

THE CLEVELAND CLIFFS IRON CO  
ORE MINING DEPARTMENT  
ANNUAL REPORT OF GENERAL MANAGER  
For Year Ending December 31st 1933

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THE CLEVELAND-CLIFFS IRON COMPANY  
ORE MINING DEPARTMENT  
MANAGER'S ANNUAL REPORT  
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Ishpeming, Michigan  
March, 7th, 1934

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 1933.

The inventories, maps, statements relative to the 1933 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.

During the year the depression was still upon us and the local conditions have been bad. The Government stepped in and especially through the C.W.A. provided a large amount of work. People in this community have been especially hard pressed due first to the fact that many men could not get any work at all and second, on account of the banking situation. Both banks in Ishpeming failed to reopen after the President's moratorium. Two banks in Negaunee, the Negaunee National and the Negaunee State Bank, were closed during the year. The former was ready to fail and a very bad situation was avoided by the First National Bank of Negaunee taking it over. At a later date, due to the defalcation of the Assistant Cashier and Cashier, the Negaunee State Bank closed its doors. In spite of these very disturbing things, the people were surprisingly sensible and did everything in their power to meet the bad situation in a calm way without becoming panicky. The life savings of many individuals have been tied up which naturally added to the great stress in the community.

Our mines worked on a two day per week basis until April 8th, when they were closed and reopened on November 8th on a three day per week schedule.

On July 16th there was an increase in wages of approximately 15% for surface and 10% for underground employees. On this same date salaries were restored as of May, 1932.

In the middle of July, although our mines were idle, we put into effect the Employees' Representation Plan. Skeleton organizations were elected at the various properties. Later on, in the early part of 1934, when more men were working, we held another election, electing the full representation from each mine. Apparently this plan has been functioning properly. Up to the present time no complaints have come to me for settlement, they all having been handled



Mr. Greene

3-7-34

locally. All of our operations have been strictly under the N.R.A. code. We have faithfully tried to live up to its regulations.

During the year 1932, the Company carried on a very active campaign to persuade as many people as possible to plant gardens and cut wood. During the present year, practically all of the available wood in the vicinity of Ishpeming and Negaunee had been cut and it was therefore not practical for the Company to put on any active wood chopping campaign. We, however, continued to try to induce as many people as possible to plant gardens. The Company co-operated in this matter simply by furnishing the land. A much smaller wood chopping program was carried on under the direction of the Marquette County Poor Commission. They also supervised the work in the gardens and in practically all cases, where the gardens were in large areas, did the plowing, furnished the seed and fertilizer.

During the year we have naturally continued to carry on our very active safety campaign. Mr. Conibear's report outlines the results in detail.

Needless for me to tell you that during these very serious times additional burdens and worries have been placed on the shoulders of all of us. I have received the most splendid kind of co-operation from everyone and I am glad that at this time things look a little brighter.

Respectfully submitted



Manager

SRE:DP

COMPARISON OF TOTAL DAYS WORKED AND TONS  
OF ORE MINED FOR THE YEARS 1933 & 1932

	1933 Days	1932 Days	1933 Days	1932 Days
Stephenson	246	224 $\frac{3}{4}$		
Princeton	261 $\frac{3}{4}$	227		
Miscellaneous Payroll	1,322	2,328 $\frac{1}{2}$		
Shops & Storehouse	9,329	3,164 $\frac{3}{4}$		
Sherwood	4,196	287 $\frac{1}{4}$		
C.C.I.Co. Miscellaneous & General	14,460 $\frac{1}{4}$	13,068		
Negaunee Mine " "	1,569	1,258 $\frac{3}{4}$		
Athens " " "	442 $\frac{1}{2}$	360		
Cliffs Power & Light Co.	9,119 $\frac{3}{4}$	9,580 $\frac{3}{4}$		
Mesaba Range Properties	15,249	23,739 $\frac{3}{4}$		
General Roll- Undistributed	17,407	19,560		
Lloyd Mine - Dev. 6th Level.	5,275 $\frac{1}{2}$			
Total	78,877 $\frac{1}{2}$	73,799 $\frac{1}{2}$		
Grand total- All operations	188,877 $\frac{3}{4}$	188,786 $\frac{3}{4}$		
Net for operating mines	110,000 $\frac{1}{2}$	114,987 $\frac{1}{2}$	110,000 $\frac{1}{2}$	114,987 $\frac{1}{2}$
Total tons	796,715	474,424		
Tons per man per Day	7.242	4.125		
<u>OPEN PIT PRODUCTION - TONS</u>				
Tilden	94,104	19,957	2,684 $\frac{3}{4}$	968 $\frac{1}{2}$
Canesteeo	302,326		18,596 $\frac{1}{4}$	
Drew	52,047		5,750 $\frac{3}{4}$	
Total	448,477	19,957	27,031 $\frac{3}{4}$	968 $\frac{1}{2}$
Open Pit tons per Man per Day	16.59	20.61		
Net U. G. Days			82,968 $\frac{1}{2}$	114,018 $\frac{3}{4}$
Net U. G. Production	348,238	454,467		
U. G. Tons per man per day	4.197	3.99		

NOTES:

354,373 tons ore mined from Minnesota properties in 1933.  
 Cliffs Shaft, Negaunee and Athens mines idle April 8th to Nov 15th 1933.  
 Maas Mine operated on development program April 8th to Nov. 15th 1933  
 Lloyd and Gardner Mackinaw idle April 8th to Nov. 15th- Both properties developing  
 and sinking Jan to April and November to January.

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

	1930	1931	1932	1933
PRODUCT.....	2,797,426	1,609,267	347,579	252,833
<u>Timber</u>				
Feet - 6 to 8 .....	545,779	362,294	94,373	170,798
8 to 10 .....	535,590	210,599	62,778	40,634
10 to 12 .....	246,070	227,377	64,492	79,993
12 to 14 .....	93,586	110,468	50,821	60,595
14 to 16 .....	4,177	14,110	5,152	17,102
7 to 9 .....	437,735	138,996		
9 to 12 .....	123,801	29,241		
Treated Timber.....	7,892	1,760	711	
Total feet.....	1,994,630	1,094,845	278,327	369,122
Total Cost.....	\$142,297.16	\$ 83,193.29	\$ 21,585.99	\$ 30,769.30
<u>Logging</u>				
Feet 5'.....	1,405,900	340,638	27,625	
6'.....	1,177,382	747,670	2,144	909,998
7'.....	4,193,004	2,870,862	969,062	
8'.....	505,618		13,704	
Total Feet.....	7,281,904	3,959,170	1,012,535	909,998
Total Cost.....	\$ 54,263.34	\$ 28,398.21	\$ 6,748.16	\$ 6,048.14
Covering Boards - Feet.....	993,129	354,187		
Total Cost.....	\$ 12,437.37	\$ 4,451.44		
Poles - Feet.....	4,219,572	2,581,462	665,435	577,707
Total Cost.....	\$ 58,843.98	\$ 35,612.05	\$ 9,135.63	\$ 6,950.03
Wire Fencing - Rods.....	6,875	5,716	370	110
Total Cost.....	5,179.00	4,567.06	315.49	95.45
Total cost for all timber.....	\$273,020.85	\$156,222.05	\$ 37,785.27	\$ 43,862.92
Average cost per foot - Timber	.0713	.0760	.0776	.0833
" " " 100 Ft- Logging	.745	.717	.666	.6646
" " " 100 Ft- Cover Bds.	1.252	1.256		
" " " 100 Ft- Poles	1.394	1.379	1.373	1.203
" " " rod - Fencing	.753	.799	.853	.867
Feet of timber per ton of ore....	.7130	.6803	.8007	1.459
" " Logging " " " " ....	2.603	2,460	2.913	3.599
" " Poles " " " " ....	1,508	1,604	1,914	2.284
" " Covering Boards per ton ore	.355	.220		
" " Wire Fencing " " " "	.121	.0586	.0176	.007
Cost per ton for Timber.....	.0508	.0516	.0621	.1217
" " " " Logging.....	.0194	.0176	.0194	.0239
" " " " Poles.....	.0210	.0221	.0263	.0275
" " " " Cover Boards....	.0044	.0029		
" " " " Wire Fencing....	.0058	.0029	.0009	.0004
Cost per ton for all.....	.0976	.0971	.1087	.1735

The 1933 product decreased 119,515 tons ore 33% due to curtailed operations.

The total cost for all timber increased \$6,077.65 or 16% due to timbering cost during idle period.

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

	1930	1931	1932	1933
PRODUCT.....	407,925	291,057	82,119	55,939
<u>POWDER</u>				
Pounds - Gelamite "A" .....		19,150	29,500	17,400
Gelamite 2 X .....		19,250	32,000	34,200
50% L.F. ....	231,600	130,646	8,350	
60% L.F.....	228,350	129,150	3,800	
60% Gelatine .....		12,700	6,500	
Total Pounds .....	459,950	310,896	80,150	51,600
Total Cost.....	\$59,952.66	\$39,783.27	\$10,047.13	\$6,330.75
Fuse - Feet.....	645,990	432,368	128,157	96,450
Caps - Number.....	130,000	79,470	24,488	16,972
Cap Crimpers.....	1	6		
Connecting Wire.....		9	11	6
Delay Fuse .....		225	275	200
Fuse Lighters .....		4,450	2,500	3,000
Fuse Containers.....		2		3
Tamping Bags.....		29,900		
Blasting Machine.....		1		
Total cost fuse, caps etc....	\$ 5,181.52	\$ 3,563.05	\$ 1,031.02	\$ 763.02
Total Cost all Explosives....	\$65,134.18	\$43,346.32	\$11,078.15	\$ 7,093.77
Average Price per Lb. - Powder	.1303	.1279	.125	.122
Cost per Ton - Powder .....	.1469	.1367	.1223	.1132
Cost per Ton - Fuse, Caps, etc..	.0128	.0122	.0126	.0136
Cost per Ton all Explosives..	.1597	.1489	.1349	.1268
Pounds Powder per ton of Ore...	1.1275	1.0681	.9760	.9224

1933 - Product decreased 26,180 tons or 32% compared with 1932

1933 - Total cost for Explosives decreased \$3,984.38 or 36% compared with 1932  
Due to curtailment of operations.

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

	1930	1931	1932	1933
PRODUCT	2,797,426	1,609,267	372,348	252,833
<u>Powder</u>				
Pounds - 35%.....	35,000			
40%.....	362,247	50,286	8,725	1,503
50%.....	329,060	301,840	87,400	87,025
55%.....	4,350			
60%.....	462,083	247,870	3,690	8,350
1X and 2X Gelamite...	249,392	234,311	73,875	11,350
Gelamite "A" .....		8,900	25,240	23,150
Total Pounds Powder.....	1,442,132	843,207	198,930	131,378
Total Cost - Powder.....	\$185,009.94	\$106,464.82	\$24,696.02	\$15,635.14
Fuse - Feet.....	4,386,169	2,475,567	616,363	431,903
Caps - Number.....	707,928	396,091	98,058	68,119
Fuse Cutter.....	1	2		
Connecting Wire - pounds.....	62			10
Tamping Bags.....	58,300	141,800	27,400	11,300
Sealing Coumpound....Pints....	21	10	2	1
Powder Bags.....	121	61	7	18
Fuse & Cap Containers.....	7	2	2	
Fuse Lighters.....		19,000	7,450	5,850
Dealy Fuses.....		500	130	
Total cost, Fuse etc.....	\$31,976.93	\$19,742.29	\$ 4,756.35	\$ 3,360.55
Total cost all Explosives..\$	216, 986.87	\$126,207.11	\$29,452.37	\$ 18,995.69
Average Price per Lb. - Powder	.1283	.1263	.1241	.1190
Cost per ton - Powder.....	.0661	.0662	.0663	.0618
Cost per ton - Fuse etc.....	.0114	.0122	.0128	.0133
Cost per ton All Explosives...	.0775	.0784	.0791	.0751
Pounds of Powder per ton of Ore.	.5155	.5240	.5343	.5196

NOTES:

1933- Product decreased by 119,515 tons or 33%

1933- Total cost for all Explosives decreased \$9,060.88 or 36.6%.

This is due to curtailment of operations.

Explosives used during year 1933 at the Gardner-Mackinaw and Lloyd Mines was for development work and is not included in the above 1933 figures.

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

SOFT ORE MINES.

YEAR	1930		1931		1932		1933	
PRODUCT	2,797,426		1,609,267		372,348		381,210	
CLASSIFICATION	AMOUNT	PER TON	AMOUNT	PER TON	AMOUNT	PER TON	AMOUNT	PER TON
General	131,887.31	.0471	81,863.81	.0509	19,482.83	.0523	19,914.25	.0522
Iron & Steel	50,884.74	.0182	25,795.75	.0160	4,691.68	.0128	4,363.60	.0114
Machinery	154,614.44	.0553	62,589.77	.0389	12,457.69	.0334	8,735.40	.0229
Explosives	216,842.35	.0775	126,553.63	.0786	27,100.07	.0727	20,310.67	.0533
Lumber & Timber	312,235.17	.1116	184,066.64	.1144	41,529.30	.1115	50,459.11	.1324
Fuel	32,702.59	.0117	20,568.90	.0128	13,376.96	.0359	9,927.61	.0260
Electric Power	483,576.60	.1729	336,176.50	.2089	123,365.53	.3313	147,269.45	.3863
Miscellaneous	39,195.76	.0140	64,271.17	.0399	4,117.38	.0111	6,169.57	.0161
Total	1,421,938.96	.5083	901,866.17	.5604	246,121.44	.6610	254,810.52	.6684

HARD ORE MINES

YEAR	1930		1931		1932		1933	
PRODUCT & TONS	407,925		291,057		82,119		55,939	
CLASSIFICATION	AMOUNT	PER TON	AMOUNT	PER TON	AMOUNT	PER TON	AMOUNT	PER TON
General	38,098.52	.093	30,082.56	.103	4,581.34	.056	3,613.35	.065
Iron & Steel	18,242.85	.045	12,219.13	.042	1,960.90	.024	923.86	.016
Machinery	41,954.95	.103	23,716.20	.081	3,000.15	.036	3,142.11	.056
Explosives	65,134.18	.160	43,346.32	.149	11,078.15	.135	7,093.77	.127
Lumber & Timber	12,367.87	.030	7,803.59	.027	1,555.34	.019	1,787.57	.032
Fuel	4,320.58	.011	3,463.12	.012	3,532.52	.043	1,870.49	.033
Electric Power	77,919.19	.190	57,905.58	.199	23,259.17	.283	14,971.89	.268
Miscellaneous	5,186.43	.013	7,962.62	.027	1,044.71	.013	276.21	.005
Total	263,224.57	.645	186,499.12	.640	50,012.38	.609	33,679.25	.602

LABOR SUMMARY - ALL COMPANIES

PRODUCT - TONS	1930		1931		1932		1933	
	DAYS	AMOUNT	DAYS	AMOUNT	DAYS	AMOUNT	DAYS	AMOUNT
	4,568,040		2,537,021		474,424		796,715	
Surface.....	282,969 <sup>1</sup>	1,330,588.07	184,235 <sup>1</sup>	861,633.10	65,217 <sup>2</sup>	250,112.23	86,757 <sup>2</sup>	329,491.79
Cost per Ton.....		.2912		.3596		.5272		.4136
Underground.....	430,126	2,256,081.04	260,729 <sup>1</sup>	1,329,358.41	94,885 <sup>1</sup>	401,467.75	77,045 <sup>2</sup>	316,543.46
Cost per Ton.....		.4939		.5240		.8462		.3973
Supt. and General Roll.....	54,850	424,159.51	50,469 <sup>1</sup>	389,532.13	28,683 <sup>2</sup>	133,460.30	25,074 <sup>1</sup>	104,801.78
Cost per Ton.....		.0929		.1635		.2918		.1315
Grand Total.....	767,945 <sup>1</sup>	4,010,828.62	495,434	2,580,523.64	188,786 <sup>2</sup>	790,040.28	188,877 <sup>2</sup>	750,837.03
Cost per Ton.....		.878		1.0171		1.6652		.9424
Average rate per Day.....		5.23		5.21		4.17		3.98
Tons per man per Day.....		5.95		5.12		2.51		4.22

NOTE: -The above is the total of all wages and salaries for all employees of the Mining Department including the Cliffs Power and Light Co. Increase in wages effective July 16th 1933 - 10% on surface with daily hours reduced from nine to eight - 15% increase for U. G. Workers.

WORKING SCHEDULE, 1933:

Cliffs Shaft - Negaunee - and Athens Mines, - Operated 1 - 8 Hr. shift 2 days per week from Jan. 1st to April 8th 1933 and 1 - 8 Hr. shift 3 days per week basis from Nov 8th to Dec. 31st, 1933. From April 8th to Nov 8th the Mines were idle - Pumping. During the course of the two and three days per week operation the Mines actually worked four and six days per week with one-half the crew working each day.

Maas Mine; - Operated the same schedule as the above mines with exception that from April 8th to Nov. 8th. when the above mines were idle the Maas worked on a development program.

Lloyd and Gardner-Mackinaw, - Operated 1 - 8 Hr. shift 2 days per week from Jan. 1st to April 8th 1933 and 1 - 8Hr. shift 3 days per week from Nov. 8th to Dec. 31st, 1933 developing and sinking shaft. From April 8th to Nov. 8th the mines were idle- Pumping

Spies-Virgil; - Operated 2 days per week from Jan 1st. to April 28th 1933, but did not resume operation again in 1933. During the idle period from April 8th development work for the Shewood property was carried on until Nov 15th.

Minnesota Properties; Canisteo Mine and Drew Mine operated during the navigation season of 1933; all other Minnesota properties were idle in 1933.

CLIFFS SHAFT MINE

ANNUAL REPORT

YEAR 1933

1. GENERAL:

The Cliffs Shaft Mine operated from Jan. 1st to April 6th and did not resume hoisting ore until Nov. 30th. The men worked two days a week during the early part of the year, which was increased to three days when operations were resumed. Pumping was done during the idle period on a two shift a day basis. During the idle period the "B" shaft dump and pocket were rebuilt, the dump having been partially rebuilt the year before. Several changes were made in the crusher building to effect economies.

2. PRODUCTION,  
SHIPMENTS &  
STOCKPILE  
BALANCES:

a. Production by Grades:

<u>Grade</u>	<u>Tons</u>
Cliffs Shaft Lump	34,301
Cliffs Shaft Crushed	14,590
Total Cliffs Shaft	48,891
Bancroft Lump	4,800
Bancroft Crushed	2,248
Total Bancroft	7,048
GRAND TOTAL ORE	55,939

Production averaged 1331 tons of ore per day.

The production each year by grades since 1927 is as follows:

<u>Year</u>	<u>Lump Ore</u> <u>Tons</u>	<u>Crushed Ore</u> <u>Tons</u>	<u>Run-of-Mine</u> <u>Ore Tons</u>	<u>Total</u> <u>Tons</u>
1927	288,804	113,726		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

b. Shipments:

<u>Grade</u>	<u>Pocket</u> <u>Tons</u>	<u>Stockpile</u> <u>Tons</u>	<u>Total</u> <u>Tons</u>	<u>Total</u> <u>Last</u> <u>Year</u>
Cliffs Shaft Lump	235	135,068	135,303	25,505
Cliffs Shaft Crushed	882	44,280	45,162	3,727
Bancroft Lump		10,105	10,105	
Cliffs Shaft Run-of-Mine				574
Total	1,117	189,453	190,570	29,806
Total Last Year	730	29,076	29,806	
Increase in Shipments	387	160,377	160,764	



CLIFFS SHAFT MINE  
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2. PRODUCTION,  
SHIPMENTS &  
STOCKPILE  
BALANCES:

Shipments by years since 1927 are as follows:

<u>Year</u>	<u>CLIFFS SHAFT</u>			<u>BANCROFT</u>			<u>Total</u> <u>Tons</u>
	<u>Lump</u> <u>Tons</u>	<u>Crushed</u> <u>Tons</u>	<u>Run-of-Mine</u> <u>Tons</u>	<u>Lump</u> <u>Tons</u>	<u>Crushed</u> <u>Tons</u>	<u>Run-of-Mine</u> <u>Tons</u>	
1927	240781	98848		22051	4639		366319
1928	267291	93078		20049	8315		388733
1929	305278	133433		43472	28747		510930
1930	126231	30460	73881	27178	4436	13075	275261
1931	17999	12099	70541	10210	285	1686	112820
1932	25505	3727	574				29806
1933	135303	45162		10105			190570

c. Stockpile Balances:

The amount of ore left on hand on Dec. 31st, 1933 shows a considerable decrease over last year.

