

THE CLEVELAND CLIFFS IRON CO.
ORE MINING DEPARTMENT
ANNUAL REPORT OF GENERAL MANAGER
For Year Ending December 31, 1936

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THE CLEVELAND-CLIFFS IRON COMPANY

ORE MINING DEPARTMENT

MANAGER'S ANNUAL REPORT

YEAR 1936

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 CROSS INDEX BY MINES - YEAR 1936

ISHPEMING DISTRICT		CLIFFS SHAFT	LLOYD	MORRIS	TILDEN			
1	General	11	49	82	91			
2	Production, Shipments & Stockpile Balances...	11-15	50-52	82-84	92-93			
3	Analysis	15-16	53	84-85	93-94			
4	Estimate of Ore Reserves	16-18	53-54	85-87	94-97			
5	Labor and Wages	18-20	55-56	-	97-98			
6	Surface	20-23	57-59	87	98			
7	Underground or Open Pit Operations	23-35	60-70	88-90	98-109			
8	Cost of Operating	35-43	71-76	-	110-114			
9	Taxes	44	76-77	-	114			
10	Accidents and Personal Injury	45	77-78	-	114			
11	New Construction & Proposed New Construction.	45-46	78	-	115			
12	New Equipment	-	78-79	-	115-116			
13	Maintenance and Repairs	46-47	79-80	-	116			
14	Power	47	80	-	116-117			
15	Nationality of Employees	48	81	-	117			
16	Explorations	43	76	-	114			
17	Water Supply	-	81	-	117			
18	Condition of Premises	-	81	-	-			
19	Pumping	-	-	90	-			

NEGAUNEE DISTRICT		ATHENS	LUCY	MAAS	NEGAUNEE	NORTH JACKSON	SOUTH JACKSON	JACKSON- CAMBRIA
1	General	118-119	159	160-161	212-213	248	211	249
2	Production, Shipments & Stockpile Balances...	119-121	-	161-165	213-214	-	-	249-250
3	Analysis	121	-	165-166	215	-	-	-
4	Estimate of Ore Reserves	121-122	-	166-167	215-216	-	211	-
5	Labor and Wages	122-124	-	167-171	216-218	-	-	-
6	Surface	125-129	-	171-174	218-221	248	211	250
7	Underground or Open Pit Operations	129-144	-	175-193	221-235	-	-	250-253
8	Cost of Operating	144-153	-	193-200	235-243	-	-	-
9	Taxes	153-154	159	200-201	243	-	211	-
10	Accidents and Personal Injury	154	-	201-203	244	-	-	-
11	New Construction & Proposed New Construction.	154	-	203-207	244	-	-	-
12	New Equipment	154-155	-	207-208	244-245	-	-	-
13	Maintenance and Repairs	155-156	-	208-209	246	-	-	-
14	Power	157	-	209	246-247	-	-	-
15	Nationality of Employees	158	-	210	247	-	-	-
16	Explorations	153	-	200	243	-	-	-
17	Condition of Premises	157	-	209	247	-	-	-
18	Maas Crusher	-	-	210	-	-	-	-

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GWINN AND IRON RIVER DISTRICT		FRANCIS	GARDNER- MACKINAW	GWINN DISTRICT	PRINCETON	STEPHENSON	VIRGIL
1	General	254	255	284-285	299	301	303
2	Production, Shipments & Stockpile Balances.	254	255-258	285	299	301	303-304
3	Analysis	254	258	-	-	301	304
4	Estimate of Ore Reserves	-	259-260	-	299-300	-	304-305
5	Labor and Wages	-	260-262	286	-	-	305-306
6	Surface	-	262	-	-	-	306-307
7	Underground or Open Pit Operations	-	263-275	-	-	-	307
8	Cost of Operating	254	275-279	-	300	302	-
9	Taxes	254	280	286-288	300	302	307-308
10	Accidents and Personal Injury	-	280	-	-	-	-
11	New Construction & Proposed New Construction	-	281	-	-	-	-
12	New Equipment	-	281-282	-	-	-	-
13	Maintenance and Repairs	-	-	-	-	-	309-310
14	Power	-	282	-	-	-	-
15	Nationality of Employees	-	283	-	-	-	310
16	Explorations	-	279-280	-	-	-	-
17	Water Supply	-	-	289-292	-	-	-
18	Condition of Premises	-	282	292-295	-	-	310
19	Gwinn Association	-	-	295-297	-	-	-
20	Gwinn Crusher	-	-	298	-	-	-
MESABA DISTRICT		CANISTEO	HOLMAN- CLIFFS	HILL TRUMBULL			
1	General	311-312	339	345			
2	Production, Shipments and Inventories	312-316	-	-			
3	Analysis	316	-	-			
4	Estimate of Ore Reserves	316-318	339-340	345-346			
5	Labor and Wages	318	-	347			
6	Surface	318-319	340-343	347-348			
7	Open Pit	319-325	-	348-349			
8	Cost of Operation	326-328	-	-			
9	Exploration and Future Explorations	329	-	349			
10	Taxes	329-330	343-344	349			
11	Accidents and Personal Injury	330-331	-	349			
12	New Construction & Proposed New Construction	332	-	350			
13	Equipment & Proposed New Equipment	332	-	350			
14	Maintenance and Repairs	332-334	-	350-351			
15	Nationality of Employees	334	-	352			
16	Washing Plant Operations	334-338	-	-			

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Ishpeming, Michigan,
March 1st, 1937

Mr. E. B. Greene, President,
1460 Union Trust Bld.
Cleveland, Ohio

Dear Sir:-

I beg to submit the report of the operations of the Mining Department for the year 1936.

The inventories, maps, statements relative to the 1936 report have gone forward to you under separate cover.

The colored portions of the maps show the work for the year. The reports of the different mines of the Company were made by the Superintendents in charge and the reports of the Engineering, Mechanical, Electrical, Geological, Safety and Welfare Departments by the Heads of these Departments.

All of our mines were operated on a progressively increasing working schedule, the details being given by the Superintendents in their reports of each mine.

The Central Shops and Storehouse have continued to function in a most satisfactory manner. Repair and new work is being done cheaper and better than in the past. We have had full use of the extension of the blacksmith shop and marvel how we got along without it for so many years. It is large enough to hold steam shovels, locomotives, cars, cages, skips, etc. It is self evident work of this kind cannot be done economically and properly outside in the dead of winter.

A vast improvement has been made in the design of skips, The new skip, which is standard for soft ore mines, has a round cast steel bottom and an improved cast steel bail. In addition, all rivets, which in time gradually work loose, have been eliminated, the plates being welded together. These skips clean themselves properly and will last much longer than the old type. They are by long odds the finest skip in use.

The Employees Representation plan continues to function satisfactorily and every complaint has been promptly taken care of. Our Representatives have not made an unreasonable request. Keen interest has been taken in elections and there is every reason to assume the mass of our employees are well pleased with this plan of bargaining.

During the year, the Company has leased the Lloyd Mine and also a strip of land to the south of the Cambria Mine 660' deep and three forties long. Both of these properties went to the Republic Steel Corporation. Although the agreements were not actually executed until the early part of 1937, Republic started to operated under them during the summer of 1936. According to the terms of the agreement we operate the Lloyd while the Jackson strip is operated by Republic in conjunction with the Cambria. We

We have been making frequent inspections at the Cambria since the middle of the summer.

I regret exceedingly to report the death, on December 25th, of W. R. Meyers, Superintendent of the Maas Mine. He was a most capable, trusted employee and his passing is a great loss to the Company.

On February 1st Mr. H. O. Moulton was appointed Superintendent at the Lloyd. This was made necessary in order to permit C. J. Stakel to devote all of his time to the Cliffs Shaft Mine. Due to the illness of Mr. Meyers, Mr. Moulton was transferred to the Maas as acting Superintendent on November 1st and after Mr. Meyer's death, he was made Superintendent. On November 1st Mr. C. W. Allen of the Engineering Department was promoted to the Superintendency of the Lloyd Mine.

For the entire year, J. H. Tregonning, Captain at the Maas, has been a patient at the Saranac Institute and died on January 28, 1937. Captain Tregonning was a most efficient mining captain and it will be difficult to replace him.

We have continued to pound safety, and the results have shown an improvement over 1935. This is gratifying when it is taken into consideration that we have been expanding, increasing our production and adding many new men who must be trained in safety. The details are given in Mr. Conibear's report.

I call your particular attention to the cost in the comparative statement for the ten year period entitled "Labor Summary - All Mines". The labor, supplies and total cost are better in 1936 than in any year during this period. The production is only exceeded by that of 1930 when there were 13 operating mines against 8 in 1936. Our properties are in the finest physical condition and are being prepared for still larger productions in 1937.

The question of local politics and extravagance in the administration of the City affairs in Negaunee is still a matter of great concern and annoyance to me. Although they are not throwing away as much money as they did in former years, the conditions are still very bad. I am of the opinion that the only way to make the community tax conscious is to restore the valuations of property owned by individuals. As soon as their pocketbooks are affected by extravagant expenditures, they will correct it with their ballot. At the present time these valuations have been reduced to such a small amount that the taxes which they pay are ridiculous.

In Ishpeming the valuations of the mines for a number of years have steadily decreased and the point has now been reached, under the limitations of the city charter, where sufficient money cannot be raised to support the City. A study of the charter is being made by Berg & Clancey and it is hoped they will be able to find some practical solution without the necessity of revising the charter.

During the year the Company has granted, under certain restrictions, a week's holiday with pay. This was greatly appreciated. Some men who had worked for many years tell me it was the first holiday they have ever had.

The Company has also inaugurated the Group Insurance and Sick Benefit plan. Its adoption was put to the vote and carried almost 100%.

It is a matter of great satisfaction to me to report a large increase in the production and the lowest cost for at least a period of ten years. It goes without saying that this could only be accomplished by the closest possible cooperation on the part of everyone concerned.

Respectfully Submitted,



Manager

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THE CLEVELAND CLIFFS IRON COMPANY
A COMPARISON OF MINING DEPARTMENT MICHIGAN TAXES FOR PAST FOUR YEARS
FOR COMPLETE DETAIL SEE THIS AND PREVIOUS TAX STATEMENTS

ASSESSED VALUATION	1936	1935	1934	1933
The Cleveland-Cliffs Iron Co	10,498,659	10,117,036	10,013,575	10,866,238
The Negaunee Mine Co.....	2,927,500	3,057,770	3,196,400	3,554,400
The Athens Iron Mining Co.....	1,929,520	1,929,520	2,077,800	2,036,500
The Cliffs Power & Light Co.....	1,424,281	1,424,711	1,418,887	1,415,063
The Cliffs Electric Co.....	-	-	-	4,500
TOTAL MICHIGAN MINING DEPARTMENT.....	16,778,960	16,529,037	16,706,662	17,876,701
Change from previous year.....	149,923	177,625	1,170,039	2,849,770
Decrease from 1932.....	3,947,511	4,197,434	5,883,562	
Percent decrease from 1932.....	19.05%	20.2%	26%	

TOTAL TAXES PAID

The Cleveland-Cliffs Iron Co.....	315,635.66	286,303.64	267,750.15	283,160.67
The Negaunee Mine Co.....	100,859.97	95,226.14	86,527.53	99,599.60
The Athens Iron Mining Co.....	66,477.06	60,089.81	56,246.84	57,065.71
The Cliffs Power & Light Co.....	30,066.37	29,817.75	31,256.06	35,992.72
The Cliffs Electric Co.	-	-	-	74.54
TOTAL MICHIGAN MINING DEPT. TAX.....	513,039.06	471,437.34	441,780.58	475,893.24
Increase over previous year.....	41,601.72	29,656.76		
Decrease from previous year.....			34,112.66	134,932.58
Decrease from 1932.....	97,786.76	139,388.48	414,641.55	
Percent Decrease from 1932.....	16%	22.8%	48.4%	
Average tax rate per \$100.00.....	3.035	2.852	2.644	2.662

Note: The Negaunee Mine does not include the Adams Strip which was paid by The Cleveland-Cliffs Iron Co. and transferred to Negaunee Mine.
Valuation 180,000. Taxes \$6,201.46

STATEMENT SHOWING COMPARATIVE COST FOR ALL EXPLOSIVES USED AT HARD ORE MINES.

	1933	1934	1935	1936
PRODUCT - Tons	55,939	223,245	268,921	456,760
<u>POWDER</u>				
Pounds - Gelamite "A"	17,400			
Gelamite "2X"	34,200	37,550		
50% L.F.		120,600	128,750	396,000
60% Gelatine		49,650	145,950	58,200
Total pounds Powder	51,600	207,800	274,700	454,200
Total Cost	6,330.75	23,426.05	32,531.91	52,098.25
Fuse - Feet	96,450	293,600	394,100	702,000
Caps - Number	16,972	70,450	75,350	114,500
Duplex Shot Wire	-	-	17,270	1,785
Connecting Wire - Pounds	6	64	-	-
Delay Fuses	200	925	3,324	3,400
Fuse Lighters	3,000	17,000	21,500	29,500
Fuse Containers	3	-	-	30
Tamping Bags	-	-	-	31,000
Total Cost - Fuse, Caps, etc.	763.02	2,716.81	3,831.04	6,087.44
Total Cost - All Explosives	7,093.77	26,142.86	36,362.95	58,185.69
Average Price per pound - Powder .....	.122	.113	.117	.1147
Cost per ton - Powder .....	.1132	.1049	.1209	.1141
" " " - Fuse, etc. ....	.0136	.0122	.0143	.0133
" " " - All Explosives .....	.1268	.1171	.1352	.1274
Pounds Powder per ton of ore .....	.9224	.9308	1.021	.9943

1936 Production increased 186,839 tons or 69.4% over 1935.

STATEMENT SHOWING COMPARATIVE COST OF ALL EXPLOSIVES USED AT SOFT ORE MINES.

	1933	1934	1935	1936
PRODUCT - Tons	252,833	878,514	1,207,924	1,913,242
<u>POWDER</u>				
Pounds - 40%	1,503	1,950	-	-
50%	87,025	296,050	445,302	746,185
60%	8,350	92,075	86,400	78,995
LX and 2X Gelamite	11,350	50,250	88,535	121,345
Gelamite "A"	23,150	-	-	-
<u>Total Pounds Powder</u>	<u>151,378</u>	<u>440,325</u>	<u>620,237</u>	<u>946,525</u>
<u>Total Cost - Powder</u>	<u>15,635.14</u>	<u>49,691.73</u>	<u>73,992.18</u>	<u>105,732.20</u>
Fuse - Feet	431,903	1,347,997	1,824,134	2,976,430
Caps - Number	68,119	213,859	293,882	434,527
Leading Wire - Feet	-	-	1,000	6,000
Connecting Wire - Pounds.....	10	20	64	42
Tamping Bags	11,300	45,600	43,650	94,150
Sealing Compound - Pints	1	20	12	32
Powder Bags	18	54	58	74
Fuse Lighters	5,850	22,600	31,600	54,100
Electric Exploders	-	3,325	2,275	11,540
Blasting Machines	-	2	-	1
<u>Total Cost Fuses, etc</u>	<u>3,360.55</u>	<u>10,925.17</u>	<u>14,435.57</u>	<u>23,872.40</u>
<u>Total Cost - All Explosives</u>	<u>18,995.69</u>	<u>60,616.90</u>	<u>88,427.75</u>	<u>129,604.60</u>
Average Price per Lb. Powder .....	.1190	.1129	.1193	.1117
Cost per Ton - Powder .....	.0618	.0566	.0613	.0553
" " " - Fuse, etc. ....	.0133	.0124	.0119	.0124
" " " All Explosives .....	.0751	.0690	.0732	.0677
Pounds of powder per ton of ore .....	.5196	.5012	.5135	.4947

1936 Product increased 705,318 tons or 53.8% over 1935.

Cost per Ton for Explosives in 1936 decreased approximately 8% compared with 1935.

STATEMENT SHOWING COMPARATIVE COST FOR ALL MINE TIMBER USED AT SOFT ORE MINES

	1933	1934	1935	1936
PRODUCT - TONS	252,833	878,514	1,207,924	1,913,242
<u>TIMBER</u>				
Feet 6- 8	170,798	318,262	289,951	513,514
8-10	40,634	97,544	176,298	222,488
10-12	79,993	169,588	236,489	361,061
12-14	60,595	97,760	84,977	131,705
14-16	17,102	5,321	1,232	5,147
Treated Timber	-	2,847	12,607	20,175
Total Feet	369,122	691,322	801,554	1,254,090
Total Cost	30,769.30	42,142.29	49,854.05	79,567.42
<u>LAGGING</u>				
Feet 5'	-	45,800	31,725	58,275
7'	909,998	2,268,496	2,827,973	4,546,086
8'	-	40,973	-	-
Total Feet	909,998	2,355,269	2,859,698	4,604,361
Total Cost	6,048.14	16,282.15	20,181.79	32,044.85
Poles - Feet	577,707	1,637,522	2,187,074	3,376,027
Poles - Cost	6,950.03	19,644.23	24,111.30	38,353.17
WIRE FENCING - Rods	110	665	1,081	1,322
" " - Cost	95.45	567.77	895.13	1,137.24
Total Cost for all Timber	43,862.92	78,636.44	95,042.27	151,102.68
Average Cost per foot - Timber .....	.0833	.061	.062	.0634
" " " 100 " - Lagging .....	.6646	.691	.706	.6959
" " " " Poles	1.203	1.200	1.102	1.136
" " " rod - Fencing .....	.867	.853	.828	.860
Feet of Timber per ton of ore	1.459	.787	.664	.655
" " Lagging " " " "	3.599	2.681	2.367	2.407
" " Poles " " " "	2.284	1.863	1.811	1.765
" " Wire Fencing" " " " .....	.007	.0125	.015	.0114
Cost per Ton for Timber .....	.1217	.0480	.0414	.0416
" " " Lagging .....	.0239	.0185	.0167	.0167
" " " Poles .....	.0275	.0224	.0199	.0200
" " " Wire Fencing .....	.0004	.0006	.0007	.0006
TOTAL COST PER TON .....	.1735	.0895	.0787	.0789

1936 Product increased 705,318 tons or 53.8% over 1935.

STATEMENT SHOWING TOTAL COST OF SUPPLIES CHARGED TO "COST OF ORE AT MINES"

SOFT ORE MINES

YEAR	1933		1934		1935		1936	
PRODUCT - Tons	381,210		878,514		1,207,924		1,913,242	
CLASSIFICATION	AMOUNT	PER TON	AMOUNT	PER TON	AMOUNT	PER TON	AMOUNT	PER TON
General Supplies	19,914.25	.0522	46,160.93	.0525	55,656.09	.0461	85,084.04	.0445
Iron and Steel	4,363.60	.0114	10,974.63	.0125	22,174.50	.0184	33,498.59	.0175
Machinery	8,735.40	.0229	24,439.92	.0278	55,855.54	.0462	74,403.36	.0389
Explosives	20,310.67	.0533	58,938.05	.0671	89,053.60	.0737	129,741.00	.0678
Lumber & Timber	50,459.11	.1324	94,709.27	.1078	108,752.97	.0900	174,127.19	.0910
Fuel	9,927.61	.0260	12,211.98	.0139	14,960.77	.0124	16,653.38	.0087
Electric Power	147,269.45	.3863	235,416.12	.2680	255,339.52	.2114	321,282.52	.1679
Miscellaneous	6,169.57	.0161	25,464.74	.0290	18,772.50	.0155	24,629.41	.0129
Total	254,810.52	.6684	508,315.64	.5786	620,565.49	.5137	859,419.44	.4492

HARD ORE MINES

YEAR	1933		1934		1935		1936	
PRODUCT - Tons	55,939		223,245		268,921		456,760	
CLASSIFICATION	AMOUNT	PER TON	AMOUNT	PER TON	AMOUNT	PER TON	AMOUNT	PER TON
General Supplies	3,613.35	.065	13,095.67	.059	26,797.41	.100	44,369.18	.097
Iron and Steel	923.86	.016	8,825.18	.039	16,001.23	.059	23,094.99	.062
Machinery	3,142.11	.056	13,273.54	.059	27,582.16	.102	44,140.79	.096
Explosives	7,093.77	.127	26,142.86	.117	36,362.95	.135	57,638.41	.126
Lumber & Timber	1,787.57	.032	3,943.05	.018	7,776.48	.029	13,026.30	.029
Fuel	1,870.49	.033	2,247.02	.010	4,574.29	.017	5,571.74	.012
Electric Power	14,971.89	.268	53,915.24	.241	58,550.36	.218	75,662.87	.166
Miscellaneous	276.21	.005	1,727.36	.008	438.49	.002	1,645.40	.003
Total	33,679.25	.602	123,169.92	.551	178,083.37	.662	270,149.68	.591

LABOR SUMMARY - ALL COMPANIES

	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936
PRODUCT - Tons.....	3,336,557	3,358,640	2,775,542	3,534,754	4,568,040	2,537,021	474,424	796,715	1,803,120	2,272,451	3,671,223
Surface - Cost per Ton.....\$	.2965	.2813	.3411	.3067	.2912	.3396	.5272	.4156	.273	.257	.244
Underground - Cost per Ton.....	.6345	.5979	.6017	.5254	.4939	.5240	.8462	.3973	.463	.479	.447
Supts. & Gen. Roll, " " .....	.1259	.1201	.1412	.1069	.0929	.1535	.2918	.1315	.080	.102	.073
Grand Total Cost per Ton.....	1.0569	.9993	1.084	.939	.878	1.0171	1.6652	.9424	.816	.838	.764
Average rate per day (1).....	5.13	5.16	5.15	5.09	5.23	5.21	4.17	3.98	4.57	4.83	4.94
Tons per man per day	4.85	5.166	4.75	5.43	5.95	5.12	2.51	4.22	5.60	5.77	6.46
Approximate Increase) In or Decrease) Wages						Oct.10%	May 15%	July 10%	Apr. 10%		Nov. 9.7%

(1) Note: The above is the total of all wages and salaries for employees of the Mining Department except salaries paid on Cleveland Roll since May 1st 1932. Also includes the Cliffs Power & Light Co.

