

THE  
CLEVELAND - CLIFFS IRON CO.  
MINING DEPARTMENT

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ANNUAL REPORT OF GENERAL MANAGER  
FOR  
YEAR ENDING  
DECEMBER 31<sup>ST</sup> 1924

MS 86-100  
1995

#1995

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January 1, 1925.

Mr. Wm. G. Mather, Pres.,

Cleveland, Ohio.

Dear Sir:-

I regret exceedingly that on account of Mr. Duncan's illness he is unable personally to forward to you report of the operations of the Mining Department for the year 1924. The inventories, maps, and statements relative to this report have gone forward under separate cover.

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

Due to the decrease in sales and the large amount of ore in stock at the majority of the Company's mines, it was decided by you to reduce the working time, effective August 1st, to four days per week. On account of the demand for Cliffs Shaft Ore, this mine was only reduced to five days; the Barnes-Hecker being in the development state continued to work at full time, two shifts, with the exception that no work was done on Saturday night. On December 1st you gave instructions to put all mines which had been on a curtailed basis on five days.

The following condensed statement shows a comparison of all

of the Company's mines for 1924, as compared with 1923:

		<u>Tons</u> <u>Per Man</u>	<u>Cost on</u> <u>Cars.</u>	<u>Avg. Rate</u> <u>Pr. Day</u>	<u>Labor Cost</u> <u>Per Ton</u>	<u>Taxes</u>
1923	3,108,507	3.83	\$2.486	\$4.91	\$1.282	\$.328
1924	<u>2,899,245</u>	<u>4.00</u>	<u>2.501</u>	<u>5.11</u>	<u>1.279</u>	<u>.345</u>
	209,262	.17	.015	.20	.003	.017

I call your attention to the fact that the efficiency, even on the reduced tonnage, has not decreased. The small increase in the cost on cars is explained by the increase in the cost for taxes. The cost per ton for taxes is naturally higher with the smaller tonnage. The labor cost per ton shows a slight decrease, although wages show an increase.

The only outstanding lease is to the Empire Iron Company, covering the E $\frac{1}{2}$  of the S $\frac{1}{4}$  and the W $\frac{1}{2}$  of the S $\frac{1}{4}$  of Section 19-47-26.

*M. M. Duceau*

\_\_\_\_\_  
Vice Pres. & Gen. Mgr.

By

*J. H. ...*

\_\_\_\_\_  
General Superintendent.

LAKE MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1924.

GRADE	IRON	PHOS.	SILICA
Lake,	(No Production)		
Lakedale,	(No Production)		

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1924.

GRADE	Mine		Lake Erie	
	IRON	PHOS.	IRON	MOIST.
Lake,	(No Shipments)			
Lakedale,	59.12	.223	59.45	14.50

ORE STATEMENT - DECEMBER 31ST, 1924.

	LAKE ORE AT MINE	LAKEDALE AT MINE	LAKE ORE STOCKED AT PRESQUE ISLE	TOTAL	TOTAL LAST YEAR
On Hand January 1, 1924,	11,522	64,986	22,963	99,471	192,390
Output for Year,	-	-	-	-	-
Total,	11,522	64,986	22,963	99,471	192,390
Shipments,	-	46,487	-	46,487	92,919
Balance on Hand,	11,522	18,499	22,963	52,984	99,471
Decrease in Ore on Hand,				46,487	

1924 -- Mine Closed.

1923 -- Mine Closed.

LAKE MINE

SHIPMENTS FOR YEAR-1924

	GRADE	POCKET	STOCKPILE	PRESQUE ISLE STOCKPILE	TOTAL	TOTAL LAST YEAR
Lake,		-	-	-	-	-
Lakedale,		-	46,487	-	46,487	92,919
Total,		-	46,487	-	46,487	92,919
Total Last Year,		-	92,919	-	92,919	
Decrease,					46,432	

LAKE MINE

COMPARATIVE WAGES AND PRODUCT

	1924	1923	INCREASE	DECREASE
PRODUCT				
No.Shifts & Hours				
AVG.NO. MEN WORKING				
Surface		1		
Underground		0		
Total		1		
AVG.WAGES PER DAY				
Surface		8.20		
Underground				
Total		8.20		
WAGES PER MO.OF 25 DAYS				
Surface		205.00		
Underground				
Total		205.00		
PRODUCT PER MAN PER DAY				
Surface				
Underground				
Total				
LABOR COST PER TON				
Surface				
Underground				
Total				
AVG.PRODUCT BRK'G & TRM'G				
"    WAGES CONTRACT MINERS				
"    "    "    TRIMMERS.				
TOTAL NO.OF DAYS				
Surface		312		
Underground		312		
Total		312		
AMOUNT FOR LABOR				
Surface		2560.00		
Underground				
Total		2560.00		

Abandoned June 1, 1921.



ANNUAL REPORT

OF THE

CLIFFS SHAFT MINE

(1924)

PRODUCTION AND SHIPMENTS.

The Cliffs Shaft Mine worked 277 days in 1924, and produced 296,508 tons of ore, an average of 1,070 tons per day. On February 23rd and on four Saturdays in March the mine was closed for want of electric power. Beginning August 1st and continuing to the end of the year the mine worked five days a week single shift. There was no shortage of labor at any time during the year. The efficiency was increased by the greater use of scrapers and the installation of five-ton cars underground and by minor changes in chutes and pockets on surface.

14,116 tons of rock were produced, all of which was dumped underground.

Shipments to the dock started on April 22nd and closed on November 26th. Shipments from stock-pile were large, and the book-balance of ore on hand was less than in 1923. There is, however, a substantial overrun in the stock-piles, which has accumulated from year to year.

TABLE I.

PRODUCTION BY GRADES.

Grade	Year 1924		Year 1923	
	Tons	Per Cent	Tons	Per Cent
Lump	199,085	67.1	192,502	66.2
Crushed	<u>97,423</u>	<u>32.9</u>	<u>98,113</u>	<u>33.8</u>
Total	296,508	100.0	290,615	100.0

TABLE II.

SHIPMENTS.

Grade	Pocket Tons	Stock-Pile Tons	Total Tons
Lump	130,415	65,595	196,010
Crushed	<u>42,094</u>	<u>80,800</u>	<u>122,894</u>
Total	172,509	146,395	318,904

TABLE III.

ORE IN STOCK, DEC. 31ST, 1924.

Lump	57,087 Tons
Crushed	<u>45,616</u> "
Total	102,703 "

TABLE IV.

DIVISION OF PRODUCT BY LEVELS.

Level	"A" Shaft			"B" Shaft			Both Shafts		
	Ore Tons	Rock Tons	Total Tons	Ore Tons	Rock Tons	Total Tons	Ore Tons	Rock Tons	Total Tons
1st				28,969		28,969	28,969		28,969
2nd	5,894		5,894	5,729		5,729	11,623		11,623
3rd	11,579	280	11,859				11,579	280	11,859
4th	5,729		5,729	5,296		5,296	11,025		11,025
5th	21,830	1,126	22,956	5,121		5,121	26,951	1,126	28,077
6th	17,723	488	18,211	7,007	672	7,679	24,730	1,160	25,890
7th	35,586	932	36,518	14,914	934	15,848	50,500	1,866	52,366
8th	8,790	1,042	9,832	3,700		3,700	12,490	1,042	13,532
9th	19,886	646	20,532	6,391		6,391	26,277	646	26,923
10th	8,167	296	8,463	2,517	1,156	3,673	10,684	1,452	12,136
11th	5,120		5,120	5,693	632	6,325	10,813	632	11,445
12th	10,007		10,007	16,435	1,588	18,023	26,442	1,588	28,030
13th				23,180	744	23,924	23,180	744	23,924
14th				19,377	628	20,005	19,377	628	20,005
15th				<u>1,868</u>	<u>2,952</u>	<u>4,820</u>	<u>1,868</u>	<u>2,952</u>	<u>4,820</u>
Total	150,311	4,810	155,121	146,197	9,306	155,503	296,508	14,116	310,624

TABLE V.

PRODUCTION BY MONTHS.

Month	Days	Ore Per Day Tons	Lump Ore Tons	Crushed Ore Tons	Total Ore Tons	Rock Tons	Total Ore and Rock Tons
January	26	994	15,908	8,537	24,445	1,414	25,859
February	23	1,024	15,403	8,142	23,545	1,136	24,681
March	22	1,043	15,054	7,892	22,946	1,318	24,264
April	24	1,048	16,221	8,935	25,156	1,258	26,414
May	26	1,089	18,396	9,917	28,313	1,244	29,557
June	24	1,107	18,640	7,925	26,565	1,086	27,651
July	25	1,148	19,956	8,742	28,698	670	29,368
August	21	1,158	16,672	7,656	24,328	944	25,272
September	20	1,171	15,902	7,522	23,424	870	24,294
October	23	1,101	17,438	7,877	25,315	1,316	26,631
November	20	1,022	13,862	6,572	20,434	1,112	21,546
December	<u>23</u>	<u>1,015</u>	<u>15,633</u>	<u>7,706</u>	<u>23,339</u>	<u>1,748</u>	<u>25,087</u>
Year	277	1,070	199,085	97,423	296,508	14,116	310,624

TABLE VI.

## DELAYS.

Date	Hours	Tons Lost	Cause	Repair Cost
Jan. 3	2 $\frac{3}{4}$	250	Channel iron across bail of skip cracked.	\$ 7.53
Jan. 4	1 $\frac{3}{4}$	225	$\frac{3}{4}$ hr. - Crushed-pile car left track. 1 hr. - Chunks at "A" & "B" shaft pocket.	.96
Jan. 5	$\frac{3}{4}$	100	Crushed-pile car left track.	5.13
Jan. 10	$\frac{3}{4}$	50	Screen frame broke in crusher building.	31.10
Jan. 16	1 $\frac{1}{4}$	150	Door catch on "B" shaft top-tram car broke.	2.03
Jan. 22	2 $\frac{1}{2}$	275	2 hrs. - Plate pulled from chute in crusher-building. $\frac{1}{2}$ hr. - Burned out fuse.	4.80
Feb. 2	4	500	Funeral of Joseph Harrington.	
Feb. 8	1	125	"B" shaft pocket blocked with chunks.	
Feb. 18	3	200	Axle broke on "A" shaft counter-weight sheave.	40.79
Feb. 21	1 $\frac{3}{4}$	150	Bail and eye on "B" shaft counter-weight bucket on top tram broke.	3.02
Feb. 29	1 $\frac{1}{2}$	150	Lower tram controller out of commission.	5.28
Mar. 19	$\frac{3}{4}$	100	No current. Main line trouble.	
Mar. 27	1	125	No current. Main line trouble.	
Mar. 31	1	100	Skip broke gate at 7th level "A" shaft.	
Apr. 5	1 $\frac{1}{2}$	75	1 hr; Apron broke on chute in shaft-house. $\frac{1}{2}$ hr; Pocket blocked with chunks on surface.	1.58
Apr. 8	1	125	Pulley broke - crusher-building.	
Apr. 9	1 $\frac{1}{2}$	175	1 hr; Pulley broke in crusher-building. $\frac{1}{2}$ hr; 7th level "A" shaft pocket blocked.	6.83
Apr. 14	1 $\frac{3}{4}$	100	Liner in "B" shaft dump wore out.	20.45
May 20	$\frac{3}{4}$	60	No railway cars at pocket.	
May 22	1 $\frac{1}{2}$	150	1 hr; Chunks at "B" shaft surface pocket. $\frac{1}{2}$ hr; Taking up puffer from first level.	
May 23	1 $\frac{1}{2}$	150	Crusher machinery not working smoothly.	
May 24	1 $\frac{1}{2}$	170	Bucket elevator jammed, blowing out fuses.	.61
May 26	1 $\frac{1}{2}$	200	1 hr; Conveyor belt jammed at crusher-building. $\frac{1}{2}$ hr; No current. Main line trouble.	
June 16	1	125	Mud dumped on "B" shaft track delayed hoisting.	
June 26	1	125	Mud hoisted at "B" shaft clogged chutes.	
July 10	1	125	"A" shaft pocket blocked. Crusher chutes clogged with mud.	
July 11	1	125	Mud hoisted at "A" shaft blocked chutes.	
July 19	1 $\frac{1}{2}$	175	Wheel on pan conveyor at crusher building came off.	2.00
Aug. 12	1	125	"B" shaft pocket blocked with chunks.	
Aug. 19	1	125	Underground chutes blocked "B" shaft.	
Sept. 22	1	150	Belt conveyor motor running hot.	
Sept. 23	1 $\frac{1}{2}$	100	"A" shaft air-line broken.	
Oct. 16	1	75	"B" shaft pocket blocked with chunks.	
Nov. 7	1	125	No railway cars at pocket.	
Nov. 14	2	250	Switch burnt out on lower tram.	
Nov. 19	1	60	"A" shaft pocket blocked with chunks.	
Nov. 28	1	100	"B" shaft pocket blocked with chunks.	
Dec. 4	$\frac{3}{4}$	75	No current. Main line trouble.	
Dec. 11	$\frac{3}{4}$	100	No current. Main line trouble.	
Dec. 12	$\frac{1}{2}$	50	Switching railroad cars.	
Dec. 23	1 $\frac{1}{4}$	150	$\frac{3}{4}$ hr; "B" shaft pocket air-lift freezing. $\frac{1}{2}$ hr; Underground pocket blocked at "A" shaft.	
Total	54 $\frac{3}{4}$	5865		\$ 132.72

TABLE VII.