<u>Grade</u>	<u>Tons</u>
Cliffs Shaft Lump Ore	114,802
Cliffs Shaft Crushed Ore	85,272
Total Cliffs Shaft Ore	200,074
Bancroft Lump Ore	30,169
Bancroft Crushed Ore	30,299
Total Bancroft Ore	60,468
<b>GRAND TOTAL ORE</b>	<b>260,542</b>

The amount of ore in stock on Dec. 31st each year since 1927 follows:

Balance in Stock, Dec. 31st, 1927	73,507 Tons
1928	76,634 "
1929	31,959 "
1930	164,623 "
1931	342,860 "
1932	395,173 "
1933	260,542 "

CLIFFS SHAFT MINE  
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2. PRODUCTION,  
SHIPMENTS &  
STOCKPILE  
BALANCES:

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		3,327	3,327
Second	3,784		3,784
Third	1,659	973	2,632
Fourth	3,842		3,842
Fifth	3,844		3,844
Sixth	3,185	934	4,119
Seventh	8,241	1,833	10,074
Eighth	1,526	2,773	4,299
Ninth	1,502	254	1,756
Tenth	8,964	808	9,772
Eleventh	3,269		3,269
Twelfth		37	37
Thirteenth		2,338	2,338
Fourteenth		2,846	2,846
Total Ore	39,816	16,123	55,939
Rock			5,674
Total Ore and Rock			61,613

e. Production by Months:

<u>Month</u>	<u>Optg.</u> <u>Days</u>	<u>C.S.</u> <u>Lump</u>	<u>C.S.</u> <u>Crushed</u>	<u>Banc.</u> <u>Lump</u>	<u>Banc.</u> <u>Crushed</u>	<u>Rock</u>
January	9	7,405	3,167	1,019	438	1,764
February	8	6,578	2,816	937	401	1,438
March	9	8,011	3,433	1,305	558	1,200
April	2	1,430	612	243	104	236
November	1	614	263			42
December	13	9,806	4,299	1,753	747	994
YEAR	42	33,844	14,590	5,257	2,248	5,674

f. Ore Statement:

	<u>C.S.</u> <u>Lump</u>	<u>C.S.</u> <u>Crushed</u>	<u>Banc.</u> <u>Lump</u>	<u>Banc.</u> <u>Crushed</u>	<u>Total</u>	<u>Total</u> <u>Last</u> <u>Year</u>
On Hand Jan. 1st, 1933	215,804	115,844	35,474	28,051	395,173	342,860
Output for Year	33,844	14,590	5,257	2,248	55,939	82,119
Transfers	457		457			
Total	250,105	130,434	40,274	30,299	451,112	424,979
Shipments	135,303	45,162	10,105		190,570	29,806
Balance on Hand	114,802	85,272	30,169	30,299	260,542	395,173
Decrease in Output					26,180	

g. Delays:

<u>Date</u>	<u>Hours</u>	<u>Cause</u>	<u>Tons Lost</u>
Feb. 6th	1	Compressor switch broken.	100
Mar. 1st	1½	"A" shaft turn sheave timber broken.	100
Dec. 4th	3	Lump top-tram car off trestle.	500
TOTAL	5½		700

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3. ANALYSIS:

a. Average Analysis of 1933 Output:

<u>Grade</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Cliffs Shaft Lump	58.78	.102	6.82
Cliffs Shaft Crushed	56.36	.102	9.50
Bancroft Lump	60.81	.103	5.67
Bancroft Crushed	57.80	.109	8.85

b. Average Analysis on Straight Cargoes:

<u>Grade</u>	<u>Iron</u>	<u>MINE</u>		<u>LAKE ERIE</u>	
		<u>Phos.</u>	<u>Silica</u>	<u>Iron</u>	<u>Moist.</u>
Cliffs Shaft Lump	59.19	.108	7.51	59.67	.50

Complete Analysis for Season 1933:

<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>
C.S. Lump	58.80	.104	7.59	.47	2.40	1.50	1.04	.012	2.16
C.S. Crushed	56.75	.110	9.82	.52	2.61	1.48	1.19	.015	2.56

c. Analysis of Ore in Stock Dec. 31st, 1933:

<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>
C.S. Lump	Dried	59.04	.109	7.07	.46	2.55	1.20	.91	.019	2.10	
	Natural	58.74	.108	7.03	.45	2.54	1.19	.90	.019	2.09	0.50
C.S. Crushed	Dried	56.18	.110	10.40	.46	2.95	1.46	1.19	.020	2.36	
	Natural	54.77	.107	10.05	.45	2.88	1.42	1.16	.019	2.30	2.50
Banc. Lump	Dried	60.57	.112	7.28	.31	2.50	1.30	.98	.016	1.65	
	Natural	60.27	.111	7.25	.30	2.49	1.29	.97	.016	1.64	0.50
Banc. Crushed	Dried	56.94	.111	8.64	.36	3.03	1.90	1.23	.019	2.43	
	Natural	55.52	.108	8.42	.35	2.95	1.86	1.20	.018	2.38	2.50

4. ESTIMATE OF ORE RESERVES:

Assumptions: 8, 9 and 10 cu. ft. per ton  
10% deduction for rock  
10% deduction for loss in mining  
No Bessemer ore

a. Ore in Sight as of Dec. 31st, 1933:

Cliffs Shaft Ore:

Developed Ore	4,461,576	Tons
Prospective Ore	29,200	"
<u>TOTAL</u>	<u>4,490,776</u>	"
Unavailable Ore	3,268,000	"
Available Ore	1,222,776	"
<u>TOTAL</u>	<u>4,490,776</u>	"

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

<u>a. Ore in Sight as of Dec. 31st, 1933 - Cliffs Shaft Grade:</u>				
	Developed	Prospective	Available	Unavailable
	Tons	Tons	Tons	Tons
"A" Shaft-Pillars	1,624,533	24,000	492,033	1,108,500
Floors	<u>1,634,923</u>		<u>712,623</u>	<u>922,300</u>
Gross Total	3,259,456	24,000	1,204,656	2,030,800
"B" Shaft-Pillars	760,400	12,000	37,000	711,400
Floors	<u>757,693</u>		<u>231,893</u>	<u>525,800</u>
Gross Total	1,518,093	12,000	268,893	1,237,200
"A" & "B" GRAND TOTAL	4,777,549	36,000	1,473,549	3,268,000
Less 10% for Rock & 10%				
for Loss in Mining		<u>6,800</u>	<u>279,973</u>	
CLIFFS SHAFT NET TOTAL		29,200	1,193,576	

<u>SUMMARY:</u>	
Prospective Ore	29,200 Tons
Available Ore	1,193,576 "
GRAND NET TOTAL AVAILABLE	1,222,776 "

<u>a. Ore in Sight as of Dec. 31st, 1933 - Bancroft Grade:</u>				
	Developed Ore		Available	
				Tons
			353,316	Tons
			<u>4,900</u>	"
			358,216	"
			159,300	Tons
			<u>198,916</u>	"
			358,216	"
	Developed	Prospective	Available	Unavailable
	Tons	Tons	Tons	Tons
Pillars	241,526	6,000	129,526	106,000
Floors	<u>163,300</u>		<u>110,000</u>	<u>53,300</u>
GROSS TOTAL	404,826	6,000	239,526	159,300
Less 10% for Rock &				
10% for Loss in Mining		<u>1,100</u>	<u>45,510</u>	
BANCROFT NET TOTAL		4,900	194,016	

<u>SUMMARY:</u>	
Prospective Ore	4,900 Tons
Available Ore	194,016 "
GRAND NET TOTAL AVAILABLE	198,916 "

ORE RESERVES AS REPORTED TO STATE TAX COMMISSION:

<u>Non-Bessemer Ore:</u>	
Cliffs Shaft Available Reserves as of Dec. 31st, 1933	1,222,776 Tons
Bancroft " " " " " " "	<u>198,916 "</u>
TOTAL	1,421,692 "

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

The following table gives the ore in sight at the end of each year, the balance in sight and the new ore developed.

	<u>1930</u>	<u>1931</u>	<u>1932</u>	<u>1933</u>
Available Ore in				
Mine Beginning of Yr.	1,388,316	1,506,700	1,538,300	1,511,731
Production During Yr.	<u>412,786</u>	<u>303,638</u>	<u>87,480</u>	<u>55,939</u>
BALANCE	975,530	1,203,062	1,450,820	1,455,792
Ore in Mine End				
of Each Year	1,506,700	1,538,300	1,511,731	1,421,692
New Ore Developed	<u>531,170</u>	<u>335,238</u>	<u>60,911</u>	<u>34,100</u>
Excess over Production	118,384	31,600	26,569	90,039

Analysis of Ore Reserves:

Run-of-Mine Ore:

	<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>
Dried	58.30	.108	6.71	.400	2.45	1.50	1.20	.018	2.25	
Natural	57.02	.106	6.56	.390	2.40	1.47	1.17	.018	2.20	2.20

5. LABOR  
AND  
WAGES:

a. General:

At the beginning of the year all of the men at the mine were employed two days a week. When operations were resumed our schedule called for three days a week for every man on the job except in a very few cases, such as pumpmen's helpers, where men were employed but two days a week.

b. Comparative Statement of Wages and Product:

	<u>1933</u>	<u>1932</u>	<u>Increase</u>	<u>Decrease</u>
PRODUCT	55,939	82,119		26,180
No. of Shifts & Hours	1-8 Hr.	1-8 Hr.		
No. of Days Operated	42	60		18

AVG. NO. OF MEN EMPLOYED:

	<u>1933</u>	<u>1932</u>	<u>Increase</u>	<u>Decrease</u>
Surface	50	46	4	
Underground	<u>200</u>	<u>180</u>	<u>20</u>	
Total	250	226	24	

AVG. WAGES PER DAY:

	<u>1933</u>	<u>1932</u>	<u>Increase</u>	<u>Decrease</u>
Surface	3.28	3.72		.44
Underground	<u>3.94</u>	<u>4.26</u>		<u>.32</u>
Total	3.71	4.11		.40

WAGES PER MONTH OF 25 DAYS:

	<u>1933</u>	<u>1932</u>	<u>Increase</u>	<u>Decrease</u>
Surface	82.00	93.00		11.00
Underground	<u>98.50</u>	<u>106.50</u>		<u>8.00</u>
Total	92.75	102.75		10.00

WAGES PER MONTH OF 22 DAYS:

	<u>1933</u>	<u>1932</u>	<u>Increase</u>	<u>Decrease</u>
Surface	72.16	81.84		9.68
Underground	<u>86.68</u>	<u>93.72</u>		<u>7.04</u>
Total	81.62	90.42		8.80

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5. LABOR  
AND  
WAGES:  
(Cont.)

b. Comparative Statement of Wages and Product: (Cont.)

	<u>1933</u>	<u>1932</u>	<u>Increase</u>	<u>Decrease</u>
<u>WAGES PER MONTH OF 17 DAYS:</u>				
Surface	55.76	63.24		7.48
Underground	66.98	72.42		5.44
Total	63.07	69.87		6.80
<u>WAGES PER MONTH OF 13 DAYS:</u>				
Surface	42.64	48.36		5.72
Underground	51.22	55.38		4.16
Total	48.23	53.43		5.20
<u>WAGES PER MONTH OF 9 DAYS:</u>				
Surface	29.52	33.48		3.96
Underground	35.46	38.34		2.88
Total	33.39	36.99		3.60
<u>PRODUCT PER MAN PER DAY:</u>				
Surface	8.65	12.27		3.62
Underground	4.57	4.66		.09
Total	2.99	3.39		.40
<u>LABOR COST PER TON:</u>				
Surface	.379	.303	.076	
Underground	.861	.908		.047
Total	1.240	1.211	.029	
<u>AVERAGE PRODUCT:</u>				
Stoping & Trimming	14.16	13.47	.69	
Stoping & Trimming In- cluding Haulage Men	11.18	10.98	.20	
Avg. Wages Cont. Miners	4.07	4.70		
" " " Trammers	4.56			
" " " Labor	4.13	4.73		.60
<u>TOTAL NUMBER OF DAYS:</u>				
Surface	6,463 $\frac{1}{2}$	6,692		228 $\frac{1}{2}$
Underground	12,231	17,590 $\frac{1}{2}$		5,359 $\frac{1}{2}$
Total	18,694 $\frac{1}{2}$	24,282 $\frac{1}{2}$		5,588
<u>AMOUNT FOR LABOR:</u>				
Surface	21,210.84	24,933.67		3,722.83
Underground	48,208.46	74,565.24		26,356.78
Total	69,419.30	99,498.91		30,079.61
<u>PROPORTION OF SURFACE TO UNDERGROUND EMPLOYEES:</u>				
1928	1 to 3.67			
1929	1 to 3.66			
1930	1 to 3.76			
1931	1 to 3.66			
1932	1 to 4.60			
1933	1 to 4.00			

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6. SURFACE:

a. Buildings and Repairs:

Very little money was expended on repairs to mine buildings except the rebuilding of the "B" shaft skip dump and pocket and the changes in the laboratory.

The ordinary repairs were as follows:

Office Building -----	\$ 46.15
Shops -----	65.34
Shaft Houses -----	120.91
Engine House -----	61.46
Dry House -----	202.34
Coal Dock -----	27.82
Miscellaneous -----	120.20
Fire Protection -----	43.28
TOTAL -----	\$ 687.50

Most of the cost shown above was due to repairing windows and making changes in the steam heating system and the decreased coal consumption in the fall and early winter months has justified the changes.

The "B" shaft dump and pocket were entirely rebuilt. We had been putting off these repairs for two years and the pocket and dump were in such bad shape that a wreck was inevitable. The pocket at "B" shaft was in worse condition than the one at "A" shaft when the latter was rebuilt. Following is a detailed cost of this improvement:

	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>
"B" Shaft Dump	396.95	304.15	701.10
"B" Shaft Pocket	250.08	255.02	505.10
TOTAL	647.03	559.17	1206.20

The rebuilding of both the "A" shaft and "B" shaft pockets has speeded up the hoisting because during December the record for a day's hoist was broken. On December 30th---1633 tons was produced on an eight-hour shift.

Extensive changes were also made at the laboratory. The old laboratory work room was too crowded and the old hood did not draw properly and as a result the chemists were working in a cloud of fumes most of the time. There were times when six chemists were trying to work simultaneously and there simply was not room enough for them all to crowd around the tables. Conditions were immediately improved by taking out the partition between the laboratory and the first aid room, which doubled the size of the work room. A new hood was then built along the east wall of this enlarged room, the hood running up through the attic and out onto the roof. The top of this hood was offset to prevent rain and snow from dropping down into the solutions placed on the heating plates. One trouble with the old hood was that foreign material dropped down from the back of the hood and everything put onto the hot plates had to be kept covered. The new hood is lined with fume resisting Transite board and has a strong up draught. After the hood was finished, the old one in the northeast corner of the work room was torn out and rebuilt. The bottoms of both hoods are also lined with tile.

After the floor is repaired and the entire room and hood have been painted, the completed job will give us a first-class laboratory. The detailed cost follows:

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6. SURFACE:  
(Cont.)

a. Buildings and Repairs: (Cont.)

E & A. No. 636 - Laboratory Improvements:

Lumber and Timber -----	\$ 210.26
Hood and Flue -----	258.36
Brick -----	2.12
Rewiring & Heating Elements ----	311.10
Miscellaneous -----	35.74
Labor -----	392.30
Total -----	\$ 1209.88
Amount Authorized -----	1138.50
Overexpended -----	\$ 71.38

Another improvement started at the close of the year was the installation of a new picking belt in the crusher building. This work was started in November. The west chute under the top tram track was torn out and the west revolving screen removed. In fact all of the old slides, pockets and chutes from the top of the building down to the main floor on the west side of the crusher were torn out. A new rock trestle was built from the west side of the building to the site of the old coal dock. It is planned to dump rock on the site of the old dock and in the gravel pit beyond. One of the top tram units from the Republic Mine was installed under this new rock trestle.

7. UNDERGROUND:

b. Development Work:

Sixth Level "A" Shaft: North Vein:

Contract No. 8 raised up nearly 100 feet above the sixth level on the 3300 East coordinate line. The ore they have discovered appears to be a new lens in the foot to the north of old No. 8's stope.

Contract No. 28 extended their new stope east of the 3200 East coordinate line. This ore appears to be widening out. The ore pitches at a very flat angle to the west.

Seventh Level "A" Shaft: North Vein:

Contract No. 67 followed the vein they have been developing until it pinched out west of the 3200 East coordinate line. The contract was moved back 100 feet to the northwest to follow the ore west from the west side of their old stope at the 500 South and 3100 East intersection. To get at this ore without disturbing the haulage way, the new stope was started in the raise 25 feet below the seventh level.

Eighth Level "A" Shaft: North Vein:

Three contracts were doing development work in the North Vein; No. 4 in the extreme west side, No. 25 in the northeast corner and No. 44 in the southeast corner. No. 4 after driving south in rock for 110 feet finally hit ore, which is probably the downward extension of the ore found by Diamond-Drill Hole No. 104 on the seventh level.

Contract No. 44 is still drifting northeast in the foot trying to get under the ore found on the sixth and seventh levels by Nos. 8 and 67 contracts.

Contract No. 25 followed the North Vein west for a short distance, but the hanging came down and cut off the ore. Then it was decided to look for the ore found by Diamond-Drill Hole No. 406 on the sixth level and also for the two or three small lenses cut by No. 28's old drift out in this same area.



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7. UNDERGROUND:  
(Continued)

b. Development Work: (Cont.)

Eighth Level "A" Shaft: North Vein: (Cont.)

To accomplish that object drifting was started east from the breast of the stope located at the intersection of the 50 North and the 2950 East coordinate lines.

Ninth Level "A" Shaft: North Vein:

Contract No. 44, which was stopped the latter part of the year, was exploring in the extreme east end of the North Vein east of the 3200 East coordinate line. Some ore was found, but it was not of sufficient width to make it pay. Besides the tram was too long so it was decided to confine the exploration for ore in this area to the tenth level.

Contract No. 60 is developing a new stope in the ore found by Diamond-Drill Hole No. 418 on the ninth level. A raise was put up in this ore to the eighth level last year and the new stope is being started at the foot of this raise.

Tenth Level "A" Shaft: Bancroft Vein:

Two Contracts, Nos. 10 and 64, explored the west and east ends of the Bancroft Vein. No. 10 is developing and outlining the ore found in Diamond-Drill Hole No. 421. They have drifted north until the foot was reached and two crosscuts were started in opposite directions following east and west along the foot.

In the northeast side of the Bancroft Vein No. 64 was breasted in rock at the close of the year. The drift is being turned onto a course of approximately 45 deg. Northeast to come under the ore found by Diamond-Drill Hole No. 418 on the ninth level. It would appear from a study of the geological sections that No. 25's ore on the eighth and the ore in Hole No. 418 on the ninth level are the same ore lens.

Tenth Level "A" Shaft: Main Vein:

Contract No. 70, on the sill floor of the tenth level, is extending their main level drift east 2100 feet due east of "A" shaft. The drift is in ore and we hope to find that this is the same ore discovered by No. 44 on the ninth level.

Eleventh Level "A" Shaft: Main Vein:

Contract No. 68, the only gang developing on the eleventh level, extended their rock drift east to the 2900 East coordinate line and then came back to raise on the north side of this drift. The raise intended to find the ore discovered in Diamond-Drill Hole No. 234 did cut ore a short distance above the sill floor. This ore was followed to the south until it pinched out and at the end of the year the miners came back down the raise to follow the ore to the north.

Twelfth Level "A" Shaft: Main Vein:

Contract No. 5 so far has failed to find old No. 3's stope, which has been developed on the ninth, tenth and eleventh levels. If the ore had continued down on the same pitch and dip we should have found it in the drift on the twelfth. A raise was started on the east side of the drift, but so far the raise, which is up 30 feet above the level, has failed to find any ore.

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7. UNDERGROUND:  
(Continued)

b. Development Work: (Cont.)

Fifteenth Level "A" Shaft: Bancroft Vein:

No. 58's drift was extended north following Diamond-Drill Hole No. 422 and this drift cut two small runs of ore. It was then planned to drive the drift north into the foot far enough to provide room for a five car spot at the foot of the raise. Just as we had reached the point to stop the drift we discovered ore in the back of the drift and at the end of the year we had taken one blast in what appears to be a pretty fair grade of specular ore. Two raises are planned to go up from the back of this drift, one to the west to catch No. 10's ore on the tenth and one to the east for the ore discovered by No. 64 on the tenth.

Third Level "B" Shaft: North Vein:

Contract No. 72, drifting in the west end of the North Vein, has developed a sizable stope of high grade ore in their westerly breast. Their drift, going southeast parallel to Diamond-Drill Hole No. 106, did not show up anything worth while.

