workings during the first two months was quite sticky, as it was all loaded below the sump level and the difficulty in keeping each cut unwatered, by pumping, resulted in the ore being quite wet. The upper part of the bank was a fine lean ore and when wet, it was so sticky that it gave considerable trouble at the mill. When Snyder ore was being mined, this sticky material could be mixed with the dry, coarser Snyder ore from the No. 32 shovel, but in the case of the Hemmens ore, it had to be run alone with a resulting low production at the mill. The ore banks varied in height from ten to twenty feet. The ore graduated from a lean wash in the upper layers to a high grade material just above the rock bottom.

In the north Bovey, the No. 32 shovel cleaned up an area south of the run-down track and it was operated in this deposit throughout August and the first part of September to such an extent as the grading and shipping would permit. When it was necessary to stock ore, the shovel was shifted in to the north side of the Snyder bottom. The ore formation was very irregular, due to numerous rock layers and chimneys. The shovel was shifted about in the small irregular area, loading ore and casting and sorting rock. The operation was slow at times and cut down the mill production when Bovey ore was being shipped. Aside from being rocky and having a high Silica content, the crude ore was of satisfactory grade and it was dry and easy to handle at the mill. Approximately 105,000 tons of concentrates were mined in this area, - the other 10,000 tons of Bovey being secured from scrams to the south of this deposit.

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7. OPEN PIT:
(Continued)

g. Open Pit Mining and Loading: (Continued)

Upon completing the operation in the Bovey in mid-September, the No. 32 machine was moved to the west Snyder and the area along the property line between the east and mid-Snyder forties. In order to mine the former, a rock cut had been made during July. The machine was shifted back and forth between the two areas during the balance of the ore season, as the grading required. The areas were restricted and shallow, and considerable track work was required. At the end of the season, there was a very small tonnage left in each area. The ore in the west end was a very good wash ore, with a high recovery - and it was used mostly for sweetening. That in the area along the property line was quite rocky; had a high Silica content and a part of it was high in Manganese. The ore was all dry and easy to handle.

During the entire season, considerable rock was moved on week-ends. This rock was dumped in the pit in worked-out areas and the cost was absorbed in operations.

The tonnage of ore secured from the Bovey and Hemmens was in excess of our estimates. This was very gratifying, due to the pre-paid royalty situation.

k. Drainage:

The sump, provided by the deep mining along the north side of the pit bottom, near the Snyder-Hemmens line during the latter part of the 1937 season, was used the greater part of the year. Late in the season the pumps were shifted into the deep cuts along the south bank. Upon the completion of mining operations, the tracks were removed, the pumps were disconnected and the pit bottom allowed to flood.

8. COST OF OPERATION:

a. Comparative Mining Costs:

<u>PRODUCT</u>	<u>1 9 3 8</u> <u>777,881 Tons</u>	<u>1 9 3 7</u> <u>606,041 Tons</u>
Average Daily Production,	7,270 Tons	4,772 Tons
Tons Per Man Per Day,	26.35 Tons	20.46 Tons
Days Operated,	107	127
<u>COST:</u>		
Open Pit Wash Ore,	\$.189	.273
General Pit Expense,	.041	.058
Concentrating,	.161	.200
General Mine Expense,	.105	.085
	<u>.496</u>	<u>.616</u>
Winter and Idle Expense,	<u>.154</u>	<u>.154</u>
Cost of Production,	\$.650	\$.770

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8. COST OF
OPERATION:
(Continued)

a. Comparative Mining Costs: (Continued)

<u>COST: (Continued)</u>	<u>1 9 3 8</u>	<u>1 9 3 7</u>
Depreciation, Plant and Equipment,	\$.197	\$.305
Amortization of Stripping,	.196	.259
Taxes - Ad Valorem,	.085	.119
Taxes - Occupational,	.082	.091
Taxes - Royalty,	.030	.077
 Total Cost at Mine,	 1.240	 1.621
 Administrative & Miscellaneous Exp.	 .104	 .111
 GRAND TOTAL, -----	 \$ 1.344	 \$ 1.732

The final figures have not been furnished by the Cleveland office and there may be some small adjustments, but the cost per ton will only be affected to a slight degree.

d. Detailed Cost Comparison:

(1) Product:

In comparing the cost of operation for 1938 with that of 1937, the increased output of 171,000 tons in 1938 was a deciding factor and also the fact that the mine was operated on three 8-hour shifts in 1938, whereas during the previous year, two 8-hour shifts were in effect. The scale of wages paid was on the same basis for the two years.

The character of the ore mined and treated during 1938 showed a slight improvement over that for the previous year. While the average haul from the pit was longer in 1938 and a considerable tonnage was mined at the water level, these unfavorable conditions were more than off-set by the fact that it was not necessary to employ the conveying system for any deep pockets of ore during 1938.

The total cost of production for 1938 was \$.120 per ton under that for 1937. The 1938 cost was, however, \$.028 over the budget. The cost of production would have been well under the budget, if the winter expense had not over-run our estimate by approximately \$.05 per ton.

(2) Open Pit Mining:

There was a decrease of \$.084 per ton in the 1938 costs under this caption, as compared with those of 1937.

Under "Mining Costs" - Drilling and Blasting showed a decrease of \$.003. This is accounted for by the increased production secured during 1938. The enlarged 1938 output was also responsible for showing a reduced cost per ton of \$.005 in Power Shovel Maintenance. The Power Shovel Maintenance item for 1937 was increased materially, due to the repairs necessary as the result of the pit flooding in September, 1937. The repairs included the baking of some of the electrical equipment.

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8. COST OF
OPERATION:
(Continued)

d. Detailed Cost Comparison: (Continued)

The operating of Locomotives and Cars was slightly higher in 1938, as the average pit haul was increased to quite an extent.

Locomotive & Car Maintenance was much lower (\$.01 per ton) - in 1938. This equipment was thoroughly overhauled during the winter of 1937-1938 and was in exceptionally good shape for operations during the season of 1938.

The Track Expense showed a decrease in 1938 as the result of the larger tonnage handled and the fact that the mine was operated on three 8-hour shifts, instead of two 8-hour shifts per day.

During 1937 it was necessary to employ the conveyor system in mining out the deep deposit of Bovey Ore. The expense of this work, spread against the entire tonnage produced during 1937, amounted to \$.008 per ton. We were able to mine out the deep Snyder ore without using the conveying system, as we had anticipated, and the mining cost was affected favorably as a result.

(3) General Pit Expense:

Less pit ditching for drainage purposes was necessary in 1938. This condition and the fact that the 1938 tonnage was appreciably greater, resulted in the cost for Pumping and Drainage being \$.009 per ton less in 1938.

The Water Supply cost was less by \$.002 per ton in 1938. Some expense was incurred in developing a water supply in 1937 and this charge was spread against the smaller tonnage obtained that year.

There was a charge of \$.009 per ton for Preparatory Expense during 1938. There was no expense of this nature in 1937, so that the 1938 cost was increased by this amount.

General Open Pit Expense showed a reduction of \$.005 per ton in 1938. The amount of money expended under this caption for 1938 was less than half of that for the previous year and the output was greater.

Open Pit Superintendence was lower in 1938 by \$.002 per ton, due entirely to the increased production.

Practically no exploratory work was undertaken during the year 1938, whereas the structure drilling campaign in 1937 resulted in a charge spread against the output for that year of \$.002 per ton.

(4) Concentrating:

The 1938 concentrating cost was \$.039 per ton under that for 1937.

CANISTEO MINE
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YEAR 1938

8. COST OF
OPERATION:
(Continued)

d. Detailed Cost Comparison: (Continued)

(4) Concentrating: (Continued)

Transportation to Mill was less by \$.016 in 1938 on account of the larger tonnage handled per shift. If it had not been for the frequent 1938 derailments, this account would have shown even a further reduction.

The actual washing charge per ton was approximately the same for each year.

