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7. UNDERGROUND (Cont.)

narrow easterly portion of #33 deposit on subs from the -30' to the -80'. No. 8 contract in December completed one slice west of the mining raise at a point approximately 100' west of the fee land boundary line, and No. 3 contract completed three slices under the jasper capping southeast of their raise on the -80' sub. No. 2 contract continued mining on the -80' and -90' subs in the central portion of #33 deposit above the 8th Level, and in June they were joined by No. 11 contract who completed the first of the 9th Level raises in this territory and then started top slicing operations west of this new raise on the -110' sub.

Nos. 10 and 12 contracts early in the year continued top slicing operations under a well established timber mat in the southwest portion of #33 deposit on the -180' sub. No. 10 contract completed mining on the -180' sub in September and then transferred to development raising and drifting in advance of sub level stoping operations above the new transfer drift on the -240' sub farther east in this same deposit. No. 12 contract finished slicing at the -180' elevation in June, and by the end of the year had mined approximately two thirds of the same area on the -190' sub.

TILDEN MINE
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1. GENERAL

The Tilden Mine operated from April 23rd to June 1st on a single shift five and two-thirds days per week and six days per week from June 1st to November 1st. From January 1st to April 23rd and from November 1st to December 31st the pit was idle except for a small crew overhauling and repairing equipment and loading two small cargoes of silica from stockpile. In December there was no work being done, the men all being laid off on November 30th, with the exception of the foreman, who acted as day watchman, the regular watchman, and the clerk. A small crew will be called back to make the necessary repairs to the crushing plant and equipment, early enough in the spring to have the work completed before shipments are required. The men having considerable years of service with the Company were placed temporarily at other properties.

The total tonnage loaded from the various pits during 1945 amounted to 197,476 tons, a decrease of approximately 21,000 tons as compared with 1944. 15,208 tons were loaded from stockpile in November, making a total shipment of 206,656 tons, of which 40,639 tons were of Tilden low phosphorus grade. There were 6,000 tons of Tilden Silica placed on stockpile in September. This is not sufficient tonnage to produce a low cost, as the entire crew has to be maintained the entire season, and in the near future there will not be enough extra work to occupy their time. If less days per week are worked than at other properties in the vicinity, the men can not be held, and it is also impractical to move them from one Company property to another temporarily. To put the pit on an efficient basis, a production of 200,000 tons on a five-day-per-week or 300,000 tons on a six-day-per-week schedule is required.

Loading was carried out in all of the pits, except the East half of the West Pit, during 1945 and at the end of the year there remained approximately 150,000 tons of broken ore, an increase of 25,000 tons over last year. The second, or upper, bench of the East Pit has now been expanded to the extent that all of the broken ore remaining on the lower bench can be safely removed without disturbing the floor of the upper bench. Almost the entire amount of low phos. ore removed from the Summit Pit was stocked in the East Pit and reloaded for the crusher during times when the mine was not operating. All of the ore was transported by the 15-ton Euclid trucks over roads that were very much improved during the year.

Four blasts were put off during 1945, one each in the Summit and upper bench of the East Pit and other two in the lower bench of the West Pit. With the exception of six holes in the West Pit, all of the drilling has been completed so that blasting can be done in all of the pits as early as necessary. The primary blasting was very satisfactory, but on account of slips in the ground, a considerable amount broke in large chunks and secondary blasting was required.

Stripping and washing was completed to the North and East of the East Pit and this finishes work of this nature in the East and West Pits for several years to come. The work was done during the time the pit was idle and therefore no extra men had to be hired. The face in the Summit Pit is now 100' in height which constitutes a hazard, in that large chunks may become loose and fall, either injuring the men or damaging equipment. This height will continue for approximately 100' before the ledge starts to dip to the North. It would appear

1. GENERAL (Cont.)

advisable to prepare and have authorized an E & A covering a new road into the pit at approximately 50' above the floor and also covering additional stripping to the North to uncover sufficient ore to meet the low phos. demands if they continue as large as in 1945. There only remains 180,000 tons developed to the edge of the present stripping which should be at least 100' from the edge of the pit to avoid contamination when washing. If it is decided to have two benches, then there would only be 90,000 tons available until the upper bench was fully developed.

Considerable work was accomplished during the year when the pit was idle relative to improving the roads and approaches into the East and Summit Pits, remodeling the crusher building so as to obtain easier access for the trucks to the crusher and also permit moving a shovel along the main road in front of the plant from one pit to the other. A new oil house was constructed at a safer distance from the shops and warehouse and office building.

2 PRODUCTION, SHIPMENTS & INVENTORIES

a. Production by Grades

	1945	1944	Increase	Decrease
Tilden Silica	156,837	190,476		33,639
Tilden Low Phos.	40,639	24,348	16,291	
Total	197,476	214,824		17,348

b. Shipments

	Pocket	Stockpile	Total	Total Last Year
Tilden Silica	150,815	15,202	166,017	176,398
Tilden Low Phos.	40,639		40,639	24,348
Total	191,454	15,202	206,656	200,746
Total Last Year	176,491	24,255	200,746	
Increase	14,963		5,910	
Decrease		9,053		

c. Stockpile Inventories

Grade	Balance on Hand Dec. 31, 1944	Stocked 1945	Shipped From Stockpile 1945	Balance on Hand Dec. 31, 1945
Tilden Silica	33,930	6,022	15,202	24,750
Tilden Low Phos.	13,815			13,815
Total	47,745	6,022	15,202	38,565

e. Product by Months

Month	Days Operated	Average Tonnage Per 8-Hr. Shift	Total Tons
April	5 - 8-hr. Shifts	1,449	7,286
May	15 - 8-hr. Shifts	1,876	28,134
June	17 - 8-hr. Shifts	2,239	38,071
July	18 - 8-hr. Shifts	2,255	40,593
August	9 - 8-hr. Shifts	1,819	16,378
September	14 - 8-hr. Shifts	1,900	26,391
October	18 - 8-hr. Shifts	2,114	38,089
November	1 - 8-hr. Shift	2,534	2,534
Total	97 - 8-hr. Shifts	2,036	197,476

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e. Product by Months (Cont.)

Low Phos. cargoes averaged 1,650 tons per shift; however, with an increase of 16,000 tons of this grade, the total average tons per shift continued to show an increase in 1945. 1,680 tons in 1942, 1,718 tons in 1943, and 1,885 tons in 1944.

Distribution of Product by Pits

	1945	1944	Increase	Decrease
West Pit (Upper Bench)	2,775	66,244		63,469
West Pit (Lower Bench)	101,389	73,439	27,950	
East Pit	66,827	52,244	14,583	
Summit Pit	26,485	22,897	3,588	
Total	197,476	214,824		17,348

f. Ore Statement

	Tilden Silica	Tilden Low Phos.	Total	Total Last Year
On Hand January 1, 1945	33,930	13,815	47,745	33,667
Output for Year	156,837	40,639	197,476	214,824
Total	190,767	54,454	245,221	248,491
Shipments	166,017	40,639	206,656	200,476
Balance on Hand December 31, 1945	24,750	13,815	38,565	47,745
Tons Stocked, 1945	6,022			

Comparison of Working Schedules, 1943 to 1945

1945 - Pit idle January 1st to April 23rd. Small crew drilling and repairing. Operating April 23rd to June 1st, 1 8-hour shift 5 2/3 days per week. June 1st to November 1st, 1 8-hour shift six days per week. (Pit idle week of August 13th for vacation.) Total operating shifts - 97. Idle November 1st to December 1st. Small crew repairing and overhauling equipment. December 1st to December 31st entire crew laid off except for watchman, foreman, and clerk.

1944 - Pit idle January 1st to May 1st, small crew drilling, repairing, stripping etc. Operating May 1st to November 1st, 1 8-hour shift five days per week. Total operating shifts - 114. Idle November 1st to December 31st; small crew working same as first of year.

1943 - 45½ - 1-8-hour shifts, 18 - 2-8-hour shifts. Total Operating - 81½ shifts.

g. Delays

Year	Hours Delay	Total Shifts Operated	Time Lost Per Shift Worked
1945	8	97	.158 hrs.
1944	17 ¼	114	.190 hrs.
1943	23 3/4	81 ½	.291 hrs.
1942	41 ½	140	.296 hrs.

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3. ANALYSIS

a. Average Mine Analysis on Output

Grade	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss by Ignition
Tilden Silica	38.93	.045	42.45	.07	1.23	.28	.25	.014	.36
Tilden Low Phos.	36.08	.014	47.12	.06	.85	.16	.14	.008	.19

b. Average Analysis on Straight Cargoes

	Mine			Lake Erie	
	Iron	Phos.	Sil.	Iron	Moist.
Tilden Silica	38.97	.042	42.26	39.79	2.34
Tilden Low Phos.	36.16	.015	46.92	37.19	1.69

c. Analysis of Ore in Stock

	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
Tilden Silica	39.45	.040	41.50	.09	.88	.27	.27	.010	.36	1.55
Tilden Low Phos.	38.00	.018	44.25	.09	.46	.18	.10	.009	.20	1.26

4. ESTIMATE OF ORE RESERVES

a. Developed Ore

1. West Pit - Above Floor at 1430'

Assumption: 13 cu. ft. equal one ton.

Total Stripped & Developed as of Jan. 1, 1945	1,812,344 Tons
*Developed by Stripping in 1945	
Mined During 1945	104,164 "
Total Remaining Jan. 1, 1946	1,708,180 Tons

*Balance not stripped under E & A CC 117 - 500,000 tons.

2. East Pit - Above 1440'

Assumption: 14 cu. ft. equal one ton.

Total Stripped & Developed above Floor 1500' as of January 1st, 1945	1,491,291 Tons
Developed by Stripping in 1945 above 1500'	499,500 "
Total Developed above 1500'	1,990,791 "
Mined During 1945	66,827 Tons
Total Remaining above 1500' Jan. 1, 1946	1,923,964 "
Total Estimated 1440' to 1500'	1,028,570 "
Total Developed by Stripping 1945, 1440' to 1500'	249,750 "
Total Developed above 1440' as of Jan. 1, 1946	3,202,284 Tons

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4. ESTIMATE OF ORE RESERVES (CONT.)

3. Summit Pit

Assumption: 14 cu. ft. equal one ton.

Total Stripped & Developed above Floor as of January 1st, 1945	205,103 Tons
Developed by Stripping in 1945	
Mined During 1945	26,485 "
Total Remaining January 1st, 1946	178,618 Tons

Total Developed Ore as of January 1, 1946:

West Pit	1,708,180 Tons
East Pit	3,202,284 "
Summit Pit	178,618 "
Total All Pits	5,089,082 Tons

Broken Ore in Pits included under Developed Ore

	East Pit	Summit Pit	West Pit Lower Bench	Total
January 1, 1946	103,301 Tons	32,280 Tons*	18,797 Tons	154,378 Tons

*7,034 tons stocked in East Pit.

Total Prospective Ore

West Pit
Balance remaining in E & A CC 117 — 500,000 Tons

East Pit
North and East of Present Pit above 1500' as of January 1st, 1945 — 3,000,000 Tons
Taken into Developed ore in 1945 — 499,500 "
Balance January 1st, 1946 — 2,500,500 Tons

Total Prospective Ore January 1st, 1946 — 3,000,500 Tons

c. Estimated Analysis of Reserves

	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Ign.	Moist.
1. West Pit										
Dried	39.17	.034	41.91	.09	.90	.20	.22	.009	.24	
Natural	38.50	.033	41.20	.09	.88	.20	.22	.009	.24	1.70
2. East Pit										
Dried	37.00	.020	45.00	.09	.54	.20	.17	.009	.34	
Natural	36.50	.020	44.40	.09	.53	.20	.17	.009	.34	1.34
3. Summit Pit										
Dried	36.00	.015	46.00	.09	.54	.20	.17	.009	.34	
Nautral	34.50	.015	45.40	.09	.54	.20	.17	.009	.34	

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4. ESTIMATE OF ORE RESERVES (Cont.)

f. Estimate of Production

The capacity of the pit under the present arrangement for a six-months season is 224,000 tons on a five-day-per-week single-shift schedule and 282,000 tons on a six-day-per-week single-shift schedule. In either schedule it is possible to produce approximately 50,000 tons of low phosphorus ore. If more than this amount were required, it might be necessary to also produce more of the silica grade to take care of the ore of higher phosphorus content obtained when loading. The ore from the Summit Pit will generally average .015 in phosphorus, but the iron content is too low, and therefore it is necessary to mix it with about 50% of East Pit ore, which runs from .012 to .020 in phosphorus and a considerable amount has to be discarded after it is in railroad cars; therefore it has to be disposed of in the near future to avoid tying up equipment.

It is always possible to increase production by putting on another shift, but in that case the total requirements should be nearly doubled, as these extra men would have to be hired for the entire season, and there is hardly enough work for the present crew if the pit is idle very long.

5. LABOR AND WAGES

a. Comments

Only five out of the 32 men comprising the Tilden Mine crew were men hired this year, and there was very little absenteeism during the shipping season. It was decided to close the pit during the winter, as there was very little repairing to equipment necessary except on the crushing plant, and drilling and stripping were also completed. Therefore early in November all of the new men and also those hired since 1943 were laid off, while the remainder completed loading two cargoes from the stockpile and also cleaned up the crushing plant and other equipment. On November 30th these men also were laid off, leaving only the watchmen, the foreman, who will act as day watchman, and the clerk at the property until some time in March when some will be called back to start repairs to the crusher. These latter men were all placed temporarily at other company properties.

The pit was idle for the week of August 13th, when the men took their vacation. Those eligible for two weeks' vacation had their pay for the other week in lieu of vacation.

21 Men, or 68% of the total, received pay for 96 hours.
4 Men, or 13% of the total, received pay for 48 hours.

There are seven men of the Tilden crew who have worked over 20 years for the company.

On November 28th a strike vote was held by the War Labor Board at the request of the C.I.O. Union, and the vote was as follows:

Affirmative	Negative	Did not Vote
17	6	6

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5. LABOR AND WAGES (Cont.)

b. Comparative Statement of Wages and Product

	1945	1944	Incr.	Decr.
Product	197,476	214,824		17,348
Number of Days Operated	97	115		18
Average Number of Men Working	29	31		2
Average Daily Wage	8.24	7.40	.84	
Tons Per Man Per Day	47.84	46.70	1.14	
Labor Cost Per Ton	.173	.153	.015	
Total Number of Days	4,131	4,599 3/4		468 3/4
Amount Paid for Labor	34,042.66	34,043.04		.38

c. Nationality of Employees

	American Born	Foreign Born	Total
English	11	4	15
Swedish	3		3
Norwegian	2		2
Finnish	5	5	10
Irish	4		4
French Canadian	1		1
	26	9	35

7. OPEN PIT OPERATIONS

a. Stripping

In May work was started on stripping to the North and East of the East Pit where the edge of the stripping was so close to the pit that the ore was contaminated by some of the gravel being washed into the pit when cleaning the ledge. An authorization had been obtained late in 1944 to use the balance of the money left in E & A CC 117, intended for the West Pit, on this project, as it was felt that work in the East Pit was more necessary at this time than in the West Pit. This work also formed an outlet for employment of themen when the pit was not operating, which was fortunate as there were only two months when the pit operated at full capacity. The stripping was completed in September, and the washing of the pockets of gravel, that could not be moved otherwise, in October. #46 Shovel, together with the R.D. Tractor, moved all the material, which was loaded into and transported by trucks to waste places West and South of the pit.

E & A CC 117 - Tilden Mine Stripping West & East Pits

Detail	Amount	Amount Expended 1945	Expended To Date	Unexpended
192,000 yds. @ 12¢ per yd.	23,040.00	3,229.56	18,079.90	4,960.10
10% for Contingencies	2,304.00			2,304.00
Total	25,344.00	3,229.56	18,079.90	7,264.10

Yards Removed in West Pit to January 1, 1945 - 95,785 Cost per Yard - .155
Yards Removed in East Pit in 1945 18,524* Cost per Yard - .174

*10,524 cu. yds. Stripped - 8,000 cu. yds. Washed

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7. OPEN PIT OPERATIONS

a. Stripping (Cont.)

This should complete the stripping in the East Pit for several years, unless there is a greatly increased production.

The high cost for stripping was partly due to major repairs to the main pump which furnishes water for washing and also to installing a pipe line in the East Pit for the same purpose. Several quite deep pockets of gravel were found that could not be stripped, and these required considerable time to clean out.

f. Drilling, Blasting & Explosives

1. Drilling

The churn drilling was much more extensive during 1945 than it has been for the past two years. There were two drills operating almost continuously, as it was necessary to have a complete line of holes ready to blast in all of the pits by May 1st when the pit started to ship. All of these holes, with the exception of those in the East half of the West Pit were blasted, and then drilling was resumed in the lower bench of the West Pit. Another blast was set off here in July, and at the end of the year all but six holes had been completed to prepare for a blast next spring. Ten holes were drilled in the Summit Pit in September and October to provide sufficient low phosphorus ore for 1946. The upper bench in the East Pit has also been completely drilled and is in readiness to blast early in 1946.

Most of the drilling this year was done on more even ground, with consequently less delay in moving, and the footage obtained per shift showed a decided increase over past years. The best results were obtained on the lower bench of the West Pit, while the poorest were in January in the East half of the West Pit, and also results were below average in the first row of holes drilled during the winter in the Summit Pit.

Cost of Operating 9-Inch Churn Drills in 1945

Total Footage Drilled 8,293
Average Footage per Hole 66'

Operating	Labor	Supplies	Total	Cost Per Foot
Drilling	$7,812.74	$ 129.32	$7,942.06	.958
Sharpening Bits	2,157.88	1,069.97	3,227.85	.390
Pipe and Fittings	122.53	864.40	986.93	.112
New Bits		704.68	704.68	.084
New Tools		547.34	547.34	.066
New Rope		114.82	114.82	.013
Electric Power		761.47	761.47	.091
Truck and Tractor	1,621.20	764.25	2,385.45	.287
Total Operating	$11,714.35	$4,956.25	$16,670.60	2.010

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7. OPEN PIT OPERATIONS

f. Drilling, Blasting & Explosives

Cost of Operating 9-Inch Churn Drills in 1945 (Cont.)

Maintenance	Labor	Supplies	Total	Cost Per Foot
Drills	$ 417.09	$2,691.55	$3,108.64	.374
Bit Dresser	24.27	399.89	424.16	.052
Total Maintenance	$ 441.36	$3,091.44	$3,532.80	.426
Roads for Drills	255.76		255.76	.030
Grand Total	$12,411.47	$8,047.69	$20,459.16	2.466

Comparison of Footages and Costs

	1945			1944		
	Footage Drilled	Footage Per 8-hr. Shift	Cost Per Foot	Footage Drilled	Footage Per 8-hr. Shift	Cost Per Foot
West Pit, East End	553	16.00	2.833	62	15.50	2.896
West Pit, Lower Bench	2,887	20.92	2.196	2,022	20.19	2.038
East Pit, Upper Bench	2,991	18.24	2.588	384	10.97	4.958
Summit Pit	1,862	18.43	2.616	236	12.42	6.567
Total	8,293	19.00	2,466	2,704	17.00	2.854

As will be seen from the above tables, a considerable saving was effected in the cost per foote for drilling during 1945. The operating cost showed a decrease of .75 per ton as compared with 1944, and this was due partly to a more continuous operation, partly to an increase in average depth per hole of 11', and also to more level ground on whcih to make their set-up. Maintenance, on the other hand, showed an increase, as it was necessary to install a new bull reel, complete jack shaft, and repair the motor on #7 Drill at a cost of approximately $2,200.00. The repairs in the bit-dressing shop were also unusually high, amounting to about $300.00

Footage Obtained from Bits

	1945		1944	
	Bits Used	Footage Per Bit	Bits Used	Footage Per Bit
West Pit, East End	82	6.74	5	12.40
West Pit, Lower Bench	249	11.60	169	11.96
East Pit, Upper Bench	278	10.75	27	14.22
Summit Pit	274	6.77	19	12.42
Total	883	9.39	220	12.27

The footage obtained from the bits showed a decrease when compared with 1944, but an increase over preceding years. The high footage obtained last year was due to drilling in material that was more uniform and having fewer cracks.

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7. OPEN PIT OPERATIONS

2. Blasting

Four primary blasts were set off during 1945, one each in the Summit and upper bench of the East Pit and two in the lower bench of the West Pit, with very satisfactory results. The cost per ton for both primary and secondary blasting showed a decrease as compared with the cost in 1944. The proportion of the cheaper amonium nitrate powder was increased from 25% to 40%, and the practice of column loading this "Hercomite" together with "E. P. #85" was continued. The fragmentation was such that loading was greatly facilitated, and although there was some secondary blasting necessary, this does not cause any delay. With the use of trucks, the shovels can easily move away from any area where there are too many large chunks and these can be broken up later on days when the pit is idle. Formerly with rail haulage, loading had to be stopped until this secondary blasting was completed, or else a considerable length of the track had to be shifted.