Sixth Level "B" Shaft: Fault Vein:

The raise put up by No. 33, 450 feet southwest of "B" shaft, was breasted in ore in March. During December a chute was built at the bottom of the raise. This ore is undoubtedly the same as appears in the floor of a crosscut on the fourth, which lies directly above the top of the raise.

Eighth Level "B" Shaft: North Vein:

Contract No. 57, drifting in the North Vein has been in rock, and as the material in the drift did not look very promising and no prospects were in sight after studying the sections, it was decided to raise in the ore in the stope 100 feet west of the breast of the drift.

Tenth Level "B" Shaft: Section 9 Exploration:

Contract No. 47 continued to drift southwest in footwall rock, being located close to the 2100 West coordinate line at the close of the year.

c. Stoping:

First Level "A" Shaft: Bancroft Vein:

Contract No. 34 continued to put up a stope raise on the footwall in the southwest corner of the vein.

First Level "A" Shaft: North Vein:

No. 9 contract mined developed reserves in the northeast corner of the North Vein near the 1000 East coordinate line.

Second Level "A" Shaft: Bancroft Vein:

No. 34 contract put up another raise on the foot of their deposit on the 1100 East coordinate line.

Second Level "A" Shaft: Main Vein:

Known reserves, that is the floor of the second level, was mined by Contract No. 27, 600 feet northwest of "A" shaft.

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7. UNDERGROUND:  
(Continued)

c. Stoping: (Continued)

Third Level "A" Shaft: Bancroft Vein:

Contract No. 29 continued to stope on the sub a short distance below the third level, 200 feet north of the south line of the Bancroft Lease, on the 1200 East coordinate line.

Third Level "A" Shaft: North Vein:

In the west end of the North Vein contract No. 30 mined out the floor of their stope between the second and fourth levels. This gang is working 700 feet northwest of "A" shaft.

Fourth Level "A" Shaft: Bancroft Vein:

Contract No. 22 continues to stope due north a short distance north of the south line of the Bancroft Lease following Diamond-Drill Hole No. 397.

Fifth Level "A" Shaft: Bancroft Vein:

In the extreme southeast corner of the Bancroft Lease, three gangs, Nos. 51, 61 and 66, are stoping Bancroft ore. These gangs are cross-cutting, taking backs and floors.

Fifth Level "A" Shaft: North Vein:

No. 32, working in two places directly east of Nos. 51 and 61, are mining the ore in the back of the fifth level and in the floor of the sub-level above. These two gangs are mining east of the east line of the Bancroft Lease. In the northwest corner of the level between "A" and "B" shafts, two contracts, Nos. 42 and 49, are taking floors; No. 42 is directly north of "B" shaft, while No. 49 is 500 feet northeast of "B" shaft.

Fifth Level "A" Shaft: Southeast Vein:

In the west end of the Southeast Vein contract No. 6 is taking the floor of the vein half way down to the sixth level. The ore is very narrow and we have decided to raise up from the back of the sixth level where the ore still has a fair width.

Contract No. 2 has practically finished taking the floor of the subs above the fifth in the central portion of the Southeast Vein.

Sixth Level "A" Shaft: North Vein:

Contract No. 40 continues to drive their sub-level stope west from their raise. The breast of the stope is now located 700 feet northwest of "A" shaft. Three more gangs, Nos. 16, 20 and 52, are taking out developed ore reserves. No. 16, on the west side of the vein, continued to stope raise close to the south side of the Bancroft Lease. No. 52, 200 feet east of No. 16, stoped north and east close to the 1800 East coordinate line. Contract No. 20 took floors in the south central portion of the vein close to the main fault. In the extreme east end of the North Vein, Contract No. 8 on the sub above the sixth level, is stoping south and east on the 3200 East coordinate line.

Sixth Level "A" Shaft: Incline Vein:

In the extreme southeast side of the sixth level contract No. 12 is raising in the back of their old stope. The ore is better and freer from sulphur. No pyrite is visible in the ore now being mined. A carefully selected sample taken all over the large pile of broken ore lying in No. 12's stope shows the sulphur to average .083, which is much lower than one would expect from the looks of the ore.

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7. UNDERGROUND:  
(Continued)

c. Stoping: (Continued)

Sixth Level "A" Shaft: Southeast Vein:

In the southeast end of this vein contract No. 45 is taking up benches on the foot between the sixth and seventh levels. This ore is so flat that a scraper has to be used to get it down to the chute. As the main scraper is located on the seventh level and the ore would have to be cross hauled two or three times, we rigged up a small 42" scraper and an air hoist to scrape the ore off the foot.

Seventh Level "A" Shaft: Bancroft Vein:

Contract No. 62, 850 feet northeast of "A" shaft in the west end of the vein, mined the floor between the seventh and eighth levels.

Seventh Level "A" Shaft: North Vein:

Two gangs, Nos. 54 and 59, are stoping and taking floors respectively on the seventh level at the north side of the North Vein. On the east end of the same vein contract No. 23 mined out all the available ore on the west side of their stope and then started exploring on the east side to try and find the ore in the raise a short distance beyond.

Eighth Level "A" Shaft: Bancroft Vein:

In the central portion of the Bancroft Vein contract No. 15 is taking the floor between the eighth and tenth levels. Most of the mining during 1933 was confined to the west of the stope.

Eighth Level "A" Shaft: Southeast Vein:

In the extreme west end of the Southeast Vein No. 41 is drifting west on the 1100 South coordinate line. There is a seam of rock cutting across the ore in the stope which means considerable sorting. At that it pays because we get five cars of ore for each car of rock picked out.

Ninth Level "A" Shaft: Main Vein:

Contracts Nos. 53 and 55 in the central portion of the main deposit mined floors the entire year between the eighth and ninth levels.

Tenth Level "A" Shaft: Main Vein:

Contracts Nos. 11, 21, 24, 26, 39, 50 and 70 were all stoping above or below the tenth level. Contract No. 11 stope raised from the sub below the tenth up on the footwall 1600 feet west of "A" shaft. Nos. 21, 24 and 26 mined floors and the latter also stripped ore off the foot side of their stope 1900 feet west of "A" shaft. No. 39 breast stoped in the central portion of the Main Vein, while No. 50 crosscutted to the south on the sub above the tenth on the north side of the deposit 1600 feet west of the shaft. No. 70 continued to breast stope southeast in the northeast corner of the level a short distance above the tenth.

Eleventh Level "A" Shaft: South Lens:

No. 3 contract is mining floors between the tenth and eleventh levels close to their raise put up from the eleventh level.

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7. UNDERGROUND:  
(Continued)

c. Stoping: (Continued)

Eleventh Level "A" Shaft: Main Vein:

In the north central part of the Main Vein No. 7 still mines floors between the tenth and eleventh levels.

"B" SHAFT:

There are fewer contracts stoping in "B" shaft than "A" and less than half the total output comes from "B" shaft territory.

First Level: Main Vein:

Two gangs, Nos. 17 and 18, stoped above the first level. No. 17 is developing a new stope on the 1220 foot sub-level 500 feet south-east of "B" shaft directly under the lump stockpile area. No. 18 has been taking benches on the foot of their stope southwest of the shaft on the 1204 foot sub-level.

First Level: Southeast Vein:

Two gangs, Nos. 1 and 35, stripped ore off the foot and took up benches on the bottom of their stopes, 1200 feet southeast of "B" shaft.

Seventh Level: North Vein:

Contract No. 13 in the south central part and No. 36 in the north-west corner mined known reserves. Both gangs mined floors.

Seventh Level: Main Vein:

In the extreme east end of the Main Vein No. 38 stoped on a new sub a short distance below the level, while No. 19, 400 feet west of No. 38, stope raised on the footwall.

Eighth Level: Main Vein:

No. 69 moved into the central part of the Main Vein and started to take down the back of an old stope. We found more ore there than we had expected to find and by the end of the year a good sized pile of ore was broken.

Tenth Level: Fault Vein:

No. 14 gang, mining in the Fault Vein 1300 feet southwest of "B" shaft, took up the bottom of their stope.

Twelfth & Thirteenth Levels: Main Vein:

Five contracts, Nos. 31, 43, 46, 48 and 56, mined known reserves either above or below the twelfth and thirteenth levels. No. 31 took floors on the twelfth level elevation 1100 feet west of the shaft; No. 43 on a sub above the twelfth, 1300 feet west of "B" shaft, breast stoped east; Nos. 46 and 48 on the thirteenth mined floors, while No. 56 in the extreme southwest corner of the twelfth level took out floors between the twelfth and thirteenth levels.

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7. UNDERGROUND:  
(Continued)

Fifteenth Level: Section 3 Exploration:

No. 71 contract, drifting northeast to the Section 3 ore body, worked only two months, January and February. The drift was in unusually hard ground. The following table shows the progress of this drift and the distances from the shaft.

	<u>Footage</u>	<u>Material</u>	<u>Distance from "B" Shaft</u>	<u>Distance from Sec. 3 Shaft Site</u>
At the end of 1932	2023		2023	2777
January - 1933	25	Diorite	2048	2752
February - 1933	26	"	2074	2726

e. Drifting and Raising:

The amount of drifting and raising done in 1933 will naturally show a further decrease compared with previous years because of less days operated.

<u>Year</u>	<u>Rock Drifts &amp; Raises</u>	<u>Ore Drifts &amp; Raises</u>	<u>Total</u>
1933	615'	372'	987'
1932	1357'	585'	1942'
1931	3577'	3212'	6789'
1930	6496'	3704'	10200'
1929	5443'	3082'	8525'
1928	4762'	1848'	6610'
1927	4874'	2494'	7368'
1926	3051'	2907'	5958'

f. Explosives, Drilling and Blasting:

Explosives Statement for 1933:

Stopping and Development in Ore:

<u>Kind</u>	<u>Quantity</u>	<u>Average Price</u>	<u>Amount 1933</u>	<u>Amount 1932</u>
Gelamite "A"	10,000	12.25	1225.68	1937.50
Gelamite "2X"	32,400	12.22	3960.00	3912.50
50% L.F. Powder				1008.88
60% Gelatine				646.49
<b>Total Powder</b>	<b>42,400</b>	<b>12.23</b>	<b>5185.68</b>	<b>7505.37</b>
Caps, Blasting No. 6	13,772	10.80M	148.85	210.14
Fuse, Eagle Brand	78,450	5.408M	424.27	521.87
Connecting Wire lbs.	6	.323	1.94	3.26
Delay Fuses	150	13.78C	20.67	25.52
Fuse Containers	2	2.37	4.74	
Fuse Lighters	2,500	6.75M	16.89	14.18
Leading Wire	250	1.00	2.53	
<b>Total Fuse, Etc.</b>			<b>619.89</b>	<b>774.97</b>
<b>TOTAL ALL EXPLOSIVES</b>			<b>5805.57</b>	<b>8280.34</b>
<b>PRODUCT</b>			<b>55,939</b>	<b>82,119</b>
Pounds Powder Per Ton of Ore			.7561	.7212
Cost per Ton for Powder			.0927	.0914
Cost per Ton for Fuse, Etc.			.0110	.0094
Cost per Ton for All Explosives			.1037	.1008

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7. UNDERGROUND:  
(Continued)

f. Explosives, Drilling and Blasting: (Cont.)

Explosives Statement for 1933:

Development in Rock and No. 3 Drift:

	<u>Quantity</u>	<u>Average Price</u>	<u>Amount 1933</u>	<u>Amount 1932</u>
Gelamite "A"	7,400	12.52	926.82	1750.00
Gelamite "2X"	1,800	12.12	218.25	87.50
50% L.F. Powder				6.12
60% " "				503.51
60% Gelatine				194.63
Total Powder	9,200	12.45	1145.07	2541.76
No. 6 Blasting Caps	3,200	10.93M	34.98	70.47
Fuse	18,000	5.30M	95.42	175.98
Connecting Wire				.97
Delay Fuses	50	13.98C	6.99	4.58
Fuse Lighters	500	6.75M	3.37	4.05
Fuse Containers	1	2.37	2.37	
Total Fuse, Etc.			143.13	256.05
<b>TOTAL ALL EXPLOSIVES</b>			<b>1288.20</b>	<b>2797.81</b>

FOOTAGE	615	1357
Cost per Foot All Explosives Dev. in Rock	2.09	2.06
Total Cost of Explosives as per Cost Sheet	7093.77	11078.15
Average Cost per Pound for Powder	.122	.125

8. COST OF OPERATING:

a. Comparative Mining Costs:

	<u>1933</u>	<u>1932</u>	<u>Increase</u>	<u>Decrease</u>
PRODUCT	55,939	82,119		26,180
Underground Costs	1.238	1.391		.153
Surface Costs	.257	.243	.014	
General Mine Accounts	.363	.530		.167
Cost of Production	1.858	2.164		.306
Depreciation	.028	.064		.036
Taxes	.630	.919		.289
(Loading & Shipping (Based on Production))	.143	.026	.117	
Total Cost at Mine	2.659	3.174		.515
Loading & Shipping Based on Tons Loaded	.419	.717		.298

Despite the fact that rock was picked out of the stockpile ore while loading was in progress the cost per ton for 1933 is considerably below 1932.

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8. COST OF  
OPERATING:  
(Continued)

b. Detailed Cost Comparison:

	<u>1 9 3 3</u>		<u>1 9 3 2</u>		<u>Increase</u>		<u>Decrease</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
A Exploring in Mine	305.38	.005	591.17	.007			285.79	.002
B Development in Rock	5563.12	.099	11950.02	.145			6386.90	.046
C Development in Ore	2626.28	.047	4389.72	.053			1763.44	.006
D Stopping	18661.66	.333	25902.82	.315	.018		7241.16	
E Timbering	1512.02	.027	2227.22	.027			715.20	.000
F Traming	15920.26	.285	26486.88	.323			10566.62	.038
G Pumping	9545.55	.171	16071.64	.196			6526.09	.025
H Compressors & Air Pipes	5850.83	.105	8923.50	.107			3072.67	.002
I Back Filling	800.32	.014	1812.07	.023			1011.75	.009
J Underground Superintendence	3075.90	.055	5332.09	.065			2256.19	.010
K Compressors & Power Drills	132.52	.002	232.54	.003			100.02	.001
L Hand Tram Equipment	99.65	.002	693.61	.009			593.96	.007
M Scrapers & Mech. Loaders	2914.87	.053	4701.82	.057			1786.95	.004
N Electric Tram Equipment	2002.82	.036	4543.47	.056			2540.65	.020
O Pumping Machinery	238.50	.004	357.82	.005			119.32	.001
P Hoisting	3327.91	.059	4996.14	.061			1668.23	.002
Q Stocking Ore	2229.47	.040	2499.17	.030	.010		269.70	
R Screening & Crushing	1791.64	.032	2858.22	.036			1066.58	.004
S Dry House	1582.56	.028	3391.72	.041			1809.16	.013
T Gen'l Surface	1263.27	.023	2366.45	.029			1103.18	.006
U Hoisting Equipment	2186.68	.039	2711.99	.033	.006		525.31	



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8. COST OF  
OPERATING:  
(Continued)

b. Detailed Cost Comparison: (Cont.)

	<u>1 9 3 3</u>		<u>1 9 3 2</u>		<u>Increase</u>		<u>Decrease</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
V Shaft	113.63	.002	444.98	.005			331.35	.003
W Top Tram Equipment	349.81	.006	364.27	.004		.002	14.46	
X Docks, Trestles & Pockets	1284.34	.023	101.05	.001	1183.29	.022		
Y Mine Buildings	253.14	.005	223.95	.003	29.19	.002		
Z1 Insurance	109.58	.002	187.10	.002			77.52	.000
Z2 Mining Engineering	680.42	.012	1220.64	.015			540.22	.003
Z3 Mech. & Elect. Engineering	507.85	.009	837.56	.010			329.71	.001
Z4 Analysis & Grading	542.53	.010	1224.29	.015			681.76	.005
Z5 Personal Injury	4820.49	.086	7470.80	.091			2650.31	.005
Z6 Safety Dept.	171.63	.003	538.71	.007			367.08	.004
Z7 Telephones & Safety Devices	350.66	.006	476.45	.006			126.29	.000
Z8 Local & General Welfare	1703.08	.031	3698.08	.045			1995.00	.014
Z9 Special Exp., Pens. & Allows.	2771.20	.050	11847.31	.144			9076.11	.094
Z10 Ishpeming Office	5311.06	.095	10592.19	.129			5281.13	.034
Z11 Mine Office	3320.24	.059	5442.56	.066			2122.32	.007

With two exceptions all the accounts show lesser amounts expended in 1933 than in 1932 and that is to be expected when you consider that the mine operated (42) shifts in 1933 and (60) in 1932. The increase in wages in the past year was not enough to counteract the shorter working schedule. Furthermore some of the accounts shown above do not give the true picture, as for instance Account "G Pumping" covers only five months pumping cost in 1933 compared with about seven months in 1932. April and May 1932 are included in the cost for that year, but not in 1933 and those two months always show high pumping costs because of the spring break-up.

Detailed cost comparisons will be shown only in case there is some unusual increase or decrease and also for those accounts where comparison can be made for all the twelve months.

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8. COST OF OPERATING:  
(Continued)

b. Detailed Cost Comparison: (Cont.)

D. STOPPING:

The detailed cost for the past two years follows:

	1 9 3 3		1 9 3 2	
	Amount	Cost Per Ton	Amount	Cost Per Ton
Contract Labor	10865.21	.208	15606.47	.203
Other Labor	899.93	.017	1822.66	.023
Total Labor	11765.14	.225	17429.13	.226
Total Supplies	6896.52	.131	8473.69	.110
Total Labor & Supplies	18661.66	.356	25902.82	.336
<u>Detail of Supplies:</u>				
General Supplies	375.07	.007	434.61	.006
Iron & Steel	65.56	.001	52.19	.001
Oil & Grease	69.21	.001	100.57	.001
Machinery Supplies	907.87	.017	613.10	.008
Explosives	5157.69	.099	6872.05	.089
Lumber & Timber			26.38	.000
Sundries	6.75	.000	17.68	.000
Expense Accts. Distributed	299.40	.006	357.10	.005
Total	6896.52	.131	8473.69	.110
Tons Produced	52,361		76,902	

Supply cost per ton increased in 1933 due partially to increase in explosive cost and due to more machinery supplies being used.

G. PUMPING:

The following table gives a detail of the pumping expense for the past two years:

	1 9 3 3	1 9 3 2
Pumpmen Labor	3,564.33	7,539.29
Other Labor	395.50	
Total Labor	3,959.83	7,539.29
Oil, Waste, Etc.	247.09	116.06
Tools & Miscellaneous Supplies	244.38	68.90
Electric Light	314.79	399.54
Compressor Charge	2,103.60	1,102.61
Electric Power	20,505.30	19,092.85
Total Supplies	23,415.16	20,779.96
Total Labor & Supplies	27,374.99	28,139.25
Gallons of Water Pumped 1933	362,953,379	
1932	369,057,075	
1931	350,061,850	
1930	446,403,100	
1929	461,403,025	

CLIFFS SHAFT MINE  
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8. COST OF OPERATING:  
(Continued)

b. Detailed Cost Comparison: (Cont.)

G. PUMPING:

The total amount of water pumped was a little less in 1933 than in 1932. Although we showed a large decrease in pumpmen's labor, the electric current expense increased. Ordinarily pumping is done on three shifts and the two reciprocating pumps will handle the water. When pumping is reduced to two shifts, all three pumps must be operated and the third unit, which is a centrifugal pump, does not operate as efficiently with all three pumps going as it does when run alone due to increased frictional resistance. The same is true although to a lesser degree with the Prescott pumps. Actual tests underground confirmed the above statements. Another reason for the cost not being decreased more in 1933 was the sump cleaning job. The main sump had not been cleaned for seven or eight years and as the storage capacity of the sump was decreased over a half by the silt in the bottom of it and as more or less silt was getting into the pump valves, we took out 200 to 250 tons of lean ore which was dumped on the rock dump.

When the mine closed on April 6th and its reopening date was indefinite it was decided to reduce expenses to a minimum. Our labor cost was reduced by pumping only two shifts and that plan was made possible by building two temporary dams on the fifteenth level in the main haulage drift on both sides of "A" shaft. Water was allowed to accumulate behind these dams, the overflow going into the main sump. The cost of these dams also increased the 1933 pumping charge.

To sum up the pumping charges, the increase in compressor and electric power charges was not cash being merely a bookkeeping charge between the mine and the Cliffs Power & Light Company.