The power charge was \$.007 per ton less in 1938, on account of the larger tonnage secured per shift and a more favorable load factor from the operation being conducted on three 8-hour shifts in 1938.

The captions "General" and "Maintenance of Buildings" - were nominal each year, as were the charges to Maintenance of Pumps and Pipe Lines.

The repairs to washing plant machinery during the year 1937 were exceptionally heavy, as it was necessary to change over some of the machines, as well as to make extensive repairs. The maintenance charges in 1938 were more or less nominal and the cost per ton for this item in 1938 was lower by \$.014.

Very little work was necessary on the tailings basin dykes during 1938, the expenditure here being only \$112.97, as compared with \$641.66 for the previous year.

(5) General Mine Expenses:

The items of Engineering were lower in 1938, as the result of the larger production.

Analysis and Grading showed an increased cost per ton in 1938 of \$.004, due to the fact that it was necessary to do more bank sampling in making ore grades. The Canisteo ore had to be shipped by itself in 1938, as the Hill-Trumbull property was not operated. Further than this, it was necessary to maintain an average grade of ore, as between shipping and stocking and this necessitated very thorough sampling in the pit.

It was necessary to load and dispose of some lean and waste material during 1938. This was a special expense and the cost of same, \$4,990.91, spread against the production for the year, amounted to \$.006 per ton. No work of this nature was necessary in 1937.

On account of the Canisteo being the only property operated on the Mesaba Range, the charges for Ishpeming and District Office were considerably higher than in 1937. Even with the increased output from the Canisteo Mine, the charge for Ishpeming Office showed an

CANISTEO MINE
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8. COST OF OPERATION:
(Continued)

d. Detailed Cost Comparison: (Continued)

(5) General Mine Expense: (Continued)

increased cost per ton of \$.005 and for the District Office - \$.015.

The items of Mine Office; Insurance; Personal Injury; Social Security and Employees' Vacation with Pay, were nominal each year and the cost per ton was approximately the same.

9. EXPLORATIONS AND FUTURE EXPLORATIONS:

There was no structural drilling, or test-pitting undertaken during the year 1938.

10. TAXES:

The following statement shows the Canisteeo Mine taxes and average rates for the years 1937 and 1938:

<u>Statement of Taxes:</u>	<u>1938</u>	<u>1937</u>	<u>Increase</u>	<u>Decrease</u>
Canisteeo Mine,	\$ 62,998.46	\$66,811.80		3,813.34
Washing Plant Lands,	3,121.79	2,875.05	246.74	-
Personal Property,	2,683.64	2,760.71	-	77.07
Total,	\$ 68,803.89	72,447.56		3,643.67
Village Lots,	219.70	205.22	14.48	
GRAND TOTAL,	\$ 69,023.59	72,652.78		3,629.19
Average Tax Rate,	.09305	.08690	.00615	

While the tax rate in the Coleraine district was increased from .0869 to \$.09305, a difference of \$.00615, the total taxes at the property show a decrease of \$3,629.19, due to the shipments of 1937 being deducted.

11. ACCIDENTS AND PERSONAL INJURY:

There was but one lost-time accident during 1938 and, unfortunately this occurred near the end of the season of activities. There was one lost-time accident in 1937 and seven during 1936.

A description of the 1938 accident follows:

CANISTEO MINE
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11. ACCIDENTS
AND
PERSONAL
INJURY:
(Continued)

NAME: Helmer Roy Kallevig DATE: September 22, 1938.
CAUSE: The mill was temporarily shut down, due to repairs to the vibrating screen. Kallevig was instructed by the foreman to repair the wooden chute to the 36" conveyor in the pit, while the mill was down. A plank had become loose in the chute. The injured man, together with fellow workmen, made ready to repair the chute. One workman, Frank Hill, went to get the ladder usually used for this work. In the meantime, Kallevig took a short ladder, about six feet long, which was in the conveyor pit, placed same on an inverted powder box and started to nail the plank in place. A plank against which one side of the ladder rested, loosened and the ladder turned sidewise, slipping off the box. Kallevig fell to the ground, a distance of five feet, landing on his back, his leg striking across the edge of the box and breaking the bone above the ankle.

NATURE: Comminuted fracture of mid 1/3 of right tibia. Comminuted fracture of upper end of right fibulae.

TIME LOST: Not returned to work as of December 31st, 1938.

COMPENSATION: Received to end of 1938 - \$232.32. Patient will not be discharged for some time.

12. NEW CONSTRUCTION
AND PROPOSED
NEW CONSTRUCTION:

There was no new construction undertaken at the Canisteco Mine during 1938.

13. EQUIPMENT AND
PROPOSED
EQUIPMENT:

No new equipment was purchased during 1938.

14. MAINTENANCE
AND REPAIRS:

Locomotives Nos. 152 and 148 were completely overhauled and put in first-class condition. The driving journals were either renewed, or built up and turned down to a true circle, in order that the crown brasses could be fitted properly. Crown brasses and hub liners were renewed. Worn tires were replaced. New side rods were installed on the No. 148 and those on the No. 152 were annealed and fitted with new bushings. The pistons and rings were repaired and the valve motion, air equipment and brake rigging overhauled. This put these two old Oliver locomotives in first-class condition. The Nos. 104, 105 and 106 were checked over and given such repairs as were necessary, prior to the ore

CANISTEO MINE
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YEAR 1938

14. MAINTENANCE
AND REPAIRS
(Continued)

season. These engines were more thoroughly overhauled upon the completion of 1938 operations.

All of the dump cars at the Canisteo Mine, 23 in number, were run through the repair shop. Worn tires and bushings were replaced; broken springs renewed; the journal boxes repaired and repacked. The bodies and frames were given the necessary repairs and the air and dumping equipment was overhauled. All worn tires were built up by electric welding. This was done for about one-fourth the cost of new wheels and it developed that these built-up wheels wear very well. The cars were again overhauled at the conclusion of the 1938 operating season.

The two blast hole drills were checked over and repaired, with special attention given to the crawling mechanism and the propelling sprockets and frictions.

The electrical crew cleaned and repaired all motors and motor generator sets. Damaged electric cables were repaired and vulcanized.

Washing Plant Repairs:

Worn plates were replaced in the crude ore pocket. The 8-ft. pan conveyor was cleaned and checked over; the rollers re-inforced; the bearings renewed and the sprocket built up.

A new arch bar was installed in the 42" jaw crusher. The conveyor rollers were all cleaned, given the necessary repairs and repacked with grease.

The three vibrating screens were repaired, re-inforced where necessary and a new upper deck was installed on the 5' x 14' machine.

Only minor repairs were necessary on the Symons crushers.

On the log washers, worn paddles were replaced.

The classifiers were checked over and tightened up.

The tailings discharge pipe was raised over the Great Northern track to comply with State requirements.

Repair work was resumed following the 1938 ore season and confined to that equipment which might be moved to the Holman Mine.

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YEAR 1938

18. NATIONALITY
OF
EMPLOYEES:

<u>NATIONALITY:</u>	NO. MEN	NO. MEN
	<u>1938</u>	<u>1937</u>
American, -----	236	161
Jugo-Slav, -----	22	14
Finnish, -----	27	16
Italian, -----	9	7
Swedish, -----	7	5
Bulgarian, -----	7	2
Austrian, -----	5	5
Canadian, -----	6	2
Norwegian, -----	3	3
Irish, -----	1	-
Dane, -----	2	2
Montenegrin, -----	2	2
English, -----	1	-
Macedonian, -----	1	-
Belgian, -----	1	1
German, -----	1	1
Russian, -----	1	1
Croatian, -----	2	-
Bohemian, -----	1	-
French-Canadian, -----	-	1
TOTAL, -----	335	223

19. WASHING PLANT:
OPERATIONS:

The operating season at the Canisteco washing plant extended from May 25th, until October 22nd, 107 days of three 8-hour shifts. The operation was carried forward five days per week for the greater part of the season and the men so rotated as to receive four shifts per week.

