

THE
CLEVELAND - CLIFFS IRON CO.
MINING DEPARTMENT

ANNUAL REPORT OF GENERAL MANAGER

FOR

YEAR ENDING

DECEMBER 31 ST. 1922

MS 86-100
1993

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#1993

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January 1, 1923.

Mr. Wm. G. Mather, Pres.,
Cleveland, Ohio.

Dear Sir:-

I beg to submit the following report of the operations of the Mining Department for the year 1922. The inventories, maps, and statements relating to this report have gone forward to you under separate cover. The colored portions of the maps show the work for the year. The reports of the different mines of the Company were made by the Superintendents in Charge and the reports of the Mechanical, Engineering, Geological, Safety, and Welfare Departments by the heads of these departments.

Operating conditions for the first six months of the year were unsatisfactory, due to the fact that the mines were working but four hours in twenty-four, with the exception of the Holmes Mine. The inevitable result was a higher cost on account of the large overhead. On June 5th all of the working mines were put on a full time, single shift, basis, and the Cliffs-Shaft re-opened. This property, however, did not begin to produce until the 29th.

Our wage scale at this time was above the Oliver because of our not having followed a reduction which they made in September, 1921. The reason for this was the fact that our men were only working half time, and we felt that any further reduction in their wages would lead to undue hardship. However, when the men began to work full time, June 5th, a reduction was made, bringing our scale to a parity with the Oliver. This brought the scale back to that of May, 1917. September 1st the Oliver Iron Mining Company increased wages 12% and we followed suit, the actual increase being

11.55%. This brought wages back to those of October, 1917. It is, therefore, possible to make a comparison of costs with the last three months of that year and the following table will show the results:

COMPARATIVE COST OF PRODUCTION
LAST THREE MONTHS 1922 WITH LAST THREE MONTHS 1917.

NEGAUNEE MINE.

1922.

Ore Produced - - - - - 95,307 tons

No. Shifts & Days Operated - 1-8hr 74

Avg. Daily Product - - - - - 1,288 "

	<u>LABOR</u>		<u>SUPPLIES</u>		<u>TOTAL</u>	
	<u>AMOUNT</u>	<u>PER TON</u>	<u>AMOUNT</u>	<u>PER TON</u>	<u>AMOUNT</u>	<u>PER TON</u>
Cost Production	\$79,814.50	.838	\$57,183.56	.600	\$136,998.06	1.438
Percent	58		42		100	

1917

Ore Produced - - - - - 132,812 tons

No. Shifts & Days Operated - 1-8hr 76

Avg. Daily Product - - - - - 1,748 "

Cost Production	\$112,330.04	.846	\$57,175.85	.430	\$169,505.89	1.276
Percent	66		34		100	

MAAS MINE.

1922

Ore Produced - - - - - 65,340 tons

No. Shifts & Days Operated - 1-8hr 74

Avg. Daily Product - - - - - 883 "

Cost Production	\$65,752.06	1.006	\$40,382.98	.618	\$106,135.04	1.624
Percent	62		38		100	

1917.

Ore Produced - - - - - 95,228 tons

No. Shifts & Days Operated - 1-8hr 76

Avg. Daily Product - - - - - 1,253 "

Cost Production	\$96,654.57	1.015	\$46,069.17	.484	\$142,723.74	1.499
Percent	68		32		100	

MORRIS-LLOYD MINE

1922.

Ore Produced - - - - - 65,743 tons
No.Shifts & Days Operated - 1-8hr 74
Avg.Daily Product - - - - - 888 "

	<u>LABOR</u>		<u>SUPPLIES</u>		<u>TOTAL</u>	
	<u>AMOUNT</u>	<u>PER TON</u>	<u>AMOUNT</u>	<u>PER TON</u>	<u>AMOUNT</u>	<u>PER TON</u>
Cost Production	\$68,840.38	1.047	\$49,700.18	.756	\$118,540.56	1.803
Percent	58		42		100	

1917

Ore Produced - - - - - 50,099 tons
No.Shifts & Days Operated - 2-8hr - - - - - 76
Avf.Daily Product - - - - - 778 "

Cost Production	\$73,369.99	1.241	\$33,330.03	.564	\$106,700.02	1.805
Percent	69		31		100	

CLIFFS SHAFT MINE.

1922

Ore Produced - - - - - 71,818 tons
No.Shifts & Days Operated - 1-8hr 74
Avg.Daily Product - - - - - 970 "

Cost Production	\$87,802.92	1.223	\$45,502.66	.634	\$133,305.58	1.857
Percent	66		34		100	

1917

Ore Produced - - - - - 87,009 tons
No.Shifts & Days Operated - 1-8hr 76
Avg.Daily Product - - - - - 1,145 "

Cost Production	\$103,437.31	1.189	\$46,066.79	.529	\$149,504.10	1.718
Percent	69		31		100	

HOLMES MINE.

1922

Ore Produced - - - - - 66,410 tons
 No.Shifts & Days Operated - 2-8hr 74
 Avg.Daily Product - - - - - 897 "

	<u>LABOR</u>		<u>SUPPLIES</u>		<u>TOTAL</u>	
	<u>AMOUNT</u>	<u>PER TON</u>	<u>AMOUNT</u>	<u>PER TON</u>	<u>AMOUNT</u>	<u>PER TON</u>
Cost Production	\$69,931.93	1.053	\$33,985.81	.512	\$103,817.74	1.565
PerCent	67		33		100	

1917

Ore Produced - - - - - 28,721 tons
 No.Shifts & Days Operated - 2-8hr 76
 Avg.Daily Product - - - - - 378 "

Cost Production	\$35,033.53	1.220	\$14,973.87	.521	\$50,007.40	1.741
Percent	70		30		100	

STEPHENSON MINE.

1922.

Ore Produced - - - - - 59,382 tons
 No.Shifts & Days Operated - 1-8hr 74
 Avg.Daily Product - - - - - 802 "

Cost Production	\$61,911.33	1.043	\$47,125.85	.793	\$109,037.18	1.836
Percent	57		43		100	

1917/ 2 Mos. Mine flooded Dec.5th.

Ore Produced - - - - - 43,288 tons
 No.Shifts & Days Operated - 1-8hr 52
 Avg.Daily Product - - - - - 832 "

Cost Production	\$46,069.33	1.064	\$24,350.98	.563	\$70,420.31	1.627
Percent	65		35		100	

AUSTIN MINE.

1922.

Ore Produced - - - - - 22,780 tons
 No.Shifts & Days Operated - 2-8hr 74
 Avg.Daily Product - - - - - 308 "

	<u>LABOR</u>		<u>SUPPLIES</u>		<u>TOTAL</u>	
	<u>AMOUNT</u>	<u>PERTON</u>	<u>AMOUNT</u>	<u>PERTON</u>	<u>AMOUNT</u>	<u>PERTON</u>
Cost Production	\$31,682.14	1.391	\$11,274.59	.494	\$42,956.73	1.885
PerCent	74		26		100	

1917. 2 Mos. Mine flooded Dec.21st.

Ore Produced - - - - - 15,992 Tons
 No.Shifts & Days Operated - 1-8hr 52
 Avg.Daily Product - - - - - 308 "

Cost Production	\$16,526.47	1.033	\$5294.71	.326	\$21,731.18	1.359
Percent	76		24		100	

REPUBLIC MINE.

1922.

Ore Produced - - - - - 38,091 tons
 No.Shifts & Days Operated - 2-8hr - - - - - 74
 Avg.Daily Product - - - - - 515 "

Cost of Production	\$68,493.38	1.798	\$28,407.60	.746	\$96,900.98	2.544
PerCent	71		29		100	

1917.

Ore Produced - - - - - 32,247 tons
 No.Shifts & Days Operated - 2-8hr 76
 Avg.Daily Product - - - - - 424 "

Cost production	\$67,221.62	2.085	\$36,901.03	1.144	\$104,122.65	3.229
Percent	65		35		100	

You will note that the labor cost per ton is almost identical, but the supply cost is considerably higher. This is due principally to two items, viz, timber and electric current. In 1918 the Company increased its power rates from 1¢ per KWH to 1¹/₂¢ per KWH. This added from 7 to 10¢ per ton to our costs. This was pointed out in the last annual report.

I consider that we are doing remarkably well not to have increased our labor cost per ton, because when the curtailment occurred, we let out practically all our young, unmarried men and kept the older married men with families. One of the problems which we face is the impossibility of getting rid of our ageing men who are less competent and efficient than the younger ones, but their long service to the Company requires their retention. This condition will become more serious as time passes. On account of a reduction in our operations, we have not had any labor shortage, but should there be a demand for ore, requiring maximum production, it would be impossible to secure sufficient men for the work. In view of the present immigration laws, the loss of our younger and more efficient men is serious, as they cannot be replaced by men coming from the old country. It is a well known fact that American born sons of foreign parents do not wish to follow in their father's foot-steps and never, unless obliged to do so, work underground. We shall feel the shortage of men less at our Negaunee and Ishpeming mines than at the outlying locations. Even now there is difficulty in keeping a normal supply of men at the North Lake and Barnes-Hecker Mines. The Gwinn District has all the men that they can employ, but they are not of the same class as those we had several years ago. The Nationality Reports show that there is a substantial increase in the number of Italians. Apparently these are the only nationality that are coming into this district.

The lease to the Crosby Mine was surrendered, effective December 31st. Practically all the machinery and equipment has been removed. The washing plant is to be leased to the M.A.Hanna Company and remains intact.

