and crosscut through the pillar north and south from their raise. They drifted east to No. 15's stope, and mined all the ore around their raise, finishing late in September.

355 Foot Sub-level.

No. 15 came down from the fourth level in September, and drifted west 60 feet along the hanging-wall towards No. 16's raise.

Footwall Deposit.

285 Foot Sub-level.

No. 11 came up from the 465 foot sub-level in May, retimbered the west drift on the footwall, and mined the ore in the back for 100 feet from 330 to 430 feet south-east of the shaft. They mined some Clinton and Salisbury ore along with the Silica.

Fourth Level or 345 Foot Sub-level.

No. 9 were stoping on the footwall from 650 to 770 feet south-east of the shaft until the mine closed. They mined some Salisbury ore, but most of their output was Silica.

South Vein.

Fifth Level.

No. 6 holed their raise from the eighth level to No. 13's old stope, 1430 feet south-east of the shaft, in May.

405 Foot Sub-level.

No. 6 and No. 17 opened this sub-level in June, cutting out on the east side of No. 6's raise, 1430 feet south-east of the shaft, and mining all the ore from foot to hanging. No. 6 went down to the next sub-level in July, and No. 17 went to the 465 foot sub-level.

420 Foot Sub-level.

No. 6 came down from the 405 foot sub-level in July, and mined all the ore east of their raise, which is 1430 feet south-east of the shaft. They finished in September.

430 Foot Sub-level.

At the beginning of the year there were three gangs stoping in the loose ground in the old room on this sub-level 900 to 950 feet south-

east of the shaft. No. 7 and No. 12 finished around their raise in February, and moved down to the next sub-level. No. 21 finished in April.

445 Foot Sub-level.

No. 7 and No. 12 came down from the 430 foot sub-level at the end of April and drifted east through the loose ground in the old room from 880 to 1040 feet south-east of the shaft, No. 7 driving the north drift and No. 12 the south one. They stoped back together until Oct. 1, and finished all the ore east of a point 880 feet south-east of the shaft.

In the ore at the east end of the vein No. 3 opened out from their raise from the eighth level, 1280 feet south-east of the shaft, in March, and stoped from 50 feet south-east of the raise to 40 feet west of it, and from two to seven sets high. The ore was very irregular in shape.

455 Foot Sub-level.

No. 8 raised from the eighth level in January, 1250 feet south-east of the shaft, and crosscut north in rock 20 feet on the 455 foot sub-level to the footwall. They moved to the next raise, 100 feet east, in March, and crosscut north-east to the footwall. They drifted east 80 feet in ore following the contact, and followed the rock around to the south-west until they holed to No. 17's raise, 30 feet east of their own chute. They moved to the fourteenth level in March, 1380 feet south-east of the shaft, and crosscut north to No. 8's drift.

No. 6 holed their raise from the eighth level, 1365 feet south-east of the shaft, in April, and continued their raise to the east until they holed to the fifth level.

465 Foot Sub-level.

At the beginning of the year No. 11 and No. 14 were working on this sub-level.

No. 11 crosscut south 35 feet in ore from the main drift 1230 feet south-east of the shaft, and drifted east 30 feet from the north raise, 1205 feet south-east of the shaft, in mixed ore and jasper. They went down to the eighth level and raised again 1350 feet east of the shaft, near the hanging-wall diorite, drifted south-east 15 feet to the contact and 20 feet

north-east to No. 17's raise. They moved back in the main drift, and crosscut south 45 feet to the capping, 1300 feet south-east of the shaft. They moved to the 285 foot sub-level on the first of June.

No. 3 holed their raise from the eighth level 1280 feet south-east of the shaft in February, and raised to the 445 foot sub-level.

No. 13 came up from the eighth level in April and drifted west from No. 11's crosscut 1230 feet south-east of the shaft for 70 feet, following the jasper around to the south-west, and opened a stope under the capping. They continued working here, until the mine closed.

No. 14 drifted west from their crosscut south of the main drift 1350 feet south-east of the shaft until they holed to the old open room. They moved to the eighth level in March.

No. 17 raised from the eighth level, 1380 feet south-east of the shaft, near the south diorite contact, and drifted north-east 40 feet to No. 8's raise in May. They moved to the 405 foot sub-level at the end of the month, but returned in August and opened a square-set stope 1310 feet south-east of the shaft. When the mine closed they were raising 1380 feet south-east of the shaft.

Eighth Level.

At the first of the year there were five gangs working on this level, Nos. 3, 6, 8, 13 and 17.

No. 3 drifted east from the main drift 1200 feet south-east of the shaft, following the jasper on the right side, and holed to the south crosscut 1280 feet south-east of the shaft. They then raised to the 465 foot sub-level.

No. 6 continued the main drift 40 feet south-east to the south diorite contact, and drifted north-east along the contact for 40 feet in ore, until the ore was cut off by rock, 1390 feet south-east of the shaft. Turning here to the north they drifted through mixed ore and paint-rock to the footwall, and raised to the 455 foot sub-level in April.

No. 8 crosscut south-east 60 feet in ore to the hanging-wall diorite, 1320 feet south-east of the shaft, and raised to the 465 foot

sub-level in February.

No. 13 widened the main drift for a siding 1160 feet south-east of the shaft, in January, and then drifted east from No. 3's raise, 1290 feet south-east of the shaft, to the next crosscut. They crosscut south 35 feet to the old room from No. 3's drift 1230 feet south-east of the shaft, and went to the 465 foot sub-level in April.

No. 17 drifted west along the south diorite contact from the end of the south crosscut 1340 feet south-east of the shaft, until they reached the jasper capping, moved back 50 feet and crosscut south-east to the diorite again, and followed the contact east to No. 6's drift. They raised to the 465 foot sub-level twice, 1360 and 1380 feet south-east of the shaft, and went to the 455 foot sub-level in April.

No. 14 raised to the 455 foot sub-level in March, 1380 feet south-east of the shaft, and went to the sixteenth level in April.

Ninth Level.

No. 19 mined the ore along the east drift from a point 230 feet north-east of No. 4 shaft west for 120 feet, and then drifted west 55 feet in caved ground from the crosscut 150 feet north of No. 4 shaft. They caved this drift back, and had just finished at the time of the mine's closing. They had nearly all Silica ore.

570 Foot Sub-level.

No. 2 were scramming all the year in the loose ground in the east open room and in the pillar between this room and the next one west, from 450 to 530 feet south-east of the shaft. They had nearly finished on this sub-level when the mine closed. They had good ore nearly all of the time.

South-West Deposit.

Thirteenth Level.

No. 1 and No. 20 finished the ore around No. 1's raise, 230 feet south-west of No. 4 shaft, in February, and moved down to the next sub-level.

750 Foot Sub-level.

No. 20 came down from the thirteenth level early in February, and drifted east 50 feet in ore from their raise, which is 310 feet south-west of No. 4 shaft. They crosscut south from the breast of the drift for 80

feet, passing through 40 feet of rock, and mined the Bessemer ore near the hanging-wall 90 feet long and 30 feet wide. They went to the fourteenth level in August.

No. 1 came down from the thirteenth level in February, and drifted west from their raise, which is 225 feet south-west of No. 4 shaft, until they holed to No. 20's drift. Then they crosscut north and north-west from the raise for 45 feet, and turned north-east, drifting along a rock contact to the footwall. They mined the ore on the footwall under No. 3's old square-set room, and had just finished this ore at the time the mine shut down.

760 Foot Sub-level.

No. 18 mined the Bessemer ore along the diorite south of their raise, which is 210 feet south of No. 4 shaft, for seven and a half months, and moved down to the next sub-level in August.

770 Foot Sub-level.

No. 18 cut out on the south side of their raise, which is 210 feet south of No. 4 shaft, in August, and drifted south-west 60 feet in good ore.

Fourteenth Level.

No. 8 came down from the 445 foot sub-level in June and started retimbering the main drift going south-east past No. 4 shaft. They reopened this drift in old workings for 60 feet, and then turned a little to the south, drifting in soft diorite. They made good progress in the soft diorite until October. At this time the ground became very hard, and progress has been slower since then. They made 167 feet in September, 109 feet in October, 120 feet in November, and 139 feet in December. The breast is now 694 feet south of No. 4 shaft.

No. 20 came down from the 760 foot sub-level in August and retimbered and widened the main drift between No. 4 shaft and the crosscut to the air shaft. They enlarged the plat in September.

855 Foot Sub-level.

At the beginning of the year there were two contracts working on this sub-level, No. 10 and No. 23. No. 10 drifted west from the raise 150

feet west of No. 5 shaft, following the footwall for 150 feet to the end of the ore. On March 4 this stope caved in, killing both the miners. The drift was reopened to the end in an endeavor to find the cause of the accident, and was then blasted in. A crosscut was driven 30 feet south from the drift 20 feet west of the raise, and a small stope opened, but the ore was lean, and the men joined No. 23 on the other side of the raise.

No. 23 drifted east from their raise to the end of the ore on the footwall, 100 feet south-west of No. 5 shaft, and then caved back. They crosscut south 35 feet from their raise, which is 150 feet west of the shaft, and drifted east 110 feet, following a narrow vein of ore. At the end of this drift they raised to the east on square-sets, No. 10 working with them, following the ore seven sets high. They caved this stope and the drift back to the crosscut, and went down to the next sub-level in September.

No. 14 raised from the main crosscut on the sixteenth level in May, 260 feet south of the shaft, and drifted east 25 feet and south 30 feet in caved ground without finding ore. They moved down to the 885 foot sub-level in June.

865 Foot Sub-level.

No. 23 in September drifted east 75 feet on the footwall from their raise, which is 150 feet west of the shaft. All their work has been in Silica ore.

885 Foot Sub-level.

No. 14 drifted 30 feet in rock from their raise, which is 260 feet south of No. 5 shaft, to a dike of paint-rock, and drifted north 50 feet and south 35 feet in good ore along this contact. They caved this back, and went down 10 feet in their raise in August.

895 Foot Sub-level.

No. 14 drifted east 15 feet from their raise, which is 260 feet south of No. 5 shaft, to the paint-rock, and followed the contact in good ore north 40 feet and south 30 feet. They finished this ore in September.

Fourteenth Level.

No. 14 came down from the 445 foot sub-level in April, and raised to the east 50 feet in lean ore on the east side of the main crosscut 260

feet south of No. 5 shaft.

The west footwall drift was repaired twice during the year.

SALISBURY MINE.

COMPARATIVE MINING COST FOR YEAR.

	1 9 1 4 (9 Mos)	1 9 1 3	INCREASE	DECREASE
PRODUCT	86,741	123,183		36,442
General Expense	.082	.062	.020	
Maintenance	.141	.123	.018	
Mining Expense	1.295	1.108	.187	
Cost of Production	1.518	1.293	.225	
Exploratory	.048	.025	.023	
DEPRECIATION.				
Equipment	.001		.001	
New Construction		.004		.004
Original Purchase	.113		.113	
Total Depreciation	.114	.004	.110	
Taxes	.036	.030	.006	
Central Office	.100	.082	.018	
Sundry Expense	.015	.025		.010
Supply Inventory	.003		.003	
COST ON STOCKPILE	1.834	1.459	.375	
Loading & Shipping	.018	.012	.006	
Total Cost on Cars	1.852	1.471	.381	
Number Days Operating	224	295		71
No. Shifts and hours	2-8hr	2-8hr		
Avg. Daily Product	387	417		30
COST OF PRODUCTION				
Labor	1,108	.982	.126	
Supplies	.410	.311	.099	
Total	1.518	1.293	.225	

SALISBURY MINE.

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COMPARISON OF COST SHEETS

FOR 1913 AND 1914.

The Salisbury Mine produced ore for only nine months in 1914, the only work done underground after October 1, being repairing and rock drifting. This caused a general decrease in those accounts directly connected with ore-production, such as Breaking Ore, Tramming, etc. After June 1 the proportion of Silica ore mined was reduced, as much high grade ore being produced as possible. This cut down the tons per man and tons per day, and increased the cost per ton all along the line. Furthermore an estimated overrun of 3300 tons in the Clinton stockpile was taken up in the 1913 production, reducing the cost per ton for that year about 3%.

Wages were raised 10¢ a day Feb. 1, 1913 and reduced 10% Oct. 1, 1914.

Production.

	Total Tons	Per Day Tons
1913(12 months)	123,183	417
1914(9 months)	86,741	387
Decrease	36,442	30

Tons Per Man Per Day.

	Surface	Underground	Total
1913(12 months)	12.48	3.59	2.79
1914(9 months)	11.14	3.39	2.60
Decrease	1.34	.20	.19

Cost Per Ton.

	Labor	Supplies	Total
1913	.982	.311	1.293
1914	1.108	.410	1.518
Increase	.126	.099	.225

COST COMPARISON.

GENERAL EXPENSE.

No. 26 - Insurance.

1913	$237.85	.002
1914	217.19	.002
Decrease	20.66	.000

No. 27 - Engineering.

1913	$565.30	.005
1914	594.43	.007
Increase	29.13	.002

The increase in cost per ton is due to the smaller production in 1914.

No. 28 - Analysis.

1913	$2781.58	.023
1914	2155.64	.025
Decrease	625.94	
Increase		.002

The decrease in total charges and the increase in cost per ton are both due to the smaller production in 1914.

No. 30 - Personal Injury Expense.

1913		
1914	$221.59	.003
Increase	221.59	.003

In 1914 $221.59 was paid to the widow of John Frost who was killed on March 4th.

No. 30a - Mine Office.

1913	$3983.31	.032
1914	3919.30	.045
Decrease	64.01	
Increase		.013

The increase in cost per ton is due to the smaller production in 1914.

MAINTENANCE.

No. 125 - Tracks and Yards.

1913	$542.32	.005
1914	366.67	.004
Decrease	175.65	.001

The charges against this account did not go on after the mine closed as they did in General Expense, the difference in the cost per month of operating time being only $2.12 in favor of 1914.

No. 126 - Docks, Trestles & Pockets.

1913	$844.26	.007
1914	684.99	.008
Decrease	159.27	.
Increase		.001

The increase in cost per month, when the mine was operating, in 1914, was $5.76. The charges against this account are high for both years on account of the extension of the stocking grounds for Silica ore.

No. 127 - Buildings.

1913	$443.73	.004
1914	465.59	.005
Increase	21.86	.001

In 1914 the engine-house roof was painted and new roofing was put on the dry. The coal tunnel was also repaired.

No. 128 - Shop Machinery.

1913	$50.80	.000
1914	36.10	.000
Decrease	14.70	.000

No. 129 - Boiler Plant.

1913	$374.88	.003
1914	68.58	.001
Decrease	306.30	.002

In 1913 the feed-water pipes were renewed, the main stack painted and the brickwork repaired in September and October. In 1914 only one boiler was operated.

No. 130 - Hoisting Machinery.

1913	$4437.85	.036
1914	3285.88	.038
Decrease	1151.97	
Increase		.002

Depreciation charges were $3054.32 in 1913, and $2150.75 in 1914, a decrease of $903.57. A reverse panel was sold to the Cliffs Shaft mine for $150.00, and brake-lining cost $90.58 less. Ropes and steam-heat were about even.

No. 131 - Compressors and Power Drills.

1913	$1843.18	.015
1914	2084.32	.024
Increase	241.14	.009

In 1913 the depreciation charges on the compressor were $1530.69, and in 1914 $1077.84, a decrease of $452.85. In 1913 one drill cost $121.89, and in 1914 three drills and equipment cost $828.34, an increase of $706.45.

No. 132 - Pumping Machinery.

1913	$3497.14	.028
1914	1860.00	.021
Decrease	1637.14	.007

In 1913 depreciation charges on pumping equipment were $2436.42 and in 1914, $1715.64, a decrease of $720.78. In 1913 repairs on the electric pump cost $780.91 and to the Cornish pump $297.50. In 1914 repairs cost $142.29

No. 133 - Top Tram Engines and Cars.

1913	$165.34	.001
1914	139.33	.002
Decrease	26.01	
Increase		.001

No. 134 - Skips and Skip-Roads.

1913	$1298.65	.011
1914	898.27	.010
Decrease	400.38	.001

In 1913 the mine was closed from July 2 to July 11 while repairs were made to the shaft-timber and skip-road, making the charges high in 1913. In 1914 after Oct. 1 the skip-road and cage-road were cleaned down from surface to the sixteenth level and the tracks repaired.

No. 135 - Underground Tracks and Cars.

1913	$1527.15	.012
1914	1295.89	.015
Decrease	231.26	
Increase		.003

The decrease is due to the shorter operating year in 1914.

No. 137 - Telephones and Safety Devices.

1913	$113.20	.001
1914	488.17	.006
Increase	374.97	.005

In 1914 charges from central station of safety department and for hospital equipment, etc. were $268.27, and mine telephones cost $84.82.

No. 138 - Ventilation.

1913		
1914	$568.34	.007
Increase	568.34	.007

Charges are for the fan, motor and six-inch pipe installed on the fourteenth level.

MINING EXPENSE.

No. 150 - Air Pipes.

1913	$510.74	.004
1914	747.30	.008
Increase	236.56	.004

The increase is the cost of the air and water-lines for the 14th level drift and new hoses for the new drills purchased during the year.

No. 151 - Compressors.

1913	$3920.58	.032
1914	2647.60	.030
Decrease	1272.98	.002

The decrease in power charges in 1914 was $344.00, in engineers wages $410.00, and in boiler-house expense $518.00

No. 152 - Hoisting.

1913	$6955.58	.057
1914	6048.23	.070
Decrease	907.35	
Increase		.013

Supplies decreased $559.08 in 1914, on account of the smaller tonnage hoisted. Labor decreased $348.27 on account of the reduction in wages, and because after Oct. 1, one less man on each shift was employed in the engine-house. The increase per ton is due to the smaller product.

No. 153 - Pumping.