The performance of the mill, as a whole, was quite satisfactory, and very few major delays were experienced. Some failures of electric equipment were caused by numerous electric storms throughout the year. The rollers and pans of the 8-ft. conveyor had become worn so badly that two large rollers had to be replaced, with a twelve-hour delay resulting, and hinges were torn from the pans quite frequently, with resultant delays for their replacement.

The production held up very well, excepting on days when it was necessary to handle sticky ore, which fed with difficulty and slowed down the operation.

The amount and analysis of the plant rejects for 1938 were as follows:

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YEAR 1938

19. WASHING PLANT
OPERATIONS:
(Continued)

<u>Lease</u>	<u>5-FT. PAN REJECTS</u>			
	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Snyder,	35,101	31.22	.069	50.33
Bovey,	14,391	30.93	.066	50.48
Hemmens,	12,883	31.18	.067	50.81
Total,	62,375	31.14	.068	50.46

	<u>36" BELT REJECTS</u>			
	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Snyder,	2,625	25.98	.065	57.89
Bovey,	1,041	25.97	.067	57.89
Hemmens,	924	25.94	.078	58.11
Total,	4,590	25.97	.068	57.93

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

<u>Lease</u>	<u>Cu. Yds.</u>	<u>Tons</u>	<u>Iron</u>
Snyder,	8,184	12,275	30.85
Bovey,	7,920	11,880	30.81
Hemmens,	420	630	28.14
Total,	16,524	24,785	30.76

The tonnage and iron unit recovery realized in the treatment of Canisteo ore during 1938, was as follows:

<u>Lease</u>	<u>Tonnage</u>	<u>Iron Unit</u>
Snyder,	66.15%	88.63%
Bovey,	71.40%	90.23%
Hemmens,	65.50%	87.98%
Total,	66.73%	88.72%

The analyses of the product from the several machines for the year 1938 was:

SNYDER MILL MACHINES:

	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Log Washer, -----	58.31	.055	10.32
Classifier, -----	58.18	.041	11.82
Tailings, -----	20.46	-	-

BOVEY MILL MACHINES:

	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Log Washer, -----	58.42	.062	10.68
Classifier, -----	58.84	.049	11.42
Tailings, -----	20.95	-	-

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19. WASHING PLANT
OPERATIONS:
(Continued)

HEMMENS MILL MACHINES:

	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Log Washer, -----	58.11	.057	10.54
Classifier, -----	57.41	.046	12.31
Tailings, -----	20.37	-	-

The following is the concentrating data for the Canisteco Mine during the year 1938:

	<u>Cu.Yds.</u>	<u>Tons</u>	<u>Percent- age of Total Mined</u>	<u>Analysis Iron Dried</u>	<u>Concentrate Recoveries Made From Tons</u>	<u>% Iron</u>
Material re- moved in min- ing operations, (exclusive of surface)	674,207	1,252,826	100.00	42.75		
Less lean ore stocked,	-	-	-	-		
	<hr/> 674,207	<hr/> 1,252,826	<hr/> 100.00	<hr/> 42.75		
Less pit rock wasted,	16,524	24,785	2.45	30.76		
Total trans- ported to mill, -	657,683	1,228,041	97.55	43.06		
Less mill rock rejects, (crusher house) -	41,583	62,375	6.17	31.14		
Total Crude Ore to Wash- ing plant,	616,100	1,165,666	91.38	43.86		
Concentrates,		777,881	62.09	58.31	66.73%	88.72%
Mill rejects off mill picking belt,		4,590	.37	25.97		
Tailings (by deduction) -		383,195	30.58	14.75		
Total rock and lean ore (from above)		87,160	6.96	31.03		

CANISTEO MINE
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CONCENTRATE STOCKPILE:

In order to mine as much available ore as possible, it was decided to stock such concentrates as the Company could not take forward. A stocking site was prepared along the Great Northern spur, immediately west of the shop building. This entailed considerable clearing, ditching and the preparing of a collar of lean ore and planking. It required an 800-foot trestle, from 12 to 16 feet in height, with a 400-foot graded approach to the same. This work was completed and ready for ore on May 24th. Using two, five-car trains, 30-yard dump cars, a special hauling rate was obtained from the Great Northern Railway, amounting to \$1.00 per train per round-trip. A Bessemer and non-Bessemer concentrate pile were built up by fanning east and west respectively from the trestle. A total of 154,157 tons of Bessemer and 98,403 tons of non-Bessemer ore were stocked, of which 29,873 tons of non-Bessemer ore was shipped from the pile during the latter part of the season.

HOLMAN-CLIFFS MINE
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1. GENERAL:

From January 1st to May 24th, two regular watchmen were employed on a full-time basis and four men on half time. This arrangement was made so as to take care of the maximum number of old employees. Subsequent to May 24th, three watchmen were employed on a full-time basis and two on half time.

During the month of October, the washing plant was seriously threatened by a brush fire, which started near the Oliver Iron Mining Company's concentrating plant to the Southwest. A crew of men was taken over from the Canisteo Mine and by means of back-firing, were able to check the progress of the conflagration, and prevented any damage to our property.

The water level in the pit is at approximately the same stage as on January 1st, 1938.

The Oliver Iron Mining Company did not remove any of the buildings in Taconite during the past year. There are 57 houses, which we are maintaining, according to agreement.

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:

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

HOLMAN-CLIFFS MINE
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4. ESTIMATE OF
ORE RESERVES:
(Continued)

a. Developed Ore: (Continued)

Bingham Mine:

Bessemer Direct, -----	269,664 tons.
Non-Bessemer Direct, -----	329,590 "
Bessemer Concentrates, -----	1,198,361 "
Non-Bessemer Concentrates, -----	<u>590,238 "</u>
 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:

An inspection of the houses and mine buildings in Taconite was made jointly with officials of the Oliver Iron Mining Company on June 7th, and repair plans were then made in line with the decision of this committee.

Repair work was started the latter part of June, a force of three carpenters and two painters being engaged. This crew worked somewhat intermittently, the carpenters completing their program early in November and the painters discontinuing activities the first week in December.

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 in 1936 and only light repairs were necessary in 1938:

<u>Ho.No.</u>	<u>Name of Occupant:</u>	<u>Repair work done:</u>	<u>Cost</u>
11	Peter Baril,	Plumbing, repairs to doors,	\$ 9.05
12	Malkolm Olson,	Complete new roof,	101.66
15	Thos. Wivell,	Repairs to sewer,	38.84
37	William Wirtanen,	Plastering,	50.55
38	Ernest Lueck,	Plastering,	32.39
39	A. W. Jenkins,	Interior cleaning; plumbing, foundation posts,	7.07
41	Mrs. A.L. Sundquist,	Window repairs,	26.12
42	Mike Shipka,	New kitchen floor; repairs to windows; chimney repairs, plumbing,	86.01
44	B. P. Axford,	Repairs to doors, plumbing,	14.50
45	Edwin Gustason,	Plastering; interior paint- ing; doors, windows and new sink cabinet; plumbing,	151.21

HOLMAN-CLIFFS MINE
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6. SURFACE:
(Continued)

a. Buildings, Repairs: (Continued)