Acting under your authorization, the surface men at the mines were placed on a nine-hour day during the month of December. Action on this matter was delayed because we felt it necessary to take the matter up with the Oliver Iron Mining Company. They do not feel that they care to adopt this plan because it would affect their operations on other ranges and they fear that it might even reach their coal mines and mills. Already a bill has been introduced in the Legislature for an eight hour day. Such legislation has been urged for many years, but has always been defeated. However, public sentiment is becoming more and more favorable to this plan, and we may ultimately expect such a law. The newspapers report that Governor Groesbeck does not favor the eight-hour day, but as a compromise would be willing to concede nine hours. If such is the case, we were fortunate in having adopted it when we did. As a matter of fact, the Company will lose nothing, as the men never gave much return for their services after the miners stopped work at five o'clock in the afternoon. Personally, I feel that our action in this matter was the proper one and that in the long run we will benefit by it. From all I can learn the men are very much pleased and appreciate what has been done for them.

Owing to the curtailment at our mines, throwing many men out of employment and putting those retained on half time, the winter of 1921-22 was a very trying one for all of our employees. To meet this condition the Board of Directors authorized me to assist all those in need of aid up to a

maximum of \$40,000.00. The President of the Company also made a generous donation of \$5,000.00. A department was organized to handle this problem and was in charge of Mr. Lucien Eaton, who was personally acquainted with most of the men in this district. Great care was exercised in distributing relief and each case was investigated. The result was that no one suffered and no advantage was taken of the Company's generosity. You will find a detailed statement of the operations of the Relief Department in Mr. Moulton's report. As he states, the credit extended by the merchants resulted in less help being needed than we anticipated.

In September you authorized us to begin the erection of the storage dam at the Dead River Hoist. No time was lost in beginning preparations and this work is now well under way. It took some time to erect the camps and secure the necessary equipment so that actual pouring of concrete did not begin until December. Weather conditions since that time, with the exception of two weeks, have been quite favorable, and the concrete is now being poured at the rate of about 200 yards a day. This will gradually be increased, and it is Mr. McClure's expectation that he can double the amount by spring. If his estimate is correct, the work will be completed by November 1st. We will not, however, secure much, if any, benefit from the breakup this spring.

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

ANNUAL REPORT

OF THE

LAKE MINE

(1922)

Shipments.

The Lake Mine remained closed throughout the year.

28,582 tons of ore were shipped from the stock-piles at the mine during the year, but no shipments were made from the pile at Presqu' Isle.

Table I.

Stock-Pile Shipments.

Grade	Tons
Lake	832
Lakedale	<u>27,750</u>
Total	28,582

Table II.

Stock-Pile Balances, Dec. 31st, 1922.

Grade	At Mine Tons	At Presqu' Isle Tons	Total Tons
Lake	11,522		11,522
Lakedale	<u>157,905</u>	<u>22,963</u>	<u>180,868</u>
Total	169,427	22,963	192,390

Damascus Bond

Table III.

Estimate of Ore Reserves.

Level	Gross Ore Tons	Deductions for Rock & Timber Tons	Net Ore Tons
Second Level	15,000	33%	10,000
1142 Foot Sub-Level	10,000	60%	4,000
Third Level	<u>10,000</u>	60%	<u>4,000</u>
Total	35,000		18,000

A factor of 15 cu. ft. per ton was used. The estimate is the same as in 1921. This ore cannot be mined at a profit.

Pumping.

Up to February 16th pumping was done on Oliver Iron Mining Co. account. On that date the new pumps at the Angeline were reported to be ready, and the Oliver Iron Mining Co. ceased pumping at the Lake Mine. The boilers were immediately started up, and the pumps were removed and stored on surface at the mine. The water rose rapidly to the third level, where it stayed for a time and then rose another thirty-five feet, at which elevation it is flowing into the Angeline Mine.

In July the 8" water-column above the third level was taken out and sent to the Maas Mine. The 6" water-column was also removed, and is stored on surface.

Surface.

The old rail in the coal-tunnel and timber-yard was taken up in August and September and sent to the Cliffs Shaft Mine. 1000 feet of 12" tile pipe was also dug up in May and June and sent to North Lake.

The coal-dock was torn down in September and October, as it was in a dangerous condition, and such of it as was sound enough was sold to the Holmes Mine.

LAKE MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1922.

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

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1922.

GRADE	Mine IRON	PHOS.	Lake IRON	Erie MOIST.
Lake,	(No Shipments)			
Lakedale,	59.58	.221	58.90	13.17

ORE STATEMENT - DECEMBER 31ST, 1922.

	LAKE ORE AT MINE	LAKEDALE AT MINE	LAKE ORE STOCKED AT PRESQUE ISLE	TOTAL	TOTAL LAST YEAR
On hand January 1, 1922,	12,354	185,655	22,963	220,972	199,564
Output for Year,	-	-	-	-	34,497
Total,	12,354	185,655	22,963	220,972	234,061
Shipments,	832	27,750	-	28,582	13,089
Balance on Hand,	11,522	157,905	22,963	192,390	220,972
Decrease in Output,				34,497	
Decrease in Ore on Hand,				28,582	

1922 -- Mine closed.

1921 -- 1-8 Hour Shift Jan. 1st to June 1st, 1921.
Mine closed May 31st, 1921.

LAKE MINE

SHIPMENTS FOR YEAR-1922

GRADE	POCKET	STOCKPILE	PRESQUE ISLE STOCKPILE	TOTAL	TOTAL LAST YEAR
Lake,	0	832	0	832	13,089
Lakedale,	0	27,750	0	27,750	0
Total,	0	28,582	0	28,582	13,089
Total Last Year,	0	6,553	6,536	13,089	
Increase,				15,493	

LAKE MINE

COMPARATIVE WAGES AND PRODUCT

	1 9 2 2	1 9 2 1
Product	-	34,497
No.Shifts & Hours		1-8hr
AVG.NO, MEN WORKING		
Surface	1	14
Underground		33
Total	1	47
AVG.WAGES PER DAY		
Surface	7.23	5.12
Underground		5.66
Total	7.23	5.50
WAGES PER MO. OF 25 DAYS		
Surface	180.75	128.00
Underground		141.50
Total	180.75	137.50
PRODUCT PER MAN PER DAY		
Surface		8.54
Underground		3.47
Total		2.47
LABOR COST PER TON		
Surface		.599
Underground		1.630
Total		2.229
AVG.PRODUCT BRK'G & TRM'G		6.86
" WAGES CONTRACT MINERS		5.69
" " "		5.69
TOTAL NO. OF DAYS		
Surface	334	4,037-3/4
Underground		9,935-1/2
Total	334	13,973-1/4
AMOUNT FOR LABOR		
Surface	2415.39	20660.02
Underground		56223.20
Total	2415.39	76883.22

1-8hr 6 days a week to May 31,1921/ Abandoned June 1,1921.
Only Captain employed during 1922.

ANNUAL REPORT
OF THE
CLIFFS SHAFT MINE

(1922)

Production and Shipments.

The Cliffs Shaft Mine worked 152 days in 1922, and produced 131,502 tons of ore, an average of 865 tons per day.

7,190 tons of rock were produced, all of which was dumped underground.

The mine remained closed until late in June, and was then put on a single-shift basis; the number of contracts being gradually increased to fifty. Operations were resumed on June 26th, and the first ore was hoisted from "A" shaft on June 29th. Production from "B" shaft started early in July.

Table I.

Production by Grades.

Grade	Year 1922		Year 1921	
	Tons	Per Cent	Tons	Per Cent
Lump	89,970	68.4	42,279	63.6
Crushed	<u>41,532</u>	<u>31.6</u>	<u>24,191</u>	<u>36.4</u>
Total	131,502	100.0	66,470	100.0

Table II.

Shipments.

Grade	Pocket Tons	Stock-File Tons	Total Tons
Lump	66,886	111,214	178,100
Crushed	<u>1,011</u>	<u>386</u>	<u>1,397</u>
Total	67,897	111,600	179,497

Table III.

Ore in Stock, Dec. 31st, 1922.

Cliffs Shaft Lump	82,706 Tons
Cliffs Shaft Crushed	<u>188,787</u> "
Total	271,493 "

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				9,679		9,679	9,679		9,679
2nd	2,654		2,654	865		865	3,519		3,519
3rd	2,539		2,539	1,165	32	1,197	3,704	32	3,736
4th				4,085		4,085	4,085		4,085
5th	9,623		9,623	906		906	10,529		10,529
6th	12,143	44	12,187	7,939	80	8,019	20,082	124	20,206
7th	11,154	510	11,664	5,324		5,324	16,478	510	16,988
8th	6,048	72	6,120				6,048	72	6,120
9th	9,453	60	9,513				9,453	60	9,513
10th	2,607	1,328	3,935	2,160	2,170	4,330	4,767	3,498	8,265
11th	7,156		7,156	5,431	682	6,113	12,587	682	13,269
12th	3,239	16	3,255	12,638	890	13,528	15,877	906	16,783
13th				9,664	710	10,374	9,664	710	10,374
14th				5,030	360	5,390	5,030	360	5,390
15th		160	160		76	76		236	236
Total	66,616	2,190	68,806	64,886	5,000	69,886	131,502	7,190	138,692

Table V.

Production by Months.