H. COMPRESSORS & AIR PIPES:

The detailed cost of operating compressors for the past two years follows:

	<u>1 9 3 3</u>	<u>1 9 3 2</u>
Labor	2,003.11	2,282.61
Tools & Miscellaneous Suppls.	2.10	.48
Electric Light	66.22	55.15
Cooling Pump	128.11	149.04
Electric Power	5,394.99	6,279.48
Heating Expense	221.46	371.66
Oil, Waste & Packing	57.66	77.85
<u>Total Supplies</u>	<u>5,870.54</u>	<u>6,933.66</u>
Total Labor & Supplies	7,873.65	9,216.27
Total Operating Expense	8,059.78	9,459.38
Cost per 1000 Cu. Ft.	.0503	.0502
Cu. Ft. Compressed	160,033,500	188,127,000

CLIFFS SHAFT MINE  
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8. COST OF  
OPERATING:  
(Continued)

B. Detailed Cost Comparison: (Cont.)

H. COMPRESSORS & AIR PIPES: (Cont.)

The labor and supplies for piping underground was as follows:

	<u>1933</u>	<u>1932</u>	
Labor	198.36	551.24	
Supplies	446.57	262.26	
Total	644.93	813.50	

L. HAND TRAMMING EQUIPMENT:

The expense for 1933 was practically nil.

M. SCRAPERS & MECHANICAL LOADERS:

Cost for 1933 again shows a reduction. The detail for three years follows:

	<u>1933</u>	<u>1932</u>	<u>1931</u>
3/8" Wire Rope	8.40	6.51	19.85
1/2" " "	17.89	29.54	365.93
5/8" " "	778.85	1021.68	4807.83
3/4" " "			231.58
Electrical Supplies	531.35	178.93	2982.76
48" Blades	121.32	365.91	1065.24
42" "		24.32	156.30
Shoes, Gears, Plates, Etc.	68.39	356.03	130.56
Other Supplies	397.95	233.54	
Total	1924.15	2216.46	9760.05

N. ELECTRIC TRAM EQUIPMENT:

The cost comparison for 1933 and 1932 follows:

	<u>1933</u>	<u>1932</u>	
Generators	134.90	7.09	
Locomotives	1303.31	1504.39	
Wiring	255.38	653.01	
Main Line Tracks	1785.86	1575.58	
Main Line Cars	321.51	1058.00	
Spotting Engines		77.35	
Total	3800.96	4875.42	

Cost per Car	.157	.134	
--------------	------	------	--

Cost per unit car shows an increase due to repairing the largest of the two motor generator sets in the engine house. Main Line Tracks also cost us more money due to rebuilding the tenth level track in both "A" and "B" shafts. Derailments were frequent on this level and the frogs and switches were also in poor shape particularly on the "A" shaft side.

CLIFFS SHAFT MINE  
ANNUAL REPORT  
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8. COST OF OPERATING:  
(Continued)

b. Detailed Cost Comparison: (Cont.)

P. HOISTING & U. HOISTING EQUIPMENT:

The following table gives the detailed cost for these accounts for the past two years:

	<u>1933</u>	<u>1932</u>
Maintenance	3948.94	2756.90
Engineers' Labor	1564.25	1973.13
Other Labor	45.72	36.37
Total Labor	<u>1609.97</u>	<u>2009.50</u>
Oil, Waste & Packing	39.57	38.12
Tools	36.22	48.30
Electric Light	77.02	83.10
Electric Power	2349.66	3285.73
Heating Expense	857.78	771.74
Total Supplies	<u>3360.25</u>	<u>4226.99</u>
Total Operating	4970.22	6236.49
Total Maint. & Opt.	8919.16	8993.39

The total cost for 1933 shows about the same figure as that for 1932, but the maintenance cost is much higher. Last year (1932) we rebuilt the "A" shaft dump and part of the pocket. During 1933 all the "B" shaft pocket from the foundation up and the dump itself was rebuilt. The following table shows the cost of both jobs:

	<u>"A" Shaft Dump &amp; Pocket</u>	<u>"B" Shaft Dump &amp; Pocket</u>
Labor	\$ 725.81	\$ 647.03
Supplies	869.65	559.17
Total	<u>\$ 1595.46</u>	<u>\$ 1206.20</u>

The "B" shaft job was a much more extensive one than that at "A" shaft, but as a result of the experience of doing one job last year, we were able to materially reduce the cost this year.

Following is a detail of the other items under Hoisting Equipment:

	<u>1933</u>	<u>1932</u>
Electric Hoists	381.22	279.52
Wire Rope	98.75	68.44
Skips, Cages & Skiproads	3468.97	3419.22
Total	<u>3948.94</u>	<u>3767.18</u>

Another repair job done in March 1933 was an emergency one. On March 1st the timber holding down the main turn sheave in "A" shaft house broke. Temporary repairs were made so that we could hoist the men. Permanent repairs were started as soon as the men were hoisted. Two heavy steel I-beams were substituted for the old fir timbers and these beams were bolted securely in place by running bolts down into the concrete in the side of the shaft house into pockets cut out by drilling. Heavy washers and plates were then fastened onto the ends of the bolts making a permanent job.

CLIFFS SHAFT MINE  
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8. COST OF OPERATING:  
(Continued)

b. Detailed Cost Comparison: (Cont.)

P. HOISTING & U. HOISTING EQUIPMENT: (Cont.)

Another repair job that had been delayed for some time was the straightening up of the "A" shaft counterweight pipe. The pipe fastenings were removed all the way from surface to the fourth level, the pipe jacked up and then securely fastened after it was plumb. The pipe was so far out of plumb that at a knuckle just above the first level the hoisting rope had completely cut away a section of pipe about 30 feet long.

X. DOCKS, TRESTLES & POCKETS:

This account shows an increase due to laying new sollar on lump ore stocking grounds and rebuilding "B" shaft pocket in 1933.

<u>DETAIL OF SUPPLIES USED:</u>	<u>1 9 3 3</u>		<u>1 9 3 2</u>		<u>Increase</u>	<u>Decrease</u>
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>		
General Supplies	3613.35	.065	4581.34	.056	.009	
Iron and Steel	923.86	.016	1960.90	.024		.008
Oil & Grease	1053.04	.019	1071.60	.013	.006	
Machinery Supplies	2089.07	.037	1928.55	.023	.014	
Explosives	7093.77	.127	11078.15	.135		.008
Lumber and Timber	1787.57	.032	1555.34	.019	.013	
Fuel	1870.49	.033	3532.52	.043		.010
Electric Power	14971.89	.268	23259.17	.283		.015
Sundries	892.97	.016	1539.32	.019		.003
Other Mines & Accts.	943.81	.017	494.61	.006	.011	
Shops	327.05	.006			.006	
<b>TOTAL</b>	<b>33679.25</b>	<b>.602</b>	<b>50012.38</b>	<b>.609</b>		<b>.007</b>

10. TAXES:

The City taxes on the description called the "Cliffs Shaft Mine" follows:

	<u>1 9 3 3</u>		<u>1 9 3 2</u>	
	<u>Valuation</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Taxes</u>
Realty	1,885,000	58,511.32	2,400,000	80,368.08
Personal	1,000,000	31,040.50	1,000,000	33,486.70
Lot 2, Sec. 2	200,000	6,208.09	240,000	8,036.81
Lot 174, Nelson's Addition	80	2.48	90	3.01
So. 35.91 Ft., Lot 179	30	.93	40	1.34
N $\frac{1}{2}$ of N.E. $\frac{1}{4}$ & N.W. $\frac{1}{4}$ , Sec. 9	75,000	2,328.05		
<b>Total</b>	<b>3,160,110</b>	<b>98,091.37</b>	<b>3,640,130</b>	<b>121,895.94</b>
Collection Fees		980.91		1,218.96
<b>Grand Total</b>		<b>99,072.28</b>		<b>123,114.90</b>
Taxes per Ton Produced		1.771		1.499
Taxes per Ton Shipped		.520		4.131

The valuation and taxes paid by the Cliffs Shaft Mine since 1930 follow:

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10. TAXES:

	<u>Taxes</u>	<u>Total</u> <u>Valuation</u>
1933	\$ 99,072.28	\$ 3,640,130
1932	123,114.90	4,000,150
1931	159,547.60	4,000,150
1930	146,588.82	3,725,150

It will be noted that the taxes are only 2/3 of what they were at the peak.

Taxes levied by the City of Ishpeming for the past three years follow:

	<u>1 9 3 3</u>	<u>1 9 3 2</u>	<u>1 9 3 1</u>
State Tax -----	\$ 5,445.48	\$ 38,301.72	\$ 46,570.45
County Tax -----	56,865.76	84,033.94	95,544.29
County Road Tax -----	4,739.04		29,295.41
County Debt Service Tax ---	12,842.75		
Highway Fund Tax -----	40,000.00	56,000.00	60,000.00
Library Fund Tax -----	6,500.00	9,000.00	11,000.00
Fire Fund Tax -----	8,000.00	10,500.00	11,500.00
School Fund Tax -----	72,032.21	104,000.00	165,000.00
School Debt Service Tax ---	26,950.00		
One Mill Tax -----		11,293.74	12,626.18
Sewer Fund Tax -----	2,000.00	1,500.00	2,000.00
Cemetery Fund Tax -----	1,500.00	2,500.00	3,500.00
City Tax -----	49,000.00	58,000.00	64,000.00
City Debt Service Tax -----	4,200.00		
Rejected Tax -----	124.91	60.29	64.42
Water Fund Tax -----	4,000.00	3,000.00	2,500.00
<b>TOTAL TAX</b>	<b>\$ 294,200.15</b>	<b>\$ 378,189.69</b>	<b>\$ 503,600.75</b>

11. ACCIDENTS  
AND  
PERSONAL  
INJURY:

There were two compensable accidents at the Cliffs Shaft Mine in 1933. Following is the comparison for the past four years:

	<u>1933</u>	<u>1932</u>	<u>1931</u>	<u>1930</u>
No lost time accidents -----	8	9	30	61
Compensable accidents -----	2	1	2	3
Lost time, but no compensation paid --	0	0	0	1

Joseph Hyytinen hurt his foot by a chunk rolling off a car while loading ore at a chute. He received \$ 175.37 in compensation.

John Tynismaa, timber foreman, lost seven weeks due to eye injuries, which resulted from the cleaning down of the counterweight compartment in "A" shaft. The company, however, although we paid \$ 110.00 for this accident was not entirely responsible.

12. NEW  
CONSTRUCTION:

Shortly before the close of the year we started installing a new picking belt in the crusher building. It is impossible to hoist all the ore free from rock when using scrapers. Prior to the mechanization of the mines when all the ore was loaded into underground cars by hand it was a comparatively simple matter to separate the rock from the ore. Rock has to be broken with the ore because it occurs as seams in the breasts and floors of the stopes and more or less hanging and foot rock also becomes mixed with the ore in the stopes. Although every effort is made to blast the rock seams separately and then scrape or pick and load the rock separately, still we hoist a certain percentage of off grade material with the ore.

CLIFFS SHAFT MINE  
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12. NEW  
CONSTRUCTION:  
(Continued)

The logical place to pick out this rock is in the crusher building before the chunks enter the crusher and are reduced in size permitting a lot of fine rock to get into the Crushed ore, where it can never be picked out.

E & A. No. 634 authorized us to install a picking belt and rock disposal plant. By the end of the year the belt was installed and most of the rock trestle erected. The chutes under the belt were partially completed and the same is true of the top tram plant brought down from the Republic Mine. The original idea was to use a dump body truck for rock disposal and the E & A. contemplated the purchase of a 1½ ton truck, but it was finally decided to adopt the more expensive but surer plan of using a trestle and saddle back car and dump rock on the old gravel pit site and in the east end of the old coal dock.

The E & A. authorized us to spend \$ 3,960.00, of which \$ 2,736.32 was unexpended at the end of the year.

14. MAINTENANCE  
AND  
REPAIRS:

The following tabulation shows the maintenance cost of our property in the City of Ishpeming. A little more repairing was done in 1933 than in 1932, but at that all of our houses are in bad shape. The General Manager's house is actually shabby, the paint having peeled off in many places. The Smith Purchase, occupied by W.R. Meyers, absolutely has to be painted this summer if the company wishes to save a heavy repair bill. You simply can't put off painting any longer. I have mentioned this in the last three annual reports and conditions become progressively worse each year.

Following are the costs for the past four years:

	<u>1933</u>	<u>1932</u>	<u>1931</u>	<u>1930</u>
Cliffs Shaft Rented Houses	426.42	202.76	862.86	5729.10
Angeline Rented Houses	227.54	504.81	911.27	3157.29
Second Addition	553.07	182.58	637.66	1221.87
Smith Purchase	81.40	74.89	166.14	301.94
Hyde Purchase No. 1	22.57	13.43	6.12	276.37
Nelson Purchase	83.64	15.96	119.61	482.58
Outhwaite Purchase	147.94	131.05	443.42	181.56
Nebraska Purchase	93.21	8.75	284.85	117.68
Salisbury Rented Houses	66.24	60.87	582.67	144.19
Hard Ore Location	1146.88			
Hyde Purchase No. 2	2.89			
TOTAL	2851.80	1195.10	4014.60	11612.58

NOTE: Of the above cost for 1933 several large amounts were spent not on the houses themselves, but on the streets and main sewers.

Detail of Street and Main Sewer Expense:

<u>Sewers:</u>	
Second Addition (West Empire Street) -----	\$ 213.92
Angeline Location -----	34.63
Salisbury Location -----	35.96

<u>Streets:</u>	
Gravelling West Empire St. by City of Ishpeming	149.42
Snow Plowing - Salisbury Location -----	29.85

The above shows that in the Second Addition \$ 363.34 was spent on sewers and streets, which leaves a balance of \$ 189.73 for the houses instead of \$ 553.07 as shown on the recap.



CLIFFS SHAFT MINE  
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15. POWER:

Following are the electric power costs for 1933 and 1932:

	<u>1 9 3 3</u>			<u>1 9 3 2</u>		
	<u>K.W.H.</u>	<u>AMOUNT</u>	<u>PER TON</u>	<u>K.W.H.</u>	<u>AMOUNT</u>	<u>PER TON</u>
Tramming	51,000	772.96	.014	54,900	823.50	.010
Pumping	1,369,067	20820.09	.372	1,299,426	19491.39	.237
Hoisting	160,337	2426.68	.043	224,494	3367.83	.041
Stocking Ore	4,490	67.76	.001	9,330	139.95	.002
Screening & Crushing	13,134	198.53	.004	20,380	305.70	.004
Dry House	3,918	59.46	.001	6,730	100.99	.001
General Surface	10,995	166.66	.003	12,861	193.02	.002
Mine Office	2,744	41.68	.001	3,108	46.62	.011
Shops	16,158	245.12	.004	14,110	211.62	.002
Compressors	368,498	5589.32	.100	432,248	6483.67	.079
Electric Haulage	42,706	646.21	.012	65,727	985.90	.012
Heating Plant	3,447	52.24	.001	4,651	69.72	.001
Loading by Hand	320	4.83	.000	90	1.35	.000
Telephone	5,200	78.90	.001			
<b>TOTAL</b>	<b>2,052,014</b>	<b>31171.44</b>	<b>.557</b>	<b>2,148,057</b>	<b>32221.26</b>	<b>.392</b>
Cost per 1000 Gals. Pumped		.056			.052	
Cost per 1000 Cu. Ft. Air		.034			.034	
Cost per Ton of Ore Stocked		.001			.002	
Cost per Ton of Ore & Rock Hoisted		.004			.004	
Cost per Ton of Ore & Rock Trammed		.012			.010	

17. CONDITION  
OF  
PREMISES:

For two years my annual report has had this statement, "The houses in all the locations need painting and if they are not taken care of very soon, we are going to have very heavy repair bills later on." That condition grows worse not as a simple progressive worser condition, but as a complicated far worse condition. Lack of paint means siding rots, sills rot, foundations go bad, leaks develop to damage plastering, etc., etc.

If we cannot repair all the houses, at least we should be permitted to look after those occupied by the Manager, Superintendents, office men, doctors, etc. There is an old adage "a stitch in time saves nine," but we cannot now even do the job with nine stitches.

18. NATIONALITY  
OF  
EMPLOYEES:

	<u>American</u>	<u>Foreign</u>	<u>Total</u>
	<u>Born</u>	<u>Born</u>	
English -----	61	15	76
Swedish -----	32	17	49
Finnish -----	22	84	106
Italian -----	1	8	9
German -----	2	1	3
French -----	13	8	21
Irish -----	5	2	7
Norwegian -----	7	5	12
Scotch -----	<u>1</u>	<u>1</u>	<u>2</u>
<b>TOTAL -----</b>	<b>144</b>	<b>141</b>	<b>285</b>

LLOYD MINE  
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1. GENERAL:

There was no production from the Lloyd Mine during 1933. Employment, however, was given to a small crew working in the Lloyd shaft. The shaft raise was completed from the sixth to the fourth levels and the shaft was stripped and finished to a point 40 feet below the new fifth level. This development work was in progress from Jan. 1st to April 8th and from Nov. 17th to Dec. 31st. During the intervening period, that is, Apr. 8th to Nov. 17th, the mine was idle as regards underground operations. All surface work, except steam shovel loading and repair work in the engine house, was also stopped during the idle period.

As all of the Lloyd Mine water is pumped by the Inland Steel Company, the mine workings were kept dry during the idle period.

Stockpile loading was very active during the shipping season, a total of 406,828 tons being loaded out.

2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES:

a. Production by Grades:  
No ore was produced in 1933.

b. <u>Shipments:</u>					<u>Total</u>
	<u>Grade</u>	<u>Pocket</u>	<u>Stockpile</u>	<u>Total</u>	<u>Last</u>
		<u>Tons</u>	<u>Tons</u>	<u>Tons</u>	<u>Year</u>
	Lloyd		35,797	35,797	
	Lloyddale		134,192	134,192	5,926
	Lloyd Silica		1,928	1,928	
	Morris		129,957	129,957	13,327
	Morris High Manganese				6,768
	Morrisville		104,954	104,954	
	Total		406,828	406,828	26,021
	Total Last Year	6,768	19,253	26,021	
	Increase in Shipments	6,768	387,575	380,807	

Shipments included 22,928 tons of Silica stockpile overrun.

The following tabulation shows shipments since 1928:

Year 1928	-	393,184	Tons Shipped
" 1929	-	638,234	" "
" 1930	-	299,791	" "
" 1931	-	172,615	" "
" 1932	-	26,021	" "
" 1933	-	406,828	" "

LLOYD MINE  
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2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES:  
(Continued)

c. Stockpile Balances:

Ore in stock Dec. 31st, 1933 is as follows:

<u>Grade</u>	<u>Tons</u>
Lloyddale	59,336
Morris	<u>160,703</u>
Total	220,039

As a matter of fact the actual tonnage in stock exceeds the figures shown above by a large margin, the stockpile overruns running in the neighborhood of 70,000 to 75,000 tons.

Stockpile balances as of Dec. 31st for previous years run as follows:

Year 1925	349,872 Tons
" 1926	415,259 "
" 1927	444,785 "
" 1928	407,765 "
" 1929	204,961 "
" 1930	370,541 "
" 1931	547,084 "
" 1932	603,939 "
" 1933	220,039 "

f. Ore Statement:

	<u>Lloyd</u>	<u>Lloyd-</u>	<u>Lloyd</u>	<u>Morris</u>	<u>Morris-</u>	<u>Total</u>	<u>Total</u>
	<u>35749</u>	<u>dale</u>	<u>Silica</u>	<u>290660</u>	<u>ville</u>	<u>603939</u>	<u>Last</u>
	<u>193576</u>	<u>12645</u>	<u>1928</u>	<u>104954</u>	<u>71309</u>	<u>22928</u>	<u>Year</u>
On Hand Jan. 1st, 1933							547084
Output for Year							82876
Transfers	48	48	14170		14170		
Overruns			3453		19475	22928	
Total	<u>35797</u>	<u>193528</u>	<u>1928</u>	<u>290660</u>	<u>104954</u>	<u>626867</u>	<u>629960</u>
Shipments	<u>35797</u>	<u>134192</u>	<u>1928</u>	<u>129957</u>	<u>104954</u>	<u>406828</u>	<u>26021</u>
Balance on Hand		59336		160703		220039	603939
Decrease in Output						82876	

3. ANALYSIS:

b. Analysis of Ore in Stock on Dec. 31st, 1933:

<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>
Morris Dried	58.85	.071	9.07	.49	2.47	1.06	0.29	.014	2.83	
Morris Natural	52.92	.064	8.16	.44	2.21	0.98	0.26	.013	2.56	10.08
Lloyddale Dried	57.74	.173	8.16	.24	2.51	1.73	0.27	.012	4.71	
Lloyddale Natural	51.74	.155	7.31	.22	2.25	1.55	0.24	.011	4.22	10.41

c. Analysis of Ore Reserves on Dec. 31st, 1933:

<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>
Lloyd Dried	58.98	.127	6.68	.25	2.29	1.18	0.38	.012	4.81	
Lloyd Natural	52.45	.111	5.93	.22	2.04	1.05	0.34	.011	4.08	11.25
Lloyddale Dried	58.25	.187	7.08	.25	2.65	1.26	0.44	.011	5.02	
Lloyddale Natural	51.56	.166	6.28	.22	2.35	1.12	0.39	.010	4.46	11.25

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4. ESTIMATE  
OF ORE  
RESERVES:

Assumption: 12 cu. ft. equals one ton  
10% Deduction for Rock  
10% Deduction for Loss in Mining

Lloyd Mine:

Ore Above 3rd Level	25,873 Tons
Ore Below 3rd Level	<u>9,353 "</u>
Total	35,226 "

Lloyd Mine East:

Above 3rd Level	167,752 Tons
Between 3rd & 4th Levels	358,218 "
Between 4th & 6th Levels	2,054,484 "
Below 6th Level	<u>282,150 "</u>
Total	2,862,604 "

Summary:

	<u>Lloyd Ore</u> Tons	<u>Lloyddale</u> Ore Tons	<u>Total</u> Tons
Above 4th Level		561,196	561,196
Between 4th & 6th Levels	513,621	1,540,863	2,054,484
Below 6th Level	<u>70,537</u>	<u>211,613</u>	<u>282,150</u>
Total	584,158	2,313,672	2,897,830

Tonnages as Reported to State Tax Commission:

All Non-Bessemer Grades:

Lloyd Ore	619,384 Tons
Lloyddale Ore	<u>2,278,446 "</u>
Total	2,897,830 "

5. LABOR  
AND  
WAGES:

a. General:

Labor was employed as a welfare relief project. Efficiency had to be sacrificed to give as many men employment as possible. A large number of the men employed in the shaft were not first class miners and in fact most of them had never worked on a shaft job.