1913	$4438.77	.036
1914	3689.41	.043
Decrease	749.36	
Increase		.007

In 1913 it was necessary to run the Cornish pump part of the time, while the electric pump was being repaired, making both labor and supply charges higher for that year. The increase in cost per ton is on account of the smaller production.

No. 154 - Sinking and Shaft Repairs.

1913	$674.57	.005
1914	479.87	.005
Decrease	194.70	
Increase		.001

In 1913 the mine was idle from July 2 to July 11 while repairs were being made to the knuckle. In 1914 general repairs were made between the 12th and 14th levels.

No. 155 - Rock Drifting.

1913	$3236.29	.026
1914	9002.83	.104
Increase	5766.54	.078

The increase is on account of the south drift on the fourteenth level, which has been driven since July.

No. 156 - Breaking Ore.

1913	$68613.87	.558
1914	49268.21	.568
Decrease	19345.66	
Increase		.010

The decrease in total charges is on account of the smaller production in 1914. The increase in cost per ton is because, after June 1, the production of Silica ore was reduced, and greater emphasis put on the mining of higher grade ore. There was also much drifting and raising.

No. 157 - Tramming.

1913	$14187.61	.115
1914	10340.73	.119
Decrease	3846.88	
Increase		.004

Both the decrease in total cost and the increase in cost per ton are due to the decrease in total and daily output.

No. 158 - Filling.

1913	$46.26	.000
1914	74.78	.001
Increase	28.52	.001

No. 159 - Timbering.

1913	$20437.70	.166
1914	17974.46	.207
Decrease	2463.24	
Increase		.041

Both the decrease in total cost and the increase in cost per ton are due to the decrease in total and daily output.

No. 160 - Captain and Bosses.

1913	$5683.37	.046
1914	4704.18	.054
Decrease	979.19	
Increase		.008

No shift bosses were employed after October 1.

No. 161 - Dry-House.

1913	$2079.69	.017
1914	1775.20	.020
Decrease	304.49	
Increase		.003

No dry-men were employed after Oct. 1, the dry being tended by one of the landers.

No. 162 - Top Landing and Tramming.

1913	$4585.39	.037
1914	3760.35	.043
Decrease	825.04	
Increase		.006

After Oct. 1, 1914 the number of landers was reduced, and they handled only rock. This accounts for both the decrease in total charges and the increase in cost per ton.

No. 163 - Stocking Ore.

1913	$1101.35	.009
1914	591.08	.007
Decrease	510.27	.002

In 1913 there were 99,546 tons of ore stocked at .011 and in 1914, 61,968 tons at .010 per ton.

No. 165 - Ventilation.

1913		
1914	$374.52	.004
Increase	374.52	.004

The charges against this account in 1914 are for operating the fan on the fourteenth level.

No. 166 - Cave In.

1913	$25.45	.000
1914	916.83	.011
Increase	891.38	.011

Charges against this account were very high in 1914 on account of reopening the drift where Jonas and John Frost were killed.

RECAPITULATION.

	1913		1914		Increase		Decrease	
Account	Total	Per Ton	Total	Per Ton	Total	Per Ton	Total	Per Ton
General Expense	7568.04	.062	7108.15	.082		.020	459.89	
Maintenance	15138.50	.123	112242.13	.141		.018	2896.37	
Mining Expense	136497.22	1.108	112395.58	1.295		.187	24101.64	
Cost of Production	159203.76	1.293	131745.86	1.518		.225	27457.90	

Lucien Eaton

SALISBURY MINE

AVERAGE MINE ANALYSIS OF OUTPUT FOR YEAR-1914

GRADE	IRON	PHOS.	SILICA
Salisbury Bessemer,	62.26	.043	
Salisbury,	62.31	.097	
Clinton,	58.13	.100	
Clinton Silica,	51.07	.062	20.60

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR-1914

GRADE	Mine			Lake Erie	
	IRON	PHOS.	SILICA	IRON	MOIST.
Salisbury Bessemer,	All mixed				
Salisbury,	"	"			
Clinton,	No Shipments				
Clinton Silica,	50.63	.064	21.65	50.58	11.50

ORE STATEMENT - DECEMBER 31ST, 1914

	SALISBURY BESS.	SALISBURY	CLINTON	CLINTON SILICA	TOTAL	TOTAL LAST YEAR
On Hand Jany. 1st, 1914	2,974		4,958	154,112	162,044	84,956
Output for Year,	28,890	2,150	626	55,075	86,741	123,183
Total,	31,864	2,150	5,584	209,187	248,785	208,139
Shipments,	31,864	2,150	0	35,076	69,090	46,095
Balance on Hand,	0	0	5,584	174,111	179,695	162,044
Decrease in Output,					36,442	
Increase in Ore on Hand,					17,651	

1914-- 2-8 Hr. Shifts Jany. 1st to Sept. 30th,
Mine Closed Oct. 1st to end of Year.

1913-- 2-8 Hr. Shifts during Year.

SALISBURY MINE

SHIPMENTS FOR YEAR--1914

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Salisbury Bessemer,	13,415	18,449	31,864	24,350
Salisbury,	2,150		2,150	1,968
Clinton,				17,294
Clinton Silica,	9,209	25,867	35,076	2,483
Total,	24,774	44,316	69,090	46,095
Total Last Year,	19,173	26,922	46,095	
Increase - 50%			22,995	

SALISBURY MINE.

COMPARATIVE AVERAGE WAGES AND PRODUCT.

PRODUCT '14 86,741 Tons.	SURFACE		UNDERGROUND		TOTAL	
PRODUCT '13 123,183 "	1914	1913	1914	1913	1914	1913
Avg. no. men working	28	33	89	115	117	148
Avg.wages per day	2.49	2.49	2.82	2.80	2.74	2.73
Avg.wages per mo.25 days	62.25	62.25	70.50	70.00	68.50	68.25
Avg.product per man per day	10.17	12.48	3.26	3.59	2.47	2.79
Labor Cost per ton	.245	.199	.865	.780	1.110	.979
Diff. in labor cost per ton	+.046,	+.005	+.085	-.001	+.131	+.004
Avg.product breakg.& Trmg.			4.85	4.60		
Avg.wages for miners contr.			2.85	2.84		
Avg. wages for trammers "			2.50	2.49		
Total avg.wages for contract			2.80	2.78		

	1 9 1 4	1 9 1 3	INCREASE	DECREASE
SURFACE				
Total number of days	8,529	9,863½		1,334½
Average rate	2.49	2.49		
Amount	21,279.96	24,553.61		3,273.65
UNDERGROUND				
Total Number of Days	26,642¼	34,296		7,653-3/4
Average Rate	2.82	2.80	.02	
Amount	75,017.29	96,023.07		21,005.78
Total Days	35,171¼	44,159½		8,988¼
Average rate	2.74	2.73	.01	
Amount	96,297.25	120,576.68		24,279.43
Labor Cost per ton	1.110	.979	.121	

No. Shifts and Hours 2-8hr 2-8hr

Tons per man per day - SURFACE DECREASE - 2.31 tons - 18.5%
UNDERGROUND " - .33 " - 9.2%
Total " - .32 " - 1.14%

Proportion Surface to Underground Men - 1914 - 1 to 3.12
1913 - 1 to 3.49
1912 - 1 to 3.51
1911 - 1 to 3.21

Increase wages per day - Surface - same; Underg - .02; total - .01

SALISBURY MINE.

TIMBER STATEMENT FOR THE YEAR ENDING DECEMBER 31, 1914.

KIND.	LINEAL FEET.	AVG. PRICE PER FOOT	AMOUNT 1914	AMOUNT 1913
6" to 8" Timber	27,958	.02	559.16	794.48
8" to 10" "	32,750	.04	1,310.00	1,579.76
10" to 12" "	32.424	.06	1,945.44	1,268.46
12" to 14" "	10,400	.08¼	858.00	357.39
Total 1914	103,532	.045	4,672.60	
Total 1913	104,691	.038		4,000.09

(850 ft. to the cord)	LINEAL FEET.	PER 100'	1914	1913
5' Lagging	347,012	.47	1,633.00	1,702.00
7' "	95,591	.55	525.75	369.07
Total Lagging	442,603	.488	2,158.75	2,071.07
Poles	136,616	.95	1,284.43	981.16
Trestle Timber	76	.15	11.40	6.15
Total 1914	579,295	.596	3,454.58	
Total 1913	532,099	.575		3,058.38

	1914	1913
Feet of timber per ton of ore	# 1.193	.850
Feet of lagging per ton of ore	# 6.68	3.48
Feet of lagging per foot of timber	4.28	4.10
Cost per ton for timber, lagging, and poles	# .0937	.0573
Equivalent of stull timber to board measure	228,840	188,489
Feet Board measure per ton of ore	# 2.64	1.53
Total Product	86,741	123,183

Total cost of timber and lagging 1914	8,127.18
Total cost of timber and lagging 1913	7,058.47
Total cost of timber and lagging 1912	6,787.05
Total cost of timber and lagging 1911	7,228.23
Total cost of timber and lagging 1910	7,065.06
Total cost of timber and lagging 1909	7,756.19
Total cost of timber and lagging 1908	7,089.14
Total cost of timber and lagging 1907	6,264.14
Total cost of timber and lagging 1906	6,976.67
Total cost of timber and lagging 1905	6,752.55

These factors higher on acct. timber being used since Oct.1,1914 in drifts; Production stopped on this date.

SALISBURY MINE.

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE.

KIND.	QUANTITY.	AVERAGE PRICES.	AMOUNT 1914	AMOUNT 1913
40% Powder	5,450	.0949	517.25	472.50
50% "	25,150	.105	2,638.75	3,315.00
Total Powder	30,600	.1031	3,156.00	3,607.50
Fuse	90,550	3,837	347.32	422.06
Caps	30,050	6.21	186.48	244.47
Total Fuse,etc.,			533.80	666.53
Grand Total			3,689.80	4,274.03
Product			86,741	123,183
Pounds Powder per ton Ore			.353	.297
Cost per ton for powder			.036	.029
Cost per ton for caps,etc.			.006	.005
Cost per ton for explosives			.042	.034
Avg.Price per lb. for powder			.1031	.0985

MINE FIRE.

On Jan. 11th, between 8 and 9 o'clock p. m., a fire started in the small pump house on the 9th level which is located a short distance from No. 2 Shaft. The general opinion is that this fire was due to a candle being carelessly left near a timber in the pump house.

John Beeby, the pump man, had come to surface for his supper. His duty was not only to look after the pumps in the station but other pumps on the 9th and 10th levels. He was notified by Joseph Young, the pump man at the main station on the 6 1/2 level, that there was smoke coming up the shaft. Beeby immediately returned to the mine. He probably ran through the 9th level and attempted to reach the pump house. As the distance from the shaft is about three thousand feet, the chances are that he was greatly exhausted by the time that he approached the fire and was easily overcome by the gas.

As the fire occurred on Sunday, the getting together of the men was slow. The first rescue party consisted of Captain Ware, John Barrett, John Frederickson, and Fred Staples. They searched the level in the neighborhood of the pump house for Beeby but were unable to find him. A short time later Victor Erickson and Richard Uren reported underground. Frederickson, Staples, and Erickson put on the helmets and after several attempts reached the pump house. Staples, the head pump man, connected the hose to the pump and was playing a stream of water on the very small fire when Erickson reported that he was not feeling well and almost immediately collapsed. If it had not been for this fact the fire would undoubtedly have been put out and no serious damage done to the mine. As soon as Erickson collapsed, Staples and Frederickson immediately turned their attention to him and attempted to drag him to a point of safety. Other attempts were made to reach the pump house and during this work several of the men were affected by gas. At about 10 o'clock Mr. Stevenson, Mr. Williams, and Mr. Conibear from the Ishpeming office went underground.

John Barrett a short time previous had been knocked out. All attempts to resuscitate him failed. Their attention was then directed to extinguish or control the fire. No. 2 Shaft, which is naturally upcast, is always kept tightly closed during the winter months. It was opened in order to aid in the rescue of the men who had been knocked out. Mr. Stevenson found that a current of air was circulating from the 9th to the 6 1/2 level in the shaft, back into the mine to the vertical winze on the 6 1/2 level, down this winze to the 9th level. This current had reached hurricane proportions. It was decided to build brattices on the 9th level to cut off the draft going down the shaft. Two of these brattices were put in, being located between the winze and the pump house. In the meantime Captain Thomas had appeared on the scene and had been able to procure quite a crew of men. These men commenced the work of building bulkheads on the 9th level in order to confine the water in the portion of the drifts which grade toward No. 2 Shaft. Three very strong bulkheads were put in; one in front of the winze which runs from the 9th to the 10th level, the object being to keep the water from flowing to the 10th level; another near the drift in which is located Raises 15 to 24. This bulkhead was necessary as these raises connect with the 10th level. The third bulkhead was built in the main drift which leads to No. 3 Shaft. I was out of town over Sunday and did not arrive until 4 a. m. Monday morning. I immediately went underground and found that the work of building the bulkheads was practically completed. The next problem was to provide some means of preventing the mine from being flooded. Very early Monday morning the blacksmiths were sent for and commenced the work of remodelling the shoes on two of the old bailers so that they would fit No. 3 Shaft. This work was pushed with all possible speed and on Tuesday morning, between 1 and 2 a. m., we commenced to pull water to the surface. In the meantime Mr. McClure had taken personal charge of installing the centrifugal pump in the permanent pump station at No. 3 Shaft. This pump was completely set up and the very large amount of necessary piping completed by 4 p. m. Tuesday. We continued to operate two bailers until 4 a. m. Tuesday when one was lost. The water in the meantime

had commenced to overflow the bulkheads and was rising rapidly in the large sump. It was feared that the centrifugal pump could not be completed in time to keep the mine from drowning. Early Tuesday morning it was decided to remove one rope and to continue to pull water with a single bailer. At 4 p. m. Tuesday the second bailer was lost. These bailers were very old, having been used originally by the Oliver Iron Mining Co. They were in extremely bad repair. The water was rising very rapidly as a large part of the sump had been filled. It was greatly feared that the bulkheads would give away at any moment. In the meantime men worked at breakneck speed to complete the piping on the centrifugal pump. When the last connection was made the water was within two or three inches of the controller. In fact it was so close that the men were preparing to raise the controller in order to prevent a short circuit. At 3:45 p. m. Tuesday the last connection was made and the pump started. It did wonderful work when it is considered the rough way which it was necessary to line it up. The water was lowered rapidly. Men were stationed at the inside bulkheads and as fast as the pump could handle it, additional water was supplied from the large volume which had been impounded in the main drift.

When the timber in the pump house commenced to fall it broke the steam line leading from the 6 1/2 level. On Sunday night it was not considered safe for the pump man to remain on the 6 1/2 level and he was therefore instructed to get out. Before leaving he was particularly careful to fill up all his lubricators and the pump continued to run until Tuesday morning when it stopped. This was a most serious state of affairs as we were not able to control the water coming even from the 9th level. If in addition it was necessary to fight against the large volume from the 6 1/2, the chances of saving the mine were slight. Mr. Stevenson and a party were notified and immediately went to the Maas Mine and advanced through the drift very cautiously and finally reached the pump house in safety. Although it was realized that the steam line leading from the 6 1/2 to the 9th had broken, and that the escaping steam had caused the pumps to stop, the valve going to the 9th was not entirely closed as it was thought that this escaping steam would help in extinguishing the fire. Wednesday morning, when we had commenced to draw on the water which had been impounded in

the main drifts on the 9th level, the broken steam line which had been covered with water was naturally exposed. The blowing off of this steam caused the pumps on the 6 1/2 to again stop. Mr. Stevenson and a crew of men returned to the pump house, traveling through the Negaunee Mine workings, and started the pumps. On Wednesday morning the larger part of the impounded water had been pumped to the surface. Work was immediately started to reclaim the portion of the main drift which is downgrade to No. 2 Shaft. A pump was set up on a truck which from time to time was moved towards the shaft. In the meantime preparations were being made to install additional pumps to handle the coming water of the mine. On Thursday afternoon two pumps were set up near the winze which extends from the 6 1/2 to the 9th level. As soon as these were in commission it was known that we were out of danger. On Thursday morning men were employed to clean up the large accumulation of dirt and other material on the main tracks. On Friday night the regular shift commenced work. During this very trying experience there was not a single man who complained or attempted to shirk his duty. There were a number of men who worked steadily from thirty-six to forty-eight hours.

Although the actual damage done to the mine by the fire was small, the loss in time due to the crushing of the working places was serious. It took much work to put the mine in good condition and there was naturally a large decrease in the product.

FATAL ACCIDENTS.

On account of the fire John Beeby lost his life due to being asphyxiated. His body was not recovered until 12 o'clock noon, Wednesday, the 14th.
John Barrett, Underground Foreman, while attempting to rescue others who had been seriously affected by gas during the fire of Jan. 11th, lost his life. At the same time Captain Ware and several other men were overcome. Captain Ware was unable to work until the 26th of January.

CRUSHING.