Month	Days	Ore Per Day Tons	Lump Tons	Crushed Tons	Total Ore Tons	Rock Tons	Total Ore and Rock Tons
June	2	196	302	89	391		391
July	25	641	11,332	4,686	16,018	604	16,622
August	27	815	15,333	6,668	22,001	1,250	23,251
September	24	886	14,823	6,451	21,274	1,114	22,388
October	26	948	17,256	7,403	24,659	1,666	26,325
November	24	967	15,317	7,890	23,207	1,304	24,511
December	24	998	15,607	8,345	23,952	1,252	25,204
Year	152	865	89,970	41,532	131,502	7,190	138,692

Table VI.

Delays.

Date	Hours	Tons Lost	Cause	Repair Cost
July 15	2 $\frac{1}{4}$	180	Axle broke on "A" shaft top tram car.	\$ 14.81
Sept. 7	1	100	Strand broke on "A" shaft counter-weight rope.	14.68
Oct. 2	1	150	Catches broke on "A" shaft top tram car.	18.55
Nov. 9	1 $\frac{1}{2}$	200	Putting new plate in "B" shaft-house pocket.	8.70
Nov. 10	2	175	"B" shaft pocket blocked with chunks.	2.16
Nov. 25	$\frac{3}{4}$	75	"B" shaft skip jammed by chunk.	.81
Dec. 18	$\frac{1}{2}$	50	No current. Main line trouble.	
Dec. 19	1	125	Catches broke on "B" shaft top tram car.	.89
Dec. 19	1	125	No current. Main line trouble.	
Dec. 27	1	75	Draw-bar bent on "A" shaft top tram car.	1.30
Total	12	1,255		\$ 61.90

Table VII.

Delays Due to Lack of Current.

Date	Hours	Tons Lost	Cause
Dec. 18	$\frac{1}{2}$	50	Main Line Trouble.
Dec. 19	1	125	Main Line Trouble.
Total	1 $\frac{1}{2}$	175	

Table VIII.

Estimate of Ore Reserves.

	"A" Shaft Tons	"B" Shaft Tons	Total Tons
Pillars	959,000	631,000	1,590,000
Floors	1,575,000	1,042,000	2,617,000
Partly Developed	<u>408,000</u>	<u>24,000</u>	<u>432,000</u>
Total	2,942,000	1,697,000	4,639,000
Less 10% Rock	<u>294,000</u>	<u>170,000</u>	<u>464,000</u>
Net Total	2,648,000	1,527,000	4,175,000
To Support Surface	<u>1,484,000</u>	<u>986,000</u>	<u>2,470,000</u>
Available Ore	1,164,000	541,000	1,705,000
Less 10% Rock and 10% Loss in Mining	<u>233,000</u>	<u>108,000</u>	<u>341,000</u>
Net Available Ore Jan. 1st, 1923.	931,000	433,000	1,364,000

Recapitulation.

	Developed Tons	Prospective Tons	Total Tons
Available Ore	1,454,000	251,000	1,705,000
Less 10% Rock and 10% Loss in Mining	<u>291,000</u>	<u>50,000</u>	<u>341,000</u>
Net Available Ore	1,163,000	201,000	1,364,000

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

Table IX.

Ore mined from C.I.M. Co.'s land, - 5,071 Tons

GENERAL

Labor

There was no difficulty in getting miners, when operations were resumed, and over 90% of the miners are old hands, but most of the trammers did not return, so that we have had to use inexperienced young men for the most part. They did not do well at first, but later showed some improvement.

There has been plenty of surface labor at all times.

New Construction

E. and A. 428. Fine Crusher.

An addition to the crushing plant has been authorized and is under construction. A 48 inch Symons Vertical Disc Crusher has been erected under the east end of the crusher building, and suitable conveyors, elevators, chutes and pockets are being erected to make it possible to crush not only the screened ore from the mine, but also the crushed ore already in stock-pile. The new crusher is set to have a 3/4 inch opening and is expected to crush the ore so that 80% will pass a one inch ring. The ore from the mine will pass through inclined chutes to a magnetic separator, which will remove tramp-iron and feed the disc crusher. The product from the disc crusher will be elevated by a bucket-elevator to two small pockets on the trestle, from which it can be discharged either into stock-pile cars or into the railroad pocket.

For recrushing the stock-pile a concrete track-hopper has been provided under the railroad track 120 feet east of the crusher-building. Stock-pile ore will be loaded into cars as usual, transferred to the track above the track-hopper, and dumped from the cars into the hopper. From here it will be elevated by an inclined belt conveyor to the bin above the magnetic separator and will be crushed, elevated and loaded into the same railroad cars again. It is planned to crush stock-pile ore at night, while the mine is idle.

CLIFFS SHAFT MINE.

The crusher, stock-pile trestle and pockets, and elevator have been erected, and the concrete work on the track-hopper has been completed. All the material has been received except three electric motors, on which delivery is promised early in next year.

Drill-Shop

A new No. 50 Drill Sharpener was purchased in August, the oldest of the No. 5 sharpeners being sold to the city. Additional storage-tanks have been erected behind the machine-shop, so that now 10,000 gals. of oil can be stored at one time. A pipe-line has been led to the drill-shop, so that rehandling charges have been reduced to a minimum.

Boiler House

All heating was done from the boiler in the dry until October 10th., at which time a boiler in the boiler-house was fired up, and the one in the dry shut down. The economizer has been cleaned and partly repaired, and will be ready for use in a short time. The boiler-settings have also been rebuilt.

Maintenance charges were high, following the shut-down, and an extra large repair-crew was necessary.

SURFACE

Buildings

The crusher-building and the wood-work of the other mine-buildings have been painted, greatly improving the appearance of the plant.

Top - Tram

New flooring of 3 inch fir, dipped in creosote, was put on the high steel trestle, except for 100 feet on the west end, which will be completed in the spring. This work was done on Saturday nights and Sundays so that there was no interruption of production.

Stock - Piles.

Crushed ore was stocked all summer, but all lump ore produced was loaded at the pocket until November 14th., The lump ore trestles were built a little further west than in 1920, and the stocking-engine, which was burned in May 1921, was repaired and put back on it's old foundation. The transformers and other electrical apparatus are now in a separate building, so that danger from fire is much less than it used to be.

Shipments by steam-shovel from the lump stock-pile were large, and some all-rail lump ore was loaded from the pile with a scraper before the shipping season began.

UNDERGROUND

Electric Haulage

The drift west of B Shaft on the tenth level has been enlarged, and straightened, new track laid and trolley-wire erected. An electric locomotive is now in use handling rock and will soon be ready to haul ore to the shaft. This installation will make available the ore above the tenth level in the Fault Vein, and will reduce both the breakage and cost of handling. Work on a similar installation on the eighth level in A Shaft has been started.

On account of the increase in the flow of water as a result of the connection with the Incline Mine, the track on the tenth level has been raised and ballasted for 800 feet east of A Shaft.

Development.

Most of the development has been done by driving breast stopes and putting up raises. A number of raises and drifts have been driven in rock, but their purpose has been more to facilitate the extraction of the ore than to discover and develop new ore-bodies. No diamond-drilling was done in 1922, but it will be advantageous to drill several holes in 1923.

In A Shaft five gangs have been developing the South-East Deposit by stoping, one gang being on each of the fifth, sixth and seventh levels, and two on the ninth. The known width of the ore-body on the ninth level, and its known length on the other levels have been increased. The top of the ore has not been reached on the fifth level, and it is likely that more ore will be discovered higher up.

In the Main Vein, one gang has continued working towards the east on the Seventh level, and is now 2300 feet east of the shaft. It is possible that this ore may connect with that which was discovered only 300 feet away in the drift and raise connecting the bottom of the Incline Mine with the eighth level.

Below the tenth level the ore has been followed east to a point 1500 feet east of the shaft on both the eleventh and twelfth levels, and the end of this particular ore-body has apparently been reached, although other ore is known to exist below the tenth level further east.

In the North Deposit the ore is being followed Eastward on the sixth level and is now opened nearly as far east as on the seventh and eighth levels. Drifting and raising has also been done in anticipation of mining the sixth level floors further west. A rock drift has been driven north on the tenth level 1400 feet east of A Shaft, and raises are being started to the ninth level. These will facilitate mining floors on the seventh, eighth and ninth levels.

No attempt has been made to develop the ore found in making the connection with the Incline Mine, and work here will be deferred until the electric haulage on the eighth level has been installed.

In B. Shaft most of the development has been on the lower levels, although a little ore has been opened in the North Deposit on the third and fifth levels. In the Main Vein a raise was put up from the South Stope on the eleventh level to the ninth level, proving the existence of new ore on the tenth level, and a drift has been driven west on the twelfth level to the top of the ore which had been followed up from the thirteenth level.

The known limits of the ore on the sublevel above the North side of the twelfth level have been extended, and two contracts have followed the hanging -wall contact north and south at the west end of the fourteenth level. A raise from the fifteenth level was also completed to these stopes.

In the Fault Vein no work was done above the tenth level, but one raise was completed from the eleventh to the tenth level, and stopes are going west in this vein on the thirteenth and fourteenth levels.

Stoping

In A. Shaft two contracts have been mining ore in and around the old workings at the east end of the Main Vein on the second level, and three gangs have been working in the North Deposit northwest of the Shaft above the fifth level. Another gang is mining floors below the fifth level near the north boundary and two more are taking down the back on the sixth and seventh levels near the east end of the vein. In the Main Vein one gang has been mining the back of the ninth level near the North Deposit and has raised to the seventh level. The other stopes in this vein and in the South-East Deposit have already been described. In the South Lens three gangs are mining floors on the fifth and eighth levels.