DELAYS DUE TO LACK OF CURRENT.

Date	Hours	Tons Lost	Cause
Feb. 23	8	1000	Insufficient water-supply.
Mar. 8	8	1000	Insufficient water-supply.
Mar. 15	8	1000	Insufficient water-supply.
Mar. 19	$\frac{3}{4}$	100	No current. Main line trouble.
Mar. 22	8	1000	Insufficient water-supply.
Mar. 27	1	125	No current. Main line trouble.
Mar. 29	8	1000	Insufficient water-supply.
May 26	$\frac{1}{2}$	75	No current. Main line trouble.
Dec. 4	$\frac{3}{4}$	75	No current. Main line trouble.
Dec. 11	$\frac{1}{2}$	100	No current. Main line trouble.
Total	$43\frac{1}{2}$	5475	

TABLE VIII.

ESTIMATE OF ORE RESERVES, DEC. 31ST, 1924.

	"A" Shaft Tons	"B" Shaft Tons	Total Tons
Pillars	1,101,000	678,000	1,779,000
Floors	2,081,000	912,000	2,993,000
Partly Developed	65,000	10,000	75,000
Total	3,247,000	1,600,000	4,847,000
Less 10% Rock	325,000	160,000	485,000
Net Total	2,922,000	1,440,000	4,362,000
To Support Surface	1,586,000	960,000	2,546,000
Available Ore	1,336,000	480,000	1,816,000
Less 10% Rock & 10% Loss in Mining	267,000	96,000	363,000
Net Available Ore	1,069,000	384,000	1,453,000

RECAPITULATION.

	Developed Tons	Prospective Tons	Total Tons
Available Ore	1,741,000	75,000	1,816,000
Less 10% Rock & 10% Loss in Mining	348,000	15,000	363,000
Net Available Ore	1,393,000	60,000	1,453,000

Factors used:- 8, 9, 10 cu. ft. per ton.

LABOR.

There was no shortage of labor at any time except in May and June. During these months some good men left to start work on their farms.

After August 1st the mine was operated five days a week.

There were no changes in the wage-scale during the year.

POWER.

The mine was closed on February 23rd and on four Saturdays in March, the 8th, 15th, 22nd and 29th, on account of shortage of water for electric power. The steam-driven air-compressor was used during this period.

The main boiler-plant was shut down on June 1st, and was started again on November 1st, the small boiler in the dry being used in the interim.

FATAL ACCIDENT. JOSEPH HARRINGTON.

At 7:55 A.M. January 28th, while the locomotive on the tenth level in "A" shaft was pushing in a train of empty cars, one of the bundles of drill-steel, that were being carried by the locomotive, rolled over the side, tilted up, and was pushed back over the rear end. It struck the brakeman, Joseph Harrington, who was riding on the rear of the locomotive, in the chest, and knocked him off. The blow caused a rupture of the lower intestines, which resulted in peritonitis, and he died during the night of the following day. He was a single man, 33 years old, and had worked at the mine for eight years.

The mine was closed for half a day on Saturday, February 2nd, for the funeral.

## ACCIDENTS TO EQUIPMENT.

### SHEAVE.

At 4:15 P.M. on March 18th the pillow-blocks on the turn-sheave of "A" shaft hoisting rope gave way, and the sheave was jammed up against the concrete beams in the shaft-house. New pillow-blocks and a new sheave were on hand, and were erected that night, so that there was no loss of product.

### SCRAPER-HOIST.

On April 11th the electric scraper-hoist on the first level in "B" shaft was entirely demolished by a large chunk of ore, which rolled over the pocket. It was almost a total loss, but was rebuilt, and another motor was obtained.

### AIR-PIPE.

The main air-pipe blew out at a joint near "A" shaft on the morning of September 23rd, and this shaft was idle for 1½ hours.

### PUMPING MACHINERY.

The centrifugal pump broke both shafts early in the year, and was sent to surface and thoroughly repaired. It was put back into service on April 9th.

## NEW CONSTRUCTION.

### E AND A. 444. FIRE PROTECTION.

Fire-doors have been erected at strategic points on the different levels so that the air-circulation between the shafts can be stopped, and another door has been erected at the foot of the raise from the Incline Mine, so that the down-cast draft can be stopped. These have been connected to air-lines, so that they can be simultaneously closed by opening an air-valve on any level in each shaft or on surface. A stench signal-system for use in case of fire underground has also been installed, and proper notices prepared. The program called for by this E. and A. has not been entirely completed, as the hose and water connections are not entirely completed, and some of the signs have not been received.



E AND A. 448. STEEL ORE-CARS.

This E and A. was started in 1923, and called for the purchase of sixteen steel, rocker-dump, five-ton ore-cars for the fifteenth level. Certain changes in chutes, pockets and tracks were necessary, and there were nearly all made last year. The cars were delivered in March and April, and the first ten were put in service on April 1st.

As a result two less men were required on this level, the overrun was increased, and hoisting capacity from this level was increased from 60 to 100 tons per hour. All the ore on the fifteenth level is now hoisted through "B" shaft.

E AND A. 453. SIX SCRAPER HOISTS AND CABLES.

As the full capacity of the air-compressors had been reached, it was decided to drive new scraper-hoists by electricity. A system of power distribution was laid out, and six scraper-hoists with 25 H.P. motors were designed and purchased, and the necessary cables, junction-boxes, etc. were purchased and installed. Five of the new hoists are now in service, and some of the air-driven hoists have been electrified.

ELECTRIC HAULAGE.

The trolley locomotive on the eighth level in "A" shaft went into commission in March, taking much of the ore that formerly went to the tenth level, and reducing the cost of handling. The proportion of lump ore was also increased by reducing breakage in the chutes.

The storage-battery locomotive from the Salisbury Mine was sent to the Cliffs Shaft Mine in July, and the gauge was widened to 24 inches. It was sent down to the sixth level in "A" shaft for experimental work in connection with a scraper-slide.

ROCK DRILLS.

Nine more No. 18 Ingersoll Leyner drills were replaced by No. 248 drills of the same make during the year, and comparative tests were made with some other makes of drills.

## EXPLORATION.

### UNDERGROUND DIAMOND DRILLING.

Eighteen diamond drill-holes were drilled during the year, a detailed description of which is given in the geologist's annual report.

In "A" shaft on the eleventh level in the Main Vein two holes were drilled to the north, and two to the south, and from the east end of the level one was drilled to the east and two to the north-east. These holes were successful in finding ore to the north and east, but no ore was found to the south. Two holes were drilled east and north-east from the east end of the twelfth level in the same vein without finding ore.

The drill was then moved to the South-East Deposit, where two holes were drilled on the fifth level, one due south, 1150 feet south-east of the shaft, which found thirty feet of ore, and one north-east, 1480 feet south-east of the shaft, which found ore under the hanging-wall.

The drill was then moved to the east end of the seventh level below the workings of the Incline Mine. Here two holes were drilled horizontally to the north-west and north-east. As it was evident that these holes were in the foot-wall, the drill was turned around, and a hole was drilled south-west at an inclination of thirty degrees up, which cut nine feet of ore at 69 feet, and then went into the hanging-wall.

The drill was moved back to the South-East Deposit, where two holes were drilled to the south without finding ore on our side of the boundary line. A third hole is being drilled to the north. All holes but one have been horizontal, and all have been in "A" shaft.

### SURFACE.

There was no important new construction on surface, but repairs to buildings and equipment were not neglected. The roads were fixed up, and the wall around the drive-way at the office was repaired and concrete steps were built on the west side.

At the pocket an old electric timber-hoist from the Lake Mine was erected to move pocket-cars on the lump ore track in the winter-time.

Cars are spotted in summer by small air-hoists.

#### STOCK-PILES.

A new car for stocking lump ore was built in January, and its use materially increased hoisting capacity.

Both lump and crushed ore stock-piles were substantially reduced during the summer, and estimated overruns in both piles were reported by the engineers, the overrun in the lump pile being considerably larger than last year.

One of the trestles erected in 1923 for lump ore was not disturbed by loading operations, and ore was stocked from this trestle until the end of the year. Another trestle was erected and a third started. No trestle is used in stocking crushed ore.

A car of trestle legs was received in September.

#### BUILDINGS.

A new roof was put on the Central Chemical Laboratory, and the inside of the shops, drill-shop and dry was painted.

#### FINE CRUSHER.

The fine crusher was put in operation on May 22nd, and was operated intermittently throughout the season. 11,851 tons of Cliffs Shaft Crushed and 14,629 tons of Holmes and Holmes Bessemer were crushed to fill special orders.

#### EQUIPMENT.

Three wooden tram-cars were built for the fifth level, and four steel-bodied cars were built as an experiment.

A 3600-gallon oil-tank was purchased and erected, the saving on a car of oil more than paying for the installation.

One scraper-hoist was entirely rebuilt, two Lidgerwood hoists were electrified for use with scrapers, and one air-hoist was electrified and erected on the second level in "A" shaft for handling cars on the rock-dump.

Two skips were rebuilt during the year, and a new rope was put on in "B" shaft.

A portable scraper-slide for loading cars underground with a scraper was built in the shops, and a permanent slide for the same purpose was erected underground.

#### SCRAP.

A scrap-yard for the collection, sorting and reclamation of scrap from the mines of the district is maintained, and a large amount of scrap was collected, much of it coming from the Salisbury Mine. Six and a half cars of scrap of various grades were sold during the season.

#### UNDERGROUND.

##### GENERAL.

At the beginning of the year there were 50 contracts working, evenly divided between the shafts, but in October and November a number of changes were made, so that there were 31 contracts in "A" shaft and 19 in "B" shaft. This was done, because the ore-reserves in "A" shaft are nearly twice as large as those in "B" shaft. In order to equalize the hoist all the ore mined below the tenth level in "A" shaft is trammed to "B" shaft on the fifteenth level, and hoisted there.

The average classification and distribution of contracts for the year is as follows:-

	"A" Shaft	"B" Shaft	Total
Stopes	10	9	19
Floors	9	8	17
Backs	1	1	2
Ore-Drifts and Raises	3	4	7
Rock	<u>3</u>	<u>1</u>	<u>4</u>
Total	26	23	49
Developing New Ore	12	10	22
Mining Known Reserves	11	12	23
Rock	<u>3</u>	<u>1</u>	<u>4</u>
Total	26	23	49

#### DEVELOPMENT.

##### "A" SHAFT.

In the North Vein the principal development has been at the east end of the sixth level, and on the eighth level underneath the sixth level deposit. One gang is stoping north on the sixth level, 1950 feet north-east of the shaft, but have not yet reached the foot-wall, and another is stoping east near the hanging-wall, 2150 feet north-east of the shaft. The ore in this part of the vein is now known to be 350 feet long and 200 feet wide at its widest point with actual limits undetermined, and there is a good chance that it will connect with ore on the fifth level of No. 3 Mine 550 feet north-east. Underneath this ore a stope is being driven east on the eighth level and a raise is being put up. The width of the ore is undetermined here also.

On the fifth level the stope that was going west, 800 feet north-west of "A" shaft, was continued west about 100 feet, but the ore pinched out. There is good ore in both back and floor, however, and a contract just below the sixth level in "B" shaft has cross-cut the ore below the middle of the stope.

On the seventh level another raise was put up at the west end of the drift 900 feet north-east of the shaft, and one gang has been stoping and drifting to the east following an irregular vein from 1500 to 1600 feet north-east of the shaft.

In the Main Vein some exploratory drifts and raises have been driven on the seventh level at the east end in an endeavor to locate the extension of the ore below the bottom of the Incline Mine, but this work has been disappointing. The ore is now being followed to the south.

The most important development in this vein has been on the eleventh and twelfth levels. The east end of the ore was reached on the eleventh level, and a raise was put up to the tenth level on the south foot-wall near the middle of the vein. Two branch-raises were also put up to different stopes on this level. One contract is now following the north part of the vein to the east. On the twelfth level stopes have been driven west and north, and the ore is now known to be at least 360 feet long and 160 feet wide at its widest point. The width has not been determined at all points.

In the South-East Deposit the development campaign started last year was continued. Two gangs are working above the fifth level. One is stoping east in fine ore on the fourth level, but the back is weak. Another apparently reached the end of the ore on the west on a sub-level ten feet below the fourth level, where the ore pitched down to the west. No work was done on the fifth level, except diamond drilling, and a short rock drift, but two veins of ore were cut by drill-holes. On the sixth level the ore was followed to the east, but it was very irregular and was cut up by rock, and little tonnage was blocked out. The vein on this level is 870 feet long. On the seventh level some stoping was done and three raises were put up to the sixth level in the west part of the vein, and a stope was driven east during most of the year. This ore pinched out, and a rock-drift is being driven east to reach a raise that was put up in ore from the ninth level.

On the ninth level 1550 feet south-east of "A" shaft a cross-cut stope has been driven to the south through ground that was considered too poor to mine,

and some good ore has been found, although it is often badly mixed with rock. A drift started in rock on the tenth level under this ore-body was in good ore in December.

In the South Lens a rock drift was driven west on the fifth level and a raise put up 400 feet south of the shaft to make available for mining the floor of a stope on the third level.

#### "B" SHAFT.

In the North Vein there has been no development, except the cross-cut on a sub-level just below the sixth level, which cut the ore found on the fifth level, 800 feet north-west of "A" shaft.