Primary Blasting

Location	Date	No. of Holes	Footage Blasted	Estimated Tonnage	Pounds Explosive	Estimated Tons Ore Per Pound Explosive
West Pit Lower Bench	4/11/45	24	1,402	58,800	24,200	2.43
Summit Pit	5/ 9/45	12	1,042	50,430	14,950	3.42
East Pit Upper Bench	6/25/45	24	1,227	54,190	19,400	2.79
West Pit Lower Bench	7/27/45	25	1,462	62,900	25,550	2.46
Total		85	5,133	226,320	84,100	2.69

STATEMENT OF EXPLOSIVES USED FOR YEAR 1945

Primary Blasting

Kind		Quantity	Price	Amount
Hercomite 7½ x 24	lb.	34,350	10.50	3,606.75
E. P. #85 7½ x 24	"	49,750	11.00	5,472.50
Total Powder		84,100	10.795	9,079.25
Blasting Supplies				
Primacord Bickford Fuse, regular	ft.	3,000	32.00 M	96.00
Primacord Bickford Fuse, Wire Bound	"	6,000	40.50 "	243.00
Total Blasting Supplies		9,000		339.00
Total All Explosives				9,418.25

		1945	1944
Total Ore Blasted	(Est.)	226,320	157,600 (Act.)
Tons of Ore per lb. of Powder		2.69	2.70
Cost per Ton for Powder		.0401	.0403
Cost per Ton for Blasting Supplies		.0015	.0020
Cost per Ton for All Explosives		.0416	.0423
Average Price per lb. for Powder		.10795	.1087

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7. OPEN PIT OPERATIONS

2. Blasting (Cont.)

Secondary Blasting Kind		Quantity	Price	Amount
60% Gelatin	lb.	7,500	11.50	862.50
Blasting Supplies				
Connecting Wire	"	6	.55	3.30
Clover Fuse	"	21,900	5.15	112.95
#6 Blasting Caps		3,000	12.23	36.70
#7 Hot Wire Lighters		900		7.15
Total Blasting Supplies				160.10
Total Secondary Explosives				1,022.60

	1945	1944
Product	197,476	214,824
Pounds of Powder per Ton of Ore	.0379	.0605
Cost per Ton for Powder	.0043	.0067
Cost per Ton for Fuse, Caps, etc.	.0009	.0007
Cost per Ton for All Explosives	.0052	.0074
Average Price per Lb. for Powder	.1150	.1113
Total All Explosives Used at Pit	$10,440.85	$8,284.81

Comparison of Blasting Costs

	Primary Blasting Cost per Ton Blasted	Secondary Blasting Cost Per Ton Produced
1945	.0416	.0052
1944	.0423	.0074
1943	.0468	.0016
1942	.0493	.0035
1941	.0510	.0030

g. Loading Operations

Loading, which started April 23rd, was confined mostly to the lower bench of the West Pit and both benches of the East Pit, with a very small amount from the East half of the West Pit when the shovel in the lower bench was out of order. There was also approximately 26,000 tons of low phosphorus ore removed from the Summit Pit, being loaded and then stocked in the East Pit on shifts when the pit was idle to make it more accessible when being crushed for shipment. While the road into the Summit Pit is in very good shape, the haul is too far for an economical operation.

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7. OPEN PIT OPERATIONS

g. Loading Operations (Cont.)

Transportation of ore was entirely by truck and this resulted in an increase of 150 tons per shift over last year when the pit was only partly motorized, and over 300 tons per shift when compared to years in which only the locomotives and cars were used. While the main approach to the West Pit and to the West end of the upper bench of the East Pit are macadamed, the other roads were also in very good shape, having been heavily graveled in the spring. They were kept raked and sprinkled whenever they were being used, and not only was the dust kept at a minimum but the tires showed very few stone bruises at the end of the season.

Since blasting in the upper bench of the East Pit in June, sufficient width has now been obtained so that all the loose ore lying on the lower bench can be removed and at any time in the future it will also be possible to make alternate blasts in the lower and upper bench, thus enabling one-half of the ore to be transported to the crusher on a level and shorter haul.

The floor of the bench of the Summit Pit has been increased by successive blasts so that very little ore is now lost temporarily by shooting over the South edge onto the hillside below; however, the height of the bench is now approximately 100' and affords a considerable hazard. It is necessary to lower men over the edge and have them bar out loose material that might otherwise fall and injure either men or equipment. This height will continue for four more blasts before the ledge starts to dip to the north, and it would seem advisable to divide this pit into two benches, which would not only be safer but would be more economical in loading. A project of this sort would also afford work for the crew on days when the pit is not operating.

Drilling has been carried out in the lower bench of the West Pit so as to make available for loading ore a considerable length of bench along the North side of the pit instead of having only one face along the West end, as was the case previous to this year. This also decreases the length of haul to the crusher for approximately 50% of the ore.

The localities and tonnages loaded by the various power shovels during the season are noted below:

Unit	Tons	Locality
No. 29 Shovel	3,170	Loading ore East End, West Pit
No. 31 Shovel	55,850	Loading ore Lower Bench East Pit Reloading Summit Pit low phos. ore
No. 46 Shovel	23,309 45,124	Loading ore Summit Pit Loading ore Upper Bench East Pit Stripping in East Pit
No. 52 Shovel	108,534	Loading ore Lower Bench West Pit Loading ore from Stockpile

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8. COST OF OPERATING

a. Comparative Mining Cost

	1945	1944
Production	197,476	214,824
Operating Cost	.337	.330
General Mine Expense	.063	.046
Idle & Winter Expense	.175	.162
Stocking Ore	.010	.014
Cost of Production	.585	.552
Depreciation - Plant & Equipment	.070	.070
Depreciation - Motorized Equipment	.080	.080
Depletion - Original Cost	.003	.002
Amortization of Development	.003	.003
Amortization of Stripping	.020	.020
Taxes	.041	.039
Loading from Stockpile	.001	.003
Total Cost at Mine	.803	.769
Average Daily Product	2,036	1,867
Tons Per Man Per Day	47.84	46.70
Number of Days Operated (1-8-hr. Shift)	97	115

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8. COST OF OPERATING

b. Detailed Cost Comparison

4. Open Pit Costs

PIT OPERATING	1945		1944	
Direct Ore	Amount	Per Ton	Amount	Per Ton
1. Drilling & Blasting	24,139.54	.122	25,689.13	.120
2. Power Shovels, Operating	6,679.34	.034	6,608.70	.030
3. Power Shovels, Maintenance	2,801.01	.014	2,114.82	.010
4. Locomotives & Cars, Operating			3,364.87	.016
5. Locomotives & Cars, Maintenance			477.35	.002
6. Track Expense			1,120.79	.005
6A. RD Tractor, Operating	907.33	.005	669.11	.003
6B. RD Tractor, Maintenance	283.15	.001	196.15	.001
7. Euclid Trucks, Operating	4,760.39	.024	3,331.33	.016
7A. Euclid Trucks, Maintenance	2,254.60	.011	898.42	.004
TOTAL DIRECT ORE	41,825.36	.211	44,470.67	.207
General Pit Expense				
8. Water Supply	507.20	.003	10.23	.000
9. Buildings	.79	.000		
10. Crushing &Screening	12,763.61	.065	14,717.16	.069
11. General Open Pit Expense	9,855.98	.050	10,130.59	.047
13. Open Pit Superintendence	1,609.16	.008	1,474.52	.007
14. Waste Pile Expense	.79	.000	24.06	.000
TOTAL GENERAL PIT EXPENSE	24,737.53	.126	26,356.56	.123
TOTAL PIT OPERATION	66,562.89	.337	70,827.23	.330
Stocking Tilden Crushed Ore	1,907.70	.010	2,906.04	.014
GRAND TOTAL	68,470.59	.347	73,733.27	.344
General Mine Expense				
16. Mining Engineering	1,243.25	.006	631.41	.003
16A. Geological	145.75	.001	688.35	.003
17. Mechanical & Electrical Engineering	225.58	.001	150.79	.001
18. Analysis & Grading	2,680.19	.014	2,240.75	.010
19. Safety Department	96.77	.001	113.87	.000
20. Local & General Welfare	173.00	.001	179.00	.001
21. Special Expense	305.20	.002	303.23	.001
22. Ishpeming Office	771.00	.004	786.00	.004
23. Mine Office	2,434.69	.012	2,053.61	.009
24. Insurance	204.06	.001	183.79	.001
25. Personal Injury	673.88	.003	199.71	.001
26. Social Security Taxes	874.36	.004	820.68	.004
27. Employees' Vacation Pay	2,583.26	.013	1,686.97	.008
TOTAL GENERAL MINE EXPENSE	12,410.99	.063	10,038.16	.046
IDLE & WINTER EXPENSE	34,558.37	.175	34,879.56	.162
COST OF PRODUCTION	115,439.95	.585	118,650.99	.552
Taxes	8,184.38	.041	8,393.54	.039
TOTAL COST AT MINE	123,624.33	.626	127,044.53	.591

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8. COST OF OPERATING

b. Detailed Cost Comparison (Cont.)

Cost of Production

Operating Pit	1945 Cost Per Ton	%	1944 Cost Per Ton	%
Labor	.191	46.5	.180	46.2
Supplies	.219	53.5	.210	53.8
Total	.410	100.0	.390	100.0

The increase in labor cost per ton was due primarily to the retroactive adjustment in wages for overtime, shift differential and vacation allowance.

Days & Shifts Operating

	1945	1944
1-8-hour	97	115

Production

	1945	1944	Incr.	Decr.
Tons Produced	197,476	214,824		17,348
Tons Shipped	206,656	200,746	5,910	
Tons Stocked	6,022	38,333		32,311
Tons Shipped from Stockpile	15,202	24,255		9,053
Average Product per 8-hr. Shift	2,036	1,867	169	

Detail ofAccounts

There was an increase of .033 per ton in the cost of production in 1945 over 1944, and this was due partly to the decreased tonnage and also to the retroactive wage adjustment. The separate accounts, where there was an unusual expense or a different explanation than that above, are listed below.

Euclid Trucks

	1945	1944
Tons Hauled	235,987*	157,832
Operating:		
Labor	3,897.18	2,845.15
Supplies	784.66	486.18
Total	4,681.84	3,331.33
Cost per Ton Hauled	.0198	.021

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8. COST OF OPERATING

b. Detailed Cost Comparison (Cont.)

Detail of Accounts

Euclid Trucks (Cont.)

	1945	1944
Maintenance:		
Labor	1,036.23	581.45
Supplies	3,050.94	804.34
Total	4,087.17	1,385.79
Cost per Ton Hauled	.0173	.0088
Total Cost per Ton Hauled	.0371	.0298

*Includes Summit Pit ore stocked in East Pit and then reloaded for crusher. The maintenance charge shows a decided increase due to complete overhauling of Nos. 1 and 2 trucks, which have been in service since 1942. The total, however, still remains much lower than the cost per ton for locomotive haulage, which was about .07 per ton.

General Mine Expense

	1945	1944
Amount	12,410.99	10,038.16
Cost per Ton	.063	.046

This account showed an increase due to more engineering on account of more drilling, a higher charge from the laboratory for analysis on account of a different method of making charges, and also in the vacation pay due to change from 3 and 10 years' service to 1 and 5 years' service, making the men eligible for vacations.

Analysis & Grading

	1945		1944	
	Amount	Per Ton	Amount	Per Ton
Pit Charge	208.46	.001	180.67	.0008
Laboratory Charge	3,311.77	.017	2,345.37	.011
Total	3,520.23	.018	2,526.04	.0118
No. of Determinations	10,497		6,951	
Cost per Determination	.315		.337	

This comparison is a combined operating and idle & winter charge and shows a decided increase in the Ishpeming laboratory expense of almost $1,000.00 with a decrease in product. This was partly due to shipping more low phosphorus ore, where individual cars are sampled, and also to more churn drill samples.

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8. COST OF OPERATING

b. Detailed Cost Comparison (Cont.)

4. Open Pit Costs

Idle and Winter Expense

	Labor	Supplies	Total
January	4,195.96	3,816.42	8,012.38
February	3,278.91	1,709.45	4,988.36
March	4,117.85	4,066.66	8,184.51
April	3,667.96	3,256.04	6,924.00
November	2,946.83	1,534.34	4,481.17
December	1,499.36	468.59	1,967.95
Total	19,706.87	14,851.50	34,558.37

	1945		1944	
	Amount	%	Amount	%
Labor	19,706.87	57.0	16,683.67	47.8
Supplies	14,851.50	43.0	18,195.89	52.2
Total	34,558.37	100.0	34,879.56	100.0

Idle and Winter Expense Detail	1945	1944
Pit Operating		
Direct Ore		
Drilling & Blasting	762.27	163.18
Power Shovels, Maintenance	8,714.75	4,935.78
Locomotives & Cars, Maintenance		198.58
Track Expense		50.30
RD Tractor, Maintenance	1,231.39	1,667.70
Euclid Trucks, Maintenance	1,876.94	487.37
Total Direct Ore	12,585.35	7,502.91
General Pit Expense		
Water Supply	97.72	
Buildings		13.25
Crushing & Screening	7,102.17	13,671.65
General Open Pit Expense	6,526.79	7,657.57
Open Pit Superintendence	1,594.99	1,468.18
Waste Pile Expense	38.46	
Total General Pit Expense	15,360.13	22,810.65
Total Pit Operating	27,945.48	30,313.56
General Mine Expense		
Mining Engineering	726.12	390.23
Mechanical &Electrical Engineering	100.97	64.95
Analysis & Grading	840.04	285.29
Safety Department	58.56	54.56
Special Expense	184.73	136.65
Ishpeming Office Expense	682.21	569.46
Local & General Welfare	116.88	123.28
Mine Office Expense	2,383.19	1,855.24
Insurance	443.88	149.40
Personal Injury Expense	255.05	359.45
Social Security Taxes	594.45	520.26
Geological	68.15	47.23
Total General Mine Expense	6,454.23	4,566.00
Inventory Loss	158.66	
TOTAL COST AT MINE	34,558.37	34,879.56

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8. COST OF OPERATING

b. Detailed Cost Comparison

Idle and Winter Expense, (Cont.)

While the actual amount expended under this heading was less in 1945, the cost per ton was higher due to decreased production. The pit was closed on November 30th and will remain closed until spring when a few men will be recalled to make the necessary repairs to the crusher before starting operations. Some of the individual costs showed an increase, however, for the following reasons. Extensive repairs to the generator set of #29 Shovel, purchased in 1926, accounted for most of the $3800 increase, and Nos. 1 and 2 Euclid Trucks, purchased in 1942, were completely overhauled, showing an increase of $1400 for that account. The large decrease of $6000 under crushing and screening was due to a considerable less amount of repairs to the various crushers.

10. TAXES

Tilden Township
Tilden Mine

	1945		1944	
	Valuation	Taxes	Valuation	Taxes
N ½ of Sec. 26, 47-27	280,000	5,215.95	305,000	5,894.61
Personal Supplies & Equip.	155,000	2,887.40	125,000	2,415.83
Total	435,000	8,103.35	430,000	8,310.44
Collection Fees		81.03		83.10
Total Tilden Mine	435,000	8,184.38	430,000	8,393.54

11. PERSONAL INJURY

There were three minor lost-time accidents at the Tilden Mine during the year 1945; two were entitled to compensation and one was home from work for two days only.

12. NEW CONSTRUCTION AND
PROPOSED NEW CONSTRUCTION

A new oil house was erected during 1945, as the former one was inadequate and also a fire hazard, being so near the office building. It was built on a concrete foundation, and sheet iron was used for siding.

There was also a small building put up to house the new pump installed in a churn drill hole just East of the office. This pump supplies the drinking water, as well as that necessary for use in the dry and shops. The North side of the crusher building was remodeled so as to permit the trucks to dump from that side more easily and also to allow a shovel to pass if necessary to move one from the East to West Pits.

The roads to the Summit and South side of the East Pits was improved and graveled, and there was also a concrete spillway placed in the dam caused by the fill for the new road into the property, put in during 1943. This road, or dam, backs up water for hydraulicing purposes and partly washed out last spring, so it was decided to install a spillway to take care of the run-off.

There is no proposed construction for 1946.

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13. EQUIPMENT AND PROPOSED NEW EQUIPMENT

The only new equipment purchased in 1945 was the small centrifugal water pump, and there are no purchases contemplated in 1946.

ATHENS MINE
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1. GENERAL:

The Athens Mine operated on a schedule of two shifts per day and five days per week until the week of January 22nd. At this time it was decided to increase the working schedule to six days per week. This was done in the underground department, but surface crews continued on an approximately five and a half day schedule or forty four hours per week. This was increased to forty six hours in March and by April the entire crew at the mine was working forty eight hours per week. This schedule was continued throughout the remainder of the year.

Production in 1945 was 438,427 tons which was 17,274 tons greater than the production in 1944. The number of man days worked in 1945 was 90,217 as compared with 96,089 days in 1944. The increased production was due to greater efficiency and also, to slightly better operating conditions which was effected by concentrating mining on two main levels instead of being divided over four main levels. In 1945 94% of the total product was divided equally between 4th and 8th Levels. This change was imperative as the requirement of the armed forces was increased which greatly reduced our working force.

Shipments decreased 44,405 tons as compared with the previous year. The total shipments amounted to 407,282 tons with only wet ore remaining in stock at the end of the shipping season which was about the third week in November.

There was very little main level development work done during the year because of lack of man power. The only work done was in connection with the ventilation program. Some drifting was started late in December on the 9th Level to develop for continued mining of the block of ore North of the cross dike where mining is approaching the 8th Level elevation. There was considerable development on sub-levels in ore as certain areas were being prepared for the sub-level caving system of mining. The development program which was slowed up during the past year will have to be greatly increased in order to provide additional working places to replace those areas which will soon be mined out.

Early in the year it was decided to develop certain areas for the sub-level caving system of mining in order to obtain greater efficiency and lower costs. A saving in timber costs was effected but the efficiency actually decreased somewhat. This was due to a number of factors which will be considered under the heading of "Stoping" in this report. A great deal of experience was gained however and with some modifications of the original system as applied, this method of mining will effect a saving in mining costs.

The shaft crew continued the work of rebolting steel sets and alligning the runners in the circular section of the shaft which extends from surface down to 1,080 feet below. Rubber shims are being installed between the runners and the brackets. This acts as a cushion against the jarring action of the skip as well as filler pieces to straighten the course of the runners.

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1. GENERAL: (CONT.)

This work is now about 70% complete and by May or June it is expected that it will be completed. It will then be possible to increase the speed of the skip which will increase the hoisting capacity. Also, in connection with the reduction of the jarring action of the skip, a new skip bail was made during the year which is four feet longer than the original skip bail. This acts similar to a longer wheel base on a car and the skip travels much smoother on the runners.

The area of the surface cave remained essentially the same in 1945. There was continued settlement of existing breaks but no new extensions were noted.

The safety record at the mine was very good in 1945, with a total of fourteen compensable accidents as compared to twenty one in 1944, and twenty six in 1943. There were no fatal accidents, and the total days lost on account of compensable accidents was only 439. There were fourteen non-compensable accidents reported during the year bringing the total days lost to 463 for the 28 accidents.

2. PRODUCTION SHIPMENTS AND INVENTORIES:

a. Production By Grades:

	1945	1944	Increase	Decrease
Athens Ore	350,322	346,842	3,480	
Mitchell Lease Ore	88,105	74,311	13,794	
Corbit Lease Ore	0	0		
Total Ore	438,427	421,153	17,274	
Rock	12,365	30,725		18,360
Total Hoist	450,792	451,878		1,086

b. Shipments:

Grade Of Ore	Pocket Tons	Stockpile Tons	1945 Total Tons	1944 Total Tons
Athens Ore	208,971	113,339	322,310	368,289
Mitchell Lease Ore	57,315	27,657	84,972	83,398
Corbit Lease Ore	0	0	0	0
Total	266,286	140,996	407,282	451,687
Total Last Year	233,739	217,948	451,687	
Increase	32,547			
Decrease		76,952	44,405	

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2. PRODUCTION SHIPMENTS AND INVENTORIES: (CONT.)

c. Stockpile Inventories:

Grade Of Ore	Dec. 31, 1945	Dec. 31, 1944	Increase
Athens Ore	49,398	21,386	28,012
Mitchell Lease Ore	8,591	5,458	3,133
Total	57,989	26,844	31,145

d. Division Of Product By Levels:

	1945		1944	
	Tons	Percent	Tons	Percent
4th Level	207,942	47.4	158,522	37.6
6th Level	12,653	2.9	2,135	.5
7th Level	3,606	.8	67,583	16.1
8th Level	205,982	47.0	145,735	34.6
9th Level	551	.1	43,111	10.2
10th Level	7,693	1.8	4,067	1.0
Total	438,427	100.0	421,153	100.0

Production was concentrated on 4th and 8th Levels during the year. Mining contracts were transferred from 9th Level to 4th Level, and mining between 6th and 7th Levels was completed late in 1944. This concentration of mining crews was made necessary as the armed forces continued to draft men from the mine which reduced the working crew to a critically low point.

e. Production By Months:

Month	Athens	Mitchell	Total	Rock
January	24,477	5,575	30,052	1,140
February	25,339	5,902	31,241	1,055
March	24,461	8,247	32,708	830
April	27,949	6,880	34,829	1,340
May	25,583	9,260	34,843	1,935
June	26,390	9,894	36,284	1,360
July	23,939	8,577	32,516	1,155
August	20,715	7,324	28,039	565
September	33,020	5,244	38,264	765
October	35,682	5,287	40,969	740
November	32,023	5,439	37,462	570
December	32,747	6,817	39,564	910
Total 1945	332,325	84,446	416,771	12,365
Current Year's Stockpile Overrun	17,997	3,659	21,656	
Total 1945	350,322	88,105	438,427	12,365
Total 1944	346,842	74,311	421,153	30,725
Increase	3,480	13,794	17,274	
Decrease				18,360

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2. PRODUCTION SHIPMENTS AND INVENTORIES: (CONT.)

f. Ore Statement:

	Athens	Mitchell	Total	Total 1944
On Hand January 1, 1945	21,386	5,458	26,844	56,648
Output For Year	332,325	84,446	416,771	408,268
Prior Years Stockpile Overrun				730
Current Year's Overrun	17,997	3,659	21,656	12,885
Total	371,708	93,563	465,271	478,531
Shipments	322,310	84,972	407,282	451,687
Balance On Hand	49,398	8,591	57,989	26,844
Increase in Output		13,200	8,503	
Decrease in Output	4,697			
Increase In Ore On Hand			31,145	

Shipments For Year 1945

Grade Of Ore	Pocket	Stockpile	Total	Total 1944
Athens Ore	208,971	113,339	322,310	368,289
Mitchell Lease Ore	57,315	27,657	84,972	83,398
Total	266,286	140,996	407,282	451,687
Total Last Year	233,739	217,948	451,687	
Increase In Shipments	32,547			
Decrease In Shipments		76,952	44,405	

g. Delays:

March 31st - 4-1/4 Hour Delay - Loss Of Product 400 Tons

Three and three-quarters hours delay due to a broken channel iron between the skip dump and the collar of the shaft. This channel supports the runners in the skip shaft.

One-half hour delay due to a break in the main air line on surface.

July 13th - Five and one-half Hours Delay - Loss Of Product 300 Tons

It was necessary to stop and put on a new hoisting rope.