On Feb. 5th, at about 3 p. m., a large territory on the footwall side

east of the boundary, commenced to crush. As no holes for a distance of 400 ft. east of the boundary had extended to the surface, it was known that the conditions were serious and the eighteen gangs working in this territory were immediately taken out. These contracts were on the 6 1/2 level and 690' sub level. The crushing continued until the morning of the 14th. There were intervals during this time when the places were fairly quiet but it was not thought safe to let the men work. On the 16th seven contracts were put on the 690' sub level. During the idle time the crushing was exceedingly severe. All of the working places on the 6 1/2 were closed and the new crosscuts on the 690' sub level showed great movement. At this elevation we were drifting over a large territory which had been undercut by sub levels at a lower elevation. In places the timber settled 3 or 4 feet. In the neighborhood of Nos. 34 and 35 raises the rock pillar on the hanging side was under great pressure. The main drift leading east was practically closed. Nos. 34 and 35 raises were badly crushed near the 6 1/2 level. The most serious part was the crushing of the main drift on the 9th level between Raises 34 and 50. A large part of this drift is in rock, and as no mining had been done directly above it for a distance of 100 feet, it was never supposed that the drift could possibly crush. The closing of this drift not only meant the losing of the working places of eighteen contracts on the footwall side, but also for fifteen contracts in the drift in which is located Raises 25 to 33. During the previous year the crushing was so severe between Raises 12 and 26 that it was impossible to keep open this part of the drift. For a few days it was necessary to provide new working places for thirty-three gangs. On the 10th of the month the footwall drift was open temporarily so that cars could pass through it. By switching back we were able to get in the drift in which is located Raises 25 to 33. In the meantime every effort was being made to keep this foot drift open and also to complete the timbering in the other main road. It was not until the 23d that we were able to tram through the main drift towards the hanging. Two gangs were immediately started to retimber the footwall drift as the work which had been done previously was only temporary. This crushing caused great delay and a large decrease in

product for several months. The movement in the upper workings was a splendid thing for the territory below the 6 1/2 level as it completely settled a large area which had been undercut.

CARBIDE LAMPS.

On Feb. 14th every man in the mine was provided with a carbide lamp and orders were given that candles would not be allowed underground. Men were sent into every contract and collected all candles and brought them to the surface. There was no opposition on the part of the men to the use of carbide lamps. In addition to greatly reducing the chances of fire, the use of carbide is desirable on account of giving a better light and also the saving of considerable money.

COOLING TOWER.

On Jan. 26th a small pump was installed in the engine house and started to return the water from the compressor and motor generator set to the cooling tower. The saving amounts to about $100.00 per month.

BULKHEAD BETWEEN MAAS AND NEGAUNEE.

In April a bulkhead was built on the 10th level in the connecting drift with the Maas Mine. A very strong concrete framework was put in. A special cast iron door has been provided. This not only controls the ventilation between the two mines, but avoids the possibility of water passing from one mine to the other in case of serious trouble due to pumps or caves.

BAILERS.

During the serious trouble due to the fire of Jan. 11th, three bailers were ordered for No. 3 Shaft. These have been stored at a point on the surface near the shaft and have been protected by a special shed.

SURFACE IMPROVEMENT.

In May work was done under the direction of Mr. Cotter which greatly improved the appearance of the location. To the west of the main entrance there was formerly a road leading to the heating plant. This has been cut out as it

is now unnecessary to team coal to the boilers. The fence was extended west from the main gate to the corner of the heating plant. This area was graded and sown with grass. Trees and shrubs were planted along the new fence and also along a part of the dry. To the west of the engine house it was not possible to improve a small area in the previous year due to a large number of temporary pipes. The permanent pipes have been put in and this area has been seeded. The entire sloping face to the south of the engine house has been planted with small pines. A very large percentage of these have lived.

SINGLE SHIFT.

On June 8th the mine was placed on a single shift, 173 men being laid off. The following statement shows the number and nationality of the men laid off and retained:

	Employed June 1st, 1914	Men Laid Off	Men Retained
Finnish,	169	79	90
Italian,	87	35	52
American,	37	5	32
Scandinavian,	49	18	31
English,	43	22	21
French,	21	6	15
Austrian,	13	7	6
German,	6	1	5
Swiss,	1	0	1
Total,	426	173	253

We were able to get rid of every man whom we had any reason to think was not desirable.

FENCING CAVED AREAS.

During May a very large amount of fencing was done around the caved areas. To the south it was necessary to increase the area as caves during the year had taken down a part of the original fence. According to your instructions, five large signs were placed in conspicuous places warning people of the danger of crossing the fenced area.

LANDERS' SHANTY.

In July a landers' shanty was constructed near the shaft. The frame-work of a small building 8 by 10 ft. with a gable roof was first made out of

2 by 4's placed at intervals of 2 ft. On top of these old rubberoid was tacked. On top of the rubberoid chicken wire fencing was attached by small staples. The window and door frames were placed in position. The paper and wire was put on the inside as well as on the outside of the building. The ceiling, roof, and floor were also covered with paper and wire. By using a home-made concrete gun, mortar was shot against the paper. By continuing to blow a small amount at a time, allowing the material to partly set, it was possible to soon get a thickness of a little more than a quarter of an inch. Charging out all of the material as new, the entire building cost $80.00. The lumber and paper were secondhand and the cost to us therefore was not $80.00. The building has a neat appearance, is fireproof, and exceedingly warm. This type of building is cheaper and more practical than one with solid concrete walls. The inner walls, due to the air space, are perfectly dry.

SAFETY APPLIANCES.

In order to comply with the recommendations of the special committee on mechanical equipment, in July we protected the ladders leading to the top of the shaft house and also to the top of the pulley stands. These have all been cased in to prevent the possibility of a man missing his footing and falling to the ground. The casing was made out of flat iron 2" wide by 1/4" thick. Running parallel with the ladder there are three strips of flat iron. At intervals of 4 ft. there are bands of flat iron firmly connected with the three long strips and also to the ladder. The distance between the rungs and the center of the semi-circle is 24".

SHAFT HOUSE.

During the summer months the man who was engaged in oiling the sheaves on the top tram has put in his spare time in painting the shaft house. This work has therefore been done without additional labor.

CAVES.

On March 2d a hole appeared on the surface at a short distance to the east of the boundary line directly above the large territory on the 6 1/2 level

which had been under great pressure for a considerable length of time. This cave did no damage to the workings in the Negaunee.

In the latter part of September two small holes showed on the surface at a point slightly north and about 75 ft. to the east of No. 1 Shaft. A year or so ago several small holes broke through to the north of No. 1 Shaft. The reason for the appearance of these holes was not at first understood as they were at a considerable distance from points where mining was being done. During the year a contour map of the ledge has been made. This shows that the deepest part of the surface exists on the northeast side of the mine near the boundary. It is evident from this map that all of the large volume of water is flowing from the south towards the north. It is assumed that a very large amount of fine material is being constantly washed from the south to the depression in the ledge. The sloping of the rock also explains why the cracks due to caving have always extended to the south. The north face of all caves does not continue to slab off. The small holes which have appeared are not serious and I do not see how any damage can be caused by them.

STOCKING TRESTLE.

During the first winter that ore was stocked we were careful not to allow the piles around the piers to cover the braces which extend from the plate girders on an angle of 45 degrees to the column. I had an idea that these braces were not sufficiently strong to withstand the settling action of the ore. The Wisconsin Bridge & Iron Co. were consulted on this point and stated that in their judgment it would be perfectly safe to stock around the braces. They were asked to guarantee that the braces would not buckle. This they were unwilling to do. In the latter part of the stocking season of 1914 we filled around two columns. This ore remained in place for several months and when it was removed by the steam shovel it was found that the braces had not been affected. It was therefore taken for granted that it would be safe to fill around the remaining braces on the west trestle. In the early part of October it was noticed that the small lateral braces running from the top of the column to a point at right angles to the main braces were buckling, and in some cases had been torn away from the column. We

immediately put on a small force of laborers and dug the ore away from the braces. It was found that in certain cases the large heavy angles which carry the main weight of the girders had been buckled. The damage was not serious and the lateral braces were easily repaired and the buckling taken out of the main braces. It is now perfectly evident that it is not safe or advisable to stock ore directly around the braces.

PUMP HOUSE AND SUMP - Acct. No. 10f, E. & A. No. 193.

Sump.

In the previous year the sump had been completed. In February the last bulkhead which would seal the sump from the vertical winze which runs below the 10th level was finished. It was decided to make sufficient arrangements so that in case anything should happen to the pumps, which would shut them down, that the station would not be flooded. In order to do this, a concrete bulkhead was put in close to the mouth of the drift through which the suctions pass. At a point near the shaft the drift which enters the pump house was also closed by a concrete bulkhead. Both of these bulkheads were provided with doors which could be made water tight. Inside of the bulkhead, which is near the shaft, a raise was connected with the winze at an elevation of 35 ft. In case anything should go wrong with the pumps, the doors in the bulkhead will be closed. The entire 10th level can then be used for a sump. The pump men could enter the pump house by traveling through the winze between the 9th and 10th levels. The bulkheads were started in March and completed in April.

Pumping Plant - Acct. No. 82a.

From the first of the year work was continued on the centrifugal and the two high speed reciprocating pumps. In March they handled a part of the water. There was more or less trouble experienced from the very start. It was found that even very small pieces of chips or dirt would hold up the valves in the high speed pumps and cause a great deal of trouble. As long as there was any difficulty it was necessary to continue to run the steam pumps on the 6 1/2 level, handling only about half of the water from the 10th level. Changes were made in the valves of one pump in April and it was found that there was a marked improvement.

In July the second pump was provided with the improved valves. During the time of the fire, or Jan. 11th, a very large amount of dirt was washed into the sump. When the new pumps were put in commission they worked so unsatisfactorily that it was impossible to keep the water low enough to get into the sump and remove the mud. The consequence was that in July it was found that the main sump was half full of mud. This interfered seriously with the work of the small centrifugal pumps which are used to force water into the suctions. In order to put the plant in condition so that it would run without danger of serious delay and would not have to rely entirely on the working of two small centrifugal pumps, changes were necessary. To accomplish this, on the 9th level, 100 ft. above the main pump house, a small sump 6 by 6 by 6 ft. deep was cut. From this sump a 10 in. pipe was run down the winze to the pump house and connected with the suction. In order to get this pipe sufficiently low on the 9th level so that the water would siphon to the main pumps without danger of sucking air, it was necessary to cut a ditch about 3 ft. deep. By allowing the 9th level water to run directly into the suction it was possible to easily prime the large pumps. In addition we are able to utilize the pressure due to the 100 ft. head. This work was quite extensive and it was necessary to order special pipe to go through the drift and the winze. The piping was completed near the end of September. It was found that it made a decided improvement in the working of the pumps. On the 29th of September the water on the 6 1/2 level, which was being pumped by steam, was sent to the 9th level. It was found that the two pumps on the 10th level could handle it, but after running for a short time, due to trouble with a wind-bore on the 9th level, it was necessary to divert the water again to the 6 1/2. This trouble was soon rectified and since Oct. 9th all of the water of the mine has been handled by the electric pumps.

Mud had accumulated rapidly in the main part of the sump and it was necessary to provide some means of removing this. At an elevation of 50 ft. below the 10th level there is a drift extending from the winze to the shaft. In September a small drift was driven from this elevation to the northwest for a distance of 25 ft. From the breast two flat raises were started, one going

up under the settling basin and the other under the main sump. In the month of December these raises were completed and the concrete bulkheads put in. Through each bulkhead there is a 10 in. pipe with a special valve on the end. The raises were stopped within a short distance of the bottom of the sump. Arrangements will be made so that they can be connected with the sump. It is thought that it will be possible to draw off the mud through the large pipes, load it into a skip, and hoist it to the 10th level. Once the large accumulation of mud has been removed from the main part of the sump, it can be kept clean. The trouble has been that there is no practical way of getting into the sump and removing this mud. We think that the present plan will solve the difficulty.

On Oct. 13th the force in No. 2 boiler house was reduced to one man on each shift. The steam pressure was lowered and the consumption of coal reduced to about 2 1/2 tons per day.

REDUCTION OF WAGES.

On Oct. 1st there was a general reduction of 10% in the wages of all employees.

COMPRESSOR.

During the year much experimenting has been conducted in connection with the compressor. In March a new oiling system was started and completed in April. In May the receiver which had been in use at No. 1 Shaft was brought up to No. 3 and connected with the line.

On Nov. 13th the transformer for the starting motor burned out. This caused a delay of four hours. The electrician states that a similar delay is very unliable to occur. There has been so much experimenting with the compressor during the year that the transformer has been overtaxed. The machine has been started and stopped probably hundreds of times. As far as I can judge, the compressor is doing good work.

ELECTRIC CURRENT DELAYS.

On Oct. 7th there was a delay of one hour due to trouble on the transmission line.

On Dec. 28th there was a delay of two and one-half hours due to the weakening of the solution in the tanks in the engine house.

PRODUCTION.

Month	Bessemer	Negaunee	Total	Rock
January,	3,088	25,208	28,296	360
February,	3,020	26,666	29,686	560
March,	3,224	31,259	34,483	156
April,	3,520	28,895	32,415	344
May,	4,903	33,948	38,851	536
June,	3,548	24,263	27,811	576
July,	4,665	18,554	23,219	148
August,	4,850	21,005	25,855	372
September,	5,674	20,436	26,110	240
October,	6,726	20,548	27,274	208
November,	5,029	18,492	23,521	104
December,	5,012	19,556	24,568	216
Total,	53,259	288,830	342,089	3,820
Transferred, From	24,830	To 24,830		
Total,	28,429	313,660	342,089	3,820

The product in January and February was small on account of serious delay due to the mine fire and crushing over a large territory. Commencing with June 8th the mine went on a single shift. Since that time there has been a marked improvement in the tons per man per day.

ESTIMATE OF PROBABLE ORE.

In the previous year the estimate of probable ore was completely refigured. For the present year the deductions have been made according to the amount mined from each territory. The assumptions are as follows: Above the 6 1/2 level, in solid ore, 12 cu. ft. to the ton, 10% deduction for rock, and 10% for loss in mining. Below the 6 1/2 level, in the territory of old rooms, a deduction of 25% for ore already mined, 12 cu. ft. per ton, 10% for rock, and

10% for loss in mining.

Estimate of Probable Ore.

Above 6 1/2 Level, Shaft Pillars:			
6 1/2 to 6th Level,	125,000		
6th to 5th Level,	119,000		
5th to 4th Level,	83,000		
4th to 3d Level,	42,000		
Total in Shaft Pillars,		369,000	
North of Fault "B", Above 700' Contours:			
Vertically below 733' Sub to 700' and East to 1050' East,	34,000		
Above 6 1/2 Level West to 1050' East,	10,400		
Above old 400' Level,	31,800		
Between 700' and 600' Contours,	329,200		
Total North of Fault "B",		405,400	
South of Fault "B":			
Between 733' and 6 1/2 Level and North of 719' Sub,	19,000		
Between 700' and 600' Contours, .	905,900		
Total South of Fault "B",		924,900	
Total Above 600' Contours,		1,699,300	
Total Ore Between 600' and 500' Contours,		2,686,700	
Total Probable Ore Above 500' Contour,			4,386,000
" " " Below 500' "			8,347,000
Total Probable Ore in Mine,			12,733,000

ANALYSIS OF COST SHEET.

Production -	1914,	342,089
	1913,	348,055
	Decrease,	5,966 Tons

During 1914 the mine worked two eight-hour shifts for 127 days and one eight-hour shift for 167 days, or a total of 421 shifts, or an average of 812 tons per

shift. During 1913 the mine worked two eight-hour shifts for 285 days, or a total of 570 shifts, or an average of 610 tons per shift. There was an increase of 201 tons per shift in 1914.

GENERAL EXPENSE

No. 26-Insurance - 1914 Amount $391.71 - Cost Per Ton $.001

1913 " 382.86 - " " " .001

Increase, $ 8.85 - .000

No. 27-Engineering - 1914 Amount $1,133.51 - Cost Per Ton $.003

1913 " 1,829.63 - " " " .005

Decrease, $ 696.12 - $.002

During 1913 there was a much larger amount of new construction work and therefore a larger expenditure.

No. 28-Analysis - 1914 Amount $8,046.60 - Cost Per Ton $.023

1913 " 6,841.05 - " " " .020

Increase, $1,205.55 - $.003

In 1914 there were 81,009 determinations, while in 1913 there were 72,548. The cost per determination in 1914 was $.08278, while in 1913 it was $.08332. The increase in determinations was due principally to a greater number of samples being taken underground. The object of this was to try and grade the ore more accurately and also to get additional check results on each cargo shipped.

No. 30-Personal Injury Expense - 1914 Amount $2,634.97 - Cost Per Ton $.008

1913 " 296.90 - " " " .001

Increase, $2,338.07 - $.007

In 1914 payments covering one-half the wages earned by men on the day of the funeral were paid for as follows:

John Barrett,	$316.06
John Beeby,	316.06
Carl A. Suojanen,	242.51
Waino Tuomi,	269.13
Total,	$1143.76

The first two lost their lives in the fire of Jan. 11th, 1914. Suojanen fell into No. 1 Shaft Aug. 27th, 1907. Tuomi was killed by a fall of ground on July 10th, 1913. The balance of this account is made up for settlements of other accidents which were not fatal. A large part of this account is for settlement of accidents which occurred previous to this year.

No. 30a-Mine Office - 1914 Amount $ 9,499.41 - Cost Per Ton $.028

1913 " 10,479.16 - " " " .030

Decrease, $ 979.75 - $.002

This account is subdivided as follows:

	Mine Office Charges	Direct Charges
1914,	$5,343.31	$4,156.10
1913,	5,360.29	5,118.87
	Decrease, $ 16.98	Decrease, $ 962.77

Total, General Expense - 1914 Amount $21,706.20 - Cost Per Ton $.063

1913 " 19,829.60 - " " " .057

Increase, $ 1,876.60 - $.006

Accounts No. 28 and 30 explain the increase.

MAINTENANCE

No. 125-Tracks and Yards - 1914 Amount $1,285.74 - Cost Per Ton $.004

1913 " 2,423.23 - " " " .007

Decrease, $1,137.49 - $.003

In 1913 there was a very heavy expense for improvement around buildings at No. 3 Shaft. The cost in 1914 was much smaller due to less work being done.

No. 126-Docks, Trestles, and Pockets - 1914 Amount $3,173.72 - Cost Per Ton $.009

1913 " 1,940.84 - " " " .006

Increase, $1,232.88 - $.003

The increase in 1914 is due to grading stocking grounds and laying a large amount of 3" sollar plank.