In B. Shaft three gangs have been stoping on the sub-levels above the first level, south of the shaft, and another is putting up a new raise in rock. Between the shafts, two gangs are mining the Floor of the second level in the North Deposit and another is mining the floor of the third level in the Main Vein. Three more are mining floors west and north of the shaft on the fifth and sixth levels, and one has been raising from the ninth level to the eighth at the west end of the level. On the eleventh level two gangs are raising on the South foot-wall and three more are mining floors on the north side. One gang has also been stoping in ore already known on the thirteenth level. The other contracts are developing new ore, and their work has been described.

The number of contracts was increased gradually until there were 50 in October.

The average number of contracts for the year from July 1 and for December and their classification are shown in the following table.

CLASSIFICATION OF CONTRACTS 1922

CONTRACTS	A. SHAFT		B. SHAFT		TOTAL	
	YEAR	DEC.	YEAR	DEC.	YEAR	DEC.
Stopping	11	11	8	8	19	19
Mining Floors	6	8	7	9	13	17
Mining Backs	3	2	0	0	3	2
Raising and Drifting In Ore	2	2	5	4	7	6
In Rock	3	3	3	3	6	6
Total	25	26	23	24	48	50
Opening New Ore	12	12	10	11	22	23
Mining Known Reserves	10	11	10	10	20	21
In Rock	3	3	3	3	6	6
Total	25	26	23	24	48	50

COMPARISON OF COST SHEETS FOR 1921 AND 1922.

In 1921 the Cliffs Shaft Mine worked on single shift, six days a week until March 26th., and thereafter five days a week, closing down on Saturdays, until June 1st. There were 25 contracts and practically no rock-work was done. On June 1st., the mine was closed, a few men only being retained until some necessary work was completed underground. In other words, the mine worked nearly three months, six days a week, and two months five days a week. At the same time pumping was continued in No. 3 Mine until connection was made with the Cliffs Shaft Mine, and this was a heavy charge against the small production maintained. Wages were reduced 15% on Feb. 1st. 1921, 12 1/2% on Aug. 1st., and again 10% on October 1st.

In 1922 the mine worked on single shift, six days a week, from June 26th., making six months operation with an average of 46 contracts. Wages were reduced 10% on June 1st., but were increased .45¢ a day on Sept. 1st., or approximately 11 1/2%.

The comparative rates of wages for the periods of operation for the two years are as 68 to 65, or the number of days as 114 to 152, and the intensity of production as 265 to 730. For this reason, no satisfactory comparison of cost sheets is possible.

In 1921 the cost of pumping was unusually high on account of work at No. 3 Mine, and in 1922 nearly all maintenance charges were high on account of resumption of operations on a larger scale. Repairs to buildings, repairs to the top-tram trestle, a new drill-sharpener and oil-storage tank, and rebuilding the haulage engine, for the stock-pile made high charges on surface in 1922, and building scrapers and hoists and installing electric haulage on the tenth level in B. Shaft raised the maintenance costs of tramming underground.

Production

	<u>1921</u>	<u>1922</u>
Days Worked	114	152
	Tons	Tons
Ore	66,470	131,502
Rock	<u>984</u>	<u>7,190</u>
Ore and Rock	67,454	138,692
Ore Per Day	583	865
Rock Per Day	<u>9</u>	<u>47</u>
Ore and Rock Per Day	592	912

Labor.

	<u>1921</u>	<u>1922</u>
Average Number of Men	151	249
Average Rate Per Day	\$ 5.70	\$ 4.19

Tons Per Man Per Day

	<u>1921</u>		<u>1922</u>	
	5 Mos.	Year	6 Mos.	Year
Surface	11.63	11.52	16.19	14.47
Underground	<u>5.63</u>	<u>4.71</u>	<u>4.50</u>	<u>4.28</u>
Total	3.79	3.34	3.52	3.30

Cost Of Production

	<u>1921</u>	<u>1922</u>
Labor	1.542	1.207 1.207
Supplies	<u>.801</u>	<u>.626</u>
Total	\$ 2.343	1.833 1.833

CLIFFS SHAFT MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1922.

GRADE	IRON	PHOS.	SILICA
Lump Cliffs Shaft,	59.68	.104	5.67
Crushed Cliffs Shaft,	58.14	.107	6.59

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1922.

GRADE	Mine		Lake Erie	
	IRON	PHOS.	IRON	MOIST.
Lump Cliffs Shaft,	59.36	.103	59.63	.48
Crushed Cliffs Shaft, (No Shipments)				

ORE STATEMENT - DECEMBER 31ST, 1922.

	LUMP CL. SHAFT	CRUSHED CL. SHAFT	TOTAL	TOTAL LAST YEAR
On hand January 1, 1922,	170,836	148,652	319,488	323,217
Output for Year,	89,970	41,532	131,502	66,470
Total,	260,806	190,184	450,990	389,687
Shipments,	178,100	1,397	179,497	70,199
Balance on Hand,	82,706	188,787	271,493	319,488
Increase in Output,			65,032	
Decrease in Ore on Hand,			47,995	

1922 -- Idle from Jan. 1st to June 28th, 1922.
 1-8 Hour Shift, 6 days per week, June 29th to Dec. 31st, 1922.

1921 -- 1-8 Hour Shift, 6 days per week, Jan. 1st to May 1st, 1921.
 1-8 Hour Shift, 5 days per week, May 1st to June 1st, 1921.
 Mine closed May 31st, 1921.

CLIFFS SHAFT MINE

SHIPMENTS FOR YEAR 1922.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Lump Cliffs Shaft,	66,886	111,214	178,100	69,860
Crushed Cliffs Shaft,	1,011	386	1,397	339
Total,	67,897	111,600	179,497	70,199
Total Last Year,	6,639	63,560	70,199	
Increase,	61,258	48,040	109,298	

CLIFFS SHAFT MINE

COMPARATIVE MINING COST FOR YEAR

	1922	1921	INCREASE	DECREASE
PRODUCT	131,502	66,470	65,032	
Underground Costs	1.543	1.919		.376
Surface Costs	.216	.431		.215
General Mine Accounts	.074	.119		.045
Cost of Production	1.833	2.469		.636
Plant Account	.015	.063		.048
Equipment	.013	.016		.003
Taxes	.363	.632		.269
Central Office	.089	.072	.017	
Contingent Expenses	.035	.033	.002	
Idle Expense	.681	1.655		.974
Cost Adjustment	.010	.037		.047
Cost on Stockpile	3.019	4.977		1.958
Loading & Shipping	.065	.084		.019
Total Cost on Cars	3.084	5.061		1.977
No. Days Operating	152	114	38	
No. Shifts & Hours	1-8	1-8		
Avg. Daily Product	865	583	282	
COST OF PRODUCTION				
Labor	1.207	1.579		.372
Supplies	.626	.890		.264
Total	1.833	2.469		.636

CLIFFS SHAFT MINE

COMPARATIVE WAGES AND PRODUCT

	1 9 2 2	1 9 2 1	INCREASE	DECREASE
PRODUCT	131,502	66,470	65,032	
No.Shifts & Hours	1-8hr	1-8hr		
AVG.NO.MEN WORKING				
Surface	31	27	4	
Underground	105	55	50	
Total	136	82	54	
AVG.WAGES PER DAY				
Surface	3.81	4.75		.94-19.8%
Underground	4.28	5.87		1.5927.1%
Total	4.17	5.50		1.33-24.2%
WAGES PER NO.OF 25 DAYS				
Surface	95.25	118.75		23.50
Underground	107.00	146.75		39.75
Total	104.25	137.50		33.25
PRODUCT PER MAN PER DAY				
Surface	14.47	9.29	5.18	
Underground	4.28	4.73		.45
Total	3.30	3.13	.17	
LABOR COST PER TON				
Surface	.263	.511		.248
Underground	1.000	1.241		.214
Total	1.263	1.752		.489
AVG.PRODUCT BRK'G & TRM'G	6.20	8.69		2.49
" WAGES CONTRACT MINERS	4.36	6.32		1.96
" " " TRAMMERS	4.62	6.62		2.00
" " " LABOR	4.52	6.44		1.92
TOTAL NO.OF DAYS				
Surface	9,088 $\frac{1}{4}$	7,154 $\frac{1}{2}$	1,833- $\frac{3}{4}$	
Underground	30,731	14,050 $\frac{1}{2}$	16,680 $\frac{1}{2}$	
Total	39,819 $\frac{1}{4}$	21,205	18,614 $\frac{1}{4}$	
AMOUNT FOR LABOR				
Surface	34587.87	33986.78	601.09	
Underground	131544.63	82479.36	49065.27	
Total	166132.50	116466.14	49666.36	

Proportion Surface to Underground Men:

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

1921
 1-8hr 6 days a week to Mar.26;
 1-8hr 5 " " Mar.28 to May 31;
 Closed June 1,1921.