In the Main Vein the ore just below the fifth level, 500 feet west of "B" shaft, has been followed east an unexpected distance, but the end is not far off. There was no development below this level till the twelfth level is reached, where two gangs have opened up and mined a fair tonnage of ore under the hanging-wall near the north side of the deposit. Two raises have been put up near the hanging-wall in the west part of the fourteenth level, but the ore is thin here. On the fifteenth level the main drift is being extended to the north-west to reach the ore found by diamond-drilling.

In the Fault Vein the ore has been followed west on the fourteenth level to the end, 1620 feet west of "B" shaft, and cross-cuts are now being driven to the hanging to determine the width. The fifteenth level drift was extended and two raises were put up to this vein, and four have been put up from the fourteenth to the thirteenth level. Three of these have been put through to the twelfth level and one to the eleventh. This vein is being prepared for underhand stoping, and when all the raises are up a large tonnage can be handled cheaply.

In the South Lens above the first level, 800 feet south-east of the shaft a bench raise is being put up to make available some ore on the 1190 foot sub-level under the hanging-wall.

STOPPING.

"A" SHAFT.

The policy started some years ago of cleaning up small, scattered reserves of ore on the upper levels and concentrating reserves in the larger ore-bodies on the lower levels has been continued as far as the maintenance of the requisite number of working places would allow. In addition it has been endeavored to keep half the contracts in advancing work on new ore, as in a mine of this character a contract on advancing work on the average develops nearly as much ore as it takes out. If this policy is maintained the estimated ore-reserves will show only a small annual shrinkage.

On the second level in "A" shaft one gang has been stoping on a sub-level under the first level in the Main Vein, 730 feet north-west of the shaft. The ore has been very irregular in both size and analysis. Another gang has been mining 130 feet further east for six months, dropping their ore directly into a chute. 600 feet east of the shaft two gangs have been mining the floor of the second level, following the ore downwards to the east. At the end of the year this place was looking better than for some time previous.

In the North Vein one gang has been mining the floor of the second level 430 feet north-east of "B" shaft most of the year, the ore going to the fifth level in "A" shaft, and another has been stoping on a sub-level 500 feet north-west of "A" shaft. This ore is narrow and irregular. There have been four gangs mining the floor of the sixth level from 900 to 1450 feet north-east of the shaft most of the year, and they have enough ore left in this territory to last for another year or more.

Another gang has finished the floor of the ninth level 1500 feet north-east of the shaft and is now cleaning up small amounts of ore left around the same raise on the seventh and eighth levels.

In the Main Vein there was no stoping done during the year, except that described under "Development."



In the South Lens one gang has been cleaning out the tail-end of an ore-body above the third level 300 feet south of the shaft, another has finished the ore above the fifth level, 550 feet south-east of the shaft, and a third has finished the ore in this deposit between the eighth and ninth levels 600 to 700 feet south-east of the shaft. Another gang mined the floor of the eighth level from 800 to 1220 feet east of the shaft, and is now starting on the floor of the ninth level 1030 feet south-east of the shaft. The available ore in this deposit is pretty well cleaned up as far down as the ninth level, a little remaining on the fourth and sixth levels only.

"B" SHAFT.

On the sub-levels above the first level four gangs have been mining floors all year. One is mining the floor of the 1204 foot sub-level at the head of the raise 450 feet south-west of "B" shaft, and has come nearly to the end of the ore. Another is mining the floor of the 1190 and 1204 foot sub-levels 100 feet further east. This place is looking very well. A third has mined the floor of the 1190 and 1200 foot sub-levels 500 and 600 feet south-east of the shaft, and is now extending the 1165 foot sub-level further east in rock before continuing their stoping operations. The fourth gang mined the floor of the 1220 foot sub-level 700 to 750 feet south-east of the shaft, and is now putting up a branch raise to mine the floor of the 1190 foot sub-level.

In the Main Vein one gang finished the ore available in the floor of the third level from 300 to 400 feet south-east of the shaft, and moved to "A" shaft in November. Another has nearly finished the ore left in the floor of the tenth level 700 to 860 feet north-west of the shaft, and another has mined the ore in the back of the thirteenth level. Another gang has mined the ore between the thirteenth and fourteenth levels near the hanging-wall on the north side of the fourteenth level drift. Another gang has stoped to the west on the thirteenth level following the south edge of the vein to the end, 1450 feet west of the shaft. Other operations in this vein have been described under "Development."

In the North Vein one gang has mined nearly all the ore above the fifth level around a raise 600 feet north of the shaft. On the sub-level below the sixth level the floor of the sixth level 400 to 500 feet north of the shaft has been finished by two contracts. One gang is starting to mine the floor of the sub-level.

In the Fault Vein two gangs are mining the floor of the eighth level from 1150 to 1300 feet south-west of the shaft. One of these gangs mined the floor of the seventh level from 1000 to 1200 feet south-west of the shaft during most of the year. The ore in this vein is finished down to the eighth level, except for a small amount of floor left on the seventh level.

CLIFFS SHAFT MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1924.

GRADE	IRON	PHOS	SILICA
Lump Cliffs Shaft,	60.03	.102	5.39
Crushed Cliffs Shaft,	57.68	.107	7.20

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1924.

GRADE	Mine		Lake Erie	
	IRON	PHOS.	IRON	MOIST.
Lump Cliffs Shaft,	59.63	.102	60.28	.38
Crushed Cliffs Shaft,	58.21	.106	58.67	1.67

ORE STATEMENT - DECEMBER 31ST, 1924.

	LUMP CL. SHAFT	CRUSHED CL. SHAFT	TOTAL	TOTAL LAST YEAR
On hand January 1, 1924,	54,012	71,087	126,099	271,493
Output for Year,	199,085	97,423	296,508	290,615
Total,	253,097	168,510	422,607	562,108
Shipments,	196,010	122,894	318,904	436,009
Balance on Hand,	57,087	45,616	103,703	126,099
Increase in Output,			5,893	
Decrease in Ore on Hand,			22,396	

1924 -- 1-8 Hour Shift, 6 days per week, Jan. 1st to Aug. 4th, 1924.  
 1-8 Hour Shift, 5 days per week, Aug. 4th to Dec. 31st, 1924.

1923 -- 1-8 Hour Shift, Jan 1st to Dec. 31st, 1923.

CLIFFS SHAFT MINE  
SHIPMENTS FOR YEAR-1924.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Lump Cliffs Shaft,	130,415	65,595	196,010	221,196
Crushed Cliffs Shaft,	42,094	80,800	122,894	215,813
Total,	172,509	146,395	318,904	437,009
Total Last Year,	171,659	265,350	437,009	
Decrease,			118,105	

CLIFFS SHAFT MINE

COMPARATIVE MINING COST FOR YEAR

	1924	1923	INCREASE	DECREASE
PRODUCT	296,508	290,615	5.893	
Underground Costs	1.524	1.541		.017
Surface Costs	.199	.218		.019
General Mine Accounts	.088	.081	.007	
Cost of Production	1.811	1.840		.029
Plant Account	.021	.003	.018	
Equipment	.004	.011		.007
Uncompleted Construction	.0	.011		.011
Taxes	.351	.343	.008	
Central Office	.100	.085	.015	
Contingent Expense	.041	.034	.007	
Cost Adjustment	.047	.031	.016	
Cost on Stockpile	2.375	2.358	.017	
Loading & Shipping	.043	.073		.030
Total Cost on Cars	2.418	2.431		.013
No.Days Operating	,277	299		22
No.Shifts & Hours	1-8	1-8		
Avg.Daily Product	1070	972	98	
<u>COST OF PRODUCTION</u>				
Labor	1.159	1.199		.040
Supplies	.652	.641	.011	
Total	1.811	1.840		.029

CLIFFS SHAFT MINE.

CLIFFS SHAFT MINE

COMPARATIVE WAGES AND PRODUCT

	1 9 2 4	1 9 2 3	INCREASE	DECREASE
PRODUCT	296,508	290,615	5,893	
No.Shifts & Hours	1-8	1-8		
Avg.No.Men Working				
Surface	60	56	4	
Underground	188	189		1
Total	248	245	3	
AVG.WAGES PER DAY				
Surface	4.34	4.18	.16-3.82%	
Underground	5.12	4.91	.21-4.27%	
Total	4.93	4.74	.19-4.01%	
WAGES PER MO.of 25 DAYS				
Surface	108.50	104.50	4.00	
Underground	128.00	122.75	5.25	
Total	123.25	118.50	4.75	
PRODUCT PER MAN PER DAY				
Surface	17.62	17.32	.30	
Underground	5.68	5.15	.53	
Total	4.30	3.97	.33	
LABOR COST PER TON				
Surface	.246	.242	.004	
Underground	.902	.954		.052
Total	1.148	1.196		.048
AVG.PRODUCT BRK'G & TRM'G	8.14	7.28	.86	
" WAGES CONTRACT MINERS	5.45	5.03	.42	
" " " TRAMMERS	5.43	5.45		.02
" " " LABOR	5.44	5.18	.26	
TOTAL NO.OF DAYS				
Surface	16825-1/2	16782 $\frac{1}{2}$	.43	
Underground	52187-3/4	56443		4.255 $\frac{1}{4}$
Total	69013-1/4	73225 $\frac{1}{2}$		4.212 $\frac{1}{4}$
AMOUNT FOR LABOR				
Surface	72,957.80	70208.25	2749.55	
Underground	267,492.32	277266.84		9774.52
Total	340,450.12	247475.09		7024.97

Proportion Surface to Underground Men:

1924 - 1 to 3.13  
 1923 - 1 to 3.37  
 1922 - 1 to 3.39  
 1921 - 1 to 2.04  
 1920 - 1 to 2.44  
 1919 - 1 to 2.30  
 1918 - 1 to 3.14

1924 - Mine worked 1-8hr 5 days per week from July 30th.

CLIFFS SHAFT MINE

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE

<u>KIND</u>	<u>QUANTITY</u>	<u>AVERAGE PRICE</u>	<u>AMOUNT 1924</u>	<u>AMOUNT 1923</u>
50% Powder	229,600	.145	33,292.00	37,894.15
60% "	13,650	.155	2,115.75	31.50
Total Powder	243,250	.1456	35,407.75	37,925.65
Fuse	325,300	6.375	2,073.80	2,162.24
Caps	74,700	10.856	810.93	840.13
Crimpers	9	1.00	9.00	.92
<u>Total Fuse, Etc.</u>			2,893.73	3,003.29
Total Explosives			38,301.48	40,928.94
Product			296,508	290,615
Pounds Powder per ton of ore			.8204	.9026
Cost per ton for powder			.1194	.1305
" fuse, etc.			.0098	.0103
" all explosives			.1292	.1408
Avg. price per lb. for powder			.1456	.1446

CLIFFS SHAFT MINE  
COMPARISON OF COST SHEETS FOR 1923 AND 1924

PRODUCTION

	<u>1923</u>	<u>1924</u>
Days Worked	299	277
	Tons	Tons
Ore	290,615	296,508
Rock	<u>15,112</u>	<u>14,116</u>
Ore and Rock	305,727	310,624
Ore per Day	972	1,070
Rock per Day	<u>50</u>	<u>51</u>
Ore and Rock per Day	1,022	1,121

LABOR

	<u>1923</u>	<u>1924</u>
Average Number of Men	246	248
Average Rate per Day	\$ 4.74	\$ 4.92

TONS PER MAN PER DAY

	<u>1923</u>	<u>1924</u>
Surface	17.32	17.62
Underground	<u>5.15</u>	<u>5.68</u>
Total	3.97	4.30

COST OF PRODUCTION

	<u>1923</u>	<u>1924</u>
Labor	\$ 1.199	\$ 1.159
Supplies	<u>.641</u>	<u>.652</u>
Total	\$ 1.840	\$ 1.811



UNDERGROUND COSTS.

Exploring in Mine.

1923	¢	2175.26	¢	.008
1924		<u>7976.16</u>		<u>.027</u>
Increase	¢	5800.90	¢	.019

Development in Rock.

1923	¢	31920.11	¢	.110
1924		<u>31925.48</u>		<u>.108</u>
Increase	¢	5.37		
Decrease			¢	.002

Development in Ore.

1923	¢	24800.76	¢	.085
1924		<u>19097.73</u>		<u>.064</u>
Decrease	¢	5703.03	¢	.021

Stopping.

1923	¢	131714.72	¢	.453
1924		<u>126061.33</u>		<u>.425</u>
Decrease	¢	5653.39	¢	.028

Timbering.

1923	¢	6296.64	¢	.022
1924		<u>9687.22</u>		<u>.033</u>
Increase	¢	3390.58	¢	.011

Tramming.

1923	¢	129297.00	¢	.445
1924		<u>123051.36</u>		<u>.415</u>
Decrease	¢	6245.64	¢	.030

Ventilation.

1923	¢	100.23	¢	.000
1924		<u>2576.75</u>		<u>.009</u>
Increase	¢	2476.52	¢	.009

Pumping.

1923	¢	27370.47	¢	.094
1924		<u>26731.12</u>		<u>.090</u>
Decrease	¢	639.35	¢	.004

Compressors and Air Pipes.

1923	¢	33715.08	¢	.116
1924		<u>33040.20</u>		<u>.111</u>
Decrease	¢	674.88	¢	.005

In 1923 the diamond drill was operated three months, while in 1924 the drill was in operation throughout the year.

The decrease is due to 22 less working days and to less raising and drifting in ore.