<u>Ho.No.</u>	<u>Name of Occupant:</u>	<u>Repair work done:</u>	<u>Cost</u>
46	Russell Wivell,	Window repairs; interior painting and papering; plumbing - water line; chimney repairs,	\$ 50.90
47	Emil Camilli,	Floors, doors and window repairs; interior painting; repairs to outhouse,	85.99
50	Linas Berg,	Plastering; interior painting; complete new roof; repairs to cellarway, doors, windows, stairs; electric wiring,	459.06
51	Oscar Engstrom,	Plumbing; new flooring; repairs to windows, steps; interior painting,	270.41
53	Claude Winkleblack,	Repairs to porch and windows; plastering; complete new roof,	204.17
55	Ray DeShaw,	Electric wiring; plumbing; floor registers; repairs to doors, windows,	40.65
56	Grant Hess,	Plastering; repair windows; doors, wall registers; complete new roof; interior painting; plumbing,	371.24
57	August Mergele,	Repairs to windows; interior redecorating,	53.17
58	Russell Barkla,	Repairs to plumbing; repair windows, screens and roof; interior painting,	66.15
59	George Beasley,	Interior painting; plumbing; repairs to doors,	136.30
60	W. F. LeClair,	Electric wiring; repairs to windows and doors,	17.30
61	John Laine,	Repair roof, steps, windows; interior painting,	93.96
62	Joseph Dolezel,	Plastering,	68.04
63	Matt Dosser,	Repairs to windows; plumbing; sink cabinet,	16.26
64	Vincent Soleture,	Repair windows, doors and sink cabinet,	21.72
65	Edwin Johnson,	Repairs to floors; windows; interior woodwork, sink; plastering,	106.85
67	Pat Maney,	Plastering; repairs to windows; floors, archway; registers; interior painting; plumbing,	193.05

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1938

6. SURFACE:
(Continued)

a. Buildings, Repairs: (Continued)

<u>Ho.No.</u>	<u>Name of Occupant:</u>	<u>Repair work done:</u>	<u>Cost</u>
68	George Lee,	Repairs to windows; interior painting,	\$ 10.27
69	Arnold Lawson,	Interior painting and papering,	2.50
70	Ambrose Hoey,	Interior redecorating; complete new roof,	192.76
71	Charles James,	Repairs to floors, sink; steps, plumbing; interior painting,	106.23
72	Martin Fleisher,	Repairs to windows and doors,	5.84
78	Lucien Decoster,	Repairs to windows and doors; plastering; interior painting; plumbing; roof repairs,	250.99
79	John Winkleblack,	Window and door repairs,	15.89
81	Lloyd Wetherell,	Repairs to windows,	2.39
97	William Saw,	Roof repairs; repairs to windows; plastering,	76.37
101	Loy Kolar,	Repairs to windows,	1.64
102	Myron Youngberg,	Repairs to furnace,	10.60
105	Dan Chamberlain,	New foundation; new kitchen floor; repairs to doors, porch, steps, windows; repairs to roof; exterior painting and varnish floor; plastering; plumbing,	552.49
106	William Ryser,	New foundation; repairs to doors; windows; floors and garbage stand; exterior painting; plastering,	441.73
107	George Whittington,	Electric wiring, repair windows and doors; new coal bin and shed repairs; chimney repairs; plumbing,	117.11
116	Carl Eggebraaten,	Repairs to windows,	6.67
155	George Sullivan,	Repair windows; siding; floors, doors and new flower box,	88.43
156	Lee Farr,	Repairs to floors; doors; plumbing,	18.64
157	J. W. Mattson,	Plastering; interior woodwork; complete new roof; plumbing; repairs to siding,	163.73
158	W. S. McComber,	Repairs to roof, windows; new flower box,	41.05
4	Charles Flynn,	Repairs to windows; plumbing,	13.76

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1938

6. SURFACE:

(Continued)

a. Buildings, Repairs: (Continued)

<u>Ho.No.</u>	<u>Name of Occupant:</u>	<u>Repair work done:</u>	<u>Cost</u>
5	Harry Hart,	Repairs to windows,	\$ 16.94
10	Harley Point,	Repairs to outside stairway, porch, windows and front steps; repairs to chimney,	55.85
	Carpenter labor - estimating cost of repairs,		28.38
	Carpenter mileage -		9.72
	Painter labor - estimating cost of repairs,		25.08
	Mason labor - estimating cost of repairs,		<u>12.16</u>
	GRAND TOTAL COST OF REPAIRS, YEAR 1938 -		\$ 5,039.84

The following statement shows the rent collections made from the occupants of the Taconite houses for the year 1938:

<u>MONTH</u>	<u>HOLMAN- CLIFFS PAYROLL</u>	<u>CANISTEO PAYROLL:</u>	<u>HILL- TRUMBULL PAYROLL:</u>	<u>GENERAL ROLL</u>	<u>CASH REMIT.</u>	<u>TOTAL</u>
January,	30.00	229.50	236.00	63.00	-	558.50
February,	30.00	240.50	236.00	63.00	151.00	720.50
March,	30.00	240.50	236.00	63.00	121.00	690.50
April,	30.00	240.50	166.00	63.00	126.00	625.50
May,	50.00	633.50	-	53.00	96.00	832.50
June,	50.00	644.50	-	53.00	92.42	839.92
July,	50.00	633.50	-	53.00	81.50	818.00
August,	61.50	569.50	-	66.00	51.50	748.50
September,	50.00	575.50	-	66.00	92.38	783.88
October,	61.50	522.50	21.50	66.00	71.50	743.00
November,	71.50	200.00	291.50	66.00	75.50	704.50
December,	60.00	257.00	67.00	66.00	81.50	531.50
TOTAL,	\$ 574.50	4,987.00	1,254.00	741.00	1,040.30	8,596.80

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

GRAND TOTAL COLLECTIONS, YEAR 1938, 120.00
\$ 8,476.80

The rental collections for 1938, in the amount of \$8,476.80, compares with a total of \$8,446.92 for the year 1937. The repair cost during 1938 was \$880.40 less than that for the previous year. The rental collections for the year 1938 were \$3,436.96 in excess of the repair expenditures. Deducting the 1938 taxes on the buildings, in the amount of \$1,096.54, and the estimated insurance of \$270.00,

HOLMAN-CLIFFS MINE
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YEAR 1938

6. SURFACE:
(Continued)

a. Buildings, Repairs: (Continued)

there would be revenue in excess of expenses, amounting to \$2,070.42. This excess revenue compares with \$1,175.34 for the year 1937 and \$528.42 for 1936. The excess revenue goes to off-set the rental charged us by the Oliver Iron Mining Company.

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 1937 and 1938:

	<u>1938</u>	<u>1937</u>	<u>Increase</u>	<u>Decrease</u>
Holman-Brown Mine,	\$ 42,527.88	39,840.85	2,687.03	
Bingham Mine,	16,699.33	15,644.22	1,055.11	
North Star Mine,	8,892.13	8,330.30	561.83	
Holman-Brown Aux.Lands,	1,977.20	2,673.00		695.80
Bingham-North Star				
Washing Plant Lands,	45.81	42.71	3.10	
Holman-Brown Lands,	23.38	21.81	1.57	
Holman-Cliffs Shops,	236.63	221.68	14.95	
Holman-Cliffs Personal				
Property,	<u>549.50</u>	<u>570.55</u>		<u>21.05</u>
TOTAL, -----	\$ 70,951.86	67,345.12	3,606.74	
Rented Buildings,	<u>852.24</u>	<u>811.34</u>	<u>40.90</u>	
GRAND TOTAL, -----	\$ 71,804.10	68,156.46	3,647.64	
Average Tax Rate,	.09254	.08670	.00584	

With the exception of the Holman-Brown auxiliary lands, where a reduced valuation was secured and the personal property, where some equipment was moved from the property, there was an increase in all taxable items at the Holman-Cliffs Mine, due entirely to the increase in rate from .08670 in 1937 to .09254 in 1938.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1938

1. GENERAL:

There were no ore operations undertaken at the Hill-Trumbull Mine during the year 1938.

The general repairing of equipment was carried forward in the shops and at the washing plant from January 3rd until April 14th, when all work was suspended, with the exception of a few special jobs. Repair work was resumed the middle of November and was continued until the holiday lay-off on December 23rd.

A comparatively small stripping program was carried on from October 25th, until November 23rd. Operations were conducted in the Trumbull area to the East of the main approach and in the Hill direct ore deposit at the East end of the pit. These stripping jobs consisted in handling of material remaining from the stripping program started during the 1937 season.

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 1938 and the reserve estimates are the same as reported a year ago:

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

No exploratory or development work was undertaken during the year 1938 and the reserve estimate remains the same as reported last year.