1922
 Mine reopened June 26,1922. Ore production
 started June 29; one 80hr shift.

CLIFFS SHAFT MINE

STATEMENT OF EXPLOSIVES USED FOR STOPING & DEVELOPING IN ORE (BREAKING ORE)

KIND	QUANTITY	AVERAGE PRICES	AMOUNT 1922	AMOUNT 1921
50% Powder - - - - -	120,800	.1454	17,566.77	9,635.50
60% " - - - - -	50	.1526	7.63	-
80% " - - - - -				50.00
<u>Total Powder - -</u>	120,850	.1454	17,574.40	9,685.50
Fuse - - - - -	168,100	6.84	1,150.39	642.06
Caps - - - - -	46,758	11.51	538.17	261.59
Crimpers - - - - -	36	.46 $\frac{1}{4}$	16.65	2.00
<u>Total Fuse, Etc.-</u>			1,705.21	905.65
<u>Total All Explosives</u>			19,279.61	10,591.15
Product			131,502	66,470
Pounds Powder per ton ore			.9189	.7868
Cost per ton for powder			.1336	.1457
Cost per ton for Fuse, etc.,			.0129	.0136
Cost per ton for All Explosives			.1465	.1593
Average price per lb. for Powder			.1454	.1852

LK. 1-25-23

ANNUAL REPORT

OF THE

SALISBURY MINE

(1922)

Shipments.

The Bessemer stock-pile and most of the Clinton Silica pile were shipped. A small tonnage was shipped from the Clinton pile. There was a shortage in the Clinton Silica pile, which had accumulated over a period of fifteen years, but it is partly offset by an overrun in the Clinton and Bessemer piles.

Table I.

Stock-Pile Shipments.

Grade	Tons
Bessemer	254
Clinton	2,404
Clinton Silica	<u>22,066</u>
Total	24,724
Shortage	7,249

Table II.

Stock-Pile Balances, Dec. 31st, 1922.

Grade	1922 Tons	1921 Tons
Bessemer		918
Clinton	27,413	23,193
Clinton Silica	<u>1,627</u>	<u>36,902</u>
Total	29,040	61,013

Table III.

Estimate of Ore Reserves.

Developed Ore.

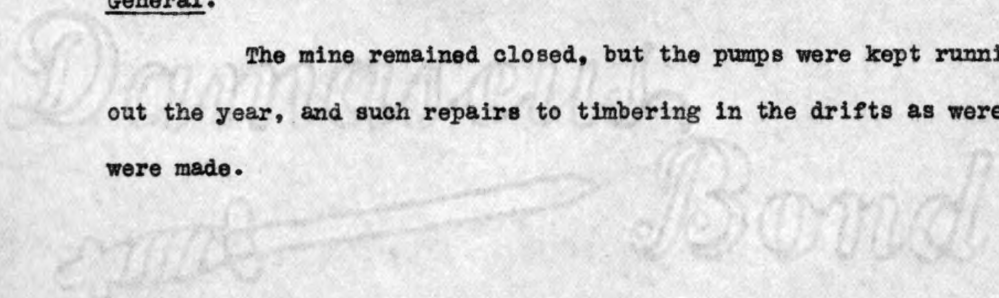
Level	Bessemer Tons	Clinton Tons	Clinton Silica Tons	Total Tons
4th			4,000	4,000
5th			4,000	4,000
8th		3,500	16,500	20,000
9th		2,500	9,000	11,500
10th		5,500	14,500	20,000
11th		4,500	11,000	15,500
12th		7,000	7,000	14,000
13th		8,500		8,500
14th	5,000	22,500		27,500
16th	<u>3,000</u>	<u>11,000</u>	<u>9,000</u>	<u>23,000</u>
Total	8,000	65,000	75,000	148,000
Less 10% Rock and 10% Loss in Mining	<u>1,500</u>	<u>13,000</u>	<u>15,000</u>	<u>29,500</u>
Net Total	6,500	52,000	60,000	118,500

Factors used:- Bessemer and Clinton in place:- 12 cu. ft.

Silica:- 13 - 15 cu. ft. per ton. The estimate is the same as in 1921.

General.

The mine remained closed, but the pumps were kept running throughout the year, and such repairs to timbering in the drifts as were necessary were made.



Labor.

Wages were decreased 10% on June 1st and were increased 45¢ a day, or approximately 12% on September 1st. Up to the end of June the men worked half time. Thereafter changes in personnel were made whereby all hands worked full time.

Repairs to Shaft.

Late in September the shaft started to squeeze at the knuckle, and on October 1st repairs were started. The cage was first repaired and shortened, and then new sets were put in. Repairs were continued in the lower shaft until December 8th, and the timbering was put in good condition from the tenth level down to the fourteenth.

Location.

All the houses in the location were repaired and painted, and the appearance of the location has been much improved.

SALISBURY MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1922.

GRADE	IRON	PHOS.	SILICA
Salisbury Bessemer,	(No Production)		
Clinton,	(No Production)		
Clinton Silica,	(No Production)		

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1922

GRADE	Mine			Lake Erie	
	IRON	PHOS.	SILICA	IRON	MOIST.
Salisbury Bessemer,	(All Mixed)				
Clinton,	(All Mixed)				
Clinton Silica,	(All Mixed)				

ORE STATEMENT - DECEMBER 31ST, 1922.

	SALISBURY BESSEMER	CLINTON	CLINTON SILICA	TOTAL	TOTAL LAST YEAR
On hand January 1, 1922,	918	23,193	36,902	61,013	61,779
Output for Year,	-	-	-	-	20,106
Transferred,	1,162	6,624	5,462	-	-
Stockpile Overrun and Shortage,	498	-	7,747	7,249	-
Total,	254	29,817	23,693	53,764	81,885
Shipments,	254	2,404	22,066	24,724	20,872
Balance on Hand,	-	27,413	1,627	29,040	61,013
Decrease in Output,				27,355	
Decrease in Ore on Hand,				31,973	
1922 -- Mine Idle.					
1921 -- 2-8 Hour Shifts Jan. 1st to March 6th, 1921. Mine closed March 5th, 1921.					

SALISBURY MINE

SHIPMENTS FOR YEAR-1922

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Salisbury Bessemer,	0	254	254	0
Clinton,	0	2,404	2,404	0
Clinton Silica,	0	22,066	22,066	20,872
Total,	0	24,724	24,724	20,872
Total Last Year,	0	20,872	20,872	
Increase,			3,852	

SALISBURY MINE

COMPARATIVE MINING COST FOR YEAR

	1 9 2 2	1 9 2 1	INCREASE	DECREASE
PRODUCT	7,249	20,106		
Underground Costs		2.120		
Surface Costs		.347		
General Mine Accounts		.170		
Cost of Production		2.637		
Plant Account		.014		
Equipment		.011		
Taxes		.067		
Central Office		.112		
Contingent Expense		.041		
Idle Expense		1.666		
Cost Adjustment		.058		
Cost on Stockpile		4.606		
Loading & Shipping		.047		
Total Cost on Cars		4.653		
No. Days Operating		53		
No. Shifts & Hours		2-8hr		
Avg. Daily Product		379		
<u>COST OF PRODUCTION</u>				
Labor		1.961		
Supplies		.676		
Total		2.637		

NOTE: Mine closed March 6, 1921. Not operated 1922.
7,249 tons shown is stock pile shortage.

SALISBURY MINE

COMPARATIVE WAGES AND PRODUCT

	1 9 2 2	1 9 2 1	INCREASE	DECREASE
PRODUCT	7.249	20,106		27,355
No.Shifts & Hours		2-8hr		
AVG. NO. MEN WORKING				
Surface	5	9		4
Underground	8	23		15
Total	13	32		9
AVG.WAGES PER DAY				
Surface	3.70	4.99		1.29-25%
Underground	4.27	5.68		1.41-24%
Total	4.05	5.49		1.44-26%
WAGES PER MO. OF 25 DAYS				
Surface	92.50	124.75		32.25
Underground	106.75	142.00		35.25
Total	101.50	137.25		35.75
PRODUCT PER MAN PER DAY				
Surface		8.05		
Underground		3.09		
Total		2.23		
LABOR COST PER TON				
Surface		.610		
Underground		1.839		
Total		2.459		
AVG.PRODUCT BRK'G & TRM'G		5.36		
" WAGES CONTRACT MINERS		6.20		
" " " TRAMMERS		4.90		
" " "		5.91		
TOTAL NO. OF DAYS				
Surface	1,282	2498 $\frac{1}{4}$		1216 $\frac{1}{4}$
Underground	2,008	6506 $\frac{3}{8}$		4498 $\frac{3}{8}$
Total	3,290	9004-3/4		5714-3/4
AMOUNT FOR LABOR				
Surface	4743.08	12457.72		7714.64
Underground	8567.48	36972.68		28405.20
Total	13310.56	49430.40		36119.84

Proportion Surface to Underground Men:

1922 - 1 to 1.660
 1921 - 1 to 2.55
 1920 $\frac{1}{2}$ 1 to 3.7
 1919 - 1 to 3.23
 1918 - 1 to 3.13
 1917 - 1 to 2.68

2-8hr - 6 days a week to Mar.5th;
 Closed March 6, 1921.

ANNUAL REPORT
OF THE
ANGELINE MINE

(1922)

Shipments.

The Angeline Mine remained closed throughout the year, but all the ore in stock was shipped.

Table I.

Shipments from Stock-Pile.

Hard Ore Bessemer	612 Tons
Angeline Bessemer	27,187 "
Angeline	2,910 "
Angeline Silica	<u>6,133 "</u>
Total	36,842 "

Table II.

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

MADE IN U.S.A

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

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

Pumping.

Up to February 15th the underground pump was operated by the Oliver Iron Mining Co. On February 15th this pump was removed and sent to the Holmes Mine to be overhauled, and the motor was sent to the Hard Ore Shops. After this date all pumping was done by the Oliver Iron Mining Co., with two Layne & Bowler pumps installed in the cage compartment.

Top-Tram.