The decrease is due to 22 less working days in 1924.

The increase is due to employing two extra timbermen the greater part of 1924.

The decrease is due to 22 less working days and fewer trammers employed.

1924 charges are for installing fire-doors and air and water-lines for fire protection, E & A. 444.

The decrease is in consumption of electric power, on account of less water pumped.

The cost of operating compressors decreased \$ 1134 in 1924, on account of 22 less working days. Air-pipes cost \$ 3496 in 1923 and \$ 3955 in 1924, an increase of \$ 459.

UNDERGROUND COSTS. (Continued)

Back Filling.

1923	\$	5260.20	\$	.018
1924		<u>5687.83</u>		<u>.019</u>
Increase	\$	427.63	\$	.001

The increase is due to more men employed handling rock.

Underground Superintendence.

1923	\$	13523.05	\$	.047
1924		<u>14001.45</u>		<u>.047</u>
Increase	\$	478.40	\$	.000

In 1924 an extra shift-boss was employed from July 1st.

MAINTENANCE ACCOUNTS.

Compressors and Power Drills.

1923	\$	5991.12	\$	.021
1924		<u>4231.51</u>		<u>.014</u>
Decrease	\$	1759.61	\$	.007

In 1923 14 - No. 248 Leyner-Ingersoll drills cost \$ 5115.25, while in 1924 9 drills of the same type cost \$ 3381.54.

Hand Trammig Equipment.

1923	\$	14322.81	\$	.049
1924		<u>20579.05</u>		<u>.069</u>
Increase	\$	6256.24	\$	.020

The increase is due to a larger number of scrapers in use. Three new scraper-hoists cost \$ 1930.72 in 1924.

Electric Tram Equipment.

1923	\$	20460.64	\$	.070
1924		<u>23624.80</u>		<u>.080</u>
Increase	\$	3164.16	\$	.010

The increase is due to charging off E & A. 448, 16 steel, rocker-dump, five-ton ore-cars for fifteenth level "B" shaft.

Pumping Machinery.

1923	\$	895.96	\$	.003
1924		<u>3673.84</u>		<u>.013</u>
Increase	\$	2777.88	\$	.010

The increase is due to re-wiring pump-house and overhauling centrifugal pump.

SURFACE COSTS.

Hoisting.

1923	\$	16888.21	\$	.058
1924		<u>16405.43</u>		<u>.055</u>
Decrease	\$	482.78	\$	.003

The decrease is in the number of days worked.

Stocking Ore.

1923	\$	7826.87	\$	.027
1924		<u>7529.03</u>		<u>.026</u>
Decrease	\$	297.84	\$	.001

The decrease is due to 22 less working days.

SURFACE COSTS. (Continued)

Screening-Crushing at Mine.

1923	\$	9468.38	\$	.033
1924		9842.45		.033
Increase	\$	374.07	\$	.000

The increase is in repairs to screens and chutes.

Dry-House.

1923	\$	7925.02	\$	.027
1924		6772.38		.023
Decrease	\$	1152.64	\$	.004

The decrease is in heating charges.

General Surface Expense.

1923	\$	6882.84	\$	.024
1924		7097.61		.024
Increase	\$	214.77	\$	.000

The increase is due to repairing the wall around the driveway at the office and building concrete steps on the west side of the wall.

MAINTENANCE ACCOUNTS.

Hoisting Equipment.

1923	\$	6894.79	\$	.024
1924		4837.18		.016
Decrease	\$	2057.61	\$	.008

In 1923 two Lilly Hoist Controls cost \$ 2199.

Shaft.

1923	\$	838.25	\$	.003
1924		2271.43		.008
Increase	\$	1433.18	\$	.005

In 1924 both shafts were relined with new casing plank.

Top Tram Equipment.

1923	\$	1924.87	\$	.006
1924		1449.08		.005
Decrease	\$	475.79	\$	.001

Motors decreased \$ 439 including part payment on a new motor in 1923. Tracks and cars decreased \$ 204 and wire-rope increased \$ 88. Repairs to rollers increased \$ 80.

Docks, Trestles and Pockets.

1923	\$	776.21	\$	.002
1924		645.38		.002
Decrease	\$	130.83	\$	.000

Grading and planking cost \$ 141 in 1923. There was no charge to this account in 1924.

Mine Buildings.

1923	\$	4008.83	\$	.014
1924		2056.50		.007
Decrease	\$	1952.33	\$	.007

The decrease is in repairs to the coal-dock.

GENERAL MINE ACCOUNTS.

Insurance.

1923	\$	245.76	\$	.001
1924		245.76		.001
	\$	0	\$	.000

GENERAL MINE ACCOUNTS. (Continued)

Engineering.

This is a Central Office charge.

1923	\$	2613.99	\$	.009
1924		<u>3250.38</u>		<u>.011</u>
Increase	\$	636.39	\$	.002

Analysis.

1923	\$	2468.80	\$	.008
1924		<u>2515.88</u>		<u>.009</u>
Increase	\$	47.08	\$	.001

Personal Injury Expense.

The increase is due to fatal accident to Joseph Harrington.

1923	\$	3921.91	\$	.014
1924		<u>7249.54</u>		<u>.024</u>
Increase	\$	3327.63	\$	.010

Safety Department Expense.

1923	\$		\$	
1924		<u>68.40</u>		<u>.000</u>
Increase	\$	68.40	\$	.000

Telephones and Safety Devices.

The decrease is largely supplies. In 1923 fire-extinguishers and buckets cost \$ 100, bulletin boards and signs \$ 88, and fire-helmets \$ 500.

1923	\$	1942.47	\$	.007
1924		<u>1262.25</u>		<u>.004</u>
Decrease	\$	680.22	\$	.003

Local General Welfare.

1923	\$	957.05	\$	.003
1924		<u>930.71</u>		<u>.003</u>
Decrease	\$	26.34	\$	.000

Mine Office.

Charges at the mine decreased \$ 954, the principal items of decrease being,

1923	\$	11268.07	\$	.039
1924		<u>10774.32</u>		<u>.036</u>
Decrease	\$	493.75	\$	.003

Janitor, Heat, Etc.	\$ 481
Telephone	27
Garage and Mileage	440

Direct charges increased \$ 458.

RECAPITULATION.

	Year 1923		Year 1924		Increase		Decrease	
	Total	Per Ton	Total	Per Ton	Total	Per Ton	Total	Per Ton
Underground Costs	447844.05	1.541	451945.83	1.524	4101.78			.017
Surface Costs	63434.27	.218	58906.47	.199			4527.80	.019
General Mine Accts.	23418.05	.081	26297.24	.088	2879.19	.007		
Cost of Production	534696.37	1.840	537149.54	1.811	2453.17			.029

ANNUAL REPORT  
OF THE  
SALISBURY MINE

(1924)

PRODUCTION AND SHIPMENTS.

The Salisbury Mine worked 141 days in 1924, and produced 54,389 tons of ore of all grades, an average of 386 tons per day. The mine was closed down on July 1st and abandoned, and the men were transferred to the Barnes-Hecker and other mines. All underground equipment was removed, and nearly all of the buildings on surface were torn down or sold.

All the ore in stock was shipped.

TABLE I.

PRODUCTION BY GRADES.

Grade	Year 1924		Year 1923
	Total Tons	Per Day Tons	Total Tons
Clinton	27,137	193	
Clinton Silica	<u>27,252</u>	<u>193</u>	<u>264</u>
Total	54,389	386	264
Rock	<u>750</u>	<u>5</u>	<u>502</u>
Total	55,139	391	766

TABLE II.

SHIPMENTS.

Grade	Pocket Tons	Stock-Pile Tons	Total Tons
Clinton	2,535	24,602	27,137
Clinton Silica	<u>9,420</u>	<u>18,650</u>	<u>28,070</u>
Total	11,955	43,252	55,207

TABLE III.

DIVISION OF PRODUCT BY LEVELS.

Level	Clinton Tons	Clinton Silica Tons	Total Ore Tons	Rock Tons	Total Ore and Rock Tons
5th		4,352	4,352	42	4,394
8th	2,420	14,688	17,108	150	17,258
12th	3,501	8,212	11,713	430	12,143
13th	8,424		8,424	48	8,472
14th	<u>12,792</u>	<u>        </u>	<u>12,792</u>	<u>80</u>	<u>12,872</u>
Total	27,137	27,252	54,389	750	55,139

TABLE IV.

PRODUCTION BY MONTHS.

Month	Days	Ore Per Day Tons	Clinton Tons	Clinton Silica Tons	Total Ore Tons	Rock Tons	Total Ore and Rock Tons
January	22	302	3,482	3,160	6,642	102	6,744
February	23	390	4,374	4,600	8,974	88	9,062
March	22	405	4,627	4,276	8,903	182	9,085
April	24	362	3,810	4,878	8,688	220	8,908
May	26	370	4,067	5,561	9,628	86	9,714
June	24	377	4,365	4,659	9,024	72	9,096
Year	141	368	24,725	27,134	51,859	750	52,609
Overrun		18	2,412	118	2,530		2,530
Total	141	386	27,137	27,252	54,389	750	55,139

TABLE V.

DELAYS.

Date	Hours	Tons Lost	Cause	Cost of Repairs
Feb. 5	1½	30	Skip left track.	\$ 3.81
Feb. 26	7	140	Two sets of skip axles broken.	75.73
Apr. 12	3	150	Skip axle broke.	10.56
Apr. 14	3	60	Skip off track.	8.73
Apr. 15	2	20	Skip off track. Ice in shaft.	6.89
Apr. 17	2	60	Ice in shaft.	4.80
Apr. 19	2½	80	Skip-rope broke.	9.74
Apr. 21	2½	40	Changing skip-rope.	47.09
May 12	1½	30	Skip off track.	48.05
Total	25	610		\$ 215.40

TABLE VI.

DELAYS DUE TO LACK OF ELECTRIC CURRENT.

On account of shortage of water-power the mine was closed on February 23rd and four Saturdays in March.

TABLE VII.

ESTIMATE OF ORE RESERVES.

DEVELOPED ORE.

Level	Bessemer Tons	Clinton Tons	Clinton Silica Tons	Total Tons
5th			4,000	4,000
8th		2,500	15,000	17,500
10th		4,000	14,000	18,000
11th		3,500	11,000	14,500
12th		6,000	6,000	12,000
14th	5,000	15,000		20,000
16th	<u>3,000</u>	<u>11,000</u>	<u>9,000</u>	<u>23,000</u>
Total	8,000	42,000	59,000	109,000
Less 10% rock & 10% loss in mining	<u>2,000</u>	<u>8,000</u>	<u>12,000</u>	<u>22,000</u>
Net Total	6,000	34,000	47,000	87,000

Factors Used:-

Bessemer and Clinton in Place:- 12 cu. ft. per ton.

Silica:- 13 - 15 cu. ft. per ton.

The ore-bodies had become so small that the mine was unprofitable,  
and there is not enough ore in sight or in prospect to warrant reopening it.



## GENERAL.

### LABOR.

The mine was started on full schedule on January 8th with seventeen contracts working double-shift. There were a dozen gangs cleaning up and starting to break ore for a week previous, but there was no night shift. The mine was closed down on July 1st, and most of the underground men were transferred to the Barnes-Hecker Mine. Some were transferred to the Holmes and Cliffs Shaft Mines, and all single men were laid off. A small crew was retained till early in September tearing down old buildings, loading mine timber, coal, etc.

There was no shortage of labor of any importance.

### MINING CAPTAIN.

Captain J.H. Dunstan retired on account of ill-health on January 31st, and Captain W.H. Bath took his place. Captain Bath remained at the mine until August 1st, and was then transferred to the Athens Mine as Assistant Captain.

### EXPLORATION.

#### SURFACE DIAMOND DRILLING.

Hole No. 70, which was started in December 1923, south of the old open pit east of the surface pump-house, was down 128 feet in diorite at the beginning of the year. It was continued in the same material to a depth of 308 feet, and the drill was then moved to Grass Lake below the Lake Sally dam, and was set up on the ice. Hole No. 71 went into jasper at ledge, but found no ore. It was stopped in diorite at a depth of 218 feet. The drill was moved 200 feet north, and Hole No. 72 was put down 186 feet. This hole was in diorite below the ledge. The drill was then moved back to the Salisbury basin, and another hole was drilled, 300 feet north-east of the pump-house, to a depth of 257 feet in diorite. This was the last hole drilled.

#### REPAIRS TO BUILDINGS.

The shaft-house was repaired, new frames being erected on all four sides inside the old timbers up to the landing-floor, and two pockets were rebuilt.

New hot-water pipes were put in the dry.

#### ACCIDENT TO EQUIPMENT.

On April 19th at 7:30 P.M. the loaded skip was thrown off the track above the twelfth level, and the rope broke about seventy five feet higher up. The skip was jammed in the shaft, but was uninjured, and hoisting was resumed in two and a half-hours.

#### SURFACE SUBSIDENCE.

On the night of April 24th the surface south of the East Terrace St. houses caved, but no harm was done either on surface or underground. The cave was extended to the west in the next month. Following this cave-in, a crack appeared in the ground north of East Terrace St. under the east seven houses, breaking the foundations and throwing the walls and floors out of line. Six of these houses were vacant at the end of the year, and the other one had been repaired.