No. 127-Buildings - 1914 Amount $ 580.07 - Cost Per Ton $.002

1913 " 2,762.19 - " " " .008

Decrease, $2,182.12 - $.006

In 1913 $1,731.38 was expended on the construction of coal dock for heating plant, also $692.73 on the cooling tower. The expense in 1914 was for general repairs and changes in buildings connected with No. 3 Shaft.

No. 128-Shop Machinery - 1914 Amount $ 441.32 - Cost Per Ton $.001
1913 " 1,005.23 - " " " .003
Decrease, $ 563.91 - $.002

In 1913 $439.40 was the cost for a new motor for the shops. A circular saw was installed in the carpenter shop and a coke oven for sharpening tools in the blacksmith shop. The expense in 1914 was for new pulleys and shafting and for general repairs and renewals of shop tools.

No. 129-Boiler Plant - 1914 Amount $ 892.72 - Cost Per Ton $.003
1913 " 1,075.16 - " " " .003
Decrease, $ 182.44 - .000

In 1914 repairs to No. 2 boiler plant amounted to $812.24 and to No. 3 $80.48, or a total of $892.72. In 1913 the expense at No. 2 was higher than in 1914. The reason for this is that during a part of the year these boilers have not been fired hard as the mine water has been pumped by electricity.

No. 130-Hoisting Machinery - 1914 Amount $751.70 - Cost Per Ton $.002
1913 " 788.40 - " " " .002
Decrease, $ 36.70 - .000

No. 131-Compressors and Power Drills - 1914 Amount $2,902.11 - Cost Per Ton $.008
1913 " 570.03 - " " " .002
Increase, $2,332.08 - $.006

In 1914 twenty Jackhammer auger machines were purchased at a cost of $1929.99. In 1913 there was

only one machine bought at a cost of $114.75. These auger machines have replaced practically all of the reciprocating type. The use of these tools is to a large extent responsible for the reduction in the cost for breaking ore.

No. 132-Pumping Machinery -1914 Amount $7,024.44 - Cost Per Ton $.021

1913 " 1,857.37 - " " " .005

Increase, $5,167.07 - $.016

In 1914 $4,990.75 was expended on repairs to electric pumps and in putting in 10" line from the 9th to the 10th level so that the 9th level water would flow directly into the pumps. This means a considerable saving in power as the head of 100 ft. is utilized. $1,221.69 was expended on raises and drifts below the main sump for the purpose of removing the mud and keeping the sump clean. During 1914 the steam pumps have been shut down since Oct. 9th. From March until October the steam pumps handled only a part of the water, the balance being taken care of by the electric pumps. There was a decrease of $1045.37 in repairs to steam pumps in 1914.

No. 133-Top Tram Engines and Cars - 1914 Amount $2,382.84 - Cost Per Ton $.007

1913 " 3,209.61 - " " " .009

Decrease, $ 826.77 - $.002

Wire ropes in 1914 cost $633.16. In 1913 they cost $937.46, or a difference of $304.30. Two new cars for top tram in 1913 cost $566.64. These represent the extraordinary expenditures in both years.

No. 134-Skips and Skip Roads - 1914 Amount $954.79 - Cost Per Ton $.003

1913 " 976.62 - " " " .003

Decrease, $ 21.83 - .000

The cost in both years was for repairs to skips and cage and renewals of wooden runners in the upper part of the shaft house.

No. 135-Underground Tracks and Cars - 1914 Amount $2,605.34 - Cost Per Ton $.008

1913 " 2,270.48 - " " " .006

Increase, $ 334.86 - $.002

In 1914 the old type of wheels and axles used on sub level cars have been largely replaced by new improved roller bearing trucks. These should last for a much greater length of time and in addition they greatly improve tramming conditions. Thirty pair were installed at a cost of $660.00.

No. 136-Electric Tram Plant - 1914 Amount $18,091.36 - Cost Per Ton $.053

1913 " 18,416.94 - " " " .053

Decrease, $ 325.58 - .000

This account is subdivided as follows:

	Motors	Wiring	Tracks	Cars
1914,	$3,187.88	$2,189.37	$7,852.68	$4,848.07
1913,	4,307.36	1,373.90	4,697.42	8,011.70
	$1,119.48	$ 815.47	$3,155.26	$3,163.63
	Decrease	Increase	Increase	Decrease

The decrease in motors is due to a smaller number of armatures being burned out. The increase in wiring is due to a much larger footage of main drifts put in commission. The increase in tracks is due to more new rail being laid. The decrease in cars is due to a smaller number having been completed. In 1913 there were twenty of the new type of cars constructed, while in 1914 there were only twelve.

No. 137-Telephones and Safety Devices - 1914 Amount $806.50 - Cost Per Ton $.002

1913 " 395.88 - " " " .001

Increase, $410.62 - $.001

The increase in 1914 was due to the purchase of a

lungmotor, additional oxygen helmets, and the placing of guardrails around ladders in shaft house and pulley stands; also additional safety devices in shops.

Total Maintenance - 1914 Amount $45,082.48 - Cost Per Ton $.132
1913 " 37,691.98 - " " " .108
Increase, $ 7,390.50 - $.024

This increase is accounted for principally under accounts No. 131 and 132.

MINING EXPENSE

No. 150-Air Pipes - 1914 Amount $2,861.45 - Cost Per Ton $.008
1913 " 2,523.81 - " " " .007
Increase, $ 337.64 - $.001

This account depends entirely upon the amount of work necessary on air pipes leading to the various contracts.

No. 151-Compressors - 1914 Amount $14,520.42 - Cost Per Ton $.043
1913 " 20,870.05 - " " " .060
Decrease, $ 6,349.63 - $.017

In 1913 air was purchased from the Maas Mine until September when the Negaunee compressor was put in commission. During 1913 there were a larger number of shifts worked than in 1914. In 1914 it has been practical to shut down the compressor for the larger part of the night, while in 1913 this was not possible.

No. 152-Hoisting - 1914 Amount $13,279.13 - Cost Per Ton $.039
1913 " 16,368.03 - " " " .047
Decrease, $ 3,088.90 - $.008

The decrease in expenditure is due to the mine working for a single shift for 6 1/2 months in 1914, while in 1913 it was on double shift for the entire year.

No. 153-Pumping - 1914 Amount $43,501.58 - Cost Per Ton $.127
1913 " 30,698.07 - " " " .088
Increase, $12,803.51 - $.039

This increase is due to the fact that it has been necessary in 1914 to operate both steam and electric plants. Since Oct. 9th no water has been pumped by the steam plant, but on account of the uncertain conditions underground and the danger of runs of sand, it has been thought advisable to keep steam up at the No. 2 boiler plant. This naturally has greatly increased the cost for pumping.

No. 154-Sinking and Shaft Repairs - 1914 Amount $526.29 - Cost Per Ton $.002

1913 " 324.74 - " " " .001

Increase, $201.55 - $.001

The increase in 1914 is due to a larger amount of repairs in the ore pockets at the shaft.

No. 155-Rock Drifting - 1914 Amount $ 7,230.36 - Cost Per Ton $.021

1913 " 10,656.73 - " " " .031

Decrease, $ 3,426.37 - $.010

The following statement shows the work done:

	Drifting	Raising	Cost Per Ft.
1914,	1187'	723'	$3.76
1913,	1233'	800'	5.24
Decrease,	46'	77'	$1.48

During 1913 the cost per foot for drifting was higher than in 1914 due to the fact that in 1913 a greater footage of motor drifts was completed. The cost per foot depends entirely upon the number of feet of small drifts and large drifts completed. It also depends upon the number of feet of raising as this is naturally much cheaper than drifting.

No. 156-Breaking Ore - 1914 Amount $144,405.07 - Cost Per Ton $.422

1913 " 151,482.86 - " " " .435

Decrease, $ 7,077.79 - $.013

The decrease in the expenditure is due to a smaller number of shifts being worked in 1914 than in 1913. It

is also due to a certain extent to the 10% reduction in wages in October 1914. The cost per ton in January was exceedingly high due to mine fire. In February, March, and April it was unusually high on account of very serious crushing. Since May the cost has been steadily decreasing. During the last two months of the year we have obtained the lowest Breaking Ore cost, $.324, which we have ever made. If it had not been for serious conditions in the early months of the year, over which we had no control, the cost for Breaking Ore would have been unusually low. Even with the showing for the first quarter we have a lower cost than in 1913 and practically the same as it was in 1912.

No. 157-Tramming -

1914 Amount $22,488.00 - Cost Per Ton $.066
1913 " 28,240.33 - " " " .081
Decrease, $ 5,752.33 - $.015

The decrease in the amount expended is due to a smaller number of shifts being worked. During 1914 it has been possible to concentrate the work and to reduce the cost by sending most of the ore to the 10th level. Early in 1915 it will be practical to send all of the ore to the 10th level, which should still further reduce the cost. During 1914 the average cost was $.066. Previous to this time the best average cost was obtained in 1911 when it was $.074.

No. 158-Filling -

1914 Amount $2,432.72 - Cost Per Ton $.007
1913 " 5,566.01 - " " " .016
Decrease, $3,133.29 - $.009

This account is regulated entirely by the amount of rock which it is necessary to blast from the hanging in order to fill open spaces.

No. 159-Timbering - 1914 Amount $53,709.25 - Cost Per Ton $.157

1913 " 49,143.20 - " " " .141

Increase, $ 4,566.05 - $.016

This increase is due to serious crushing and a tremendous amount of retimbering during the first quarter of the year.

No. 160-Captain and Bosses - 1914 Amount $8,506.41 - Cost Per Ton $.025

1913 " 9,508.91 - " " " .027

Decrease, $1,002.50 - $.002

This decrease is due to there being only one shift operated for 6 1/2 months.

No. 162-Top Landing and Tramming - 1914 Amount $4,010.40 - Cost Per Ton $.012

1913 " 5,376.12 - " " " .016

Decrease, $1,365.72 - $.004

This decrease is due to there being only one shift operated for 6 1/2 months of the year.

No. 163-Stocking Ore - 1914 Amount $ 97.38 - Cost Per Ton $.000

1913 " 156.49 - " " " .001

Decrease, $ 59.11 - $.001

There was a smaller amount of labor expended in 1914 in removing snow from the stocking grounds.

No. 164-Sorting Ore - 1914 Amount $578.40 - Cost Per Ton $.002

1913 " 357.30 - " " " .001

Increase, $221.10 - $.001

A larger amount of labor was employed in picking rock and removing wood from the ore in 1914 than in the previous year.

No. 165-Cave In - 1914 Amount $ 482.91 - Cost Per Ton $.001

1913 " 9,735.84 - " " " .028

Decrease, $9,252.93 - $.027

On March 2d a small amount of sand entered the mine

when a large territory above the 6 1/2 level broke through to the surface. This cave caused no delay in the Negaunee. A small amount of labor was employed in removing this and also in building bulkheads in order to keep it out of the workings. The last cave in 1913 occurred on May 19th. Since that time there have been no runs of sand.

Total, Mining Expense - 1914 Amount $322,748.28 - Cost Per Ton $.944
1913 " 345,788.14 - " " " .994
Decrease, $ 23,039.86 - $.050

The decrease in the expenditure is due to the mine being worked on a single shift for 6 1/2 months of the year, and also on account of the 10% reduction in wages on the 1st of October. The cost per ton is the lowest obtained since 1911 and if it had not been for the serious fire and extreme crushing during the early part of the year, the showing would have been better than that year. During the last three months of the year the cost per ton has been about eighty cents.

Cost of Production - 1914 Amount $389,536.96 - Cost Per Ton $1.139
1913 " 403,309.72 - " " " 1.159
Decrease, $ 13,772.76 - $ .020

The same remarks under Total Mining Expense apply to the Cost of Production. During the last quarter the cost has been below $1.00.

UNDERGROUND.

6 1/2 LEVEL.

In the early part of the year four contracts were removing the pillars at this elevation. Under the head of "CRUSHING, extreme pressure was exerted over the entire 6 1/2 level to the west of the 1000' coordinate. The working places were closed and for several months little ore was obtained. As soon

as the crushing subsided we commenced to retimber the raises and again attacked this territory. On the end of the year three contracts are mining.

690' SUB LEVEL.

During the crushing in February great delay was caused on the 690' sub level. All of the working places were badly crushed and it was necessary to retimber them. A number of the crosscuts settled as much as 3 or 4 feet. On the first of the year we commenced at No. 35 raise and put in a new drift connecting with No. 46 raise. This was to provide a second outlet for the 690' sub level. As explained from month to month, the conditions on the 690' sub level were unusual and it was necessary to work this territory cautiously. In order to avoid serious runs of sand, extensive work was done in the previous year on the 646' sub level to undermine and drop a large section of ground. Work on the 690' sub level had to pass over this undercut territory. In addition it was known that directly above there existed a large amount of sand. If open places were allowed there were chances of this sand entering the 690' sub level and finding its way to the main levels below. As soon as two slices were removed the places were invariably blasted in. On the end of the year the larger part of the ore has been taken and there are four gangs which are pulling back. In January we were under the workings of the old 699' sub level and it was not known whether it was filled with sand. Connections were finally made with this sub level and it was found in places that sand did exist but it was dry. The water is coming through over a very large part of the territory, and it is therefore thought that the chances of its accumulating and backing up to a sufficient elevation to cause it to break through, are small. The work of slicing will be continued until all of the pillars have been removed.

673' SUB LEVEL.

For the last three months of the year No. 22 has been connecting raises commencing at No. 56B and drifting east parallel with the foot. In a short time it will be possible to provide working places for the gangs as they play out on the 690' sub level.

646' SUB LEVEL.

During the present year only a small amount of work was done in removing the few remaining pillars, the greater part of this territory being mined in the previous year.

640' SUB LEVEL.

In the previous year the larger part of the crosscutting had been done. From the first of the year up until June a number of gangs were engaged in slicing. This entire territory has been under pressure and the cost for retimbering to the east of No. 28 raise has been heavy. In June, with the exception of some pillars on the west end, which it was decided not to attack at the present time, all of the ore had been mined. In the early part of the year from sixteen to eighteen contracts were engaged in slicing. The men worked as close together as practical in order to remove the ore rapidly and to save the large cost of retimbering. On the east end, between Raises 17 and 20, the ore was blocked out and mined. There is nothing of particular interest to state about this territory with the exception that retimbering is constantly necessary.

630' SUB LEVEL.

Practically this entire sub level has been opened up during the present year. On the west end the crosscuts have been extended to the south and have been connected with the new raises from the 10th level on the hanging side. This makes it possible to tram a part of the ore to the hanging and a part to the foot. The conditions on the lower sub level will be greatly improved as it will be possible to connect a larger number of the crosscuts to new raises. On the end of the year raises from No. 89 to 94, inclusive, have been connected. On the footside a few gangs are engaged in removing pillars. On the east end, to the west of the ore which is left to support No. 1 shaft, mining is being continued. The ore has been blocked out into pillars and on the end of the year is being removed by seven contracts. There now remains only a few pillars.

9TH LEVEL.

Under the head of "CRUSHING" it was described that the footwall drift

on the 9th level had been practically closed in February. In addition it was extremely difficult to keep open the drift between Raises 12 and 26. While this crushing was going on a large crew of men were employed on the 9th level endeavoring to prop up the timbers and to save the footwall drift. After the crushing subsided the work of retimbering was attacked vigorously and continued through the month of April. Commencing in March a gang of miners started to retimber the raises which extend from the main footwall drift to the 6 1/2 level. The extreme crushing had caused a number of these raises to slab off, making it practically impossible to handle ore through them. It was never dreamed that this would occur as there is practically 100 ft. of solid ground between the 9th level and the 690' sub level. Retimbering of raises was continued for several months. During the present year a very large amount of drifting has been done on the hanging side connecting Raises 74 to 96, inclusive. The greater part of this drift passed through old rooms and for this reason the work was slow. In the central part of the territory crosscuts have been driven to the hanging and also towards the foot and a large amount of ore has been mined. All of the ore on the footwall side adjacent to the main drift in which Raises 18 to 24, inclusive, are located, has been taken. On the hanging side on the end of the year a number of gangs are engaged in crosscutting and blocking out additional ore. On the extreme west end No. 12 is continuing to drift west connecting additional raises.

In August it was decided to cut a number of small sumps along the main drift in order to try and remove the greater part of the heavy material from the mine water. It was found in September that these sumps, not only on the 9th but also on the 10th level, took out a large amount of the ore and preventing it from going into the sump.

595' SUB LEVEL.

On the footside, commencing with the first of the year, a drift was started from the old winze which extends from the 9th to the 10th level and has followed the foot to the west connecting Raises 17 to 24A, inclusive. In December six crosscuts have been started towards the hanging. The conditions on this elevation will be much better than anything that we have ever had before, as the work is all

in solid ground. On the hanging side Raises 78 to 83, inclusive, have been connected. No. 41 gang will continue to drift west connecting additional raises. Crosscuts will be started north to intersect with those from the foot side. By having the line of raises, or the main drifts, 200 ft. apart, it is unnecessary for any gang to tram ore for a greater distance than 100 ft. In this solid territory it will be possible to lay out the work in a systematic way. In a large part of the upper workings it has not been practical to do this as in many cases the old rooms were filled with rock and it was necessary to drift around them. This caused crooked crosscuts and unsystematic work. During the coming year we will show you sub levels laid out properly.

10TH LEVEL.

The main footwall drift on the 9th level, in which is located Raises 36 to 56, inclusive, is continually crushing and difficult to keep open. The tramming conditions are bad. With the exception of the small territory directly above the main footwall drift on the 9th level and a part of the west end of the 630' sub level, the rest of the ore is going directly to the 10th. By commencing near the boundary on the 10th level and driving another drift practically east it will be possible to put up raises and connect with those above the footwall drift on the 9th level. When this drift is completed it will be unnecessary to handle any ore to the shaft on the 9th level until the shaft pillars are attacked. By sending all of the ore to the 10th we will be able to do away with the men at the shaft on the 9th, loaders, and several track cleaners. In addition, the work which it takes two motors to handle on the 9th level can be done by one on the 10th level. The operating conditions on the 10th level are much better than those on the 9th. Commencing with April and extending through to November we have continued to drive the footwall drift in rock. In November we commenced to raise. On the end of the year several of these raises had been taken to within a few feet of the floor of the 9th level. Early in the following year it will be possible to stop all tramming on the 9th level. This will greatly improve the conditions and will naturally decrease the cost.