From Jan. 1st to April 8th we operated on a 3-8 hr. day six day a week schedule, the men working two days per week. The Saturday night shift from 11:00 P.M. to 7:00 A.M. Sunday, however, was omitted. The plan actually developed into this, i.e., the men worked a week and stayed home two weeks. Under that scheme we gave employment to (54) men in the shaft. When operations were resumed in November we took on (36) men in the shaft, the lesser number compared with the first three months being due to working everybody at least three days a week.

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5. LABOR  
AND  
WAGES:  
(Cont.)

b. Comparative Statement of Wages and Product:

	<u>1933</u>	<u>1932</u>	<u>Increase</u>	<u>Decrease</u>
PRODUCT	0	82,876		82,876
No. of Shifts & Hours	3-8 Hr.	1-8 Hr.	2-8 Hr.	

AVG. NO. OF MEN EMPLOYED:

Surface	20	35		15
Underground	54	111		57
Total	74	146		72

AVG. WAGES PER DAY:

Surface	3.84	3.75	.09	
Underground	4.29	4.46		.17
Total	4.10	4.28		.18

Year	Surface	Underground	Total
1925	\$ 4.34	\$ 5.02	\$ 4.86
1926	4.32	5.02	4.85
1927	4.33	5.14	4.94
1928	4.34	5.09	4.90
1929	4.35	5.08	4.90
1930	4.35	5.27	5.06
1931	4.42	5.12	4.97
1932	3.75	4.46	4.28
1933	3.84	4.29	4.10

WAGES PER MONTH OF 25 DAYS:

	<u>1933</u>	<u>1932</u>	<u>Increase</u>	<u>Decrease</u>
Surface	96.00	93.75	2.25	
Underground	107.25	111.50		4.25
Total	102.50	107.00		4.50

WAGES PER MONTH OF 22 DAYS:

Surface	84.48	82.50	1.98	
Underground	94.38	98.12		3.74
Total	90.20	94.16		3.96

WAGES PER MONTH OF 17 DAYS:

Surface	65.28	63.75	1.53	
Underground	72.93	75.82		2.89
Total	69.70	72.76		3.06

WAGES PER MONTH OF 13 DAYS:

Surface	49.92	48.75	1.17	
Underground	55.77	57.98		2.21
Total	53.30	55.64		2.34

WAGES PER MONTH OF 9 DAYS:

Surface	34.56	33.75	.81	
Underground	38.61	40.14		1.53
Total	36.90	38.52		1.62

TOTAL NUMBER OF DAYS:

Surface	2196 $\frac{1}{4}$	4798		2601 $\frac{3}{4}$
Underground	3079 $\frac{1}{2}$	13769 $\frac{1}{2}$		10690
Total	5275 $\frac{3}{4}$	18567 $\frac{1}{2}$		13291 $\frac{3}{4}$

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5. LABOR  
AND  
WAGES:  
(Cont.)

b. Comparative Statement of Wages and Product: (Continued)

<u>AMOUNT FOR LABOR:</u>	<u>1933</u>	<u>1932</u>	<u>Increase</u>	<u>Decrease</u>
Surface	\$ 8,428.42	\$ 17,988.02		\$ 9,559.60
Underground	13,210.23	61,499.55		48,289.32
Total	\$ 21,638.65	\$ 79,487.57		\$ 57,848.92

PROPORTION OF SURFACE TO UNDERGROUND MEN:

1925	1 to 3.22
1926	1 to 3.31
1927	1 to 3.56
1928	1 to 3.33
1929	1 to 3.20
1930	1 to 3.41
1931	1 to 3.82
1932	1 to 3.18
1933	1 to 2.70

6. SURFACE:

a. Buildings:

Repairs on all mine buildings were held down to a minimum. There were a few changes made in the Lloyd Mine engine house. The boiler plant in the basement was moved to make room for a compressor foundation. A double door was provided for the basement entrance to permit us to park the tractor inside during the winter months.

b. Stockpile Grounds:

Stocking trestles from which to stock both Lloyd and Lloyd-dale ores were erected in November. Although no ore will be stocked until perhaps in March 1934, the time to erect the trestles the cheapest is to do the work before we get any snow.

c. Engine House:

Several changes were made in the Lloyd Mine engine house to save money. Prior to February 1933 we purchased compressed air from the Inland Steel Company. Our compressor charge for January, for instance, was \$ 1820.46 or \$ 72.00 per working day. We installed a 590 cu. ft. compressor which was originally purchased for the South Jackson Mine, putting it in operation on the 23rd of February. In March our compressor expense totaled \$ 809.57 or \$ 31.00 per working day.

This old Jackson Mine compressor although ample in capacity for our shaft sinking job, would be too small to take care of the regular load when mining is resumed and it was, therefore, decided to move the 1400 cu. ft. Sullivan compressor from the Boeing Mine. The foundation for this machine was completed in November and the compressor was installed in December.

A rotary converter from the Armour Mine was also set up and to make room for this machine and the two compressors all the grids and switchboard panels, formerly on the ground or main floor of the engine room, were moved up onto a platform suspended from the roof trusses. It was first planned to build an addition on the east side of the engine house to house some of this equipment, but the platform idea was much cheaper although it is admitted that the engine house looks crowded at present.

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6. SURFACE:  
(Cont.)

d. Top Tram Plant:

Repairs on the switchboard of the top-tram plant were completed in November. This board was damaged by lightning in October.

e. Timber Yards:

All of the dozy timber was cut up and hauled away for fire wood. We were caught with quite a lot of useless timber because the Inland Steel Company refused to purchase but a small quantity of stull timber in the Morris Mine yard. They were faced with a similar problem, i.e. they had (40) or (50) cars of tamarack timber left in the Armour Mine timber yards to move or give away, and after securing a cheap freight rate, decided it was cheaper to move their own timber rather than buy ours even at reduced rates. We offered our timber for sale at half the inventory price.

Due to cessation of mining operations at the Lloyd in the winter of 1932-33, most of the timber in the Lloyd yard also became unfit for use. We salvaged what we could, however, shipping a number of cars to the Maas and Negaunee Mines.

7. UNDERGROUND:

a. Development:

All underground efforts in 1933 were concentrated on development work. The sixth level crosscut was finished in 1932 and the Lloyd Mine shaft raise was up 19 feet above the sixth level on January 1st, 1933. The raise 8' x 12' in size was located centrally with respect to the wall plates. The ladder and bucket compartment on the east side of the raise was 4'4" x 8' in size, leaving the bulk of the raise untimbered for the dirt compartment. A 10" fan pipe was always carried to the top of the raise for ventilation. A large door was installed and moved after each blast to cover over the top of the ladder compartment. The dirt compartment was kept full of rock to make the operation safer and to protect the cribbing from the blasting.

We tried three methods for drilling and blasting the holes at the top of the raise. The first scheme consisted of drilling (28) holes, (4) cut holes being drilled vertically over the centre of the dirt compartment, the other holes being planned to throw the dirt westerly into the dirt compartment. We had trouble with broken cribbing and then we decided to put up a pilot raise first, all the holes being blasted on the west side over the rock compartment. This pilot raise was put up 15 feet and then 10 feet of the rest of the raise drilled and blasted, always keeping the pilot raise at least 5 feet above the back of the main raise. This plan was successful in reducing the hazard of broken cribbing, but it took too much powder per round. The third scheme used to finish the raise with was to take advantage of the slips dipping 80° to the south. The first six holes were shallow ones and were drilled along the south side of the raise at right angles to the slips. The next six holes were also drilled against the slips, but were deeper than the first row and pointed more nearly vertical. The next row going north was drilled straight up and the last row, the finishing holes, actually pointed to the north a little. By using instantaneous fuses and (9) sets of delays, blasting the two holes in the southwest corner first; then two more, the first delays on the south side; then two, the second delays in the southeast corner and so on we were able to blast the holes using a minimum amount of powder and breaking no cribbing. The raise was holed to the bottom of the Lloyd shaft below the fourth level on March 15th. Stripping was started a few days later, a delay resulting

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7. UNDERGROUND:  
(Continued)

a. Development: (Cont.)

from the poor condition of the timber in the bottom part of the shaft. Several sets had to be replaced, the old sets being broken by the skip falling to the bottom of the shaft several years ago.

When operations ceased on April 8th the completed shaft was down to the back of the new fifth level.

The plat and pocket on the fifth level were cut in November and early in December and at the close of the year the completed shaft was down 40 feet below the fifth. We have decided to make a change in the design of the pocket on the new level and instead of putting in a large three compartment storage pocket and two measuring pockets, we are going to build two slides equipped with doors, the idea being to have only a car full of ore stored in each pocket or slide for each skip.

d. Timbering:

When orders came to stop operations in April, a crew of (24) men alternating two days a week, was employed for three weeks retimbering and propping. We worked eight men each day split into two and sometimes three gangs. All of the main level drifts and crosscuts on the third and fourth levels were propped. No one was employed underground the balance of the year.

8. COST OF  
OPERATING:

There having been no ore produced at the Lloyd Mine during 1933, makes it impossible to make the usual cost comparison.

The Lloyd shaft raise and shaft sinking job was in progress, however, for 4½ months during 1933 and a total of \$ 28,756.09 was expended on the 310 ft. raise, 95 ft. of completed shaft and the plat and pocket on the fifth level.

The following tabulation shows the total expenditures for the year, including taxes and depreciation, for the development work, for the idle shutdown period and for the shipping expense.

Lloyd Shaft Raise, Stripping & 5th Level Plat & Pocket	\$ 28,756.09
Idle Expense, Including Taxes and Depreciation	64,752.30
Loading Cost, Steam Shovel & Crushing	18,181.90
GRAND TOTAL	\$ 111,690.29



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10. TAXES:

Ishpeming Township:  
Lloyd Mine and Section Six:

	1 9 3 3		1 9 3 2	
	Valuation	Taxes	Valuation	Taxes
SW $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 6-47-27, 41.08 Acres )				
S $\frac{1}{2}$ Ex. SE $\frac{1}{4}$ of SE $\frac{1}{4}$ Sec. 6-47-27, 282.93 Acres)	515,000	8,685.57	610,000	16,557.57
Personal-Supplies & Equipment	600,000	10,120.01	505,000	13,706.08
S $\frac{1}{2}$ of NE $\frac{1}{4}$ Sec. 6-47-27, 80 Acres	320	5.40	400	10.84
SE $\frac{1}{4}$ of NW $\frac{1}{4}$ " 6-47-27 40 "	350	5.91	350	9.49
SE $\frac{1}{4}$ of SE $\frac{1}{4}$ " 6-47-27 40 "	575	9.71	630	17.04
Total	1,116,245	18,826.60	1,116,380	30,300.02
Collection Fees		188.27		303.00
Total Lloyd		19,014.87		30,603.02
<u>North Lake Dwellings:</u>				
Houses on Section 6, The C.C.I. Co.	40,500	689.93	50,000	1,356.94
" " " " The Inland Steel Co.	4,500	76.67		
Collection Fees		7.67		13.57
Total Dwellings	45,000	774.27	50,000	1,370.51
Total Ishpeming Township	1,161,245	19,789.14	1,166,380	31,973.53
Rate		1.687		2.714

Taxes Raised in Ishpeming Township:

	<u>1933</u>	<u>1932</u>	<u>1931</u>
State -----	\$ 856.64	\$ 5,095.48	\$ 6,248.24
County -----	10,965.97	11,179.47	12,818.94
County Road -----	745.51	0	3,930.50
Township Contingent -----	3,635.18	3,000.00	3,000.00
Highway Improvement -----	0	1,000.00	1,000.00
Road Repairs -----	0	5,500.00	7,000.00
School Tax -----	8,947.68	13,497.36	16,306.23
One Mill Tax -----	0	1,502.64	1,693.77
Rejected Tax -----	104.80	3.88	4.96
TOTAL TAX -----	\$ 25,255.78	\$ 40,778.83	\$ 52,002.64

Taxes have been cut in half the last two years, but the School District will be forced to cut the school year unless relief is furnished by the State. The taxes raised for the School District will bring in only \$ 25.30 per pupil enrolled and obviously no one can run a decent school on that basis.

11. ACCIDENTS  
AND  
PERSONAL  
INJURIES:

The accident record for the past three years follows:

	<u>1933</u>	<u>1932</u>	<u>1931</u>
Fatal Accidents -----	0	0	1
Compensible Accidents -----	0	0	4

We had eight slight accidents, but in no case did the man stay home over a shift.

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13. EQUIPMENT:

Because of the fact that no mining was being done, our purchases of equipment were kept at a minimum. We did, however, take the Wade Mine tractor, (4) of the Wade Mine scraper-hoists and (12) of the RB-12 drilling machines. All of this second-hand material was added to the Lloyd Mine inventory.

The shaft was raised and sunk with second-hand drills borrowed from the Maas, Spies and Tilden Mines.

14. MAINTENANCE  
AND  
REPAIRS:

As mentioned previously the bills incurred for maintenance and repairs were kept down to a minimum. We have (128) dwellings in the location and the total cost for 1933, including the Superintendent's residence, was \$ 625.68, of which \$ 157.40 was labor and \$ 468.28 supplies. This figures out less than \$ 5.00 per house. Last year, that is in 1932, we spent \$ 1189.54, but we cannot expect to keep the cost down in 1934 because the houses will go to "rack and ruin" unless some repairs are made, particularly those that need paint.

The location expense, however, includes another \$ 1171.03, which covers \$ 425.00 for policemen's time; \$ 370.00 for cleaning alleys and \$ 250.00 for outhouses. There were also small amounts expended for repairing hydrants and water mains.

The Club House was in bad shape both inside and out and certain repairs could not be put off any longer. All the windows were puttied and painted. The boiler plant was repaired and the hot water heating boiler put in good shape. Toilets were repaired and the sewer line cleaned out. The bowling alleys were also scraped and varnished and repairs on one pool table finished. The moving picture booth was torn out and the main floor auditorium converted into a play room or gymnasium for juniors.

A change in personnel was also made and two custodians appointed, one to represent the Cleveland-Cliffs Iron Company and the other The Inland Steel Company.

18. NATIONALITY  
OF  
EMPLOYEES:

Finnish -----	27
French -----	18
English -----	6
Italian -----	7
Scandanavians -----	10
Austrian -----	1
TOTAL -----	69

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1. GENERAL

Operations at the Tilden started on June 21st and continued on an average basis of 18 shifts per month until October 25th. The operations were day shift only except for the churn drilling in the East or low phosphorus Pit.

The schedule was one nine hour shift until July 16th and one eight hour shift for the rest of the season. The change was made to comply with the National Recovery Act Code. From October 25th until the end of the year a crew of five men and the Captain were engaged three days per week making repairs to equipment.

Operations were conducted in both the pits, i.e., the regular Tilden or West Pit and the East or Low Phosphorus Pit. Early in the summer the broken ore remaining in the West Pit was loaded out and the double row of holes drilled in 1931, blasted on July 26th. The tonnage broken by the blast was estimated at 225,000 tons.

At the East pit one cargo of low phosphorus ore was shipped in the fall of 1931. An area had been stripped in anticipation of further calls for low phosphorus ore. Early in July came a request for a cargo. Fifteen holes were drilled and blasted on July 19th, breaking 14,000 tons. The formation was standing practically vertical with alternate layers of low and higher phosphorus. The results of the blast were disappointing, the phosphorus running much higher than expected. Two small cargoes were sorted out, one of 1,363 tons averaging .026 phos., the other of 3,736 tons averaging .030. The balance of the blast was mixed with the West Pit ore and shipped as Tilden.

During the season two other blasts were made in this Pit, one of eleven holes on August 7th and another of five holes on October 16th. The indications are that the product is improving as the Pit advances to the North and East.

2. PRODUCTION  
SHIPMENTS &  
INVENTORIES

a. Production by Grades

	<u>Total</u>		
	<u>Mined</u>	<u>Transferred</u>	<u>Net Grade</u>
Tilden Low Phosphorus	25,924	13,881	12,043
Tilden Silica	68,180	13,881	82,061
Total	94,104		94,104 tons

This production compares with 19,957 tons produced during 1932, an increase of 74,147 tons.

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2. PRODUCTION  
SHIPMENTS &  
INVENTORIES

b. Shipments

The shipments from the Tilden for 1933 were the same as the production figures.

c. Stockpile Inventories

There is no ore in stock at the Tilden. Following is an estimate of the broken ore:

West Pit	174,435 tons
East Pit (Low Phos.)	<u>3,428 "</u>
Total Broken Ore	177,863 "

e. Product by Months

<u>Month</u>	<u>Days Operated</u>	<u>Average Daily Tonnage</u>	<u>Total Tons</u>
June	3 (1-9 hr)	2,047	6,140
July	15	1,171	17,560
August	18 (1-8 hr)	866	19,063
	2 (2-8 hr)		
September	14 (1-8hr)	1,590	22,267
October	18 (1-8 hr)	1,615	29,074
Total	70	1,307	94,104

f. Ore Statement

	<u>Year Tons</u>	<u>Last Yr. Tons</u>	<u>Increase</u>	<u>Decrease</u>
On Hand Jan.1,1933	0	0		
Output for year	94,104	19,957	74,147	
Total	94,104	19,957	74,147	
Shipments	94,104	19,957	74,147	
Balance on hand	0	0		

1933 1-9 hr. shift to July 16  
1-8 hr. shift to end of season

1932 1-9 hr. shift as tonnage was required

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2. PRODUCTION  
SHIPMENTS &  
INVENTORIES

g. Delays

There were no serious delays, either mechanical or electrical, during the season. Detail of delays follow:

<u>Month</u>	<u>Duration</u>	<u>Cause</u>
Aug. 25	1½ hrs.	Pile caved, East Pit
Sept. 7	2 "	No.10 McCully crusher blocked
" 16	¾ "	Repairing brake pulley #29 Shovel
" 16	2 "	Changing bearings on Generator set
" 29	1 "	Installing new hoisting rope #29 shovel
" 29	4 "	Changing motor on boom engine #31 "
" 30	1 "	Changing pit brace #29 shovel
Oct. 13	2¾ "	Repairing brake bands #31 "
" 18	2 "	Repairing thrust motor #31 "

h. Delays from Lack of Current

Aug. 23	1¾ hr.	No current. Tree across transmission line.
Oct. 3	1 "	Wood cutters chopped tree on line

3. ANALYSIS

a. Average Mine Analysis on Output

<u>Grade</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag. Sul.</u>	<u>Loss on Ignition</u>	
Tilden									
Silica	40.25	.042	40.68	.10	.81	.35	.18	.012	.43
Tilden									
Los Phos.	35.10	.019	47.04	.12	1.05	.32	.20	.010	.61

b. Average Analysis on Straight Cargos

<u>Grade</u>	<u>Mine</u>			<u>Lake Erie</u>	
	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Iron</u>	<u>Moist.</u>
Tilden	38.95	.041	41.76	39.15	1.84
Tilden Low Phos.	34.77	.021	47.23	35.19	.96

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4. ESTIMATE  
OF ORE  
RESERVES

a. Developed Ore

1. West Pit (Tilden Silica)

Assumption: 14 cu.ft. equals 1 ton  
10% deduction for rock.