#### UNDERGROUND.

During the six months that the mine was working the average number of gangs in the Old Mine was eleven, one of which was in rock, and in the South-East Deposit six, all in ore. Some rock-work incidental to stoping was also done in this vein. The average number of gangs stoping was eleven, drifting and raising five, and rock one, seventeen in all.

In the North Vein the ore around old No. 2 shaft near Raises 503 and 505 was entirely mined on the 1240 and 1230 foot sub-levels and the fifth level, and ore lower down in this same territory was mined on both sides of

Raise 803 on the 1205, 1195 and 1154 foot sub-levels. Further east in the North Vein, 800 feet south-east of No. 5 shaft, the ore on the 1205 foot sub-level was exhausted, and more than half of that on the 1185 foot sub-level was mined. When the mine closed there were four gangs working on this sub-level.

Below the eighth level two gangs nearly finished the ore in the old workings east of Raise 901 on the 1101, 1095 and 1085 foot sub-levels in the North Vein, and mined all the ore on the ninth level around Raise 1223 in the South Vein. One gang started to open up the pillar around Raise 907, and another was repairing Raise 1021, which had partly caved. Another gang mined a pillar lying on the south foot-wall 100 feet south of Raise 1218 on the tenth level and 1000 foot sub-level, and were opening up a new sub-level in June.

In No. 4 shaft pillar one gang put up a raise 36 feet from the twelfth level, and started to mine the ore on the 960 foot sub-level.

In the South-East Deposit there was some ore left at the east end of the vein on the 905, 895 and 890 foot sub-levels. This was mined down to the thirteenth level. West of Raise "EH" the ore was mined down to the 870 foot sub-level, one sub below the thirteenth level, and the next sub-level was being opened. There were four gangs working on this, the 860 foot sub-level, when the mine closed.

#### DISMANTLING.

##### SURFACE.

The trestles, coal-dock, dry and shaft-house were torn down, and the usable material was sold to the Cliffs Shaft Mine. The rope-house, booster pump-house, surface pump-house, shops and office were sold. The office was made into a dwelling-house, but the other buildings were, or are to be torn down. The engine-house, coal-hoist house and barn are in good condition, and are used for storage of machinery.

The mine timber was all sold and shipped to the Holmes Mine, and the coal was loaded and shipped to the Cliffs Shaft Mine. Nearly all the rail, pipe, old cars, trucks, iron and steel, tools, scrap iron, etc. were sold to the Cliffs Shaft Mine for scrap, but the Barnes-Hecker Mine received a good deal of second-hand equipment from underground.

#### UNDERGROUND.

The pumps were stopped on July 1st, and were taken out as soon as possible. They were stored at the Lake Mine in the dry. The surface centrifugal pump and motor were sent to the General Storehouse, and the booster-pump to the Holmes Mine.

The Cliffs Shaft Mine received the storage-battery locomotive and its charging set, and the Holmes Mine received three Little Tugger hoists and all the drills that were not sent to the Barnes-Hecker Mine. The fan was taken out, and stored at the Lake Mine, and the fan-pipe was sent to the Holmes Mine.

All the rail, pipes, cars, trucks, etc. that were in reasonably good shape, were taken out of the mine, and the cable, water-column and air-pipe above the twelfth level were also taken out.

After everything was out of the mine the shaft was thoroughly covered over and the pit and caved ground fenced off.

No watchman is employed.

SALISBURY MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1924.

GRADE	IRON	PHOS.	SILICA
Salisbury Bessemer,	61.93	.059	5.98
Clinton,	58.74	.112	8.83
Clinton Silica,	49.12	.079	23.16

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1924.

GRADE	Mine			Lake Erie	
	IRON	PHOS.	SILICA	IRON	MOIST.
Salisbury Bessemer,	(No Shipments)				
Clinton,	(All Mixed)				
Clinton Silica,	(All Mixed)				

ORE STATEMENT - DECEMBER 31ST, 1924.

	SALISBURY BESSEMER	CLINTON	CLINTON SILICA	TOTAL	TOTAL LAST YEAR
On Hand January 1, 1924,	-	-	264	264	29,040
Output for Year,	1,212	23,768	26,879	51,859	264
Transferred,	1,337	1,082	255		
Stockpile Overruns and Shortages,	125	2,287	672	3,084	1,853
Total,	-	27,137	28,070	55,207	27,451
Shipments,	-	27,137	28,070	55,207	27,187
Balance on Hand,	-	-	-	-	264
Increase in Output,				53,354	
Decrease in Ore on Hand,				264	

1924 -- 1-8 Hour Shift, 6 days per week, Jan. 1st to Jan. 5th, 1924.  
 2-8 Hour Shifts, 6 days per week, Jan. 5th to June 30th, 1924.  
 Mine closed June 30th, 1924.

1923 -- Mine Idle.

SALISBURY MINE  
SHIPMENTS FOR YEAR-1924

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Salisbury Bessemer,	-	-	-	-
Clinton,	2,535	24,602	27,137	24,419
Clinton Silica,	9,420	18,650	28,070	2,768
Total,	11,955	43,252	55,207	27,187
Total Last Year,	-	27,187	27,187	
Increase,			28,020	

SALISBURY MINE

COMPARATIVE WAGES AND PRODUCT

	1 9 2 4	1 9 2 3	INCREASE	DECREASE
PRODUCT	54,943	1,589	56,532	
No.Shifts & Hours	2-8hr			
AVG.NO.MEN WORKING				
Surface	16	5	11	
Underground	52	6	46	
Total	68	11	57	
AVG.WAGES PER DAY				
Surface	4.32	4.39		.07-1.55%
Underground	5.10	4.91	.19-3.87%	
Total	4.91	4.67	.24-5.14%	
WAGES PER MO. OF 25 DAYS				
Surface	108.00	109.75		1.75
Underground	127.50	122.75	4.75	
Total	122.75	116.75	6.00	
PRODUCT PER MAN PER DAY				
Surface	11.23			
Underground	3.71			
Total	2.79			
LABOR COST PER TON				
Surface	.385			
Underground	1.374			
Total	1.759			
AVG.PRODUCT 'BRK'G & TRM'G	4.67			
" WAGES CONTRACT MINERS	5.35			
" " " TRAMMERS				
TOTAL NO.OF DAYS				
Surface	4890-3/4	1,542	3348-3/4	
Underground	14814-1/4	1,851	12963-1/4	
Total	19705	3,393	16312	
AMOUNT FOR LABOR				
Surface	21,149.20	6770.34	14,378.86	
Underground	75,525.86	9087.00	66,438.86	
Total	96,675.06	15857.34	80,817.72	

NOTE: Mine idle 1922 and 1923; Re-opened Jan.1, 1924; closed June 30, 1924.

Proportion Surface to Underground Men:

1924-1 to 3.25  
 1923-1 to 1.2  
 1922-1 to 1.66  
 1921-1 to 2.55  
 1920-1 to 3.7  
 1919-1 to 3.23

SALISBURY MINE

TIMBER STATEMENT FOR THE YEAR ENDING DECEMBER 31, 1925.

KIND	LINEAL FEET	AVG. PRICE PER FOOT	AMOUNT
6" to 8" Timber	31,370	.039	1,223.43
8" to 10" "	12,326	.0802	989.65
10"to 12" "	12,276	.095	1,167.04
Total 1924	55,972	.0603	3,380.12
5' Lagging	180,200	.814	1,468.50
7' "	4,018	.766	30.80
Total Lagging	184,218	.814	1,499.30
Tamarack Poles	77,920	1.10	857.06
Total lagging and poles	262,138	.899	2,356.36
Product (6 months)			53,606
Feet timber per ton of ore			1.044
" lagging "			3.436
" " per ft. of timber			3.311
Cost per ton for timber			.063
" " lagging			.028
" " poles			.016
" " " lagging & timber			.107
Total cost for timber, poles & lagging - 1924			5736.48

NOTE: Mine was abandoned June 30, 1924.



SALISBURY MINE

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE

<u>KIND</u>	<u>QUANTITY</u>	<u>PRICE</u>	<u>AMOUNT</u>
50% L.F. Powder	17,350	.1450	2,515.75
Total Powder	17,350	.1450	2,515.75
Fuse	65,400	6.373	416.80
Blasting Caps	19,000	1.155	219.23
Crimpers	29	1.00	29.00
Total Fuse, etc.			665.03
Total Explosives			3,180.78
Product (6 months)			53,606
Pounds powder per ton of ore			.3237
Cost per ton for powder			.0469
"	blasting supplies		.0124
"	" and powder		.0593
Avg. price per pound for powder			.1450

NOTE: Mine was abandoned June 30, 1924.

ANNUAL REPORT

OF THE

ANGELINE MINE

(1924)

GENERAL.

The Angeline Mine remained closed throughout the year, and pumping was continued by the Oliver Iron Mining Co. in "D" shaft.

SURFACE.

The old barn and the office and laboratory have been sold and torn down, and the old carpenter shop has been sold. Part of the carriage shed in front of the old barn has also been sold and torn down.

The joiner in the old carpenter-shop was sent to the Morris-Lloyd Mine, and the other machinery was stored at the Lake Mine in the dry.

NO. 56 RAISE.

No. 56 Timber-raise has caved badly, and is apparently entirely blocked. It has caved around the collar, and a new fence has been erected around it for protection.

There has been another subsidence in the caved ground west of No. 56 timber-raise, indicating that more of the workings left open in this pillar have caved in.

Estimate of Ore Reserves.

Developed Ore.

Sub-Level	Angeline Bessemer Tons
1318	4,600
1310	5,300
1290	5,000
1274	1,500
1258	<u>2,300</u>
Total	18,700
Less 10% Mining Loss and 10% Rock	<u>3,700</u>
Net Total	15,000

A factor of 12 cu. ft. per ton was used. All the ore is near No. 56 raise above the fourth level, and the estimate is the same as in 1921, 1922 and 1923.

The mine has been abandoned, and the amount of ore in sight is not sufficiently valuable to pay the cost of reopening and extraction.

ANNUAL REPORT

OF THE

HOLMES MINE

(1924)

PRODUCTION AND SHIPMENTS.

The Holmes Mine worked on double-shift for one week in January, and then went on single shift. It was shut down on February 23rd and on four Saturdays in March on account of shortage of power, and went on a schedule of four days a week at the end of July, and five days a week on December 1st. Shipments were light, and the stock-pile room was pretty well filled at the end of the year. The mine worked 261 days and produced 154,300 tons of all grades, an average of 591 tons per day.

10,392 tons of rock were produced, an average of 40 tons per day.

TABLE I.

PRODUCTION BY GRADES.

Grade	1924 Tons	1923 Tons
Holmes Bessemer	28,340	53,662
Holmes	18,292	19,544
Junction Bessemer	37,948	47,933
Junction	<u>69,720</u>	<u>155,533</u>
Total	154,300	276,672

TABLE II.

SHIPMENTS.

Grade	Pocket Tons	Stock-Pile Tons	Total Tons
Holmes Bessemer		5,999	5,999
Holmes		10,778	10,778
Junction Bessemer	19,752	18,408	38,160
Junction	<u>13,857</u>	<u>13,139</u>	<u>26,996</u>
Total	33,609	48,324	81,933

TABLE III.

STOCK-PILE BALANCES, DEC. 31ST, 1924.

Grade	Tons
Holmes Bessemer	29,569
Holmes	30,267
Junction Bessemer	6,008
Junction	<u>195,149</u>
Total	260,993

TABLE IV.

DIVISION OF PRODUCT BY LEVELS.

Level	Holmes Bessemer Tons	Holmes Tons	Junction Bessemer Tons	Junction Tons	Total Ore Tons	Rock Tons	Total Ore and Rock Tons
Second	127	360	808	2,045	3,340	360	3,700
Third	27,765	17,932	36,724	66,051	148,472	8,592	157,064
Fourth	<u>448</u>		<u>416</u>	<u>1,624</u>	<u>2,488</u>	<u>1,440</u>	<u>3,928</u>
Total	28,340	18,292	37,948	69,720	154,300	10,392	164,692

TABLE V.

PRODUCTION BY MONTHS.

Month	Days	Ore Per Day Tons	Holmes Bessemer Tons	Holmes Tons	Junction Bessemer Tons	Junction Tons	Total Ore Tons	Rock Tons	Total Ore and Tons
January	26	621	3,587	1,624	2,820	8,106	16,137	944	17,081
February	23	545	1,963	1,988	2,228	6,351	12,530	1,456	13,986
March	22	585	2,830	1,000	3,308	5,726	12,864	1,080	13,944
April	24	545	2,239	1,548	3,492	5,809	13,088	1,264	14,352
May	26	597	2,992	1,492	3,804	7,229	15,517	816	16,333
June	24	570	2,091	2,152	3,812	5,636	13,691	852	14,543
July	24	578	2,707	1,412	3,775	5,971	13,865	832	14,697
August	17	614	1,827	1,244	3,088	4,279	10,438	672	11,110
September	18	641	2,018	1,224	3,283	5,017	11,542	616	12,158
October	18	626	1,377	1,796	3,242	4,851	11,266	504	11,770
November	16	622	1,713	1,356	1,884	4,998	9,951	524	10,475
December	23	583	2,996	1,456	3,212	5,747	13,411	832	14,243
Year	261	591	28,340	18,292	37,948	69,720	154,300	10,392	164,692

TABLE VI.

DELAYS.