The top-tram motor was taken to the Dead River Storage Dam in November.

Location.

General repairs were made to all the houses in the location, and all the houses were painted. Improvements were also made in sewage-disposal for some of the houses, which previously had had cess-pools.

Damascus
Bond

MADE IN U.S.A

ANGELINE MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1922.

GRADE	IRON	PHOS.	SILICA
"D" Shft. Angeline Hard Bessemer,	(No Production)		
"D" Shft. Angeline,	(No Production)		
"D" Shft. Angeline Silica,	(No Production)		

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1922.

GRADE	Mine		Lake Erie	
	IRON	PHOS.	IRON	MOIST.
"D" Shft. Angeline Hard Bessemer,	(All Mixed)			
"D" Shft. Angeline,	(All Mixed)			
"D" Shft. Angeline Silica,	(All Mixed)			

ORE STATEMENT - DECEMBER 31ST, 1922.

	"D" SHFT. BESSEMER	"D" SHFT. ANGELINE	"D" SHFT. ANGELINE SILICA	"D" SHFT. HARD BESSEMER	TOTAL	TOTAL LAST YEAR
On hand Jan. 1, 1922,	28,306	3,810	6,432	746	39,294	17,294
Output for Year,	-	-	-	-	-	22,000
Stockpile Shortage,						-
Total,	27,187	2,910	6,133	612	36,842	39,294
Shipments,	27,187	2,910	6,133	612	36,842	-
Balance on Hand,	-	-	-	-	-	39,294
Decrease in Output,					24,452	
Decrease in Ore on Hand,					39,294	

1922 -- Mine idle all Year.

1921 -- 2-8 Hour Shifts Jan. 1st to June 1st, 1921.
Mine closed May 31st, 1921.

ANGELINE MINE

SHIPMENTS FOR YEAR 1922.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
"D" Shaft Bessemer,	-	27,187	27,187	-
"D" Shaft Angeline,	-	2,910	2,910	-
"D" Shaft Angeline Silica,	-	6,133	6,133	-
"D" Shaft Hard Bessemer,	-	612	612	-
Total,	-	36,842	36,842	-
Total Last Year,	-	-	-	-
Increase,			36,842	

Damascus
Bond
 MADE IN U.S.A.

ANGELINE MINE

COMPARATIVE WAGES AND PRODUCT

	1 9 2 2	1 9 2 1		
Product	2,452	22,000		
No.Shifts & Hours		2-8hr		
AVG. NO. MEN WORKING				
Surface		8		
Underground		24		
Total		32		
AVG.WAGES PER DAY				
Surface	6.15	4.75		
Underground		5.46		
Total	6.15	5.27		
WAGES PER MO. OF 25 DAYS				
Surface		118.75		
Underground		136.50		
Total		131.75		
PRODUCT PER MAN PER DAY				
Surface		8.96		
Underground		3.16		
Total		2.33		
LABOR COST PER TON				
Surface		.530		
Underground		1.730		
Total		2.260		
AVG.PRODUCT BRK'G & TRM'G		4.13		
" WAGES CONTRACT MINERS		5.54		
" " " TRAMMERS		5.54		
TOTAL NO. OF DAYS				
Surface	22	2454-3/4		
Underground		6972-3/4		
Total	22	9427-1/2		
AMOUNT FOR LABOR				
Surface	135.39	11651.17		
Underground		38069.39		
Total	139.99	49720.56		

Abandoned June 1, 1921.

1922 is for proportion of clerk only.

ANNUAL REPORT

OF THE

HOLMES MINE

(1922)

Production and Shipments

The Holmes Mine worked 302 days in 1922, and produced 218,066 tons of ore, an average of 722 tons per day. The Mine worked on single shift with two crews working alternate weeks, six days a week, from Jan. 1st., to June 5th., and thereafter worked on double shift, full time.

262,251 Tons of all grades were shipped during the year, the largest shipments made in any year since the mine was opened. Nevertheless the amount of ore in stock at the end of the year is unusually large.

13,730 tons of rock were produced, an average of 45 tons per day.

Table I

Grade	<u>Production by Grades</u>	
	1922 Tons	1921 Tons
Holmes Bessemer	64,734	52,041
Holmes	7,910	7,813
Junction Bessemer	39,618	24,636
Junction	<u>105,804</u>	<u>93,510</u>
Total	218,066	178,000

MADE IN U.S.A.

Table II.

Shipments.

Grade	Pocket Tons	Stock-File Tons	Total Tons
Holmes Bessemer	23,778	25,447	49,225
Holmes	2,936	13,573	16,509
Junction Bessemer	21,353	21,596	42,949
Junction	<u>70,434</u>	<u>83,134</u>	<u>153,568</u>
Total	118,501	143,750	262,251

Table III.

Stock-Pile Balances, December 31st., 1922.

Grade	Tons
Holmes Bessemer	115,635
Holmes	37,473
Junction Bessemer	7,452
Junction	<u>79,587</u>
Total	240,147

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
First							
Second	46,498	2,321	35,420	98,962	183,201	8,485	191,686
Third	17,926	5,224	3,031	5,341	31,522	3,683	35,205
Fourth	<u>310</u>	<u>365</u>	<u>1,167</u>	<u>1,501</u>	<u>3,343</u>	<u>1,562</u>	<u>4,905</u>
Total	64,734	7,910	39,618	105,804	218,066	13,730	231,796

MADE IN U.S.A.

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 Rock Tons
January	26	478	2,334	831	1,919	7,341	12,425	582	13,007
February	24	467	2,731	498	1,049	6,933	11,211	844	12,055
March	27	485	2,974	549	2,834	6,747	13,104	806	13,910
April	24	500	2,990	896	1,934	6,184	12,004	881	12,885
May	26	494	3,430	728	2,198	6,482	12,838	463	13,301
June	25	866	5,780	881	4,884	10,103	21,648	1,578	23,226
July	25	864	6,398	1,030	3,261	10,908	21,597	1,576	23,173
August	27	927	6,955	597	4,291	13,175	25,018	1,576	26,594
September	24	888	5,582	444	4,024	11,271	21,321	2,088	23,409
October	26	928	5,188	396	4,549	14,000	24,133	1,504	25,637
November	24	870	4,758	308	4,027	11,789	20,882	780	21,662
December	24	891	5,614	752	4,108	10,921	21,395	1,052	22,447
Year	302	720	54,734	7,910	39,078	115,854	217,576	13,730	231,306
Transfers			10,000		50	-10,050			
Stock-Pile Overrun			64,734	7,910	39,128	105,804	217,576	13,730	231,306
					490		490		490
Net Total	302	722	64,734	7,910	39,618	105,804	218,066	13,730	231,796

Delays

Date	Hours	Tons Lost	Cause	Repair Cost.
Dec. 29	4	300	Broken Runner in Shaft	\$ 16.00

Delays Due To Lack Of Current

There were no delays to lack of current in 1922.

Table VI.

Estimate Of Ore Reserves.

<u>Developed Ore.</u>					
Level	Holmes Bessemer Tons	Holmes Tons	Junction Bessemer Tons	Junction Tons	Total Ore Tons.
Second	4,000		14,000	50,000	68,000
Third	190,000	42,000	90,000	514,000	836,000
Fourth	<u>95,000</u>	<u>90,000</u>	<u>120,000</u>	<u>680,000</u>	<u>985,000</u>
Total	289,000	132,000	224,000	1,244,000	1,889,000
Less 10% Rock and 10% Less in Mining	<u>58,000</u>	<u>26,000</u>	<u>45,000</u>	<u>249,000</u>	<u>378,000</u>
Net Total	231,000	106,000	179,000	995,000	1,511,000

<u>PROSPECTIVE ORE.</u>					
Level	Holmes Bessemer Tons	Holmes Tons	Junction Bessemer Tons	Junction Tons	Total Ore Tons.
Fourth	10,000	15,000			25,000
Below Fourth	_____	_____	<u>50,000</u>	<u>293,000</u>	<u>343,000</u>
Total	10,000	15,000	50,000	293,000	368,000
Less 10% Rock and 10% Less in Mining	<u>2,000</u>	<u>3,000</u>	<u>10,000</u>	<u>59,000</u>	<u>74,000</u>
Net Total	8,000	12,000	40,000	234,000	294,000
Total Ore	239,000	118,000	219,000	1,229,000	1,805,000

Factors Used: Hard Ore - 9 Cu. Ft. Per Ton.

Soft Ore - 12 Cu. Ft. Per Ton.

GENERAL.

Labor.

When the mine was put on a full time, double shift, basis on June 5th., about 15 surface-men were laid off, and two extra contracts were started underground in order to give employment to all the underground force.

When the Cliffs Shaft Mine was started in the last week of June, many men were transferred from the Holmes Mine and former employes were hired in their places.

There was no shortage of labor except in November, when many men were home sick or were out deer-hunting.

On June 1st., wages were reduced about 10%, making the wage-scale approximately that in effect on May 1, 1917. On September 1st., they were raised .45¢ a day, equivalent to nearly 12%.

Serious Accident.

Jacob Kangas, a miner working in No. 21 contract on the second level fell 60 feet from the 375 foot sub-level in Raise 354 on the night of Friday November 24th., and was seriously injured. Both legs were broken and he was cut about the head and was injured internally. He is a Finn, 29 years old, and is married and has two small children.

Water.