Grade: Tilden Silica

Ore in sight Jan. 1, 1933, Upper Bench	687,818 tons
Ore mined in 1933, " "	68,180 "
Ore in sight Jan. 1, 1934, " "	619,638 "
Ore in sight Jan. 1, 1934, Lower Bench	<u>1,870,000 "</u>

Total Developed Ore Jan. 1, 1934, West Pit 2,489,638 tons

2. East Pit (Tilden Low Phosphorus)

Assumption: 14 cu. ft. equals 1 ton  
10% deduction for rock  
Tonnage figured is all above 1500'  
elevation ( Track grade from Crushing  
Plant)

Grade:

Ore in sight Jan. 1, 1933, Grading above .015 Phos.	2,054,115 tons
Ore mined during 1933 Grading above .015 Phos.	<u>25,924 "</u>
Ore in sight Jan. 1, 1934 Grading above .015 Phos.	2,028,191 "
Ore in sight Jan. 1, 1933 Grading below .015 Phos.	3,467,288 tons
Ore mined in 1933 Grading below .015 Phos.	<u>0</u>
Ore in sight Jan. 1, 1934 Grading below .015 Phos.	3,467,288 tons

Total developed ore Jan. 1, 1934 5,495,479 "

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4. ESTIMATE  
OF ORE  
RESERVES

a. Developed Ore (Continued)

3. East & West Pits

Total developed ore Jan. 1, 1934 West Pit	2,489,638 tons
Total developed ore Jan. 1, 1934 East Pit	<u>5,495,479 "</u>
Total East & West Pits	<u>7,985,117 tons</u>

b. Prospective Ore

In addition to the developed ore, there is probably a very large tonnage to the North and East of the area developed by the East Pit drilling, while at the West Pit there is probably a large tonnage of ore to the North and West, which due to the heavy overburden in the swamp to the north, and the existence of a dike of considerable size between the present pit and the ore to the north-west, it would be too expensive to secure.

c. Estimated Analysis

<u>1. West Pit</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Ign.</u>	<u>Moist.</u>
Dried	42.50	.045	35.10	.120	.67	.48	.31	.014	.90	
Natural	41.44	.045	34.22	.118	.65	.47	.30	.013	.88	2.50
<u>2. East Pit</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Ign.</u>	<u>Moist.</u>
Dried	38.20	.017	42.12	.120	.67	.48	.31	.014	.90	
Natural	37.24	.017	41.07	.118	.65	.47	.30	.013	.88	2.50

Of the tonnage estimated for the East Pit, the low phosphorus tonnage will average under .015 and the silicious grade material .022 based on diamond drill results of 1930.

f. Estimate of Production

The following is the estimate of tonnage and analysis of ore that can be produced at the Tilden during 1934. The figures for production are conservative and can be increased materially without difficulty.

<u>Grade</u>	<u>Tonnage</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Sul.</u>	<u>Moist.</u>	<u>Iron Natl.</u>
Tilden Silica							
West Pit	150,000	40.00	.043	40.50	.012	2.5	39.00
Tilden Low							
Phos. East Pit	60,000	34.50	.027	46.50	.009	2.5	33.64

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4. ESTIMATE  
OF ORE  
RESERVES

f. Estimate of Production

If ore running .020 Phos. is desired, it can be secured at the East Pit by careful grading. 50% should go .020 Phos. and the other 50% .034 Phos. The .034 Phos. would then have to be absorbed in the product of the West Pit in the proportion of 70% West to 30% East. This would give the following grades based on a production of 130,000 tons:

<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Sul.</u>	<u>Moist</u>	<u>Iron Natl</u>
Tilden Silica							
70% West							
30% East	100,000	38.35	.381	42.30	.011	2.5	37.40
Tilden Low Phosphorus	30,000	34.50	.020	46.50	.009	2.5	33.64

The iron in the Tilden Silica mixture can be regulated by the amount of East pit ore absorbed.

5. LABOR  
AND  
WAGES

a. Comments

1. Labor & Wages

During the active operations this year, the men worked on a 40 hour per week schedule., i.e., 5 - 8 hour shifts. On account of the slight repairs made to equipment during the winter 1931-1932 and early 1933, it is necessary to do considerable overhauling this winter. This work will be done by the Captain and a crew of five men. When the most important repairs are completed, the mine will go on an idle basis - employing only the Captain and Watchman.

From June 21st until July 16th, the mine operated the same as in 1932, viz., 1 - 9 hour shift per day schedule. On July 16th a 1 - 8 hour schedule was adopted and continued for the balance of the year. This schedule conforms to the N.R.A. code. A maximum working week of forty hours was permitted. With the adoption of the eight hour working day came an increase in the daily wage, effective on July 16th, of 10%. This made the new wage scale for common labor \$3.20 per day as compared with \$2.90 for 1932. The hourly rate was increased from 32.2¢ to 40¢, or an increase of 24%.



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5. LABOR  
AND  
WAGES

a. Comments (Continued)

2. New Construction

A power line costing \$316.52 was extended to the East Pit, and an 8" water line was laid for East Pit stripping, costing \$417.27.

b. Comparative Statement of Wages and Product

	<u>1933</u>	<u>1932</u>	<u>Increase</u>	<u>Decrease</u>
Production, Tons	94,104	19,957	74,147	
No. of Shifts & Hours	10-1-9 hr., 58-1-8 2-2-8	1-9		
Average Number of men Working	20	23		3
Average Wages per day	3.88	3.89		.01
Tons per man per day	46.27	45.15	.0112	
Labor cost per ton, Labor Stmt.	.084	.0856		.016
Labor cost per ton, Cost Sheet	.092	.188		.096
Total number of days	2,035 $\frac{1}{2}$	634 $\frac{1}{2}$	1,400 $\frac{3}{4}$	
Amount paid for labor per labor statement	\$7,905.63	\$2,465.67	\$5,439.96	
Amount paid for labor per cost sheet	8,640.97	3,758.87	5,882.10	

6. SURFACE

A few minor repairs were made to the windows and doors of the mine buildings, and the corrugated iron sheeting was removed from lower portion of the crusher building to improve the ventilation.

7. OPEN PIT  
OPERATIONS

a. Stripping

There was no stripping in either Pit in 1933.

In 1930 and 1931, 10,000 yards were stripped at the East Pit at a cost of \$ .616 per yard. Most of the overburden was removed by means of a scraper hoist, the remaining material being washed. This latter operation has been greatly handicapped at the Tilden due to lack of pressure at the Monitor. In order to improve this condition, a portion of the 6" supply line has been replaced by 8". A booster pump will be installed and water delivered at the Monitor nozzle at 200 lb. per square inch. This will make a much more effective washing.

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7. OPEN PIT  
OPERATIONS

a. Stripping (Continued)

If operations are to be continued at the East pit a considerable area should be worked during the coming year. This should be done early in the spring when a sufficient quantity of water is available.

e. Open Pit Operations

Loading operations for the season started at the West Pit on June 22nd and continued three days; 6,140 tons being loaded by the two electric shovels, Nos. 29 and 31. The ore loaded was from the blast of November 1, 1930.

In July a prospective sale of 10,000 tons of low phosphorus ore made it necessary to churn drill the north side of the East Pit to see if this tonnage were available. Fifteen holes were drilled for a field blast. The analyses were very erratic and while low phosphorus ore was found it was not as low as desired by the customer. By sampling in five car lots, two small cargos averaging .026 phos. and .031 phos. respectively, were saved. The balance of the blast was worked off with West Pit ore, in the proportion of 30% East pit and 70% West Pit. A larger proportion of East Pit would lower the iron content too low for standard Tilden Silica.

When operations started in June, both shovels were in the West Pit. In order to load at the East Pit it was necessary to move the #31 shovel to this Pit, requiring about two days time. The shovel remained there until September, when it was moved back to the West Pit where it remained until October 9th, when it was again transferred to the East Pit.

It has been found that a better average cargo of Tilden can be obtained by loading with two shovels in the West Pit. This is to be expected as the Pit has lean and richer areas that can be mixed more readily by loading with two shovels.

In the East Pit it is possible to use only one shovel at a time as the pit is not opened up sufficiently to provide room for another. Here too the loading is slower than at the West Pit as two cars only can be loaded at one time as the pit extends into the hillside.

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**7. OPEN PIT  
OPERATIONS**

**e. Open Pit Operations (Continued)**

In the West Pit, the loading is along a side cut and a full train can be loaded. This makes East Pit loading more expensive.

Ore from the East and West Pits cannot be loaded simultaneously unless they are to be mixed in a cargo and then only on the basis of 30% and 70% respectively, which means the slowing up of the East Pit operations to keep the proper proportions.

Whenever possible, two shovels are used in the West Pit. Ordinarily, if one shovel is operating, it requires a crew of about fifteen men to operate the crusher, pocket, shovel, two locomotives, etc. By the addition of five men, a second shovel can operate and the product of the mine doubled.

**f. Drilling, Blasting & Explosives**

The only drilling for the year 1933 was at the East Pit where 1873 feet were drilled.

At the West Pit, the 102 holes drilled in the winter of 1930-1931 were cleaned out and blasted on July 26th.

The total tonnage broken for the year was 260,000.

WEST PIT

Cost of Drilling & Blasting 225,000 tons; 102 holes;  
9738 feet of drilling (Nov. 1930 - Apr. 1931) - Holes  
blasted July 26th, 1933

<u>Drilling Cost</u>	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>	<u>Cost</u> <u>Per</u> <u>Foot</u>	<u>Cost</u> <u>Per</u> <u>Ton</u>
<u>Operating:</u>					
Drilling at Mine	6,163.84	2,968.85	9,132.69	.937	
Building Roads	325.65	167.10	492.75	.051	
Sharpening Bits	865.00	441.67	1,306.67	.134	
Pipe & Fittings	105.01	193.69	298.70	.031	
Rope		360.17	360.17	.037	
Electric Power		432.29	432.29	.044	
Truck & Tractor	601.82	403.26	1,005.08	.103	
<b>Total Operating</b>	<b>8,061.32</b>	<b>4,967.03</b>	<b>13,028.35</b>	<b>1.337</b>	<b>.0579</b>

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7. OPEN PIT  
OPERATIONS

f. Drilling, Blasting & Explosives (Cont.)

Cost of Drilling & Blasting - West Pit (Cont.)

<u>Drilling Cost</u>	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>	<u>Cost per Foot</u>	<u>Cost per Ton</u>
<u>Maintenance</u>					
Drills	238.27	552.88	791.15		
Sharpener	51.49	50.54	102.03		
Total Maintenance	289.76	603.42	893.18	.092	.0039
<u>TOTAL OPT. &amp; MAINT.</u>	<u>8,351.08</u>	<u>5,570.45</u>	<u>13,921.53</u>	<u>1.429</u>	<u>.0618</u>
<u>Opt. Drills &amp; Cleaning Holes</u>					
Drilling	178.64	12.50	191.14		
Rope		52.80	52.80		
Electric Power		2.85	2.85		
Total Opt. Clean. Holes	178.64	68.15	246.79		.0010
<u>Maint. Drills &amp; Cleaning Holes</u>					
Drill Sharpener		55.81	55.81		
Drills	14.70	28.43	43.13		
Total Maint. Cl. Holes	14.70	84.24	98.94		
<u>Total Opt. &amp; Maint. Cleaning Holes</u>	<u>193.34</u>	<u>152.39</u>	<u>345.73</u>	<u>.035</u>	<u>.0010</u>
<u>Primary Blasting</u>					
Labor Loading Holes	145.92		145.92		
Explosives		10,799.43	10,799.43		
Other Supplies		42.91	42.91		
Total Primary Blasting	145.92	10,842.34	10,988.26		.0488
<u>TOTAL DRILLING AND BLASTING</u>	<u>8,690.34</u>	<u>16,565.18</u>	<u>25,255.52</u>	<u>2.59</u>	<u>.1122</u>

EAST PIT

Drilling & Blasting, 1933 - 31 holes; 1873 feet, 35,000 tons

<u>Drilling Cost</u>	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>	<u>Cost per Foot</u>	<u>Cost per Ton</u>
Drilling	1,428.22	318.68	1,746.90	.933	.0499
Maintenance	58.38	41.31	99.69	.053	.0030
Total Opt. & Maint.	1,486.60	359.99	1,846.59	.986	.0529
<u>Primary Blasting</u>					
Labor Loading Holes	60.48		60.48		
Explosives		2,049.30	2,049.30		
Other Supplies		12.07	12.07		
Total Cost Blasting	60.48	2,061.37	2,121.85	1.13	.0600
<u>TOTAL COST DRILLING AND BLASTING</u>	<u>1,547.08</u>	<u>2,421.36</u>	<u>3,968.44</u>	<u>2.11</u>	<u>.1129</u>

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7. OPEN PIT  
OPERATIONS

f. Drilling, Blasting & Explosives (Cont.)

Statement of Cost of Explosives

<u>PRIMARY BLASTING</u>	<u>QUANTITY</u>	<u>PRICE</u>	<u>AMOUNT</u>
<u>Kind</u>			
Gelamite No. 2	39,100	12.49	4,883.75
60% Gelatin	7,500	12.75	957.51
80% "	32,900	16.50	5,434.25
90% "	4,500	19.00	852.75
Total Powder	84,000	14.43	12,128.26
 <u>Blasting Supplies</u>			
Single Countered Cordeau-Bickford Fuse	1,932	42.00M	81.14
Double " " " "	6,063	47.75M	289.50
No.2 Wire " " " "	5,552	62.00M	360.88
Total Fuse, etc.			731.52
 <b>TOTAL ALL EXPLOSIVES</b>			<b>12,859.78</b>
 Total Ore Blasted 1933			260,000
Pounds of Powder per Ton of Ore			.0032
Cost per Ton for Powder			.046
Cost per Ton for Fuse & Caps			.003
Cost per Ton for all Explosives			.049
Average Price per Pound for Powder			.1443
 <u>SECONDARY BLASTING</u>			
<u>Kind</u>			
60% Gelatin	3,775	12.75	481.31
Total Powder	3,775	12.75	481.31
 <u>Blasting Supplies</u>			
No. 6 Blasting Caps	1,600	11.59M	18.44
Electric Caps	50	6.04C	3.02
Crescent Fuse	11,300	6.34M	71.51
Total Fuse, etc.			92.97
<b>TOTAL ALL EXPLOSIVES</b>			<b>574.28</b>
 <b>PRODUCT</b>			<b>94,104</b>
Pounds of Powder per Ton of Ore			.0004
Cost per Ton for Powder			.005
Cost per Ton for Fuse & Caps			.001
Cost per Ton for All Explosives			.006
Average Price per Pound for Powder			.1275

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7. OPEN PIT  
OPERATIONS

f. Drilling, Blasting & Explosives (Cont.)

Statement of Cost of Explosives Used for 1933

<u>Kind</u>	<u>Quantity</u>	<u>Avg. Price</u>	<u>Amount</u>
Gelamite No. 2	39,100	12.49	4,883.75
60% Gelatin	11,275	12.75	1,438.82
80% "	32,900	16.50	5,434.25
90% "	4,500	19.00	852.75
Total Powder	87,775	14.36	12,609.57
 <u>Blasting Supplies</u>			
No. 6 Blasting Caps	1,600	11.59M	18.44
Electric Caps	50	6.04C	3.02
Crescent Fuse	11,300	6.34M	71.51
Single Countered Cordeau-Bickford Fuse	1,932	42.00M	81.14
Double " " " "	6,063	47.75M	289.50
No. 2 Wire " " " "	5,552	65.00M	360.88
Total Fuse, Etc.			824.49
TOTAL ALL EXPLOSIVES			13,434.06
Total Ore Blasted 1933			260,000
Pounds of Powder per Ton of Ore			.0033
Cost per Ton for Powder			.049
Cost per Ton for Fuse, Caps, Etc.			.003
Cost per Ton for All Explosives			.052
Average Price per Pound for Powder			.1436
Broken Ore Remaining 1932	11,967		
West Pit-Blasted July, 26, 1933	225,000		
Total	236,967		
Shipped from Tilden West Pit 1933	62,532		
Balance Ore Broken - Tilden		174,435	
Blasted East Pit-Los Phos. 1933	35,000		
Shipped 1933	31,572		
Balance Ore Broken-East Pit		3,428	
TOTAL BROKEN ORE REMAINING			177,863 Tons

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8. COST OF  
OPERATING

a. Comparative Mining Costs

	<u>1933</u>	<u>1932</u>	<u>Increase</u>	<u>Decrease</u>
Production	94,104	19,957	74,147	
Average Daily Product	1,344	1,814		470
Tons per Man per Day	46.27	45.15	.012	
Number of Days Operating	70	11	59	
Number of Shifts and Hours	10, 1-9 58, 1-8 2, 2-8	1-9		
Budget - Estimate Production		60,000		
Budget - Est. Cost at Mine		.734		
<u>Cost</u>				
Pit operating Accounts	.247	.456		.199
Pit General Accounts	.060	.170		.110
Cost at Mine per Cost Sheet	.317	.626		.309
<u>Depreciation</u>				
Plant and Equipment	.077	.077		
Taxes	.054	.301		.247
Stripping	.016	.016		
Supply Inventory		.000		
Total Cost at Mine	.464	1.020		.556
Idle Expense	.062	.338		.276
GRAND TOTAL AT MINE	.526	1.358		.832
<u>Expense Beyond Mine</u>				
Rail Freight	.700	.700		
Lake Freight	.760	.760		
Cargo Insurance & Analysis	.010	.010		
Shrinkage	.011	.017		.006
Total Cost Lower Lakes	2.007	2.845		.838

b. Detailed Cost Comparison

1. Days and Shifts

The mine did not operate on any definite schedule during 1933, operating only 70 days for the season. The Pit was worked when cargoes were wanted and holes were drilled and blasted at the East Pit as the low phosphorus ore was required.

2. Production

The 1933 production showed an increase of 74,147 tons over 1932. The average daily product loaded showed a decrease of 470 tons per day. In 1932 two shovels loaded without interruption at the West Pit. In 1933 the decreased loading per day was caused by loading from the East and West Pits at the same time, grading the East pit ore, one hour less working time, and delays incident to blasting, i.e., cutting in, casting, etc.

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8. COST OF OPERATING

b. Detailed Cost Comparison (Continued)

3. Cost of Production

The year 1933 shows a decrease in cost on cars over 1932 of \$ .832. This was due principally to the larger tonnage produced. The taxes alone in 1933 showed a decrease of \$ .247, per ton. The idle expense also showed a big decrease amounting to \$ .276 although repairs on the large crusher, charged to this account, were started in October and extended to the end of the year.

4. Open Pit Costs

	<u>1933</u>	<u>1932</u>	<u>Increase</u>	<u>Decrease</u>
Days per Week				
Shifts and Hours	10, 1-9			
	58, 1-8	11, 1-9	59	
	2, 1-8			
Production, Tons	94,104	19,957	74,147	
Average Daily Production	1,344	1,814		470
Number of Days Worked	70	11	59	

	<u>1933</u>		<u>1932</u>		<u>Increase</u>		<u>Decrease</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
<u>PIT OPERATING</u>								
<u>DIRECT ORE</u>								
1. Drilling and Blasting	11,454.88	.122	2,010.31	.151	9,444.57	.		.029
2. Electric Shovels Operating	2,024.04	.021	388.83	.019	1,635.21	.002		
3. Electric Shovels, Maintenance	1,353.82	.014	851.40	.043	502.42			.029
4. Locos. & Cars, Operating	2,179.66	.024	382.42	.019	1,797.24	.005		
5. Locos. & Cars, Maintenance	172.75	.002	201.01	.010			28.26	
6. Track Expense	1,254.25	.013	37.88	.002	1,216.37	.011		
<b>TOTAL DIRECT ORE</b>	<b>18,439.40</b>	<b>.196</b>	<b>4,871.85</b>	<b>.244</b>	<b>13,567.55</b>		<b>28.26</b>	<b>.048net</b>



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8. COST OF  
OPERATING

b. Detailed Cost Comparison(Continued)

	<u>1933</u>		<u>1932</u>		<u>Increase</u>		<u>Decrease</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
<u>GENERAL PIT EXPENSE</u>								
9. Water Supply	68.06	.001	34.83	.002	33.23			.001
11. Crushing and Screening	3,621.74	.039	1,529.32	.077	2,092.42			.038
12. Gen.Open Pit Expense	1,045.40	.011	1,159.29	.058			113.89	.047
13. Open Pit Supts.	610.75	.006	1,421.00	.071			810.25	.065
15. Waste Pile Expense	385.83	.004	86.65	.004	299.18			
Total Gen.Pit Expense	5,731.78	.061	4,231.09	.212	1,500.69			.151 net
TOTAL PIT OPTG.	24,171.18	.257	9,102.94	.456	15,068.24			.199
<u>GENERAL MINE EXPENSE</u>								
18. Insurance	47.96	.001	108.92	.005			60.96	.004
19. Mining Engineering	113.05	.001	11.17	.001	101.88			
20. Mech. & Elec. Engineering	166.42	.002	206.34	.010		.001	39.92	
21. Analysis & Grading	585.79	.006	99.80	.005	485.99	.001		
22. Personal Injury	272.91	.003	184.70	.009	88.21			.006
23. Geological	14.47	.000	15.07	.001			.60	.001
24. Safety Dept.	33.11	.000	157.30	.008			124.19	.008
25. Welfare Expense	709.03	.007	123.00	.006	586.03	.001		.001
26. Special Expense	1,278.91	.013	169.00	.008	1,109.91	.005		.008
27. Ishpeming Office	1,856.19	.020	230.00	.011	1,626.19	.009		
29. Mine Office	614.04	.007	2,093.03	.106			1,478.99	.099
TOTAL GEN. EXPENSE	5,691.88	.060	3,398.33	.170	2,293.55			.110 net

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8. COST OF OPERATING

b. Detailed Cost Comparison (Cont.)