October 19th - Three Hours Delay - Loss Of Product 200 Tons

The signal rope located in the skip compartment broke at surface and fell in the shaft causing a delay while it was being taken out.

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2. PRODUCTION SHIPMENTS AND INVENTORIES: (CONT.)

g. Delays: (Cont.)

November 28th - Three Hours Delay - Loss Of Product 250 Tons

An electric short circuit in a power cable leading to a switch caused a fire on the -660' Sub-level. All the men were called out of the mine while helmet crews went in and put out the fire.

December 28th - Two Hours Delay - Loss Of Product 200 Tons

The concrete wall at the bottom of the North storage raise above 8th Level broke out and the ore spilled out at the plat.

3. ANALYSIS:

a. Average Mine Analysis On Output:

	1945				1944			
Grade	Tons	Iron	Phos.	Sil.	Tons	Iron	Phos.	Sil.
Athens	332,325	59.21	.115	7.98	337,022	59.54	.113	7.59
Mitchell	84,446	59.52	.119	7.64	71,246	59.59	.113	7.53

The average mine analysis was lower than last year due to dilution from sub-level caving operations, and also from slicing operations where areas were being developed under new jasper capping. Also, the sub-level caving area located South of the cross dike and West of the fire pillar is somewhat lean on the footwall side due to thin stringers of slate which project into the ore body.

b. Average Analysis On Straight Cargoes:

Grade	Mine	Lake Erie
Athens Ore	None	None
Mitchell Lease Ore	None	None

c. High Sulphur Ore:

No high sulphur ore was encountered in the mine in 1945.

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4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:

Assumption: 12:75 Cubic feet equals one ton
10 percent for rock and loss in mining
Percent of Bessemer - None

	Athens Lots 1, 7, 10 & 12	Mitchell Lease Lots 8, 9 & 11	Corbit Lease Lot 13	Total Tons
4th Level and Above	424,433	253,518	502,380	1,180,331
4th to 6th Level	608,914	634,286	25,371	1,268,571
6th to 7th Level	135,785	71,694		207,479
7th to 8th Level	381,744	7,333		389,077
8th to 9th Level	309,709			309,709
9th to 10th Level	437,466			437,466
Below 10th Level	70,490			70,490
New Orebody North of Big Dike	354,216			354,216
Total Gross Tons As Of November 30, 1945	2,722,757	966,831	527,751	4,217,339
Less Dec. 1945 Production	32,747	6,817		39,564
Total Gross Tons As Of December 31, 1945	2,690,010	960,014	527,751	4,177,775
Less 10% For Mining & Rock	272,276	96,683	52,775	421,734
Net Tons - 1945	2,417,734	863,331	474,976	3,756,041
Net Tons - 1944	2,232,494	830,140	429,086	3,491,720
Increase	185,240	33,191	45,890	264,321

The table shows a total increase of 264,321 net tons over last year. This is due to a change in the deductions in the estimate. Last year deductions of 10% for rock and 10% for loss in mining were shown, while this year a single deduction of 10% for both was made. A better comparison can be made by using the gross figures which show a decrease in estimated reserves of 138,989 tons. Subtracting this figure from the production of 438,427 tons, shows that 299,438 tons were developed during the year.

A new orebody North of the big dike was discovered by diamond drilling. This alone developed 354,216 tons so there was actually a decrease in the estimated reserves in the old orebody. This was due to a reduction of the ore areas used in previous estimates.

b. Prospective Ore:

Diamond drilling during the year developed an orebody North of the big dike. The engineers estimate show a tonnage of 354,216 tons. It is believed that this estimate is conservative and the present drilling indicates tonnage of 500,000 tons or more. There are also prospects of developing additional tonnage with future drilling.

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4. ESTIMATE OF ORE RESERVES: (CONT.)

c. Estimated Analysis:

Ore Reserves:			Approximate Expected Natural Analysis								
	Tons	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
Athens	3,756,041	51.50	.100	7.17	.350	2.75	.490	.760	.009	1.30	13.08
Ore In Stock:			**Average Dried Analysis**								
Athens	49,398	50.95	.109	7.36	.310	2.93	.430	.820	.010	1.46	13.18
Mitchell	8,591	51.01	.181	7.61	.360	2.64	.570	.690	.009	1.35	13.18

5. LABOR AND WAGES:

a. Comments:

The average number of employees in 1945 was 306 as compared with 358 in 1944, a decrease of 52. Since 1942 the average number of employees working decreased from 419 to 306, a total of 113 men. Actually there were many more who left our employ or were drafted, as the above figures are based on total hours worked. During the year 57 men were hired and 34 left our employ making a net gain of 23 men. Of the men that were hired, 41 were new men, 13 were returned servicemen, and 3 came on transfers from other departments. Analyzing the separations, we find that 22 quit, 5 were transferred to other mines, 3 were drafted, 3 were retired, and 1 died.

With the end of the war in August there came a definite rise in employment. Some of these men returned to the mines from other war time jobs. Also, there were a number of servicemen who returned late in the year. Early in 1946 it is expected that a large number of servicemen will be discharged so the labor situation will be definitely improved.

The average monthly wages of employees in 1945 was $208.02 as compared with $178.61 in 1944. The increase was due mainly to increased overtime in 1945.

b. Comparative Statement Of Wages And Product:

	1945	1944	Increase	Decrease
PRODUCT	438,427	421,153	17,274	
No. Shifts & Hours	1-8 10	1-8 26		16
	2-8 291	2-8 133	158	
	3-8 0	3-8 124		124
Average No. Men Working				
Surface	66	72		6
Underground	240	286		46
Total	306	358		52

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5. LABOR AND WAGES: (CONT.)

b. Comparative Statement Of Wages And Product: (Cont.)

Note: For comparative purposes only, the 1944 retroactive pay has been subtracted from the 1945 figures and added to 1944.

Average Wages Per Day:

	1945	1944	Increase	Decrease
Surface	7.56	7.10	.46	
Underground	8.71	8.22	.49	
Total	8.47	7.99	.48	

Average Wages Per Month: (Based on Mine Payroll Including Captain & Clerks)

Surface	184.68	166.98	17.70	
Underground	214.44	181.53	32.91	
Total	208.02	178.61	29.41	

Product Per Man Per Day:

Surface	22.66	20.74	1.92	
Underground	6.19	5.56	.63	
Total	4.86	4.38	.48	

Labor Cost Per Ton:

Surface	.333	.343		.010
Underground	1.409	1.479		.070
Total	1.742	1.822		.080

Average Product Mining:

Stoping	23.11	21.44	1.67	
Development In Ore	14.87	9.00	5.87	
Total	21.77	20.51	1.26	

Average Wages Per Day For Contract Miners	9.35	8.78	.57	

Total Number of Man-Days:

Surface	19,346¼	20,310		963- 3/4
Underground	70,870¼	75.779		4,908- 3/4
Total	90,216½	96,089		5,872½

Amount For Labor:

Surface	146,265.60	144,274.56	1,991.04	
Underground	617,593.43	623,026.20		5,432.77
Total	763,859.03	767,300.76		3,441.73

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5. LABOR AND WAGES: (CONT.)

b. Comparative Statement Of Wages And Product: (Cont.)

Average Wages Per Month As Per Labor Statement-Less Captain & Clerks:

	1945	1944
Surface	178.48	162.28
Underground	210.94	178.61
Total	203.44	175.32

Proportion Of Surface To Underground Men:

1945 - 1 to 3.64

5 2-8 hour shifts January 1st to January 22nd.
6 2-8 hour shifts January 22nd to December 31st 1945.

1944 - 1 to 3.97

5 3-8 hour shifts and one 2-8 hour shift January 1st to June 26th.
5 2-8 hour shifts June 26th to December 31st 1944.

c. Operating Schedules - 1945:

Month	Days Mine Worked Per Week	Days Per Month	Days Men Worked Per Week	Avg. Shifts Worked Per Month By Each Man
January	5	24	5	24
February	6	24	6	24
March	6	27	6	27
April	6	25	6	25
May	6	26	6	26
June	6	26	6	26
July	6	25	6	25
August	6	25	6	20
September	6	24	6	24
October	6	27	6	27
November	6	25	6	25
December	6	23	6	23
Total		301		296

Average For Year Mine Operated 25.08
Average For Year Worked By Each Man 24.67

6. SURFACE:

a-1. Buildings:

The concrete retaining wall in the West end of the timber tunnel began to tilt into the tunnel when it became cracked up due to surface movement toward the cave. It was necessary to straighten it up and concrete

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6. SURFACE: (CONT.)

a-1. Buildings: (Cont.)

dead heads were placed about 10 or 15 feet from the wall with tie rods fastened to the wall in order to hold it up.

A new door was installed in the Southeast corner of the engine house in July. This was done as a safety measure to allow the men to enter in the Southeast corner instead of walking along the North side where they were exposed to ice falling from the roof during winter months.

Concrete footings and new pillars were installed in the basement of the main office to support the floor. The old ones which were cedar posts had decayed to the point where they no longer gave any support.

A new smoke stack was installed on the boiler room to replace the old one which had rusted out. Also, in the boiler room a new concrete floor was put in to replace the old one which was badly cracked.

A new corrogated metal roof was put on the rock transfer house to replace the old composition roof which was punctured in several places from falling rock.

a-2. Docks, Trestles And Pockets:

The South loading pocket in the shaft house was repaired during the year. New planks were put in with wearing plates on top.

Repair work was started late in the year on the head frame. This work became necessary as many of the steel members had rusted badly especially below the dump where salt had been used to thaw the ice. A regular steel crew started the work in September and by October the most necessary repairs were completed. The crew was then called to one of the other mines and this work will be completed next Spring when the weather warms up.

Three additional bents were put up on the rock trestle in order to extend it a little farther out to provide additional stocking capacity.

b. Stockpiles:

(1) Ore

Ore was stocked under the East steel trestle and under two bents of the South steel trestle. It was not necessary to use the new wooden trestle which was constructed last year. Shipments from stockpile started early in April and continued into October at which time all of the dry ore was loaded. Only a small amount of wet ore remained at the extreme end of the East steel trestle.

(2) Rock

It was necessary to use the bulldozer during the year to push rock away from the 20' rock trestle. The trestle was extended during the Summer to provide a little more stocking capacity.

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6. SURFACE: (CONT.)

c. Cave To Surface:

The limits of the surface cave remained the same during the year and about the only change was continued settlement within previous cracks. With mining being conducted in Athens Lot 12 along the North footwall it is expected that an extension of the cave to the East will eventually approach the stockpile grounds. In anticipation of this a portion of the South steel trestle has been abandoned for stockpiling.

d. Deep Wells:

No. 1 Deep Well continued operating with about the same volume being pumped as last year. The only necessary maintenance to the pump is a daily visit to fill the oil cups.

No. 2 Deep Well did not operate as there is no water supply.

Breitung Shaft

Pumping was continued from the Breitung Shaft throughout the year. Only minor repairs were necessary to the suction tank. Maintenance consisted of a regular inspection every three or four weeks to grease the pump, and see that everything was in good working order.

e. Water Purchased For Heating, Cooling, etc.:

The cost of water purchased from the City of Negaunee the last three years is as follows:

	1945		1944		1943	
	Gallons	Amount	Gallons	Amount	Gallons	Amount
1st Quarter	3,919,000	280.83	4,428,000	312.96	2,818,000	207.94
2nd Quarter	4,763,000	339.91	4,206,000	297.42	3,195,000	233.92
3rd Quarter	4,921,000	350.97	3,964,000	280.48	3,111,000	229.07
4th Quarter	5,503,000	391.71	3,742,000	264.84	3,492,000	247.44
Total	19,106,000	1363.42	16,340,000	1155.70	12,616,000	918.37
Product - Tons	438,427		421,153		517,814	
Cost Per Ton	.0031098		.002744		.001774	

f. Grounds And Fences:

The grounds at the mine were kept in good condition during the year. The shrubs were pruned and the lawn was kept in good order.

Several fences in front of the houses in the mine location were repaired and renewed during the summer. A regular inspection of all fences around the caved area was made and all necessary repairs were completed. In addition, some new fence was put up on the Southeast side of the stocking area.

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7. UNDERGROUND:

a. Shaft Sinking:

There was no shaft sinking in 1945.

b. Development, General Remarks:

There was no development work done for main haulage ways in 1945. The small amount of development that was done on main levels was in connection with improvements in the ventilation system. All main level rock development was at a minimum due to a shortage of labor and increased demands for iron ore. There was, however, a normal amount of raise development and sub-level ore drift development increased considerably due to advance work in connection with the sub-level caving system of mining.

Because of the fact that rock development work was retarded in 1945 it will be necessary to step up this work as soon as the labor shortage is relieved. Plans are now made to develop for mining Corbit Lot 13 and this work will be started as soon as possible.

b-1. Development In Ore:

4th Level

Most of the ore development above 4th Level was done in connection with the sub-level caving system of mining. The major portion of the drifting was done on the -260' Sub-level and on the -315' Sub-level, with a smaller amount on the -245' Sub-level. There was also, small amounts of development drift and raise on various other sub-levels during the year.

A new raise located between No. 419 and No. 421 Raises was put up during the year. This was done in order to replace No. 423 Raise which has been discontinued due to the encroachment of the South footwall and also, to shorten the scraping distance West to the mining limit.

5th Level

Contract No. 21 advanced 64' of ore drift Southwest from No. 650 Raise. At a distance of about 100' from the 6th Level raise, a transfer raise was started. This raise was extended to the -385' elevation where it was cut out. This now provides a ventilation connection and will be used later for mining.

6th Level

There was no ore development on 6th Level during the year.

7th Level

There was considerable ore drifting on 7th Level and on the sub-levels above in connection with development work in advance of sub-level caving operations. The advance of a sub-level caving slice was contracted for on a footage basis in order that there would be no incentive to allow

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7. UNDERGROUND: (CONT.)

b-1. Development In Ore: (Cont.)

7th Level (Cont.)

ore to cave from the back of the slice. As the slices were retreated they were contracted on a tonnage basis.

There was no main level haulage drift development in ore during the year.

8th Level

The only main level development in ore was No. 863 Raise which was put up to the -675' elevation above 7th Level.

On the sub-levels between 7th and 8th Levels, a total of 1,295' of ore drift and 486' of ore raise was developed in connection with sub-level caving operations, ventilation, and water control.

9th Level

One new raise was started late in the year and was advanced 106' in ore. This raise is being put up to replace No. 801 Raise on 8th Level which is badly crushed. Also, the new raise will provide a new ventilation connection to replace No. 910 Raise which is crushed beyond repair.

Some drifting was also done Southwest from No. 1032 Raise in the sub-level caving development in Block 2.

10th Level

No. 1038 Raise was completed to the -905' Sub-level during the year. Drifting was then started to the Northwest and Southeast along the limit of the old workings. This work was done in order to drain some of the water which occurs in this area. If most of the water can be drained near the outer limits of the ore body it will improve mining operations which are being resumed in Block 2.

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7. UNDERGROUND: (CONT.)

b-1. Development In Ore: (Cont.)

The following is a summary of the development footages in ore in 1945:

Location	Drifting	Raising	Total
-245' Sub-level	140	13	153
-260' "	322	28	350
-275' "	25		25
-290' "	45		45
-315' "	234		234
-375' "		15	15
4th Level	10	71	81
5th Level	64	218	282
6th Level			0
-660' Sub-level	555	38	593
-675' "	450		450
7th Level	156		156
-710' Sub-level	500	38	538
-720' "	672	438	1,110
-735' "	81		81
-745' "	42	10	52
8th Level		145	145
9th Level	203	106	309
-905' Sub-level	415		415
10th Level		62	62
Total 1945	3,914	1,182	5,096
Total 1944	726	876	1,602
Increase	3,188	306	3,494

b-2. Development In Rock:

4th Level

The only rock development on 4th Level was 30' of drift East from No. 652 Ventilation Raise. This work completed a new, permanent rock ventilation connection between 6th and 4th Levels.

5th Level

A raise was started to the Southeast from the transfer Southwest of No. 651 Raise. After an advance of about 35' in soft footwall slates it was discontinued when the back started caving ahead of the cribbed portion making it impossible to enter above the covering. It was then decided to continue the main raise from 6th Level and, also, put up a branch raise to the Southeast. This was done and these raises were completed to the 4th Level elevation during the year. The rate of advance was very slow due to loose, caving ground which required the constant use of head boards.

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7. UNDERGROUND: (CONT.)

b-2. Development In Rock: (Cont.)

6th Level

Main level rock drifting consisted of driving a new ventilation connection from No. 70 Ventilation Raise East to the main 6th Level drift. This greatly improved the ventilation conditions as it now provides a second permanent connection in rock between 7th and 6th Levels. Additional rock drifting was also done from No 700 Ventilation Raise in order to enlarge and straighten the old connection to the main drift.

No. 652 Ventilation Raise was completed to the 4th Level elevation early in the year and a connection was made to the 4th Level cross-cut for ventilation. This connection now provides a good supply of fresh air to the Southeast area above 4th Level where working conditions were unsatisfactory due to crushing on the previous ventilation connection which was in ore.

7th Level

There was no development in rock on the 7th Level during the year.

8th Level

There was no development in rock on the 8th Level during the year.

9th Level

A small amount of rock drifting was done on the 9th Level late in the year as a new cross-cut was started South from the main drift. This turn-out is located about 25' East of No. 1002 Ventilation Raise and it will be extended about 200' to the South in the footwall. Raises will be put up to replace No. 862 and No. 864 Raises, where mining is rapidly approaching the 8th Level elevation.

10th Level

Rock development on 10th Level consisted of 40' of raising in connection with water drainage in the West side of Block 2.

The following is a summary of rock development in 1945:

Location	Drifting	Raising	Total
4th Level	30		30
5th Level		234	234
6th Level	144	55	199
9th Level	20		20
10th Level		40	40
Total 1945	194	329	523
Total 1944	1,534	695	2,229
Decrease	1,340	366	1,706

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7. UNDERGROUND: (CONT.)

c. Stoping:

(1) General:

The product in 1945 came from Blocks 2, 3, 4, 5, and 6, and by levels from 10th, 9th, 8th, 7th, 6th, and 4th. Very little product came from Block 2 as mining was not resumed there until December. Ninety-four percent of the total product in 1945 came from 4th and 8th Levels. Development of the North half of a portion of Block 6 continued during the year, with three contracts working in the area. Two to three sub-levels are now mined so a fair mat is being established under the new hanging. Block 6 is comprised of Athens Lot 12 and Corbit Lease Lot 13. The Corbit Lease has not yet been developed for mining.

The locations of the mining contracts at the end of the year 1945 and 1944 are shown below:

1945		1944	
12	above 4th Level	13	above 4th Level
0	above 6th Level	2	above 6th Level
5	above 7th Level	2	above 7th Level
6	above 8th Level	9	above 8th Level
3	above 9th Level	0	above 9th Level
2	above 10th Level	0	above 10th Level
Total 28		Total 26	

There were 28 contracts working in December 1945 as compared with 26 a year ago. They were divided as follows:

1945	1944
Mining - 23 Contracts	Mining - 21 Contracts
Developing - 1 Raising	Developing - 3 Raising
- 4 Drifting	- 2 Drifting
Total - 28 Contracts	Total - 26 Contracts

Above the 4th Level elevation ore was mined in 1945 on the -220', -230', -245', -260', -275', -290', -300', -315', -330', -340', -375' sub-levels, and on 4th Level.

Between 4th and 6th Levels there was a small amount of ore mined as the result of development work on 5th Level.

Between 6th and 7th Levels ore was mined on the -635', -645', -660', -675' sub-levels and on 7th Level.

Between 7th and 8th Levels ore was mined on the -710', -720', -735', and -745' sub-levels.

The only ore produced between 8th and 9th Levels was the result of raise development.

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7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

(1) General (Cont.)

Some ore was mined between 9th and 10th Levels as the result of development work.

During the year 1945 there were mining operations on 28 different sub-levels as compared with 31 in 1944.

(2) Detail Of Stoping

The following is a detailed description of mining in the various blocks beginning with the highest areas in Blocks 5 and 6 above 4th Level.

Blocks 5 And 6 Above 4th Level

Mining was completed early in the year on the -220' Sub-level in the narrow ore area along the North footwall in Athens Lot 12. In order to increase efficiency, and mine this area down to the elevation of mining from No. 413 Raise to the South as soon as possible, it was decided to move down to the -245' Sub-level and develop the area for the sub-level caving system of mining. This system of mining was studied on the Gogebic range and it was tried out in certain areas at the Athens Mine. In the above mentioned area a mining drift was driven to the South on the -245' Sub-level and 20' below a transfer drift was also driven in the same direction. Before mining could be started the tremendous pressures which are present in this area had crushed both the mining drift and the transfer drift to the point where repairs were necessary. About two months time was spent in an attempt to get started but the weight was too great. It was then decided to move down to the transfer elevation which was on the -260' Sub-level and continue mining by using a radial caving system whereby the ore is scraped directly into the raise instead of a transfer. This worked quite satisfactorily and by December only a small amount of ore on the hanging side of Raises No. 415 and No. 417 remained to be mined.

In the area around No. 413 Raise which is South of the above mentioned area, one contract completed mining on the -260' and -275' Sub-levels. This is a new territory which is being opened under new jasper capping and some delay was experienced due to rock runs. For the most part, however, mining progressed very satisfactorily. In December month the contract cut-out the raise on the -290' Sub-level.

In the area around No. 401 Raise in Athens Lot 10 mining was completed on the -275' and -290' Sub-levels. Contract No. 1 then moved down 25' to continue mining on the -315' Sub-level. Most of the ore on the -300' Sub-level had previously been mined from No. 402 Raise. This ore area has been decreasing in size on the last three sub-levels due to a roll in the jasper capping which has reduced the ore limits to the South of No. 401 Raise. As indicated by previous development the area will become larger again as mining progresses downward. In December month Contract No. 1 completed three slices East of the raise on the -315' Sub-level. Only a small amount of ore now remains to be mined on this sub-level.

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7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

(2) Detail Of Stoping (Cont.)