For the entire year a gang of men have been employed in raising from the center main drift to the capping. All of these raises have extended above

the 9th level. The farther west we go the shorter the distance to the capping. Near the boundary line it is practically at the elevation of the 9th level.

The center main drift was extended to the boundary line. Parallel with the boundary a drift was continued to the hanging. No. 38 gang then started to drift southeast on line with the third main crosscut. At a point about 140 ft. from the boundary the breast struck the hanging. No. 36 contract drifting northwest on line with No. 38 during the month of December has also found the hanging. The distance between these breasts is about 180 ft. and at the present time it is not the intention to make the connection. At a later date, when mining is being done above this drift and the ventilation becomes bad, it will undoubtedly be necessary to connect the two breasts. Early in the following year it is the intention to commence the fourth main crosscut. This will extend north from the main rock drift and connect with No. 36. This crosscut will pass directly under the center of the synclinal and will probably be in Bessemer ore for a part of its length. While the drift is being extended it is planned to raise preparatory to opening up and mining Bessemer ore. I am not absolutely sure that Bessemer ore does exist at this elevation but from the data obtainable from various drill holes the indications are that Bessemer ore invariably is found directly below the capping in the center of the synclinal.

During the year a large amount of ditching has been done on the 10th level and every effort made to keep the tracks clean. In some of the raises on the footwall side it has been difficult to keep the water out. At times it has broken in on top of the ore causing a large amount of mud to be washed down on the tracks. This is difficult to prevent when the raises pass through a territory cut up by old square set rooms. In solid ground it is practical to keep the water out, but extremely hard in places which are partly mined.

ROCK DRIFTING.

During the year we have drifted 1187 ft. in rock and raised 723 ft. in rock.

NEGAUNEE MINE.

COMPARATIVE MINING COST FOR YEAR.

	1 9 1 4	1 9 1 3	INCREASE	DECREASE
PRODUCT	342,089	348,055		5.966
General Expense	.063	.057	.006	
Maintenance	.132	.108	.024	
Mining Expense	.944	.994		.050
Cost of Production	1.139	1.159		.020
DEPRECIATION				
Equipment	.003	.003		
New Construction (new shaft)	.031	.118		.087
Total depreciation	.034	.121		.087
Taxes	.198	.195	.003	
General Office	.054	.054		
Sundry Expense	.016			.016
COST ON STOCKPILE	1.409	1.517		.108
Loading & Shipping	.014	.022		.008
Administration	.014		.014	
Total cost on cars	1.437	1.539		.102
Number of days operating	294	285	9	
Number of shifts and hours	2-8hr 1-8hr	2-8hr		
Avg.daily product	1,164	1,221		57
COST OF PRODUCTION				
Labor	.725	.787		.062
Supplies	.414	.372	.042	
TOTAL	1.139	1.159		.020

NEGAUNEE MINE

AVERAGE MINE ANALYSIS OF OUTPUT FOR YEAR-1914

GRADE	IRON	PHOS.
Negaunee Bessemer,	61.12	.058
Negaunee,	59.44	.097

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR-1914

GRADE	Mine		Lake Erie		
	IRON	PHOS.	IRON	PHOS.	MOIST
Negaunee Bessemer,	60.67	.057	59.93	.064	12.05
Negaunee,	59.01	.093	58.67		11.89

ORE STATEMENT - DECEMBER 31ST, 1914

	NEGAUNEE BESSEMER	NEGAUNEE	TOTAL	TOTAL LAST YEAR
On Hand January 1st, 1914	17,794	93,380	111,174	91,968
Output for Year,	28,429	313,660	342,089	348,055
Total,	46,223	407,040	453,263	440,023
Transferred to Lake Stockpile at Presque Isle,				468
Shipments,	37,315	210,169	247,484	328,381
Balance on Hand,	8,908	196,871	205,779	111,174
Decrease in Output - 1.7%			5,966	
Increase in Ore on Hand,			94,605	

1914 -- 2-8 Hr. Shifts from Jany. 1st to June 7th,
1-8 Hr. Shift from June 8th to end of Year.

1913 -- 2-8 Hr. Shifts during Year.

SHIPMENTS FOR YEAR-1914

	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Negaunee Bessemer,	17,244	20,071	37,315	59,928
Negaunee,	115,113	95,056	210,169	268,453
Total,	132,357	115,127	247,484	328,381
Total Last Year,	182,195	146,186	328,381	
Decrease - 25%			80,897	

NEGAUNEE MINE.

STATEMENT OF COMPARATIVE WAGES.

	1 9 1 4.	1 9 1 3.	INCREASE.	DECREASE.
SURFACE.				
Total Number of days	16,111	20,427½		4,316½
Average rate	2.42	2.42		
Amount	38,981.06	49,334.46		10,353.40
UNDERGROUND.				
Total Number of days	75,535½	87,682½		12,147
Average rate	2.78	2.73	.05	
Amount	210,210.89	239,457.49		29,246.60
Total Days	91,646½	108,110		16,463½
Average rate	2.72	2.67	.05	
Total Amount	249,191.95	288,791.95		39,600
Labor Cost per ton	.729	.830		.101

No. Shifts and hours: 2-8hr-127
1-8hr-167 2-8hr.

Changed from 1-10hr to 1-8hr Mar. 11,1912.
" 1-8hr to 2-8hr June 18,1912.
" 2-8hr to 1-8hr June 8 ,1914.

Increase Wages for 1914:

Surface Same
Underground .05 ----- 1.8%
Total .05 ----- 1.9%

NEGAUNEE MINE.

COMPARATIVE AVERAGE WAGE AND PRODUCT.

PRODUCT '14 342,089 TONS	SURFACE.		UNDERGROUND.		TOTAL.	
PRODUCT '13 348,055 "	1914.	1913.	1914.	1913.	1914.	1913.
Avg.no.men working	51	64	251	289	302	353
" wages per day	2.42	2.42	2.78	2.73	2.72	2.67
" " per mo. 25 days	60.50	60.50	69.50	68.25	68.00	66.75
" product per man per day	21.23	17.04	4.53	3.97	3.73	3.22
Labor cost per ton	.114	.142	.615	.688	.729	.830
Diff. in labor cost per ton	-.028	-.087	-.073	+.028	-.101	-.059
Avg. product breaking & Trmmg.			7.95	7.27		
" wages for Miners cont.			2.92	2.83		
Total avg.wages for contract			2.92	2.83		

	TONS.	%
Tons per man per day Surface Increase	4.19	24.6
" " " Underground "	.56	14.1
" " Surface & Underground "	.51	15.8

Proportion of surface to underground men:

1914 - 1 to 4.69
1913 - 1 to 4.51
1912 - 1 to 2.68
1911 - 1 to 2.95
1910 - 1 to 3.95

NEGAUNEE MINE.

TIMBER STATEMENT FOR YEAR ENDING DECEMBER 31, 1914.

KIND.	LINEAL FEET.	AVG. PRICE PER FOOT.	AMOUNT 1914	AMOUNT 1913
6" to 8" Timber	74,165	.016	1,249.64	186.13
8" to 10" "	151,612	.038	5,815.10	6,055.01
10"to 12" "	2,412	.06	143.88	217.80
Total 1914	228,189	.0316	7,208.62	
Total 1913	155,419	.0415		6,458.94
	LINEAL FEET.	PER 100'	1914	1913
7" Lagging	901,180	.54	4,885.28	4,585.42
Poles	125,616	.91	1,142.74	1,283.59
Total 1914	1,026,796	.587	6,028.02	
Total 1913	1,005,973	.583		5,869.01

	1914	1913
Feet of timber per ton of ore	.667	.446
Feet of lagging per ton of ore	2.63	2.50
Feet of lagging per foot of timber	3.95	5.62
Cost per ton for Timber, Lagging, and Poles	.039	.035
Equivalent of stull timber to Board Measure	300,794	208,931
Feet Board Measure per ton of ore	.879	.60
Total Product	342,089	348,055

Total cost of timber and Lagging - 1914	13,236.64
Total cost of timber and Lagging - 1913	12,327.95
Total cost of timber and Lagging - 1912	12,191.04
Total cost of timber and Lagging - 1911	15,137.84
Total cost of timber and Lagging - 1910	14,654.57
Total cost of timber and Lagging - 1909	14,530.85
Total cost of timber and Lagging - 1908	11,992.30
Total cost of timber and Lagging - 1907	15,449.01

NEGAUNEE MINE.

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE.

KIND.	QUANTITY.	AVERAGE PRICES.	AMOUNT 1914	AMOUNT 1913
40% Powder	135,525	.095	12,864.95	12,541.50
35% "	2,750	.0915	251.63	
60% "				98.22
50% "	5,450	.105	572.25	
80% "	9,250	.14	1,295.00	1,188.00
Total Powder	152,975	.098	14,983.83	13,827.72
Fuse	382,200	.383	1,481.45	1,420.63
Caps	90,000	.637	573.31	497.58
Tamping Bags				.69
Total Fuse,Etc.			2,054.76	1,918.90
Grand Total			17,038.59	15,746.62
Product			342,089	346,055
Pounds Powder per ton ore			.447	.428
Cost per ton for Powder			.044	.040
" " fuse, caps,etc.			.006	.005
" all explosives			.050	.045
Av.Price per lb.for Powder			.098	.0928

STOCKPILES.

In April the trestles for the Maas grade were filled and it was necessary to erect five additional bents. These were filled during May and we commenced to use side-dump cars in order to stock additional ore along the entire length of the trestle. It was hoped that sufficient ore would be shipped to make it unnecessary to erect a new trestle, but this was not the case and early in June we commenced to construct an entirely new trestle to the South of the old piles. The construction of this trestle was difficult and slow on account of the connection with the other permanent trestle. Before commencing to curve and run west parallel with the old piles, about 150 ft. of permanent trestle was necessary. In the latter part of July nine bents of the stocking trestle were completed and it was possible to commence to stock. Up to this time we had been badly cramped for room and in order to keep the mine going it was necessary to use additional labor to shovel the ore away from the track. During the latter part of August the new trestle was extended for a distance of about 300 ft. This entire trestle was expensive and the account, "Docks, Trestles, and Pockets", was high due to the large amount of new material used.

ROCK TRESTLE.

In August, the old rock trestle being filled, it was necessary to erect three bents running due East. As only a small amount of rock is being hoisted, this trestle will last for sometime.

There has always been considerable delay in handling rock. The grade of the trestle is too flat near the shaft for a gravity system. The conditions were such that the track could not be elevated. The puffer which has been in use for a long time was slow acting and antiquated. The rock has always been dumped into an end-dump car and pushed out by men. While ore was being shipped the handling of this car has always caused delay. It was decided to put in a

small transfer engine which had been used at the Lucy Mine and to dump the rock into a saddleback car which would be handled by the tail rope system. Early in January the engine was set up and the new car put into service.

COAL DOCK.

In June, before receiving our allotment of coal, the dock was inspected by the carpenter of the L. S. & I. R'y. It was found that several legs had been burned off and in addition there were a number of others which had decayed. As soon as it was possible to repair the damage, work was started. Before any coal was dumped the dock was inspected by the railroad and declared to be in good condition.

COMPRESSOR.

Practically no delay has been due to trouble with the compressor. When the Negaunee Mine was being furnished with air from the Maas, the compressor being worked constantly at full capacity, there was considerable trouble due to various reasons. During the present year the compressor has not worked at anywhere near its full capacity.

SURFACE IMPROVEMENT.

During May Mr. Cotter with a large force of men were engaged in making extensive changes around the location. To the North of the boiler house there has always been a large area which was used for storing ashes. As explained in the previous year, the ashes are now disposed of at a point to the East of the coal dock. The area in front of the boiler house was plowed and the top six or eight inches scraped off and filled in with good soil. There were formerly a number of roads leading to the various buildings. These were reduced to a single road and the large area occupied by numerous roads turned into lawn. In order to screen the coal dock a number of trees were planted. To the South and West of the dry the area which was made by moving the fence in the previous year has all been improved. Most of this has been turned into lawn. Along the entire fence line shrubs have been planted. A large proportion of these shrubs were obtained from the old Catholic and City cemeteries. The appearance of the place

was decidedly improved by this work. During the summer months two men were kept constantly busy mowing the grass and working around the new plants.

CASING SHAFT.

The part of the shaft from the collar to the ledge pump house has not been cased between the ladder road and the cage road. In October men were engaged for a few days in protecting the ladder road through this distance by guard rails.

FREEZING OF SHAFT.

Since the connection between the Maas and Negaunee was made on the 2d level there has been a strong current which has flowed in the winter time from the Maas to the Negaunee. Tight doors were built on the 1st and 2d levels to try to prevent the air coming down the Maas. We were not successful in this and the shaft commenced to freeze up rapidly during a very severe cold spell. On the 12th of February the conditions got so bad that it was impossible to get the skip through the compartment. A few days previous to this extra heaters were placed in the shaft at a point about 30 ft. below the tunnel level. In addition a hose was lowered and steam allowed to escape in the skip compartment. Even with all of this heat it was impossible to change the current. On the 12th and 13th it was necessary to shut down the mine. Several days previous to this the conditions were so bad and the ore froze so rapidly in the skips that only a small product could be handled. The shaft was so cold that even the water in the carbide lamps froze while the men were traveling on the cage between the surface and the levels. Ice formed in the skip pit. On the 12th all of the compartments of the shaft and both ends of the tunnels on the surface were closed. On the 2d level additional work was done around the door in order to shut off the current. On the 1st level the connection, not only on the main level, but in the sub levels, were planked up and then sealed by being covered with dirt. A large amount of steam was admitted to the shaft and in a short time it commenced to thaw as the current changed to upcast. As soon as it was possible, an examination was made of the skip roads. It was found that the forming of the ice in the compartments had pushed the skips out of the vertical

position while passing through the shaft, causing a number of brackets which hold the rails in place to be sheared off. The timber crew worked day and night replacing these broken brackets. The shoes on the skips had been badly damaged and it was necessary to remove the skips and do considerable repair work. On the 14th hoisting was resumed.

CARBIDE LAMPS.

On Feb. 14th all men in the Maas Mine commenced the use of carbide lamps. Certain men were sent into every contract in the mine to collect all candles. Orders were given that the use of candles would not be allowed. A small place was provided in the dry for the keeping of carbide under lock and key. No one was allowed to get more than a single container full each day. There was no trouble of any kind in discontinuing the use of candles. Aside from the fact that carbide is considerably cheaper, the large amount of danger due to the possibility of fire from the careless use of candles has been eliminated.

CRUSHING.

On Feb. 24th severe crushing on the 1st level from Raises 12 to 20, inclusive, was noticed. The men were immediately taken out of the sub levels above and also directly below. This crushing continued during the day and a considerable force of men was used in retimbering and keeping open the main drift. The following day the crushing subsided and the gangs above the 1st level commenced to work. The pressure noticed on the 1st level must have been due to mining which was being done on the 639' and 623' sub levels which are below the 1st level. The material on the footside is mostly dike and as new hanging is undercut, increasing the width, a certain amount of movement must have taken place on the footside. In the main traveling road between the 1st level and the sub levels below extra cribbing was put in in order to avoid the possibility of rock falling down and injurying the men. Work was immediately started on both shifts to complete a second traveling road between the 2d level and the 639' sub level.

In the middle of April very severe crushing took place over a large part of the territory above the 1st level, but especially in the sub levels which are under the Roman Catholic cemetery. For two shifts it was necessary to stop all mining. A number of men were kept busy putting in sprags and props in order to prevent the drifts from closing. After the crushing subsided a large amount of retimbering was necessary. This crushing was undoubtedly due to the settling of a very large slab from the hanging.

FLOW OF SAND.

On March 2d, at about 7:50 a. m., sand entered the 1st level at some point near the boundary. The first indications were that a number of men were shut in. Above the 1st level six men were imprisoned for a short time. They worked their way through the soft mud which was about waist deep. Below the 1st level, on the 639' sub level, the escape of six men by way of the 1st level was temporarily blocked on account of the sand flowing down the traveling road. They could not pass to the 2d level because the raise was being repaired and temporarily closed. The traveling road to the 1st level was in rock and it was thought that this would afford a safe outlet under any conditions. It was never dreamed of course that the sand would break through from the Negaunee and fill the 1st level. Five of the men on the 663' sub level were rescued on a raft built out of 3" plank and worked in to the first raise on the 2d level which leads to the sub levels above. The stoppers of this raise were opened and the men taken out to a point of safety. The body of John Juhola was found at 12 o'clock noon on the day of the accident. He was trying to reach the 1st level when the sand commenced to enter, the men having been warned of its approach by Thomas Curtis. As they started up the ladder road the sand commenced to flow down the raise. Juhola headed the procession and before he could return to the level was knocked off the ladder and covered with sand. The other men reached the sub level safely.

On the beginning of the shift a large mass of capping broke away on the Negaunee side, the hole extending to the surface. Previous to this fall there must have been an open space above the sub levels in the Negaunee which was

either filled or partly filled with wet sand. When the capping broke this sand was pushed out in all directions. It broke through to the shrinkage stope in the land of the American Mining Co. and a large amount of it was forced through a small opening in the bulkhead between the two mines. It was so soft and was composed of such fine material that it flowed as freely as water.