OPERATING MINES

	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936
Cliffs Shaft	x	x	x	x	x	x	x	x	x	x	x
Holmes	x	x	x	x	x	out					
Maas	x	x	x	x	x	x	x	x	x	x	x
Morris Lloyd	x	x	x	x	x	x	x	Lloyd	x	x	x
Barnes-Hecker	out		Gardner-Mackinaw	x	x	x	x	x	x	x	x
Stephens on	x		out								
Austin	x		out								
Republic	x		x	out							
Spies Virgil	x	x	x	x	x	x	x	x	Idle	Idle	Idle
Ogden	x	x	x	Tilden	x	x	x	x	x	x	x
Negaunee	x	x	x	x	x	x	x	x	x	x	x
Athens	x	x	x	x	x	x	x	x	x	x	x
Hill Trumbull	x	x	x	x	x	x	Idle	Idle	Idle	Idle	Idle
Boeing	x		Out		Holman	x	Idle	Idle	Idle	Idle	Idle
					Wade	x	out				
					Alexandria	x	out				
								Ganisteo	x	x	x
								Drew	x	out	

WORKING SCHEDULE - 1936 - MICHIGAN MINES

All active underground mines, with the exception of the Cliffs Shaft, operated from January 1st to February 1st with two crews working six day shifts each week, each crew getting three days work weekly. On February 1st operations were increased to six day shifts and 2 night shifts weekly, each crew averaging four days work weekly. On May 1st operations were again increased to five day shifts and five night shifts, with crews alternating so that each man received five days work weekly. The Cliffs Shaft Mine operated five day shifts weekly with one full crew from January 1st to September 1st when operations were increased to six day shifts weekly. The Tilden Pit operations for 1936 began on April 20th and closed November 5th. Operations were conducted on two 1-8 hour shifts five days per week. The Spies Virgil Mine was idle - pumping during the year 1936.

WORKING SCHEDULE - 1936 - MINNESOTA PROPERTIES

The Ganisteo pit operations for 1936 began May 4, 3-8 hour shifts five days per week and during June operations were increased to six days per week, 3-8 hour shifts. Ore operations closed for the season on October 8th. Holman Cliffs and Hill Trumbull Mines idle during year 1936.

COMPARISON OF TOTAL DAYS WORKED AND TONS OF ORE MINED FOR THE YEAR 1936 AND 1935

	1936 DAYS	1935 DAYS	1936 DAYS	1935 DAYS
<u>NON-PRODUCTIVE UNITS</u>				
Stephenson Mine	363	291		
Princeton Mine	311 $\frac{1}{4}$	333 $\frac{3}{4}$		
Miscellaneous Pay-Roll	2,130 $\frac{3}{4}$	1,748		
Shops and Storehouse	2,861 $\frac{3}{4}$	1,980 $\frac{3}{4}$		
C. C. I. Co. Miscellaneous and General	48,728 $\frac{1}{2}$	31,099		
Negaunee Mine " " "	2,604 $\frac{1}{2}$	1,781		
Athens Mine " " "	952	699 $\frac{3}{4}$		
Cliffs Power & Light Co.	17,532	13,067 $\frac{3}{4}$		
Mesaba Range Properties	30,507 $\frac{1}{2}$	22,154 $\frac{3}{4}$		
General Roll - Undistributed	29,597	25,425 $\frac{1}{2}$		
Spies-Virgil - Idle	2,982 $\frac{3}{4}$	2,186 $\frac{1}{2}$		
Total Deductions	138,570 $\frac{3}{4}$	100,767 $\frac{3}{4}$		
Grand Total - All Operations	567,879 $\frac{1}{2}$	393,972 $\frac{1}{2}$		
Net for Operating Mines	429,308 $\frac{3}{4}$	293,204 $\frac{1}{2}$	429,308 $\frac{3}{4}$	293,204 $\frac{1}{2}$
Total Tons	3,671,223	2,272,451		
Tons per man per day	8.551	7.750		
<u>OPEN PIT PRODUCTION - TONS</u>				
Tilden	291,341	190,511	9,360 $\frac{3}{4}$	5,388 $\frac{1}{2}$
Canisteo	1,009,880	605,095	40,420 $\frac{3}{4}$	34,362
Total	1,301,221	795,606	49,781 $\frac{1}{2}$	39,750 $\frac{1}{2}$
Open Pit Tons per man per day	26.14	20.01		
Net Underground days			379,527 $\frac{1}{4}$	253,454
Net Underground Production	2,370,002	1,476,845		
Underground Tons per man per day	6.245	5.827		

CLIFFS SHAFT MINE

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1. GENERAL:

Production was increased the latter part of the year by increasing the working schedule and by putting additional men to work. The mine operated one 8-hour shift 5 days a week with full crew from January 1st to September 1st. On Saturdays of each week hoisting was done to clean out the ore accumulated in the chutes. On September 1st operations were increased to 6 days a week, each man averaging 48 hours per week, and ore was hoisted overtime on Tuesdays and Thursdays each week from 4 to 8 P. M. On December 1st night shift mining was introduced in six mining places in "B" Shaft and overtime hoisting was stepped up to three nights a week, Monday, Wednesday, and Friday, from 4 to 8 P. M.

During the last week in August the entire mine crew enjoyed a vacation with pay. On October 7th the underground crew started working a straight 8-hour shift, the men remaining underground during the noon hour. At 7:30 A. M. the first cage goes down as formerly but the first cage to bring men up is hoisted at 4 P. M. instead of 5 P. M.

The working schedule in force at the end of the year seems rather complicated, but the whole idea is to work a man not over 8 hours. A part of the surface crew come out at 7 A. M. and quit at 3:30 P. M. with half hour for dinner. The majority of the surface men report at 7:30 A. M. and quit at 4 P. M. with half hour intermission at noon. Another portion of the surface men start at 12 Noon and work until 8 P. M. These men handle the ore that is hoisted overtime. Most of the underground crew go to work at 8 A. M. and quit at 4 P. M. A portion of the motormen, brakesmen, scraper men, etc. start at 12 Noon and work until 8 P. M. The regular night shift crew handling rock work from 8 P. M. to 4 A. M. The night shift mining gangs go on duty at 10 P. M. and quit at 6 A. M. Skiptenders and cage riders work on an 8-hour cycle starting at 7 A. M. One not familiar with the duties of the various men would judge that they are going and coming all the time, but, as a matter of fact, after two months of breaking in the new employees, operations go along very smoothly.

The year 1936 also chalked up a new operating record, a 456,760 ton product with no loss in ore reserves. In fact, the tonnage in sight underground shows a gain of 58,794 tons. That means that 525,000 tons of new ore was developed in 1936.

2. PRODUCTION
SHIPMENTS &
INVENTORIES:

a. Production by Grades

<u>Grade</u>	<u>Tons</u>	<u>% of Total</u>
Cliffs Shaft Lump	265,163	
" " Mine Run	165	
" " Crushed	117,686	
Total Cliffs Shaft Ore	383,014	83.8
Bancroft Lump	50,568	
" Mine Run	214	
" Crushed	22,964	
Total Bancroft Ore	73,746	16.2
GRAND TOTAL ORE	456,760	100.0

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Production by grades for the past few years follows:

<u>Year</u>	<u>Lump Ore</u> <u>Tons</u>	<u>Crushed Ore</u> <u>Tons</u>	<u>Run-of-Mine Ore</u> <u>Tons</u>	<u>Total Tons</u>
1926	240,396	99,857		340,253
1927	288,804	113,728		402,532
1928	275,018	116,844		391,862
1929	295,600	125,714		421,314
1930	226,059	94,910	86,956	407,925
1931	153,717	65,113	72,227	291,057
1932	57,104	24,449	566	82,119
1933	39,101	16,838		55,939
1934	156,776	66,469		223,245
1935	189,883	79,038		268,921
1936	315,731	140,650	379	456,760

Production for 1936 exceeded the previous high year of 1929 by 35,446 tons.

The following table gives the ratio of lump to crushed ore for the past five years. The years 1930 and 1931 do not show the actual ratio because of the run-of-mine ore produced in those years. The small tonnage of 566 tons in 1932 and 379 tons of run-of-mine ore in 1936 was split 70 and 30.

<u>Year</u>	<u>LUMP</u>		<u>CRUSHED</u>	
	<u>Tons</u>	<u>% of Total</u>	<u>Tons</u>	<u>% of Total</u>
1932	57,500	69.97	24,619	30.03
1933	39,101	69.89	16,838	30.11
1934	156,776	70.23	66,469	29.77
1935	189,883	70.61	79,038	29.39
1936	315,996	69.18	140,764	30.82

The amount of ore produced from the Bancroft or leased area of the mine is the largest since the lease was signed in 1924. The Bancroft production since that area was leased by years follows:

<u>Year</u>	<u>Bancroft Ore</u> <u>Tons</u>
1925	15,658
1926	37,529
1927	38,372
1928	34,730
1929	65,889
1930	61,385
1931	43,303
1932	10,964
1933	7,048
1934	27,987
1935	27,447
1936	73,746
Total	444,058

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The proportion of ore as mined from the fee and leased lands show for the past five years that a larger percentage of ore is now coming from the Bancroft area.

<u>Year</u>	<u>Cliffs Shaft Ore</u>	<u>% of Total</u>	<u>Bancroft Ore</u>	<u>% of Total</u>
1932	71,155	86.6	10,964	13.4
1933	48,891	87.4	7,048	12.6
1934	195,258	87.5	27,987	12.5
1935	241,474	89.8	27,447	10.2
1936	383,014	83.9	73,746	16.1

In the 1935 annual report the statement made that "The 1936 figures will show a substantial increase in the Bancroft percentage of the total mined" is borne out by the above table.

b. Shipments

<u>Grade</u>	<u>Pocket Tons</u>	<u>Stockpile Tons</u>	<u>Total Tons</u>	<u>Last Year</u>
Cliffs Shaft Lump	156,890	147,375	304,265	251,246
" " Crushed	69,940	83,798	153,738	91,596
Bancroft Lump	33,499	15,066	48,565	35,137
" Crushed	14,802	16,914	31,716	20,523
Cliffs Shaft Mine Run	165	-	165	-
Bancroft Mine Run	214	-	214	-
Total	275,510	263,153	538,663	398,502
Total Last Year	170,771	227,731	398,502	
Incr. in Shipments	104,739	35,422	140,161	

Shipments for the last decade follow:

<u>Year</u>	<u>CLIFFS SHAFT</u>			<u>BANCROFT</u>			
	<u>Lump</u>	<u>Crushed</u>	<u>Run-of-Mine</u>	<u>Lump</u>	<u>Crushed</u>	<u>Run-of-Mine</u>	<u>Total</u>
1927	240,781	98,848	-	22,051	4,639	-	366,319
1928	267,291	93,078	-	20,049	8,315	-	388,733
1929	305,278	133,433	-	43,472	28,747	-	510,930
1930	126,231	30,460	73,881	27,178	4,436	13,075	275,261
1931	17,999	12,099	70,541	10,210	285	1,686	112,820
1932	25,505	3,727	574	-	-	-	29,806
1933	135,303	45,162	-	10,105	-	-	190,570
1934	142,891	47,607	-	30,238	16,703	-	237,439
1935	251,246	91,596	-	35,137	20,523	-	398,502
1936	304,265	153,738	165	48,565	31,716	214	538,663

It will be noted that the tonnage shipped in 1936 exceeds that forwarded in 1929, which was the previous high mark.

c. Stockpile Balances

The ore left in stock on Dec. 31, 1936 is the smallest tonnage since 1929.

Balance in stock - Dec. 31, 1931	-	342,860 tons
" " " 1932	-	395,173 "
" " " 1933	-	299,585 "
" " " 1934	-	275,391 "
" " " 1935	-	145,810 "
" " " 1936	-	82,072 "

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The 82,072 tons shown on hand at the end of the year was made up as follows:

Cliffs Shaft Lump	26,843 Tons
" " Crushed	44,918 "
Bancroft Lump	5,303 "
" Crushed	5,008 "
Total	82,072 "

d. Division of Product by Levels

<u>Level</u>	<u>"A" Shaft</u> <u>Tons</u>	<u>"B" Shaft</u> <u>Tons</u>	<u>Total</u> <u>Tons</u>
First	13,640	21,386	35,026
Second	6,365	15,818	22,183
Third	24,454	-	24,454
Fourth	15,667	-	15,667
Fifth	23,112	3,221	26,333
Sixth	32,682	18,910	51,592
Seventh	58,264	18,538	76,802
Eighth	14,843	10,074	24,917
Ninth	52,003	7,376	59,379
Tenth	48,938	8,121	58,059
Eleventh	18,587	5,489	24,076
Twelfth	-	21,123	21,123
Thirteenth	-	17,149	17,149
Fourteenth	-	-	-
Total	309,555	147,205	456,760
Rock			32,550
Total Ore & Rock			489,310

The figures that follow show the division of product between "A" and "B" Shafts for the past six years:

<u>Year</u>	<u>"A" Shaft</u>		<u>"B" Shaft</u>		<u>Total</u>
	<u>Tons</u>		<u>Tons</u>		<u>Tons</u>
1931	193,747	66.5%	97,310	33.5%	291,057
1932	56,533	68.7%	25,586	31.3%	82,219
1933	39,816	71.3%	16,123	28.7%	55,939
1934	157,835	70.8%	65,410	29.2%	223,245
1935	194,847	72.3%	74,074	27.7%	268,921
1936	309,555	67.6%	147,205	32.4%	456,760

It will be noted that we have succeeded in producing more ore in the "B" Shaft area in 1936 and it is significant that despite the fact that a larger percentage of ore came from "B" Shaft, the ore reserves showed a healthy increase in 1936 in this area as will be noted later in this report.

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e. Production by Months

Month	Optg. Days	Cliffs Shaft		Bancroft		Total
		Lump	Crushed	Lump	Crushed	
January	22	19,595	8,400	3,247	1,404	32,646
February	20	18,792	8,070	3,268	1,432	31,562
March	22	20,610	8,905	3,693	1,621	34,829
April	21	20,008	8,571	3,477	1,591	33,647
May	21	21,759	9,618	4,391	2,248	38,016
June	22	21,592	9,428	4,707	2,057	37,784
July	23	24,061	10,722	4,960*	2,087	41,830
August	19	18,415	9,228	3,253	1,525	32,421
September	24	23,493	11,275	4,671	2,157	41,596
October	27	26,033**	12,851	5,061***	2,316	46,261
November	23	21,791	9,646	4,655	2,084	38,176
December	25	24,179	10,972	5,399	2,442	42,992
Year	269	260,328	117,686	50,782	22,964	451,760

* Includes 56 tons of Bancroft Mine Run

** " 165 " " Cliffs Shaft Mine Run

*** " 158 " " Bancroft Mine Run

f. Ore Statement

	Cliffs Shaft			Bancroft			Total	Last Year
	Lump	Crushed	Mine Run	Lump	Crushed	Mine Run		
On Hand Jan. 1st, 1936	47,780	80,970	-	3,300	13,760	-	145,810	275,391
Output for Year	260,163	117,686	165	50,568	22,964	214	451,760	268,921
Overruns	23,165	-	-	-	-	-	23,165	-
Total	331,108	198,656	165	53,868	36,724	214	620,735	544,312
Shipments	304,265	153,738	165	48,565	31,716	214	538,663	398,502
Balance on Hand	26,843	44,918	-	5,303	5,008	-	82,072	145,810
Increase in Output							206,004	

g. Delays

Date	Hours	Tons Lost	Cause
March 27th	2	300	Sleet storm
July 6th	3	300	"B" Shaft Hoist Motor
Year	5	600	

3. ANALYSISa. Average Analysis on 1936 Output

	Iron	Phos.	Silica
Cliffs Shaft Lump	58.20	.110	8.80
" " Mine Run	63.35	.123	5.34
" " Crushed	54.53	.108	12.69
Bancroft Lump	59.29	.110	7.06
" Mine Run	58.80	.104	7.48
" Crushed	55.87	.109	10.86

b. Average Analysis on Straight Cargoes

Grade	MINE			LAKE ERIE	
	Iron	Phos.	Silica	Iron	Moist.
Cliffs Shaft Lump *	58.54	.110	8.36	59.21	0.46
" " Mine Run *	57.64	.111	9.49	58.16	0.99
" " Crushed *	56.45	.109	10.57	56.46	2.10

*Includes Bancroft Ore shipped.

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c. Complete Analysis for 1936 Season on all ores shipped to Furnaces And Docks:

<u>Grade</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Alum</u>	<u>Mang</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>
Lump Ore - Cliffs									
Shaft & Bancroft	58.60	.107	8.27	2.17	.44	1.50	1.01	.013	2.14
Crushed Ore - Cliffs									
Shaft & Bancroft	55.45	.110	11.78	2.55	.45	1.48	1.15	.014	2.38

d. Analysis of Ore in Stock Dec. 31, 1936:

<u>Grade</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>
Cliffs Shaft Lump	Dried	57.60	.109	9.99	.50	2.24	1.48	1.03	.014	2.06	
"	Natural	57.31	.108	9.94	.50	2.23	1.47	1.02	.014	2.05	.50
Cliffs Shaft Crush.	Dried	55.07	.110	11.40	.43	2.61	1.46	1.19	.016	2.36	
"	Natural	54.16	.108	11.21	.42	2.57	1.43	1.17	.016	2.32	1.65
Bancroft Lump	Dried	58.40	.109	9.38	.47	2.60	1.56	1.15	.014	2.32	
"	Natural	58.11	.108	9.33	.47	2.59	1.55	1.14	.014	2.31	.50
Bancroft Crushed	Dried	55.62	.115	11.17	.34	3.06	1.40	1.11	.020	2.00	
"	Natural	54.63	.113	10.97	.33	3.01	1.37	1.09	.019	1.96	1.78

e. Analysis of Ore Reserves

Run-of-Mine Ore - Natural Analysis

	<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>
Cliffs Shaft Ore	56.50	.109	8.79	.39	2.40	1.47	1.17	.018	2.20	2.20
Bancroft Ore	57.02	.106	6.56	.39	2.40	1.47	1.17	.018	2.20	2.20

4. ESTIMATE OF ORE RESERVES:

Assumptions: 8, 9 and 10 cu. ft. per ton. Most of the ore is estimated with the factor 9.
10% Deduction for Rock
10% " " loss in mining

a. Ore in Sight on Dec. 31, 1936:

Available Bancroft Ore "A" Shaft

<u>Level</u>	<u>Developed</u>		<u>Prospective</u>	<u>Total Tons</u>
	<u>Floors</u>	<u>Pillars</u>	<u>Breasts</u>	
	<u>Tons</u>	<u>Tons</u>	<u>Tons</u>	
1st	-	1,800	-	1,800
2nd	10,500	-	2,000	12,500
3rd	5,000	800	2,000	7,800
4th	8,900	2,900	-	11,800
5th	2,400	-	2,000	4,400
6th	15,600	10,900	-	26,500
7th	10,900	-	4,000	14,900
8th	-	8,000	-	8,000
9th	13,400	3,800	6,000	23,200
10th	5,500	129,700	6,000	141,200
11th	62,100	-	-	62,100
Total	134,300	157,900	22,000	314,200

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Summary

Bancroft Ore Available	314,200 tons
Less 10% for loss in mining & 10% for rock	<u>59,700 "</u>
Difference	254,500 "
Less December production	<u>7,841 "</u>
Net Total	246,659 "

Available Cliffs Shaft Ore "A" Shaft

Level	Developed		Prospective	Total Tons
	Floors Tons	Pillars Tons	Breasts Tons	
1st	-	7,700	-	7,700
2nd	11,600	-	4,000	15,600
3rd	2,500	-	-	2,500
4th	-	-	-	-
5th	12,600	20,700	4,000	37,300
6th	75,200	82,000	12,000	169,200
7th	179,400	18,100	18,000	215,500
8th	136,400	21,300	4,000	161,700
9th	169,500	2,300	-	171,800
10th	62,100	132,300	18,000	212,400
11th	40,800	129,700	4,000	174,500
12th	66,000	61,200	-	127,800
15th	38,100	-	-	38,100
Total	794,800	475,300	64,000	1,334,100

Available Cliffs Shaft Ore "B" Shaft

Level	Developed		Prospective	Total Tons
	Floors Tons	Pillars Tons	Breasts Tons	
1st	7,300	-	4,000	11,300
2nd	16,200	-	-	16,200
3rd	11,500	23,500	4,000	39,000
5th	5,300	-	4,000	9,300
6th	2,000	7,000	2,000	11,000
7th	22,500	4,200	4,000	30,700
8th	50,700	22,800	2,000	75,500
9th	25,300	-	-	25,300
10th	23,000	-	2,000	25,000
11th	22,500	2,800	-	25,300
12th	4,300	5,500	2,000	11,800
13th	16,900	-	2,000	18,900
14th	23,700	-	2,000	25,700
15th	30,800	14,600	-	45,400
Total	262,000	82,400	26,000	370,400

Summary

Cliffs Shaft Ore Available "A" Shaft	1,334,100 tons
" " " " "B" "	<u>370,400 "</u>
Total Available Cliffs Shaft Ore	1,704,500 "
Less 10% for loss in Mining & 10% for rock	<u>323,900 "</u>
Difference	1,380,600 "
Less December production	<u>35,151 "</u>
Net Total	1,345,449 "

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Recapitulation

Cliffs Shaft Ore Available	1,345,449 Tons
Bancroft " "	246,659 "
Grand Total Ore Available	1,592,108 "

The following comparison shows the increase in ore reserves compared with last year:

	<u>1936</u>		<u>1935</u>
Cliffs Shaft Ore Available	1,345,449	tons	1,322,885
Bancroft " "	246,659	"	210,429
Total	1,592,108	"	1,533,314
Increase for year 1936	58,794	"	

The following figures show very clearly that ore reserves have not been depleted in the last 15 years, in fact, show an increase of nearly 200,000 tons.