In Mitchell Lease Lot 11 mining was completed on the -275' and -290' Sub-levels. This mining is being carried on mainly by two contracts from Raise No. 414 and No. 416. During the year a third contract completed mining on the -275', -290', -300', and -315' of a narrow ore body which was discovered between the small East-West dike and the North footwall. In December mining was being done on the -300' Sub-level of the main ore body by Contract No. 14 and 22. No. 14 Contract completed a connection from No. 416 Raise to No. 414 Raise and then continued mining to the North. Contract No. 22 completed three slices Southwest from No. 416 Raise.

Along the South footwall in Athens Lot 12 and a portion of Mitchell Lease Lot 11 mining was completed on the -300', -315', and -330' Sub-levels. By the end of the year mining had just started on the -340' Sub-level. Four contracts continued operations in this territory which is the most productive area above 4th Level. This pillar of ore is rapidly becoming smaller, however, due to the encroachment of the South footwall. Mining from No. 423 Raise has been abandoned entirely and very little mining is expected from No. 421 Raise due to lean ore. It will soon be necessary to transfer one of the mining crews to another territory.

The following work was done in December in the above area.

Contract No. 29 completed a connection from No. 419 Raise to No. 421 Raise. Mining was then started to the South but due to lean ore the slices were stopped after advancing only a short distance. Contract No. 8 working from No. 419 Raise started mining operations to the Northwest and completed the first drift and two slices. No. 18 Contract completed the first drift and two slices West to the old workings and jasper capping. Contract No. 31 completed three short slices Northwest from No. 418 Raise.

Mining was completed early in the year on the -375' Sub-level in the area around No. 406 Raise and No. 408-A Raise. Due to the shortage of men these crews were split up temporarily in order to fill shortages in other mining contracts. Later in the year as development from 5th Level had reached the 4th Level elevation and the labor shortage was relieved somewhat these crews were reorganized again and mining was continued on the 4th Level. Ventilation connections were completed and Contract No. 7 and 30 started mining late in the year. In December Contract No. 7 completed the connection from No. 651-B Raise to No. 651 Raise and advanced the first mining drift North 70 feet to the jasper capping. Contract No. 30 working from No. 651-B Raise completed the first drift about 35 feet Southeast to lean ore. Considerable difficulty is experienced in advancing slices in this area due to water and mud runs.

Between 4th And 6th Levels

There was no mining done between these levels during the year. The only work done consisted of development working from 5th and 6th Levels which has been previously described under development.

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7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

(2) Detail Of Stoping (Cont.)

Above 7th Level - North Of Fault Dike - Block 4

Slicing operations were completed on the -645' Sub-level early in the year. In order to increase the efficiency it was decided to continue mining this territory by the sub-level caving method of mining. Development for this was underway before slicing operations were completed. A new raise was put up from 8th Level and was cut out on the -675' Sub-level. A mining drift was advanced Southeast to the cross dike and 20' below at the 7th Level elevation a transfer drift was also driven in this same direction. After connecting these two drifts with single compartment cribbed raises which were spaced at 20 to 25 feet intervals, mining was started on the -675' Sub-level. A total sub-level interval of 25 feet was mined by advancing the slices at right angles to the mining drift from one of the transfer raises. This slice is actually a drift which is advanced in the solid pillard with 8' timber. After this drift (called a slice in this system of mining) has reached the limit of the ore body, the ore on the sides and in the back is mined by blasting and caving it into the open slice. Efficiency with this system of mining was actually less than with the top slicing which was previously used. This was due to several factors which can be overcome as certain modifications are made in the general layout of the system. Due to the heavy pressures that are present in most areas of the Athens Mine it is not practical to use a transfer drift below the mining drift. It requires entirely too much maintenance to keep both drifts open. In the future only one drift will be driven and the ore from the slice will be cross hauled on the mining drift. Another factor effecting the efficiency was the variation in height of back due to crossing under under an old mining limit. On the hanging side of the raise there was practically no pillar at all in the back. A third factor which undoubtedly effects the efficiency is the lack of experience in this system of mining. All of these difficulties will be overcome as certain changes are made to adapt this system of mining to the conditions present in the Athens ore body. By the end of the year the 7th Level elevation in this area was opened for mining and Contract No. 15 and 18 advanced two slices to the Northeast from the mining drift.

South Side Of Fault Dike - Block 4

Mining was completed on the -675' Sub-level by top slicing operations from No. 866 and No. 868 Raises. A narrow pillar of ore located between the cross dike and the 7th Level main drift was not mined at this time as it was very difficult to extend the slices over the top of the 7th Level main drift. This pillar would be mined later as plans were then underway to complete mining in this ore body by using the sub-level caving system of mining. This was first developed on the -710' Sub-level and by September mining was completed and Contract No. 3 moved down to develop the next sub-level. By December only a small amount of ore remained to be mined on the -720' Sub-level. Each succeeding lower sub-level is becoming smaller and the ore body will soon be pinched out against the cross dike.

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7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

(2) Detail Of Stoping (Cont.)

Ore Area South Of Fault Dike - Block 3 Above 7th Level

This area which had previously been abandoned due to the fire was again reopened early in the year. The entire block was not reopened however, as the East half still remains unavailable in order that the gob be left intact where the main fire occured. It was decided that this area be developed for sub-level caving and work was started early in the year with the transfer drift being driven on the -720' Sub-level below the 7th Level elevation. Raises were put up and mining development was continued on the -660' Sub-level. Considerable water occurs in this area along the old workings on the Southwest side and it was necessary to drive drainage drifts along the old workings in order to catch the water. Mining was then started with slices that extend Northwest and Southeast from the transfer raises. Four slices were completed during the year and in December three contracts developed slices and they were ready to be caved back to the transfer raise. Variable success was achieved with this system of mining due to variations in the height of back in this area. These variations are due to irregular mining on the sub-levels above where considerable difficulty was experienced due to wet conditions along the old workings. Where conditions were favorable and height of back was normal, very good results were obtained. Mining will soon be completed on the -660' Sub-level and if the water can be controlled good results can be expected on the next lower sub-level.

North Of Cross Dike - Block 3 Between 7th And 8th Levels.

Five contracts continued slicing operations in this area throughout the year. Mining was completed on the -710' and -720' Sub-levels. In the East half of the block, mining was completed down to the -735' Sub-level and by December was nearly completed on the -745' Sub-level. This still continued to be one of the most productive areas in the Athens Mine although it is becoming smaller due to encroachment of the South footwall. In December, Contracts No. 2, 5, and 19 were working on the -735' Sub-level and Contracts No. 25 and 27 were working on the -745' Sub-level.

8th, 9th And 10th Levels

There was no mining on these levels during the year and the development work has been discussed earlier in this report.

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7. UNDERGROUND: (CONT.)

d. Timbering:

The total cost for timbering increased $2,298.64 and decreased $.027 in cost per ton. This increase in cost was due mainly to increased labor expense as the total cost of timber, lagging, poles and cribbing was $5,091.05 less than in 1944. The cost per foot for cribbing and stull timber increased about 4% in 1945 and the cost per foot of lagging and poles increase a little over 3%. The total amount of timber used in 1945 was less than in 1944 due to the increased use of sub-level caving which requires less timber. About 17.5% of the product came from sub-level development and sub-level caving in 1945. As this proportion is increased, a greater saving in timber supplies can be expected.

Main level and raise repairs were continued throughout the year. Several raises on 4th Level required repairs and some of them were repaired twice during the year as heavy pressures caused them to be crushed. Some repairs were necessary in the main cross cut to the Southeast as old timber became rotted. Constant repair work was necessary in that portion of drift around No. 401 and No. 402 Raises.

Sixth Level repair work consisted mainly of installation of treated timber in the cross cut to the Southeast. These treated timber lining sets were necessary as the original timber sets were becoming rotted.

Repairs on 7th Level were made in the ventilation drift between the main drift and No. 800 Ventilation Raise. Maintenance of this drift is necessary as it is the main ventilation connection between 8th and 7th Levels.

A normal amount of raise repair was done on 8th Level during the year. Considerable main level repairs were necessary in the length of drift Northeast and Southwest from No. 801 Raise and also in No. 810 cross cut. Some repairs were also made in No. 860 cross cut.

Toward the end of the year as new raises were planned for continuation of mining in Block 3 above 8th Level and, also, as mining was again started in Block 2 on 9th Level, it was necessary to do considerable repair work on 9th Level from the first switch in beyond No. 966 Raise. Some repairs were also made in the length of drift extending into No. 910 Ventilation Raise.

On 10th Level repairs were made in the length of drift between No. 1034 and No. 1036 Raises.

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7. UNDERGROUND: (CONT.)

d. Timbering (Cont.)

Statement Of Timber Used:

	Lineal Feet	Avg. Price Per Foot	Amount 1945	Amount 1944
6" to 8" Cribbing	132,093	.0579	7,651.39	8,852.83
8" to 10" Stulls	3,455	.0832	287.55	1,161.86
10" to 12" Stulls	98,952	.1335	13,206.73	14,829.13
12" to 14" Stulls	40,633	.1945	7,901.19	8,339.47
14" to 16" Stulls	8,007	.2250	1,801.55	3,627.80
Treated Timber	3,412	.3160	1,078.05	0
Total 1945	286,552	.1114	31,926.46	
Total 1944	343,582	.1071		36,811.09
		Per 100'		
7' Lagging	1,267,462	1.3852	17,557.36	18,625.38
9½' Poles	1,087,783	2.1379	23,256.00	22,457.04
Total 1945	2,355,245	1.7329	40,813.36	
Total 1944	2,446,550	1.6792		41,082.42
Wire Netting	1,650		104.40	41.76

	1945	1944
PRODUCT FOR YEAR - TONS	438,427	421,153
Ft. Timber Per Ton Of Ore	.6536	.8158
Ft. Lagging Per Ton Of Ore	2.8909	3.1323
Ft. Poles Per Ton Of Ore	2.4811	2.6769
Ft..Lagging Per Ft. Of Timber	4.4230	3.8395
Cost Per Ton For Timber	.0728	.0874
Cost Per Ton For Lagging	.0401	.0442
Cost Per Ton For Poles	.0530	.0533
Cost Per Ton For Wire Netting	.0002	.0001
Cost Per Ton For Timber, Lagging, Poles, & Netting	.1661	.1850
Equivalent Of Stull Timber To Board Measure	477,510	811,489
Ft. Of Board Measure Per Ton Of Ore	1.0891	1.9268
Lin. Ft. Of Netting Per Ton Of Ore	.0038	.0015
Sq. Ft. Of Netting Per Ton Of Ore	.0157	.0065

		Amount	Cost Per Ton
Total Cost Of Tbr., Lagging, Poles, Etc. For Year	1945	72,844.22	.1661
do	1944	77,935.27	.1850
do	1943	82,305.17	.1589
do	1942	82,410.65	.1209
do	1941	67,589.93	.1041
do	1940	59,589.66	.1155
do	1939	47,153.85	.1164
do	1938	35,920.27	.1340
do	1937	49,763.66	.1123
do	1936	35,719.77	.1149

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7. UNDERGROUND: (CONT.)

e. Drifting And Raising:

The following table gives a comparison of total feet of drifting and raising in ore and rock in 1945 and 1944:

	Drifting		Raising		
Year	Ore	Rock	Ore	Rock	Grand Total
1945	3,796	214	1,220	438	5,668
1944	806	1,534	796	695	3,831
Increase	2,990		424		1,837
Decrease		1,320		257	

The large increase in ore drifting was due to the increased ore development in connection with the sub-level caving system of mining. The mining drifts and slices were paid on a footage basis and they were included under development during the year.

f. Explosives, Drilling And Blasting:

The cost per pound for powder has been the same for the past five years, namely $.115 per pound. The total cost of all explosives increased $1,957.33 in 1945 and the cost per ton increased $.0024.

All employees that handled explosives in 1945 were licensed according to the regulations. Regular blasting inspections of each contract were made every 60 days by the shift bosses and reports of the same were sent to the mine office. There was no change in blasting practise in 1945, with the two methods being used, namely fuse and electric.

Statement Of Explosives Used: (Ore Development And Stoping)

	Quantity	Average Price	Amount 1945	Amount 1944
60% AM-Gelatin Powder, lbs.	370	11.50	42.55	
No. 1. Gelamite Powder, lbs.	167,001	11.50	19,205.11	17,381.43
Total Powder	167,371	11.50	19,247.66	17,381.43
Fuse - Feet	644,930	5.14	3,316.72	3,192.35
Caps	86,971	12.20	1,061.05	1,055.28
Electric Caps & Delays	1,175	12.04	141.42	176.17
Tamping Bags	40,000	2.15	86.00	69.88
Fuse Lighters	15,000	6.75	101.28	128.29
Connecting Wire, lbs.	58	.55	31.90	25.30
Shot Firing Cord - Feet				
Total Fuse, Caps, Etc.			4,738.37	4,647.27
Total Cost All Explosives			23,986.03	22,028.70
PRODUCT			438,427	421,153
Pounds Powder Per Ton Of Ore			.3818	.3589
Tons Of Ore Per Lb. Of Powder			2.6195	2.7865
Cost Per Ton For Powder			.0439	.0413
Cost Per Ton For Fuse, Caps, Etc.			.0108	.0110
Cost Per Ton For All Explosives			.0547	.0523

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7. UNDERGROUND: (CONT.)

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

Statement Of Explosives Used: (Sinking, Rock Development, Etc.)

	Quantity	Average Price	Amount 1945	Amount 1944
60% Am. Gelatin Powder, lbs.	1,980	11.50	227.70	1,437.27
No. 1. Gelamite Powder, lbs.	1,749	11.50	201.14	1,133.80
Herculite	150	10.00	15.00	15.00
Total Powder 1945	3,879	11.44	443.84	
Total Powder 1944	22,507	11.49		2,586.07
Fuse - Feet	15,070	5.15	77.57	279.58
Caps	2,029	12.20	24.75	91.52
Electric Caps & Delays	1,075	12.30	132.27	296.01
Tamptite Paper Shells				7.20
Shot Firing Cord - Feet	500	17.46	8.73	
Total Fuse, Caps, Etc.			243.32	674.31
Total All Explosives			687.16	3,260.38
Total Explosives Used At Mine			24,673.19	25,289.08
Average Price Per Pound For Powder			11.50	.1150

g. Mining And Loading

There was a decrease in total tramming costs of $2,720.71 and a decrease of $.015 per ton in 1945. This decrease was due to a concentration of mining on 2 levels namely, the 4th and 8th Levels. Tramming was completed on 7th Level early in the year and the crew was transferred to one of the other operating levels.

During 1945 the sub-level caving system of mining was introduced in certain areas in the Athens Mine with the purpose of increasing efficiency. A study of this system of mining was made on the Gogebic iron range in December 1944 and it was later applied to the Athens ore body. This change was made in four different areas of the mine in order to prove the merits of the system under all existing conditions. Results were variable and several changes and modifications of the original plans will be necessary to adapt this system of mining to the Athens ore body. Due to heavy ground it was found that it is impractical to use a transfer drift which is located 20 to 25 feet below the mining drift. The maintenance work was too great. Also, it is impractical to use 8' timber in the mining or transfer drifts. Nine foot timbers are much better as they allow more room for installing props and lining sets. The height of the pillar to be mined was originally 20 feet. This should be increased to at least 25 feet and possibly more, depending on how readily the ground caves. Generally the results obtained from the crews working with this system was not very impressive but with improvements in the general plan together with the experience which has been gained, it is believed that this system of mining will eventually improve the efficiency.

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7. UNDERGROUND: (CONT.)

h. Ventilation

Ventilation throughout the mine was good during the year with only 2 or 3 contracts requiring the use of auxiliary fans to supply fresh air to the working face while the air outlet was temporarily blocked. The problem of ventilation at the Athens Mine is particularly difficult because both the downcast and upcast air travels through the main hoisting shaft which makes it necessary to maintain a good seal between the skip and cage compartments as well as on the plats to prevent the fresh air from re-circulating. Improvements in the ventilation raise system were made during the year with a permanent rock connection between 4th and 6th Level and also, a permanent rock connection between 6th and 7th Levels. In addition No. 908 Raise was concreted during the year which makes a good smooth air passage. Also, the drift between No. 700 Ventilation Raise and the main drift was enlarged to allow a greater volume to pass. Regular ventilation surveys were made by the ventilating engineers during the year which show approximately 80,000 cubic feet per minute being delivered by the main fan which is located on the Tenth Level. Their comments were that a good supply of air is being delivered to all parts of the mine. All recommendations made were complied with.

i. Pumping

The following table gives data on pumping at the Athens and Breitung Shafts:

Period	Avg.K.W. Per Day - Athens	K.W.Per Month Breitung Pump	Avg. Gal.Per Min. - Athens	Total Cost Both Mines From Athens Cost Sheet
January	3,661	2,014	306	$ 2,267.85
February	3,583	2,120	302	1,982.94
March	3,487	1,370	293	1,999.53
April	4,035	5,840	342	2,439.54
May	4,297	5,040	365	2,438.36
June	4,267	4,970	359	2,380.51
July	4,290	4,030	359	2,572.63
August	4,260	2,750	355	2,626.83
September	4,077	1,970	338	2,377.37
October	3,955	1,510	329	2,288.59
November	3,857	2,250	325	2,211.00
December	3,647	370	307	2,696.76
1938 Avg.	3,767	3,433	314	2,350.42
1939 "	3,991	4,391	331	2,291.90
1940 "	4,141	858	351	2,381.69
1941 "	4,008	1,883	354	2,351.56
1942 "	4,435	2,258	388	2,668.91
1943 "	4,351	3,358	372	2,701.08
1944 "	3,696	1,688	308	2,528.62
1945 "	3,951	2,853	332	2,356.83

Average cost in 1934 prior to pumping at the Breitung 2,611.79

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7. UNDERGROUND: (CONT.)

i. Pumping: (Cont.)

Saving in 1935 when expense was heavy account of installing	$ 2,600.59
Saving in 1936	10,148.52
Saving in 1937	10,352.04
Saving in 1938	3,135.96
Saving in 1939	3,838.65
Saving in 1940	2,761.20
Saving in 1941	2,922.76
Saving in 1942	685.44 *
Saving in 1943	1,071.50 *
Saving in 1944	83.17
Saving in 1945	3,059.52

(*) Above the cost, prior to pumping at the Breitung.

The number of gallons pumped per minute at the Athens Mine in each month of the year for the past seven years is given in the following statement:

Month	1945	1944	1943	1942	1941	1940	1939
January	306	315	359	399	330	325	297
February	302	297	334	388	327	318	282
March	293	296	330	373	324	322	297
April	342	295	356	374	334	318	293
May	365	307	404	402	334	340	338
June	359	312	411	402	367	380	357
July	359	314	431	393	386	420	382
August	355	313	419	394	363	350	375
September	338	311	390	384	363	369	360
October	329	312	364	397	360	373	348
November	325	316	337	379	365	343	334
December	307	308	328	368	397	348	329
Average	332	308	372	388	354	351	331

ATHENS MINE
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8. COST OF OPERATING:

a. Comparative Mining Costs:

	1945	1944	Increase	Decrease
Underground Costs	2.062	2.087		.025
Surface Costs	.254	.258		.004
General Mine Expense	.331	.322	.009	
Cost Of Product	2.647	2.667		.020
Depletion - Original Cost	.021	.029		.008
- Increment	.039	.051		.012
Depreciation - Plant And Equipment	.028	.028		
Development	.034	.034		
Taxes	.235	.284		.049
Loading And Shipping	.051	.071		.020
Administrative And General Expense	.050	.054		.004
Miscellaneous Income And Expense	.022	.012	.034	
Total Cost At Mine, Before Royalty	3.127	3.206		.079
Budget - Estimated Cost Per Ton	3.141	3.144		.003
PRODUCT	438,427	421,153	17,274	
No. Of Days Operated	301	283	18	
No. Of Shifts And Hours				
1 - 8 Hour	10	26		16
2 - 8 Hour	291	133	158	
3 - 8 Hour	0	124		124
Average Daily Product	1,457	1,488		31

	1945		1944	
COST OF PRODUCTION	Cost Per Ton	Percent	Cost Per Ton	Percent
Labor	1.824	68.9	1.829	68.6
Supplies	.823	31.1	.838	31.4
Total	2.647	100	2.667	100

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison:

(1) Days And Shifts

Year	Days Mine Worked	Shifts & Hours	Men Employed	Total Shifts Worked
1945	301	5-2-8 Hr. to 1/22 6-2-8 Hr. 1/22 to 12/31/45	306	90,217
1944	283	5-3-8 Hr. to 6/26 5-2-8 Hr. 6/26 to 12/31/44	358	96,089
Increase	18			
Decrease			52	5,872

(3) Comparison Of Production:

Production - 1945	438,427 Tons
Production - 1944	421,153 Tons
Increase	17,274 Tons

(4) Comparison Of Number Of Men And Wages:

	No. Men	No. Days	Amount	Rate Per Day
1945	306	90,217	763,859.03	8.47
1944	358	96,089	767,300.76	7.99
Increase				.48
Decrease	52	5,872	3,441.73	

(5) Tons Per Man Per Day:

	1945	1944	Increase	Decrease
Surface	22.66	20.74	1.92	
Underground	6.19	5.56	.63	
Total	4.86	4.38	.48	

(6) Cost Of Production:

	Total	Cost Per Ton
1945	1,160,486.73	2.647
1944	1,123,215.34	2.667
Increase	37,271.39	
Decrease		.020

	Labor	Percent	Supplies	Percent
1945	774,496.39	68.2	360,790.58	31.8
1944	795,323.13	69.3	353,091.07	30.7
Increase			7,699.51	1.1
Decrease	20,826.74	1.1		

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)
(7) Detail of Accounts:

		1945		1944	
	Days Per Week	5 & 6		6 & 5	
	Shifts & Hours	2-8 Hr.		1 & 2 & 3-8 Hr.	
	Production - Tons	438,427		421,153	
	Average Daily Product - Tons	1,457		1,488	
	Number Of Days Worked	301		283	
	UNDERGROUND COSTS:	AMOUNT	PER TON	AMOUNT	PER TON
1.	Exploring in Mine	10703.70	.024	297.15	.001
2.	Sinking in Shaft				
3.	Development in Rock	11326.98	.026	30295.22	.072
4.	Development in Ore	42487.59	.097	13830.71	.033
5.	Stoping	215889.82	.492	215830.47	.512
6.	Timbering	350421.52	.799	348122.88	.826
7.	Tramming	95007.04	.217	97727.75	.232
8.	Ventilation	18870.53	.043	12162.59	.029
9.	Pumping	28281.91	.065	30343.44	.072
10.	Compressors and Air Pipes	43990.75	.100	42371.43	.101
11.	Fire And Damage	70.70	.000		
12.	Underground Superintendence	37071.05	.085	34783.86	.082
13.	Cave-in			74.79	.000
14.	Maint: Compressors and Power Drills	3192.65	.007	2032.15	.005
15.	Scrapers & Mechanical Loaders	24631.48	.056	22325.61	.053
16.	Electric Tram Equipment	19771.22	.045	25219.73	.060
17.	Pumping Machinery	2398.42	.005	3625.02	.009
	Total Underground Costs	904115.36	2.062	879042.80	2.087
	SURFACE COSTS:				
18.	Hoisting	39206.92	.089	39504.45	.094
19.	Stocking Ore	8239.46	.019	9702.36	.023
20.	Screening-Crushing at Mine				
21.	Dry House	14862.15	.034	10524.12	.025
22.	General Surface Expense	11257.81	.026	12098.65	.029
23.	Maint: Hoisting Equipment	14181.83	.032	15474.09	.037
24.	Shaft	8640.15	.020	5879.57	.014
25.	Top Tram Equipment	2193.89	.005	2759.59	.006
26.	Docks, Trestles & Pockets	2948.25	.007	7408.70	.017
27.	Mine Buildings	9684.50	.022	5330.92	.013
	Total Surface Costs	111214.96	.254	108682.45	.258
	GENERAL MINE EXPENSES:				
28.	Mining Engineering	4125.56	.009	3765.15	.009
29.	Mechanical & Electrical Engineering	2240.76	.005	2146.38	.005
30.	Analysis And Grading	15721.61	.036	16830.19	.040
31.	Safety Department	2193.47	.005	2156.08	.005
32.	Telephones and Safety Devices	2554.19	.006	2233.15	.005
33.	Local and General Welfare	3930.63	.009	3847.28	.009
34.	Spc. Exp., Pensions & Allowances	7840.88	.018	8519.57	.020
35.	Ishpeming Office	19721.94	.045	20259.11	.048
36.	Mine Office	19484.61	.044	20598.97	.049
37.	Insurance	3836.99	.009	3348.81	.008
38.	Personal Injury	12574.76	.029	13736.26	.033
39.	Social Security Taxes	18229.79	.041	17509.99	.042
40.	Employees Vacation Pay	31445.39	.072	17902.93	.043
41.	Group Annuity Premiums	1255.83	.003	2634.72	.006
	Total General Mine Expenses	145156.41	.331	135488.59	.322
	COST OF PRODUCTION	1160486.73	2.647	1123213.84	2.667
42.	Taxes	102902.62	.235	119599.84	.284

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8. COST OF OPERATING: (CONT.) (Retroactive payroll not divided between 1945 & 1944 from hereon.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail Of Accounts: (Cont.)