Immediately after the cave men commenced to ditch the wet sand preparatory to handling it in cars and hoisting it to the surface. On both the 1st and 2d levels sand was in the main drift for a distance of about 800 ft. It varied in thickness from a foot to seven feet. A crew of men worked steadily from the 2d until the night shift of the 12th. During this time it was not possible to hoist any ore. In some places miners broke ore and put it into chutes, but this was done only for a few days. After the 12th, each Saturday night, Sunday, and Sunday night a crew of men was worked on sand. This work was continued until the end of April. The sand was so fine that it was extremely difficult to keep it in the cars. In dumping at the shaft a large amount went to the bottom and accumulated in the skip pit. In order to provide against the possibility of another flow of sand entering the Maas from the Negaunee, additional bulkheads have been put in. These have been made very strong and have been filled in with a large amount of ore. They are practically water tight.

DAMAGE TO STEEL SETS.

On the night shift of the 4th of April in some way a skip overturned in the concrete part of the shaft at a point about 100 ft. below the collar. Before the engine could be stopped three steel sets had been damaged to such an extent that they could not be repaired. Men immediately started to take out these sets and to prepare to put in temporary wooden sets. This work was difficult and progressed slowly and it was not until Tuesday at 8 a. m. that it was completed. The skips are unusually long and easy to overturn. In the timbered part of the shaft there is such a small amount of clearance that it would be practically impossible for the skip to turn over. This is not the case in the concrete part as here there is a great deal of room.

BAILERS.

After the serious fire in the Negaunee Mine pump house on Jan. 11th it was decided to purchase three bailers for the Maas Mine. These were received and the clearance thoroughly tested so that we could be absolutely sure that in case they were needed they would fit the runners. They have been stored at a point a short distance West of the shaft and have been covered by a tight shed.

MAIN WATER LINE.

On the 1st of June a leak started in the main line which supplies the mine with water. The stockpiles had been extended so far to the west that they had passed over the pipe. Unfortunately for us, the break occurred somewhere under the ore. In order to put in a new line and to get it away from the stockpiles it has been necessary to lay 1450 ft. of 4 in. wooden pipe. This pipe was received in the middle of June and on the end of the month the greater part of it had been laid. The work was finished early in July.

AMERICAN MINING CO.

Up to March 2d work had been done in the land of the American Mining Co. preparatory to the opening of a shrinkage stope and removing the ore. Since the cave of March 2d this territory has been abandoned for reasons which will be stated below. To the east of the American Mining Co. land, or near the boundary of the Negaunee Mine, there is a section of capping for a distance of 125 ft. which is not broken. When the cave of March 2d occurred the open space between the solid capping and the broken rock below undoubtedly filled with sand. An examination of the raises and shrinkage stope in the American Mining Co. land showed that a certain amount of sand had entered this territory not only from the height of the top drift, 150 ft. above the 1st level, but also at the elevation of the shrinkage stope, or 50 ft. above the 1st level. At the present time there is every reason to suppose that just to the east of this pillar a considerable amount of sand exists. Until the capping directly east of the boundary line has been broken and the open space, now filled with sand, closed, I do not believe that the ore in the American Mining Co. land can be removed with safety. When the capping has been broken and the entire territory directly

east is under pressure, the chances of sand existing in open places and suddenly breaking through under pressure are practically none. At the present time the water on the Negaunee side is passing to the sub levels. If, for any reason, this water should not reach the Negaunee and should commence to back up, it would flow across to the Maas. The chances of this are very remote. As long as the sand, which must exist in the open spaces to the east of the American Mining Co. land, is wet there is some possibility of it entering the land of the American Mining Co.

From the first of the year up to March 2d, when sand entered the mine, through the land of the American Mining Co., a little work had been done preparatory to the mining of this ore. It was planned to remove it by the shrinkage stope method and at an elevation of 50 ft. above the 1st level a stope had been started and some ore broken. In order to provide an outlet for the men the stope was connected with a raise from the 762' sub level, which was taken to a height of 150 ft. above the 1st level. This raise and a part of the drift were completed in the previous year, but during the present year a drift was extended and connected with the main raise which passes through the center of the stope. The object of this connection was to make it possible for men to travel upward from the stope and then across to the Maas. This was considered the safest plan for this kind of work. After the cave of March 2d an examination of the shrinkage stope was made. It was found that a certain amount of sand had passed over the broken ore and had settled down into the pile. When this ore is removed it may be possible to wash the sand away by the use of mine water.

CLOSING MINE.

In the latter part of September instructions were received to close the mine on the first day of October. All of the miners underground were directed to collect their tools, powder, caps, and other things of value. This material was brought to the shaft and then taken to the surface. For a few days it was necessary to keep a small force to bring supplies to the surface. Previous to the closing of the mine a crew of men worked on both shifts taking a large amount of timber underground and storing it in the main levels.

It was thought that it would only take a few days to start the centrifugal pump which is located on the 3d level. Due to delay in receiving special pipe and other supplies the pump was not put into commission until the 15th. Due to trouble on the transmission line the work of the electricians was delayed two days as they had to be taken off the pump in order to put the lines in condition. The work of tightening the tremendous number of bolts in the discharge in the shaft was slow and tedious. The ladder road is only 2 ft. wide and for this reason many of the bolts were very difficult to get out. This work had to be done by men working on top of the cage. After the pump was started it was found to work very satisfactorily and no trouble due to heating was experienced. It was found that by pumping once each twenty-four hours that the sump could be drained in one hour and twenty minutes. This shows that the mine is making somewhere between seventy-five and eighty gallons per minute. On the 16th of October a small part of the pump broke. This had to be taken out and sent to Ishpeming and it was not received until the 19th. On the 18th, day and night shifts, the water was pumped by air furnished by the Negaunee compressor.

Underground four shift bosses have been engaged from the time that the mine was shut down up to the end of the year in retimbering. These men travel through the Negaunee Mine to the Maas. The greater part of their work has been on the 1st level where there is one place in the main drift between Raises 12 and 20 which is crushing. In addition to this work they visit each level daily and inspect the drifts. In order to aid in the ventilation the motor on each level is run for a short time each day. The Maas shaft has been sealed and in addition the door between the 2d level, Maas, and 10th level, Negaunee, is kept closed. The consequence is that the air is not good. In the latter part of December it was found that above the 1st level the air was stagnant. Men, upon visiting this territory, were nearly overcome. It is the intention to put the cage hoist in commission as soon as possible and to uncover the Maas shaft. If the door between the Maas and the Negaunee is kept closed it is thought that the current in the Maas and also Negaunee can be made upcast. When the air becomes

stagnant the timbers decay rapidly. The Maas hoist can be operated without additional men. The putting of this hoist in commission will save considerable time as now it is necessary for the men to travel a very long distance to their work. In addition they have to do a large amount of climbing. There would also be some saving in operating the pump. At the present time two men are sent across from the Negaunee to the 3d level. This consumes practically half a shift. If the hoist is put in commission this work can easily be done by the machinist at the Maas.

In order to save as much money as possible, it was decided to shut down the boiler plant as it would not pay to keep steam up to handle the few men working underground. Early in October preparations were therefore made to draw the fires from the boilers. All of the radiators in the various buildings were disconnected and blown out with air. A stove was set up in the transformer house in order to provide heat for the engineers looking after the transformers and switchboards. On Oct. 22d the fires were drawn. A few days after, due to very low water, it was necessary to start the turbine for a few days. On Dec. 4th the turbine was again started and has continued to run up to the end of the year.

SUMP AND PUMP HOUSE - Acct. #12, E. & A. #247.

From February up until the time of the closing of the mine work was continued on the sump and pump house. The larger part of the work in the pump house had been done previous to the present year. In order to make room for the two new pumps it was necessary to increase the size of the excavation. This work was not carried on continually but was done intermittently as it was difficult to handle the large amount of rock. In the latter part of May a carpenter completed the forms for the centrifugal pump and they were filled with concrete. This pump was put into commission Oct. 15th. In order to provide against the possibility of the pump being flooded due to a serious delay in electric current or break-down, a relay of pumps were put in which can be run by compressed air.

To the south of the pump house the ground has been cut away to a depth

of 16 ft. to form a part of the sump. Going north from this elevation a drift has been extended for a distance of 50 ft. At a point 500 ft. south of the shaft an inclined drift running north, dropping down at a steep angle, was continued until a depth of 16 ft. was reached. The men then started to drift north on the same line as the drift going south from the pump house. This drift was extended for about 100 feet. When these two drifts connect a number of short branch drifts will be driven in order to get sufficient capacity for the sump. The progress in both of these drifts was very slow and the work expensive on account of the extreme hardness of the ground. It was difficult to make the drills stand up and it required a tremendous number of them in order to complete the cut. In September it was suggested that we try the new patented Carr bit. This has a large amount of wearing surface and a chisel faced cutting edge. It was soon demonstrated that this bit was way ahead of anything we had ever tried for hard ground.

In the pump house a raise 30 ft. high was put up in the direction of the shaft and connected with the ladder road. In addition to this a second raise 25 ft. high was completed over the point where the suctions will finally go. This second raise is to make it possible to remove the suctions. After the second pump is installed a concrete bulkhead will be built across the south side of the pump house and connected with the rock in the back. If, for any reason, the mine should be flooded this bulkhead will prevent the water from entering the pump house until the entire 3d level has been flooded. The raise in the pump house will serve as a safe outlet for the pump men.

WINZE TO 4TH LEVEL.

In March work on the winze which will extend to the 4th level was commenced. In the first crosscut from the shaft on the 3d level, at a distance of about 30 ft. from the breast, the winze was located. It contains three compartments, consisting of two skip roads and a ladder road. Its inclination is 45 degrees. Above the level the winze was extended to a height of 50 ft. on an angle of 45 degrees. On line with the winze from the main haulage way a two-compartment raise was constructed from the main drift on an angle of 60 degrees.

This connected with the part of the winze above the level. This raise will serve as a pocket for the material hoisted from the winze. The inside dimension of the winze is 5 by 7 ft. On the level bearers were placed and during March the winze sunk 10 ft. It was then covered and the work of raising the part above the level commenced. From cross-sections which have been prepared, it is almost certain that the winze will be in ore for its entire distance. During April the miners were engaged in raising the winze above the level and they also extended the drift for tail room in order to locate the hoist. In May the upper part of the winze was connected with the raise from the main drift. The balance of the month was taken up in extending the crosscut to the hanging and widening out the same in order to make room for the hoist. In June sufficient room on the hanging side of the winze had been made, the forms for the foundation of the hoist put in place and filled with concrete. The heavy parts of the hoist were taken underground. In July the main cable to furnish power to operate the hoist was placed in position. This was supported from pins on the side of the main drift. These pins were placed in holes in the wall at intervals of 7 ft. There was delay in putting the hoist in commission. It was found that there was a mistake in the data furnished us for the foundation, a part of this being 3 in. too high. There was also some delay in receiving certain parts of the electrical equipment. It was found in July that it was advisable to obtain a little more headroom above the level in the shaft so it was extended an additional 10 ft. In the latter part of August the hoist was finally put in commission. After running for a few minutes the motor burned out. This was due to defects on the part of the manufacturers. In addition to this, after a part of the motor had been rewound two of the transformers burned out. It was perfectly evident that sufficient care had not been taken by the Allis-Chalmers people who furnished this material. After the mine was shut down the motor was taken out and returned to the makers. A certain amount of water was flowing from the breast of the crosscut and entering the winze. In September the floor of the crosscut was concreted and practically all of this water cut off. There was a delay in the early part of the month due to trouble with the electrical equipment. On the

end of September the winze had been sunk to a depth of 50 ft. below the level. After this date no work was done as the mine was shut down. See monthly mine report for February 1915

FATAL ACCIDENTS.

On Feb. 16th, shortly after 8 o'clock,a. m., Peter Allen and Mike Stefanelli, miners in No. 32 contract, were instantly killed by a fall of ground. This accident was described in detail by your committee on accidents on Feb. 17th. I will review in a general way the conditions under which these men were working. They were removing a triangular piece of ore between crosscuts on the main level which extends south to the hanging from the main drift on the 3d level. Through this territory the hanging is very flat. Raises are put up at some distance from the hanging to the rock. From these raises drifts are driven south to the rock and the ore is sliced parallel to the hanging. Successive slices are removed until a point is reached where the rock is 10 or 12 ft. above the floor of the slice. As a general rule, due to the flat angle of the rock, this condition is reached when about two slices have been taken. Slicing is then stopped and the timber blasted in and the men commence the work of breaking capping to fill the open space. After the opening has been filled as far as practical it is then thought safe to either continue the work of slicing or to drop down and remove the ore directly below this broken rock, taking up the lagging above. Stefanelli and Allen were engaged in removing a slice of ore. To the south of them was a large amount of filling. Without the slightest warning a large piece of ore settled off from the hanging, crushing the timbers and burying the men. Upon the inspection of Captain Thomas and a shift boss at 9:30 it was noticed that No. 32 was filled and immediately search was made for the miners and it was soon determined that they must have been buried as they could not be found on the level. The work of rescuing their bodies was started and they were recovered in the afternoon. From the position in which these men were found it was evident that they had not time to make an attempt to escape.

The ore under the flat hanging is extremely hard and has always been known to be treacherous. For this reason we have been particularly careful and have endeavored to use special precautions in order to prevent just such an

accident as this. It is my opinion that a crack or pressure plane must have extended through the ore to the rock, allowing a large mass to settle off without warning. This mass of ore was of sufficient weight to ride the timber foreward. After this accident special instructions were given to the captain and bosses that in all similar places each set of timber must be securely laced in order to prevent it being ridden. The work under new hanging, where it is necessary to continually blast to provide filling, is particularly dangerous. As an extra precaution the captain was instructed to use larger timber in similar places and in addition put the sets closer together. This, however, was not the cause of the present accident as the legs were not broken. In addition to the above, the system of mining will be slightly changed. After two slices have been taken the men will be required to come back and drive the third crosscut in solid ore parallel with the hanging. They will then turn and remove the 7 ft. of ore in the short slice. This will provide at least a safe outlet and there will only be 7 ft. of the drift which is exposed to a sudden fall of ground.

Under the heading of "FLOW OF SAND" I have described the cause of the death of John Juhola.

I regret exceedingly to have to report these three fatalities. I am sure that practically every one connected with the mine takes a keen interest in safety work and we have endeavored in every way to reduce accidents to a minimum. Outside of these accidents, which I feel were out of our control to prevent, it will be found that the Maas has made a creditable showing in safety work during the year. The miners are taking a decided interest in this work and there has not been a single case of an injury in which first aid has not been given.

WAGES.

On Oct. 1st there was a general reduction of 10 per cent in the wages of all employees.

PRODUCTION.

Month	Bessemer	Maas	Total	Rock
January,	133	24,379	24,512	225
February,		18,649	18,649	510
March,	174	13,745	13,919	4,776
April,	1,435	20,072	21,507	1,809
May,	1,326	24,255	25,581	324
June,	1,291	24,447	25,738	489
July,	1,482	22,550	24,032	726
August,	3,325	23,141	26,466	696
September,	2,058	24,212	26,270	696
Total,	11,224	195,450	206,674	10,251
Transferred, From	1,122	To 1,122		
Total,	10,102	196,572	206,674	10,251

During the year a very large percentage of the work has consisted of drifting, opening up new territories preparatory for mining a larger product. There have been a number of serious delays which have been described. The flow of sand of March 2d demoralized a large percentage of the men and the amount of ore obtained showed a decided decrease.

On account of the Negaunee Mine fire on the night of Jan. 11th the Maas Mine was idle until the night shift of Jan. 14th. It was known that for a part of the time the current was upcast in the Maas and that a certain amount of gas passed from the Negaunee to the Maas. It was feared that this gas might have accumulated in the workings. It was not until the afternoon of the 13th that we were reasonably sure that the Negaunee Mine fire had been extinguished. For this reason it was thought that there was a possibility of the gas reaching the Maas at any time. On the 14th a thorough inspection of the mine was made and it was determined that there was no gas. Work was therefore resumed on that night shift.

The ore in the Maas is unusually hard in all territories below the capping. It is necessary to do much filling to provide safe working conditions in the lower sub levels. This work is slow and expensive.

ESTIMATE OF PROBABLE ORE.

During the previous year the estimate was calculated from cross-sections. During the present year the amount mined has been deducted.

Estimate of Probable Ore.

Above 1st Level, North of Fault,	52,500		
" " " South " "	25,000		
At D. D. Hole No. 11,	5,300		
Total Ore Above 1st Level,		82,800	
Between 1st and 2d Levels,		837,100	
" 2d " 3d "		2,120,600	
Total Ore Above 3d Level,			3,040,500

ASSUMPTION: 12 cu. ft. equal to one ton; 10% deduction for rock; 10% deduction for loss in mining.

UNDERGROUND.

777' SUB LEVEL.

At the time the mine was shut down there still remained a few pillars on this sub level. Under the Roman Catholic cemetery No. 17 contract had completed a new drift next to the footwall and was preparing to remove two small pillars. On the west end, in the neighborhood of the old square set room, there remains a few small pillars. These were being removed by Contracts 2, 40, and 42. It was found that a certain amount of lean ore extended to the south of the original outline of the sub level. In order to remove this a drift was completed in the rock from No. 13 raise to a point opposite No. 9. The object of this was to provide a safe outlet for the men. The west end of this sub level was taking weight and before the mine is again reopened these working places will undoubtedly be closed.

762' SUB LEVEL.

Under the Roman Catholic cemetery there remains a few pillars next to the main footwall drift. The three pillars next to the boundary line will have

to be left until the ore in the land of the American Mining Co. has been removed. This is necessary in order to protect the raises leading to the upper part of the American Mining Co. land. Just previous to the closing of the mine we had opened up the footwall drift and No. 9 contract had commenced to pull the pillars from the east to the west. Outside of the Roman Catholic cemetery a small amount of work has been done during the year. No. 7 has drifted south and was following the hanging to the east. On the extreme west end No. 14 has followed the footwall preparatory to removing the ore in the old square set room.

746' SUB LEVEL.