Available Ore in Mine at end of each year:

1936	1,592,108	tons
1935	1,533,314	"
1934	1,546,917	"
1931	1,541,050	"
1930	1,506,700	"
1929	1,388,216	"
1928	1,358,000	"
1927	1,392,000	"
1926	1,436,000	"
1925	1,444,000	"
1924	1,453,000	"
1923	1,361,000	"
1922	1,364,000	"
1921	1,386,000	"
1920	1,404,000	"

5. LABOR & WAGESa. General

The men employed at the Cliffs Shaft Mine have worked practically full time the entire year. Although the mine was not stepped up to a full 6-day operation until September 1st, still enough men were employed overtime hoisting, tramping, and scraping ore to give them 6 days a week. When production was increased by working all of the crew on Saturday, extra men were hired to do the overtime hoisting after 4 P. M.

Wages were increased approximately 10% on November 16th, 1936.

b. Comparative Statement of Wages and Product

	<u>1936</u>	<u>1935</u>	<u>Increase</u>	<u>Decrease</u>
PRODUCT	456,760	268,921	187,839	
No. of Shifts & Hours	3 8-hr	1 8-hr		
No. of Days Operated	269	167	102	

It will be noted that 3 8-hour shifts are reported for 1936. As mentioned early in this report, there are men in the mine at all hours of the day working overlapping shifts. The bulk of the crew, however, work day shift only.

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AVERAGE NUMBER OF MEN EMPLOYED

	<u>1936</u>	<u>1935</u>	<u>Increase</u>	<u>Decrease</u>
Surface	78	65	13	
Underground	255	242	13	
Total	333	307	26	

AVERAGE WAGES PER DAY

Surface	4.20	4.03	.17	
Underground	5.11	4.92	.19	
Total	4.89	4.70	.19	

WAGES PER MONTH OF 25 DAYS

Surface	105.00	100.75	4.25	
Underground	127.75	123.00	4.75	
Total	122.25	117.50	4.75	

WAGES PER MONTH OF 22 DAYS

Surface	92.40	88.66	3.74	
Underground	112.42	108.24	4.18	
Total	107.58	103.40	4.18	

WAGES PER MONTH OF 17 DAYS

Surface	71.40	68.51	2.89	
Underground	86.87	83.64	3.23	
Total	83.13	79.90	3.23	

WAGES PER MONTH OF 13 DAYS

Surface	54.60	52.39	2.21	
Underground	66.43	63.96	2.47	
Total	63.57	61.10	2.47	

PRODUCT PER MAN PER DAY

Surface	19.67	17.42	2.25	
Underground	6.46	6.08	.38	
Total	4.86	4.51	.35	

LABOR COST PER TON

Surface	.214	.232		.018
Underground	.791	.809		.018
Total	1.005	1.041		.036

Following are comparative figures for past nine years:

<u>Year</u>	<u>Surface</u>	<u>Underground</u>	<u>Total</u>	<u>Labor</u>
	<u>Labor</u>	<u>Labor</u>	<u>Labor</u>	<u>Index</u> *
1936	.214	.791	1.005	164.29
1935	.232	.809	1.041	149.79
1934	.194	.728	.922	138.05
1933	.379	.861	1.240	129.78
1932	.303	.908	1.211	132.27
1931	.232	.888	1.120	157.44
1930	.222	.890	1.112	161.70
1929	.213	.843	1.056	161.70
1928	.214	.861	1.075	161.70

* Labor index compares yearly wage rate with that in effect June 30, 1916.

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The labor index has been added to give a clearer picture. It will be noted that the labor cost per ton for 1936 would show a decided decrease over any other year if the wage schedule had remained uniform.

	<u>1936</u>	<u>1935</u>	<u>Increase</u>	<u>Decrease</u>
Average Product Stopping and Traming	16.18	16.10	.08	
Average Product Stopping and Traming, including haulage men	13.51	13.24	.27	
Average Wages - Cont. Miners	5.59	5.54	.05	
" " - " Trammers	6.73	6.33	.40	
" " - " Labor	5.76	5.67	.09	

TOTAL NUMBER OF DAYS

Surface	23,220 $\frac{1}{2}$	15,436	7,784 $\frac{1}{2}$	
Underground	70,715 $\frac{3}{4}$	44,161	26,554 $\frac{3}{4}$	
Total	93,936 $\frac{3}{4}$	59,597	34,339 $\frac{1}{4}$	

AMOUNT FOR LABOR

Surface	\$ 97,575.45	62,302.40	35,273.05	
Underground	361,494.59	217,647.51	143,847.08	
Total	\$459,070.04	279,949.91	179,120.13	

PROPORTION OF SURFACE TO UNDERGROUND MEN

1936	1 to 3.28
1935	1 to 3.72
1934	1 to 4.05
1933	1 to 4.00
1932	1 to 4.60
1931	1 to 3.66
1930	1 to 3.76
1929	1 to 3.66

6. SURFACE

a. Buildings & Repairs

Quite a few changes were made on surface to improve operating conditions and to eliminate delays during the stocking season.

Crusher Building

This building was given particular attention because all the production from the mine has to pass through it. We have tried to decrease the fire hazard and to speed up the stocking of the ore in the winter months. Work was started early in the year tearing out all the old chutes, slides, pockets, and machinery that is no longer being used. After all the surplus material had been removed, the electric wiring system was revamped. All the switches, starting boxes, resistance grids, etc. were moved from within the building to a new building located on the ground East of the foundation for the main crusher. The entire electric system was put into conduits, new lights installed, and every possible electric fire hazard removed. The main motor was enclosed in a fire proof room and the old wooden

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flume around the main drive belt removed. The old oil room was torn down and a new one about half the size of the old one erected. At the close of the year the rebuilding process was still going on but the entire project will probably not be finished until the Spring of 1937. The idea is to provide winter work for the carpenter gang.

To improve operating conditions and to speed up production, both the fine ore and lump ore chutes were rebuilt. The lump chute underneath the discharge end of the revolving screen was doubled in size, the plan being to have storage capacity enough to fill the new 160 cu. ft. top tram stocking car when it is spotted underneath the mouth of the pocket. New steel fingers were installed at the base of this pocket and the slide leading to the lower pocket, used in the summer months, was rebuilt and enlarged.

The new 10-ton double truck steel stocking car was placed in service early in December and although this was of a comparatively new design the car operated perfectly after very few slight adjustments. It will be noted from the monthly cost sheet that the average daily product for December was 1720 compared with 1660 in November and 1714 in October, the latter two months having overrun added to the daily hoist, which was not true of December. It is evident that the plant now is capable of producing and handling as much ore in the winter as in the summer.

Another change made was the rebuilding of the lump ore top tram control room. This was enlarged and lined with sheet rock and heat installed to prevent delays on cold and frosty mornings.

The entire crusher building was given two coats of aluminum paint. The corrugated iron sheets, that form the outside walls, were refastened, repaired, and replaced wherever new ones were needed.

Stockpile Grounds

Lump ore was removed from the North side of the stockpile as rapidly as the Sales Department would move the ore and the entire area to be covered by ore from the new trestle was replanked. That means that we repaired 80,000 sq. ft. of stockpile grounds. The Southern portion of the lump ore stocking ground was repaired in 1935 and there now remains only a central area to be fixed up in 1937.

Dry

Several changes were made in the dries. A new surface dry was constructed in its entirety. The old dry was in a wooden building and space for a surface crew of 65 to 70 men was confined to an area about 15 x 20 ft. The new surface dry is 40 x 40 ft. in area. It was constructed in the Northeast corner of the old boiler house. Six rows of lockers with twelve in each row were brought down from the old Republic Mine. Showers, toilets, clothes hooks and chains, etc., as installed in all of our regular mine dries, comprise part of the equipment installed.

In the regular dry for underground employees we installed 30 new lockers, 24 in the shift bosses' room and 6 in the wash room. This building is now crowded a little beyond the rated capacity. The old first aid room, housing the miners' lamps, was moved and the partition between this room and the old shift bosses' room removed, making a nice large room. A new lamp room three times the size of the old one was provided on the West side of the dry

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by taking out half the toilets that were not in regular use. The old lamp room had racks for 120 Edison electric lamps, while the new racks accommodate 290 lamps. We also have provided a space for all the mine respirators. In a corner of the shift bosses' new room, a cabinet has been built for detachable bits, making it possible for the miners to get their supply of new bits without climbing the hill to the warehouse. This convenience is especially appreciated by the "B" shaft miners.

A false ceiling of "Flex-Board", which is a non-combustible product manufactured by the Johns-Manville Co., was put in the wash room. This cut down the area to be heated by one-half and made the room more comfortable for the men using the shower baths.

Shaft Houses

A new 12 ft. steel lined sheave was put into commission in the top of "A" shaft house. The main timbers carrying the turn sheave at the bottom of "B" shaft house were also replaced.

Pulley Stands

Several new pulley stands were built between the engine house and "A" shaft, close to the engine house.

Laboratory & Crusher Room

A new concrete floor was laid in the basement of the laboratory. A shower bath and new sink was installed for the men grinding and preparing the samples in the new crusher room. The dust collecting apparatus in the latter room was improved with the addition of a large suction fan and a box, or rather a hole covered with a box, filled with large stones sprayed with oil was placed outside on the South side of the building to receive the end of the discharge pipe from the suction fan. The purpose of this contrivance was to provide a confined space for the dust discharged by the fan.

A new large capacity electric dryer was also installed in the crusher room. This dryer was provided with fans to speed up the driving off of the moisture in the ore samples.

A new 6" sewer line was also laid from the basement of the laboratory to the main sewer on Spruce Street. This was rather a difficult job because the sewer line in the street is far below the usual 6 ft. depth and we tried to use the new line as fast as it was put in because the old line was blocked. The laboratory discharges quite a lot of waste water each day when operating and chemists are working night shift as well as in the day time.

Shops

An additional jackbit grinder, called No. 4, was purchased in 1936 and installed on the East end of the long table upon which the other three are mounted. Another grinder was needed in case one broke down and, as a matter of fact, all four grinders are busy during the entire 8 hour shift during the summer months. In the winter there is a little let up because the open pits are not operating. The pits use detachable bits for blockholing.

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Engine House

About half the underside of the main roof over the engine and compressor rooms has been covered with Flex-Board. This is a fire-prevention measure and although, because of double roof construction, the addition of this asbestos product does not make the roof entirely fire-proof, still it will stop the rapid spread of any flames.

The old Nordberg steam compressor was sold for scrap during 1936. After it was removed the old boiler plant was also torn down and scrapped.

Miscellaneous

All the mine buildings were painted during the summer. The roofs of the engine house, dry, shop building, and laboratory were repaired and tarred. The woodwork, windows and doors, etc., were repaired and painted.

Following is comparative data on repairs to the mine buildings.

	<u>1936</u>	<u>1935</u>	<u>1934</u>	<u>1933</u>	<u>1932</u>
Office & Warehouse	411.83	280.72	590.14	46.15	49.24
Shops	743.92	410.10	1.80	65.34	16.38
Shaft House	857.16	404.32	127.51	120.91	62.00
Engine House	1708.73	66.97	114.71	61.46	42.94
Dry House	2034.40	823.32	224.16	202.34	68.17
Coal Dock & Trestle	11.21	146.79	892.50	27.82	36.68
Crusher Building	677.10	-	-	-	-
New Surface Dry	2921.83	-	-	-	-
Miscellaneous	<u>1077.39</u>	<u>506.90</u>	<u>428.70</u>	<u>163.48</u>	<u>37.53</u>
Total	<u>10443.57</u>	<u>2639.12</u>	<u>2379.52</u>	<u>687.50</u>	<u>312.94</u>

The foregoing figures clearly indicate how repair costs were kept down during the lean years.

7. UNDERGROUNDa. Development

There can be doubt after examining the ore reserve figures about the extent of our development campaign because the available tonnage in sight at the end of the year is larger than we started with at the beginning of 1936. The following tabulation shows month by month the number of gangs developing and depleting the ore reserves.

<u>1936</u>	<u>No. of Gangs Developing</u>	<u>No. of Gangs Mining Developed Reserves</u>	<u>Total No. of Gangs</u>
January	42	39	81
February	41	37	78
March	41	37	78
April	46	36	82
May	47	37	84
June	49	35	84
July	49	35	84
August	45	37	82
September	46	37	83
October	47	36	83
November	45	39	84
December	<u>45</u> *	<u>39</u>	84
% of total for Year	55.2	44.8	

* Some of these gangs working double shift.

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It has been proven in years past that if half the contracts in the mine are kept on development work that these gangs invariably develop as much new ore as the others take out of the floors and backs. In the past 12 months we had 9.6% more gangs developing than depleting and we developed 12.8% more ore than we mined.

Development gangs are those not only on ore but naturally all rock drifting and raising contracts. All miners driving advancing headings into new territory come under the heading developing. During 1936 there was an average of 55 gangs adding to our ore reserve each month. Never over 11 nor less than 7 gangs were employed on rock work. The balance of the 55 contracts were on ore development. Most of these are shown on the labor statement as stoping because they were driving advancing breast stopes 20 to 25 ft. wide and 12 to 16 ft. high.

The work done by all the developing gangs in detail follows:
"A" Shaft - Drifts & Raises

6th Level

In the East end of the 6th level area in the North Vein, contract No. 74 drove a drift in footwall rock 425 ft. over near the old No. 3 mine. The drift was stopped when it came close to the hanging wall stope between the 4th and 5th levels because the bottom of the old No. 3 mine workings were filled with water. At the time this report is being written both the 4th and 5th levels are dry. The drift will now be extended and raises put up to the old 3rd level floors with the idea of trying to get some tonnage from the old workings to supplement the regular production from the Cliffs Shaft Mine. The breast of this drift is also the nearest workings we have, in the Cliffs Shaft Mine, to the old New York Mine, the title to which is held by the Harlow Estate of Marquette.

8th Level

No. 52 put up a new raise in the North Vein near the intersection of the 2400 East and 200 South coordinates. The raise was put up in ore to the floor of No. 52's old stope near the 6th level elevation. No. 52 then started and No. 78 finished the crosscut headed for the ore found in Diamond Drill Hole No. 223 and also for the old 7th level floors tested back in 1930. The drift started in ore, went into jasper, and back into ore. In the Southwest corner of the same level in the West end of the Southeast vein, contract No. 41 drifted Northwest for approximately 300 feet. All of the drift with the exception of a few blasts was in dike. From the drift, however, if no ore is found at the 8th level elevation, we can put up raises to reach the ore in the floor of the 6th level and also the ore found in the diamond drill hole drilled from the South end of the North-South drift that parallels the 1300 East meridian.

In the Northeast corner of the 8th, in the North Vein territory, three gangs have been developing, Nos. 25, 64, and 77. No. 25 opened up an extension of the North Vein running West parallel with the 100 North meridian. No. 64 connected the top of their 10th level raise with the 8th level by crosscutting South for 60 ft. through the hanging wall. No. 77, after driving Southeast in ore, encountered dike for a few feet and then hit ore again. They also raised to the 7th level, drove a sub at that elevation, and then started to raise for the ore cut in Diamond Drill Hole No. 406 on the 6th level.

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10th Level

In the North Vein No. 4 drifted West in ore and conglomerate for 200 ft. parallel with the 300 South meridian. A raise was also put up through the jasper back to the bottom of the old sub between the 9th and 10th levels in order to provide an outlet for the ore discovered on the 8th level by No. 5 a short distance Southeast of the 200 South and 2000 East coordinates.

In the Bancroft area four gangs did quite a lot of development work. No. 5 on the East side of the Bancroft Lease drove Northeast in ore, crossed Diamond Drill Hole No. 429, and then headed for Hole No. 431 which also shows two runs of high grade ore. No. 76, over on the West side, is a double contract and one miner drove due West through dike, encountering ore after passing the 1700 East meridian. The drift continued in ore for 60 ft. Footwall material then cut off the ore again and the drift will be extended for 100 ft. farther and raises put up to the bottom of old No. 628 stope on the 8th level. In the Northwest corner No. 76 also crosscutted in ore to the East a short distance North of the 200 North coordinate line. A short drift was also driven connecting the 10th level with the top of No. 58's raise from the 15th level. At the close of the year a new gang, No. 80, was put to work stripping this raise down to the 12th level, cutting out for a puffer and getting ready to develop the ore body at the 12th level elevation.

One contract, called No. 70, spent most of the year raising in ore. After finishing the raise No. 53 now uses going from the 10th to the 8th level, two more raises were put up in ore between the 2300 and 2400 East coordinate lines. After the raises were finished a drift was put through connecting them at the top of the ore a little above the 9th level elevation.

11th Level

Three contracts, Nos. 11, 50 and 68, drifted and raised in the Main Vein. No. 11 finished a crosscut along the South Central side of the vein. A new raise was then pushed up to the 10th level and some new ore developed on the 10th level. No. 50 finished a new raise in the Southeast corner of the Main Vein connecting this raise with the one put up last year. A short distance to the Northeast No. 68 drifted in footwall rock looking for the downward extension of the ore No. 35 found on the 10th level. At the close of the year the drift was still in rock.

12th Level

In the Bancroft area No. 58 drove a sub, most of it in mixed ore, and also holed their main raise from the 15th to the 10th level.

15th Level

Contract No. 75 finished the raise that is to serve the extreme East end of the 11th level territory. This raise started on the 15th level near the intersection of the 600 South and 2800 West coordinate lines. Most of the raise was in the foot. Two more branches from the same raise will be put up in 1937 to make the ore in the floors on the 11th level between 2500 East and 2700 East available for "B" shaft to balance the hoisting cycle.

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"B" Shaft8th Level

No. 36, a double contract, finished two raises from the 8th to the 6th in the North Vein northwest of "B" Shaft.

10th Level

The main level drift going West was driven from the 2800 to the 3800 West coordinate lines. Most of the drift was in dike but the last 200 ft. cut through a very hard jasper formation. No ore was found during the year but the drift is headed for a diamond drill hole that shows ore at the elevation of the 10th level. This hole should be reached about August 1937.

A short raise was also driven by No. 49 near the 2500 West coordinate line to find the ore shown up in a diamond drill hole drilled from the surface. The ore, however, was lean and too narrow to mine.

Developing Stopes"A" Shaft1st Level

Contract No. 34, in the Northwest corner of the Bancroft ore area, mined all their tonnage from a raising stope that went up on the footwall in the Southwest corner of the Bancroft Lease. Two cross-cuts were also driven over to the next stope on the East side.

2nd Level

In the Bancroft area two gangs, Nos. 30 and 34, put up raising stopes on the foot to the top of the ore. Both gangs worked between the 1000 and 1200 East meridian.

In the Main Vein No. 27, after finishing the raise that was put up to the 1st level parallel with the 400 East coordinate, mined some of the old floors.