The flow of water increased about 30% in January, due to a new break in the hanging-wall, and there was the usual temporary increase at the time of spring break-up. On Easter day the surface ditch at the Section 16 Mine was blocked, so that the water backed up and flowed down the cracks in the surface into both mines, and there was a heavy flow of water for a week thereafter.

SURFACE.

Stock-Piles.

The Junction Bessemer stock-pile was entirely cleaned up and a large hole was made in the Junction pile west of the Shaft. Most of the ore stocked in the spring and fall was dumped from the new trestle south of Excelsior St., and this trestle is now practically full. Ore was also shipped from the Holmes Bessemer and Holmes stock-piles, making room for the winter's production.

Timber - Yard.

The tracks in the timber-yard were changed and a trolley locomotive put in use in September, greatly facilitating the handling of timber.

Buildings.

The Steel shaft-house and pulley-stand and the wood-work of the other mine-buildings were painted during the summer, and as a result the appearance of the plant is much improved.

UNDERGROUND.

Development.

The necessary drifting for completing the program of development in outlining the ore on the 340 and 240 foot sub-levels, halfway between the second and third levels and between the third and fourth levels respectively, was finished early in the year and raises Nos. 317, 328, 344, 355, 356, and 363 were completed from the 340 foot sub-level to the second level and raises Nos 341, 345, 346, 349, 361, 365 and 367 were completed from the third level to the second level. Raises Nos. 347, 357 and 358 were put up from the third level to the 340 foot sub-level, and raise No. 454 was put up from the fourth level to the 240 foot sub-level. The drifting on the 340 foot sub-level consisted of four short cross cuts and two drifts. Three of the cross-cuts were driven north to the foot-wall, and the fourth was completed across the middle of the vein.

A short drift was driven south-east from raise 347 to No. 1 cross-cut, and another was driven along the foot-wall east of No. 1 cross-cut. The known area of the ore was slightly reduced by this work.

On the 240 foot sub-level, cross-cuts were driven over Nos. 1, 3 and 5 cross-cuts on the fourth level, and another was driven in the proper place for No. 2 cross-cut. Several changes in the mapping of the outline of the ore were made as a consequence of this work.

No. 4 cross-cut on the fourth level was advanced 45 feet in rock.

Stoping.

In the soft ore vein, all the ore above the 440 foot sub-level has been mined, the 470, 460, 450, 445 and 440 foot sub-levels having been finished. In the middle of the vein there are 3 gangs working on the 435 foot sub-level in the soft ore, but this will soon be finished. All the soft ore within 150 feet of the east boundary has been mined down to the 420 foot sub-level, and within 150 feet of the South Boundary the 410 foot sub-level has also been mined. Stopping operations are now being carried on in steps, beginning at the south on the second level and rising to the 400 and 410 foot sub-levels towards the north. Another sub-level is being opened near the South boundary ten feet below the second level.

The hard ore left between the shrinkage stopes above the second level has been mined down to the 400 foot sub-level, the first sub-level above the second level, and, at the east end of the vein has been mined down to the second level. The ore next to the hanging-wall has also been mined down to the 355 foot sub-level, three subs below the second level, for a distance of 80 feet north from the south boundary-line. The 375 foot sub-level has been opened for a distance of 250 feet from the line. One gang is now stoping on the 340 foot sub-level.

Up to June 5., there were 29 gangs of miners working, and thereafter there were 31. The average number of gangs stoping was 17, drifting and raising 12, and 1 in rock. There were on the average 10 gangs in hard ore, and 19 in soft ore.

HOLMES MINE.

COMPARISON OF COST SHEETS FOR 1921 AND 1922.

In 1921 the Holmes Mine worked on double shift six days a week until March 5th., then five days a week until June 1st., and thereafter on single shift six days a week. The mine worked 111 days on double shift and 178 days on single shift. The proportion of development to stoping was large, but the charge for rock-work was not as heavy as in previous years.

In 1922 the mine worked on single shift up to June 5, and thereafter on double shift. 130 days were worked on single shift and 172 on double shift. There were 29 contracts up to June 5, and 31 thereafter.

Wages were decreased 15% on Feb. 1st., 1921, 12 1/2% on Aug. 1st., and 10% on Oct. 1st. In 1922 there was another decrease of 10% on June 1st., and an increase of 45¢ a day or approximately 11 1/2% on Sept. 1st. On the basis of wage-rates alone, the average wage for 1922 was 82% of that for 1921, or as 65 to 80; but, correcting this figure to take into account the number of shifts worked, the wages for 1922 were approximately 87% of those in 1921, or as 65 to 75.

Production.

	<u>1921</u>	<u>1922</u>
Days Worked	289	302
	Tons	Tons
Ore	178,000	218,066
Rock	<u>13,635</u>	<u>13,730</u>
Ore and Rock	191,635	231,796
Ore Per Day	616	722
Rock Per Day	<u>47</u>	<u>45</u>
Ore and Rock Per Day	663	767

Labor

	<u>1921</u>	<u>1922</u>
Average Number of Men	164	177
Average Rate Per Day	\$ 5.02	\$ 4.15

Tons Per Man Per Day

	<u>1921</u>	<u>1922</u>
Surface	12.81	15.68
Underground	<u>5.29</u>	<u>5.51</u>
Total	3.74	4.08

Cost Of Production.

	<u>1921</u>	<u>1922</u>
Labor	\$ 1.378	1.029
Supplies	<u>.737</u>	.541
Total	\$ 2.115	1.570

MADE IN U.S.A.
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HOLMES MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1922.

GRADE	IRON	PHOS.	SILICA
Holmes Bess. Crushed,	62.91	.031	5.42
Holmes Crushed,	61.22	.065	7.29
Junction Bessemer,	62.38	.031	5.83
Junction,	57.91	.090	7.01

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1922.

GRADE	Mine		Lake Erie		
	IRON	PHOS.	IRON	PHOS.	MOIST.
Holmes Bess. Crushed,	62.42	.032	62.45	.035	4.26
Holmes Crushed,	61.12	.062	61.29	-	3.85
Junction Bessemer,	(All Mixed)				
Junction,	57.93	.086	58.25	-	9.17

ORE STATEMENT - DECEMBER 31ST, 1922.

	HOLMES				TOTAL	TOTAL LAST YEAR
	BESS. CRUSHED	HOLMES CRUSHED	JUNCTION BESSEMER	JUNCTION		
On hand January 1, 1922,	100,126	46,072	10,783	127,351	284,332	148,275
Output for Year,	54,734	7,910	39,078	115,854	217,576	177,511
Transferred,	10,000	-	50	10,050	-	-
Stockpile Overrun,	-	-	490	-	490	489
Total,	164,860	53,982	50,401	233,155	502,398	326,275
Shipments,	49,225	16,509	42,949	153,568	262,251	41,943
Balance on Hand,	115,635	37,473	7,452	79,587	240,147	284,332
Increase in Output,					40,065	
Decrease in Ore on Hand,					44,185	

1922 -- 1-8 Hour Shift, 6 days per week, Jan. 1st to June 4th, 1922.
2-8 Hour Shifts, 6 days per week, June 5th to Dec. 31st, 1922.

1921 -- 2-8 Hour Shifts, Jan. 1st to March 5th, 1921.
2-8 Hour Shifts, 5 days per week, March 5th to June 1st, 1921.
1-8 Hour Shift, 6 days per week, June 1st to Dec. 31st, 1921.

MADE IN U.S.A.

HOLMES MINE
SHIPMENTS FOR YEAR 1922

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Holmes Bessemer Crushed,	23,778	25,447	49,225	0
Holmes Crushed,	2,936	13,573	16,509	20,109
Junction Bessemer,	21,353	21,596	42,949	16,347
Junction,	70,434	83,134	153,568	5,487
Total,	118,501	143,750	262,251	41,943
Total Last Year,	5,663	36,280	41,943	
Increase,	112,838	107,470	220,308	

Dennars
Bond
MADE IN U.S.A.

HOLMES MINE

COMPARATIVE MINING COST FOR YEAR

	1 9 2 2	1 9 2 1	INCREASE	DECREASE
PRODUCT	218,066	178,000	40,066	
Underground Costs	1.246	1.667		.421
Surface Costs	.210	.312		.102
General Mine Accounts	.114	.136		.022
Cost of Production	1.570	2.115		.545
Original Cost	.002	.002		
Plant Account	.500	.506		.006
Equipment	.002	.002		
Taxes	.219	.267		.048
Central Office	.084	.088		.004
Contingent Expense	.041	.045		.004
Cost Adjustment	.009	.089		.080
Cost on Stockpile	2.431	3.114		.683
Loading & Shipping	.048	.013	.035	
Cost on Cars	2.479	3.127		.648
No. Days Operating	302	289	3	
No. Shifts & Hours	1-8;2-8	2-8;108		
Avg. Daily Product	722	616	106	
<u>COST OF PRODUCTION</u>				
Labor	1.029	1.378		.349
Supplies	.541	.737		.196
Total	1.570	2.115		.545