At the beginning of the year the only work done at this elevation was the completion of the footwall drift under the Roman Catholic cemetery which connected the raises. During the present year the crosscuts to the hanging have been driven and a part of the ore directly under the rock has been removed. Some of the square set rooms from the 1st level extended up to a height of 28 ft. As this sub level is only about 40 ft. above the 1st level there was some danger in passing over a few of the rooms. For this reason we connected with the high rooms and blasted ore in order to fill them. A considerable amount of material was blasted by Contracts 3 and 45 into the room on the west end of the Roman Catholic cemetery. Outside of the cemetery, raises from No. 7 to 14, inclusive, have been connected. No. 5 has done a small amount of drifting towards the hanging.

Under the hanging of this sub level, and also the 762', it has been necessary to continue to blast filling in order to protect the men at a lower elevation. As far as can be told, the entire territory above the 1st level has been filled as far as practical.

639' and 623' SUB LEVELS.

From the first of the year up to March 2d a small amount of mining was done in these two sub levels. When the sand flowed across from the Negaunee it went down the main traveling road and entered a part of the 639' sub level. At the time of this flow work was being done on a second outlet from the second level. The old raise was in bad condition and the retimbering of it was difficult.

In the early part of the year the main drift on the 1st level crushed between Raises 10 and 20. This was undoubtedly due to the mining on the 639' and 623' sub levels. Although this work is at a considerable distance from the foot, the material directly south of the main drift was so soft that the mining below had a tendency to pull the main drift. After the sand came into the mine it was decided to stop these two sub levels temporarily.

610' SUB LEVEL.

Midway between the 1st and 2d levels a certain amount of drifting has been done in order to connect new raises which were being put up between the 2d and 1st levels. The object of this drift was to divide the distance in half so that the height of the raises was broken. No. 24 gang, when the mine was shut down, was continuing to drift east in order to connect raises from No. 46 to 49, inclusive, which had been put up to this elevation. From Nos. 41 to 45, inclusive, the raises have been taken to the 1st level. This work of raising was much delayed as the men were taken out at various times to fill other contracts which were in ore.

2D LEVEL.

At the shaft a part of the plat directly opposite the cage road has been increased in size in order to make it possible to tram timber directly to the main line. In the early part of the year a gang of miners were employed in cleaning up and timbering the main footwall drift towards the Negaunee Mine. When this drift was driven little timber was put in as the material was practically all rock. When raising was started it was necessary to commence at No. 41 and retimber and clean up the large amount of dike material which had fallen. This work was continued until the entire drift was placed in good condition.

Between the Maas and Negaunee mines a steel door was placed in a very substantial concrete bulkhead. In case the 10th level, Negaunee Mine, should ever become flooded the water can be kept out of the Maas by closing this door.

422' SUB LEVEL.

A small part of this sub level, between Nos. 91 and 92 raises was opened in the previous year. During the present year the drift has been extended east and west and additional raises connected. The ore has been blocked out and the larger part of it removed. At the time that the mine was shut down there remained a few pillars which were being removed by Contracts 26 and 37. The small sub level to the west which was partly opened up in the previous year was completed in the early part of April. No. 19 contract then commenced to blast rock in order to fill the open space. We have previously blasted a large amount of material in this small territory, but as the work progressed downward it was necessary to continue this blasting.

401' SUB LEVEL.

This sub level is midway between the 2d and 3d levels. For a considerable length of time the main drift in the center of the workings has been completed. It was only during the present year that we commenced to crosscut to the foot and hanging preparatory to mining this ore. In this territory, particularly on the hanging side, the ore is unusually hard and the cost for doing this large amount of drifting was heavy. When the mine shut down there were seven gangs on the footwall side which had just commenced to mine. Up to the present time we have received little benefit from the large amount of expensive drifting. On the hanging side two contracts, Nos. 21 and 36, were drifting on the end of the year. This ore on the hanging was high grade Bessemer. When the mine again resumes work we will be able to make a good showing at this elevation. On the west end the ore is very pockety. Small pillars were being scrammed out by Contracts 18 and 19. At the time that the mine was closed No. 19 was engaged in blasting filling. This end of the mine is being pulled down more rapidly than the part to the east where we have been engaged ever since the mine was opened in removing the ore above the 1st level. It has not been practical to attack the ore below the main part of the 1st level on account of the large number of gangs working above. It is very desirable that the ore above the 1st level be taken as soon as practical and that mining be started between the 1st and 2d levels.

395' SUB LEVEL.

All of the work shown at this elevation has been done during the present year and consists almost entirely of drifting. The conditions are such that we have not been able to open up fast enough in order to mine directly below the capping. On the west end a small amount of ore was mined over the tenth room. This sub level broke into the old square set room and a large amount of ore was blasted down in order to make working conditions safe. Some of this ore was pulled out on the sub level. On the east end the ore has been partly outlined on the hanging side and a drift has been continued back towards the foot by No. 34. This work was all expensive and little return has been obtained up to the present time.

385' SUB LEVEL.

No. 23 contract was drifting west on this new sub level connecting raises. Before the 401' sub level is mined it will be possible to commence to crosscut and block out additional ore.

355' SUB LEVEL.

The larger part of this work has been done during the present year. Near the boundary line the capping was found to be exceedingly flat. Here it was possible to remove the ore back to such a point that the rock was not over 12 ft. above the floor. The upper ore will be taken from the 395' sub level. Still higher up there undoubtedly will be triangular pieces of ore which will have to be removed on other sub levels. The hanging is quite irregular and for this reason it has been impossible to open up a large territory on any one sub level. In certain places, shortly after commencing to mine, it was found that the ore extended above us. Mining would therefore have to be stopped, the raises continued to a greater elevation, and new crosscuts driven to the hanging. When this upper ore has been removed and we are able to mine to a considerable width it will be possible to put in a number of gangs and get good results. On the end of the year Nos. 11 and 30 were mining directly under the hanging near the boundary line. No. 29 was drifting south in order to locate the hanging. To the west No. 31 was mining directly below the hanging. In all of these rooms

the ground has been unusually treacherous and for this reason extra precautions had to be taken in removing the ore. Directly below the flat rock the ore is hard and has a tendency to slab off in large masses. As soon as a slice, two sets in width, has been removed mining is stopped and sufficient rock is blasted from the hanging in order to fill the opening. Before filling is blasted we have been particularly careful to close-lag the entire floor.

335' SUB LEVEL.

In the ninth crosscut No. 33 gang has been removing a single slice of ore between two old square set rooms. At the time the mine was shut down No. 33 had practically completed this work.

315' SUB LEVEL.

From the third, fifth, and seventh crosscuts gangs have been engaged in removing a slice of ore between old square set rooms. Previous to this time the ore above had been taken and the work on these sub levels consisted of removing another slice, taking up the lagging in the floor of the upper sub levels. This work is practically completed and at the time the mine was shut down No. 33 was the only gang working here. The bottom of these sub levels is at an elevation of only 6 ft. above the rail of the main level.

CONCLUSION.

During the present year a very large proportion of the work has consisted of drifting, opening up new territories. This, taken in connection with a number of serious delays, has kept down the product and made the cost high. There has been a large number of places in which it was necessary to blast filling in order to make the working places safe. There is a large territory above the 3d level where much drifting has been done in the present year. Here the cost has been high, and up to the time that the mine was shut down we obtained little return for the work done.

ROCK DRIFTING.

During the year we have drifted 387 ft. in rock and raised 910 ft. in rock.

MAAS MINE.

COMPARATIVE MINING COST FOR YEAR.

	1 9 1 4 (9 Mos)	1 9 1 3	INCREASE	DECREASE
PRODUCT	206,674	295,088		88,414
General Expense	.057	.048	.009	
Maintenance	.150	.078	.072	
Mining Expense	.978	.911	.067	
Cost of production	1.185	1.037	.148	
DEPRECIATION				
Equipment	.010	.006	.004	
Original Purchase	.200	.200		
New Construction	.003	.078		.075
Plant	.255	.250	.005	
Total depreciation	.468	.534		.066
Taxes	.161	.149	.012	
Central Office	.064	.052	.012	
Sundry expense	.017	.083		.066
Miscellaneous	.005		.005	
Idle Expense	.091		.081	
COST ON STOCKPILE	1.981	1.855	.126	
Loading and shipping	.007	.007		
Total cost on cars	1.988	1.862	.126	
Number of days operating	207	300		93
Number of shifts and hours	2-8hr	2-8hr		
Average daily product	998	1,132		134
COST OF PRODUCTION				
Labor	.841	.760	.081	
Supplies	.344	.277	.067	
Total	1.185	1.037	.148	

Mine closed down October 1, 1914.

No. 30-Personal Injury Expense - 1914 Amount $595.29 - Cost per ton $.003

1913 " 490.62 - " " " .002

Increase, $104.67 - $.001

In 1914 there were three fatalities, while in 1913 there was one. On the cost sheet for the year in 1913 there was an adjustment of $306.00.

No. 30a-Mine Office - 1914 Amount $6,519.96 - Cost per ton $.032

1913 " 5,035.81 - " " " .024

Increase, $1,484.15 - $.008

In 1914 the mine office account was $3,943.26, while in 1913 it was $3,300.05, an increase of $643.21. There was an increase of direct charges of $840.94. In 1914 there was extra help in the office which amounted to $263.65. In addition, in this year the proportion of superintendent's choreman and stenographers wages was charged to the Maas.

Total, General Expense - 1914 Amount $12,377.62 - Cost per ton $.060

1913 " 10,393.59 - " " " .049

Increase, $ 1,984.03 - $.011

This increase is explained by accounts No. 28, 30, and 30a.

MAINTENANCE

No. 125-Tracks and Yards - 1914 Amount $1,468.05 - Cost per ton $.007

1913 " 789.63 - " " " .004

Increase, $ 678.42 - $.003

This increase is due to a much larger amount of improvement work being done around mine buildings and extra labor necessary in keeping the same in condition.

No. 126-Docks, Trestles, and Pockets - 1914 Amount $9,492.86 - Cost per ton $.046

1913 " 401.00 - " " " .002

Increase, $9,091.86 - $.044

This increase is explained by the large amount of new trestle which it was necessary to construct in 1914. In 1913 no new trestle material was purchased.

No. 127-Buildings - 1914 Amount $547.68 - Cost per ton $.003
1913 " 884.40 - " " " .004
Decrease, $336.72 - $.001

In 1913 extensive repairs were necessary in the coal dock and a large amount of work was done in the timber tunnels to facilitate the handling of timber. The principal expense in 1914 was for a new rubberoid roof on the engine house.

No. 128-Shop Machinery - 1914 Amount $ 3.87 - Cost per ton $.000
1913 " 49.98 - " " " .000
Decrease, $46.11 - .000

In 1913 repairs were necessary on the drill sharpener.

No. 129-Boiler Plant - 1914 Amount $ 814.88 - Cost per ton $.004
1913 " 1,148.77 - " " " .005
Decrease, $ 333.89 - $.001

In 1914 the repairs to boilers was ordinary, while in the previous year there was an extraordinary expenditure of about $300.00 on the automatic stokers.

No. 130-Hoisting Machinery-1914 Amount $5,959.24 - Cost per ton $.029
1913 " 792.34 - " " " .004
Increase, $5,166.90 - $.025

$3,336.66 was expended on auxiliary hoist used at the winze which is being sunk to the 4th level. In 1914 there was a charge of $860.00 against heating in shaft. In addition there was one rope purchased at a cost of $373.40.

No. 131-Compressors and Power Drills - 1914 Amount $1,633.15 - Cost per ton $.008

1913 " 2,380.50 - " " " .011

Decrease, $ 747.35 - $.003

In 1914 thirteen drill machines were purchased at a cost of $1,616.75, while in 1913 seventeen were bought costing $2,380.50.

No. 132-Pumping Machinery -1914 Amount $607.40 - Cost per ton $.003

1913 " 210.08 - " " " .001

Increase, $397.32 - $.002

In 1914 there was an extraordinary expense of laying 905 ft. of 3 in. pipe in order to be able to pump Maas water to the Negaunee Mine. During this year there were large Hard Ore bills for repairs to pumps.

No. 133-Top Tram Engines and Cars - 1914 Amount $707.58 - Cost per ton $.003

1913 " 661.24 - " " " .003

Increase, $ 46.34 - .000

No. 134-Skips and Skip Roads - 1914 Amount $1,788.97 - Cost per ton $.009

1913 " 1,027.53 - " " " .005

Increase, $ 761.44 - $.004

In 1914 there was $309.79 charged against this account for work connected with the winze to 4th level. Due to the overturning of a skip and the tearing out of two steel sets, there was a charge of $325.00.

No. 135-Underground Tracks and Cars - 1914 Amount $494.33 - Cost per ton $.002

1913 " 1176.07 - " " " .005

Decrease, $681.74 - $.003

In 1913 there was a heavy charge against building sub level cars and equipping the same with roller bearing wheels. The expense in 1914 was much less.

No. 136-Electric Tram Plant - 1914 Amount $5,390.46 - Cost per ton $.026

1913 " 5,823.00 - " " " .027

Decrease, $ 432.54 - $.001

This account is subdivided as follows:

	Motors	Wiring	Tracks	Cars
1914,	$ 694.73	$280.07	$3,170.15	$1,245.51
1913,	1,295.83	561.46	2,875.82	1,089.89
	$ 601.10 Decrease	$281.39 Decrease	$ 294.33 Increase	$ 155.62 Increase

In 1913 there was much trouble due to motors burning out and for this reason the expense was very heavy. During 1913 a very large amount of wiring was done in order to prevent the possibility of the current from the lights setting the timbers on fire. In 1914 the expense for tracks was increased on account of more labor necessary to keep them clean. There was also an increase in cars due to more repair work being done.

No. 137-Telephones and Safety Devices - 1914 Amount $1,179.97 - Cost per ton $.006

1913 " 1,258.63 - " " " .006

Decrease, $ 78.66 - .000

A smaller amount of safety work was done in 1914 than in the previous year. The expenditure for both years is high as a large amount of labor was necessary in safety work.

No. 140-Fire Expense and Damage - 1914 Amount $102.62 - Cost per ton $.000

1913 " 0.00 - " " " .000

Increase, $102.62 - .000

This charge was for damage done by fire in coal dock.

Total, Maintenance - 1914 Amount $30,191.06 - Cost per ton $.146

1913 " 16,603.17 - " " " .077

Increase, $13,587.89 - $.069

The heaviest part of this increase is accounted for under accounts No. 126 and 130.

MINING EXPENSE

No. 150-Air Pipes - 1914 Amount $2,146.90 - Cost per ton $.010
1913 " 2,104.57 - " " " .010
Increase, $ 42.33 .000

No. 151-Compressors - 1914 Amount $6,955.43 - Cost per ton $.034
1913 " 5,965.53 - " " " .028
Increase, $ 989.90 - $.006

Up until March 1st, 1914 the Maas Mine furnished air to the Negaunee. The daily cubic feet made was figured by the revolutions and amounted to a large figure. When the Negaunee commenced to make its own air the cost to the Maas Mine increased immediately about $200.00 per month.

No. 152-Hoisting - 1914 Amount $10,500.24 - Cost per ton $.050
1913 " 9,870.16 - " " " .046
Increase, $ 630.08 - $.004

When the Negaunee Mine stopped receiving air from the Maas it was necessary to readjust the distribution of the boiler house expense. According to the new estimate of the mechanical department a large additional amount had to be charged against hoisting.

No. 153-Pumping - 1914 Amount $6,476.55 - Cost per ton $.031
1913 " 5,896.71 - " " " .028
Increase, $ 579.84 - $.003

When the Negaunee Mine stopped receiving air from the Maas it was necessary to charge an additional amount to pumping. The old air estimate was calculated from the revolutions of the machine, regardless of the fact as to whether the pressure was eighty pounds or a much lower amount than this. It was difficult to determine the actual output of the compressor.

No. 154-Sinking and Shaft Repairs - 1914 Amount $196.21 - Cost per ton $.001

1913 " 322.14 - " " " .002

Decrease, $125.93 - $.001

In 1913 $165.00 was expended on casing a part of the shaft. The remainder is for general repairs to pockets.

No. 155-Rock Drifting - 1914 Amount $3,098.21 - Cost per ton $.015

1913 " 4,952.23 - " " " .023

Decrease, $1,854.02 - $.008

In 1914 the total amount of drifting and raising was 1327 ft. at a cost of $2.33 per foot, while in 1913 there was 1063 ft. at a cost of $4.66. In 1914 the work consisted largely of raising, therefore the cost was lower.

No. 156-Breaking Ore - 1914 Amount $ 97,672.72 - Cost per ton $.473

1913 " 108,865.45 - " " " .510

Decrease, $ 11,192.73 $.037

An increase of wages occurred in February, 1913. There were 19 days less worked in 1914 than in 1913. Charged against this account is $520.63 which was for work in the winze during 1914.

No. 157-Tramming - 1914 Amount $20,167.45 - Cost per ton $.097

1913 " 19,023.90 - " " " .089

Increase, $ 1,143.55 - $.008

A considerable part of this increase is due to handling sand during the cave of March 2d. During the year, as an additional safety precaution, two extra men were used on the motors on the 3d level. Previous to this time it had been the policy for one of the dumpers at the shaft to ride the motor and assist in the loading. This was discontinued on account of the danger connected with the extra man being on the motor.

No. 158-Filling - 1914 Amount $2,850.21 - Cost per ton $.014
1913 " 1,791.50 - " " " .009
Increase, $1,058.71 - $.005

This account is regulated entirely by the amount of rock which it is necessary to blast from the hanging.

No. 159-Timbering - 1914 Amount $31,307.51 - Cost per ton $.152
1913 " 27,455.56 - " " " .129
Increase, $ 3,851.95 - $.023

The increase is due to a large amount of retimbering on account of extreme crushing on several occasions above the 1st level.