4th Level

No. 29 drove two breast stopes, one to the East and the other to the West, on their sub in the Bancroft ore area. They also holed the West stope to the 3rd level. After the ore narrowed up on the East side, No. 34 moved down from the 2nd level and started to drift in ore following the hanging to the Northeast. To the South of No. 29, No. 30 mined a considerable tonnage in a breast stope and crosscut that started on our property in the North Vein near a point 1300 due East of the origin of the coordinate system. The ore led the miner over onto the Bancroft Lease. A raising stope that started on the 1200 East coordinate line holed eventually to the 2nd level.

In the Northeast corner of the level a half mile to the East of "A" Shaft, Contract No. 8, a double gang, added to the ore reserves by finding new tonnage 600 ft. Southwest of the Southwest corner of the old New York Mine. The raising stope that parallels the 300 South coordinate line is up to the 3rd level elevation. The other stope, a little further North, seems likely to show up a large addition to our ore reserves when fully developed.

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6th Level

Contract No. 28 drove a flat pitching breast stope up on the foot that centered on the 3400 East coordinate line 75 ft. South of the origin of the coordinate system. This gang is in the old No. 3 Mine territory, in fact, we believe they are actually mining the extension of the old 3rd and 4th level lenses from No. 3 Mine.

In the Southeast corner, near the old Incline Shaft, both No. 12 and No. 60 mined ore not included in our ore estimate because their raising stopes were outside the known ore area limits. No. 12 also holed a short drift to the 3rd level No. 3 Mine and a survey was run into all of the old No. 3 mine workings that were safe to travel around in. The same openings were geologized and early in 1937 we plan on mapping the lower levels as fast as they are unwatered. As far as we know from inspection and gauge readings, all of No. 3 Mine should be dry except the bottom or 6th level. This is a small level, that shows no ore, and we plan to keep the bottom drift filled with water to act as a reservoir for our clean water supply for drilling and spraying.

7th Level

Only two contracts out of a total of nine increased the ore reserves in the 7th level territory. No. 44, in the North Vein close to the main East-West fault, opened up a new stope in the ore found in Diamond Drill Hole No. 104. By the end of the year a sizeable area was opened up and there are good indications that the stope will parallel the fault for a distance of 300 ft.

In the Southeast corner of the level, No. 67, starting a raising stope in the North Vein on the 7th, holed to the 6th and reached a point above the 6th by the end of the year that leads us to believe that the hanging of old No. 8 stope is the foot of the new stope that No. 67 is opening up.

8th Level

One contract, No. 78 by number, opened up a new breast stope in the North Vein in an abandoned section of the mine and will probably develop considerable new ore along an East-West axis parallel to and 50 ft. South of the 200 South meridian between the 1800 and 2000 East coordinates.

In the Bancroft Vein to the North of No. 78, Contract No. 53 breast stoped West towards Diamond Drill Hole No. 385.

9th Level

In the Bancroft Vein Nos. 10 and 70 added to the ore reserves by opening new breast stopes 200 ft. North of the South line of the leased area in the Southeast corner of the 60 acres in Government Lot No. 2, Section 3-47-27. These two new working places are located 70 ft. above the 10th level and there is every indication to prove that the ore is continuous for a depth of over 100 ft., in fact, over on the West side under No. 10 the ore has been proven to have a vertical thickness of 135 ft.

About 400 ft. Northeast of No. 70, over to the East of the Bancroft Lease, No. 64, a double gang, is also opening up new territory with three breast stopes going East, West, and South. To improve working conditions, a branch raise was put up from 64's main raise over on the East side of the stope.

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10th Level

Three gangs in the East end of the Main Vein, Nos. 11, 26, and 50, mined all their 1936 production from breast stopes. All three of them also increased the known ore area.

11th Level

Two contracts, Nos. 74 and 68, increased our developed reserves by breast stoping Northwest and East respectively. In the Northwest corner of the Main Vein, No. 7, after going through mixed material, finally hit nothing but high grade ore and for the last 100 ft. of their stope lost all track of foot and hanging also. In other words, we know nothing of the extent of the ore here as to its height and width. Over on the East side of the level we know that 68's new stope will extend through to the 10th level but there is probably only 5 or 10 ft. of ore in the bottom of the stope.

"B" Shaft

1st Level

In the Southeast corner of the "B" Shaft territory in the Southeast Vein close to the South boundary of the property, No. 1 drove West and South. They are headed for the ore shown in Diamond Drill Hole No. 101. There is rock in the back and also in the floor and on both sides, so that we are mining the ore as fast as we find it.

In the Main Vein near the 900 South and 400 West coordinates, Contract No. 17 is mining all available tonnage in short raising stopes on the foot. They also drove a short breast stope around a new pillar near 800 South and 400 East.

Over to the Southwest of "B" Shaft, Contract No. 18 stope raised on the foot to the South and West of their raise, finding good ore under the jasper that was previously assumed as the foot of this ore body.

3rd Level

Nos. 63 and 72 continue to develop considerable new tonnage for "B" Shaft. Both gangs are in the Northwest corner of the North Vein and have proven that this ore area, which is roughly 300 ft. long and at least 50 ft. wide, extends from close to the 1st level all the way down to the 5th level. These two contracts are also mining both day and night shifts.

6th Level

Contract No. 42 was speeded up to about twice its normal productive rate by providing the miners with a new raise, eliminating a long cross haul. This gang is breasting West 350 ft. directly North of "B" Shaft.

7th Level

Contract No. 13, 300 ft. Northwest of "B" Shaft, is another gang developing ore by stope raising where no ore was expected to be found. They have opened up a new area about 75 ft. square. That may not seem like much ore but it must be kept in mind that a pillar of Cliffs Shaft ore 200 ft. square and 90 ft. high totals 500,000 tons, or a good year's production.

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10th Level

Contract No. 49 spent the entire year on development, most of it in the Fault Vein. They mined some tonnage from the back of the old stope in the extreme West end of the vein in the area supposedly mined out. Then they tackled the footwall side and again found ore. They finally started stope raising on the foot parallel and close to the 1400 West coordinate line.

12th Level

No. 56, another day and night shift gang, developed a sizeable stope in the fault vein 1200 ft. directly West of "B" Shaft. This may develop into a very large stope within the next two or three years. It is now time, however, for us to try and find the downward extension of this ore lens at a lower elevation and get some new raises started from below in order to shorten the cross haul.

13th Level

One gang only, No. 31, stope raised from the 13th to the 12th level in the West end of the fault vein. The other gangs in this territory mined floors.

b. Stoping

Contracts Mining known or developed Reserves

"A" Shaft

2nd Level

Contract No. 27, in the Main Vein, mined floors 400 ft. North-West of "A" Shaft. In order to get at some of these floors it was necessary to scrape back old rock piles dumped onto the floors 30 or 40 years ago.

In the extreme Northeast workings in the Bancroft area No. 34, after finishing at the top of their raising stope, mined out a little of the 2nd level floor near the intersection of the 200 North and 1200 East coordinate lines. This floor proved a disappointment because we had hoped the ore would go down through to the 3rd level sub but a large seam of jasper cut off the ore.

3rd Level

No. 30 took out all available floors in the West end of the North Vein between the 3rd and 4th levels and down to within 20 ft. of the 5th level.

5th Level

Four gangs, Nos. 32, 51, 61 and 66, mined floors in the ore area that is centered at the Southeast corner of the Bancroft Lease. The first two gangs mined in the North Vein to the East and South of the leased lands while Nos. 61 and 66 spent the entire year mining benches at the bottoms of their stopes in the Bancroft area. In this particular case the Bancroft Vein and the North Vein are one and the same ore body, but are distinguished by the two names to properly allocate the tonnage mined to the proper fee owners.

In the Southeast Vein in the central portion of the lens, No. 2 mined floors to the East of the 2200 East coordinate line until the pillar in the Southeast corner of their working place developed too much "loose". It was decided that it would be much safer to put up a new raise further West and to discontinue the travelling road near the pillar.

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6th Level

Two gangs, Nos. 20 and 66, mined known reserves in the North Central portion of the 6th level, the former in the North Vein and the latter on the Bancroft Lease. No. 20 mined all the available ore from floors close to the main East-West main fault between the 1900 and 2100 West meridians. No. 66 took out a circular shaped piece of floor 200 ft. West of the East line of the Bancroft Lease.

In the Northwest corner of the level in the North Vein between "A" and "B" Shafts, No. 40 took out the floor of their sub as close as they dared go to the 7th level and then moved up to the 5th level. A short distance to the North of No. 40, Contract No. 57 after breasting East towards the Southwest corner of the Bancroft Lease less than 100 ft. away was moved back to their main raise to take floors. The material in the breast stope was lean and despite the fact that we knew of high grade ore on the level above, the working place was stopped and the miner moved to a new location.

7th Level

Seven gangs, widely scattered over the level in four different veins, mined floors between the 7th and 8th levels. In the Bancroft Vein No. 54 mined floors along the foot between the 1700 and 1800 East coordinate lines. Along the main fault in the North Vein No. 20 took out a small floor close to the 200 East meridian. Continuing East, No. 52, over on the extreme East end of the North Vein, took out a large floor between the 6th and 7th levels. At the close of the year, in order to reach a floor of ore on the 6th to the South of their regular working place, a short drift in dike was driven South at the 7th level elevation and a raise put up to the floor to be mined.

Contract No. 59, one of the best in the mine, took out a large floor area from the 7th to nearly the back of the 8th level in the East end of the Main Vein 1200 ft. East of "A" Shaft.

In the Southeast Vein Nos. 6 and 45 mined developed reserves, the former in the West end and the latter the East end of the Vein. No. 6 also put up a new raise and drove a crosscut on a sub level to facilitate the travelling in and out of their working place.

Over on the extreme East end of the level Contract No. 15, although mining floors part of the year, also drove a raising breast stope from the 7th to the 6th, holing to the latter level about the middle of the year, after which they resumed mining the floor of their stope.

9th Level

Five gangs, Nos. 3, 24, 35, 55, and 65, took out floors and backs on or near the 9th level. In the East end of the North Vein No. 35 mined the floor of their stope down for a distance of 20 ft. below the 9th. In the Main Vein three gangs, Nos. 3, 24 and 55, took floors. Nos. 3 and 55 worked close together in the crotch in the South Central part of the Main Vein, sometimes referred to as the South Lens. Over on the North side of the Main Vein No. 24 took floors all the way from the 9th to nearly the 10th level elevation near the intersection of the 600 South and the 1800 East meridians.

10th Level

Over on the West side of the Main Vein along the South, or hanging wall side, Nos. 21 and 39 mined the floor of the 10th level out to half way down to the 11th level.

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"B" Shaft2nd Level

One of the best producing gangs in the mine, Contract No. 73, took out a large floor 200 ft. Northwest of "B" Shaft between the 2nd and 3rd levels.

3rd Level

Contract No. 33 took out a small floor 400 ft. Southwest of "B" Shaft from the 3rd to the 4th levels. First a part of the ore was mined through a raise that goes to the 6th level. Then the area stoped out was filled with the rock covering the 3rd^{level} floor to be mined and the ore made available by the removal of the rock was then also mined into the 6th level raise. In the latter part of the year No. 33 was moved to the 5th level where two new breast stopes were started, one East and one West of the same raise going to the 6th level. No. 33 is a double gang, that is, it works both day and night shift.

7th Level

Over in the North Central part of the Main Vein we had three gangs mining in 1936 - Nos. 19, 38 and 69. All of them are depleting gangs in a sense because they were taking out floors, but on the other hand all three gangs found some ore available for mining that was not included in the 1935 estimate because they found stringers of ore leading off the Main Vein that were not known until developed.

10th Level

There was only one gang, No. 14, mining floors in the fault vein between the 1200 and 1300 West coordinate lines. The ore here is spotty and mixed, but it is a case of trying to mix some of the leaner ore with the high grade ore mined in other portions of the mine.

13th Level

Three contracts, Nos. 43, 46, and 48, mined floors in the Main Vein. These gangs were over on the West side of the vein

14th Level

The lowest operating gang in the mine, No. 37, mined out a large floor area between the 1300 and 1400 West coordinates between the 13th and 14th levels.

The following tabulation is made to distinguish the contracts by number between stoping and developing:

"A" Shaft - Developing Contracts

1st Level	- Bancroft Vein	- No. 34
2nd "	- " "	- Nos. 30 & 34
2nd "	- Main "	- No. 27
4th "	- Bancroft "	- No. 29
4th "	- North "	- No. 8
6th "	- North "	- Nos. 12, 28, 60, and 74
7th "	- " "	- Nos. 44 & 67
8th "	- North "	- Nos. 5, 25, 64, 77, 78 & 79
8th "	- Southeast "	- No. 41

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9th Level	- Bancroft Vein	- Nos. 10 & 70
9th "	- North Vein	- No. 64
10th "	- Bancroft Vein	- Nos. 5, 23, 44 & 76
10th "	- North "	- No. 4
10th "	- Main "	- Nos. 11, 26, & 50
11th "	- Main "	- Nos. 7, 11, & 68
12th "	- Bancroft "	- No. 58
15th "	- Main "	- No. 75

"B" Shaft - Developing Contracts

1st Level	- Southeast Vein	- No. 1
1st "	- Main "	- Nos. 17 & 18
3rd "	- North "	- Nos. 63 & 72
5th "	- Main "	- No. 33
6th "	- North "	- No. 42
7th "	- North "	- No. 13
8th "	- Main "	- No. 19
8th "	- North "	- No. 36
10th "	- Fault "	- No. 49
10th "	- Sec. 9 Deposit	- No. 47
12th "	- Fault Vein	- No. 56

"A" Shaft - Depleting Contracts

2nd Level	- Bancroft Vein	- No. 34
2nd "	- Main "	- No. 27
3rd "	- North "	- No. 30
5th "	- Bancroft "	- Nos. 61 & 66
5th "	- North "	- Nos. 32 & 51
5th "	- Southeast "	- No. 2
6th "	- North "	- No. 20
7th "	- Bancroft "	- No. 54
7th "	- Main "	- Nos. 52 & 59
7th "	- Southeast "	- Nos. 6 & 45
7th "	- North "	- No. 15
9th "	- North "	- No. 35
9th "	- Main "	- Nos. 3, 24 & 55
9th "	- Southeast "	- No. 65
10th "	- Main "	- Nos. 21 & 39

"B" Shaft - Depleting Contracts

2nd Level	- Main Vein	- No. 73
3rd "	- Main "	- No. 33
6th "	- North "	- Nos. 40 & 57
7th "	- Main "	- No. 38
8th "	- Main "	- No. 69
10th "	- Fault "	- No. 14
12th "	- Fault "	- No. 31
13th "	- Main "	- Nos. 46 & 48
13th "	- Fault "	- No. 43
14th "	- Main "	- No. 37

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Tons per Man per Day Stopping

Year 1936	-	24.44
" 1935	-	25.93
" 1934	-	24.74
" 1933	-	20.00
" 1932	-	23.02
" 1931	-	23.19
" 1930	-	23.80
" 1929	-	22.41
" 1928	-	21.15

The year 1936 apparently has taken a step backwards according to the record, but what has really happened is that because times are better and there is a greater demand for ore we have put more miners in developing stopes and also a larger percentage of narrower and leaner ore bodies are being mined.

c. Drifting and Raising

The total footage of drifting and raising in 1936 adds to 6,846 ft. That is the largest amount since 1931 when the figures were 6,789 ft. The following table shows the footage for the past six years:

<u>Year</u>	<u>Rock Drifts & Raises</u>	<u>Ore Drifts & Raises</u>	<u>Total Feet</u>
1936	4,122	2,724	6,846
1935	3,043	2,646	5,689
1934	2,061	1,109	3,170
1933	615	372	987
1932	1,357	585	1,942
1931	3,577	3,212	6,789

d. Explosives, Drilling and Blasting:

Explosives Statement for Year 1936
Stopping and Development in Ore

	<u>Quantity</u>	<u>Average Price</u>	<u>Amount 1936</u>	<u>Amount 1935</u>
50% L.F. Ex. Gelatin	149,150	10.65	15887.50	14261.29
60% L.F. Ex. Gelatin	242,550	11.90	28888.25	12154.08
Total Powder	391,700	11.47	44775.75	26415.37
Fuse - Feet - Eagle Brand	617,700	5.68 M	3511.97	1858.77
No. 6 Caps	102,100	11.12 M	1135.81	729.83
Electric Caps	1,200	10.99	131.90	188.72
Fuse Lighters	24,250	5.79 M	140.39	133.12
Wire (shot cord)			83.57	83.85
Fuse Cans, etc.			75.00	49.60
Tamping Bags	25,500	2.125M	54.20	-
Total			5132.84	3043.89
TOTAL ALL EXPLOSIVES FOR STOPPING			49908.74	29459.26

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Explosives Statement for Year 1936 (Cont)

PRODUCT	<u>Quantity</u>	<u>Average Price</u>	<u>Amount 1936</u>	<u>Amount 1935</u>
			456,760	268,921
Lbs. of Power per Ton of Ore			.8575	.8387
Cost per Ton for Powder			.0980	.0982
Cost per Ton for Fuse, etc.			.0112	.0113
Cost per Ton for All Explosives			.1092	.1095
<u>Development in Rock</u>				
50% L. F. Extra	4,300	10.65	445.75	71.87
60% L. F. Extra Gelatin	58,200	11.90	6876.75	6044.67
Total Powder	62,500	11.47	7322.50	6116.54
Fuse - Feet	84,300	5.68 M	463.87	387.60
No. 6 Caps	12,400	11.12 M	141.22	106.97
Electric Caps	2,200	10.99	234.79	168.01
Fuse Lighters	5,250	5.79 M	35.67	10.12
Wire	785		56.20	85.45
Tamping Bags	5,500	2.125M	14.05	-
Miscellaneous			8.80	29.00
Total			954.60	787.15
Total All Explosives for Rock Development			8277.10	6903.69
Feet Rock Development			4,002	3,043
Cost per ft. Rock Development			2.07	2.268
GRAND TOTAL ALL EXPLOSIVES			58185.84	36362.95
Avg. Cost per Lb. for Powder			.1147	.117

Following are comparative figures for the past six years showing pounds of powder used per ton of ore produced and also the cost per ton for powder.

<u>Year</u>	<u>Lbs. Powder Per Ton of Ore</u>	<u>Cost per Ton for Powder</u>
1936	.8575	.0980
1935	.8387	.0982
1934	.7838	.0879
1933	.7561	.0927
1932	.7312	.0914
1931	.8512	.1080

The figures indicate that the miners are more generous in the use of powder, which is true, but the reason is the full time operating schedule. Back in 1932, 1933, and 1934, blockholing could be done by the bosses themselves on the days the mine did not operate. Now under full time operation the miners must do some bulldozing as well as blockholing to keep the skips and cars moving. Nearly exactly 40% of the holes blasted underground are blockholes. Furthermore, as mentioned before in this report, we are doing a larger amount of development work and mining a larger proportion of conglomerate and steel ore, both of which are harder to drill and blast than the slate and specular ores.

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The following tabulation shows some comparative data for the rock drifts and raises.

Year	Footage	Lbs. of Powder	
		Used	Lbs. per Foot
1936	4,002	62,500	15.5
1935	3,043	49,150	16.1
1934	2,061	32,800	15.9
1933	615	9,200	15.0
1932	1,357	20,100	14.8
1931	3,577	63,150	17.6

The amount of powder per foot of drift for 1936 shows a small decrease over 1934 and 1935. Again, however, figures do not actually mean anything unless the proportionate amount of hard or softer rocks is known. A drift in jasper or siderite will require much more powder per foot than one in dike or slate.

8. COST OF OPERATING:

a. Comparative Mining Costs:

	1936	1935	Increase	Decrease
PRODUCT	456,760	268,921	187,839	
Underground Costs	1.326	1.430		.104
Surface Costs	.221	.224		.003
General Mine Expenses	.226	.262		
Cost of Production	1.773	1.916		.143
Depreciation	.002	.002		
Taxes	.242	.378		.136
Loading & Shipping	.035	.043		.008
TOTAL COST AT MINE	2.052	2.339		.287
No. of Days Operating	269	167	102	
No. of Shifts & Hours	3 8-hr*	1 8-hr		
Average Daily Product	1,698	1,610	88	

*At the beginning of the year the mine operated two shifts, the ore mining crew by day and the rock crew by night. At the end of the year there were two mining crews employed day and night and an overlapping crew moving rock so that there were actually workmen in the mine for the full 24 hours each day.

The following figures show clearly how production has been speeded up the last year. The mine has maintained an all time record average daily production.

Year	Average Daily Product
1936	1,698
1935	1,610
1934	1,595
1933	1,331
1932	1,368
1931	1,448
1930	1,383
1929	1,400

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Three more tons per day would have put the mine over the 1700 ton per day mark. It should be borne in mind, however, that there is a limit to the Cliffs Shaft Mine productive capacity. We have just about reached the limit with the present hoisting equipment. We have felt the benefit of the changes made the past two or three years to remove all the "bottle necks" so-called. The most important fact that governs production, however, is the ability to find new ore. Each year that problem becomes more intense. We are rapidly eliminating the possibilities in the Northeast corner of the property. There remains there only 6 or 8 acres of what we now know to be possibly mineral bearing formation to be explored. A lease on the New York property now owned by the Harlow Estate of Marquette would permit us to expand our field of exploration in that direction.