1. Exploring in Mine

Covers a proportion of Geological Department expense, and in 1945 the expense to E. & A. - A.M.-16 - Diamond Drill Exploration for drilling 1,600 feet from the 8th Level of Athens Mine to explore the trough of iron formation lying to the North of the East-West diabase dike.

The increase in cost for 1945 was $10,406.55 of which $9,114.08 was for diamond drill expense.

(3) Development in Rock

Total feet of drifting and raising in rock was 652 feet in 1945 as compared with 2,229 feet in 1944. Decrease in expense was $18,968.24 and in cost per ton $.046. Drifting in 1945 was 214 feet; in 1944, 1,534 feet. Raising in 1945 was 438 feet; in 1944, 695 feet.

(4) Development in Ore

There were 3,070 feet more ore drifting and an increase of 344 feet raising in 1945. The increase in expense was $28,656.88, and in cost per ton $.064.

(5) Stoping

The increase in expense was $59.35 and the cost per ton decreased $.020.

(6) Timbering

The increase in expense was $2,298.64, while the cost per ton decreased $.027. The cost of timber, lagging and poles decreased $.0189 per ton. There were three new "HU" Utility Air Hoists purchased in 1945 at the cost of $475.00 each.

(7) Tramming

There was an increase of 17,274 tons in production. The expense to this account decreased $2,720.71 and cost per ton $.015.

(8) Ventilation

The increase in expense was $6,707.94 and cost per ton $.014. The increase in expense was due to concreting a ventilation raise and $3,456.81 more for electric power.

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail Of Accounts: (Cont.)

9. Pumping

Expense decreased $2,061.53 and cost per ton $.007.
Gallons of water pumped in 1945 - 174,073,654
Gallons of water pumped in 1944 - 161,935,952
Gallons increase - 12,137,702
Average gallons per minute in 1945 - 332
Average gallons per minute in 1944 - 308
Gallons increase 24
The cost for electric power was $1,815.89 less than in 1944.

In 1945 the pumping was done on two shifts while in 1944 the pumps were operated on the three shifts to December 16th which required one more pumpman.

10. Compressors And Air Pipes

Expenditures increased $1,619.32 and cost per ton decreased $.001.
Cubic feet air compressed in 1945 - 873,710,000
Cubic feet air compressed in 1944 - 900,765,000
Decrease 27,055,000

Cost of electric power in 1945 - $28,757.13
Cost of electric power in 1944 - 29,140.13
Decrease 383.00

11. Fire And Damage

Expense in 1945 - $70.70
Expense in 1944 - None

12. Underground Superintendence

The increase in expense was $2,287.19 and cost per ton $.003. The increase was due to payment of retroactive pay adjustment for 1944 and 1945, and part of district captain expense.

13. Cave-in

Expense in 1945 - None; cost per ton - none.
Expense in 1944 - $74.79; cost per ton - $.000.

14. Compressors And Power Drills

The increase in expense was $1,160.50 and cost per ton increased $.002. There were four R.B-12 Jackhammer drill machines purchased in 1945 costing $200.00 each as compared to one R-58 Wet Stoper Machine bought in 1944. There were also increases in repairs to the Ingersoll-Rand compressor and 6" air line in shaft.

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail Of Accounts: (Cont.)

15. Scrapers And Mechanical Loaders:

The expense in 1945 increased $2,305.87 and cost per ton $.003. There were no new electric scraper hoists or scrapers bought in 1945. The repairs to electric scraper hoists increased due to several of the hoists being older models.

16. Electric Tram Equipment

The decrease in expense was $5,448.51 and cost per ton $.015.

Detail:

	Generators	Locomotives	Wiring	M.L. Track	M.L. Cars
1945	87.24	5,556.45	562.53	9,864.81	3,690.19
1944	418.74	7,124.15	1,131.98	9,119.30	7,425.56
Increase				745.51	
Decrease	331.50	1,567.70	569.45		3,735.37

There was an increase in repairs to main line tracks, while the expense to generators, locomotives, wiring and main line cars showed a decrease in expenditures.

17. Pumping Machinery

Expenditures decrease $1,226.60 and cost per ton $.004. The decrease in expense was due to less repairs to electric pumps.

SURFACE COSTS:

18. Hoisting

	Ore	Rock	Total
Product 1945 - Tons	438,427	12,365	450,792
Product 1944 - Tons	421,153	30,725	451,878
Increase	17,274		
Decrease		18,360	1,086

Expenditures decreased $297.53 and cost per ton $.005. The electric power charge was $1,253.01 less than in 1944.

19. Stocking Ore:

Tons stocked in 1945 -	150,485
Tons stocked in 1944 -	174,529
Decrease	24,044

There was a decrease in expense of $1,462.90 and cost per ton $.003. Part of the decrease in expense was due to taking down wood stocking trestle in 1944.

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ANNUAL REPORT
YEAR - 1945

8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail Of Accounts: (Cont.)

21. Dry House Expense

The expenditures increased $4,338.03 and cost per ton $.009. The increase was due to more expense for heating on account of an extra fireman in the heating plant. In 1944 the dryman done the firing on the day shift.

22. General Surface Expense:

Expense decreased $840.84 and cost per ton $.003. The decrease in expense was due to the day shift policeman being taken off except on Sundays and holidays.

23. Hoisting Equipment

	Electric Hoists	Hoisting Ropes	Skips And Skip Roads	Sheaves
1945	3,374.13	2,831.21	5,974.56	2,001.93
1944	3,382.04	4,060.75	7,506.69	524.61
Increase				1,477.32
Decrease	7.91	1,229.54	1,532.13	

Expense decreased $1,292.26 and cost per ton $.005. The increase in expense for sheaves was due to purchase of two new type 8' bicycle head frame sheaves to replace old type on skip ropes. The expense for electric hoists and skips and skip roads decreased due to less repairs. In 1945 two 1-3/8" skip ropes costing $2,831.21 were charged out as compared with two 1-3/8"skip ropes and one 1¼" cage rope costing $4,060.75 in 1944.

24. Shaft

There was an increase in expense of $2,760.58 and cost per ton $.006.

	Steel Sets	U. G. Pockets
1945	2,381.95	6,258.20
1944	1,024.37	4,855.20
Increase	1,357.58	1,403.00

There were more repairs to steel sets and underground pockets in 1945.

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail Of Accounts: (Cont.)

25. Top Tram Equipment

There was an decrease in expense of $565.70 and cost per ton $.001.

	Engines & Motors	Wire Rope	Sheaves Rollers, Etc.	Tracks & Cars
1945	122.20	None	547.26	1,524.43
1944	127.13	489.33	522.89	1,620.24
Increase			24.37	
Decrease	4.93	489.33		95.81

There was 150,485 tons stocked as compared with 174,529 tons in 1944.

26. Docks, Trestles, And Pockets

The decrease in expenditures was $4,460.45 and cost per ton $.010. There was no wood trestle erected in 1945 while in 1944 there were seven bents of permanent ore stocking trestle and twelve bents of temporary trestle erected between the North and Southeast steel stocking trestles.

27. Mine Buildings

The expenditures increase $4,353.58 and cost per ton $.009.

Office	617.27	Moving furnace to old laboratory building. Putting in new pipes for heating system and water lines. Remodeling back room for map room.
Shops	230.02	Making new doors, repairing windows and brick work.
Shaft House	6,170.13	Replacement of corroded structual steel members. $5,970.00 was transferred from E. & A.-AM -15 to this account.
Engine House	877.52	Building new doors, repairing windows and brick work.
Heating Plant	87.97	Putting in new cement floor and repairing windows.
Dry House	480.90	Repairs to brick work, pipe lines, and painting.
Coal Dock	4.86	New railing.
Timber Tunnel	532.53	Repairing concrete wall on North side which was cracked and shifted.
Top Tram Building	78.89	Repairs to windows and doors.
Storage Building	85.21	Repairs to brick work.
Miscellaneous Buildings	519.20	Installing heating plant in old laboratory building, and remodeling for office and change room for captain and surface foreman.
Total	9,684.50	

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail Of Accounts: (Cont.)

GENERAL MINE EXPENSE:

28. Mining Engineering:

The expense to this account increased $360.41 and cost per ton remained at $.009, same as in 1944. Covers time and expense of mining engineer and helper.

29. Mechanical And Electrical Engineering:

The increase in expense to this account was $94.38 while the cost per ton remained the same as last year. The charge to this account covers the time spent by mechanical and electrical department men on inspections and repairs.

30. Analysis And Grading:

	Sampling At Mine	Central Laboratory exp.	Shipping Dept. Exp.	Trucking Samples, Etc.
1945	2,470.73	9,653.51	2,854.67	742.70
1944	3,903.86	9,391.37	2,901.37	633.59
Increase		262.14		109.11
Decrease	1,433.13		46.70	

Determinations 1945 - 71,434 - Cost per determination - .135139
Determinations 1944 - 34,390 - Cost per determination - .273084

There was a decrease in expenditures to this account of $1,108.58 and cost per ton $.004.

31. Safety Department

	First Aid Supplies	First Aid & Helmet Practice	Ishpeming Office Charge
1945	142.03	94.96	1,933.73
1944	133.90	95.20	1,926.98
Increase	8.13		6.75
Decrease		.24	

The expense to this account increased $37.39 while the cost per ton remained the same.

32. Telephones And Safety Devices

Expenditures to this account increased $321.04 and cost per ton $.001.

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail Of Accounts: (Cont.)

32. Telephones And Safety Devices: (Cont.)

	1945	1944	Increase	Decrease
Lights At Shaft & Levels	1,533.84	1,778.78		244.94
Mine Telephone	160.12	176.99		16.87
Safety Gates	687.21	18.93	668.28	
Sign Boards & Signals	85.03	130.99		45.96
Fire Equipment	87.99	127.46		39.47

33. Local And General Welfare:

The expense to this account increased $83.35 and the cost per ton remained the same.

34. Special Expense, Pensions And Allowances:

	Legal	Saranac Investigation	Retirement	Other Expense	Pensions & Allowances
1945	401.04	1,901.73	3,089.83	1,483.20	965.08
1944	756.70	1,794.95	2,777.25	2,093.92	1,096.75
Inc.		106.78	312.58		
Dec.	355.66			610.72	131.67

There was a decrease in expenditures of $678.69 and cost per ton $.002.

35. Ishpeming Office:

Ishpeming Office expense is pro-rated to various mines on basis of labor costs. There was a decrease in expense of $537.17 and cost per ton $.003.

36. Mine Office:

	Salaries	Central Warehouse Exp.	Miscellaneous
1945	14,208.62	4,093.78	1,182.21
1944	15,152.68	4,348.57	1,097.72
Increase			84.49
Decrease	944.06	254.79	

The decrease in expenditures was $1,114.36 and cost per ton $.005.

37. Insurance:

	Property	Group	Catastrophe
1945	1,329.59	1,969.82	537.58
1944	1,814.90	1,024.96	508.95
Increase		944.86	28.63
Decrease	485.31		

The expense to this account increased $488.18 and cost per ton $.001.

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail Of Accounts: (Cont.)

38. Personal Injury:

	Compensation And Doctors	Compensation Department	Hospital Loss
1945	5,931.63	658.85	5,984.28
1944	10,471.54	667.55	2,597.17
Increase			3,387.11
Decrease	4,539.91	8.70	

There was a decrease in expense of $1,161.50 and cost per ton $.004.

39. Social Security Taxes:

	Unemployment Insurance Tax	Old Age Benefit Tax
1945	10,303.77	7,926.02
1944	9,896.96	7,613.03
Increase	406.81	312.99

The expense to this account increased $719.80 and cost per ton $.001.

40. Employees Vacation Pay:

There was an increase in expense of $13,542.46 and cost per ton $.029. The increase in expense was due to an adjustment in 1945 and 1944 vacation pay on a basis of one week vacation for one year of service and two weeks vacation for five years of service. The previous schedule was one week vacation for three years of service and two weeks vacation for ten years of service.

41. Group Annuity Premiums:

There was a decrease of $1,378.89 and cost per ton $.003.

42. Taxes:

The expense to this account decreased $16,697.22 and cost per ton $.049.

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9. EXPLORATIONS AND FUTURE EXPLORATIONS:

An underground diamond drilling program to explore the structure North of the large diorite was started late in January and continued until the middle of June with four holes being completed. Two were drilled from 8th Level and two from 10th Level.

Following is the locations and logs of the four drill holes.

D.D. Hole No. 13 - 8th Level - S 3066.11 & 753.62 W Dip + 3° N83°-50'W El. -790.02

D.D. Hole No. 14 - 8th Level - S 3060.85 & 753.00 W Dip + 3° N51°-21'W El. -790.

D.D. Hole No. 15 - 10th Level - S 3314.15 & 1339.42 W Dip + 1° N29°-42'W El. -994.33

D.D. Hole No. 16 - 10th Level - S 3310.81 & 1334.60 W Dip + 0° N 1°-05'E El. -995.1

D. D. Hole No. 13	D. D. Hole No. 14	D. D. Hole No. 15	D. D. Hole No. 16
0'-530' Sl.& Grwacke	0'-126' Sl.& Grwacke	0'-165' Diorite Dk.	0'-131' Diorite Dk.
530'-644' Blue Jasper	126'-139' Dike	165'-342' Ore	131'-142' Lean Ore
644'-655' Ore	139'-870' Sl.& Grwacke	342'-423' Slate	142'-220' Ore
655'-660' Lean Ore	Stopped 3/17/45	Stopped 6/1/45	220'-283' Ferr. Slate
660'-672' Ore			Stopped 6/15/45
672'-690' Lean Ore			
690'-795' Blue Jasper			
Stopped 4/12/45			

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10. TAXES:

COMPARATIVE STATEMENT OF TAXES FOR THE YEARS 1945 AND 1944

DESCRIPTION	1945 VALUATION	1945 TAXES	1944 VALUATION	1944 TAXES
CITY OF NEGAUNEE				
Realty (Tax Commission)	2,095,000	88,383.65	2,365,000	98,784.16
Stockpile, Supplies and Equipment	320,000	13,500.13	470,000	19,631.52
Total by Tax Commission	2,415,000	101,883.78	2,835,000	118,415.68
Collection fees		1,018.84		1,184.16
Total Operating Athens Mine		102,902.62		119,599.84
HARVEY ADDITION				
Lot 1, Portion of	950	40.08	950	39.68
Lot 2, Portion of	190	8.02	190	7.94
Lot 3, Portion of			100	4.18
Lots 5, 6, Portion of (Cedarblade) .33 acres	760	32.06	760	31.74
Lot 6, Portion of .36 acres	855	36.07	855	35.71
Lot 7, Portion of .34 acres			950	39.68
Lot 7, Portion of (Lehman)	475	20.04	475	19.84
Lot 7, Portion of, Records 81	475	20.04	475	19.84
Lot 7, Portion of, Records 213	665	28.05	665	27.78
Appros. .5 acres in Sec. 6, 47-26 (Primeau)	475	20.04	475	19.84
Portion of Sec. 6, 47-26, (Anderson Pur.)			760	31.74
STERLING ADDITION				
Lot 1 & W. 13' Lot 2, & W 6½' of Lot 3	190	8.02	190	7.94
Lot 7, (Vassanen)	1,330	56.11	1,330	55.55
Lots 8, 9 (Bjornberg)	1,140	48.09	1,140	47.61
Lot 10, (Delarye)	855	36.07	855	35.71
Lots 11, (2 Houses)	1,140	48.09	1,140	47.62
Lots 12, 13	2,185	92.18	2,185	91.27
Lot 14, (Wisk)	1,045	44.10	1,045	43.64
Lot 15, (Johnson)	1,425	60.12	1,425	59.52
Lots 16, 17 (Roma)	1,520	64.13	1,520	63.49
Lot 18 (CCI Co.)	1,140	48.09	1,140	47.62
Lot 19, (Turpinen)	855	36.07	855	35.71
Lot 20, (Savola)	475	20.04	475	19.84
Lot 22, (Pachette)	475	20.04	475	19.84
Lots 23, 24 (CCI Co.)	1,425	60.12	1,425	59.52
Lot 25, (Foreland)	855	36.07	855	35.71
Lot 26, (CCI Co.)	855	36.07	855	35.71
Lot 27, (Maki)	855	36.07	855	35.71
Lot 28, (CCI Co.)	1,330	56.11	1,330	55.55
Lot 29, (Mattson)	1,710	72.14	1,710	71.43
Lot 30, (Rund)	1,330	56.11	1,330	55.55
Lots 31 to 38 (CCI Co.)	4,370	184.36	4,370	182.53
Lot 72, (Lehman)	100	4.22	100	4.18
Lots 73, 74, 75	290	12.24	290	12.12
Total	31,740	1,339.06	33,550	1,401.34
Collection fees		13.39		14.02
Total Rented Buildings		1,352.45		1,415.36
Total Athens Iron Mining Co.	2,446,740	104,255.07	2,868,550	121,015.20
Total	2,446,740	104,255.07	2,868,550	121,015.20

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11. ACCIDENTS AND PERSONAL INJURY:

The following table gives number and time lost from compensable accidents in the past six years.

	1945	1944	1943	1942	1941	1940
Fatal	0	0	0	0	0	1
Time Lost - Over 4 months	0	2	4	2	1	1
- 1 to 4 months	7	7	4	9	7	4
- Less than 1 month	7	12	18	5	10	3
Total compensable accidents	14	21	26	16	18	11
Number of cases paid compensation for accidents prior to Jan. 1st each year.	4	4	4	4	4	4
Number of cases paid difference in wages (included in above total.)	2	2	1	2	2	3

The following table gives the accident record of the 9 underground properties compared to the Athens Mine.

	Hrs. Of Labor	No. Of Compensable Accidents	Days Lost	Frequency	Severity
Compensable Accidents 9 U.G. Mines	5,211,076	99	13,340	19.00	2.560
All Accidents 9 U. G. Mines	5,211,076	222	13,661	42.60	2.622
Compensable Accidents Athens Mine	735,204	14	439	19.04	.596
All Accidents Athens Mine	735,204	28	463	38.08	.630

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11. ACCIDENTS AND PERSONAL INJURY: (CONT.)

Nature and Classification of Compensable Accidents:

Date	Remarks	Days Lost
1/23/45	Compound fracture, left thumb	54
1/24/45	Fracture, mid finger, left hand	45
3/30/45	Fracture, right forearm	43
4/5/45	Bruised left knee	47
5/18/45	Sprain lower back	14
5/29/45	Bruised left leg and thigh	29
6/6/45	Bruised right ankle	10
6/12/45	Contusion, left great toe	10
9/19/45	Laceration over eye	10
9/13/45	Fracture, 10th rib, right	22
10/1/45	Laceration of heel	55
10/12/45	Sprained lower back	25
10/29/45	Bruised chest wall	59
12/14/45	Bruised chest and right shoulder	16

12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION:

There were no new E. & A.'s authorized in 1945.