	<u>1933</u>		<u>1932</u>		<u>Increase</u>		<u>Decrease</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
COST OF PRODUCTION	29,863.06	.317	12,501.27	.626	17,361.79	.		.309 net
30. Depr. Plant & Equipt.	7,246.01	.077	1,536.70	.077	5,709.31			
32. Amortization Stripping	1,505.66	.016	319.31	.016	1,186.35			
33. Taxes	4,994.34	.054	6,000.00	.301			1,005.66	.247
COST AT MINE	43,609.07	.464	20,357.28	1.020	23,251.79			.556 net
34. Inventory Adjustment	13.75	.000			13.75			
COST - TOTAL	43,622.82	.464	20,357.28	1.020				.556
35. Idle Expense	5,843.01	.062	6,751.25	.338			908.24	.276
TOTAL COST AT MINE	49,465.83	.526	27,108.53	1.358	22,357.30			.832 net

GENERAL

On account of the difference in operating schedules it is extremely difficult to compare cost sheets. In 1932 the mine operated 11 shifts and produced 19,957 tons, whereas in 1933 it operated 70 shifts and produced 94,604 tons. On July 16, 1933 there was an increase in wages of 10%. The 8 hour shift was effective the same date.

1. Drilling & Blasting

On July 26th, 102 holes were blasted in the West Pit. Inasmuch as these holes were drilled during the months of November, 1930 to April, 1931, it was necessary to clean them out thoroughly before charging. This was done at a cost of \$345.73 or \$ .033 per foot.

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8. COST OF  
OPERATING

b. Detailed Cost Comparison (Cont.)

4. Open Pit Costs (Cont.)

1. Drilling & Blasting (Cont)

On July 19, 15 holes were blasted in the East Pit estimated to produce 15,000 tons of ore and on August 11th, 11 holes were blasted estimated to produce 14,000 tons of low phosphorus ore. The cost of these two blasts were figured together. The cost was \$ .1145 per ton for drilling and blasting.

In order to complete the season's shipments, 5 holes were blasted on October 16, at the East Pit at a cost of \$ .108 per ton for drilling and blasting. Our records show 31,572 tons loaded from the East Pit leaving a balance of 3,428 tons of broken ore.

In the West Pit the estimated broken ore at the end of 1932 was 11,967 tons. This, plus 225,000 tons blasted on July 26, 1933 equals 226,967 tons. Shipped from the West Pit in 1933, 62,532 tons leaving a balance of 174,435 tons of broken ore in the West Pit.

2. Electric Shovels Operating

The increase in this account is due to moving #31 electric shovel to the West Pit and East Pit, increase of wages of 10% on July 16, 1933 and change of working schedule from 9 to 8 hour working day.

3. Electric Shovels Maintenance

Increased amount of money spent due to 4 links broken, \$110.00; due to frequent movements of #31 electric shovel; three hoisting ropes charged out, cost \$204.06 and sundry repairs to #29 electric shovel. The decrease of \$.029 per ton is due to increased tonnage.

4. Locomotives & Cars Operating

The increase in cost per ton of .005 is due to increased wages.

6. Track Expense

The increase in cost and cost per ton is principally due to dismantling and relaying the loading track in the West Pit on account of the big blast, also to extensions to the loading track in the East Pit for three blasts.

11. Crushing and Screening

The decreased rate per ton of .038 due to increased tonnage.

12. General Open Pit Expense

The decrease in expenditure is due to more watchman labor required in 1932 owing to the mine being idle practically the whole of the year. The decrease in cost per ton is due to a larger tonnage.

TILDEN MINE  
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8. COST OF  
OPERATING

b. Detailed Cost Comparison (Continued)

4. Open Pit Costs (Cont.)

13. Open Pit Superintendence

Mining Captain's time charged to Operating costs for July August, September and October only, balance of the year being charged to Idle Expense. During the year 1932, Captain's time was charged to Operating Accounts from January to September.

18. Insurance

In 1933, four months only, July to October inclusive, were charged to Operating. Balance to Idle Expense. The charge to Operating in 1932 was \$108.92 whereas in 1933 it was \$47.96, a decrease of \$60.96.

19. Mining Engineering

More engineering required in 1933 on account of 102 holes being blasted at the West Pit and 31 holes, located drilled and blasted at the East Pit.

20. Mechanical & Elec. Engineering

Less charges to this account in 1933.

21. Analysis and Grading

The large increase in cost and cost per ton is due to the larger tonnage and a large number of determinations in 1933, several cargoes were assayed in one car lots.

22. Personal Injury

There were two accidents. The increased cost is accounted for by more time being worked in 1933 and the decreased cost per ton is due to the larger tonnage.

25. Welfare Expense

This is a distributive account, the increased cost being due to the larger tonnage.

26. Special Expense

This is a distributive account. The increased cost is due to a larger tonnage.

27. Ishpeming Office

The increased cost is due to larger production. The cost per ton shows an increase of 1 mill only.

29. Mine Office

The large decrease in this account is due to less charges for Superintendent's time.

33. Taxes

Decreased charges, and increased tonnage shows a decrease of .247 per ton.

TILDEN MINE  
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8. COST OF  
OPERATING

b. Detailed Cost Comparison (Continued)

4. Open Pit Costs (Cont.)

35. Idle Expense

	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>
January	471.75	45.25	517.00
February	461.10	63.79	524.89
March	469.65	34.85	504.50
April	466.25	65.56	531.81
May	181.75	39.22	220.97
June	178.70	37.96	216.66
November	813.88	672.28	1,486.16
December	614.97	1,226.05	1,841.02
	3,658.05	2,184.96	5,843.01

10. TAXES

Tilden Township  
Tilden Mine

	<u>1933</u>		<u>1932</u>	
	<u>VALUATION</u>	<u>TAXES</u>	<u>VALUATION</u>	<u>TAXES</u>
N $\frac{1}{2}$ of NW $\frac{1}{4}$ of Sec. 26, 47-27 )			195,000	7,358.67
S $\frac{1}{2}$ of NW $\frac{1}{4}$ of " 26, " )			400	15.10
N $\frac{1}{2}$ of NE $\frac{1}{4}$ of " 26, " )	115,000	3,249.51	1,400	52.84
S $\frac{1}{2}$ of NE $\frac{1}{4}$ of " 26, " )			900	33.97
Personal, Supplies & Equipt.	60,000	1,695.38	80,000	3,018.94
Total	175,000	4,944.89	277,700	10,479.52
Collection Fees		49.45		104.79
TOTAL TILDEN		4,994.34		10,584.31

In 1932 the mine assessment as fixed by the Appraiser of Mines, included only the N $\frac{1}{2}$  of the NW $\frac{1}{4}$  of Section 26, 47-27. The S $\frac{1}{2}$  of the NW $\frac{1}{4}$  and the NE $\frac{1}{4}$  of Section 26, were assessed separately by the local assessor.

In 1933 the mine assessment by the Mine Appraiser included the whole of the N $\frac{1}{2}$  of Section 26.

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11. PERSONAL  
INJURY

There were no accidents during 1933. The Tilden Mine maintained a perfect record, having gone since December 14, 1929 without a lost time accident. During this period 538,114 tons have been produced by 12,083 man days.

12. NEW CONSTRUCTIONS  
AND PROPOSED  
NEW CONSTRUCTION

As noted in 5. a. 2, a power line was extended to the East Pit and an 8" water line was laid for East Pit stripping.

14. MAINTENANCE  
AND REPAIRS

1. Shovels

There were no extraordinary repairs to the electric shovels during the year 1933. The small repairs incident to operation were taken care of during the season. During the winter season, these will be overhauled so as to be put in first class working condition for the year 1934.

2. Locomotives

The ordinary maintenance repairs for the three locomotives were made during the operating season. During the winter shutdown they will be overhauled to be in good condition for next year.

Cars

3. The Easton cars used between the Pit and Crusher were in operation throughout the year with practically no repairs. The overhauling that is necessary will be done during the winter shutdown.

Two dump cars used for disposing of the rock were replanked during the operating season.

4. Crushing Plant

The east #10 Superior fine crusher gave some trouble this summer. It was found that the main shaft was bent slightly so it had to be removed and a new shaft with head installed. This required the babbiting of the main bearings. This crusher is the one that came from the Maas Mine and is referred to as No. 1 crusher at the Mine. It will be necessary to reline the southwest or No.2 crusher during the shut down season.

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14. MAINTENANCE  
AND REPAIRS

4. Crushing Plant (Continued)

When the plant closed down in October, repairs were immediately started on the large Traylor crusher. It was necessary to rebabbit the main bearings, install a new mantle, reset the concave manganese liners in babbit so as to cut down the clearance. There has been considerable wear to these liners but they can probably be utilized for about 100,000 tons more before new ones will be necessary. The above repairs to the large crusher have been practically completed

5. General

The sheets of corrugated metal were removed from the building during the operating season to insure better ventilation and cut down the dust nuisance.

15. NATIONALITY  
REPORT

English	12
Finnish	9
Irish	4
French Canadian	3
Swedish	5
Norwegian	<u>1</u>
Total	34

NEGAUNEE MINE  
ANNUAL REPORT  
YEAR 1933

1. GENERAL:

The Negaunee Mine operated on a two days per week schedule from January 1st to April 8th, was then idle for seven months or until November 9th. Since reopening it has operated on a schedule of three days per week.

During the operating period in the early part of the year, ore was hoisted four days per week, two of these days representing the former night shift hoist. However, the underground force was divided into two crews, each working four days every other week, the equivalent of two days per week. The surface crew, except the two top landing crews, worked two days every week, the top landing crews worked four days every other week. On reopening in November, the three day per week schedule was arranged on a corresponding basis, except that the underground men work six successive days in each two weeks period so as to keep within the N. R. A. code. The surface crew, with the exception of the top landers, work on Monday, Wednesday and Friday. The top landers work on the same staggered basis as the underground force. The above plan of operation reduces the number of working places one-half, thereby reducing amount of equipment, also area of openings to maintain, etc.

The two crews employed from January 1st to April each averaged 120 in number, during the idle period they were reduced to an average of 30. Since reopening, the crew has been gradually increased and at the end of the year there was a total of 194 men on the payroll, divided into two crews of approximately 97 each. The number of men employed on the three days per week that the surface crew work average about 10 men greater than on the other three days of the week.

Shipments from stockpile in 1933 were 476,114 tons as compared with 10,024 tons in 1932. All the ore stocked from the steel trestle West of the shaft was shipped, also nearly all ore under the East steel trestle and in addition over one-half the ore stocked from the wood trestle. The balance in stock when the mine reopened on November 9th was 48,123 tons, exclusive of the overrun. Based on the present rate of production there will be a total of approximately 200,000 tons available for shipment to November 1st, 1934, exclusive of the overrun.

Mining was concentrated in a few areas due to working on a staggered basis during the five months operating period of 1933. The areas mined were mainly located near the footwall as they were behind in mining or, in other words, out of step with mining in the hanging wall areas. In order to prevent the loss of a large number of raises, due to rotting of cribbing, it is now planned to reopen the idle areas, repair the raises, and do a limited amount of mining.

Repair of the shaft was underway all the year and is still in progress. The repairs have been quite extensive and on completion it will be in better condition than ever before. The work covered the reinforcing of all the steel sets, new casing between cage and skip roads, and new runners in cage road throughout the circular shaft (from surface to a point below the 9th level, a distance of 960 ft.). At the end of the year this work was 95% completed.

The six months idle period in 1932, with the curtailed operating schedule of the winter of 1932-1933, followed by the seven months idle period in 1933, and the present curtailed basis of operation, will influence operating costs for a long time in the future. It will increase the ratio of repair work to the product, due to rotting of timber and cribbing, chutes and lining planks in raises, ladders, and ladder sollars, etc.

Due to the curtailed operating schedule in 1933 and the necessity of keeping cash expenditures at a minimum, fewer safety meetings of foremen and bosses were held than in 1932. Safety was stressed, however, by direct contact with the bosses and the men with the result that the year's record compares favorably with previous years. There were two lost time accidents in 1933 as compared with three in 1932.



NEGAUNEE MINE  
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1. GENERAL: (Cont)

The mines have operated since July under the N. R. A. code adopted by the Lake Superior Iron Ore Association. This has reduced surface working hours from nine to eight hours and in several jobs has made it necessary to employ more men. To offset those unfavorable factors the men are required to give eight hours actual work and closer supervision is given all jobs and all employees.

2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES:

a. Production by Grades:

	<u>1933</u>	<u>1932</u>	<u>Decrease</u>
Negaunee Bessemer Ore	0	0	--
Negaunee Ore	61,941	84,046	22,105
Total Ore	61,941	84,046	22,105
Rock	3,776	2,568	1,208 Incr.
Total Hoist	65,717	86,614	20,897

b. Shipments:

<u>Grade of Ore</u>	<u>Pocket</u> <u>Tons</u>	<u>Stockpile</u> <u>Tons</u>	<u>Total</u> <u>Tons</u>	<u>Total</u> <u>Last Year</u>
Negaunee Bessemer	0	0	0	0
Negaunee Ore	8,898	467,216	476,114	10,024
Total	8,898	467,216	476,114	10,024
Total Last Year	7,656	2,368	10,024	
Increase	1,242	464,848	466,090	

c. Stockpile Inventories:

<u>Grade of Ore</u>	<u>Dec. 31, 1933</u>	<u>Dec. 31, 1932</u>	<u>Decrease</u>
Negaunee Bessemer	0	0	0
Negaunee Ore	61,638	475,811	414,173
Total	61,638	475,811	414,173

d. Division of Product by Levels:

The ore hoisted from the various levels was as follows:

	<u>1933</u>		<u>1932</u>	
10th Level	0	00.0%	0	00.0%
11th Level	29,776	48.1%	38,822	46.2%
12th Level	32,165	51.9%	45,224	53.8%
Total	61,941	100.0%	84,046	100.0%

e. Production by Months:

The production by months is as follows:

<u>Month</u>	<u>Negaunee</u>	<u>Rock</u>
January	12,311	948
February	12,321	820
March	14,108	916
April	2,985	4
November	4,862	304
December	15,354	784
Total	61,941	3,776
Total 1932	84,046	2,568
Decrease	22,105	
Increase		1,208

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2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES: (Cont)

e. Production by Months: (Cont)

The product by leases was distributed as follows:

	<u>1933</u>	<u>1932</u>	<u>Decrease</u>
Negaunee Mine	57,945	79,736	21,791
American Mining Co.	<u>3,996</u>	<u>4,310</u>	314
Total	61,941	84,046	22,105

f. Ore Statement:

	<u>Negaunee</u>	<u>Total</u>
		<u>Last Year</u>
On Hand Jan. 1, 1933	475,811	401,789
Product for Year	61,941	84,046
Overrun	0	0
Total	<u>537,752</u>	<u>485,835</u>
Shipments	<u>476,114</u>	<u>10,024</u>
Balance on Hand	61,638	475,811
Decrease in Output	22,105	
Decrease in Ore on Hand	414,173	

1933 - 1 8-hour shift, 2 days per week, January 1st to April 8th.  
Mine idle April 8th to November 9th.  
1 8-hour shift, 3 days per week, November 9th to December 31st.

1932 - 1 8-hour shift, 2 days per week, January 1st to April 30th.  
Mine idle May 1st to November 1st.  
1 8-hour shift, 2 days per week, November 1st to December 31st.

g. Delays:

One-half day March 1st. Time lost by men made up on March 3rd so no loss in product. Casting on brake frame of cage hoist broke. Repairs completed at 10 P. M., March 1st.

h. Delays from Lack of Current:

None.

3. ANALYSIS:

a. Average Mine Analysis on Output:

<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>1933</u> <u>Phos.</u>	<u>Silica</u>	<u>Iron</u>	<u>1932</u> <u>Phos.</u>	<u>Silica</u>
Negaunee	61,941	60.78	.110	6.27	60.72	.101	6.91

b. Average Analysis on Straight Cargoes:

<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Mine</u> <u>Phos.</u>	<u>Silica</u>	<u>Lake Erie</u> <u>Iron</u>	<u>Moisture</u>
Negaunee	276,475	60.10	.104	7.87	None	

4. ESTIMATE  
OF ORE  
RESERVES:

a. Developed Ore:

Assumption: 12 cubic feet equals one ton  
10% deducted for rock  
10% deducted for loss in mining  
Percentage of Bessemer equals 5%

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4. ESTIMATE  
OF ORE  
RESERVES: (Cont)

a. Developed Ore: (Cont)

<u>Above 9th Level:</u>			
No. 1 Shaft Pillar	1,148,681 Tons		
No. 2 Shaft Pillar	<u>113,906 "</u>		
Total above 9th Level		1,262,587 Tons	
Between 10th and 11th Levels		721,334 "	
Between 11th and 12th Levels		<u>1,705,795 "</u>	
Total Developed Ore above 12th Level, 12/31/33		<u>3,689,716 "</u>	

No new ore was developed in 1933. In the above estimate the hoist by levels has been deducted from the estimate of 1932.

Statement showing ore reserves and new ore development for the following years:

	<u>1929</u>	<u>1930</u>	<u>1931</u>	<u>1932</u>	<u>1933</u>
Ore in Mine Jan. 1st	5,046,197	4,702,191	4,160,089	3,831,393	3,751,657
Production	<u>552,417</u>	<u>579,740</u>	<u>340,838</u>	<u>79,736</u>	<u>61,941</u>
Balance	4,493,780	4,122,451	3,819,251	3,751,657	3,689,716
Ore Reserves, Dec. 31	<u>4,702,191</u>	<u>4,160,089</u>	<u>3,831,393</u>	<u>3,751,657</u>	<u>3,689,716</u>
New Ore Developed	208,411	37,638	12,142	0	0

b. Prospective Ore:

No prospective ore is shown in the above estimate.

c. Estimated Analysis:

<u>Ore Reserves:</u>	<u>Approximate Expected Natural Analysis:</u>									
	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Igni.</u>	<u>Moist</u>
Bessemer	53.30	.044	5.80	.220	2.30	.900	.290	.008	1.50	12.00
Negaunee	53.00	.094	6.50	.210	2.60	1.10	.320	.011	1.94	12.00

<u>Ore in Stock:</u>	<u>Average Natural Analysis:</u>									
	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Igni.</u>	<u>Moist</u>
Negaunee	53.00	.094	6.50	.210	2.55	1.00	.290	.010	1.94	11.50

5. LABOR  
AND  
WAGES:

a. Comments:

(1) Labor:

From January 1st to April 8th labor was on a two-day a week basis, this schedule was continued during the idle period. On reopening the mine on November 9th a three-day per week schedule was adopted. At the end of the year two full crews were employed, working on a staggered basis to give each crew three days per week or thirteen days per month. The Civil Works Administration has provided work for practically all idle men in the community, so that there is no longer a large number of men seeking employment at the mines.

(2) New Constructions:

There were no E & A's authorized or active in 1933.