We may also rob a few thousand tons from the old workings in the old No. 3 Mine in the next few years.

The Southeast limb of the Cliffs Shaft Mine syncline does not look very promising. Along this territory, however, over to the South of our boundary line lies the Oliver Iron Mining Company's hard ore reserve that may produce 500,000 to 1,000,000 tons of ore. This ore can easily be reached from the Cliffs Shaft workings. The Oliver Iron Mining Company may, however, decline to lease this area to us, preferring perhaps to keep it in reserve to use when their Soudan Mine may become exhausted.

To the North the Bancroft Lease is now being thoroughly explored and its possibilities are being pretty well defined. We can be safe in predicting that 750,000 to 1,000,000 tons of additional ore will be mined from the lease.

Over in "B" Shaft the big gamble is the deposit over on the West side of Section 9-47-27. The State Tax Commission carries a tonnage of 225,000 tons on this description but there is a possibility that this area may eventually produce 500,000 to 600,000 tons of ore.

Considerable ore the past two years has been mined in old abandoned stopes in both "A" and "B" Shaft. We are constantly going through the old levels to find ore left behind because it was too hard to get at formerly or because it was too hard to drill with the old type drill machines or because the grade was off color.

Production in 1937 is going to be largely dependent on the speed with which new ore can be developed and made ready for stoping.

Cost of Production and the total cost at mine shows a decrease compared with 1935. You have to go back to 1925 to find the total cost at the mine lower than it was in 1936, the figure for 1925 being 2.005 compared with 2.052 in 1936. In 1925 the actual cost on cars, however, was nearer 2.25, the cost being reduced to 2.005 by adding 55,755 tons of stockpile overrun to the year's production. Obviously, with a production of only 318,601 tons in 1925, the overrun added in that year was overrun actually accumulated since 1916 when 19,828 tons of overrun was added to production.

Detailed explanations of various items on the cost sheet follow:

Exploring in Mine

Comparisons cannot be drawn between 1935 and 1936 because the diamond drill crew only started to work in December 1935 after a shut-down of five years. A total of \$10,597.54 was spent in 1936, made up in detail as shown in the table that follows. The total in the detailed statement shows only \$8,464.89 as expended but the difference between the cost sheet totals and those on the tabulation are charges that cover

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a portion of the geological department expense. In 1936 the Cliffs Shaft Mine was charged with \$2,132.65 from the Central Office to cover the major portion of Mr. Sundeen's time and a part of Mr. Derby's salary.

	<u>For Year</u>	<u>Cost per Foot</u>
Labor for diamond drilling	\$ 3,211.02	
Carbon Loss - 12.65 carats	1,761.36	
Pipe and Fittings	7.73	
Drill Equipment and repairs	414.66	
" " Rental	605.78	
Miscellaneous Supplies	57.83	
Compressor Expense	625.00	
Proportion of D. D. Supt's time	119.43	
	<hr/>	
	\$ 6,802.81	\$2.023
Miscl. & Direct Charges	1,171.05	.348
Analysis Expense	491.03	.146
	<hr/>	
Grand Total Exploratory Cost	\$ 8,464.89	\$2.517
Feet drilled for year	3,362	

Experiments were conducted with E. J. Longyear's "Bortset" Bits but the successful use of this cheap set-up apparently is denied the Cliffs Shaft property because of the alternating hardness of the formation to be drilled. Mr. Derby in his annual report will undoubtedly give more detailed information than is available in our files at the mine office.

Development in Rock

A comparison for the last three years follows:

Year	Footage	<u>Labor Cost</u>		<u>Supply Cost</u>		<u>Total Cost</u>	
		Total	Per Foot	Total	Per Foot	Total	Per Foot
1936	4,122	\$29,973.19	7.27	\$13,826.79	3.35	\$43,799.98	10.62
1935	3,043	19,725.90	6.48	11,486.68	3.77	31,212.58	10.25
1934	1,932	14,556.29	7.53	7,341.89	3.80	21,898.18	11.33

The unit cost for 1936 shows an increase over 1935. It will be noted that all of the increase is in the labor cost. This is partially accounted for by the increase in wages but mostly by the fact that a great deal of rock raising was done and whereas in previous years the miners in the raises worked alone, in 1936 all of them were provided with partners. Some additional footage was obtained by putting on the extra men as is evident when the feet raised per miner per day for 1936 is compared with previous year. The cost per foot, however, increased and this must be charged off to our accident prevention program and the desire to comply fully with all laws relative to working men not over 300 ft. apart in any underground operation.

The supply cost shows a gratifying decrease.

The man days worked by the rock mining crews and the footage per man per shift is shown in comparison with two previous years as follows:

Year	Footage	Shifts	Feet per Shift
1936	4,122	2,556	1.62
1935	3,043	1,756 $\frac{3}{4}$	1.74
1934	1,932	1,567 $\frac{1}{4}$	1.23

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In 1936 we put up two unusually high raises. Contracts No. 58 and 75 worked in raises 335 to 350 ft. high. Because of the desire to improve working conditions, all high raises are now divided into two compartments, one side having a permanent ladder road to obviate the use of the chain ladders used for the past many years, in fact, they were commonly used in hard ore mines since the early 70's in the 19th century.

Development in Ore

Comparative costs for three years follow:

Year	Footage	Labor Cost		Supply Cost		Total Cost	
		Total	Per Foot	Total	Per Foot	Total	Per Foot
1936	2,724	\$18,307.16	6.68	\$ 9,289.02	3.40	\$27,596.18	10.08
1935	2,646	17,344.75	6.58	7,909.62	2.98	25,254.37	9.51
1934	1,109	6,533.36	5.88	4,446.31	4.02	10,979.67	9.90

Increased unit cost due largely to increase in supply costs. We purchased special raising machines in 1936 and put into use a new style safety staging.

Stoping

The unit cost for stoping shows an increase for 1936 compared with 1935, due more to an increase in labor costs than supply costs. Part of the increase is due to a difference in bookkeeping. Heretofore all scraper operators were charged to the tramming account on the theory that the scraping equipment replaced the hand tramming equipment. In 1936, however, a great deal of the scrapermen's time was charged to stoping because every scraper operator helps the miner set up his machine, brings in the miner's tools, helps with the powder, etc. The shift bosses are instructed to turn in each day just how much help each miner gets and as a result stoping is now being charged with labor that formerly was absorbed by other underground accounts.

Following is the detailed costs for 1935 and 1936:

Labor	1936		1935	
	Total	Cost per Ton	Total	Cost Per Ton
Miners' Labor	100,376.39	.227	54,429.67	.208
Other Labor	32,602.34	.074	14,797.25	.056
Total Labor	132,978.73	.301	68,826.92	.264
<u>Supplies</u>				
General	2,275.31	.005	686.17	.002
Iron & Steel	9,454.15	.021	3,492.71	.013
Oil	681.87	.002	481.89	.002
Machinery	5,352.61	.012	3,907.86	.015
Explosives	43,514.50	.098	24,720.83	.096
Lumber	195.92	.001	93.53	.000
Sundries	430.26	.001	144.24	.000
Expense Accounts	4,140.74	.009	2,282.73	.010
Total Supplies	66,045.36	.149	35,809.96	.138
TOTAL	199,024.09	.450	104,636.88	.402
Tons Stoping	442,180		259,961	

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Timbering

The timbering account totals \$8,273.56 or 0.30 per ton in 1935. The 1936 cost sheet shows a total of \$14,041.32 or 0.31 per ton. The unit costs are practically identical and the 1935 totals bear the same ratio almost exactly to the 1936 totals as 269 is to 167, the latter figures being the shifts operated in the last two years. The timber crew undertook no new projects and no radical changes were made in the use of timber underground.

Tramming

The cost for tramming ore is quite a sizeable item as it approximates one-quarter of the entire underground costs. Only about 6% of the total tramming cost is supplies charged out, the greater part being labor. The mine employs 18 to 20 gangs of trammers of which 7 gangs are contract, the balance company account. All of the scraper operators, 42 in number, are charged to the tramming account when they are scraping ore. The night shift scraper men are mostly employed cleaning up rock drifts and so are charged to Development in Rock. The cost for two years follow:

Year	Labor		Supplies		Total Cost	
	Total	Per Ton	Total	Per Ton	Total	Per Ton
1936	\$129,185.38	.283	\$ 9,708.66	.021	\$138,894.04	.304
1935	75,775.81	.282	6,346.35	.024	82,222.16	.306

Following are the comparative maintenance costs for the electric haulage system:

	1936			1935
	Labor	Supplies	Total	Total
Generators & Motors	74.88	52.72	127.60	36.02
Locomotive	1807.71	2729.16	4536.87	4165.38
Wiring	991.59	1614.87	2606.46	1533.65
Main Line Tracks	7294.47	4607.70	11902.17	9080.82
Main Line Cars	2742.02	6518.74	9260.76	5926.31
Spotting Engines	-	91.69	91.69	16.79
Total	12910.67	15614.88	28525.55	20758.97

In 1936 - 10 new 5-ton cars were put into service on the 8th and 10th levels "A" Shaft. That item accounts for the large increase in 1936 under the caption "Main Line Cars"..

The main line on the 15th Level "B" Shaft side of the mine was completely rebuilt the week the mine was idle in August.

Pumping

		Cost per Ton
Operating Cost as per Cost Sheet for 1936	- \$27,774.37	.061
Maintenance " " " " " " "	- 741.76	.002
Total	- 28,516.13	.063
Operating Cost as per Cost Sheet for 1935	- 30,031.56	.112
Maintenance " " " " " " "	- 838.46	.003
Total	30,870.02	.115

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A detail of the 1936 cost follows:

Maintenance	\$ 741.76
Pumpmen Labor	6,170.22
Other Labor	359.47
Total Labor	6,529.69
Compressor Expense	830.00
Oil, Waste & Packing	265.54
Tools	38.58
Electric Light	390.14
Electric Power	19,720.42
Total Operating Exp.	27,774.37
Total Maint. & Optg.	28,516.13

Gallons water pumped	390,115,773
Gallons water pumped per minute	741

The reason for the decreased cost is due to a reduction in the average rate paid per K. W. H. from .016 in 1935 to .01397 in 1936.

During 1936 were drained the bottom levels of old No. 3 Mine. The average gallons per minute pumped for the past year follows:

January	699
February	727
March	664
April	672
May	696
June	697
July	750
August	757
September	815
October	813
November	815
December	772
Average	741 for the year

Gallons per minute pumped in 1935 averaged 697 for the year.

Compressors & Air Pipes & Power Drills

The two accounts covering both operating and maintenance expense will be considered jointly.

	1936		1935		Increase
	Total	Per Ton	Total	Per Ton	
Compressors & Air Pipes	37164.15	.081	25158.85	.094	12005.30
" & Power Drills	10983.09	.024	8947.53	.033	2035.56
Total	48147.24		34106.38		14040.86

The total cost in each case increased but the unit cost shows a decrease.

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Following is some detailed data regarding these accounts.

	1936			1935		
	Labor	Supplies	Total	Labor	Supplies	Total
Compressors	4313.28	25735.86	30049.14	4732.90	16907.74	21640.64
Air Pipes	1899.82	6267.96	8167.78	1299.10	3158.15	4457.25
Power Drills	-	9930.32	9930.32	-	8008.49	8008.49
Total	6213.10	41934.14	48147.24	6032.00	28074.38	34106.38

New Drills purchased in 1936:

- 22 - N-75 Ingersoll-Rand standard drifters
- 2 - D-12 Cleveland standard drifters
- 2 - S-49 Ingersoll-Rand stopers

Air and water pipes installed in 1936:

1/2" Pipe	-	300 ft.
3/4" "	-	2,952 "
1" "	-	9,546 "
1 1/4" "	-	2,302 "
1 1/2" "	-	1,192 "
2" "	-	8,180 "
3" "	-	1,617 "
Total	-	26,089 "

Detailed Cost of Operating Compressors

	1936	1935
Maintenance Cost	1,057.92	839.04
Labor Operating	3,606.14	4,391.40
Supplies	29,435.86	19,475.20
Total Cost	34,099.92	24,705.64

Total cu. ft. air compressed	907,196,600	525,140,000
Cost per 1000 cu. ft.	.0376	.04703
Average rate per K.W.H. for year	.01397	.016
Cu. ft. of air per shift optd.	2,372,400	3,144,560

Scrapers & Mechanical Loaders

Total cost for 1935	\$ 25,881.96
" " " 1936	41,112.53
Increase for 1936	15,230.57

Detailed supply cost for the two years follows:

	1936		1935	
	Amount	Cost	Amount	Cost
3/8" Wire Rope	2450'	208.97	-	-
1/2" "	2150'	234.91	2650'	280.41
5/8" "	66961'	9120.90	39408'	5425.82
Electric Cables	4000'	1480.13	-	(
" Motors (new)	11	2923.23	-	(4162.63
New Scraper units (new)	6	3724.85	-	-
General Repairs	-	5406.15	-	4976.83
" Electrical Reprs. & Renewals	-	3214.51	-	2910.72
Total		26313.65		17760.41

It will be noted that production increased 70% while cost of supplies increased 48%.

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Hoisting

The yearly costs for 1936 and 1935 follow:

	<u>1935</u>	<u>1935</u>
Maintenance	\$ 5,321.99	\$ 4,698.09
Operating Expense:		
Engineers Labor	6,098.49	3,537.25
Other Labor	<u>1,132.44</u>	<u>527.37</u>
Total	7,230.93	4,064.62
<u>Supplies</u>		
Oil, Waste & Packing	114.52	80.96
Tools	47.64	68.51
Electric Light	95.32	88.70
Electric Power	13,733.90	9,549.43
Compressor Expense	390.00	285.00
Heating Expense	<u>831.03</u>	<u>1,161.67</u>
Total Supplies	15,212.41	11,234.27
Total Operating Expense	22,443.34	15,298.89
Total Maint. & Optg. "	27,765.33	19,996.98
Tons of Ore & Rock Hoisted	489,310	288,047
Average Depth Hoisted	671	667

Stocking Ore

		<u>Per Ton</u>
Total as per cost sheet for 1935	\$ 8,166.61	.030
" " " " " " " 1936	12,225.77	.027

Cost for 1936 is quite heavy due to construction of five practically new trestles. 100 new trestle legs and 2500 lineal ft. of new stringers were charged out in 1936. The lump ore stocking trestle was strengthened by the addition of a center leg in order to make sure that the additional weight of the new 10-ton stocking car would not cause the stringers to break.

Screening - Crushing

	<u>1936</u>		<u>1935</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
Labor	12,864.12		5,228.19	
Supplies	<u>12,378.67</u>		<u>3,677.52</u>	
Total	25,242.79	.055	8,905.71	.033

The above figures indicate a very large increase for 1936. A great deal of this is accounted for by the improvements made within the building. A new picking belt, in fact, two belt conveyors were ordered and assembled. The second one is a spare always to be kept on hand. New manganese wearing strips were put into all the chutes. Two sets of manganese wearing plates were ordered for the revolving screen. The crusher was equipped with new dust collars and mantle. These repairs total nearly \$7,000.00. Another \$1600.00 was spent for supplies on rewiring the building. All of these items required labor to install.

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Top Tram Equipment

This is another account that shows more than a normal increase for 1936. The total expended for the two years 1936 and 1935 is as shown below.

1935	Total Cost	\$2,458.85	Per Ton	.010
1936	"	4,471.64	"	.010

The unit cost under normal operating conditions should show a decrease, but in 1936 well over \$1,000.00 was needed to rebuild the top tram portion of the control apparatus housed in the crusher building.

Mine Buildings

The improvements and repairs necessary to bring the mine buildings somewhere near back to the standard heretofore maintained by the Company have already been discussed under the heading "Surface".

General Mine Expenses

Several new items appear under this general heading in 1936.

Vacation-With-Pay-Plan

This item added \$7,072.82 to the cost for the year 1936.

Accrued Unemployment Insurance

The sum of \$4,758.80 goes against 1936 costs for this item.

Group Insurance

This is another new account which represents the Company's proportion of the premiums payable for the policies issued to employees.

9. EXPLORATIONS:

The Section 9-47-27 drift continues to progress West, having reached the 3700 West coordinate line by the end of 1936. By the middle of 1937 the breast ought to be in the neighborhood of the drill holes that discovered the ore.

The diamond drill was kept going during the entire year. Sixteen holes were drilled and although some of them were purposely planned to crosscut the formation to ascertain certain geological controlling features, we discovered quite a footage of new ore during the year.

Diamond Drill Hole No.	427	-	269	ft. deep	-	5	ft. of ore
"	428	-	350	"	-	14	"
"	429	-	143	"	-	38	"
"	430	-	467	"	-	68	"
"	431	-	155	"	-	25	"
"	432	-	305	"	-	0	"
"	433	-	231	"	-	12	"
"	434	-	305	"	-	16	"
"	435	-	70	"	-	14	"
"	436	-	253	"	-	11	"
"	437	-	170	"	-	23	"
"	438	-	149	"	-	18	"
"	439	-	130	"	-	74	"
"	440	-	147	"	-	18	"
"	441	-	70	"	-	11	"
"	442	-	136	"	-	0	"

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10. TAXES:

A comparison of the taxes charged to the Cliffs Shaft Mine for the past two years follows:

	1936		1935	
	Valuation	Taxes	Valuation	Taxes
Realty	\$ 2,025,000	68615.91	1,915,000	60309.48
Mineral under NW $\frac{1}{4}$ Sec 9-47-27	80,000	2710.75	80,000	2519.47
Personal	780,000	26429.85	910,000	28658.82
Lot 2, Sec. 3-47-27 - 60 Acres (Bancroft) mineral	300,000	10165.32	250,000	7873.30
SE $\frac{1}{4}$ of NE $\frac{1}{4}$ Sec. 9-47-27 (Old Barnum Mine)	47,000	1592.57	47,000	1480.18
Lot 174, Nelson Addition	100	3.39	80	2.52
South 35.91 ft. of Lot 179	50	1.69	30	.95
Total	3,232,150	109519.48	3,202,110	100844.72
Collection Fees		1095.20		1008.45
GRAND TOTAL		110614.68		101853.17
Taxes per ton produced		.2422		.3787
" " " shipped		.2054		.2556

The valuations and the taxes paid by the Cliffs Shaft property since 1930 follow:

Year	Taxes	Valuation
1936	\$ 110,614.68	3,232,150
1935	101,853.17	3,202,110
1934	99,486.51	3,119,110
1933	99,072.28	3,160,110
1932	123,114.90	3,640,130
1931	159,547.60	4,000,150
1930	146,588.82	3,725,150

The increase in taxes is largely due to increase in rate. The rate in 1935 was \$3.14932 which in 1936 increased to \$3.388613.

The total tax levy for the City of Ishpeming for 1935 and 1936 follows:

	1936	1935
County Tax	\$ 64,865.22	\$ 63,491.53
" Road Tax	6,023.20	7,002.74
" Debt Service Tax	3,205.48	3,455.34
Highway Fund Tax	69,450.00	55,000.00
Library " "	7,300.00	11,800.00
Fire " "	12,400.00	13,200.00
School " "	67,181.84	68,626.88
" Debt Service Tax	25,312.50	25,787.50
Sewer Fund Tax	2,100.00	2,000.00
Cemetery Fund Tax	4,500.00	4,000.00
City Tax General Fund	37,850.00	36,700.00
" Debt Service Tax	8,500.00	-
Water Fund Tax	5,300.00	2,300.00
Total	313,988.24	293,363.99
Rejected Tax	16.23	687.59
GRAND TOTAL	314,004.47	294,051.58

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11. ACCIDENTS
AND
PERSONAL
INJURIES:

During the past five years the Cliffs Shaft Mine has sustained the record that follows:

	<u>1936</u>	<u>1935</u>	<u>1934</u>	<u>1933</u>	<u>1932</u>
No. of No-Time Lost Accidents	62	49	51	8	9
Compensable or Fatal Accidents	3	7	9	2	1
No. of Man Shifts Worked	93,937	59,597	45,910	18,694	24,192

Both Frequency and Severity rates were less in 1936 than they were in 1935.

We, however, suffered one fatal accident, which occurred on January 31st. Dominic Vallela, a contract trammer employed on the 6th level "A" Shaft, was killed by a fall of ground in No. 8 stope. Vallela and his partner were scraping rock that had been barred from the back in order to make the ore in the floor accessible for mining. A huge slab of rock 15 to 20 ft. long, 10 ft. or more wide, and a foot or more in thickness, fell out of the back and struck Vallela, injuring him so badly that he died a short time later in the Ishpeming Hospital.

12. NEW
CONSTRUCTION:

E. & A. No. 679

This covers the construction of a new aluminum combined skip and cage for "B" Shaft. The new equipment was put into service early in 1936 and then the E. & A. was kept open to include the cost of a spare skip box. All work planned under this E. & A. was completed in 1936.