No. 160-Captain and Bosses - 1914 Amount $5,794.99 - Cost per ton $.028
1913 " 4,628.70 - " " " .022
Increase, $1,166.29 - $.006

As an extra safety precaution two additional bosses were added to the third level in order to give closer supervision to certain contracts in which it was necessary to use extra care in removing the ore.

No. 161-Dry House - 1914 Amount $2,874.66 - Cost per ton $.014
1913 " 2,083.15 - " " " .010
Increase, $ 791.51 - $.004

This increase is due to the changing of the subdivision of the boiler house expense.

No. 162-Top Landing and Tramming - 1914 Amount $4,458.47 - Cost per ton $.022
1913 " 3,408.73 - " " " .016
Increase, $1,049.74 - $.006

In 1914 there were 154,063 tons stocked against 82,026 in 1913. This would naturally increase the amount expended.

No. 163-Stocking Ore - 1914 Amount $1,261.09 - Cost per ton $.006
1913 " 1,325.93 - " " " .006
Decrease, $ 64.84 - .000

No. 164-Sorting Ore - 1914 Amount $391.02 - Cost per ton $.002

1913 " 164.06 - " " " .000

Increase, $226.96 - $.002

No. 166-Cave In - 1914 Amount $6,107.15 - Cost per ton $.030

1913 " 0.00 - " " " .000

Increase, $6,107.15 - $.030

This heavy expense was on account of a serious run of sand which entered the Maas on March 2d, 1914.

Total, Mining Expense - 1914 Amount $202,258.81 - Cost per ton $.979

1913 " 197,858.32 - " " " .928

Increase, $ 4,400.49 - $.051

There was a large increase in accounts No. 159 and 166.

Cost of Production - 1914 Amount $244,827.49 - Cost per ton $1.185

1913 " 224,855.08 - " " " 1.054

Increase, $ 19,972.41 - $ .131

This very large increase is explained under unusual Maintenance accounts. There was also a heavy increase in Timbering and Cave in.

MAAS MINE

AVERAGE MINE ANALYSIS OF OUTPUT FOR YEAR-1914

GRADE	IRON	PHOS.	
Maas Bessemer,	62.04	.056	
Maas,	58.72	.102	

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR-1914

	Mine		Lake Erie	
GRADE	IRON	PHOS.	IRON	MOIST.
Maas Bessemer,	All mixed.			
Maas,	58.83	.109	57.06	10.82

ORE STATEMENT - DECEMBER 31ST, 1914

	MAAS BESSEMER	MAAS	TOTAL	TOTAL LAST YEAR
On Hand Jany. 1, 1914	4,002	139,241	143,243	19,630
Output for Year,	10,102	196,572	206,674	295,088
Total,	14,104	335,813	349,917	314,718
Transferred to Lake Stockpile at Presque Isle,				770
Shipments,	10,062	45,841	55,903	170,705
Balance on Hand,	4,042	289,972	294,014	143,243
Decrease in Output - 30%			88,414	
Increase in Ore on Hand,			150,771	

1914 -- 2-8 Hr. Shifts Jany. 1st to Sept. 30th,
Mine Closed Oct. 1st to end of Year.

1913 -- 2-8 Hr. Shifts during Year.

SHIPMENTS FOR YEAR--1914

	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Maas Bessemer,	7,150	2,912	10,062	7,080
Maas,	45,462	379	45,841	163,625
Total,	52,612	3,291	55,903	170,705
Total Last Year,	162,625	8,080	170,705	
Decrease - 67%			114,802	

MAAS MINE.

COMPARATIVE AVERAGE WAGES AND PRODUCT.

PRODUCT '14 206,674 Tons PRODUCT '13 295,088 "	SURFACE.		UNDERGROUND.		TOTAL.	
	1914.	1913.	1914.	1913.	1914.	1913.
Avg. No. men working	31	37	181	229	212	266
Avg. wages per day	2.38	2.43	2.77	2.78	2.71	2.73
Avg. wages per mo. 25 days	59.50	60.75	69.25	69.50	67.75	68.25
Avg. product per man per day	20.85	25.04	3.81	4.24	3.22	3.62
Labor cost per ton	.114	.097	.728	.657	.842	.754
Diff. in labor cost per ton	+.107	-.121	+.071	-.036	+.088	-.157
Avg. product breakg, &trammg.			7.11	6.85		
Avg. wages for miners contract			2.89	2.92		
Total avg.wages for contract			2.89	2.92		

	1 9 1 4	1 9 1 3	INCREASE	DECREASE
SURFACE				
Total no. of days	9,911-3/4	11,782¼		1,870½
Average rate	2.38	2.43		.05
Amount	23,621.84	28,569.68		4,947.84
UNDERGROUND				
Total no. of days	54,297	69,650¼		15,353¼
Average rate	2.77	2.78		.01
Amount	150,484.89	193,745.16		43,260.27
Rotal days	64,208-3/4	81,432½		17,223½
Average rate	2.71	2.73		.02
Total Amount	174,106.73	222,314.84		48,208.11
Labor cost per ton	.842	.754	.088	

No. shifts and hours		2-8hr	2-8hr TONS	%
Tons per man per day	Surface	DECREASE	4.19	16.8
" " "	Underground	DECREASE	.43	10.1
" " "	Surf.& Undg.	DECREASE	.40	11.

Proportion of surface to underground men:
1914 - 1 to 5.48
1913 - 1 to 6.18
1912 - 1 to 2.88

Decrease Wages per day:
Surface .05 - 2.06%
Underg. .01 - 0.36%
Total .02 - 0.73%

MAAS MINE.

TIMBER STATEMENT FOR YEAR ENDING DECEMBER 31,1914.

KIND.	LINEAL FEET	AVG. PRICE PER FOOT	AMOUNT 1914	AMOUNT 1913
6 " to 8" Timber	2,668	.02	53.36	253.70
8" to 10" "	54,500	.042	2,315.15	2,331.10
10" to 12" "	27,600	.06	1,656.18	1,699.00
12" to 14" "	3,380	.082	278.79	548.67
Total 1914	88,148	.0488	4,303.48	
Total 1913	106,734	.0453		4,832.47

	LINEAL FEET	PER 100'	1914	1913
5" Lagging				2.67
6" "				21.96
7" "	545,967	.55	3,003.92	5,340.42
8" "				606.67
Total Lagging	545,967	.55	3,003.92	5,971.72
Poles	10,990	.95	104.45	201.67
Total 1914	556,957	.558	3,108.37	
Total 1913	1,026,069	.602		6,173.39

	1914	1913
Feet of timber per ton of ore	.427	.362
Feet lagging per ton of ore	2.64	3.40
Feet lagging per foot of timber	6.19	9.42
Cost per ton for timber,lagging and poles	.036	.037
Equivalent of stull timber to board measure	137,922	185,363
Feet board measure per ton of ore	.668	.628
Total product	206,674	295,088

Total cost of timber and lagging - 1914	7,411.85
Total cost of timber and lagging - 1913	11,005.86
Total cost of timber and lagging - 1912	3,726.32
Total cost of timber and lagging - 1911	None
Total cost of timber and lagging - 1910	5,770.97
Total cost of timber and lagging - 1909	6,324.50
Total cost of timber and lagging - 1908	4,373.23

MAAS MINE.

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE.

KIND.	QUANTITY	AVERAGE PRICES	AMOUNT 1914	AMOUNT 1913
40% Powder	12,250	.0934	1,143.18	5,278.50
50% "	85,550	.104	8,904.75	8,390.00
Total Powder	97,800	.102	10,047.93	13,668.50
Fuse	247,400	3.82	946.32	1,358.18
Caps	50,500	6.38	322.14	432.45
Cap Crimpers	36	25	9.00	19.85
Tamping Bags	1735	1.35	2.41	3.36
Connecting Wire				6.96
Total Fuse,Etc.			1,279.87	1,820.80
Grand total			11,327.80	15,489.30
Product			206,674	295,088
Pounds Powder per ton ore			.473	.483
Cost per ton for powder			.047	.046
Cost per ton for fuse,caps,etc.			.006	.006
Cost per ton for all explosives			.053	.052
Avg.price per lb. for powder			.102	.0958

ATHENS MINE.

E. & A. NO. 261.

CAGE HOIST - Accts. #76d-e-f.

The work on the cage hoist was commenced in January. A small crew continued to work on this machine and the compressor up until the 8th of June when sinking was commenced in the shaft. No serious trouble has been experienced in the operating of the hoist. It is tremendously powerful and on account of the small depth of the shaft it is not practical to operate the machine at speed. In hoisting from the bottom to the surface it is necessary to keep the brake on. This heats up the resistance and we have had some trouble due to the grids burning out.

COMPRESSORS.

Acct. #77a.

The compressor is of the same type and size as that used at the Negaunee Mine. Due to a disagreement with the Nordberg people the machine was not completed and put into operation until the 9th of June. It has been operated without serious trouble. Its capacity is two thousand feet per minute; much too large for the small amount of work which we have for it at the present time. There are times when it has to be run simply for one small pump or for the drill sharpener in the blacksmith shop.

Acct. #2f.

In the latter part of September a foundation was made in the engine house for the small electric driven compressor owned by the South Jackson. On the 1st of October it was put into commission. At all times, except when drilling is being done in the shaft, the small compressor furnishes sufficient air for our use. It will therefore mean considerable saving.

PRELIMINARY WORK.

Acct. #3e.

Early in March the six steel sets had been lined up and drilled to fit the cast iron brackets in the part of the shaft completed in the previous year.

The lower four sets were then removed and brought to the surface in order to prevent their being damaged by the blasting in the bottom of the shaft when sinking was resumed.

Accts. #9e and 79.

In the latter part of March a blacksmith and a helper commenced the work of sharpening drills and repairing and changing the forms which are used in concreting. A new Leyner drill sharpener was purchased and set up in the small temporary shop. This is a splendid machine and will certainly pay for itself in a short time.

EQUIPMENT FOR CONCRETE - Acct. #9e.

To the west of the shaft a pit 5 ft. deep was sunk and cribbed up in March. In this pit a yard mixer was set up. The hopper of the mixer is midway between the two ore pockets. From the lower part of each pocket chutes 3 ft. square extend to a point a short distance above the hopper. When the pockets are filled with gravel it can be drawn off directly into the hopper and measured. The cement house is located very close to the mixer, being only a few feet to the west of it. The north side of this house is only a short distance from the railroad track. Cement is brought in on cars and unloaded on a truck which can be trammed through the entire length of the cement house. This makes the cost for unloading very small. Below the mixer the concrete dumps into a hopper. From this hopper a 6 in. pipe has been run through the walls of the shaft and extends down to the bottom of the completed part. The concrete is dumped directly into this 6 in. pipe. It flows down this pipe and drops into a kibble which is hung from a steel set in the shaft. The kibble is supported by a 2 in.piece of round iron firmly attached to the center of the bottom. This single rod extends about a foot below the bottom of the kibble and is securely braced to the sides of the same. The chute from the kibble consists of an 8 in. pipe about 8 ft. long. Over this pipe there is a piece of 10 in. spiral pipe 10 ft. in length. The kibble being supported from a central point, it is possible to swing the extension spout around the radius of the greater part of the shaft. In this way it is practical to distribute

the concrete evenly. During a larger part of the work the spout was not revolved at all. It was found that the concrete had a tendency to build up directly below the spout. Although no serious disadvantage was noticed from this, it was thought to be more advisable to distribute it evenly around the circumference. The concrete flows down the pipe with considerable velocity and, in order to prevent it from splashing out of the kibble, the top has been covered by a piece of sheet iron. The entire equipment has worked most satisfactorily and as long as the gravel in the pockets last it is possible to pour concrete at an average rate of a yard in two minutes. We have completed a 40 ft. section in five hours. It is impossible to store a sufficient amount of gravel in the ore pockets for a large section of concrete. It is not practical with the equipment which we have to hoist it as fast from the pit as it can be used by the mixer. In November the size of one of the ore pockets has been increased by making it 4 ft. higher. This will enable us to store sufficient gravel in the two pockets for a 40 ft. section. In October a frame building was constructed over the mixer. In the pockets and chutes steam pipes were laid. We have had a chance to test the practicability of these steam pipes in the pockets and find that they have sufficient radiation to keep the gravel in a thawed condition.

GRAVEL PIT - Accts. #3c and 4c.

In the previous year, while sinking the shaft, a bed of gravel about 18 ft. in thickness was passed through. Test pitting was done and it was found that this gravel extended to the south and was quite irregular in structure and also in thickness. It was thought that upon opening up there would be sufficient gravel to last us for a considerable length of time. The gravel pit did not come up to expectations. The structure of the material was too fine and in addition was not uniform. In the following year it is planned to obtain gravel from the large bank near the coal dock at the Cliffs Shaft Mine.

The gravel is elevated from the pit to the ore pockets by a single rope tramway of special design. From a point above the top landing a 1 1/4 in. cable was supported from a high post, stretched to the south for a distance of

300 ft., and anchored. On the landing floor a puffer was set up. The carrier is of the same type as that used at the Republic Mine and it is operated by a single rope. When the bucket is elevated the carrier stays in a fixed position on the rope until it is released by the bucket. It then travels up the rope to a point over the pockets, where the bucket is dumped. Upon lowering the carrier runs down until it strikes a block attached to the cable when the bucket is released and is lowered to the pit. On the start we used automatic dumping buckets of a quarter yard capacity. It was soon found that these were too slow and half a yard buckets were made and put in use.

CAGE - Acct. #76g.

In sinking a cage of special design is used. The reasons for using a cage instead of a bucket are: (1). It can be operated with much greater safety to the men in the bottom of the shaft than the ordinary bucket. (2) It makes it possible to handle the material more rapidly. (3) A much larger amount of rock can be brought up at each trip. Cages have been used in sinking for a number of years. The common type has been one with exceedingly long shoes. This cage has been designed on radically new lines and has worked out with great satisfaction. At a point opposite the end of the runners special chairs are placed in the shaft. Directly above the cage there is a movable crosshead. When the cage is lowered and reaches the end of the runners this crosshead is held there by the chairs, the cage continuing to the bottom of the shaft. In order to prevent it from swinging there are two extra ropes parallel to the main hoisting rope suspended from a second crosshead which is firmly attached to the hoisting rope at a point 60 ft. above the top of the cage. These extra ropes pass through small holes in the movable crosshead. In hoisting, these two extra ropes, which are kept in tension by springs on top of the cage, guide the cage into the runners. The cage actually strikes the lower crosshead before it reaches the points of the runners. The instant that it strikes the crosshead it is in perfect alignment with the runners and it is impossible for it to get out of the guides. It is found that even in sinking to a point 60 ft. below the bottom of the runners that there is not

the slightest trouble experienced in bringing the cage into the guides. Several other methods were thought of for obtaining this end, but the use of the two extra ropes was suggested by Mr. Eaton. It is perfectly practical, cheap and more flexible than the other methods. The cage is so constructed that it is open on all sides with the exception of a short distance which is taken up by the shoes. A very low car of peculiar construction is used on the cage. It has been found that dirt can be loaded rapidly by this method and at the same time with a small amount of exertion on the part of the men for the car is not as high as an ordinary ton bucket. It has also been demonstrated that it is practical for men to take hold of the cage and shift it to any part of the shaft where they want it. The car is held firmly in position on the cage by two sets of dogs. One of these clamps the wheels while on each end of the car there is a bar which is let down. In hoisting to the surface the cage rests on chairs and the loaded car is pushed off by being bumped by an empty car. As soon as this empty car is on the cage the dogs are thrown down and the cage is lowered. This complete operation can be performed in a few seconds. It takes a much longer time to dump a bucket and in addition there is the continual danger of pieces of rock falling down the shaft and injurying the men. The loaded car is run out to a tipple, turned over, and dumped into a large saddle-back car. In order to avoid the possibility of either the empty or the loaded car being pushed into the shaft special safety devices are provided which block the track. These consist of pieces of hardwood which are kept up against the rails by springs and work automatically. The loaded car, for example, cannot be pushed towards the shaft unless the block of wood is held away from the line of track. These are simple safety devices but have been proven practical. The cage is provided with safety catches and a bonnet and is constructed in the same general way as all cages which are used in the handling of men. In order to avoid the possibility of material being knocked down the shaft, or of people sticking their heads into the compartment, it has been provided with safety doors which entirely enclose it except when the cage is spotted at the collar. When the cage comes to the collar these doors are automatically raised and when

it is lowered they are automatically closed.

ROCK DUMP - Accts. #9a and 9d.

Two cars are used for the removal of the rock from the shaft. On the north side an empty is always in position before the cage is placed on the chairs. This empty pushes off the load and the cage is not held up while the full car is being dumped. After the full car has been run into the tipple it is switched around the shaft and placed into position to be lowered into the mine. The rock is dumped into a large saddleback car of four tons capacity. This car is pulled up on a trestle of thirty per cent grade. It is the intention to continue to extend the pile on this grade to handle all of the rock of the shaft. When a point is reached where the legs will be over 40 ft. the extension can be made by placing the legs on the inclined face of the rock. As the height increases the capacity of course increases very rapidly. It was not practical to build up the collar of the shaft to a greater height than 12 ft. For this reason it was necessary to elevate the rock, as a pile of small height would increase in length very rapidly. No delay has been experienced in the handling of rock.

SINKING IN ROCK - Acct. #4a.

From June 13th to 19th a single shift of five men was worked. From the 19th to the 22d two shifts were employed. From the 22d up to the end of the year the men have worked on three eight-hour shifts. For the larger part of the time these shifts have consisted of five men and a boss. Two shift bosses look after the afternoon and night shifts, while on the day shift the work is supervised by the captain. In the previous year we tested out a heavy self-rotating Cleveland Sinker weighing about ninety pounds. In very hard Chert or Siderite this machine was found to drill rapidly and to be able to put down holes where we failed with the smaller type of hand sinker known as the Jack-hammer. The machine which we had in the previous year was in use for several months and stood up remarkably well. Six of these were ordered. A short time after commencing work they started to give trouble. It was found that the