The following is a detail of the active E. & A.'s which were authorized in 1944:

E. & A. No. A.M. - 15 - Shaft House Repairs - Approved December 26th, 1944

	Amount Authorized	Expended	Unexpended
Angles and Plate	$ 900.00	$1,844.31	944.31
Rivets, Acetylene Gas, Etc.	1,200.00	886.26	$ 313.74
Labor	3,960.00	3,411.90	548.10
Total	6,060.00	6,142.47	82.47

E. & A. No. A.M. - 16 - Diamond Drill Exploration - Approved Dec. 26th 1944

1,600' Diamond Drilling	10,000.00	9,114.08	885.92
Supplement 8/27/45	2,445.09		
Total	12,445.09	9,114.08	3,331.01

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13. EQUIPMENT AND PROPOSED EQUIPMENT:

a. Power Shovels:

The Athens Iron Mining Company does not own a power shovel. No. 43 Steam Shovel owned by the Cleveland Cliffs Iron Company loaded the ore shipped from stockpiles in 1945. Rent for each day this shovel operated was paid by the Athens Iron Mining Company.

b. Scraper Hoists:

Following is a list of scraper hoist equipment at the mine:

		1945			1944	
Company		Machines	Total Cost Of Machines Repaired	Each Mach. Repaired	Total Cost Of Machines Repaired	Each Mach. Repaired
Sullivan	15 H.P. Elec.	15	5	$320.37	9	$199.33
Sullivan	20 H.P. "	3	3	285.17		
Sullivan	25 H.P. "	1				
Ing.-Rand	15 H.P. "	6	3	300.08		
Ing.-Rand	20 H.P. "	7	3	357.21	3	508.20
Ing.-Rand	25 H.P. "	4	2	220.86		
Total		36	16	285.68	12	276.55

There were no new scraper hoists purchased in 1945 or in 1944. During 1945 three 15 H.P. Sullivan scraper hoists were scrapped; one being buried in a mud run and two left in the area of the fire in January 1943.

c. Drill Machines:

Purchases in 1945 and 1944 are listed below:

1945

4 - RB-12 Ing.-Rand Auger Drill Machines

1944

1 - R-58 Ing.-Rand Wet Stoper Machine

Eight RB-12 Ingersoll-Rand Auger Drill machines were scrapped during 1945 due to being worn out.

d. Motor Haulage Cars:

No new cars were purchased in 1945 or in 1944. Eight of the underground haulage cars were overhauled at the mine in 1945 as compared with twenty-two in 1944. The cost of repairs in 1945 was $3,690.19 and in 1944 $7,425.56.

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13. EQUIPMENT AND PROPOSED EQUIPMENT: (CONT.)

e. Timber Hoists:

During the year three H.U. Utility Air Hoists were purched in 1945 as compared with two in 1944. It is necessary to continue replacing the old timber hoists as they are worn out. The old ones are obsolete and parts are no longer available.

14. MAINTENANCE AND REPAIRS:

a. Steel Trestles:

There was no work done on the steel trestles during 1945.

b. Comparison Of Costs - 1945 with 1944:

Maintenance and repairs listed under underground costs:

	Amount	Cost Per Ton
1945	$49,993.77	$.113
1944	53,202.51	.127
Decrease	3,208.74	.014

Maintenance and repairs listed by the four accounts as shown on the cost sheet:

	1945	1944	Increase	Decrease
Comp. & Power Drills	3,192.65	2,032.15	1,160.50	
Scraper Equipment	24,631.48	22,325.61	2,305.87	
Elec. Tram Equipt.	19,771.22	25,219.73		5,448.51
Pumping Machinery	2,398.42	3,625.02		1,226.60
Total	49,993.77	53,202.51		3,208.74

Purchases 1945

Power Drills: 4 - RB-12 Ingersoll-Rand Drill Machines - $800.00

Scraper Hoists and Scrapers - None.

Maintenance and repairs listed under surface costs:

	Amount	Cost Per Ton
1945	37,648.62	$.086
1944	36,852.87	.087
Increase	795.75	
Decrease		.001

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14. MAINTENANCE AND REPAIRS: (CONT.)

b. Comparison Of Costs - 1945 with 1944 (Cont.)

Maintenance and repairs listed in the five accounts as shown on the cost sheet:

	1945	1944	Increase	Decrease
Hoisting Equipment	14,181.83	15,474.09		1,292.26
Shaft	8,640.15	5,879.57	2,760.58	
Top Tram Equipment	2,193.89	2,759.59		565.70
D. T. & Pockets	2,948.25	7,408.70		4,460.45
Mine Buildings	9,684.50	5,330.92	4,353.58	
Total	37,648.62	36,852.87	795.75	

15. POWER:

Detail of electric current purchased compared with 1944:

	1945 - 12 Mos. Optg.		1944 - 12 Mos. Optg.	
	Cost	Per Ton	Cost	Per Ton
Stoping	2,749.82	.006	2,804.72	.007
Ventilation	12,615.59	.029	9,158.78	.022
Pumping	21,774.58	.050	19,958.69	.047
Hoisting	24,944.48	.057	26,197.49	.062
Stocking Ore	672.15	.001	832.01	.002
Dry House	874.69	.002	809.36	.002
Lights at Levels	724.51	.002	781.87	.002
Compressors	28,757.13	.066	29,140.13	.069
Electric Haulage	2,432.32	.005	2,532.75	.006
Shops	417.16	.001	339.63	.001
Heating	17.54	.000	17.27	.000
Office	53.85	.000	41.89	.000
Storage Battery Loco.	29.50	.000	32.50	.000
Surface Lights	421.19	.001	414.80	.001
Total	96,484.51	.220	93,061.89	.221
Main Line Meter - K.W.	6,798,000		6,668,019	
Separate Meter Readings	6,598,367		6,503,548	
Line Loss	199,633		164,471	
Product	438,427		421,153	
K.W. Per Ton (Inc. Line Loss)	15.505		15.438	
Cost Per K.W. (Avg.)	.014193073		.014313583	
15 Min. Demand (Avg.)	1577		1433	
Load Factor (Avg.)	48.92%		52.75%	

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17. CONDITION OF PREMISES:

a. The grounds around the mine were kept in good condition throughout the year.

b. Athens Mine Houses:

The following statement give the total cost of repairs and the average cost per house for 1945 and 1944:

Year	No. Houses	Amount Repairs	Avg. Cost Per House	Rental Income	Taxes And Insurance	Net Income
1945	30	$6,760.91	$225.36	$5,329.80	$1,490.10	$2,921.21
1944	30	5,514.73	183.82	5,005.00	1,536.80	2,046.53

18. NATIONALITY OF EMPLOYEES:

The following statements show, first, the nationality by parentage, and secondly, a separation of nationalities into American and foreign born.

As To Parentage	1945	Percent	1944	Percent
Finnish	133	41.8	148	40.9
Italian	53	16.7	64	17.7
English	52	16.3	53	14.6
French (Canadian)	35	11.0	42	11.6
Swedish	25	7.9	29	8.0
French (France)	1	0.3	1	0.3
Scotch	1	0.3	1	0.3
German	4	1.3	6	1.7
Austrian	4	1.3	4.	1.1
Norwegian	5	1.6	7	1.9
Irish	2	0.6	6	1.1
Greek	1	0.3	1	0.3
Polish	2	0.6	2	0.5
Total	318	100.	362	100.

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18. NATIONALITY OF EMPLOYEES: (CONT.)

	American Born		Foreign Born	
As To Birth	1945	1944	1945	1944
Finnish	96	107	37	41
English	40	41	12	12
Italian	22	31	31	33
French (Canadian)	32	40	3	2
Swedish	20	23	5	6
French (France)	1	1	0	0
Scotch	1	1	0	0
German	4	6	0	0
Austrian	3	3	1	1
Norwegian	5	7	0	0
Irish	2	4	0	0
Greek	0	0	1	1
Polish	2	2	0	0
Total	228	266	90	96
Percent	71.7%	73.5%	28.3%	26.5%

CAMBRIA-JACKSON MINE
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1. GENERAL:

The Cambria-Jackson Mine operated on an eleven-shift per week schedule during the entire year, two shifts for the first five days of the week and one shift on Saturday. The other shift on Saturdays was used to take down supplies. The problem of taking down supplies is still the controlling factor in the amount of ore that can be produced. It has been estimated that if enough men were available to take down supplies on the midnight shift and two or three gangs of miners added on the operating shifts the production could be considerably increased and at a considerable reduction in costs. This will probably be done when enough men can be procured.

Production in 1945 was 315,514 tons, an increase of 33,330 tons over the previous year. To this amount there should be added approximately 5,000 tons representing the estimated overrun in ore stocked. As the ore stocked was not entirely loaded out no credit was received for this overrun.

Development for the mining of the ore below the Sixth Level in the West Deposit was completed the forepart of the year and mining is now in operation. This ore is being mined on the sub-level caving system.

There were a great number of delays and loss in tonnage due to breakdowns, most of which occurred in the engine house. There should be a considerable decrease in the number of delays next year as all equipment is now in very good condition.

The Seventh Level pumproom was enlarged during the year to make room for the installation of a new Gould triplex plunger pump. The pump is erected and lined up but is not yet connected to the discharge line. There is also on hand a Prescott horizontal duplex plunger pump complete with motor and controls which was purchased from the Oliver Iron Mining Company's Holmes Mine, which will be installed in the same pumproom as soon as the Gould pump is put into operation. These installations will eliminate all pumps on the Fifth and Sixth Levels.

The Aerodyne fan, which was purchased last year for ventilation between the Mather Mine and the Cambria-Jackson when it was proposed to connect the two mines, has been installed and put in operation on the Sixth Level. This fan is set for the deliverance of 35,000 cubic feet per minute as compared with less than 20,000 cubic feet per minute from the fan formerly used. The ventilation throughout the mine has been greatly improved by this installation.

2. PRODUCTION SHIPMENTS & INVENTORIES:

a. Production by Grades:

	1945	1944	Increase	Decrease
Cambria Lease Ore		67		67
Jackson Strip Ore	315,514	282,117	33,397	
Rock	3,708	16,220		12,512
Total Hoist	319,222	298,404	20,818	

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2. PRODUCTION SHIPMENTS & INVENTORIES: (CONT.)

b. Shipments:

	Pocket Tons	Stockpile Tons	Total Tons	Total Tons Last Year
Cambria Lease				702
Jackson Strip	207,659	86,834	294,493	341,651
Total 1945	207,659	86,834	294,493	342,353
Total 1944	157,736	184,617	342,353	
Increase	49,923			
Decrease		97,783	47,860	

Shipments decreased 13.98% in 1945 and were 21,021 tons less than the product for the year.

c. Stockpile Inventories:

	Dec. 31, 1945	Dec. 31, 1944	Increase
Cambria Lease			
Jackson Strip	43,596	22,575	21,021
Total	43,596	22,575	21,021

d. Division of Product by Levels:

	1945	Percentage	1944	Percentage
6th Level	94,945	30.09	63,491	22.50
7th Level	220,569	69.91	218,693	77.50
	315,514	100.00	282,184	100.00

The increase in production from the 6th Level was due to change from top slicing to sub-level caving.

e. Production by Months:

Month	Cambria Lease	Jackson Strip	Total Ore	Rock
January		20,763	20,763	872
February		24,970	24,970	112
March		30,622	30,622	472
April		22,114	22,114	868
May		26,464	26,464	108
June		24,283	24,283	412
July		25,456	25,456	432
August		28,896	28,896	
September		27,093	27,093	208
October		31,312	31,312	36
November		26,725	26,725	
December		26,816	26,816	188
Total 1945		315,514	315,514	3,708
Total 1944	67	282,117	282,184	16,220
Increase		33,397	33,330	
Decrease	67			12,512

f. Ore Statement:

	Cambria Lease	Jackson Strip	Total 1945	Total 1944
On Hand Jan. 1, 1945		22,575	22,575	72,504
Product for Year		315,514	315,514	270,541
Total		338,089	338,089	343,045
Stockpile Overrun				21,883
Total		338,089	338,089	364,928
Shipments		294,493	294,493	342,353
Balance on Hand Dec.31,1945		43,596	43,596	22,575
Increase in Output	67	45,040	44,973	4,980
Increase in Ore on Hand		21,021	21,021	49,929

2. PRODUCTION SHIPMENTS & INVENTORIES: (CONT.)

1945 Five 2-8 hr. Shifts 1-1-45 to 1-22-45
Five 2-8 hr. Shifts and 1 1-8 hr. Shift 1-22-45 to 12-31-45

1944 Five 2-8 hr. Shifts and 1 1-8 hr. Shift 1-1-44 to 7-1-44
Five 2-8 hr. Shifts 7-1-44 to 12-31-44

1943 Five 3-8 hr. Shifts and 1 2-8 hr. Shift 1-1-43 to 6-12-43
Five 3-8 hr. Shifts and 1 1-8 hr. Shift 6-12-43 to 7-6-43
Five 2-8 hr. Shifts and 1 1-8 hr. Shift 7-6-43 to 12-31-43

g. Delays:

January 2, 16 hours delay - Loss of Product - 800 Tons

Compressor belt failure. The belt was changed on Sunday, December 31st, and everything was ready to start operations on Tuesday, January 2nd. The compressor was started on Tuesday morning about one-half hour before the men were due to go underground. The compressor had run only a few minutes when it was discovered that one of the splices on the belt was unravelling and that it would have to be repaired. As no mining could be done without air all the crew was sent home except a few men selected to do repair work and take down supplies.

January 19, 4-3/4 hours delay - Loss of Product - 238 Tons

The top tram larry car was run off the end of the stocking trestle with a vertical drop of about 40 feet and wrecked the car almost beyond repair. The spare car was at the general shops at Ishpeming where it had been taken several months before for an overhauling. This job had been held up awaiting delivery of parts. As the parts required to complete this car were undamaged on the car that had run off the trestle it was possible to complete repairs on the spare car.

January 31, 4-1/2 hours delay - Loss of Product - 383 Tons

Delay was caused by the worm gear bearing on the larry car burning out and again it was necessary to rob parts from the car that had run off the trestle and which had been taken to the general shops to be rebuilt.

March 5, 1 hour delay - No Loss of Product

Catches of skip catching on stringers.

April 14, 8 hours delay - Loss of Product - 500 Tons

Hoist motor failure. One of the fin spacers placed between the outside rotor lamination and the compression ring broke loose, scored the stator insulation as it turned with the rotor and then fell into and wedged between two coils of the stator where it broke down the stator insulation and shorted several coils.

April 23, 2 hours delay - Loss of Product - 130 Tons

Electric power failure. Low voltage.

April 30, 4 hours delay - Loss of Product - 200 Tons

Hoisting rope failure. This rope was being watched and inspected very closely as it was badly worn, but there was not a single wire broken and it was thought that it could be used for another week or two. Two hours after the inspection it was discovered that scores of breaks had occurred since the inspection, there being as many as six broken wires in four feet of rope. After looking the rope over carefully it was decided to change the rope immediately.

2. PRODUCTION SHIPMENTS & INVENTORIES: (CONT.)

g. Delays: (Cont.)

June 1, 11-3/4 hours delay - Loss of Product - 900 Tons
Hoist motor failure. Current blew through insulation short circuiting and burning out several coils.

July 2, 1-1/4 hours delay - Loss of Product - 60 Tons
Hoist motor flashing. This motor, after the June 1st failure, was taken into the general shop and a factory employee came up from Milwaukee and made the repairs. This motor was again in operation on the 10th of June. After three weeks of running the motor started flashing on heavy loads. This went along until the weekend of July 8th, when it was taken out and sent to Milwaukee for a complete overhaul. The motor was returned and put in operation on August 5th. The whole trouble with the motor seems to have been faulty insulation. During the time this motor was being repaired the hoist was operated with a 400-horsepower motor which was much slower and could hoist only partly loaded skips, causing a considerable loss of time, which had to be made up by hoisting overtime.

July 24, 1 hour delay - Loss of Product - 100 Tons
Burned coils in Engine House.

July 25, 1/2 hour delay - Loss of Product - 50 Tons
Inspecting skip rope.

July 26, 3/4 hour delay - Loss of Product - 75 Tons
Repairing skip.

August 3, 2 hours delay - Loss of Product - 250 Tons
Repairing skip.

August 6, 1-1/2 hours delay - Loss of Product - 150 Tons
Cutting hoist rope.

November 20, 2-1/2 hours delay - Loss of Product - 250 Tons
Burned out coils in Motor-Generator Set. The spare Motor-Generator set had been moved into the new addition to the engine house and was all lined up but not hooked up when this breakdown occurred. A temporary hookup was made and the generator was in operation in 2-1/2 hours.

The total loss of product from the 14 delays listed above amounted to 3,986 tons. It will be noted that most of this loss was due to failures in the engine house. Unless something unforseen happens delays during next year should be almost entirely eliminated, as the engine house is now equipped with a spare generator and compressor and all machinery is in excellent condition.

h. Delays Due to Lack of Current:

On April 23 there was a delay of 2 hours due to low voltage.

3. ANALYSIS:

a. Average Mine Analysis on Output:

Grade	Tons	Iron	Phos.	Silica	Sulphur
Cambria Jackson	315,514	59.57	.079	8.39	.015

b. Average Mine Analysis on Straight Cargoes:

All ore shipped was mixed with other grades.

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4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:

Assumption:

12.00 cubic feet equals one ton
10% deduction for loss in mining and rock

Percentage of Bessemer:

None.

Area	City of Negaunee Cambria Lease	City of Negaunee Jackson Strip	Ishpeming Jackson Strip	Total Standard Ore	City of Negaunee High Sul. Ore
Above 5th Level - #1 Deposit	24,394			24,394	
Between 5th & 6th Lev.- "	41,146			41,146	
Above 6th Lev.-#2 Deposit	2,667	329,707		332,374	
Bet.6th&7th Lev.- "	3,188	1,418,108		1,421,296	335,735
Bet.6th&7th Lev.-#3 Deposit	6,885		97,348	104,233	
Below 7th Lev. - #2 Deposit		14,688		14,688	146,771
Total Gross as of November 30, 1945	78,280	1,762,503	97,348	1,938,131	482,506
December 1945 Production		26,816		26,816	
Total Gross as of December 31st, 1945	78,280	1,735,687	97,348	1,911,315	482,506
Less 10% for Loss in Mining and Rock	7,828	173,569	9,735	191,132	48,251
Net Total as of Dec.31,1945	70,452	1,562,118	87,613	1,720,183	434,255

b. Total Developed Ore:

	Cambria Lease	Jackson Strip	Total
1944 Estimate	8,539	1,525,968	1,534,507
Increase 1945	61,913	123,763	185,676

The ore estimate at this mine is divided between the Cambria Lease and Jackson Strip in the City of Negaunee and a portion of the Jackson Strip in the City of Ishpeming. The product in 1945 was 315,514 tons, which amount must be added to the increase in ore reserves shown at the end of 1945, making a total of 501,190 tons developed in 1945. This figure of ore developed in 1945 is not actual because in making the estimates in 1944 a 10% reduction was made for loss in mining and another 10% for rock, whereas in 1945 a reduction of only 10% was made to cover both loss in mining and rock, which would bring the ore actually developed in 1945 down to 328,621 tons. The increase is due to diamond drilling on the Fifth Level and a slight increase in the areas of ore being mined.

It is very probable that a considerable tonnage of ore will be developed in that portion of the Jackson Strip adjoining the Mather Mine as at the present time the Mather Mine is mining along the West line of the Jackson Strip.

c. Expected Average Natural Analysis:

Tons	Iron	Phos.	Silica	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moisture
1,720,183	51.62	.073	8.40	.18	2.22	.55	.25	.018	1.61	12.50

d. Ore in Stock; Average Natural Analysis:

Cambria-Jackson Ore:

Tons	Iron	Phos.	Silica	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moisture
43,596	51.99	.075	7.68	.17	2.38	.51	.17	.013	2.04	11.95

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5. LABOR AND WAGES:

a. Comments:

There were 179 men on the payroll on December 31st, 1944, and 185 on December 31st, 1945, showing an increase of 6 men. During the year one man was drafted, ten quit to take other jobs, three discharged for cause, three retired due to age, one transferred to another property and 24 men were hired, making a net gain of 6 men.

Three greivances were presented by the union during the year, two of which were denied and settled in the lower steps, and the third withdrawn before any action was taken.

b. Comparative Statement of Wages and Product:

		1945	1944	Increase	Decrease
Product:		315,514	282,184	33,330	
No. Shifts and Hours	1-8	57	27	30	
	2-8	242	251		9
Average No. Men Working:					
Surface		52	54		2
Underground		131	136		5
Total		183	190		7
Average Wages per Day:					
Surface		7.75	6.97	.78	
Underground		8.83	7.93	.90	
Total		8.52	7.76	.76	
Average Wages per Month:					
Surface		188.10	161.10	27.00	
Underground		207.76	174.11	33.65	
Total		202.17	170.41	31.76	
Product per Man per Day:					
Surface		20.83	18.83	2.00	
Underground		8.53	7.87	.66	
Total		6.05	5.55	.50	
Labor Cost per Ton:					
Surface		.372	.370	.002	
Underground		1.035	1.007	.028	
Total		1.407	1.377	.030	
Average Product Mining:					
Stoping		23.85	20.89	2.96	
Development in Ore		8.13	2.88	5.25	
Total		23.36	20.75	2.61	
Average Wages Contract Labor:		9.62	8.68	.94	
Total Number of Days:					
Surface		15,149⅓	14,984	165⅓	
Underground		36,987⅔	35,843⅓	1,144	
Total		52,137	50,827⅓	1,309⅔	
Amount for Labor:					
Surface		117,373.32	104,389.60	12,983.72	
Underground		326,596.74	284,150.12	42,446.62	
Total		443,970.06	388,539.72	55,430.34	
Average Wages per Month as per Labor Statement - Less Captain and Clerks:					
Surface		188.93	160.66	28.27	
Underground		206.86	173.39	33.47	
Total		202.03	169.95	32.08	

5. LABOR AND WAGES: (CONT.)

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

Proportion of Surface to Underground Men:

1945 1 to 2.52

Five 2-8 hour Shifts 7-1-44 to 1-22-45
Five 2-8 hour Shifts and 1 1-8 hour Shift 1-22-45 to 12-31-45

1944 1 to 2.52

Five 2-8 hour Shifts and 1 1-8 hour Shift 7-6-43 to 7-1-44
Five 2-8 hour Shifts 7-1-44 to 12-31-44

Note: Proportion 1945 Vacation Pay for Surface	3,500.83
Proportion 1945 Vacation Pay for Underground	7,860.50
Total	11,361.33

In previous year Vacation Pay was not included in Costs for Labor.