E. & A. No. 681

This covers 10 new 76-cu. ft. 5-ton rocker dump cars which were delivered in March 1936, 5 of them placed on the 8th level and 5 on the 10th level "A" Shaft. The new cars are more sturdy than any 5-ton cars in the mine and we hope to be able to operate them for years with only minimum maintenance charges.

E. & A. No. 708

E. & A. No. 708 really applies to 1937 costs because it contemplates the purchase of new drilling machines, new scraper hoists, and new batteries for storage battery locomotives. At this writing, arrangements are being made to replace old worn-out Edison cells for storage batteries and parts have been ordered to complete two new scraper hoists.

E. & A. No. 709

Repairs to Cliffs Cottage are covered by E. & A. No. 709. The stoker has been installed and several new radiators placed in the bedrooms. The fan driven unit to provide heat for the rooms downstairs was only partially set up in 1936. Repairs to the roof were practically completed except that the cold weather came on so early in October and November that all the work planned for the roof over the West end of the Cottage was not completed. The metal ledge around the sun porch was rebuilt and the basement walls and ceilings repaired.

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E. & A. No. 717

This E. & A. covers the cost of fire-proofing the crusher building. Work on this project has been in progress for a year and it will take two or three more months to finish the job. We have gotten to the point where only Sundays are available to accomplish anything worth while.

The biggest fire hazard was removed when the building was rewired and all the oil switches and controls were taken completely out of the building. The improvements embraced in this entire project have previously been described in detail in this annual report under various previous headings.

14. MAINTENANCE
AND
REPAIRS:

Dwellings:

Detailed costs for all the rented buildings that are carried on the General Storehouse books follow:

	<u>Rented Buildings</u>			<u>Loc. Expense</u> <u>Cleaning, etc</u>	<u>Grand</u> <u>Total</u>
	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>		
Hard Ore Location	1509.83	2398.35	4408.18	855.73	5263.91
Nebraska "	26.01	30.45	56.46	-	56.46
Barnum "	390.79	819.18	1209.97	19.43	1229.40
Angeline "	71.15	374.73	445.88	346.01	791.89
Salisbury "	83.59	173.14	256.73	110.18	366.91
Second Addition	1804.82	1426.88	3231.70	846.18	4077.88
Outhwaite Purchase	279.42	363.18	642.60	-	642.60
Hyde Purchase No. 1	19.61	20.00	39.61	-	39.61
" " " 2	101.21	135.17	236.38	-	236.38
Smith Purchase	174.27	307.05	481.32	-	481.32
Nelson Purchase	45.07	6.69	51.76	-	51.76
Republic Rented Buildings	32.11	35.59	67.70	-	67.70
Total	4537.88	6590.41	11128.29	2177.53	13305.82

The following table gives comparative costs for the past two years:

	<u>1936</u>	<u>1935</u>
Nebraska Location	56.46	53.20
Second Addition	4077.88	2943.39
Cliffs Shaft Location	1229.40	3049.36
Hard Ore Location	5263.91	7778.47
Nelson Purchase	51.76	3998.24
Outhwaite Purchase	642.60	652.84
Smith Purchase	481.32	1409.73
Hyde Purchase No. 1	39.61	372.53
" " " 2	236.38	511.29
Angeline Location	791.89	717.85
Salisbury Location	366.91	109.91
Total	13238.12	21497.81

It will be noted that the amount expended to maintain the Company's locations in 1936 was approximately two-thirds of the 1935 cost.

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During 1936 an effort was made to sell some of the houses to employees. Two were sold in the Cliffs Shaft or Barnum Location and eleven in the Hard Ore Location.

The lowest recommended selling price on the statement sent to the Cleveland Office for these dwellings was \$6,250.00. They were sold for \$8,900.00, or 40% more than the lowest figure carried on our books.

15. POWER:

The Cliffs Shaft Mine used 5,415,857 kilowatts compared with 3,710,853 in 1935. The average rate paid in 1936 was .01397 compared with .0161 in 1935. The decrease is due to a better and more favorable power factor. A detail for 1936 follows:

	<u>K. W. H.</u>	<u>Amount</u>
Tramming	311,794	4,355.76
Pumping	1,439,292	20,106.91
Compressors	2,072,739	28,959.52
Hoisting	990,324	13,834.82
Stocking Ore	13,608	190.10
Screening & Crushing	114,974	1,606.18
Dry House	9,046	126.37
Surface	17,447	243.74
Telephones & Safety Devices	54,177	756.85
Mine Office	6,439	89.84
Bit & Drill Shop	11,743	164.05
Heating Plant	12,406	173.31
Electric Haulage	357,942	5,000.45
Machine Shop	3,427	47.88
Loading at Pocket	508	7.09
Total	5,415,857	75,662.87

A comparison for 1935 and 1936 follows:

	<u>1936</u>	<u>1935</u>	<u>% Increase</u>
Production (tons)	456,760	268,921	69.8
Tramming	311,794 KWH	184,100 KWH	69.4
Pumping	1,439,292 "	1,290,881 "	11.5
Compressors	2,072,739 "	1,188,451 "	74.5
Hoisting	990,324 "	612,564 "	61.6
Stocking Ore	13,608 "	14,934 ")	
Screening & Crushing	114,974 "	54,688 ")	84.5
Dry House	9,046 "	7,648 "	18.3
Surface	17,447 "	17,789 "	Decrease
Telephones & Safety Devices	54,177 "	34,720 "	56.1
Mine Office	6,439 "	5,951 "	8.2
Bit & Drill Shop	11,743 "	4,031 "	192.1
Heating Plant	12,406 "	8,327 "	49.1
Electric Haulage	357,942 "	198,480 "	80.2

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18. NATIONALITY
OF
EMPLOYEES:

	<u>American</u> <u>Born</u>	<u>Foreign</u> <u>Born</u>	<u>Total</u>
English	66	32	98
Finnish	49	86	135
Swedish	39	25	64
Italians	5	11	16
French	27	5	32
Norwegians	7	7	14
Irish	8	2	10
Germans	4	-	4
Scotch	1	-	1
Total	<u>206</u>	<u>168</u>	<u>374</u>

LLOYD MINE
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1. GENERAL

The year 1936 was one of marked activity, both surface and underground, at the Lloyd Mine. The desired erection of the combined shop and office building was consummated, and other improvements to the surface plant were made, or were still in the course of construction at the end of the year. The working schedule underground accelerated three different times, the average daily hoist being raised from 926 tons in January to nearly 2,000 tons at the end of December. The largest single increase came the second week in December when a third shift was added by the employment of 65 additional men.

A change in the operating status, or ownership of production, occurred May 1st, when the property was leased by the Republic Steel Corporation, The Cleveland-Cliffs Iron Company remaining as the owner and operator. Production subsequent to May 1st was for the account of the Republic Steel Corporation and during the shipping season 202,020 tons of Republic ore were forwarded in addition to the Cleveland-Cliffs Iron Company shipments. These amounted to 151,086 tons so the total shipments from the property for the year reached the figure of 353,106 tons in comparison to 180,208 tons in 1935.

Mining operations continued in the East Lloyd deposit in three separate areas or sections. The highest of these, in the east end, passed below the 3rd Level in October; the second in the central and west portion, covered sub levels from 60' above the 4th Level down to the first sub 15' above this level; and the third was a newly developed area under the hanging wall which was sub level stope above the west end of the 5th Level. Much the larger share of new development was at the 5th Level elevation or in raises carried up to the mining subs just above the 4th. Working conditions generally were improved by the completion of these new traveling road and ventilation connections, and by the elimination of the decreased ore compartment storage space of the old 4th Level raises.

The source of greatest production was the central part of the ore body above the 4th Level where top slicing operations continued throughout the year. Lloydale grade was here produced in quantity together with varying amounts of silica. The same was true of the higher east end where the proportion of Lloydale was lower. The stope under the hanging wall above the 5th Level produced a considerable amount of Lloyd grade ore but since this was not shipped or stocked separately, it served to reduce the Lloydale phosphorus average from .195 in the 1935 output to .158 in 1936.

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2. PRODUCTION
SHIPMENTS &
INVENTORIES

a. Production by Grades

<u>Grade</u>	<u>Tons</u>
Lloyddale	260,577
Lloyd Silica	102,528
Lloyd Silica #1	1,221
Total	364,326

The above product compared with a total of 222,121 tons in 1935. The proportion of silica, approximately 28%, was about the same in each year. No Lloyd grade ore was produced in 1936, the lower phosphorus material from the west end of the 5th Level being included in the Lloyddale grade.

b. Shipments

<u>Grade</u>	<u>Pocket Tons</u>	<u>Stockpile Tons</u>	<u>Total Tons</u>	<u>Total Tons Last Year</u>
Lloyddale	155,927	118,906	274,833	125,099
Lloyd Silica	49,744	27,308	77,052	50,960
Lloyd Silica #1	1,221	0	1,221	4,149
Total	206,892	146,214	353,106	180,208
Total Last Year	114,562	65,646	180,208	
Increase	92,330	80,568	172,898	

The following table shows the shipments for the past five years:

Year 1932	5,926 tons
1933	171,917 "
1934	99,023 "
1935	180,208 "
1936	353,106

The sharp increase in 1936 may be noted. Also that production and shipments nearly equalled one another.

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2. PRODUCTION
SHIPMENTS &
INVENTORIES (Cont.)

c. Stockpile Inventories

<u>Grade</u>	<u>Tons</u>
Lloyddale	104,983
Lloyd Silica	51,995
Lloyd Silica #1	<u>4,910</u>
Total	161,888

This figure compares with 150,668 tons at the end of 1935 or an increase of only 11,220 tons.

d. Division of Product by Levels

The ore produced above various levels was as follows:

	<u>Lloyddale</u>	<u>Lloyd Silica</u>	<u>Lloyd</u>	<u>Total</u>
	<u>Tons</u>	<u>Tons</u>	<u>Silica #1</u>	<u>Tons</u>
Third Level	23,538	19,636	-	43,174
Fourth Level	178,167	72,741	1,200	252,108
Fifth Level	58,872	10,151	21	69,044
Total	<u>260,577</u>	<u>102,528</u>	<u>1,221</u>	<u>364,326</u>

e. Production by Months

<u>Month</u>	<u>Days</u>	<u>Lloyddale</u>	<u>Lloyd Silica</u>	<u>Total Ore</u>	<u>Rock</u>
		<u>Tons</u>	<u>Tons</u>	<u>Tons</u>	<u>Tons</u>
January	26	17,604	6,482	24,086	606
February	25	16,450	4,438	20,888	1,062
March	26	14,870	10,457	25,327	1,848
April	19	11,531	13,188	24,719	990
May	23	23,956	5,703	29,659	1,203
June	23	20,559	9,302	29,861	1,041
July	24	22,487	10,781	33,268	543
August	19	20,952	6,538	27,490	393
September	24	30,543	7,412	37,955	432
October	27	30,329	11,263	41,592	1,074
November	22	24,373	7,348	31,721	717
December	21	26,923	10,837	37,760	786
Year	279	<u>260,577</u>	<u>103,749</u>	<u>364,326</u>	<u>10,695</u>

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2. PRODUCTION
SHIPMENTS &
INVENTORIES (Cont.)

f. Ore Statement

	<u>Lloyd</u> <u>Lloyddale</u> <u>Tons</u>	<u>Lloyd</u> <u>Silica</u> <u>Tons</u>	<u>Lloyd</u> <u>Silica</u> <u>#1 Tons</u>	<u>Morris</u> <u>Tons</u>	<u>Total</u> <u>Tons</u>	<u>Total</u> <u>Last</u> <u>Year</u>
On hand Jan.1.,1936	119,239	24,750	6,679	33,598	184,266	200,235
Output for year	260,577	102,528	1,221	0	364,326	222,121
Transferred		1,769	1,769			
Total	379,816	129,047	6,131	33,598	548,592	422,356
Shipments	274,833	77,052	1,221	0	353,106	238,090
Balance on hand	104,983	51,995	4,910	33,598	195,486	184,266
Increase in Output					142,205	
Increase in ore on hand					11,220	

The operating schedule for the past five years follows:

- 1932 - 1-8 hr. shift 2 days per week Jan. 1st to June 1st.
 Mine idle June 1st to Nov. 1st.
 3-8 hr. shifts 6 days per week Nov.1st to Dec.31st.
- 1933 - 3-8 hr. shifts 6 days per week Jan. 1st to Apr. 8th.
 Mine idle Apr. 8 to Nov. 8.
 3-8 hr. shifts 6 days per week Nov. 8 to Dec. 31.
- 1934 - 3-8 hr. shifts six days per week Jan. 1st to Apr. 3rd.
 1-8 hr. shifts 3 days per week Apr. 3rd to Sept. 1st.
 1-8 hr. shifts 2 days per week Sept.1st to Dec.31st.
- 1935 - 1-8 hr. shift 2 days per week Jan. 1st to Feb. 11th.
 1-8 hr. shift 3 days per week Feb. 11 to Dec. 31st.
- 1936 - 1-8 hr. shift 3 days per week Jan. 1st to Feb. 1st.
 1-8 hr. shift 4 days per week Feb. 1st to May 1st.
 2-8 hr. shifts 5½ days per week May 1st to Dec.7.
 3-8 hr. shifts 5 days per week Dec.7 to Dec. 31st.

g. Delays

There were no serious delays or interruptions to production during the year from either mechanical or electrical causes.

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3. ANALYSIS

a. Average Mine Analysis on Output

<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Lloyddale	260,577	58.63	.149	7.09
Lloyd Silica	102,528	51.20	.134	17.15
Lloyd Silica #1	1,221	50.78	.096	18.22

The slightly higher iron content and lower phosphorus content of the Lloyddale grade as compared to 1935 resulted from the increased proportion of ore mined at the west end of the 5th Level. A large percentage of the product from the stope above this level was Lloyd grade, but was mixed with and included in the Lloyddale product. There were no straight cargoes forwarded from the mine in 1936 so the output analysis is the only one given.

b. Analysis of Ore in Stock Dec. 31, 1936

<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>
Lloyddale - Dried	104,983	58.16	.175	7.45	.21	2.51	.80	.27	.011	4.71	
Nat'l.		52.12	.157	6.68	.19	2.25	.72	.24	.010	4.22	10.38
Lloyd Silica-Dried	51,995	51.70	.137	16.10	.20	2.63	.75	.38	.011	4.00	
Nat'l.		46.79	.124	14.57	.18	2.38	.68	.34	.010	3.62	9.50
Lloyd Silica #1											
Dried	4,910	52.52	.107	16.79	.19	2.65	.75	.36	.012	4.54	
Nat'l.		47.53	.097	15.19	.17	2.40	.68	.32	.011	4.11	9.50
Morris											
Dried	33,598	58.58	.077	8.34	.42	2.47	.48	.29	.012	2.10	
Nat'l.		52.93	.069	7.54	.38	2.23	.43	.26	.011	1.88	9.64

4. ESTIMATE OF ORE
RESERVES

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 Dec. 31, 1936

Lloyd East Deposit

	<u>Lloyd Ore</u> <u>Tons</u>	<u>Lloyddale Ore</u> <u>Tons</u>	<u>Total Ore</u> <u>Tons</u>
Fourth Level and above	0	291,113	291,113
Fourth Level to 5th Level	0	748,699	748,699
Fifth Level to 6th Level	329,875	989,623	1,319,498
Total Ore above 6th Level	329,875	2,029,435	2,359,310
Below 6th Level	70,537	211,613	282,150
Total Reserve Lloyd Mine East	400,412	2,241,048	2,641,460

Lloyd Deposit

	<u>Lloyd Ore</u> <u>Tons</u>	<u>Lloyddale Ore</u> <u>Tons</u>	<u>Total Ore</u> <u>Tons</u>
Above 3rd Level	25,873		25,873
Below 3rd Level	9,353		9,353
Total Reserve Lloyd Deposit	35,226		35,226
Total Reserve Lloyd Mine	435,638	2,241,048	2,676,686

The following table shows the development of standard ore reserves during the past three years:

	<u>1934</u>	<u>1935</u>	<u>1936</u>
Ore in Mine Jan. 1st	2,897,830	2,756,818	2,771,174
Production	60,904	161,406	260,577
Balance	2,836,926	2,595,412	2,510,597
Ore in Mine Dec. 31st	2,756,818	2,771,174	2,676,686
New ore Developed	80,108	175,762	166,089

b. Estimated Analysis

The estimated analyses of the Lloyd and Lloyddale grade reserves are the same as the previous year, and are shown in the following table.

<u>Grade</u>		<u>Iron</u>	<u>Phos.</u>	<u>Sul.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moist.</u>
<u>Lloyd</u>	Dried	58.98	.127	6.68	.25	2.29	1.18	.38	.012	4.81	
	Natural	52.45	.111	5.93	.22	2.04	1.05	.34	.011	4.08	11.25
<u>Lloyddale</u>	Dried	58.25	.187	7.08	.25	2.65	1.26	.44	.011	5.02	
	Natural	51.56	.166	6.28	.22	2.35	1.12	.39	.010	4.46	11.25

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5. LABOR
AND
WAGES

a. General

Due to continued general unemployment in the district there was an over supply of common labor. The working force was gradually increased during the year and in December, a sharp increase was made by the addition of the third shift. In choosing the 65 men from the hundreds of applicants, thought was given first to qualifications, and then to the applicants connection or former service with the company, and also the number of dependents.

Because of the care in which young men were selected for tramming and timber hoisting jobs during the past few years, a number of these men were available for the step up to mining contracts. In this way, nearly one half of the added miners were from our own trained working force and were young men vitally interested and appreciative of the chance to advance themselves. They were placed with older miners and it is thought that within a short time better than normal results will be effected. The task of choosing the remaining miners showed that there was a real scarcity of these skilled workers.

The wage rates that were in effect since April 1, 1934 continued until Nov. 16. At that time a minimum increase of $6\frac{1}{2}\phi$ per hour was made and this was of course reflected in the costs for these last two months.

b. Comparative Statement of Wages & Product

	<u>1936</u>	<u>1935</u>	<u>Inc.</u>	<u>Dec.</u>
PRODUCT	364,326	222,121	142,205	
No. Shifts & Hours.				
Jan.1 to May 1	1-8 hr.	1-8 hr.		
May 1 to Dec. 7	2-8 hr.			
Dec. 7 to Dec.31	3-8 hr.			
<u>AVG. NO. MEN WORKING</u>				
Surface	42	42		
Underground	140	138	2	
Total	182	180	2	
<u>AVG. WAGES PER DAY</u>				
Surface	4.30	4.19	.11	
Underground	5.25	4.98	.27	
Total	5.03	4.78	.25	

Average wages per day surface and underground respectively were: 1931, 4.42 and 5.12; 1932, 3.75 and 4.46; 1933, 3.84 and 4.29; and 1934, 4.18 and 5.00.

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5. LABOR
AND
WAGES (Cont.)

b. Comparative Statement of Wages & Product (Cont.)

	<u>1936</u>	<u>1935</u>	<u>Inc.</u>	<u>Dec.</u>
<u>WAGES PER MO. of 25 DAYS</u>				
Surface	107.50	104.75	2.75	
Underground	131.25	124.50	6.75	
Total	125.75	119.50	6.25	
<u>WAGES PER MO. OF 22 DAYS</u>				
Surface	94.60	92.18	2.42	
Underground	115.50	109.56	5.94	
Total	110.66	105.16	5.50	
<u>PRODUCT PER MAN PER DAY</u>				
Surface	32.51	26.33	6.18	
Underground	9.77	9.44	.33	
Total	7.51	6.85	.66	
The increase in tons per man per day is a result of the decreased proportion of development work, and the increased proportion of ore from sub level stoping in regular mining operations.				
<u>LABOR COST PER TON</u>				
Surface	.132	.159		.027
Underground	.538	.528	.010	
Total	.670	.687		.017
<u>AVG. PRODUCT STOPING & TRAMMING</u>	18.14	15.97	2.17	
<u>AVG. WAGES CONTRACT MINERS</u>	5.92	5.59	.33	
<u>TOTAL NO. OF DAYS</u>				
Surface	11,206	8,434	2,772	
Underground	37,276 $\frac{3}{4}$	23,538 $\frac{1}{4}$	13,738 $\frac{1}{2}$	
Total	48,482 $\frac{3}{4}$	31,972 $\frac{1}{4}$	16,510 $\frac{1}{2}$	
<u>AMOUNT FOR LABOR</u>				
Surface	48,210.70	35,387.93	12,822.77	
Underground	195,848.15	117,315.87	78,532.28	
Total	244,058.85	152,703.80	91,355.05	

Proportion Surface to Underground men:

1932	1 to 3.18
1933	1 to 2.70
1934	1 to 2.88
1935	1 to 3.29
1936	1 to 3.33

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6. SURFACE

a. Buildings

Ground was broken in May for the newly authorized combined shop, dry and office building. The site chosen was near the top of the slope about 300' southeast of the shaft. Foundations were poured, concrete floors laid in June, and the erection of steel started early in August. The bonded roof was completed and installation of interior partitions and equipment started in September. The building contains, from north to south, the following rooms: surface dry with boiler room beneath; blacksmith and machine shop; carpenter and electric shops with electric cap lamp charge racks and service space in the latter; shower and lavatory room; change and locker room with shift bosses space separate and fuse cutting room at south end; warehouse room; and separated for cleanliness by a double door system and hallway at the south end of the building is the office space consisting of the supply clerk's room, Captain's office and change room, and Clerk's and Superintendent's offices.