Trumbull Mine:

<u>Assumption:</u> <u>Grade</u>	<u>Rock</u> <u>Deduction</u>	<u>Cu. Ft.</u> <u>Per Ton</u>	<u>Recovery</u>
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%

HILL-TRUMBULL MINE
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4. ESTIMATE OF
ORE RESERVES:
(Continued)

a. Developed Ore: (Continued)

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

As no explorations were carried forward on this property during 1938, the estimated ore reserve is the same as that reported a year ago.

While the so-called jig ore deposit, largely along the North side and West end of the Trumbull pit, was not explored any further during 1938, it is possible to set up in the ore reserves of the Trumbull Mine 1,466,000 tons of concentrates from the treatment of this ore. This estimate is based on a 45% weight recovery. The concentrates should run approximately one-third Bessemer, with a Dried Iron of 57.50% and Silica of 10.00%. Further experimentation on the treatment of so-called jig ores is being conducted and we should have considerable valuable information by the end of this year. It is quite likely that additional jig material will be developed in the Trumbull Mine and no doubt advancement in treatment processes will result in betterment as to weight recovery, as well as analyses of the product.

It will be necessary to conduct some explorations in the Hill pit before any definite figures can be arrived at as to the tonnage and grade of jig concentrates in this property. A very rough estimate was made from the meagre data available and we feel that there is a possibility of securing in the neighborhood of 900,000 tons of jig concentrates within the limits of the present Hill pit.

b. Prospective Ore:

Aside from the possibilities as to jig material, some additional structural drilling will be necessary to determine the Southerly limits of the Trumbull wash ore body. The results of exploration work in 1937 indicate the likelihood of the Trumbull ore body extending South beyond the present limits of the East forty. The original explorations do not show that a workable ore body exists in this area, but from the showing of the drilling campaign of 1937, we feel justified in assuming that the old Oliver Iron Mining Company's drilling was not entirely reliable. Several structure drill holes will be necessary to disclose the true character of the ore material.

HILL-TRUMBULL MINE
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YEAR 1938

5. LABOR & WAGES:
(Continued)

a. Comments:

(2) New Construction: (Continued)

A dyke was built around the South end of the new tailings basin to provide for the handling of waste material during the 1939 ore operations. The gasoline dragline from the Canisteo Mine was used on this job. A fill, approximately 7 feet high and 1200 feet long was cast during the last two weeks in November.

6. SURFACE:

a. Buildings, Repairs:

The following repairs were made to the rented houses in Marble during 1938:

<u>Ho.No.</u>	<u>Name of Occupant:</u>	<u>Work done:</u>	<u>Cost.</u>
1	H. C. Bolthouse,	Repair porches and cellarway,	\$ 105.45
2	R. G. Wilson,	Varnish and water pipe repairs,	8.90
4	Walter Blanchard,	Bath-room repairs,	23.65
5	D. C. Anderson,	Roof repairs,	4.67
6	M. E. Gaffney,	Storm window repairs,	4.54
7	G. S. Hayden,	Storm window repairs; toilet seat; radiator valve; interior decorating,	320.15
8	J. K. Young,	Window glass,	.82
9	S. T. McKercher,	Furnace repairs; bath-room repairs; window glass,	17.11
10	John Trembath,	Window repairs, furnace repairs,	20.20
11	W. S. Hanson,	Storm door repairs,	3.20
12	W. S. Hanson,	Storm door repairs,	.59
13	Eli Rantala,	Window repairs; paint,	10.40
GRAND TOTAL COST OF REPAIRS, YEAR 1938, -			\$ 519.68

c. Tracks, Roads, Transmission Lines:

Before stripping operations could be started it was necessary to put the dump, loading and main line tracks in shape. A crew of 24 men started this work on October 19th and were employed during the stripping operation on tracks and in connection with the disposal of material on the dumps.

7. OPEN PIT:

a. Stripping:

Anticipating a resumption of ore mining activities in the spring of 1939, it was advisable to clean up the stripping job in the Trumbull approach and the Hill direct ore areas. These stripping jobs were left unfinished when operations were suspended in the winter of 1937.

HILL-TRUMBULL MINE
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YEAR 1938

7. OPEN PIT:
(Continued)

a. Stripping: (Continued)

The stripping jobs in both areas were started on October 25th and were conducted on a schedule of five days per week of two shifts per day. The men employed were staggered so that they worked three shifts per week, each.

The 120-B electric shovel took several short cuts in the Hill direct ore area, handling both lean ore and waste material. This operation was completed on the 2nd of November.

The 350-ton "Marion" steam shovel, operating in the Trumbull approach area, removed a wedge-shaped bank of waste material from the southeast corner of this pit and was then moved back to take a sinking cut along the south line. The cut was carried eastward to the Oliver boundary and the machine then started in the second cut, which was taken to sufficient depth to uncover the wash ore. This job was completed on November 23rd.

The operation in the Trumbull area was delayed upon several occasions. A heavy rain storm on the night of November 2nd, flooded this part of the pit and resulted in the loss of two shifts as pumping equipment had to be installed and the water removed before operations could be resumed. The cylinder head on the boom engine broke on November 8th and the machine was tied up for a shift while repairs were being made. A tooth broke out of the pinion on the intermediate shaft of the hoisting engine and this caused a loss of one shift.

The following table shows in detail the material handled in connection with the stripping jobs:

<u>MONTH</u>	<u>WASTE</u>		
	<u>HILL</u>	<u>TRUMBULL</u>	<u>TOTAL</u>
	<u>CU. YDS.</u>	<u>CU. YDS.</u>	<u>CU. YDS.</u>
October,	7,450	7,300	14,750
November,	1,379	4,965	6,344
Total,	8,829	12,265	21,094
	<u>LEAN ORE</u>		
	<u>HILL</u>	<u>TRUMBULL</u>	<u>TOTAL</u>
	<u>CU. YDS.</u>	<u>CU. YDS.</u>	<u>CU. YDS.</u>
October,	3,375	1,650	5,025
November,	495	39,884	40,379
Total,	3,870	41,534	45,404

HILL-TRUMBULL MINE
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YEAR 1938

7. OPEN PIT:
(Continued)

a. Stripping: (Continued)

<u>MONTH</u>	<u>WASH ORE DUMPED IN PIT</u>		
	<u>HILL</u> <u>CU. YDS.</u>	<u>TRUMBULL</u> <u>CU. YDS.</u>	<u>TOTAL</u> <u>CU. YDS.</u>
November,	-	1,814	1,814
GRAND TOTAL,	12,699	55,613	68,312

d. Timbering:

It was not necessary to replace any ties in connection with the stripping job during 1938.

In order to hold back the surface material from washing in to the pit along the north side of the Trumbull property, it was necessary to place 360 pieces of tamarack cribbing. A cribbing wall had previously been provided and the work undertaken during 1938 was for the purpose of raising and strengthening this structure.

f. Explosives, Drilling and Blasting:

No explosives were used during the year 1938.

k. Water Level in the Pit:

The water level in the Trumbull pit was held at approximately the elevation of the bottom throughout the year. This was accomplished by operating the Layne-Bowler deep-well pump intermittently. Usually three shifts per week was sufficient. There was only one occasion on which there was any considerable quantity of water in the pit and this occurred the first week in May. Continuous heavy rains during the month of April and the fore part of May completely saturated the ground and resulted in flood conditions in the drainage area to the north of the Hill-Trumbull property. The excessive quantity of water overtaxed the capacity of the drainage ditch and a break occurred, permitting a large volume of water to flow in to the west end of the mine. The flood waters carried down several thousand yards of surface material and raised the water level in the pit approximately 20 feet.

The caterpillar tractor and a crew of 20 men were employed for several days in repairing the break in the ditch, providing a new ditch channel and straightening out bends in the old ditch. Approximately 1,000 sand bags were used in connection with diking operations before the flood waters were brought under control.