Date	Hours	Tons Lost	Cause	Repair Cost
April 24	6	400	Water in the shaft.	\$ 58.53
Oct. 30	4	350	South skip hung up in shaft-house.	84.38
Nov. 10	1 $\frac{1}{4}$	100	Overloaded skip.	
Dec. 11	1	65	Ore pocket blocked.	
Total	12 $\frac{1}{4}$	915		\$ 142.91

TABLE VII.

DELAYS DUE TO LACK OF CURRENT.

Date	Hours	Tons Lost	Cause
Feb. 23	8	600	Insufficient water supply.
Mar. 1	8	600	" " "
Mar. 8	8	600	" " "
Mar. 15	8	600	" " "
Mar. 22	8	600	" " "
Dec. 11	$\frac{1}{2}$	<u>35</u>	No current. Main line.
Total	$40\frac{1}{2}$	3035	

TABLE VIII.

ESTIMATE OF ORE RESERVES.

DEVELOPED ORE.

Level	Holmes Bessemer Tons	Holmes Tons	Junction Bessemer Tons	Junction Tons	Total Tons
Third	88,000	30,000	43,000	292,000	453,000
Fourth	<u>75,000</u>	<u>72,000</u>	<u>96,000</u>	<u>543,000</u>	<u>786,000</u>
Total	163,000	102,000	139,000	835,000	1,239,000

PROSPECTIVE ORE.

Fourth	8,000	12,000			20,000
Below Fourth	—	—	<u>40,000</u>	<u>235,000</u>	<u>275,000</u>
Total	8,000	12,000	40,000	235,000	295,000
Total Ore	171,000	114,000	179,000	1,070,000	1,534,000

Factors Used:- Hard Ore - 9 cu. ft. per ton.

Soft Ore - 12 cu. ft. per ton.

Deductions of 10% for loss in mining and 10% for rock were made in calculating tonnage.

## GENERAL.

### LABOR.

There was no shortage of labor in 1924. The number of men employed was slightly increased, when the Salisbury Mine closed, in order to provide employment for some of the old hands.

There was no change in the wage-rate during the year.

### POWER.

Owing to a shortage of electric power the mine was closed on February 23rd and on four Saturdays in March.

### ACCIDENTS TO EQUIPMENT.

The rotary converter for the electric haulage burned out in the middle of February, but a spare motor-generator set was installed at night, and was ready for work the next morning, so that there was no delay in the operation of the mine.

On Thursday, October 30th, at one o'clock the south skip was hoisted through the dump, and was jammed in such a way that it could not be lowered until after six o'clock. No ore was hoisted on that afternoon, but hoisting was resumed on Friday morning.

### EXTRAORDINARY REPAIRS.

In May and June the boiler used as an air-receiver was repaired, all the tubes being removed and new ends put in.

In September new head-sheaves for the skips were put up, and the smoke-stack on the boiler in the dry was replaced with a new one.



### NEW CONSTRUCTION.

A new four-ton top-tram car was built in March for use with the hard ores.

In July a parking-place for automobiles was laid out and fenced, and all cars were required to be parked there.

### E AND A. 444. FIRE PROTECTION.

Fire-doors have been erected in the mine so arranged that they can be closed by opening a valve on any level or on surface, thereby immediately stopping the circulation of air. The work of lining the shaft with sheet-iron was continued from the collar down to where the timber is wet.

### BUILDINGS.

The dry, office and shops were painted and calcimined, and the roofs of nearly all the buildings were given a coat of roofing tar.

### MINE TIMBER.

On account of the reduced schedule of operations the requirements of timber were not large, and were partly met by the timber from the Salisbury Mine which was all shipped to the Holmes Mine after the Salisbury Mine had closed down.

### WATER.

The flow of water underground has remained normal most of the time, except for a month when the snow melted, but it is entering the mine through cracks in the hanging-wall further west, and causes some trouble in the chutes.

On April 24th the ground on Section 16 property cracked across the ditch where the surface water drains off, and let a large flow of water into the mine at night, so that the skip-pit was filled, and hoisting was delayed until three o'clock the following afternoon. The ditch was dammed further west, and the flow of water in the mine returned to normal in 48 hours. Some changes were made in the Holmes Mine drainage ditch, but a crack appeared here

also in August, and the ditch was dammed off. In October and November a ten inch pipe-line was laid around the end of the stock-piles, replacing the ditch and carrying the surface water away from the cave.

#### CAVED GROUND.

The subsidence over the Section 16 Mine workings has not extended appreciably in area on Holmes Mine property, but the ground has gone down about ten feet near our south-east corner. The area of the caved ground has been extended to the south and west, however, and has crossed the track leading to the Salisbury Mine. There are cracks in the ground also within fifty feet of the main line of the C. & N.W. Ry. on the west, 250 feet south of the Holmes Mine property line.

#### SURFACE.

#### STOCK-PILES.

The Junction Bessemer stock-pile was nearly cleaned up, only about 2,000 tons remaining at the end of the shipping season. A short cut was taken out on the east side of the Junction pile and also on the west side of the Holmes pile. The small pile of Holmes ore that was overcast last year to make room for Holmes Bessemer was shipped this year, and a small cargo was shipped from the overrun pile of Holmes Bessemer near the C. & N.W. Ry. main line tracks. About 8,000 tons remains in this pile, which is in the way of the Junction pile. Enough stocking-room is available for all grades for this season at the present rate of production.

UNDERGROUND.

GENERAL.

Up to July 1st the number of contracts was 33, but in July this number was increased to 36, in order to take care of some of the older employees from the Salisbury Mine. The only development undertaken was raising and such drifting as was necessary in opening new sub-levels, except a short cross-cut to the south boundary-line on the 240 foot sub-level, which was driven to make another connection with the Section 16 Mine. Practically all the raising on the third level is finished, and raises are now being put up from the fourth level.

The average classification of contracts was as follows:-

Stoping	21	Contracts
Drifting and Raising in Ore	12	"
Drifting and Raising in Rock	<u>1</u>	"
Total	34	"
Hard Ore Vein	11	Contracts
Soft Ore Vein	22	"

There was an increase in the proportion of hard ore mined from 26.4% of total production in 1923 to 30.2% in 1924. The proportion of bessemer ore in the hard ore product decreased again from 73.3% in 1923 to 60.8% in 1924. In the soft ore production, however, the proportion of bessemer ore increased slightly from 23.5% in 1923 to 35.2% in 1924.

In the Hard Ore Vein the softer, slaty ore in the eastern part has been entirely exhausted, and the ore remaining is harder and much more difficult to mine, and is badly mixed with seams of rock. The ore areas as mined, however, are somewhat larger than estimated.

## DEVELOPMENT.

Raise 401 was put up in rock at the west end of the mine from the fourth level to the 240 foot sub-level, and in hard ore from the 240 foot sub-level to the third level.

Raise 460 was put up at the south-east end of the mine to the third level, being in rock to the 240 foot sub-level and in ore above that point. Raises 461, 462 and 463 were started in rock, but soon passed into ore, No. 461 being in soft ore and No. 462 in hard ore above the 240 foot sub-level. Raise 463 has not been finished.

Early in the year a cross-cut was driven south 55 feet from the third level drift 15 feet east of Raise 360 into the hanging-wall, and a flat raise was put up in rock to the 340 foot sub-level to take down the water that was coming in through the hanging. This raise is still carrying a large part of the water, but new cracks have developed farther west that have partly drained it.

## STOPPING.

### HARD ORE VEIN.

Stoping has been continued in the Hard Ore Vein between the second and third levels in the same manner as in 1923, that is, in a series of steps rising towards the west from the 310 foot sub-level at a point near where this vein crosses the south boundary-line of the property to the 365 foot sub-level at the west end of the vein at Raise 317. There are twelve contracts working in this vein, distributed as follows:- two each on the 365, 355 and 345 foot sub-levels, one on the 340 foot sub-level, three on the 330 foot sub-level and two on the 310 foot sub-level.

The ore west of Raise 361 is harder than it was higher up, and the western part of the vein is much cut up by seams of rock. Just below the second level the ore does not extend as far west as it did higher up, but further east the area mined is larger than estimated.

### SOFT ORE VEIN.

Practically all of the ore has in 1924 been hoisted from the third level, although a little ore was mined early in the year from the second level and above. All of the ore above the second level has been mined except a very small amount close to the cross-cut to the shaft, and this is rather high in sulphur.

At the beginning of the year the 375 foot sub-level had been mined for a distance of 180 feet north of the south boundary and 200 feet west of the east boundary. This sub-level has been finished except for a small area close to the foot-wall under the second level cross-cut. The 365 foot sub-level has also been extensively opened and mined, and there are now thirteen contracts working on it. The work is concentrated along the north foot-wall and in the middle part of the vein.

The 355 foot sub-level has also been mined further west, and is worked out close behind the 375 foot sub-level, and now has two gangs working on it.

The 340 foot sub-level has been worked out east and south of Raise 348. There is a big dike that cuts through the ore 25 feet south of this raise, and all the ore has been mined on this sub-level south of this dike nearly to No. 3 cross-cut. One gang is working here.

On the 330 foot sub-level the ore has been mined for a distance of 300 feet west from the east boundary and 100 feet north of the south boundary, and there are now three gangs working between this area and the foot-wall, the one farthest west being 220 feet from the east boundary.

The ore within 30 feet of the south main drift on the third level has been mined as far west as Raise 357, 280 feet from the east boundary, on the 320 foot sub-level, except a small block east of Raise 354, on which one gang is now working.

Two gangs are working on the 320 foot sub-level, which has been mined as far west as the Hard Ore vein at Raise 355.

The 300 foot sub-level has been finished from the point where the foot-wall crosses the south boundary west to Raise 356, and north from this raise to the foot-wall. One gang is working here.

DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
BOND  
MADE IN U.S.A.

HOLMES MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1924.

GRADE	IRON	PHOS.	SILICA
Holmes Bessemer,	61.74	.039	7.56
Holmes,	60.37	.077	8.10
Junction Bessemer,	60.77	.033	8.01
Junction,	57.95	.078	8.41

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1924.

GRADE	Mine		Lake Erie		
	IRON	PHOS.	IRON	PHOS.	MOIST.
Holmes Bessemer,	63.36	.030	63.58	.032	2.52
Holmes,	60.90	.072	60.85	-	2.76
Junction Bessemer,	(All Mixed)				
Junction,	(All Mixed)				

ORE STATEMENT - DECEMBER 31ST, 1924.

	HOLMES		JUNCTION		TOTAL	TOTAL LAST YEAR
	HOLMES BESS.	HOLMES	BESSEMER	JUNCTION		
On hand January 1, 1924,	7,228	22,753	6,220	152,425	188,626	240,147
Output for Year,	28,340	18,292	37,948	69,720	154,300	276,672
Total,	35,568	41,045	44,168	222,145	342,926	516,819
Shipments,	5,999	10,778	38,160	26,996	81,933	328,193
Balance on Hand,	29,569	30,267	6,008	195,149	260,993	188,626
Decrease in Output,					122,372	
Increase in Ore on Hand,					72,367	

1924 -- 2-8 Hour Shifts, 6 days per week, Jan. 1st to Jan. 5th, 1924.  
 1-8 Hour Shift, 6 days per week, Jan. 5th to July 26th, 1924.  
 1-8 Hour Shift, 4 days per week, July 26th to Nov. 30th, 1924.  
 1-8 Hour Shift, 5 days per week, Dec. 1st to Dec. 31st, 1924.

1923 -- 2-8 Hour Shifts, Jan. 1st to Dec. 31st, 1923.

HOLMES MINE

SHIPMENTS FOR YEAR-1924.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Holmes Bessemer,	-	5,999	5,999	161,964
Holmes,	-	10,778	10,778	34,176
Junction Bessemer,	19,752	18,408	38,160	49,165
Junction,	13,857	13,139	26,996	82,695
Total,	33,609	48,324	81,933	328,000
Total Last Year,	106,789	221,211	328,000	
Decrease,			246,067	



HOLMES MINE

COMPARATIVE MINING COST FOR YEAR

	1924	1923	INCREASE	DECREASE
PRODUCT	154,300	276,672		122,372
Underground Costs	1.470	1.347	.123	
Surface Costs	.286	.214	.072	
General Mine Accounts	.130	.140		.010
Cost of Production	1.886	1.701	.185	
Original Cost		.001		.001
Plant Account	.002	.215		.213
Equipment	.002	.001	.001	
Uncompleted Construction		.002		.002
Taxes	.367	.177	.190	
Central Office	.113	.081	.032	
Contingent Expense	.046	.031	.015	
Cost Adjustment	.014	.015		.001
Cost on Stockpile	2.430	2.224	.206	
Loading & Shipping	.040	.077		.037
Cost on Cars	2.470	2.301	.169	
No. Days Operating	261	301		40
No. Shifts & Hours	2-8- 4 1-8-257	2-8		
Avg. Daily Product	591	919		328
<u>COST OF PRODUCTION</u>				
Labor	1.287	1.152	.135	
Supplies	.599	.549	.050	
Total	1.886	1.701	.185	

HOLMES MINE

COMPARATIVE WAGES AND PRODUCT

	1 9 2 4	1 9 2 3	INCREASE	DECREASE
PRODUCT	154,300	276,672		122,372
No.Shifts & Hours	2-8;1-8	2-8		
AVG.NO.MEN WORKING				
Surface	46	55		9
Underground	105	166		61
Total	151	221		70
AVG.WAGES PER DAY				
Surface	4.39	4.17	.22-5.27%	
Underground	5.31	5.02	.29-5.77%	
Total	5.03	4.81	.22-4.57%	
WAGES PER MO.OF 25 DAYS				
Surface	109.75	104.25	5.50	
Underground	132.75	125.50	7.25	
Total	125.75	120.25	5.50	
PRODUCT PER MAN PER DAY				
Surface	13.19	16.88		3.69
Underground	5.64	5.53	.11	
Total	3.95	4.17		.22
LABOR COST PER TON				
Surface	.333	.247	.086	
Underground	.940	.907	.033	
Total	1.273	1.154	.119	
AVG.PRODUCT BRK'G & TRM'G	8.18	7.48	.70	
" WAGES CONTRACT MINERS	5.63	5.25	.38	
" " " LABOR	5.63	5.25	.38	
TOTAL NO.OF DAYS				
Surface	11,702	16,393		4,691
Underground	27,344	50,024		22,680
Total	39,046	66,417		27,371
AMOUNT FOR LABOR				
Surface	51329.17	68327.85		16998.68
Underground	145098.64	251038.80		105940.16
Total	196427.81	319366.65		122938.84

Proportion Surface to Underground Men:

1924 - 1 to 2.28  
 1923 - 1 to 3.01  
 1922 - 1 to 2.78  
 1921 - 1 to 2.63  
 1920 - 1 to 2.87  
 1919 - 1 to 2.55

1924 - 1-8hr shift from Jan.7th;  
 1-8hr " 4 days per week from July 30th to  
 Dec.1st.  
 1-8hr " 5 days " from December 1st.