Occupancy of the building could not be effected until October 20th because of delayed shipment of the shower supply hot water tank. During that weekend lockers and other equipment were moved from the Section 6 dry, thoroughly cleaned, painted and installation completed. The working force was relieved to abandon the overcrowded damp Section 6 dry and justly proud of their new quarters. The office force had preceded them by moving from the also overcrowded space at the Morris Mine office, at the beginning of November. It is not too much to say that, as far as the Lloyd Mine employees were concerned their primary need was met by the erection of this modern building, but it is somewhat in the nature of an anticlimax to add that the employment of the third shift has already taxed its capacity.

A new garage and storehouse building, also of steel and concrete construction, was erected 100' east of the combined shop and office building. This building from east to west provides space for 12 automobiles, the south side being open to the weather; an unheated but enclosed storeroom 30' x 20' in size; and a heated garage for the mine truck and two automobiles. Construction had been completed except for the interior lining and installation of the unit heater in the last named space.

Upon removal from the Section 6 dry and engine houses the windows of these buildings were boarded up, the pipes in the dry house drained, and the interiors cleaned. The engine house remained in use at intervals until the middle of December when all timber in the yard had been lowered for use at the east end of the mine. The hoist will remain available for use at any

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6. SURFACE (Cont.)

a. Buildings (Cont.)

time in this second outlet which, it is hoped, will not be affected for some time by the ground movement to the south.

A new coal dock or unloading pocket was constructed under the railway siding west of the timber yard to provide for the increased coal used in heating the new buildings. The pocket and a scraper outfit were built and installed in June. An area about 75' x 100' was levelled and a plank sollar laid so that the winter's supply of coal was later easily handled.

b. Stocking Grounds

The increased production schedule made necessary the preparation for use of all available stocking room on the Lloyd property plus a 1.1 acre parcel extending west on the Morris Mine surface which was leased from the Inland Steel Company. Trestle construction was started early in September with the erection of a new rock trestle. This was extended south of the shaft on a line with, and west of, the old rock pile. The surface cave at the south end will provide room for dumping rock for years to come and only eight bents were necessary to reach this depression.

Early in October an ore trestle of 28 bents was extended south-east of the shaft and stocking of Lloydale ore started on the 26th of that month. This was followed by the rebuilding of 6 bents on the northeast trestle and the extension of 7 new ones to the east. Early in December 5 bents were repaired west of the shaft and a new trestle of 22 bents extended across the boundary line toward the Morris shaft. There is room available on each trestle for stocking either Lloydale or silica grade, but because of the narrow stocking grounds east of the shaft, it is not possible to utilize the full height of the trestle and scraping of ore between the piles will have to be resorted to in the spring.

c. Engine House

There were no construction or large repair items necessary in the engine house during 1936. The larger surface lighting load however, made necessary the installation of a transformer of larger capacity in the spring. At the close of the year preparations were being made to fireproof the ceiling above the control panels and grids with flexboard. This work will be completed early in 1937.

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6. SURFACE (Cont.)

d. Shaft House

The enclosing of the headframe above the landing floor with steel ferrodeck was begun in September and had practically been completed that month. The same material was also used to enclose the new transfer control house which was placed on the south side of the headframe so that an unobstructed view could be obtained both east and west. The construction of the two new steel and concrete transfer motor buildings was nearing completion in December and it is hoped that both units may be placed in operation early in 1937 although controllers, wiring, etc. still remain to be placed.

The cage and skip compartments of the headframe from the collar to the landing floor were enclosed with composition material to prevent freezing of the upper portion of the shaft. The Lloyd shaft is strongly downcast and this work was only partially successful since only a few very small openings will start the freezing action in very cold weather. At the same time, it is very important that the natural ventilation be maintained at the maximum volume so the mine may be kept free of powder smoke during the continuous five day per week operation. For this reason, work was started in December on a new air inlet at the southeast end of the 1st Level and this will be explained in more detail under the heading of "Ventilation".

The timber tunnel leading to the shaft house from the timber yard on the north was widened and concreted in the spring. All levels underground leading from the cage road are double tracked so that it is now possible to send up an empty timber truck on each return trip of the cage. The wooden supports for the tunnel had been in place since the opening of the mine, so when the widening was done both sides and the roof of the tunnel were concreted to eliminate future replacement of timber.

e. Roads

A new road was constructed from the main township road east of the Lloyd shaft to the new buildings, and considerable fill placed around the buildings and on the road. The fill was obtained from the old rock pile, using a steam shovel and hired trucks for this purpose. Later a covering of gravel was placed on that portion of the road near the buildings to keep the premises clean.

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7. UNDERGROUND

a. Shaft Sinking.

There was no shaft sinking or stripping during 1936.

b. Development

New development was largely concentrated on the 5th Level, as in 1935. The present contemplated program of drifting and cross-cutting at this elevation was completed in December. Early in 1937 the opening up of the new lower, or 5½ Level, will be started, in order to keep development well ahead of the accelerated mining schedule.

The only development above the 4th Level elevation was the completion of two raises, Nos. 485 and 486. Raise #485 was carried up to the 925' sub level in ore in February and extended an additional 12' in the jasper hanging so that mining could be started at the west end of the ore body at that elevation. Raise #486 was extended from a height of 50' to the 890' sub level in March and then continued an additional 65' to the 3rd Level elevation where mining operations were started in May. At the 4th Level elevation the connection of the new 5th Level raises to existing drifts comprised the only development. A total of 285' of small size drifts provided the connections, starting with a long drift under the jasper hanging wall from raises 543 and 544 to 431 crosscut. Other connections from raise numbers 531, 532 and 533 to the same crosscut followed, and also from raise 522 to 451 cross-cut.

All of the small raise and drift development preparatory to stoping operations above the west end of the 5th Level was done in 1936. This work was on sub levels from the 725 down to the 640, the latter being the transfer sub level. At the end of the year, development at the southwest end of the ore body was underway at higher elevations, and #542 raise was being cut out at the 640' elevation preparatory to starting a third stope along the north boundary of the ore body.

In January 1936, the 5th Level west, or #5 crosscut, was completed in the south footwall and in December #511 raise had been started from the east or #1 crosscut which had been finished the month previous. So in 1936 the north main rock drift was extended some 450' east; numbers 1, 2 and 3 crosscuts turned off, driven through the ore body and completed in the

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7. UNDERGROUND (Cont.)

b. Development (Cont.)

south footwall; while earlier in the year ore drifting had been completed in Nos. 4 and 5 crosscuts and they too were finished in the south footwall. Raising was in progress above the 5th Level elevation throughout the year. In January Nos. 551 and 552 raises were started from the west crosscut and, as noted before, #511 raise was started from the east crosscut in December. The total number of double compartment cribbed raises was 15 and 12 of these were completed during the year. The first raise connection from the 5th to the 4th Level was made in June with material benefit to working conditions, because of the improved ventilation. At the end of December, #4 contract had reached a height of 79' in #511 raise. The material was rock to a height of 33', ore in the north compartment to a height of 73', and all ore above. #15 contract in #521 raise at the end of December reached a height of 120', the raise entering the ore body at a height of 58' earlier in the month. The third development contract above this level, #18, raised in ore in #531 raise, reaching the 4th Level elevation late in the month.

c. Stoping

At the start of the year, mining operations progressed in the east and central portions of the ore body south of Section 6 shaft. With the exception of one small stope at the east end, all mining was by the top slicing method in these areas. In July another territory was added when a sub level stope was opened under the jasper hanging wall at the southwest end of the 5th Level. A large percentage of the mine product came from the stope during the following months, and as noted before, its high iron, low phosphorus analysis was a welcome addition to the product. In September a second but smaller stope was opened under the jasper hanging wall at the southwest end of the 4th Level but mining operations here were nearing completion in December.

The detailed review of the year's mining operations is as follows:

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7. UNDERGROUND (Cont.)

c. Stoping (Cont.)

Subs Above the 3rd Level

970' Sub Level

Stoping operations were started in the extreme east end of the ore body in January. The stope was worked on sub levels from the 970' down to the 890' elevation, the latter being the transfer sub. Top slicing operations were also under way in January to the west of the sub level stopelimits. The ore from this contract was trammed on the 3rd level until May when the heavy pressure on the 3rd Level drifts made necessary a change over to #487 raise from the 4th Level. Stoping operations were concluded in March and top slicing operations at this elevation were completed in July.

3rd Level

In addition to the sub level stope at the extreme east end of the ore body, top slicing operations were started here in June. #486 raise was cut during that month and was soon followed by a second contract at #487 raise. Slicing operations in the narrow ore body were soon finished, both contracts moving to the sub below in October.

Subs Above the 4th Level

940' Sub

The west half of the ore body at this elevation was completely mined during the period from October to December. No. 8 contract drove the last slice along the south footwall and dropped to the sub below and cut out the raise at the end of December. No. 1 contract remained at this elevation at the end of the year with two small pillars yet to be mined west of #487.

925' Sub

Sub level stoping operations at the east end of the deposit were completed early in the year. #485 raise was cut out and top slicing operations started in the west portion of the ore body in April. This small area had been mined in July and the contract dropped down to cut out the raise. Mining in the central portion was started in December when No. 8 contract cut out the raise at the end of the month.

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7. UNDERGROUND (Cont.)

c. Stoping (Cont.)

910' Sub

At this elevation the east and west portions of the small ore body were mined in 1936. The sub level stope at the east end was completed early in the year while the ore adjacent to 485' raise was removed by top slicing in the interval between July and October.

900' Sub

Sub level stoping operations were also completed at the east end of the ore body at this elevation early in the year. Top slicing of the ore adjacent to #485 raise was started in October and had nearly reach completion at the end of December. During the last named month No. 2 contract mined the ore as far east as the temporary mining limit and between the north and south footwalls.

890' Sub

Sub level stoping operations extended from this elevation to the 970' sub level at the east end of the ore body. This stope was worked from January until the middle of March, the ore being scraped to the west to #486 raise. Subsidence at the 3rd level elevation filled the stope with lean material and made necessary its discontinuance at that time.

840' and 820' Subs

In September a test drift in search of the ore encountered in diamond drill hole #60 penetrated this extension at the southwest end of the ore body at the 765' elevation. This drift was later used as the transfer, mill raises being extended above to the 840' elevation where jasper was encountered. Mining operations progressed in the small sub level stope developed here on elevations from the 840 to the 765 starting in September, and reaching completion in December. The south boundary of the stope was a dike and the water issuing from the drill hole spread over the back of the stope making mining conditions difficult.

810' Sub Level

#545 raise was cut out at this elevation early in December and an exploratory drift driven northeast to #438 raise. Most of the material encountered was lean ore and jasper but two small pockets of ore were developed and mined. A second test drift was being extended southwest of the raise along the dike at the end of the year by No. 19 contract.

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7. UNDERGROUND (Cont.)

c. Stoping (Cont.)

800' Sub

This elevation is the highest in which mining operations were conducted in the central portion of the ore body above the 4th Level. In discussing the mining operations in this territory, a separation into blocks may be made. No. 1 at the east end being the downward extension of the ore being mined by the three contracts near the 3rd Level elevation; No. 2 is the next block to the west extending to the 3100 E. coordinate line; and No. 3 to the 2800 E. coordinate line. The extreme west end of the ore body can be classified as Block No. 4.

During the year mining operations were carried on in blocks 2 and 4. Three contracts were top slicing from raises Nos. 472 and 482 in Block 2 from January to April. Later in the year sub level stoping operations above the 765' elevation were carried on in the vicinity of diamond drill hole #60 and also farther north in a westerly extension of the stope that had been mined in 1935. Both of these stopes were in so-called Block #4.

790' Sub

The whole of Block #2 was mined during the year, three contracts being engaged in top slicing here from January until August. Block 3, the next one to the west, was completed in April while mining operations in Block 4 were finished in the northwest stope in October and in the southwest in December.

775' Sub

Mining operations were still under way at this elevation in December, No. 6 contract mining to the south and east of No. 482 raise. Early in the month #16 contract had completed the mining of the last pillar east of #462 raise and had dropped down to the sub below. Mining operations in Block 3, which had been in progress at the beginning of the year, were completed at #431 raise in August. As noted on sub levels above, two small stopes at the west end of the ore body were mined during the latter part of the year.

765' Sub

With the exception of one small area centered on the 3000 S. coordinate line, all other mining operations at this elevation took place during 1936. Nos. 472 and 462 raises in Block 2 were cut out in December. No. 7 contract drifted easterly from

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7. UNDERGROUND (Cont.)

c. Stoping (Cont.)

#472, connected to #482 and started slicing operations along the south footwall. No. 16 contract had opened #462 raise at the end of the month preparatory to drifting to #472. #457 raise in Block 3 was cut out in January and mining operations progressed in this area throughout the year. In December #13 contract was mining east of #432 raise and #10 contract to the east and west of #434.

No. 9 contract completed sub level stoping operations at the northwest end of the ore body in Block 4 and in December started slicing operations to the east of #543 raise. #17 contract which had been engaged in sub level stoping operations southwest of #544 raise had completed this work and were blasting in the back of the transfer drift so that top slicing operations could be started in this area.

755' Sub

Mining operations had been advanced in Block 3 to this lowest elevation, which is only one sub level above the 4th Level. #522 raise from the 5th Level reached this elevation in September, and mining was underway here with two contracts during the remainder of the year. Slices were driven both east and west of the raise and at the end of December #11 contract was slicing southeasterly toward the footwall and #12 contract in a southwesterly direction toward the same contact.

4th Level

No regular mining operations were conducted at this elevation during the year. As raises were extended from the 5th Level to this elevation, connections were made to extending drifts. The first of these was the longer connection along the jasper hanging wall contact from Nos. 543 and 544 raises to #432 crosscut. There followed in order connections from Nos. 533 and 532 raises to the same crosscut, from #522 raise to the 450 crosscut and from #531 raise to 431 crosscut.

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7. UNDERGROUND (Cont.)

Subs Above the 5th Level

725', 700', 690', 675', 650', 640' Subs

All of the above sub levels may be grouped under one heading because of the fact they cover the vertical range of the so-called No. 5 stope developed and mined in 1936 above the southwest end of the 5th Level. The development of this area was started in January when Nos. 551 and 552 raises were extended above the 5th Level west crosscut. The next step in development was the extension at the 640' elevation of exploratory drifts westerly towards the jasper hanging wall. These drifts, two of which were west of #551 raise and one west of #552 raise, encountered jasper at distances of from 90' to 140' west of the raises and they later served as transfer drifts for the ore mined in the stope above. The next several months were spent in mill raise and small drift development on sub levels as high as the 700. Stopping operations started at the 700' elevation above the central drift in July and this was followed by mining operations at 650' elevation above the north drift in August. As mining progressed to the east, these two arms joined in one stope and mining was still underway along this east face in December. Two other transfer drifts had been driven easterly from Nos. 551 and 552 raises to #540 crosscut so mill raise and drift development was kept well ahead of the extension of the east boundary of the stope. #5 contract mined here in December on sub levels from the 650 to the 700.

At the end of the year, development was still underway above the transfer drift southwest of #552 raise. The south limit of the main or #5 stope was a seam of jasper which at higher elevations was parallel to and vertically over the southwest transfer. On the south side of this jasper and extending to the south footwall dike, is a mass of transition material, the exact limits of which were undetermined at the end of December. High grade material is known to exist from the 640' elevation to at least the 725' which is only one sub level below the 4th Level, so the area to be stoped will be high and narrow as compared to neighboring #5 stope on the north. No. 3 contract was engaged in this development work during December on sub levels from the 640' to the 725'.

A third stoping area is available in the northerly curve of the jasper hanging wall northwest of the present #5 stope. Exploration of this area was started late in December by cutting out #542 raise at the 640' elevation. #14 contract was timbering the raise and a transfer drift will be driven due west to the jasper. Mill raise and sub development preparatory to future stoping operations will follow early in 1937.

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7. UNDERGROUND (Cont.)

d. Timbering

The total timber cost in 1936 was nearly double that of 1935 because of the increased production. The amount of timber per ton of ore also showed a considerable increase, especially in the use of lagging and the larger average diameter of stall timber. This was a direct result of the increased pressure on the sub level slices, particularly in the wider portion of the ore body above the 4th Level. Development of the double compartment cribbed raises from the 5th to the 4th Levels may be noted by the increased amount of cribbing timber used. The slightly lower price paid for timber in 1936 served to keep the cost per ton below 6¢.

The following table gives the timber statistics and comparisons:

Statement Showing Timber Used for Year 1936

	Lineal Feet	Av. Price Per Foot	Amount 1936	Amount 1935
6" to 8" Cribbing Timber	118,236	.033	3,865.44	1,553.25
8" to 10" Stall Timber	46,404	.055	2,553.56	2,612.67
10" to 12" " "	50,400	.083	4,189.25	1,831.40
12" to 14" " "	11,678	.122	1,426.53	222.84
Total Timber 1936	226,718	.053	12,034.78	6,220.16
Total Timber 1935	113,703	.055	6,220.16	
		<u>Per 100 Ft.</u>		
7' Lagging	717,645	.688	4,941.81	1,638.46
Maple Covering Boards	21,136	1.15	243.06	
3½" Poles	367,418	1.16	4,287.31	3,216.99
Wire Fencing, 260 Rds.	4,290	4.96	212.72	356.58
Total Poles Etc.	392,844	1.21	4,743.09	3,573.57
Total Lagging, Poles & Fencing for 1936	1,110,489	.87	9,684.90	5,212.03
Total Lagging, Poles & Fencing for 1935	564,467	.92	5,212.03	

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7. UNDERGROUND (Cont.)d. Timbering(Cont.)

	<u>1936</u>	<u>1935</u>
Product - Tons	364,326	222,121
Feet of Timber per ton of ore	.622	.512
Feet of Lagging per ton of Ore	1.969	1.092
Feet of Lagging per Foot of Timber	3.165	2.134
Cost per ton for Timber	.033	.0280
" " " Lagging	.0136	.0074
" " " Poles, Fencing, Etc.	<u>.0130</u>	<u>.0161</u>
Cost per ton for All Timber	.0596	.0515
Equivalent of Stull Timber to Board Measure	377,070	173,049
Feet of Board Measure Per Ton of Ore	1.035	.779

	<u>Cost</u>	<u>Amount</u>
	<u>Per Ton</u>	
Cost of Timber, Lagging, Poles and Fencing - 1936	.0596	21,719.68
1935	.0515	11,432.19
1934	.0409	5,028.24
1932	.0729	6,047.62
1931	.0747	26,098.93
1930	.0729	33,914.29
1929	.0687	29,885.03
1928	.0777	27,690.94
1927	.0857	27,993.33
1926	.0752	21,787.65

m e. Drifting and Raising

The larger share of development in 1936 was raising from the 5th to 4th Levels. In 1935 the opposite was true, drifting to the ore body on the 5th Level placing most of the work under that heading. The following table shows the comparison:

	<u>Ore</u>	<u>Rock</u>	<u>Total</u>	<u>Ore</u>	<u>Rock</u>	<u>Total</u>	<u>Grand</u>
	<u>Drift</u>	<u>Drift</u>	<u>Drift</u>	<u>Raise</u>	<u>Raise</u>	<u>Raise</u>	<u>Total</u>
1936	3,216	824	4,040	4,629	274	4,903	8,943
1935			4,530			1,595	6,125

Increase in Total 2,818

If the small untimbered raise and drift development in advance of sub level stoping operations is eliminated from the above table, the full size rock and ore development done in 1936 may be shown as follows:

<u>Ore Drift</u>	<u>Rock Drift</u>	<u>Total Drift</u>	<u>Ore Raise</u>	<u>Rock Raise</u>	<u>Total Raise</u>
914	824	1,738	1,850	164	2,014

Grand Total - 3,752.