The Layne-Bowler deep-well pump was operated 24 hours per day from May 6th to June 4th, in order to drain the Trumbull pit. During the balance of the year, pumping was conducted on a three-shift-per-week basis.

The pump on the north side of the Hill pit was operated throughout the month of May, in order to lessen the pressure on the water which had accumulated behind the concrete dam.

HILL-TRUMBULL MINE
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YEAR 1938

9. EXPLORATIONS
AND FUTURE
EXPLORATIONS:

No exploratory work of any nature was undertaken during the year 1938.

There are several areas in the Hill-Trumbull Mine that should be drilled before the ore possibilities in this property are exhausted. The 1937 drilling campaign, which was carried on in the Trumbull Mine to the west of the approach, was not completed and additional holes should be put down to complete the information on several sections.

In order to determine the extent of the ore body to the south of the east Trumbull forty, several structure drill holes are required. As these holes will have to be put down to a depth in excess of 200 feet, it will be necessary to let a contract, as the mine equipment is not adequate for the required depths.

The direct ore area at the east end of the Hill pit requires further exploration. The rock horse, which was encountered near the center of the deposit, should be definitely outlined, so that plans can be made for the mining of the ore to the best advantage. Several additional holes are also required to determine the extent of the ore along the southerly limits of this area.

The area to the north of the Hill pit, in the vicinity of the taconite island, should be drilled within the next few years and probably upon the conclusion of the 1939 ore program. The character of the ore material here should be determined. It is quite likely that a considerable part of the deposit will be of jig character and it is important to determine the quantity and quality of such material in connection with the treating plant to be installed for other jig ores now developed.

10. TAXES:

The following statement shows the taxes and average rate at the Hill-Trumbull Mine for the years 1938 and 1937:

	1938	1937	Increase	Decrease
Hill Mine, -----	\$42,009.52	39,973.88	2,035.64	
Trumbull Mine, -----	57,358.49	47,896.33	9,462.16	
Hill-Trumbull Shops, ---	832.92	834.31		1.39
Hill-Trumbull W.P.Lands,	2,968.12	2,802.81	165.31	
Personal Property, ----	2,529.41	1,696.10	833.31	
 TOTAL, -----	 \$ 105,698.46	 93,203.43	 12,495.03	 -
 Village Lots, -----	 498.88	 547.36		 48.48
 GRAND TOTAL, -----	 \$ 106,197.34	 93,750.79	 12,446.55	 -
 Average Tax Rate, ----	 .08673	 .08180	 .00493	

HILL-TRUMBULL MINE
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YEAR 1938

10. TAXES:
(Continued)

While there was a slight decrease in the 1938 tax on the Hill-Trumbull shops, due to depreciation and on the Village lots, as the result of an adjustment, the other tax items all show an increase, resulting from the higher tax rate in 1938. This increase in tax rate amounted to .00493. The mineral value and taxes in both the Hill and Trumbull properties were increased, due to the larger tonnage disclosed by structure drilling during the summer of 1937.

11. ACCIDENTS
AND
PERSONAL
INJURY:

No lost-time accidents were sustained at the Hill-Trumbull Mine during the year 1938.

12. NEW CONSTRUCTION
AND PROPOSED
NEW CONSTRUCTION:

The year 1938 saw no new construction enterprises entered into.

It will be necessary to supply a change house for the washing plant employees. This facility should be provided prior to the opening of the ore season in 1939.

13. EQUIPMENT AND
PROPOSED
EQUIPMENT:

It was not necessary to secure any new equipment for the Hill-Trumbull property in 1938.

Plans have been made for the equipping of the 350-ton "Marion" steam shovel with caterpillar crawlers during the spring of 1939. This improvement will greatly facilitate the moving of this large piece of machinery, as well as eliminate four pit men in the operation.

14. MAINTENANCE
AND REPAIRS:

The repair work in the shops was resumed on January 3rd, following the holiday lay-off.

The overhauling of locomotive No. 101, which had been started in December, was continued. This machine was damaged in a wreck during the fall of 1937 and the repairs were considerably more extensive as a result. The inside door sheet was cut out in order to straighten the front head and a new sheet was made and welded in. The stay-bolts, which had been removed, were replaced and the necessary riveting done. Upon completing the boiler work, the asbestos covering and jacket were put on; a new pair of pistons were made and fitted with rings and the guide bars were machined and lined up. The drivers were reassembled and the shoes and wedges, as well as the spring hangers, were overhauled and adjusted. The tender of this

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1938

14. MAINTENANCE
AND REPAIRS:
(Continued)

locomotive, which was extensively damaged in the wreck, was repaired. The machine was turned out of the shops on March 21st.

Repairs on locomotive No. 128 were started in January. The drivers were removed and the tires taken off and turned down. The driving boxes were machined and reassembled and the worn journals were built up and fitted. The spring equipment and brake rigging were overhauled and the cylinder heads were ground to a smooth fit. A new guide bar block was made and new cross-head and liners were provided. It was necessary to supply a new ash pan. The old cab was damaged to such an extent that it was beyond repair and a new steel cab was provided. The work on this engine was completed April 14th.

The overhauling of locomotive No. 102 was started March 14th, and finished by April 14th. New pistons, piston rods and rings were made and the cylinder heads were ground. The steam valve spools were fitted with new rings and springs, the rear drivers removed and the driving boxes cleaned and all parts reassembled. The brake rigging, air lines and springs were overhauled. New brass liners were put in the crossheads and the guides were rebabbitted and machined. The main rod brasses were repaired and the air pump overhauled.

After being in service at the Canisteco Mine during the 1938 ore season, locomotive No. 102 was returned to the Hill-Trumbull Mine in October and the necessary repairs were started the second week in November. The job was completed December 9th. The rear drivers were removed and the driving boxes rebabbitted and machined. The springs were removed and repaired and the brake rigging was overhauled. The air equipment was also overhauled.

Some of the lower flues in the boiler of locomotive No. 19 were removed early in April, but the repairs on this machine were not completed until stripping operations were started in October.

Two of the Armstrong blast hole drills were given a thorough overhauling in January and February.

Between January 3rd and April 14th, fifteen of the 30-yard cars were put through the shops and the necessary repairs made. These cars were returned to the shops upon the completion of the stripping this fall and eighteen of the twenty-two cars had been put in shape for service by the end of the year.

Most of the work done on the 30-yard cars during November and December was for the account of the Canisteco Mine, as this equipment had been used at that property during the ore season in handling concentrates from the washer to the stocking ground.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1938

14. MAINTENANCE
AND REPAIRS:
(Continued)

The caterpillar treads were removed from the 120-B electric shovel and the lugs were built up by welding. The yoke blocks on the take-up wheels, the propelling shaft, the main clutch, the shipper shaft pinion and the frame were repaired. The boom was fitted with new stay-cables. The repair work on this machine was completed by the end of March.

Repair work was started on the 350-ton "Marion" steam shovel during the last week in January and was completed April 14th. The boom, swing and hoisting engines were overhauled and the grates and ash pan of the boiler were repaired. The center pin and propelling shaft were given the necessary attention and the hoisting drum shaft bearings were rebabbitted.

The dipper on the new electric shovel, No. 47, was repaired.

The wooden sills supporting the railway tracks in the car shops had rotted and new ones were put in the fore part of January.

Washing Plant Repairs:

A small crew resumed repair work at the washing plant on January 3rd.

The 14" return rollers were removed from the 8-ft. pan conveyor and sent to the shops for repairs. The rollers on the 36" belt conveyor and the picking belt were cleaned and greased.

The Dorr bowl classifiers were given a thorough overhauling.

The revolving screen was repaired and a new rock chute was installed between the picking belt and the rock pocket.

The log washers were given a general overhauling.

The 4' x 6' vibrating screens were taken down for inspection and the necessary repairs made.

The apron on the 5-ft. pan conveyor; the rock chutes under this machine and the ram were repaired.