1945 Retroactive Pay included, as follows:

Surface	3,609.71
Underground	9,994.50
Total	13,604.21

Total increase in Labor Cost, due to above additions 24,965.54

6. SURFACE:

Buildings:

a. Engine House:

A 24-foot addition was built to the East end of the engine house to house the compressor purchased from the Oliver Iron Mining Company and also the spare motor-generator set which was crowded into the engine house last year when the old engine house was put up for sale. This addition was made to conform as nearly as possible to the rest of the building with the material available. The foundation, floors and exit were constructed of concrete, the general frame work of steel, the same as in the main building, and the walls and roof of Camesco Board instead of the steel-covered Celotex as used in the old building. The location of this addition made it necessary to change the connection of the power line to the engine house as one of the poles was in this area. This was done by putting in an additional pole on the main line and running from there to the front of the engine house with an underground cable, which was a big improvement over the old connection, which took off overhead from a pole located about two feet from the building. The building was completed in November and the installation of the compressor in December. At the end of the year the compressor valves were being cleaned and final adjustments made. The machine was put into regular operation on January 15th and is working very satisfactorily. The air receiver included in the purchase of this compressor was also installed and is in operation.

b. Plant Buildings:

Very little work was done on the plant buildings other than the engine house. Many of the buildings still are covered with asphalt roofing material awaiting the time when the imitation brick metal sheeting can be obtained.

6. SURFACE: (CONT.)

Buildings: (Cont.)

c. Ore Trestle and Stocking Grounds:

The erection of the Northeast trestle for the 1944-1945 stocking season was completed in September. Fourteen bents were put up, making a total of 21 bents, there being seven bents standing which were not used last season.

Erection of the Southeast stocking trestle was started the later part of December. Four of the fourteen bents contemplated were put up during the month.

No work was done on the stocking grounds during the year except the laying of one-inch hardwood boards spaced at about twenty-five-foot intervals as a guide for the contact of the rock sollar and the ore.

d. Rock Trestle:

A new rock trestle comprising 15 bents was erected during the year. This trestle extends West from the shafthouse to the cave which is gradually being filled. The first six were put up as permanent bents on concrete piers and the top deck was closely covered with plank and sideboards and railing erected. The trestle crosses the pocket track requiring special bents constructed to provide standard clearance for railroad cars passing underneath.

e. Railroad Tracks:

The maintenance and operation of the railroad tracks was taken over by the Lake Superior and Ishpeming Railway Company on June 1st. Since this change the tracks were put in fairly good repair and the service has been very good. It is now planned to put in the new track layout in the spring and to raise the tail track for empties, West of the shaft, putting it on a one and one-half percent grade instead of the present one percent grade. When this work is completed it will make a very good track layout and will provide more room for enlarging the stocking grounds if necessary.

f. Fences and Caves:

The cave West of the shaft continues to settle slowly and the area has increased considerably to the South. This necessitated the moving of the fence to make an inclosure. This cave is all on Cambria property.

The first cave to surface on the Jackson Strip occurred on the morning of October 29th. An area about 100 feet in diameter dropped approximately 40 feet. This area is located immediately over the high territory being mined above the Sixth Level. The ore in this deposit is standing vertically between two nearly perpendicular dikes and has been mined down about 95 feet from the top, which is about 1,050 feet below surface. The center of the cave is located about 400 feet Southwesterly from the main railway track and 500 feet South of the South side of the ground that started settling in April. A temporary five-strand barbed wire fence of about 800 lineal feet was erected and warning signs put up. Next year it is proposed to extend the existing permanent fence surrounding the cave West of the shaft to include all the territory under which mining is being carried on.

g. Grounds:

Not much work was done on the grounds this year due to a shortage of labor. The old engine house which was sold last year was torn down and removed and the foundations blasted out and smoothed over so that it improved the appearance from the highway very much. The expense for this improvement was slight as the regular surface crew did the work when not

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6. SURFACE: (CONT.)

Buildings: (Cont.)

g. Grounds: (Cont.)

otherwise engaged. The new road from the main highway to the office, the construction of which was proposed for this year, will probably be put in next year. This will eliminate driving through mud in wet weather and keep the hematite dust from entering the office and other buildings in dry weather. The new road will also be located far enough away from the line of hoisting ropes so that the accumulation of grease and mud on the ropes is not thrown on cars passing by.

7. UNDERGROUND:

a. Shaft Sinking:

There was no shaft sinking in 1945.

b. Development:

The following table gives the total footage of drifting and raising for 1945 as compared with 1944:

	Drifting		Raising		Grand
Year	Ore	Rock	Ore	Rock	Total
1945	79'	384'	473'	143'	1,079'
1944	58'	1,103'	1,117'	517'	2,795'

The large decrease in development work in 1945 was due to the fact that the big development program planned in 1943 when the Cleveland-Cliffs Iron Company took over the operating of the Cambria-Jackson was completed early in 1945.

Development work on the Sixth Level consisted of putting up No. 607 Raise from a point 15 feet West of No. 606 Raise on the 6th Level to the elevation of the 280-foot sub-level and No. 624 Raise from a point 40 feet Southerly from No. 622 Raise to the top of the ore, which at this location was 61 feet above the floor of the level.

Development of the West Deposit below the Sixth Level for sub-level caving was completed in July and mining got under way in August.

b-1. Rock Development:

The following table gives the total footage of rock drifting and raising for 1945 and 1944:

	Drifting	Raising	Total 1945	Total 1944
6th Level	71'	48'	119'	183'
7th Level	242'	95'	337'	1,437'
Total 1945	313'	143'	456'	1,620'
Total 1944	1,103'	517'	1,620'	
Decrease	790'	374'	1,164'	

There was no main level development work done during 1945. Mostly all the footage of rock drifting and raising shown in the above table was done on the various subs for ventilation and travelling ways. Some rock was encountered in each of the three regular work raises which were put up this year.

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7. UNDERGROUND: (CONT.)

b-1. Rock Development: (Cont.)

The following table gives the number, location, total footage of each raise and the footage of ore and rock raising done in 1945:

Number	Location	Total Footage	Ore Footage	Rock Footage	Total 1945
No. 607	6th Level	183'	171'	12'	183'
No. 624	6th Level	51'	47'	4'	51'
No. 747	7th Level	193'(110' in 1944)	28'	55'	83'
Total		427'	246'	71'	317'

b-2. Ore Development:

The following is a summary of ore development in 1945 as compared with 1944:

	Drifting	Raising	Total 1945	Total 1944
6th Level	219'	161'	380'	405'
7th Level	79'	164'	243'	770'
Total 1945	298'	325'	623'	1,175'
Total 1944	58'	1,117'	1,175'	
Increase	240'			
Decrease		792'	552'	

c. Stoping:

(1) General:

On January 1st of this year all mining was being done on the top-slicing system. With the top-slicing system the mining area in the high territory above the 6th Level became very heavy, in fact so much so that the men were spending as much time repairing as they were mining. Under these conditions it was decided to change to sub-level caving, which proved very satisfactory as it eliminated practically all repairing, used only 25% of the amount of timber required in top-slicing and through close supervision the analyses were held to exactly the same point as in top-slicing, and the percentage of extraction was very high. Four gangs are sub-level caving in this territory. Sub-level caving proved so successful in this territory that it was also adopted for mining the West Deposit, the development of which was started last year. The development of the West Deposit was completed in July and two gangs have been mining there since that time with very good results. From the observation of gangs now sub-level caving it has been proven that mining by the sub-level caving system does increase production at a reduced cost and that contamination can be kept to a minimum with proper supervision. It is now proposed to put five or six more gangs on sub-level caving during 1946.

The change of these few gangs from top-slicing to sub-level caving increased the total production by about 12%, or 33,300 tons, and reduced the cost considerably. The production from the high territory above the 6th Level was increased from 22.5% of the total product last year to 30.1% in 1945 and the two gangs sub-level caving in the West Deposit produced 8.7% of the total production for 1945 in five months.

The only great handicap under which the mine is now operating is its shaft. This could be partially overcome if enough men were available so that supplies could be taken down on the midnight shift and three or four more mining gangs added. It has been estimated that with an addition of 26 men working on a 10-shift per week schedule instead of the present 11 shifts production would increase about 20% with a decrease in cost of about 20 cents per ton.

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7. UNDERGROUND: (CONT.)

c. Stoping:

(1) General:

The location and number of mining contracts at the end of 1945 and 1944 are as follows:

Location of Contracts	December 31, 1945	December 31, 1944
Sixth Level and Above		
300' Sub-Level		5
280' Sub-Level	2	
240' Sub-Level	2	
Sixth Level	1	1
Seventh Level and Above		
90' Sub-Level	2	
60' Sub-Level		4
50' Sub-Level	3	3
35' Sub-Level	2	4
25' Sub-Level	5	
Seventh Level	—	2
Total	17	19
Decrease	2	

Occupation of Contracts were divided as follows:

	December 31, 1945	December 31, 1944
Mining	13 Contracts	16 Contracts
Repairing Raises	3 Contracts	
Raising	1 Contract	2 Contracts
Drifting	—	1 Contract
Total	17 Contracts	19 Contracts

(2) Detail of Stoping:

300' Sub - South Riser Ore Body:

This sub was started in September, 1944 and was completed in May, 1945. The ore area on this sub increased considerably in size toward the West over that of the sub above. Up to the time of the completion of this sub there was only one direct raise in the ore West of the main North-South dike. With the large increase of this ore area, the one raise proved to be inadequate, so a second raise was put up to serve in the mining of the next sub.

280' Sub - South Riser Ore Body:

Due to the excessive weight and the extremely high cost of repairs experienced on the sub above, it was decided to mine this sub by the sub-level caving system. Development of this sub for sub-level caving was started in January and the first caving got under way in February. Due to the many dikes cutting through this deposit forming irregular ore areas, it was found expedient to deviate somewhat from the normal rectangular system and adopt radial slicing. At the present time a 20-foot vertical interval with slices 20 feet from center to center is being employed. Since the adoption of sub-level caving, repairs have been nil, production increased, and through careful supervision the analyses have been exactly the same as obtained by top slicing on the sub above. At the end of the year there are two gangs mining the area West of the main North-South dike, the remainder of the sub having been completed.

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7. UNDERGROUND: (CONT.)

c, Stoping: (Cont.)

(2) Detail of Stoping: (Cont.)

260' Sub - South Riser Ore Body:

This sub was started in April and the mining of all ore East of the main North-South dike was completed in October. The small ore area North of the North dike and East of the North-South dike petered out at the elevation of this sub. It was necessary to drive the one and only drift in this area, mostly in jasper, to recover the ore in the floor of the sub above. There was no one employed on this sub at the end of the year.

240' Sub - South Riser Ore Body:

Development of this sub for sub-level caving was started in October, and at the present time there are two gangs on this sub.

90' Sub - West Deposit:

Development of this sub for sub-level caving was started in May and stoping got under way in August. Sub-Level caving was adopted for this deposit because of the fact that the tonnage of the deposit is very small and if mined by top-slicing would have required an additional 165 feet of cribbed rock raise, which would have increased the cost of developing considerably. Sub-level caving in this area has proven very satisfactory. Stoping did not get under way until August. The two gangs employed in this area produced 27,366 tons during the year, or 8.7% of the total product of the mine.

60' Sub - West Deposit:

This is a transfer sub for the transfer of all ore mined on the 90' Sub, and consists of a single drift West from which mills were put up to the 90-foot sub at 20-foot intervals. A connection for ventilation and travelling was made to the Sixth Level by drifting 108 feet North into the footwall and putting up a single-compartment raise in jasper, holing to the Sixth Level.

60' Sub - Main Deposit:

The mining of this area was started in June, 1944 and was completed in October, 1945. This territory was mined by top-slicing and the operation proved very satisfactory.

50' Sub - Main Deposit:

Mining on this sub was started in May and at the end of the year there were 3 gangs in this territory. The sub is being mined by top-slicing, and the area will probably be about the same as the sub above.

50' Sub - Southwest Riser:

This sub, which was started in January 1944, was completed in July 1945. This sub was mined by top-slicing, but considerable ore was recovered from the back, as the vertical interval to the sub above was 22 feet. This greater than normal interval was made necessary because of the fact that the sub above was mined on the sub-level caving system and therefore was not closely covered.

35' Sub - East Riser:

Mining was started in July, 1944 and completed in April, 1945. This area is being mined to an established limit to the West to keep a large pillar intact to support the main 6th Level haulage drift, over which all the ore from the South Riser Deposit is being transported to the shaft. The ore on this sub is very hard and blocky, which to some extent has impeded good progress in mining. Two gangs were employed in this area during the year.

7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

(2) Detail of Stoping: (Cont.)

35' Sub - Southwest Deposit:

Mining on this sub was started in July, 1944 and is nearing completion at the present time. At the end of the year there were still two gangs mining in this area. All mining in this area has been done by top-slicing. As to size, this area is about the same as it was on the sub above, or probably a little larger. Slicing in this territory was very satisfactory and the grade of ore good.

25' Sub - East Riser:

This sub was started in May and should be completed in January, 1946. This area, like the one above, is being mined to the limit of the East side of the pillar being retained to support the 6th Level haulage drift. Two gangs were employed in this area until November, when one was transferred to the Southwest Deposit.

25' Sub - Southwest Deposit:

A little mining was done last year in the Southwest corner of this deposit, but was abandoned at that time due to the fact that the raise was surrounded by jasper and the elevation of the sub was too close to the hanging. Mining of the territory corresponding to the area above was started in May, and at the present time is being mined by four gangs. Mining is being done by top-slicing, and from present indications it appears that the area of this sub will be greatly increased over that of the one above.

d. Timbering:

Timbering throughout the mine was just about normal. A great number of sets of timber on the levels were replaced, and a numerous number of lining sets were put in.

Statement of Timber Used:

	Lineal Feet		Average Price per Foot		Amount	Amount
	1945	1944	1945	1944	1945	1944
8" Stulls	26,855	20,008	.0905	.0868	2,429.42	1,736.90
10" Stulls	42,038	43,759	.1310	.1342	5,507.42	5,872.28
12" Stulls	24,083	19,994	.1774	.1798	4,273.42	3,594.73
14" Stulls(& over)		971		.2242		217.71
Total	92,976	84,732	.1313	.1348	12,210.26	11,421.62
Hardwood Cribbing	3,309		.0360		119.12	
6" Cribbing	31,883	488	.0560	.0589	1,786.13	28.76
Lagging - 7'	555,935	697,558	.0138	.0142	7,693.50	9,936.63
Poles - 9½'	558,074	504,795	.0210	.0217	11,698.69	10,966.85
Total	1,149,201	1,202,841	.0185	.0174	21,297.44	20,932.24
Wire Fencing-Feet	495	8,085	.0633	.0633	31.32	511.56
Grand Total					33,539.02	32,865.42

	1945	1944
Product	315,514	282,184
Feet of Timber per Ton of Ore	.294	.300
Feet of Cribbing per Ton of Ore	.112	.002
Feet of Lagging per Ton of Ore	1.762	2.472
Feet of Wire Fencing per Ton of Ore	.0016	.0290
Cost per Ton for Timber	.0387	.0405
Cost per Ton for Cribbing	.0060	.0001
Cost per Ton for Lagging	.0244	.0352
Cost per Ton for Wire Fencing	.0001	.0018
Cost per Ton for Poles	.0371	.0389
Total Cost per Ton	.1063	.1165

The cost per ton for timber shows a slight decrease over that of last year due to the fact that mining in a few places was changed from top-slicing to sub-level caving.

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7. UNDERGROUND: (CONT.)

e. Drifting and Raising:

The following table gives a comparison of total feet of drifting and raising in ore and rock in 1945 and 1944:

	Drifting		Raising		
Year	Ore	Rock	Ore	Rock	Grand Total
1945	79'	384'	473'	143'	1,079'
1944	58'	1,103'	1,117'	517'	2,795'
Decrease		719'	644'	374'	1,716'
Increase	21'				

The large decrease in footage of drifting and raising in 1945 over that of 1944 is due to the fact that the big development plan laid out in 1943 was completed in 1944, so that the only development done in 1945 was that made necessary by current mining operations.

f. Explosives, Drilling and Blasting:

Supervision of blasting practices was continued during 1945. At least one report per month for every gang of miners was made by each shift boss and any faulty practices brought to the attention of the miners.

The breakage of drill steel has been considerable due to the hardness of the ore. The ore in some sections of the mine is too hard to drill with auger steel and here jackrods with jackbits are used.

Year	Cost per Lb. For Powder	Lbs. Powder per Ton of Ore	Cost per Ton For Powder	Cost per Ton Fuse & Caps	Cost per Ton Total
1945	.115	.4120	.0474	.0092	.0566
1944	.115	.3305	.0380	.0082	.0462

Statement of Explosives Used: (Ore Development and Stoping)

	Quantity	Average Price	Amount 1945	Amount 1944
Gelamite #1 - Lbs.	129,980	11.50	14,947.72	10,726.51
Total Powder	129,980	11.50	14,947.72	10,726.51
Tamping Bags				14.97
Fuse - Feet	404,938	5.14	2,081.38	1,639.50
Caps - #6	57,351	12.20	699.68	552.92
Fuse Lighters - Hot Wire	12,500	6.75	84.40	89.78
Fuse Lighters - Master	[illegible]	[illegible]	[illegible]	10.32
Electric Detonators	283	12.78	36.17	
Connecting Wire - Lbs.	4	.55	2.20	3.30
Total Fuse, Etc.			2,903.83	2,310.79
Total All Explosives			17,851.55	13,037.30
Product			315,514	282,184
Pounds of Powder per Ton of Ore			.4120	.3305
Cost per Ton for Powder			.0474	.0380
Cost per Ton for Fuse, Caps, Etc.			.0092	.0082
Cost per Ton for All Explosives			.0566	.0462

Statement of Explosives Used: (Sinking, Rock Development, Etc.)

Gelamite #1 - Lbs.	2,710	11.50	311.65	74.75
60% Gelatin - Lbs.	1,675	11.50	192.63	
Total Powder	4,385	11.50	504.28	74.75
Fuse - Feet	10,177	5.14	52.31	12.51
Caps - #6	1,441	12.20	17.58	4.06
Electric Detonators	80	12.70	10.16	
Total Fuse, Etc.			80.05	16.57
Total All Explosives Rock Development, Etc.			584.33	91.32

7. UNDERGROUND: (CONT.)

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

Statement of Explosives Used: (Cont.)

	Amount 1945	Amount 1944
Total All Explosives Used in Mine	18,435.88	13,128.62
Average Price per Pound for Powder	.115	.115
Explosives Used for Stoping and Development	18,435.88	13,128.62
Explosives Used for Ventilation Drift		344.34
Explosives Used for Blasting Stockpile		23.23
General Surface Expense	41.39	
Total as per Cost Sheet	18,477.27	13,496.19

g. Mining and Loading:

On January 1st, 1945 all gangs were mining by top-slicing, but by May 1st six gangs were again either sub-level caving or developing for sub-level caving. The reasons for changing from top-slicing to sub-level caving have been fully explained under the heading of stoping. Other than this change mining has been pretty much the same in 1945 as in 1944.

As reported last year, considerable trouble has been experienced in keeping raises in repair due to the wear from the raises being so high and the ore so hard and rubbly. To counteract this wear and reduce repairs, the idea of covering the floor or bottom of the raises with steel strips was adopted. These strips are of .50% carbon steel one-half inch by six inches, 10 feet long. The use of steel strips on the floor of raises is new to Cleveland-Cliffs operations, but the Republic Steel Corporation had put them in one of the raises that is still being used. Plates were put in this raise about a year before The Cleveland-Cliffs took over and it has been in constant use ever since with but very little repairs, whereas all other raises in the mine have been repaired several times. The additional cost per raise using steel strips amounts to approximately $300.00, which is less than half of what it costs to repair a raise. This item should prove to be a big factor in reducing the cost of raise repairs and eliminate much lost time in making the repairs. As raises come up for repairs the steel strips are added. Since September ten raises have been repaired and the strips put in. It is planned to salvage the steel as mining progresses.

h. Ventilation:

Until June of this year ventilation was provided by a fan of 20,000 cubic feet per minute capacity, located on the Sixth Level, the fresh air being drawn into the mine through a cave to surface and exhausted to surface from the Seventh Level through the operating shaft after having passed through the working areas. As mining progressed and more timber was introduced into the mine this fan proved inadequate for proper ventilation, so it was decided to install the Aerodyne fan which was purchased in 1943 for ventilation between the Mather Mine and Cambria-Jackson when connections could be made between the two mines. This fan is rated at 35,000 to 45,000 cubic feet per minute, depending on the various settings of the blades. This fan was installed on the Sixth Level at a point about 700 feet nearer the shaft and the blades were set for a volume of 35,000 cubic feet per minute, which has proven sufficient for good ventilation up to the present time. The source of fresh air remains the same. Prior to this installation there was only one door between the fan and the shaft, causing a large loss of air every time the motor passed through. This loss was eliminated by the erection of a second door, forming an air lock for tramming operations.

In addition to this installation, several drifts and short raises were put in throughout the entire mining areas for ventilation purposes.

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7. UNDERGROUND: (CONT.)

i. Pumping:

The number of gallons pumped per minute in each month of the year for the past six years are shown in the following statement:

Month	1945	1944	1943	1942	1941	1940
January	317	333	369	413	374	332
February	284	285	340	387	342	326
March	315	328	335	375	340	309
April	456	344	433	430	392	330
May	460	425	619	477	435	555
June	453	389	620	465	424	540
July	439	378	583	421	407	513
August	374	347	411	379	390	481
September	341	410	395	362	382	461
October	315	408	402	391	386	431
November	299	423	340	394	419	400
December	292	397	340	386	459	374
Average gallons per Minute	363	372	432	407	396	421

Figures previous to June, 1943, were taken from Republic Steel Corporation records.

It will be noted that despite the heavy precipitation in 1945 the pumping shows a decrease. This probably due to the fact that the water impounded in the formation is gradually being drained as developments progress. Several of the raises which encountered considerable water when they were put up are practically dry at the present time.