LLOYD MINE
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7. UNDERGROUND (Cont.)

f. Explosives, Drilling and Blasting

The following statement shows the explosives used for breaking ore and in rock development:

	<u>Quantity</u> <u>Lbs.</u>	<u>Average</u> <u>Price</u>	<u>Amount</u> <u>1936</u>	<u>Amount</u> <u>1935</u>
<u>Breaking Ore</u>				
Gelamite Powder #2	110,805	11.56	12,809.55	10,760.55
" " #1	2,050	11.25	230.63	
Hercomite " #3	6,450	10.75	693.38	
Gelatin 50%	550	10.68	58.75	
" 60%	52,570	11.77	6,187.58	243.75
Total Powder	172,425	11.59	19,979.89	11,004.30
Fuse - Feet	598,221	5.66M	3,385.36	1,798.58
No. 6 Blasting Caps	83,740	11.20M	937.87	587.77
Tamping Bags - Size B	5,350	2.03M	10.88	4.13
Electric Explosives	3,675	10.85C	398.61	81.17
7" Safety Fuse Lighters	9,100	6.75M	61.45	28.29
No. 14 Single Lead Wire	3,000	7.00M	21.00	7.00
Total Fuse,Caps,Etc.			4,815.17	2,506.94
Total All Explosives			24,795.06	13,511.24
Product - Tons			364,326	222,121
Pounds Powder per ton of ore			.473	.406
Cost per ton for Powder			.055	.050
" " " for Fuse, Caps.Etc.			.0132	.011
Cost per ton All Explosives			.068	.061
<u>DEVELOPMENT IN ROCK</u>				
Hercomite No. 3	50	10.76	5.38	
Gelamite No. 2	1,990	11.82	235.26	47.25
Gelatine 60%	10,225	12.09	1,236.64	5,844.76
Total Powder	12,265	12.04	1,477.28	5,892.01
Fuse - Feet	39,408	5.67	223.33	556.60
No. 6 Blasting Caps	5,287	11.20	59.22	143.69
Tamping Bags - Size B	1,500	2.12	3.18	
Electric Explosives				13.33
7" Fuse Lighters	1,000	6.75	6.75	10.75
Total Fuse, Caps, Etc.	47,195		292.48	724.37
Total All Explosives			1,769.76	6,616.38

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7. UNDERGROUND (Cont.)

f. Explosives, Drilling & Blasting (Cont.)

	<u>Amount</u> <u>1936</u>	<u>Amount</u> <u>1935</u>
Rock Drifting - Feet	1,071	2,625
Cost per foot for Powder	1.379	2.244
" " " Fuse, Caps. Etc.	.273	.276
Cost per Foot All Explosives	<u>1.652</u>	<u>2.520</u>
 Grand Total Explosives Used in Mine	 26,564.82	 20,127.62
Used Loading by Shovel, Etc.	20.00	8.64
Total as per Cost Sheet	<u>26,584.82</u>	<u>20,136.26</u>
 Cost per ton all Explosives used	 .073	 .091
Average Price per pound for Powder	.1162	.1231

The direct cost per ton of broken ore increased slightly in proportion to the amount of powder used. The reduced amount of rock development however, cut down the total powder consumption so that the cost per ton dropped from .091 to .073.

g. Ventilation

Ventilation of the mine as a whole improved considerably in 1936. The 5th Level raise connections to the 4th were the first steps in this progress, and the cooler weather in the fall increased the volume to such an extent that the Lloyd shaft collar had to be enclosed to prevent freezing of the upper portion of the shaft. The higher elevation of the Section 6 shaft collar forms a natural chimney at the east end of the mine and if an air inlet independent of the hoisting shaft can be developed a full time natural ventilating system will be the result.

Work was started toward this end late in the year when an effort was made to provide a connection from the first level drift to the surface cave southeast of the Lloyd shaft. The low elevation of the bottom of this cave will increase the difference in barometric pressure, and the volume can be regulated in its passage along the first level to prevent freezing the Lloyd shaft. Rock falls were being cleared away and the volume of air along the level drift increased slightly at the end of the year. If the desired volume is not realized a new small sized drift will be driven to the lower side of the cave early in 1937.

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YEAR 1936

8. COST OF
OPERATING

a. Comparative Mining Costs

	<u>1936</u>	<u>1935</u>	<u>Incr.</u>	<u>Decr.</u>
Product	364,326	222,121	142,205	
Underground Costs	.869	.919		.050
Surface Costs	.143	.158		.015
General Mine Expense	.166	.195		.029
Cost of Production	1.178	1.272		
Depreciation	.062	.044	.018	
Taxes	.080	.115		.035
Loading & Shipping	.029	.025	.004	
Total Cost at Mine	1.349	1.456		.107
Number of Operating Days	303	291	12	
No. of Shifts & Hours	115 - 1-8 hr. 172 - 2-8 hr. 16 - 3-8 hr.	1-8 hr.		
Average Daily Product	1,202	763	439	

The explanation of the detailed accounts that follow include comparison of extraordinary or varying costs which are of interest. Those accounts which show only the normal small reduction in cost per ton are not sub divided where this decrease is roughly proportional to the increased production and is therefore self-explanatory.

STOPPING

Detailed cost for 1936 and 1935 follows:

	<u>1936</u>		<u>1935</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
General Supplies	4,683.57	.013	2,884.15	.013
Iron & Steel	1,790.87	.005	496.54	.002
Oil and Grease	240.00	.001	136.42	.001
Machinery Supplies	1,377.65	.004	1,027.69	.004
Explosives	19,136.46	.052	12,825.88	.058
Lumber & Timber	14.62	.000	11.31	.000
Electric Power	253.32	.001	122.31	.001
Sundries	509.84	.001	464.70	.002
Total Supplies	28,006.33	.077	17,969.00	.081

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8. COST OF
OPERATING (Cont.)

STOPPING (Cont.)

	1936		1935	
	Amount	Per Ton	Amount	Per Ton
Payroll Labor	84,663.25	.232	53,211.61	.239
Cliffs Shaft Labor	611.49	.002	459.04	.002
General Shops Labor	940.81	.003	850.36	.004
Shop Labor, Etc.	839.78	.002	565.79	.003
Total Labor	87,055.13	.239	55,086.80	.248
GRAND TOTAL	115,061.46	.316	73,055.80	.329
Production - Tons	364,326		222,121	
Avg. Miners Rate for Stopping		5.91		5.59

The proportion of siliceous ore was approximately the same in 1936 as in 1935. The supply cost was reduced 4 mills and the labor cost 7 mills in spite of the increase in the daily rate from 5.59 to 5.91. This indicates an actual increase in mining efficiency with the increased production.

PUMPING

A new plan was put into effect in 1935 to allocate the Pumping expense between the Inland Steel and the Cleveland-Cliffs Iron Company. During 1936 we again paid as our share the percentage that our weir readings bore to the total gallons pumped as calculated from the weir readings in both mines. The total weir calculations were further checked by figuring the pump revolutions minus a 3% slippage factor and with remarkably close results throughout the year.

The following table gives the details:

	<u>Inland Steel Co. Morris Mine</u>			<u>C. C. I. Co. - Lloyd Mine</u>		
	Amount	Percent	Gals. Per Min.	Amount	Percent	Gals. Per Min.
January	\$ 1,194.56	67.98	225	\$ 562.55	32.02	106
February	1,144.24	68.13	201	535.30	31.87	94
March	1,350.27	65.73	202	704.01	34.27	104
April	1,064.59	51.99	204	982.94	48.01	230
May	1,006.57	43.70	202	1,296.57	56.30	250
June	1,279.13	52.72	202	1,147.08	47.28	185
July	1,248.88	59.03	206	866.65	40.97	139
August	1,312.63	65.07	207	704.70	34.93	113
September	1,216.60	65.07	203	652.93	34.93	107
October	1,297.73	66.06	210	666.71	33.94	107
November	1,405.02	68.22	233	654.40	31.78	109
December	1,367.27	67.02	201	672.92	32.98	99

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8. COST OF OPERATING (Cont.)

PUMPING (Cont.)

	Inland Steel			C.C.I.Co.		
	Amount	Percent	Gals. Per Min.	Amount	Percent	Gals. Per Min.
TOTAL	14,887.49	61.2	208 Av.	9,446.76	38.8	137 Av.
Year 1935	8,864.80	51.40		8,384.18	48.60	
1934	7,449.56	44.27		9,378.76	55.73	
1933	8,068.44	49.11		8,361.29	50.89	

The above figures show clearly that the Morris Mine is paying an increasing proportion of the total pumping charges. The underground examination of this property reveals the added source of water to be new openings under the jasper hanging wall at the west end plus an increase in the amount entering the workings along the northeast foot-wall.

COMPRESSORS & AIR PIPES

While the cost per cu. ft. of air compressed increased because of the installation of the 4" air line on the fourth level in December, the cost per ton decreased, because of the larger tonnage in 1936.

Following are the figures for the two years:

	<u>1936</u>	<u>1935</u>
Operating Compressors	13,986.42	11,102.89
Air Pipes	4,909.33	3,150.65
Total	18,895.75	14,253.54
Cost for 1000 cu. ft.	.048	.041

COMPRESSORS & POWER DRILLS

This account shows an increased cost due to purchasing 8 new RB-12 drilling machines in 1936, while no new machines were bought in 1935.

SCRAPERS & MECHANICAL LOADERS

The cost for 1935 totaled \$5,736.96. This increased to \$7,724.85 in 1936. In the past year three 15 H.P. Sullivan Double Drum Hoists were purchased and charged out to the above account compared to two in 1935.

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8. COST OF
OPERATING (Cont.)

ELECTRIC TRAM EQUIPMENT

	<u>1936</u>	<u>1935</u>
<u>Operating:</u>		
<u>Labor</u>		
Motormen and Brakemen	\$ 25,241.25	\$ 17,209.40
Chutemen	2,769.74	1,368.53
Total Labor	28,010.99	18,577.93
<u>Supplies</u>		
General	242.31	80.82
Oil and Grease	207.28	139.80
Electric Power	3,989.92	2,918.78
Total Supplies	4,439.51	3,139.40
Total Operating	32,450.50	21,717.33
<u>Maintenance</u>		
Generator and Dynamo	130.37	244.52
Locomotives	3,083.24	1,557.37
Wiring	1,641.39	1,419.45
Main Line Tracks	4,129.68	4,061.74
Main Line Cars	2,646.56	1,954.65
Total Maintenance	11,631.24	9,237.73
Grand Total Operating and Maintenance	44,081.74	30,955.06

The cost per ton of ore trammed for 1936, is .089. If \$1,887.36 of the operating costs is deducted for development in rock, then the cost per ton of ore trammed is reduced to .084.

HOISTING

	<u>1936</u>	<u>1935</u>
<u>Maintenance</u>		
	3,100.64	2,487.12
<u>Operating</u>		
<u>Labor</u>		
Engineers	5,854.14	4,534.82
Other Labor	0	386.57
Total Labor	5,854.14	4,921.39
<u>Supplies</u>		
Oil, Waste & Packing	82.31	83.96
Tools & Misc. Supplies	117.93	59.05
Electric Power	10,935.24	7,772.29
Heating Expense	898.39	480.11
Total Supplies	12,033.87	8,395.41
Total Operating Expense	17,888.01	13,316.80

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8. COST OF
OPERATING (Cont.)

<u>Hoisting (Cont.)</u>	<u>1936</u>	<u>1935</u>
Tons of Rock & Ore Hoisted	373,353	249,671
Average Depth Hoisted	880	855

Although the average hoist depth increased in 1936, the operating expenses did not rise in proportion to the tonnage. The operating expense increased approximately 25% and the tonnage 34%. The largest factor in effecting this saving was the reduced average cost of electric power.

Screening & Crushing

The costs for 1936 were \$1,192.57 and for 1935 \$1,761.75. A new spindle had been installed in the crusher head and the chute and grizzly rebuilt in 1935 so that extra expense was incurred during that year. The cost in 1936 was normal.

Top Tram Equipment

Costs for 1936 were \$3,751.36 compared to \$2,165.89 in 1935, or an increase of \$1,585.47 due to addition repairs on the old plant and the start of installing a new plant in 1936. A detail of the 1936 cost follows:

Engine and Motors	\$ 1,551.90
Tracks and Cars	1,058.35
Wire Rope	700.11
Sheaves Rollers, etc.	<u>441.00</u>
	3,751.36

Included in the above is the erection of the new transfer buildings and the new control house on the south side of the headframe. With additional charges for electrical equipment this standard and improved plant is expected to go into operation early in 1937.

Docks, Trestles & Pockets

The expenditure under this account rose from \$779.74 in 1935 to \$5,526.14 in 1936. This large increase was due to long deferred replacement and repairs to the permanent trestle near the shaft house, the construction of a new rock trestle, and the erection of the new trestle west of the shaft to provide for the increased production.

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8. COST OF
OPERATING (Cont)

Mine Buildings

Costs for 1936 were \$6,004.00, compared to \$1,095.07 in 1935, or an increase of \$4,908.93 due to enclosing shaft house with fireproof material. The charges incurred in erecting the new combined office and shop building and the garage and warehouse building were carried under E & A Nos. 667 and 694 respectively. The former was closed on December 31st and the detailed statement appears under the heading of New Construction.

9. EXPLORATIONS AND
FUTURE EXPLORATIONS

Toward the close of the year exploratory work was being conducted in two separate areas in the Southwest portion of the ore body. The first of these was above the 4th level, East and West of No. 545 raise where small bodies of high grade material were found outside the limits of former stopes. The second area is really development in connection with sub level stoping operations above No. 552 raise along the South footwall above the 5th level. The interesting development here is that high grade ore has been traced to above the 4th level elevation at least 100 ft. West of any former work at this elevation.

In this connection it may again be brought out that the South footwall of both the areas mentioned above is a dike which may or may not be the extreme limit of formation in this direction. Possibly an opportunity will present itself during 1937 to inexpensively penetrate this dike and determine the character of the material on its South side.

10. TAXES

The following figures show the taxes paid in Ishpeming Township for the past two years by the Mining Department on the Lloyd Mine, on lots in West Ishpeming, and on property in the North Lake Location.

	<u>1936</u>		<u>1935</u>	
	<u>Valuation</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Taxes</u>
<u>Lloyd & Section 6</u>				
S $\frac{1}{2}$ of NW $\frac{1}{4}$ of Sec. 6-47-27 - 81 Acres)	1,125,000	19,425.71	950,350	16,724.45
S $\frac{1}{2}$ exc SE $\frac{1}{4}$ of SE $\frac{1}{4}$ " -282.93 ")				
Personal - Supplies & Equipment	525,000	9,065.74	470,000	8,271.20
S $\frac{1}{2}$ of NE $\frac{1}{4}$ Sec. 6-47-26 - 80.00 Acres	320	5.56	320	5.64
SE $\frac{1}{4}$ of SE $\frac{1}{4}$ " - 40.00 "	575	9.91	575	10.11
Total	1,650,895	28,506.92	1,421,245	25,011.40
Collection Fees		285.08		250.11
Total Lloyd		28,792.00		25,261.51
 Lots in West Ishpeming	 425	 7.50	 327	 6.09
 <u>North Lake Dwellings</u>				
Houses on Sec. 6 - The C. C. I. Co.	40,500	699.35	40,500	712.72
Collection Fees		7.00		7.13
Total Dwellings		706.35		719.85
Total Ishpeming Township	1,691,820	29,505.85	1,462,082	25,987.45
Rate		1.73		1.76

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10. TAXES (Cont)

The tax rate for the two years shows a small change in favor of 1936, but the total taxes paid are larger because of the increased valuation.

Another table showing comparative figures for the Lloyd Mine based on production and shipments follows:

	<u>1936</u>	<u>1935</u>
Total Taxes - Lloyd Mine	28,792.00	25,261.51
Product - tons	364,326	222,121
Taxes per ton - production	.079	.1137
Shipments - tons	353,106	180,208
Taxes per ton - shipments	.0815	.1401

11. ACCIDENTS AND
PERSONAL INJURY

The 1936 Lloyd Mine accident record was not an enviable one from the standpoint of the number of accidents, but their severity fortunately was not in the same proportion. There were five compensable accidents in 1935 and eight in 1936, and these figures are almost exactly in proportion to the number of man-shifts worked in each year. The enumeration of each accident follows:

- Accident #777 - Chas. Bjerne - 4th Level Pocket
Injured March 21, 1936. Hook slipped and struck him in face. Time lost - March 21, 1936 to April 13, 1936
- Accident #778 - Geno Baldini - No. 7 Contract East Lloyd
Injured May 19, 1936. Strained back lifting piece of timber. Time Lost - May 19, 1936 to Aug. 3, 1936
- Accident #779 - James Gravidone - Co. Acct. Miner
Injured July 17, 1936. Tripped on cable and bruised left knee. Time lost - July 17, 1936 to July 28, 1936
- Accident #780 - Lauri Huttinen - No. 12 Contract
Injured Sept. 3, 1936. Timber slipped and fell on left forearm. Time lost - Sept. 4, 1936 to Oct. 19, 1936
- Accident #781 - Dominic Tasson - No. 5 Contract
Injured Oct. 10, 1936. Fall of ground struck him on back. Still home.
- Accident #782 - Chas. Saardini - No. 13 Contract
Injured Oct. 14, 1936. Fall of ground, piece hitting him on right thumb. Time Lost - Oct. 15, 1936 to Oct. 28, 1936
- Accident #783 - Vincenzo Elvertti - Timber Hoister. Injured
Nov. 11, 1936. Squeezed between car and side of drift. Still home.
- Accident #784 - Angelo Bozio - Cage Rider. Injured Nov. 17, 1936.
Slipped and fell, straining back. Time lost - Nov. 18, 1936 to Dec. 1, 1936.

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11. ACCIDENTS AND
PERSONAL INJURY (Cont)

It is unquestionably true that interest in safety was stimulated by the contest at the end of the year, and it is hoped that this interest will be kept alive and active by the monthly contests planned for 1937. As an additional precaution, each of the new men hired were given personal instruction in the matter of safety by both the mine captain and superintendent before receiving their regular working instructions underground.

12. NEW CONSTRUCTION AND
PROPOSED NEW CONSTRUCTION

The largest item to be covered by the above heading is, of course, the construction of the new combined dry, shop, and office building. The description of this building and the work connected with it appear elsewhere in the report. Construction E & A #667 was closed Dec. 31, 1936, and the statement follows:

Preparing Site & Fencing	\$ 322.59
Excavating & Foundations	2,494.38
Concrete Floors	1,357.01
Steel Building & Erecting	12,256.39
Heating Plant & Wiring	4,548.14
Sewers & Cess Pool	941.49
Fixtures	<u>1,140.02</u>
Total	\$23,060.02

The work on the garage and warehouse building is expected to be completed early in 1937 with a small addition to the total expenditure which amounted to \$2,726.99 on Dec. 31st. The E & A No. is 694. The lining of the garage interior is the only expense yet to be incurred.

The installation of a stoker fired boiler to replace the present headframe heating plant falls under the heading of New Construction. It is hoped that the proposed change in the mine ventilation will decrease the load on the old boiler and thus defer replacement until a new building can be erected at the same time during the warmer months. The old building is gunite over metal lath and timber. The timber has rotted, and in some places is exposed, so that the structure is no longer fireproof and must be replaced.

13. EQUIPMENT AND
PROPOSED EQUIPMENT

Because of the fact that little new equipment was purchased during the past few years, many items needed replacement or additions under the accelerated mining schedule in 1936. The need for some of this equipment was at times quite pressing and the following is a list of the more important purchases:

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- 8 RB-12 Ingersoll-Rand Auger Drill Machines
- 4 Sullivan double-drum 15 h.p. scraper hoists
- 2 Ingersoll-Rand double-drum 15 h.p. scraper hoists (E & A #707)
- 1 Chicago Pneumatic air driven wood boring machine
- 2 Top Tram 4-ton cars
- 1 Electric Arc Welder
- 1 Sirrocco 5 h.p. ventilating fan
- 2 Drive Belts (water supply pump, and compressor)
- 210 Electric cap lamps, with necessary charging racks, motor generator, set, etc.
- 6 Timber Trucks
- 6 4-ton rocker dump cars for 5th Level (E & A #690)
- 1 Kewanee 25 h.p. boiler to replace one used in heating headframe.

The 3-shift operation necessitated the rapid handling and delivery of mining timber underground. For this reason 6 additional timber trucks have been ordered for delivery early in 1937. The stoker for the headframe boiler will also be received early in the new year.

14. MAINTENANCE AND REPAIRS

a. Mine

Larger repair jobs in 1936 included a complete overhauling of the Butler loader, repairs to the underground haulage generator, and replacement of the North top tram motor in February. The North skip and the cage head sheave were changed in May, and a new South skip rope added in June. The crusher motor was repaired, and a new crusher pinion, ring gear and eccentric added in July. The belt for the water supply pump on 2nd level was replaced in July and the larger belt on the compressor in August. The North skip rope was changed in November, and the next month one of the 5 h.p. ventilating fan units was sent to the General Shops for repairs.

b. Location

1. General Maintenance

The following is the detailed cost of maintaining the mine location in 1936 and the comparison with former years:

	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>
Proportion of Policemen's Time	1,800.78	-	1,800.78
Repairs to Fire Hydrants	63.22	6.78	70.00
Fencing	520.27	19.16	539.43
Cleaning Alleys	768.42	26.17	794.59
Removing Snow & Ice	63.36	6.00	69.36
Repairing Water Mains	361.36	116.50	477.86
Water	-	1,056.94	1,056.94
Repair Water Tank	560.08	495.07	1,055.15
Sewers & Cess Pools	-	88.10	88.10
Total Cost - 1936	4,137.49	1,814.72	5,952.21
" - 1935			3,248.22
" - 1934			2,600.78
" - 1933			625.68
" - 1932			1,189.54