A new lining was furnished in the concentrating bin.

The Symons crushers were thoroughly cleaned and given a general overhauling.

All of the chutes throughout the mill were repaired and replacements made where needed. The old grizzly was worn out. This was removed and will be replaced by a new one before washing operations are resumed.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1938

14. MAINTENANCE
AND REPAIRS:
(Continued)

The rock cars were overhauled and new tail castings were provided for the logs.

In order to eliminate the dust being blown from the south tailings basin, this area and the dykes were seeded with sweet clover during the month of April.

The pumping equipment was moved from its original location, south of the washing plant, to a position directly east of the washer at the North end of the lake. This change was made, as it was necessary to replace the worn out 20" pipe line and to reduce the amount of pipe required. Further than this, the new tailings basin will be located in the proximity of the old site and it would not be advisable to take a chance on the tailings dyke letting go and endangering the pumping equipment.

The transferring of the pumping equipment was started the latter part of January. The pumps were dismantled and moved during February and early March.

The foundations for the pumps at the new site, were prepared in February and most of the machinery had been installed by the end of March.

The pump-house was moved across the ice during the week of March 12th.

The dragline was used to dig a water supply channel from the lake to the new pump-house location. This work was started the end of February and finished the fore part of April.

During the month of November, the new 16" pipe line was laid from the plant to the pump-house; the poles for the power line were set and a dyke was cast around the south end of the new tailings basin.

18. NATIONALITY
OF
EMPLOYEES:

<u>NATIONALITY:</u>	<u>NO. OF MEN</u>
Welch, -----	1
English, -----	5
Irish, -----	7
Swedish, -----	7
Finnish, -----	5
German, -----	5
Jugoslav, -----	3
French, -----	2
Italian, -----	1
Bulgarian, -----	2
Norwegian, -----	1
TOTAL, -----	39

Safety Department

Annual Report

Year 1938

11. ACCIDENTS
AND
PERSONAL
INJURY.

a. Fatal Accident.

It is very desirable to be in a position to report each year a more favorable safety record than in any other year, but success in preventing fatal and serious accidents rests on an insecure foundation and the duration of a good record is always a matter of uncertainty. Mining involves the association of men with many hazardous occupations, and nothing is a complete substitute for alertness and watchfulness when they are exposed to danger.

Our annual fatality rates for the past eight years show improvement in safety when compared to the rates for prior years and they are lower than the rates of the mining industry as a whole. But comparison should now be made on the basis of what is possible of attainment, and that means the elimination of all accidents that are recognized as preventable ones. The two following tables are given to illustrate this viewpoint.

<u>Year</u>	<u>Number of Fatalities</u>	<u>Classification of Fatalities</u>	
1931	3	I. Trade Risk	3
1932	0		
1933	2	II. Negligence of Company	
1934	3		
1935	2	Improper method of doing work	3
1936	2	Failure to use proper	
1937	1	appliances	1
1938	3	Failure to instruct men	
	<u>16</u>	properly	1
		III. Negligence of Workers	
		Failure to use safety devices	1
		Violation of rules	1
		Improper method of doing work	<u>6</u>
			16

Our average annual fatality rate for these years, based on the total number of men employed, was slightly more than one per 1000 men. Based on the number of man-shifts worked and crediting each worker with 300 shifts per year, the rate rises to 1.71. The rate for all metal mines is between 2.50 and 2.70, but statistics for 1937 and 1938 are not yet available.

Safety Department

Annual Report

Year 1938

11. ACCIDENTS
AND
PERSONAL
INJURY.a. Fatal Accident. (Continued)

Three fatalities occurred in 1938: two at the Cliffs Shaft and one at the Athens. The first accidental death at the Cliffs Shaft was due to a fall of ground and the other was a haulage accident. The Athens fatality was caused by a worker contacting a live trolley wire under circumstances which made possible death from electric shock.

Description of Fatal AccidentsFatal Accident No. I

Richard S. Cain, a miner's helper, was caught by a fall of ground in the Cliffs Shaft Mine on May 9 and sustained injuries which ended his life several hours after the accident.

Cain worked with Wm. Ollikainen in a stope about 500 feet north of "B" Shaft. Loose ground was encountered along an old water course in the back of the stope. Much time had been spent in an effort to make the back safe but without avail. It was then decided to cut out a bench and thus provide a place where the loose might drop and cause no harm. It took three weeks' work to do this job.

On the day of the accident the two men started work barring the back and shoveling the broken rock off the floor of the bench. At ten o'clock they completed this work and were ready to place a pole across the edge of the bench. Cain picked a hitch for the pole in one wall and Ollikainen did likewise in the opposite wall. After the hitches were completed Cain made a remark to the effect that the place was in safe condition and at the same time, as in proof of his belief, he sounded the back with a short bar. Instantly a large slab of rock, seven feet long, two feet wide and averaging eighteen inches thick, fell without warning. The chunk broke into several pieces when it struck the floor of the bench. Both men were struck by it; Cain's injuries were mostly internal but fatal and Ollikainen received a slight glancing blow. Ollikainen summoned assistance and within a few minutes Cain was taken to surface and thence to the Ishpeming Hospital.

Cain had been employed many years in our soft ore mines before coming to the Cliffs Shaft mine in 1924. He was a Manxman, 54 years of age and leaves a widow and three adult children. No inquest was held. The accident was accepted as a trade risk cause.

Safety Department

Annual Report

Year 1938

11. ACCIDENTS
AND
PERSONAL
INJURY.a. Fatal Accident. (Continued)Fatal Accident No. II

Vaino Etelemaki, a young miner, was instantly killed at the Athens Mine on November 21, by accidentally striking a live trolley wire with a steel bar.

This worker was a partner with his father, William Etelemaki, and when killed was repairing a raise on the 7th level. It was a wet raise and during the course of the day his clothes became saturated along his arms and legs. Both men took turns working in the raise and also at the bottom of the raise. An empty steel haulage car was spotted under the chute for receiving the ore that was being cleaned out of the raise as it went under repairing. The old cribbing was being placed along the drift.

Another crew of miners were doing similar work in a nearby raise. About 2:30 P.M. on the day of this accident, Arvo Saari, a member of this gang, passed the car where Vaino was working to get two planks. Returning with the planks he conversed with Vaino and the latter rendered assistance in moving the planks over the car. Saari carried them to his raise and returned almost immediately with the intention of obtaining a piece of cedar lagging for making a couple of measuring sticks. He came upon the body of Vaino, prostrated along side of the drift, beyond the coupling of the car, where he had been working in apparent safety. A hurried examination of the situation indicated that Vaino was probably dead but that he had met with an accident was not apparent because of the lack of any clue that would support the fact. Saari summoned help and in a short time the body was taken on a locomotive to the shaft station and then on the cage to surface, where a physician was available for medical service.

The haulage car had been placed a short distance off the center of the raise and it was possible for Vaino to touch the trolley wire with the long chute bar while leaning over the end of the car. The trolley wire was well guarded in front of the chute, which provided protection for loaders when filling cars. The height of the wire exceeded our stipulated distance. With arms and legs very wet and resting against a steel car, the conditions were right for a perfect grounding of the 250 voltage, provided he struck the trolley wire with the chute bar. No other reasonable conclusion could be reached, and microscopic examination of the victim's blood indicated that his death was by electrocution.

Etelemaki was American born, of Finnish descent, age 24 years. He had been married but a short time. A verdict at the inquest which was held several weeks after the accident occurred was "accidental death." The accident was classified preventable by the Central Safety Committee.

Safety Department

Annual Report

Year 1938

11. ACCIDENTS
AND
PERSONAL
INJURY.a. Fatal Accidents. (Continued)Fatal Accident No. III

William Ninnis, Jr., a locomotive operator, was fatally injured at 10:15 P.M. December 23, on the 8th level, "A" Shaft of the Cliffs Shaft Mine. He was squeezed between the side of a drift and a haulage car while engaged in switching cars.