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5. LABOR AND WAGES: (Cont)

b. Comparative Statement of Wages and Product: (Cont)

Proportion of Surface to Underground Men:

1933 - 1 to 2.94 - 1 8-hr shift, 2 days per week, Jan. 1st to April 8th  
 Mine idle April 8th to November 9th.  
 1 8-hr shift, 3 days per week, Nov. 9th to Dec. 31st

1932 - 1 to 3.53 - 1 8-hr shift, 2 days per week, Jan. 1st to Apr. 30th  
 Mine idle May 1st to October 31st.  
 1 8-hr shift, 2 days per week, Nov. 1st to Dec. 31st

6. SURFACE:

a. Buildings, Repairs:

Only minor and absolutely necessary repairs to buildings were made in 1933. An individual steam heating plant was installed in the shop building late in the year, but due to delay in receipt of some parts for the heating boiler, it is not yet in operation. Unit heaters, one in each shop, will be used instead of the old pipe heaters which depend on steam from the heating plant, 500' distant.

b. Stockpiles:

The large shipments in 1933 left most of the stockpile area vacant. On present basis of operation, grounds are available for two years operation without any shipments. The wood trestles erected in 1931 and 1932 were dismantled this year and the good timber salvaged.

c. Tracks, Roads, Etc.

There was no expense incurred in 1933 on account of tracks or roads. Water used at mine purchased from the City of Negaunee for the past five years was as follows:

	<u>1933</u>	<u>1932</u>	<u>1931</u>	<u>1930</u>	<u>1929</u>
1st Quarter	54.25	58.11	104.72	180.01	257.57
2nd "	36.00	68.68	57.41	175.71	279.79
3rd "	52.14	51.25	76.41	219.47	305.55
4th "	36.29	40.43	46.55	147.36	173.39
Total	178.68	218.47	284.99	722.55	1016.30
Product	61,761	84,046	338,696	579,740	555,919
Cost per ton	.002893	.0026	.00084	.00124	.00182

The cost per ton in 1931 reflects the saving due to installation of hot well near the boilers, the actual cash cost was low in 1932 and 1933 but due to curtailed output in these years the cost per ton was high.

e. Grounds:

Expense for grounds was kept at a minimum in 1933. The grass on lawn was mowed as required, there was no other expense.

7. UNDERGROUND:

a. Shaft Sinking:

None in 1933.

b. Development:

Only absolutely necessary development work was done in 1933. The first three months of the year rock drifting on two shifts per week schedule was underway on the 13th level, this work has not yet been resumed since the mine reopened.

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5. LABOR  
AND  
WAGES:

b. Comparative Statement of Wages and Product:

	<u>1933 (a)</u>	<u>1932 x</u>	<u>Increase</u>	<u>Decrease</u>
PRODUCT	61,941	84,046		22,105
No. Shifts and Hours	1-8	1-8		
 <u>AVERAGE NO. MEN WORKING PER MO.</u>				
Surface	34	36		2
Underground	<u>100</u>	<u>127</u>		<u>27</u>
Total	134	163		29
 <u>AVERAGE WAGES PER DAY:</u>				
Surface	3.91	3.86	.05	
Underground	<u>4.02</u>	<u>4.34</u>		<u>.32</u>
Total	3.93	4.22		.29
 <u>AVERAGE WAGES PER MONTH:</u>				
	9.84 days	9.85 days		
Surface	45.29	44.28	1.01	.01
Underground	<u>39.86</u>	<u>40.78</u>	<u>.32</u>	<u>.92</u>
Total	41.13	41.55		.42
 <u>PRODUCT PER MAN PER DAY:</u>				
Surface	13.77	16.95		3.18
Underground	<u>5.46</u>	<u>5.87</u>		<u>.41</u>
Total	3.91	4.36		.45
 <u>LABOR COST PER TON:</u>				
Surface	.269	.228	.041	
Underground	<u>.737</u>	<u>.739</u>		<u>.002</u>
Total	1.006	.967	.039	
 <u>AVERAGE PRODUCT MINING:</u>				
Stopping	19.80	21.54		1.74
Ore Development	-	<u>7.19</u>		-
Total	19.80	21.25		1.45
 <u>AVERAGE WAGES CONT. LABOR</u>				
	4.32	4.86		.54
 <u>TOTAL NUMBER OF DAYS:</u>				
Surface	4,497 $\frac{1}{2}$	4,957 $\frac{3}{4}$		460 $\frac{1}{2}$
Underground	<u>11,345<math>\frac{1}{2}</math></u>	<u>14,317</u>		<u>2,971<math>\frac{1}{2}</math></u>
Total	15,843	19,274 $\frac{1}{2}$		3,431 $\frac{1}{2}$
 <u>AMOUNT FOR LABOR:</u>				
Surface	16,644.18	19,129.01		2,484.83
Underground	<u>45,622.39</u>	<u>62,142.96</u>		<u>16,520.57</u>
Total	62,266.57	81,271.97		19,005.40
 <u>AVERAGE WAGES PER MONTH BASED ON MEN CARRIED ON MINE PAYROLL:</u>				
	9 & 13 days	9 days		
	<u>per month</u>	<u>per month xx</u>		
Surface	43.06	40.26		
Underground	<u>38.41</u>	<u>39.06</u>		
Total	40.73	39.05		

x Includes 6 months operating and 6 months idle period

xx 15% reduction in wages - May 16th, 1932

a Includes 5 months operating and 7 months idle period

b 15% increase in wages effective July 16th, 1933

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7. UNDERGROUND: (Cont)

b. Development: (Cont)

No. 4 crosscut on the 12th level was extended 40 ft. in rock early in the year.

Some rock drifting and raising was done on the 360' sub level above the 12th level in preparation for opening a new transfer system to mine a pillar on the footwall of the 11th level. The above, with a rock raise from the 12th level started after the mine reopened, comprised the rock development work of the year 1933.

There was no development in ore during 1933.

Development in rock for the year was 325 ft. drifting and raising, an increase of 14 ft. as compared with 1932. There was no development in ore in 1933, in 1932 there was only 90 ft.

c. Stoping:

(1) General Remarks:

Mining was restricted to the same small areas as in 1932, i.e. the North and South footwalls just below the 10th level and the North central portion of the ore body just below the 11th level. Since reopening the mine in November, the central and South portions of the ore body below the 11th level are being reopened and the raises repaired, in anticipation of the resumption of mining here when an increased working schedule goes into effect. The present production schedule requires about 23 contracts, an average of 19 mining and 4 on development work. All working places operate six days per week with two crews of men, so that each gang works three days per week. An increase in the working schedule to four or five days per week will require twice the number of working places, but no increase in the number of men.

(2) Detail of Stoping:

488' Sub Level - North Footwall:

Mining of the small pillar on the North footwall, adjacent to the Maas boundary, was started late in 1931 and completed when the mine closed last Spring. The ore area was smaller than on the sub above but the ore was higher grade.

488' Sub Level - South Footwall:

Mining of the ore body between No. 1 dike and the South footwall was started in the Spring of 1932 and has been continued during the curtailed operating period of 1933. It was 80% completed at the end of the year. Three contracts worked here in 1933. The West end of the sub level near the hanging is quite wet, making mining difficult and hazardous.

Another area on this sub level, lying between No. 1 and No. 2 dikes, was in progress of being opened for mining during 1933. This area, roughly 160' x 200' in size, of which 25% is jasper, is the wettest area in the mine. The hanging jasper breaks up into small pieces which are very difficult to hold back even when the floors of sub above have been covered with poles and wire netting, especially so when the water dams back and comes in with a rush. It is hoped to be able to mine the area adjacent to the hanging where most of the water comes in, which, if successful, will improve mining conditions on the balance of the sub level. Mining here is much more expensive than elsewhere, but it must be continued to keep pace with mining in adjacent areas.

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7. UNDERGROUND: (Cont)

c. Stoping: (Cont)

475' Sub Level - South Footwall:

The East half of the ore body lying between No. 1 and No. 2 dikes was opened for mining in 1931 and two contracts are now mining the last two pillars. Mining is now 95% completed in this area. When mining is completed, this area will be left idle until mining in the hanging area reaches this elevation.

475' Sub Level - North Footwall:

Mining of the small area left on the footwall near the Maas boundary, commonly called the "Railroad Pillar", was started when the mine reopened in November. Four contracts were working here at the end of the year; drifting to connect the raises is now nearly completed and slicing will start in January. The lean area adjacent to the footwall on the sub levels above has now nearly disappeared and a higher grade product will be obtained on this sub level.

425' Sub Level - North Footwall:

Mining of the North central footwall pillar just above the 11th level on this sub level was not completed in 1932. Mining was continued in 1933 from 1280 raise and was completed when the mine closed last Spring.

11th Level:

Several small pillars had not been mined on this sub level in the North central footwall area prior to 1933. Preparation for mining was underway most of the past year. One large pillar will be mined through a transfer system that is now about 75% completed. The transfer sub level has been opened in the footwall at the elevation of the 360' sub level and three transfer raises are now being put up through the footwall to the ore, 50 ft. above. Mining of this pillar will be underway early in 1934.

In the Northeast part of the North footwall pillar there was one small area that was not mined in 1932 or 1933. At the close of the year mining was started by one contract at No. 1280 raise and this pillar will now be removed. Connection to the footwall haulage drift on the 11th level is by way of a rock drift in the footwall on the 425' sub which provides a second outlet and ventilation for the new sub being opened at the elevation of the 11th level.

395' Sub Level:

This sub level provided more than half of the ore hoisted in 1932 and in 1933 up to March 1st. On January 1st, 1933, ten gangs were mining in the area above the 1270 and 1290 series of raises. When the mine closed in April, mining was practically completed in this area, except a small pillar North of 1277 raise. The drifts at top of this raise were kept open during the shutdown and one contract resumed work here on reopening in November. By the end of the year most of this pillar was removed and mining will be completed here within 30 days.

There are several pillars left to mine on the footwall that are not available from the 1270 series of raises. They will be mined later, one from a new raise now being put up from the 12th level and the others from the 1280 series of raises and the transfer system located on the 360' sub level.

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7. UNDERGROUND: (Cont)

c. Stoppings: (Cont)

385' Sub Level

This new sub level was opened early in 1933 above the 1290-A series of raises. When the mine closed in April, eight raises had been connected by drifts, at two of these raises slicing was underway. This series of raises parallel the Maas boundary and on this sub level mining operations to the North of the raises will encounter the old Maas workings, on the sub above, jasper was encountered at most points on the boundary. The Maas is mined 100' deeper in this area than the Negaunee but there is no evidence that Negaunee Mine ore has caved into the Maas workings. On reopening the mine in November, work was resumed here with six gangs of miners. Four gangs are mining the ore on the side toward the Maas Mine and two gangs are drifting to open up the six raises in the 1290 series. The 1290 series are parallel with and 90' distant from the 1290-A series.

In November one gang opened out at 1274 raise and in December drifted over to #1275 raise. They are opening this area for mining and repair of the eight raises in the 1270 series. A number of these raises have rotted and started to crush so that repairs had to be made.

370' Sub Level:

Mining on this sub level in the area under the hanging above the 1240 series of raises was completed in 1932. No mining was done in 1933. The main area of the sub level, above the 1250, 1260, 1270, 1290, and 1290-A series of raises has not yet been opened for mining. At the present rate of production it will be nearly two years before there is much mining underway on this sub level.

360' Sub Level:

In November 1932 a drift was started North in the footwall from 1284 raise to be used as a transfer sub level for handling ore that would come from mining a footwall pillar at the elevation of the 11th level. This work was continued in 1933, the drift being completed when the mine closed in April. Since reopening, raising has been underway and at the close of the year two raises were completed and the third and last one well advanced. These raises were in rock for 45' when ore was encountered at approximately the elevation of the 11th level. The 11th level pillar could not be mined from the 1280 series of raises as all of these raises had crushed beyond repair before mining of the foot-wall pillar could be started. The pillar to be mined is triangular in shape with an area of approximately 9500 sq. ft. Mining should be underway within sixty days.

In order to save the raises in the 1240 series, that have been idle since 1931, it was decided to open the 360' sub level in this area, connect the nine raises in this series and repair all the raises. If general business conditions improve and a larger product is desired, working places will be immediately available. The ore in this area runs low in phos. and if it becomes necessary to lower the phosphorous in the product, some mining may be done here during the coming year. One contract started working at 1242 raise late in November and by the end of December had repaired this raise and drifted to 1243 raise.



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7. UNDERGROUND: (Cont)

c. Stopings: (Cont)

12th Level:

Aside from general repair work there was very little development work done on this level during 1933. In the early part of the year the footwall drift that will connect No. 4 and 5 crosscuts was extended 40' in jasper. On account of curtailment of expense, drifting was temporarily stopped but will be resumed and completed in 1934. 60' of drifting remains to be done. When the mine reopened in November, a raise, No. 1209, located at the turn of the East footwall drift between the 1270 and 1280 series of raises, was started and at the end of the year was up 35' in rock. It will not encounter ore until near the elevation of the 395' sub level, where there is a pillar to be mined that lies on the East footwall.

13th Level:

Development of the 13th level was underway in the first three months of the year but since the mine reopened has not yet been resumed. The tail drift South of the shaft pocket was completed in January, when it reached a point 124' South of the pocket.

The drift to the North of the pocket was then started and at the end of March, when work was stopped, it had advanced to a point 120' North of the shaft. The drift will be continued for 80' and then widened to make room for two timber tracks to the cage compartment, after which the main drift to the ore body will be started. It is planned to resume work here early in 1934, as soon as some rock work now underway on the 12th level and 360' transfer sub level is completed. It will require several years to complete the development of the 13th level.

d. Timbering:

The cost per ton for timbering shows a decided increase in cost per ton in 1933; the actual money cost for the two years was practically equal. The increase in cost per ton was due to small product, to charging out timber that had rotted, and to use of larger sized timber to offset partial rotting and drying, also to including timber used during the idle period. The actual cost for timber used during the operating period was approximately \$0.09, the increase over this figure is explained above. The cost in 1932 was above normal due to small product and timber used during the idle period. The stock of old stull timber is very low; since reopening green timber caps have been exclusively used and old large size timber for legs on sub levels. All poles in stock have been used; there is quite a stock of sound 7 ft. lagging and some good cribbing timber on hand. Stull timber and 9½ ft. poles are being purchased and delivered to the mine.

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7. UNDERGROUND: (Cont)  
d. Timbering:

Statement of Timber Used:

	<u>Linear Feet</u>	<u>Avg. Price per Foot</u>	<u>Amount 1933</u>	<u>Amount 1932</u>
6" to 8" Gribbing	11,325	.0397	450.03	738.04
8" Stulls	11,580	.0661	765.44	1,685.96
10" "	20,823	.099	2,061.72	1,737.64
12" "	17,090	.1295	2,213.53	1,166.38
14" "	4,531	.1412	640.37	261.85
16" "	447	.1372	61.35	51.71
Total - 1933	65,796	.0941	6,192.44	5,641.58
" - 1932	74,648	.0756		
Lagging - 7 ft.	197,365	.70	1,381.33	1,723.47
Poles - 9½ ft.	176,575	.862	1,523.05	1,563.67
Total - 1933	373,940		2,904.38	
" - 1932	360,379			3,287.14
Wire Fencing - 60 rods			51.00	59.50
Grand Total - 1933			9,147.82	
Grand Total - 1932				8,988.22
Product			61,941	84,046
Feet of timber per ton of ore			1.062	.8882
" " lagging per ton of ore			3.19	2.932
" " " " ft. of timber			3.00	3.301
" " wire fencing per ton of ore			-	.0154
Cost per ton for timber			.0999	.0671
" " " " lagging			.0223	.0205
" " " " poles			.0246	.0186
" " " " wire fencing			.0008	.0007
Total Cost per ton			.1477	.1069
Equivalent of Stull Timber to Board Measure			198,747	148,947
Feet of Board Measure per Ton of Ore			3.21	1.772

Total Cost for Timber, Lagging, Poles, etc.

<u>Year</u>	<u>Amount</u>	<u>Cost per Ton</u>
1933	9,147.82	.1477
1932	8,988.22	.1069
1931	33,408.70	.0986
1930	52,500.62	.0906
1929	45,512.75	.0899

Cost for timber, lagging, and poles:

	<u>Amount</u>	<u>Per Ton</u>
Operating Period	7,747.82	.1284
Idle Period	1,200.00	.0193
Total	8,947.82	.1477

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7. UNDERGROUND: (Cont)

e. Drifting and Raising:

Drifting and raising decreased in 1933 as compared with the previous year. This work was curtailed in both years to reduce expenses. Following is a statement for years 1933 and 1932:

Year	Drifting	Raising		Total
	Rock	Ore	Rock	
1933	290'		35'	325'
1932	154'	90'	157'	401'
Increase	136'			
Decrease		90'	122'	76'

f. Explosives, Drilling and Blasting:

The cost per pound for powder decreased 3% in 1933, while the pounds of powder per ton of ore increased. Experiments made in the early months of 1933 with a new powder "Gelumite A", demonstrated that there was no economy in changing from "50% Gelatin Low Freezing Powder", which had been used heretofore. The "Gelumite A" powder ran more sticks to the box and was supposed to be the same strength as 50% Gelatin powder. Since reopening, Gelatin L. F. powder has been exclusively used. The concentration of mining in the footwall areas where the ore is tight and hard to break increased the pounds of powder per ton of ore and also the cost for explosives. Stating the above fact in another way, the small product in 1933, with practically no mining in areas where the ore was easily broken, increased the cost for all explosives.

Statement of Explosives Used: (Ore Development and Stopping)

	Quantity	Average Price	Amount	Amount
			1933	1932
50% Gelatin Powder	18,625		2,156.07	3,787.58
60% " " "	750		96.13	-
Gelumite "A"	8,450		1,055.50	456.61
" 2X	3,850		481.25	106.25
Total Powder - 1933	31,675	.1196	3,788.95	
" " - 1932	35,225	.1235		4,350.44
Fuse - Feet	101,314		575.10	610.68
Caps - No. 6	16,572		185.34	194.05
Tamping Bags	9,300		20.92	15.98
Fuse Lighters	1,700		11.50	10.38
Delay Fuses	100		12.00	-
Total Fuse, Etc. - 1933			804.86	
" " " - 1932				831.09
Total All Explosives - 1933			4,593.81	
" " " - 1932				5,181.53
Product			61,941	84,046
Pounds of Powder per Ton of Ore			.511	.4191
Cost per Ton - Powder			.061	.0518
" " " - Fuse, Caps, etc.			.013	.0099
" " " - All Explosives			.074	.0617

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7. UNDERGROUND: (Cont)

f. Explosives, Drilling and Blasting: (Cont)

Statement of Explosives Used: (Cont)

	<u>Sinking, Rock Development, Etc.</u>	<u>Average</u>	<u>Amount</u>	<u>Amount</u>
	<u>Quantity</u>	<u>Price</u>	<u>1933</u>	<u>1932</u>
Total Powder - 1933	2,950		370.00	
"    "    - 1932	2,350			296.99
Total Fuse, Caps, etc. - 1933			49.19	
"    "    "    "    - 1932				191.88
Total All Explosives - 1933			419.19	
"    "    "    "    - 1932				363.01
Total Explosives Used in Mine			5,013.00	5,544.54
Average Price per lb. for Powder			.1196	.1235

Comparison of cost of all explosives for period 1927 to 1933 inclusive:

<u>Year</u>	<u>Cost per Ton</u>	<u>Product</u>
1927	.0629	487,880
1928	.0676	454,563
1929	.0571	555,919
1930	.0574	579,740
1931	.0601	338,696
1932	.0617	84,046
1933	.0740	61,941

g. Mining and Loading:

Due to the continuation of curtailment of product, only electric scraper hoists were in use during 1933. Costs for repairs of scraper units have been low due to elimination of air hoists. Some deterioration of motors on hoists may have occurred due to the long idle periods; if this took place, it will develop after the hoists are in operation. All ore mined is handled on the sub levels by scraper hoists, even in areas that are wet. If an increase in production with longer working schedule for the men is desired in 1934, more electric scraper units will have to be purchased.

h. Ventilation:

Ventilation was maintained during the year by 24-hour operation of the 120,000 cu. ft. per minute capacity fan at No. 2 shaft. Booster fans have also been operated to force air to the sub levels. The rotting of timber uses up the oxygen in the air, making it essential to maintain good ventilation during the idle periods. When the mine is operating, ventilation is partly provided by escaping compressed air from drill machines, movement of equipment, etc. Severe cold weather interferes with ventilation due to partial closing of the airways by ice. The fan is then reversed and pulls warm air through No. 2 shaft until the ice is melted. During the periods of below zero weather, ventilation is not as good as at other times. A ventilation system should provide the required amount of fresh air for each man in the mine. The large fan at No. 2 shaft provides more than the required amount except when the areas of airways are restricted by ice. The problem is to get the fresh air to the men working on the sub levels. This requires ventilation doors in main drifts and in raises, also booster fans.