HOLMES MINE

TIMBER STATEMENT FOR THE YEAR ENDING DECEMBER 31, 1924.

KIND	LINEAL FEET	AVG. PRICE PER FOOT	AMOUNT 1924	AMOUNT 1923
6" to 8" Timber	71,928	.0404	2906.69	2381.47
8" to 10" "	30,436	.0595	1811.21	6018.26
10" to 12" "	20,399	.0835	1704.25	4321.74
12" and larger	14,377	.10	1437.70	2480.34
Total 1924	137,140	.0573	7859.85	
Total 1923	232,458	.0654		15201.81
	LINEAL FEET	PER 100'		
5' Lagging	590,325	.8225	4855.40	8223.61
7' "	6,671	.60	40.03	
Total Lagging	596,996	.820	4895.43	8223.61
Poles	225,530	1.108	2499.88	4435.17
Total Lagging & Poles	822,526	.8991	7395.31	
" 1923	1,388,693	.926		12658.78
Product			154,300	276,672
Feet timber per ton of ore			.889	.940
" lagging "			3.869	5.02
" " per ft. of timber			4.353	5.97
Cost per ton for timber			.051	.055
" lagging			.032	.030
" poles			.016	.016
" all timber			.099	.010
Ft, board measure per ton of ore			1.67	1.64
Cost for timber, lagging, poles 1924				15255.16
" " 1923				27860.59

HOLMES MINE

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE

<u>KIND</u>	QUANTITY	AVERAGE PRICE	AMOUNT 1924	AMOUNT 1923
50% L.F. Powder	27,500	14.50	3,987.50	10,230.89
60% "	45,090	15.50	6,988.95	10,175.74
50% Gelatin				23.25
60% "	100	16.75	16.75	50.53
80% "	950	20.75	197.13	
Total Powder	73,640	15.20	11,190.33	20,480.41
Fuse	194,100	6.37	1,237.04	2,555.38
Caps	51,900	10.73	556.88	1,100.39
Tamping Bags	3,000	2.15	6.45	
Cap Crimpers	13	1.00	13.00	18.00
<u>Total Fuse, etc.</u>			1,813.37	3,873.97
Total Explosives			13,003.70	24,154.38
Product			154,300	276,672
Pounds Powder per ton of ore			.4773	.4954
Cost per ton for powder			.0725	.0740
" fuse, etc.			.0118	.0133
" explosives			.0843	.0873
Avg. prices per lb. for powder			.1520	.1494

HOLMES MINE

COMPARISON OF COST SHEETS FOR 1923 AND 1924

PRODUCTION

	<u>1923</u>	<u>1924</u>
Days Worked	300	261
	Tons	Tons
Ore	276,672	154,300
Rock	<u>13,308</u>	<u>10,392</u>
Ore and Rock	289,980	164,692
Ore per Day	922	591
Rock per Day	<u>44</u>	<u>40</u>
Ore and Rock per Day	966	631

LABOR

	<u>1923</u>	<u>1924</u>
Average Number of Men	221	151
Average Rate per Day	\$ 4.81	\$ 5.03

TONS PER MAN PER DAY

	<u>1923</u>	<u>1924</u>
Surface	16.88	13.19
Underground	<u>5.53</u>	<u>5.64</u>
Total	4.17	3.95

COST OF PRODUCTION

	<u>1923</u>	<u>1924</u>
Labor	\$ 1.152	\$ 1.287
Supplies	<u>.549</u>	<u>.599</u>
Total	\$ 1.701	\$ 1.886

UNDERGROUND COSTS.

Development in Rock.

1923	\$	20982.86	\$	.076
1924		<u>16537.39</u>		<u>.107</u>
Decrease	\$	4445.47		
Increase			\$	.031

Development in Ore.

1923	\$	4232.86	\$	.015
1924		<u>1695.74</u>		<u>.011</u>
Decrease	\$	2537.12	\$	.004

Stoping.

1923	\$	205975.70	\$	.744
1924		<u>114230.06</u>		<u>.740</u>
Decrease	\$	91745.64	\$	.004

Timbering.

1923	\$	64332.33	\$	.233
1924		<u>39539.80</u>		<u>.256</u>
Decrease	\$	24792.53		
Increase			\$	.023

Tramming.

1923	\$	27500.90	\$	.099
1924		<u>16881.36</u>		<u>.110</u>
Decrease	\$	10619.54		
Increase			\$	.011

Ventilation.

1923	\$	198.44	\$	.001
1924		<u>627.81</u>		<u>.004</u>
Increase	\$	429.37	\$	.003

Pumping.

1923	\$	8466.37	\$	.031
1924		<u>7751.31</u>		<u>.050</u>
Decrease	\$	715.06		
Increase			\$	.019

Compressors and Air-Pipes.

1923	\$	20119.69	\$	.073
1924		<u>11368.36</u>		<u>.074</u>
Decrease	\$	8751.33		
Increase			\$	.001

Underground Superintendence.

1923	\$	10082.72	\$	.036
1924		<u>7257.55</u>		<u>.047</u>
Decrease	\$	2825.17		
Increase			\$	.011

In 1923 2588 feet cost \$ 8.11 per foot, and in 1924 1974 feet cost \$ 8.38 per foot.

The decrease is in raising in ore.

In 1923 the mine was working two shifts, while in 1924 it worked only one shift.

The decrease is due to only working one shift in 1924.

In 1924 the mine was operated only one shift.

In 1924 five fire-doors were installed in the mine on E & A. 444.

The decrease is mostly in electric power.

The cost of operating the compressor decreased \$ 7498.21 in 1924 on account of only working one shift. Air-pipe extensions decreased \$ 1253.12 in 1924.

The decrease is due to only working one shift in 1924.

UNDERGROUND COSTS. (Continued)

Cave-In.

1923	\$	74.88	\$ .000
1924			
Decrease	\$	<u>74.88</u>	\$ .000

MAINTENANCE ACCOUNTS.

Compressors and Power Drills.

1923	\$	1589.24	\$ .006
1924		<u>1233.15</u>	.008
Decrease	\$	356.09	
Increase			\$ .002

There was only one new power drill charged out in 1924.

Hand Trimming Equipment.

1923	\$	3021.75	\$ .011
1924		<u>3512.85</u>	.023
Increase	\$	491.10	\$ .012

The increase is in repair parts and new wheels for hand tram cars.

Electric Tram Equipment.

1923	\$	5554.38	\$ .020
1924		<u>5088.18</u>	.033
Decrease	\$	466.20	
Increase			\$ .013

The decrease is in repairs to main line tracks.

Pumping Machinery.

1923	\$	449.98	\$ .002
1924		<u>1075.05</u>	.007
Increase	\$	625.07	\$ .005

In 1924 54 feet of 30" belt for plunger pump cost \$ 260.03, and repair parts for centrifugal pump cost \$ 225.21. Labor cost for making repairs increased \$ 288.18 in 1924.

SURFACE COSTS.

Hoisting.

1923	\$	17733.62	\$ .064
1924		<u>11791.20</u>	.076
Decrease	\$	5942.42	
Increase			\$ .012

The decrease is due to only operating one shift in 1924.

Stocking Ore.

1923	\$	12230.22	\$ .044
1924		<u>9190.14</u>	.060
Decrease	\$	3040.08	
Increase			\$ .016

Portable trestle cost decreased \$ 519.23, and operating top tram system decreased \$ 2795.48. The cost for rock picking on stockpile increased \$ 247.63 in 1924. Three rockpickers are now employed instead of two.

Screening-Crushing at Mine.

1923	\$	5993.03	\$ .022
1924		<u>2521.49</u>	.016
Decrease	\$	3471.54	\$ .006

The decrease is due to only operating one shift in 1924.

SURFACE COSTS. (Continued)

Dry House.

1923	\$	6222.57	\$	.023
1924		6288.52		.041
Increase	\$	65.95	\$	.018

General Surface Expense.

1923	\$	7339.76	\$	.027
1924		7643.44		.050
Increase	\$	303.68	\$	.023

The increase is due to digging trench and laying ten inch pipe to carry off surface water.

MAINTENANCE ACCOUNTS.

Hoisting Equipment.

1923	\$	4159.98	\$	.015
1924		1764.02		.011
Decrease	\$	2395.96	\$	.004

In 1923 two Lilly Hoist Controllers cost \$ 1955. Repairs to skips and cages decreased \$ 511.23 in 1924.

Shaft.

1923	\$	493.47	\$	.002
1924		604.77		.004
Increase	\$	111.30	\$	.002

Charges are higher in 1924 on account of lining upper part of shaft with galvanized sheet iron, E and A. 444.

Top Tram Equipment.

1923	\$	1154.75	\$	.004
1924		1238.13		.008
Increase	\$	83.38	\$	.004

Docks, Trestles and Pockets.

1923	\$	2318.24	\$	.008
1924		1610.03		.010
Decrease	\$	708.21		
Increase			\$	.002

The decrease is in additions to stocking trestles built in 1923.

Mine Buildings.

1923	\$	1416.55	\$	.005
1924		1504.29		.010
Increase	\$	87.74	\$	.005

GENERAL MINE ACCOUNTS.

Insurance.

1923	\$	31.48	\$	.000
1924		32.78		.000
Increase	\$	1.30	\$	.000

Engineering.

1923	\$	1497.20	\$	.005
1924		1550.71		.010
Increase	\$	53.51	\$	.005



GENERAL MINE ACCOUNTS. (Continued)

Analysis.

1923	¢	8931.46	¢	.032
1924		<u>7046.67</u>		<u>.046</u>
Decrease	¢	1884.79		
Increase			¢	.014

The cost of sampling at the mine decreased \$ 329.84 in 1924. Balance is central laboratory charges.

Personal Injury Expense.

1923	¢	15951.05	¢	.058
1924		<u>2399.92</u>		<u>.015</u>
Decrease	¢	13551.13	¢	.043

This is a Central Office charge. The principal items in 1923 were payment for Mike Ritari's death \$ 4200, settlement with Jacob Kangas, \$ 3871, and settlement with Paul St. John, \$ 1292.

Safety Department Expense.

1923	¢	163.51	¢	.001
1924		<u>222.45</u>		<u>.002</u>
Increase	¢	58.94	¢	.001

Telephones and Safety Devices.

1923	¢	1726.47	¢	.006
1924		<u>222.22</u>		<u>.001</u>
Decrease	¢	1504.25	¢	.005

1923 charges included cost of Fire Extinction material, E & A. 444, \$ 748.93. Safety gates and underground improvements cost \$ 739.26 less in 1924.

Local General Welfare.

1923	¢	875.23	¢	.003
1924		<u>539.04</u>		<u>.003</u>
Decrease	¢	336.19	¢	.000

Central Office charge.

Mine Office.

1923	¢	9670.14	¢	.035
1924		<u>8128.52</u>		<u>.053</u>
Decrease	¢	1541.62		
Increase			¢	.018

Charges at the mine decreased \$ 730, the principal items of decrease being,

Supt.'s Choreman	\$ 145.00
Garage and Mileage	371.98
Exchange	112.00
Office Furniture	47.54

Central Office charges decreased \$ 811.

RECAPITULATION.