In this mine it is not practicable to extend the trolley wire across the chutes in the haulage drifts. It is considered a safer method to carry the current around the back of chutes with insulated feeder cable. The gap in the trolley wire provides a safe place when loading cars at the chutes.

Ninnis and his brakeman, Clifford Trudell, were spotting a car to the end of a rock drift where there was some rock to be cleaned up. Trudell went ahead of the train to throw the switch to the track that led to the rock pile. Ninnis advanced the train, as locomotive runner, but it stalled under a chute. He then locked the trolley pole in a horizontal position, stepped out of the runner's pit and walked several steps along the drift, where the clearance between the cars and the wall of the drift was close, for the purpose of attaching his "jump" wire to the trolley wire. He made one fatal error. He had neglected to throw the controller of the locomotive into neutral position. Immediately as the wires came in contact the train started forward. Ninnis was caught between a car and the side of the drift and badly crushed across the chest. In some manner the "jump" wire became separated from the trolley wire, stopping the train. Trudell heard an outcry and hurried back to Ninnis, who requested that he be taken to the shaft station. He expired in a fellow worker's arms as he was being slowly transported on the locomotive.

Ninnis was American born, of English parentage, 29 years old and is survived by a wife and an infant child. His father is a pumpman at the mine. No inquest was deemed necessary by the coroner. The accident was the consequence of a violation of the haulage standard which required that the position of the trolley pole must not be changed when the controller is on.

b. Non-Fatal Accidents.

The non-fatal accident record for the year was below the fairly good records that were made in 1936 and 1937. We suffered six accidents whose combined loss, measured in compensable days, amounted to more than one-half of the total number of such days for all accidents, excluding the fatalities. One of those accidents will doubtless be a total disability. A description of these accidents and the number of compensable days that must be charged against them appear in this report.

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11. ACCIDENTS
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INJURY.b. Non-Fatal Accidents. (Continued)

A glance over the comparative data in Table III indicates the unfavorable record of the past year with respect to accidents of this nature.

TABLE III
COMPARATIVE ACCIDENT RECORD
1937 and 1938
COMPENSABLE ACCIDENTS

Mine or Plant	1937			1938		
	Number of Accidents	Days Lost	Severity Rate	Number of Accidents	Days Lost	Severity Rate
Athens	7	702	8.80	5	489*	8.70
Canisteo	1	66	1.47	1	150*	3.45
Cliffs Shaft	10	1027	9.06	9	915*	11.70
C. P. & L. Co.	1	42	2.40	0	0	0
Gardner-Mackinaw	2	134	3.64	2	136*	10.10
Lloyd	7	853	11.00	5	235	5.85
Maas	15	1179	8.64	12	2453*	33.07
Negaunee	10	714	6.72	10	1473*	23.00
Spies-Virgil	1	360	23.30	1	18*	1.10
Shops & Storehouse	1	38	1.40	0	0	0
Tilden	0	0	0	0	0	0
Miscellaneous	0	0	0	0	0	0
Total	55	5115	7.69	45	5869	11.93
Fatal Accidents						
Athens				1	1800	
					2289T	40.87
Cliffs Shaft				2	3600	
					4515T	57.43
Negaunee	1	1800				
		2514T	23.70			
Total	56	6915	10.39	48	11269	22.83

* Estimates

T Total Days Lost

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11. ACCIDENTS
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INJURY.b. Non-Fatal Accidents. (Continued)

Of the 45 accidents, now under consideration, 36 occurred under conditions far from being identical. They are accidents that point out very clearly that there are many phases to our accident problem and they are proof of the fact that a wide field in accident prevention work still confronts us. Carelessness or improper methods of doing work may be advanced as one of the principle causes for many of these accidents but that is an explanation of subordinate importance. The important thing is the severity of accidents is influenced much more by perfecting working conditions than by human perfection. A downward trend in accident prevention should be continued indefinitely with no lesser goal than the elimination of all fatal and serious accidents. It is a goal which perhaps may never be reached, but, nevertheless, it exists and must be steadily kept in mind.

The Tilden Mine, the C. P. & L. Co., and the General Shops and Storehouse were exempted from lost-time accidents.

Most of the working places within the Athens Mine are subjected to very heavy ground movement. Of this mine's five compensable accidents the three severest injuries may be traced to causes brought about by this ground movement. The same fact holds true for the mine's fatality. Other factors were responsible for two accidents, which entailed a combined loss of 75 compensable days.

The one accident that occurred at the Canisteo Mine was the result of an opportunity that appealed to a worker to construct a flimsy ladder support, and when climbing the ladder its foundation collapsed.

Accidents 1 and 7, Cliffs Shaft Mine, were related to haulage and of a nature easy to prevent. Accident 3 was entirely inexcusable. Nos. 2, 5, and 6 were hernia cases, which prior to 1938 were not taken as compensable accidents.

The two Gardner-Mackinaw Mine accidents are more acceptable because their causes come closer to trade risk hazards, that are not always apparent when associated with work.

The Lloyd Mine had two serious and three slight compensable accidents. New regulations were adopted to prevent possible repetition of the two serious accidents, namely Nos. 2 and 3. The elimination of eye accidents, similar to No. 4, will be accomplished only by compelling miners to always wear their safety goggles.

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11. ACCIDENTS
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INJURY.

a. Non-Fatal Accidents. (Continued)

Accident No. 5, Maas Mine, stares us in the face because it caused a total disability and was the result of "taking a chance" with a danger that is not incidental to mining providing men will only comply with instructions and obey our safety regulations. The other accidents at this mine could be absorbed in the year's record and the mine would not carry a poorer record than it had in 1937.

Handling timber and falls of miners in raises were responsible for half of the ten Negaunee Mine accidents. The compensable days paid for those five accidents amount to 5/7 of the total charged against the mine.

COMPENSABLE ACCIDENTS

<u>Mine</u>	<u>Occupation</u>	<u>Description</u>	<u>Days Lost</u>
Athens Mine	Surface Laborer	1. Hoisting timber at treating plant. It swung and struck his back. Fractured vertebra.	54
	Miner	2. Chopping end of timber. Axe slipped and cut his foot.	24
	Miner	3. Making hitch for timber. Piece of old lagging fell off forepoles, striking his back. Fractured vertebrae.	51
	Miner	4. Hoisting planks for repairing raise. Moved a plank to let locomotive pass. Journal box of a car caught plank and pushed it against his foot. Contusion.	300*
	Miner	5. Operating scraper in crushed drift. Scraper caught timber; pole holding hoist broke; back of hoist lifted and fell back on his foot. Contusion.	60*

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11. ACCIDENTS
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INJURY.

b. Non-Fatal Accidents. (Continued)

<u>Mine</u>	<u>Occupation</u>	<u>Description</u>	<u>Days Lost</u>
Canisteco	Washing Plant Laborer	1. Used a short ladder placed on a box. Ladder turned side-wise and he fell to the ground. Fractured rib.	150*
Cliffs Shaft	Shift Boss	1. Running locomotive and reversed the same instead of advancing it. Arm caught between locomotive and back of drift.	49
	Trammer	2. Pulling up apron on chute and felt a pain in his right side. Hernia.	43
	Drill Sharpener	3. Changing die in drill sharpener. Failed to use safety block. Overhaul caught the air valve and the head of machine dropped on his thumb. Crushed thumb.	284
	Stockpile Laborer	4. Standing on stockpile watching man open door of car filled with wet ore. Door of car on one side opened causing car to go over the dump. Tram car rope swept him off the track and he fell 10 feet. Dislocation of shoulder and fragment torn off head of humerus.	300*
	Scarper Operator	5. Lifting chunk of ore into car and ruptured his left side.	46
	Trammer	6. Barring loose ore and he felt a pain in right side. Hernia.	46
	Locomotive Brakeman	7. While sitting on locomotive he put his left foot between coupling of car and locomotive. Foot was pinched.	17