During 1945 the Seventh Level pumproom was enlarged to provide room for the new vertical triplex pump which was delivered at the mine in October. This pump has been erected but is not yet connected to the discharge line which had to be renewed. When this pump is put in operation it is proposed to remove the present Aldrich pump and replace it with a 5" x 18" Prescott pump, purchased on E. & A. No. CC-161 from the Holmes Mine of the Oliver Iron Mining Company. When these installations are completed all pumping on the Fifth and Sixth Levels will be eliminated, and if the Seventh Level sump is enlarged one shift of pumping could also be done away with.

Concurring with the recommendation by the electrical department that a second 2300-volt cable be installed in the shaft, an E. & A. was obtained and the installation completed. Prior to this installation there was only one cable in the shaft to supply current to the motors of the underground pumps, and any serious break in this cable would have caused interruption of pumping with probable damage to the mine.

j. Underground in General:

The underground workings of the mine are now in very good condition as is also all the equipment, with the exception of underground cars. The same cars that were in use when the company took over operations and which were in very bad condition at that time are still in operation. These are a rocker dump type of 2.3 tons capacity. In May E. & A. No. CC-151 was authorized for the purchase of sixteen 65 cubic-foot rocker dump cars from the Lake Shore Engineering Company. A 90-day delivery was promised on this order, but due to their inability to secure parts has not as yet been delivered. It now appears that these cars will be shipped the latter part of January, 1946.

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8. COST OF OPERATING:

a. Comparative Mining Costs:

	1945	1944	Increase	Decrease
Product	315,514	282,184	33,330	
Underground Costs	1.630	1.649		.019
Surface Costs	.251	.358		.107
General Mine Expense	.320	.320		
Cost of Production	2.201	2.327		.126
Taxes	.162	.177		.015
Depletion and Depreciation	.071	.122		.051
Loading and Shipping	.041	.069		.028
Total Cost	2.475	2.695		.220
No. of Days Operated	299	278	21	
Total No. of Shifts Operated	541	529	12	
Average Daily Product	1,055	1,015	40	

Cost of Production:

	1945	Percent	1944	Percent	Increase	Decrease
Labor	1.479	59.8	1.511	56.1		.032
Supplies	.996	40.2	1.184	43.9		.188
Total	2.475	100.0	2.695	100.0		.220

b. Detailed Cost Comparison:

(1) Days and Shifts:

Year	Days Mine Worked	Shifts & Hours	Men Employed	Total Shifts
1945	299	541 - 8 Hr.	183	52,137
1944	278	529 - 8 Hr.	190	50,827⅓
Increase	21	12		1,309⅔
Decrease			7	

(2) Wages:

An increase in wages in 1945 was effected by a War Labor Board directive issued March 3rd, 1945, and made retroactive to January 4th, 1944. The order directed that a five-cent differential be granted to men working on the afternoon or midnight shift. The increase for 1944, amounting to $12,288.00, was taken care of by General Ledger Control, and the $13,604.21 for 1945 was charged directly to operating costs.

(3) Comparison of Production:

Production - 1945	315,514 Tons
Production - 1944	282,184 Tons
Increase	33,330 Tons

(4) Comparison of Number of Men and Wages:

Year	No. of Men	No. of Days	Amount	Rate per Day
1945	183	52,137	443,970.06	8.52
1944	190	50,827⅓	388,539.72	7.76
Increase		1,309⅔	55,430.34	.76
Decrease	7			

(5) Tons per Man per Day:

	1945	1944	Increase
Surface	20.83	18.83	2.00
Underground	8.53	7.87	.66
Total	6.05	5.55	.50

(6) Cost of Production:

1945	$ 694,576.84	Cost per Ton	$ 2.201
1944	$ 656,637.11	Cost per Ton	$ 2.327
Increase	$ 37,939.73		
Decrease			$ .126

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(6) Cost of Production: (Cont.)

	Labor	Percent	Supplies	Percent
1945	$ 459,011.81	66.1	$ 235,565.03	33.9
1944	$ 414,120.92	63.1	$ 242,516.19	36.9
Increase	$ 44,890.89	3.0		
Decrease			$ 6,951.16	3.0

The increase in percentage of labor was due to increased production and higher wages.

(7) Detail of Accounts:

	1945		1944		Increase or Decrease	
Days per Week	5½		5		½	
Shifts and Hours	1-8 57		1-8 27		30	
	2-8 242		2-8 251		9	
Production, Tons	315,514		282,184		33,330	
Average Daily Production, Tons	1,055		1,015		40	
Number of Days Worked	299		278		21	
	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton
UNDERGROUND COSTS:						
1. Exploring in Mine	15,817.21	.050	9,102.83	.032	6,714.38	.018
2. Sinking in Shaft						
3. Development in Rock	5,143.48	.017	688.56	.003	4,454.92	.014
4. Development in Ore	5,112.10	.016	1,047.08	.004	4,065.02	.012
5. Stoping	178,586.67	.566	155,967.56	.553	22,619.11	.013
6. Timbering	139,668.64	.443	127,907.28	.453	11,761.36	.010
7. Tramming	57,784.70	.183	59,789.98	.212	2,005.28	.029
8. Ventilation	4,506.20	.014	8,584.05	.030	4,077.85	.016
9. Pumping	27,567.92	.087	25,739.49	.091	1,828.43	.004
10. Compressors and Air Pipes	22,273.69	.071	27,679.91	.098	5,406.22	.027
11. Back Filling						
12. Underground Superintendence	15,482.09	.049	11,014.23	.039	4,467.86	.010
13. Cave-in	54.40				54.40	
14. Maint: Compressors and P. D.	2,318.02	.007	669.01	.002	1,649.01	.005
15. Scraper Equipment	6,861.65	.022	9,110.44	.032	2,248.79	.010
16. Electr. Tram Eqt.	25,617.92	.081	26,422.88	.094	804.96	.013
17. Pumping Machinery	7,389.46	.024	1,604.10	.006	5,785.36	.018
Total Underground Costs	514,184.15	1.630	465,327.40	1.649	48,856.75	.019
SURFACE COSTS:						
18. Hoisting	21,134.48	.067	21,530.58	.076	396.10	.009
19. Stocking Ore	9,874.31	.031	11,923.57	.042	2,049.26	.011
20. Screening-Crushing at Mine						
21. Dry House	8,577.26	.027	9,349.48	.033	772.22	.006
22. General Surface Expense	12,507.75	.040	13,138.16	.047	630.41	.007
23. Maint: Hoisting Equipment	18,425.69	.059	12,935.66	.046	5,490.03	.013
24. Shaft	2,005.20	.006	1,915.76	.007	89.44	.001
25. Top Tram Equipment	3,914.14	.012	3,697.08	.013	217.06	.001
26. Docks, Trestles & Pkts.	1,642.35	.005	1,439.70	.005	202.65	
27. Mine Buildings	1,212.79	.004	25,014.05	.089	23,801.26	.085
Total Surface Costs	79,293.97	.251	100,944.04	.358	21,650.07	.107
GENERAL MINE EXPENSES:						
Supply Inventory Adjustment	310.55	.001	596.31	.002	285.76	.001
Group Annuity Premiums	812.84	.003	1,019.97	.004	207.13	.001
28. Insurance	2,599.12	.008	2,519.21	.009	79.91	.001
29. Mining Engineering	3,232.11	.010	4,141.65	.015	909.54	.005
30. Mechanical & Electr. Engrg.	2,335.75	.007	1,985.32	.007	350.43	
31. Analysis and Grading	11,838.98	.038	10,649.69	.038	1,189.29	
32. Personal Injury	11,035.80	.035	6,594.18	.023	4,441.62	.012
33. Safety Department	1,226.13	.004	1,134.40	.004	91.73	
34. Telephones and Safety Devices	4,064.60	.013	4,700.09	.016	635.49	.003
35. Local and General Welfare	2,299.59	.007	2,014.47	.007	285.12	
36. Spec. Exp., Pensions & Allwnces.	4,546.19	.014	4,154.87	.015	391.32	.001
37. Ishpeming Office	12,536.64	.040	10,607.83	.037	1,928.81	.003
Vacation Pay	15,255.40	.048	11,537.52	.041	3,717.88	.007
38. Social Security Taxes	9,914.51	.031	8,957.55	.032	956.96	.001
39. Mine Office	19,090.51	.061	19,752.61	.070	662.10	.009
Total General Mine Expenses	101,098.72	.320	90,365.67	.320	10,733.05	
COST OF PRODUCTION	694,576.84	2.201	656,637.11	2.327	37,939.73	.126
40. Taxes	51,002.54	.162	50,031.68	.177	970.86	.015
TOTAL COST	745,579.38	2.363	706,668.79	2.504	38,910.59	.141
Budget - Tons and Cost	285,287	2.491	259,830	2.533		.042

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail of Accounts:

UNDERGROUND COSTS:

1. Exploring in Mine:

Increase due to diamond drilling. There was 3,265 feet of drilling in 1945, as compared with 1,453 feet in 1944.

3. Development in Rock:

Increase due to the fact that in 1945 all development in rock was absorbed in operating costs, whereas in 1944 it was practically all charged to an E. & A.

4. Development in Ore:

Increase due to all costs being charged to operating in 1945; in 1944 mostly to E. & A.

5. Stoping:

Increase due to more supervision and increased wages.

6. Timbering:

Increase due to larger production and increased wages.

7. Tramming:

Decrease due to less costs to operating transfer scrapers.

8. Ventilation:

Decrease due to no repairs to ventilation drift in 1945.

9. Pumping:

	Total Gallons Pumped	Gallons per Minute
Year 1945	190,160,114	363
Year 1944	196,152,831	372

10. Compressors and Air Pipes:

Decrease due to less air piping and fittings and using mine water for cooling compressors instead of city water.

11. Back Filling:

There was no back filling in 1945.

12. Underground Superintendence:

Increase due to added supervision.

13. Cave-In:

Small charge to temporary fencing around surface cave-in.

14. Compressors and Power Drills:

Increase due to purchase of four side-cone power feeds, $1,040.00; 3 - RB-12 jackhamers $601.31.

15. Scraper Equipment:

Decrease due to less repairs and no purchases of scraper hoists in 1945.

16. Electric Tram Equipment:

Decrease due to a larger proportion being charged to E. & A. No. CC-119 in 1944 than in 1945.

17. Pumping Machinery:

Increase due to charging off proportion of E. & A. No. CC-141, $4,569.38; Prescott pump motor, $192.96, and repairs to 4th Level pump.

CAMBRIA-JACKSON MINE
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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail of Accounts: (Cont.)

SURFACE COSTS:

18. Hoisting:

No appreciable difference.

19. Stocking Ore:

Decrease due to less ore stocked and less stocking trestle erected.

21. Dry House:

Decrease due to less labor and less expense to hot water system.

22. General Surface Expense:

Decrease due to one less policeman and a smaller surface crew.

23. Hoisting Equipment:

Increase due to repairs to hoist motor, $1,910.32; new headframe sheave, $855.56; rebuilding old sheave, $332.66; one hoisting rope, $1,372.41; absorbing $1,859.83 of charges to E. & A. No. CC-149, and increase of wages, $99.69.

24. Shaft:

Little difference in charges to shaft.

25. Top Tram Equipment:

Increase due to rebuilding one larry car.

26. Docks, Trestles and Pockets:

Increase due to dismantling old rock trestle and erecting a new one.

27. Mine Buildings:

Decrease due to only general repairs being made in 1945. In closing E. & A. No. CC-119 last year, $23,404.02 of this account was charged to 1944 operating expense.

GENERAL MINE EXPENSES:

28. Insurance:

Slight increase over last year.

29. Mining Engineering:

Less surveying required than in 1944, when a great deal of the mine was resurveyed.

30. Mechanical and Electrical Engineering:

The expense in this account was incurred by men in these two departments who inspected equipment on surface and underground, and supervised repairs.

31. Analysis and Grading:

The cost to this account is made up as follows:

	Sampling at Mine	Central Laboratory	Shipping Dept. Expense	Trucking Samples, Etc.	Retroactive
1945	444.73	9181.24	1659.22	547.54	6.25
1944	950.56	7785.28	1519.18	394.67	
Increase		1395.96	140.04	152.87	6.25
Decrease	505.83				

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail of Accounts: (Cont.)

GENERAL MINE EXPENSES: (CONT.)

32. Personal Injury:

The detail of charges to this account were as follows:

	Compensation & Doctors	Compensation Department	Hospital Loss
1945	10,652.86	382.94	None
1944	6,244.64	349.54	None
Increase	4,408.22	33.40	

33. Safety Department:

Charges to this account were normal.

34. Telephones and Safety Devices:

The detail of charges to this account were as follows:

	1945	1944	Increase	Decrease
Lights for Shaft and Levels	2997.36	3305.53		308.17
Mine Telephones	58.86	311.10		252.24
Safety Appliances	945.46	933.96	11.50	
Fire Equipment	45.75	149.50		103.75
Retroactive Pay	17.17		17.17	
Total	4064.60	4700.09		635.49

35. Local and General Welfare:

The detail of charges to this account were as follows:

	1945	1944	Increase
General Welfare	1877.29	1656.09	221.20
District Welfare	422.30	358.38	63.92

36. Special Expense, Pensions and Allowances:

The detail of charges are as follows:

	1945	1944	Increase	Decrease
Pensions	560.93	574.26		13.33
Legal	233.10	203.93	29.17	
Retirement Expense	1795.89	1454.19	341.70	
Saranac Invest.	1136.88	1026.81	110.07	
Weekly Wage Record	319.55	401.25		81.70
Other Expenses	499.84	494.43	5.41	
Total	4546.19	4154.87	391.32	

37. Ishpeming Office:

1945	$ 12,536.64	Cost per Ton	.040
1944	10,607.83	Cost per Ton	.037

Vacation Pay:

1945*	$ 15,255.40	Cost per Ton	.048
1944	11,537.52	Cost per Ton	.041

* Includes 1945 Vacation Pay $11,361.33 and 1945 Retroactive Vacation Pay $3,894.07.

38. Social Security Taxes:

The detailed charges in this account were as follows:

	Unemployment Tax	Old Age Benefit Tax
1945	$ 5,603.78	$ 4,310.73
1944	5,062.97	3,894.58
Increase	540.81	416.15

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail of Accounts: (Cont.)

GENERAL MINE EXPENSES: (CONT.)

39. Mine Office:

The detail of charges to this account were as follows:

	Salaries Supt. & Clerks	Central Warehouse	Miscellaneous	Total
1945	$ 13,657.42	$ 4,016.71	$ 1,416.38	$ 19,090.51
1944	13,987.49	4,407.31	1,357.81	19,752.61
Increase			$ 58.57	
Decrease	$ 330.07	$ 390.60		$ 662.10

40. Taxes:

The decrease in cost per ton for taxes was due to increased production.

9. EXPLORATIONS AND FUTURE EXPLORATIONS:

One diamond drill unit using bortz bits has been in constant operation throughout the year. Six holes were drilled on the 5th Level, two on the 6th Level, one of which was discontinued temporarily, and two holes on the 7th Level.

The two holes on the 7th Level were drilled to determine the limits of the known ore body at that elevation.

The two holes on the 6th Level were drilled to explore the territory West of the big North-South fault. The first hole was drilled on a due South course, directly West of the fault, encountered rich formation but no ore and showed that this area has been thrust about 175 feet horizontally to the South. The second hole was drilled from the same station but on a course of South 25° West. This hole was stopped in November and will be continued at a later date when drilling has been completed on the 5th Level.

Explorations on the 5th Level consisted of the drilling of six holes to determine the extent of the ore shown in a hole drilled many years ago. This exploration was done in two periods, the first beginning in February and ending in August, and the second was started in November and is still in progress. During the first period four horizontal holes were drilled, two of which encountered first class ore. The drill was then moved to the 6th Level. In November the Geological Department made an urgent request that drilling be resumed on the 5th Level to determine the depth of the ore, so that an intelligent estimate might be made of the tonnage to be reported to the fee owners of the Cambria Lease.

When explorations are completed on the 5th Level it is planned to continue drilling on the West end of the 6th Level to explore the territory between the North-South fault and the West boundary of the property. It is very probable that the upward trend of the ore being mined on the Mather Mine property will extend above the elevation of the 6th Level of the Cambria-Jackson Mine. It has also been decided to do some drilling on the 7th Level from the drift being driven to connect to the Mather Mine.

A record of the cost of drilling is given in the following tables, also the log of each hole:

Drilling Cost:	Labor	$ 8,382.77
	Supplies & Misc.	1,635.72
	Bortz	5,903.52
	Total	$ 15,922.01
Overhead Expense:	Analysis	$ 67.01
	Geological Dept.	556.83
	Total	$ 623.84
Grand Total		$ 16,545.85
Deduct drilling on Negaunee Mine Co. property		1,600.12
	Total Cost	$ 14,945.73

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9. EXPLORATIONS AND FUTURE EXPLORATIONS: (CONT.)

Feet Drilled	Cost per Foot	Total Cost
3,265	$ 5.07	$ 14,945.73

Logs of Holes Drilled:

D. D. Hole No.	Location	Dip	Course	El.	Date Started	Date Stopped
162	7th Level	/1°56'	S0°03'W	-96.8'	12-8-44	1-12-45

Material	Iron	Phos.	Sul.
210' to 220' - Soft Ore Jasper			
220' to 230' -	57.30	.028	.061
230' to 260' -	53.85	.043	.032
260' to 285' - Jasper			
285' to 290' -	56.03	.056	.080
290' to 295' -	53.22	.124	.029
295' to 300' -	47.82	.089	
300' to 305' -	52.08	.068	.055
305' to 310' - Jasper			

D. D. Hole No.	Location	Dip	Course	El.	Date Started	Date Stopped
163	7th Level	0°	S19°E	-97.3'	1-19-45	2-14-45

Material	Iron	Phos.	Sul.
0' to 25' - Slate			
25' to 137' - Transition Slate & Jasper			
137' to 147' -	52.84	.107	.022
147' to 153' -	58.70	.061	.023
153' to 168' - Transition Slate & Jasper			
168' to 183' -	62.87	.091	.010
183' to 188' -	52.40	.123	.011
188' to 247' - Jasper			
247' to 324' - Soft Ore Jasper			
324' to 331' - Dike			
331' to 436' - Soft Ore Jasper			
436' to 445' - Dike			
445' to 459' - Soft Ore Jasper			

D. D. Hole No.	Location	Dip	Course	El.	Date Started	Date Stopped
164	5th Level	0°	Due South	/428'	2-24-45	5-29-45

Material
0' to 108' - Blue Jasper
108' to 133' - Diabase Dike
133' to 310' - Blue Jasper
310' to 385' - Hard Blue Jasper
385' to 567' - Soft Ore Jasper

D. D. Hole No.	Location	Dip	Course	El.	Date Started	Date Stopped
165	5th Level	/2°	S43°08'W	/426'	6-7-45	6-28-45

Material
0' to 300' - Soft Ore Jasper
300' to 334' - Diabase Dike
334' to 368' - Soft Ore Jasper

D. D. Hole No.	Location	Dip	Course	El.	Date Started	Date Stopped
166	5th Level	/2°30	S70°15'E	/426.55'	7-2-45	7-16-45

Material	Iron	Phos.	Sul.
0' to 75' - Blue Jasper			
75' to 165' -	62.90	.171	.012
165' to 225' - Soft Ore Jasper			
225' to 235' -	51.99	.106	.012
235' to 296' -	59.42	.113	.012
296' to 317' - Soft Ore Jasper			
317' to 321' - Dike			

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9. EXPLORATIONS AND FUTURE EXPLORATIONS: (CONT.)

Logs of Holes Drilled: (Cont.)

D.D.Hole No.	Location	Course	Dip	Elevation	Date Started	Date Stopped
167	5th Level	S50°00'E	/2°00	/426.55'	7-25-45	8-8-45

Material			Iron	Phos.	Sul.
0'	to 75'	- Blue Jasper			
75'	to 111'	-	64.62	.038	.012
111'	to 167'	- Blue Jasper			
167'	to 176'	-	45.44	.131	.012
176'	to 182'	- Blue Jasper			
182'	to 193'	-	54.70	.188	.007
193'	to 205'	- Blue Jasper			
205'	to 210'	-	50.55	.087	.025
210'	to 220'	-	46.00	.074	.009
220'	to 235'	- Blue Jasper			
235'	to 265'	- Dike			
265'	to 295'	- Soft Ore Jasper			

D.D.Hole No.	Location	Course	Dip	Elevation	Date Started	Date Stopped
168	6th Level	S0°56'W	/2°	/114.5'	9-5-45	11-7-45

Material		
0'	to 21'	- Slate
21'	to 60'	- Trans. Jasper
60'	to 65'	- Soft Ore Jasper
65'	to 105'	- Dike
105'	to 196'	- Slate
196'	to 247'	- Trans. Jasper
247'	to 357'	- Soft Ore Jasper
357'	to 371'	- Dike
371'	to 418'	- Soft Ore Jasper
418'	to 440'	- Blue Jasper
440'	to 452'	- Dike
452'	to 615'	- Blue Jasper
615'	to 621'	- Lean Ore
621'	to 714'	- Blue Jasper

D.D.Hole No.	Location	Course	Dip	Elevation	Date Started	Date Stopped
169	6th Level	S25°W	/2°	/114.5'	11-17-45	Discontinued temporarily 11-24-45

Material		
0'	to 22'	- Slate
22'	to 35'	- Tr. Sl. & Jas.
35'	to 44'	- Dike
44'	to 86'	- Sl. & Graywacke

D.D.Hole No.	Location	Course	Dip	Elevation	Date Started	Date Stopped
170	5th Level	S51°38'E	-25°	/424'	11-26-45	12-18-45

Material			Iron	Phos.	Sul.
0'	to 41'	- Soft Ore Jasper			
41'	to 102'	- First Class Ore			
102'	to 121'	-	61.17	.109	.011
121'	to 123'	-	45.45	.084	
123'	to 136'	- Dike			
136'	to 216'	- Soft Ore Jasper			
216'	to 247'	- Dike			
247'	to 265'	- Soft Ore Jasper			

D.D.Hole No.	Location	Course	Dip	Elevation	Date Started	Date Stopped
171	5th Level	N45°W	0°	/426'	12-19-45	12-28-45

Material		
0'	to 81'	- Soft Ore Jasper
81'	to 99'	- Tr. Sl. & Jas.