	Year 1923		Year 1924		Increase		Decrease	
	Total	Per Ton	Total	Per Ton	Total	Per Ton	Total	Per Ton
Underground Costs	372582.10	1.347	226798.61	1.470		.123	145783.49	
Surface Costs	59062.19	.214	44156.03	.286		.072	14906.16	
General Mine Accts.	<u>38846.54</u>	<u>.140</u>	<u>20142.31</u>	<u>.130</u>			<u>18704.23</u>	<u>.010</u>
Cost of Production	470490.83	1.701	291096.95	1.886		.185	179393.88	

	<u>1924</u>	<u>1923</u>	<u>INCREASE</u>	<u>DECREASE</u>
Product,	249,428	247,212	2,216	
Days Operated,	261	298		37
Average Daily Product,	956	830	126	
Days Worked - Surface,	12,444-3/4	11,923 $\frac{1}{2}$	521 $\frac{1}{4}$	
" " - Underground,	<u>42,770<math>\frac{1}{4}</math></u>	<u>41,913<math>\frac{1}{2}</math></u>	<u>856-3/4</u>	
Total,	55,215	53,837	1,378	
Rate Per Day, Surface,	4.43	4.29	.14	
" " " Underground,	5.02	4.91	.11	
" " " Total,	4.88	4.77	.11	
Stopping, Number Days,	17,751	17,759-3/4		8-3/4
Tons Per Man Per Day Surface,	20.04	20.73		.69
" " " " " Underground,	5.83	5.89		.06
Total,	4.52	4.59		.07
Labor Cost Per Ton, Surface,	.221	.207	.014	
" " " " " Underground,	.861	.833	.028	
" " " " " Total,	1.082	1.040	.042	

TONS PER MAN PER DAY AND COST PER TON FOR LABOR, BY MONTHS, FOR YEAR 1924.

	<u>TONS PER MAN PER DAY</u>			<u>COST PER TON FOR LABOR</u>		
	<u>Surface</u>	<u>Underground</u>	<u>Total</u>	<u>Surface</u>	<u>Underground</u>	<u>Total</u>
January,	22.87	6.05	4.79	.193	.840	1.033
February,	22.38	5.99	4.72	.198	.845	1.043
March,	18.36	5.76	4.38	.240	.872	1.112
April,	19.95	6.01	4.62	.223	.852	1.075
May,	22.11	6.02	4.73	.200	.835	1.035
June,	20.05	6.16	4.71	.221	.812	1.033
July,	21.58	5.71	4.51	.204	.864	1.068
August,	18.93	5.97	4.54	.240	.829	1.069
September,	15.81	4.66	3.61	.283	1.055	1.338
October,	17.26	5.32	4.06	.255	.932	1.187
November,	14.93	5.26	3.89	.283	.957	1.230
December,	19.74	5.19	4.11	.225	.971	1.196
Year,	20.04	5.83	4.52	.221	.861	1.082

NEGAUNEE MINE - 1924.

The product for the year by grades was as follows:-

Bessemer,	47,250 tons,
Negaunee,	275,873 "
Total,	323,123 "
Rock,	3,176 "

This product is considerably below normal but is due to the fact that from July 29th to December 1st the mine operated on a four-day per week schedule and from December 1st on five days a week.

During the first part of the year our product was in the neighborhood of 32,000 tons per month, whereas previous to 1921 it averaged from 45,000 to 50,000 tons per month. When operating on full time schedule of six days per week, therefore, we are mining only about two-thirds of our normal capacity.

The work during the past year has been on the ninth level and immediately below in the vicinity of the Maas Mine; on the South foot between the ninth and tenth levels near #1 shaft pillar; and in the center of the ore deposit between the tenth and eleventh levels. The principal development work has been in finishing the shaft to the thirteenth level and opening the twelfth level plat. In the latter place work is now in progress.

The work for the year on the various levels and sub levels is as follows:-

UNDERGROUND.

NINTH LEVEL - NORTH FOOT - NEAR MAAS MINE.

When the American Mining Company strip and the supporting pillar in this area were mined, pillars were left on the foot between raises #56 and #48. The expense of mining these at the ninth level elevation was prohibitive so it was decided to mine them from the 590' sub level by transferring the ore. This territory is extremely wet. The work was started early in the

year and discontinued in May. It was started again and completed in December.

In the East end of the mine a ventilation drift was started in November to hole to the incline raise which extends from the ninth to the tenth levels. This is being continued in December and should be completed early in January.

#### SUBS BETWEEN NINTH AND TENTH LEVELS.

##### 595' SUB LEVEL - NORTH FOOT.

In the American Mining Company strip and supporting pillar work was in progress during the whole year.

In December there were four contracts to the North and one South of the large dike. All in the supporting pillar.

A timber raise from the 588' sub level to this sub was holed in December. This is located in the American Mining Company strip Northeast of #60 raise.

##### 588' SUB LEVEL.

##### NORTH FOOT.

This was started in January and the development work carried on during the entire year in the American Mining Company strip and supporting pillar.

In December one contract was driving East on the foot wall, one putting up a timber raise to the 595' sub level in the American Mining Company strip, and a third just to the West of #58 raise drifting South through the dike.

##### 580' SUB LEVEL.

##### SOUTH FOOT.

This sub level, both North and South of #1 dike, was opened in 1923. Mining has been in progress in both areas during the entire year. In the Northwest end of the mine the drift Southeast of #60 raise was repaired preparatory to opening this territory under the hanging on the 595' sub level.

In December five contracts were employed on the South foot between #1 and #2 dikes and four between the foot wall and #1 dike; all of which were stoping.

555' SUB LEVEL.

SOUTH FOOT.

Development was started in January and continued throughout the year. The territory has been opened between #2 dike and the foot wall and mining is in progress in two places, namely, under the hanging West of the vertical winze and South of #2 dike.

In December between #1 and #2 dikes one contract developed East toward #154 raise. Four contracts stoped South of #2 dike while between #1 dike and the foot, one contract is developing East toward #149 raise and another stoping under the hanging just to the West of the winze.

TENTH LEVEL.

Early in the year a small territory in the hanging was mined from #244 raise in the West end of the mine.

SUBS BETWEEN TENTH AND ELEVENTH LEVELS.

488' SUB LEVEL.

This sub level, North of #2 dike, was opened in 1922 and mining has continued without interruption to the present time. The entire territory has been mined with the exception of a few pillars in the Northwest end along the hanging in the vicinity of #220 and #244 raises. This sub level should be completed by spring.

In December four contracts were stoping in the territory tributary to #8 and #10 crosscuts, eleventh level.

475' SUB LEVEL.

The development of this sub level North of #2 dike with the exception of the incline stopes, near the North foot and under the hanging, was started in February. The work has been in progress during the entire year.

In December in the territory tributary to #9 and #10 crosscuts, eleventh level, were three contracts stoping; between #210 and #212 raises two contracts developing, one to the Southwest along the dike, the other to the Northwest from #208-A raise.

One contract is developing Northeast from #233 raise.

On the hanging side are twelve contracts stoping and one developing Northeast along #2 dike.

Over #4-A crosscut at the incline stope, one contract took three slices during the month, two of which were to the North and one to the South.

460' SUB LEVEL.

SOUTHWEST END.

Work here was over #4 crosscut at the incline stope where work started late in 1923 and finished in February.

450' SUB LEVEL.

SOUTHWEST END.

Work here was also at the incline stope over #4 crosscut, eleventh level, directly below the area mined on the 460' sub level. Mining started in February and was finished in June.

440' SUB LEVEL.

SOUTHWEST END.

This is in the same territory as mentioned above over #4 crosscut. The work was started in June and finished in December.

ELEVENTH LEVEL.

The connecting drift to the Maas Mine, 8' above this level, is being enlarged to standard size. This will be driven to Maas Mine raise #120 and should be finished early in January. It will act as the main air inlet to the Maas Mine when the new ventilation system is started.

In #5 crosscut two raises were started in December.

TWELFTH LEVEL.

The pentice in the shaft at this elevation was removed in August. The plat was widened to the East of the shaft in October and in December the pocket excavation started. A small sump was cut at the entrance to the pump-house.

The development of this level will be pushed during the coming summer.

#### THIRTEENTH LEVEL.

In June and July the plat was cut and the pumphouse excavated, also a small sump at the entrance to the pumphouse. The pumphouse was gunited in December. In September a false bottom was placed in the bottom of the skip compartment and a chute extended to the North to handle the skip pit spillage.

SHAFT.

The work at the shaft which had been discontinued during the winter months was resumed in June. One set was placed below the thirteenth level and then the pentice below the twelfth level removed. The casing between the compartments has been completed and the shaft is now in use to the thirteenth level.

#### UNDERGROUND IN GENERAL.

The mine is in excellent shape for production. During the past few years or since we have been operating on a curtailed output, we have done no mining in the #2 shaft pillar. If a larger monthly production were desired these areas could be opened with little difficulty. During the past year the mining has been the regular top slicing and most of the ore extracted by hand shoveling, however, nine Mayne Loaders and two Tugger Hoists and Scrapers were used. Both of these mechanical devices gave good results. The tons per man per day where these were employed being nearly double that of hand work.

#### MAYNE LOADERS.

During the year nine Mayne Loaders were used on the sub levels. Each loader is operated by two men who also do their own tramming, drilling, blasting and timbering. These eighteen men produced 73,392 tons or 22.4% of the total mine output.

Below is a tabulation showing the results obtained with these loaders:-

<u>LOADER NUMBER</u>	<u>DAYS WORKED</u>	<u>CONTRACT PRICE PER TON LESS THAN OTHER MINERS</u>	<u>INCREASED EARNINGS PER DAY OVER OTHER MINERS</u>	<u>TONS PER MAN INCREASE OVER AVG. OF MINE</u>	<u>TONS</u>	<u>TONS PER MAN PER DAY</u>
2	506	28.6%	15.2%	59.1%	8,484	16.77
3	483	26.6%	15.1%	73.1%	8,588	17.78
4	387	28.3%	17.3%	73.5%	7,032	18.17
5	470	27.4%	21.4%	89.3%	9,344	19.88
6	436	26.8%	20.8%	78.3%	8,364	19.18
7	470	27%	16.6%	77.5%	8,624	18.34
8	411	27.1%	11.5%	61.8%	7,016	17.07
9	444	27.5%	17.7%	80.4%	8,408	18.94
10	377	25.8%	10.7%	66.7%	6,532	17.33
Average -		27.2%	16.3%	74.5%		18.17
Total -	3,984				72,392	

Average tons per man per day, with loaders, 18.17

" " " " " " , hand shoveling, 10.41

While the nine loaders showed an average of 74.5% increase in tons per man per day over the average of miners hand shoveling, #5 loader showed 89.3% for the year with individual months running much higher, January 101%, February 115%, March 114%, May 112% and November 97%.

The ore mined with the loaders was at a saving of from  $11\frac{1}{4}$ ¢ to  $18\frac{3}{4}$ ¢ per ton to the Company. The 72,392 tons mined, using the average saving of 15 cents per ton, means \$10,858.80. This is figured on 261 operating days, and would have been proportionately larger if the mine had operated at its normal rate of 300 days.

The total maintenance for the year on the nine loaders, labor and supplies, was \$904.15.

These have been used wherever possible. In development work drifts can be driven at double the speed where hand loading is used.



#### INCLINE SLICING.

In my last two annual reports, I have mentioned a method of mining which we have instituted here and from which we are getting excellent results. This incline slicing was originally started by working from vertical raises spaced at 12' to 15' intervals. At right angles to the line of these raises, the slices were driven for a distance of 35' to 50' laterally. These were driven on an angle of 35° from the horizontal, the idea being that the ore, when blasted from the breast, would slide down the poles placed on the bottom and feed directly into the top of the raises. Good results were obtained by this method, but when the breast was more than 15' from the raise it was found that considerable scraping was necessary to get the ore in the chutes. The angle was not sufficient for the ore to slide into the chutes freely. At this angle, however, it was extremely difficult for the miners to place their sets in the breast as there was a large over-hanging portion in the back and it was awkward to place the cap on the legs. Furthermore, it was a little hazardous as the men had little chance in getting to a place of safety in case loose chunks dropped from the back or breast.

During the past year we have cut the angle of inclination of the slice down to 20° from the horizontal and are using double drum tugger hoists and scrapers for pulling the ore into the chutes. This method has worked very well on the two incline stopes operated this year over #4 and #4-A cross-cuts, eleventh level. I think that practically as good results could be obtained if we cut down the inclination somewhat more. Two types of tugger hoists have been used for this work, one is the 6H model of the Ingersoll-Rand Company, the other the Waugh. The latter is made by the Denver Rock Drill Company. Both have given excellent results. We have just received two new Ingersoll-Rand hoists, model 6HC, for slusher work.

#### DEVELOPMENT WORK.

During the coming year the principal development work will be in opening the twelfth level. We are in good shape for this as a drift already

connects #2 shaft with the vertical winze from the twelfth to the tenth levels inside of the mine. This should help in our ventilation problem. One of the first drifts driven will be to connect with the Maas Mine, which will help materially in the ventilation of both mines.

#### VENTILATION.

During July it was found from tests that the air in the Negaunee Mine was deficient in oxygen and high in carbon dioxide. The Maas Mine showed a more serious condition. The two mines are connected. It was therefore necessary to consider both mines in arriving at a method for improving the air conditions. A careful study was made and it was decided to install a blower fan at the collar of #2 shaft Negaunee and to split the air so that it would give proper ventilation to both mines. Very little underground work is required at the Negaunee Mine for proper forced ventilation. A short drift is being driven on the ninth level and air locking doors for the motor trains will have to be installed on the ninth, tenth and eleventh levels and later on the twelfth level. Auxiliary fans will be used where necessary when opening new sub levels.

#### SHAFT REPAIRS.

During the spring, it was necessary to place new brackets for the cage runner supports. The rivets holding the original brackets had enlarged the holes and made the support insecure.

#### FIRE DOORS.

Fire doors have been installed on the ninth, tenth and eleventh levels near #3 shaft. These are controlled by valves located at each plat and also on surface. The opening of any one of these valves immediately closes all doors.

#### WATER.

The average number of gallons of water pumped per minute during the year as compared with 1923 is as follows:-