HOLMES MINE

COMPARATIVE WAGES AND PRODUCT

	1 9 2 2	1 9 2 1	INCREASE	DECREASE
PRODUCT	218,066	178,000	40,066	
No.Shifts & Hours	1-8;2-8	2-8-1-8		
AVG.NO. MEN WORKING				
Surface	60	66		6
Underground	167	166	1	
Total	227	232		5
AVG.WAGES PER DAY				
Surface	3.75	4.38		.63-14.4%
Underground	4.29	5.28		.99-18.9%
Total	4.15	5.02		.87-17.3%
WAGES PER MO.OF 25 DAYS				
Surface	93.75	109.50		15.75
Underground	107.25	132.00		24.75
Total	103.75	125.50		21.75
PRODUCT PER MAN PER DAY				
Surface	15.68	12.81	2.87	
Underground	5.51	5.29	.22	
Total	4.08	3.74	.34	
LABOR COST PER TON				
Surface	.239	.342		.003
Underground	.778	.999		.221
Total	1.017	1.341		.324
AVG. PRODUCT BRK'G & TRM'G	7.26	7.00	.26	
" WAGES CONTRACT MINERS	4.39	5.43		1.04
" " " TRAMMERS				
" " " LABOR	4.39	5.43		1.04
TOTAL NO.OF DAYS				
Surface	13,903	13,898-3/4	4 1/4	
Underground	39,547	33,659	5,887-3/4	
Total	53,450	47,558	5,892	
AMOUNT FOR LABOR				
Surface	52195.87	60877.07		8681.20
Underground	169720.30	177813.55		8093.25
Total	221916.17	238690.62		16774.45

Proportion Surface to Underground Men:

1922 - 1 to 2.78
 1921 - 1 to 2.63
 1920 - 1 to 2.87
 1919 - 1 to 2.55
 1918 - 1 to 2.5

1921
 2-8hr 6 days a week Mar.5;
 2-8hr 5 " " Mar.6 to May 31;
 1-8hr 6 days " June 1 to Dec.31.
 1922
 2-8hr June 5,1922.

HOLMES MINE.

TIMBER STATEMENT FOR THE YEAR ENDING DECEMBER 31, 1922.

KIND	LINEAL FEET	AVG. PRICE PER FOOT	AMOUNT	
			1 9 2 2	1 9 2 1
6" to 8" Timber	103,053	.0406	4,181.82	6,398.71
8" to 10" "	64,221	.0603	3,971.77	7,269.91
10" to 12" "	32,408	.0872	2,832.86	2,742.74
12" and Larger Timber	26,184	.1054	2,759.88	852.60
Total - 1922	225,866	.0609	13,746.33	
Total - 1921	203,211	.0849		17,263.96
	LINEAL FEET	PER 100'		
5' Lagging	843,200	.7816	6,590.45	8,468.85
7' "	9,415	.7702	72.50	107.00
Total - 1922	852,615	.7815	6,662.95	8,575.85
Poles	347,710	1.0876	3,782.74	3,761.60
Total - 1922	1,200,325	.9874	10,445.69	
Total - 1921	1,057,893			12,337.45
Product			218,066	178,000
Feet timber per ton of ore			1.036	1.141
" lagging "			3.91	4.62
" " per foot of timber			3.77	4.04
Cost per ton for timber			.063	.096
" lagging			.031	.048
" poles			.017	.021
" timber, lagging & poles			.111	.166
Ft. Bd. measure per ton of ore			2.13	1.80
Total cost for timber, lagging & poles				
	1922			24192.02
	1921			29601.41

HOLMES MINE.

STATEMENT FOR EXPLOSIVES USED FOR BREAKING ORE.

KIND	QUANTITY	AVERAGE PRICE	AMOUNT 1922	AMOUNT 1921
50% L.F. Powder	92,600	.1512	14,001.94	8,413.89
60% " "	22,350	.1584	3,540.25	4,771.51
60% Gel. "	9,500	.1933	1,836.62	7,164.28
80% " "				2,765.50
Total Powder	124,450	.1557	19,378.81	23,115.18
Fuse	317,700	6.926	2,220.42	2,016.36
Caps	74,400	11.55	859.07	861.84
Crimpers	17	1.03	17.55	15.49
Total Fuse, Etc.			3,077.04	2,893.69
Total Explosives			22,455.85	26,008.87
Product			218,066	178,000
Pounds Powder per ton of Ore			.5707	.653
Cost per ton for Powder			.0889	.129
" Fuse, Caps, Etc.			.0141	.016
" All Explosives			.1030	.146
Avg. Price per Lb. for Powder			.1557	.1988

Mine Operated from Jan. 1st to June 5th - 1 - 8hr. shift.
 " " June 5th to Dec. 31st - 2 - 8hr shifts.

NEGAUNEE MINE - 1922.

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

Bessemer,	33,267 tons,
Negaunee,	265,784 "
Total,	299,051 "
Rock,	968 "

The product of 11% Bessemer and 89% Negaunee is practically the same division as made in 1921.

Previous to the curtailment of operations at the mine in 1921, the mine had been operating at its maximum output for a number of years. This required large working areas throughout the mine. With the curtailment, however, the number of working places had to be reduced very materially. To operate at as low a cost as possible, the work was concentrated into as limited a space as possible, however, some of the sub levels which had been opened had to be completed before this was done. During the latter part of 1921 we were operating four hours per day, with a product of approximately 15,000 tons per month. Conditions changed in June 1922 when on the 5th of the month the mine went on a new schedule of eight hours per day. This meant that although the product was doubled, no new contracts were necessary, the men occupying their places for a full days time instead of one-half day. Practically no development work was done except a little on the eleventh level, where a few raises were put up and one of the main drifts extended. In the #2 shaft pillar, where work was in progress early in 1921, nothing was done during the present year.

The work on the various levels and sub levels in detail is as follows:-

UNDERGROUND.

620' SUB LEVEL.

NORTHWEST END - NEAR MAAS MINE.

This sub level was opened in the American Mining Company strip and

the supporting pillar in April 1921. Work was continued here throughout the year and the sub level completed in November.

NINTH LEVEL.

NORTHWEST END.

The work in the American Mining Company strip and supporting pillar was opened in August at #58 raise in the territory South of the old square set rooms, and at #30 raise North of these rooms on the foot wall. The work to date has been principally development.

In December two contracts stoped in the American Mining Company pillar and eight in the supporting pillar.

SOUTH FOOT.

The work started here in 1921 was completed in July. This was in a triangular shaped territory South of #1 dike between the foot and hanging wall near #148 and #150 raises. The remaining pillars being taken in this territory.

SUBS BETWEEN THE NINTH AND TENTH LEVELS.

595' SUB LEVEL.

In July a drift was driven connecting #30 and #31 raises to drain the water from #30 raise, which was being used as the ore chute to the tenth level.

In December one contract cut out from #58 raise to drive to #59.

588' SUB LEVEL.

SOUTH END.

This sub level was opened late in 1921. Work for the year has been almost wholly between #1 and #2 dikes where mining has practically been completed. Between #1 dike and the foot, to the South, development is now in progress.

In December three contracts were stoping and two developing South of #1 dike.

580' SUB LEVEL.

SOUTH END.

This sub level was opened directly South of #2 dike in December 1921

and has been worked the entire year, retreating from #2 dike South toward #1.

In December thirteen contracts were stoping between #1 and #2 dikes, one finished the traveling road South of #150 raise, one blasted filling South of #234 raise, while another repaired near #55 raise.

545' SUB LEVEL.

The only work at this elevation during the year was in the extreme South end of the mine where in October and November test raises were put up to find the height of the hanging. This work was done from the drift which connects #126 and #150 raises. The hanging was found at a point about 30' above the sub level.

TENTH LEVEL.

The work on the tenth level was in two areas, one in the Northwest end of the mine, the other to the North and immediately adjacent to #2 dike.

At #234 raise a connection was made to the stub end of the tenth level due West of the raise. This connection was made in ore which was followed and found to be a small deposit in the hanging from 30 to 40' in width extending about 100' to the South.

The area along #2 dike which was developed several years ago and partially mined in 1921 was finished in October of this year. Raise #153 which was stopped previous to this year on account of hitting rock was continued to the 588' sub level, mostly in ore.

From the drift paralleling the Maas boundary at a point 10' South of #60 raise a short drift was driven to the Northwest to connect with the Maas Mine Second Level which is now used as a traveling road between the two mines.

SUBS BETWEEN THE TENTH AND ELEVENTH LEVELS.

500' SUB LEVEL.

A few small pillars above #10 crosscut eleventh level were mined early in the year. These were on the North foot wall.

The Northwest end tributary to #9 and #10 crosscuts on the eleventh level has been worked since the first of the year.

The territory North of #2 dike from #4 crosscut North to #10 was developed and is now being mined. There is considerable ore left here from #4 to #8 crosscuts adjacent to the dike. Mining will be continued until this sub level is completed.

In December six contracts stopped in the Northwest end of the sub, six in the center portion and four in the Southwest end under the hanging.

488' SUB LEVEL.

Work at this elevation was started in May and has been carried on in two areas, one in the North end of the mine on the foot wall near #10 crosscut, and the other in the Southwest end of the mine above #5 crosscut.

In the North area between #227-A and #212 raises an incline system of mining has been started. This method has been in operation but a short time and to date it is impossible to tell whether it will be practical. We will continue the work and if it develops satisfactorily, a larger area will be opened.

In the area above #5 crosscut three contracts are developing between #261 and #263 raises.

In December two contracts were developing along the foot wall between #211 and #214 raises, one slicing on the incline near #212 raise and three contracts developing between #260 and #264 raises.

475' SUB LEVEL.

In December two contracts were developing between #212 and #227-A raises.

460' SUB LEVEL.

In the North end of the mine, to the South of #10 crosscut, a drift was driven from #212 to #227 raise and nine one-compartment untimbered raises were put up to the 488' sub level. This work was done in August, September and October for the purpose of trying out the incline system of mining.

ELEVENTH LEVEL.

The only work on this main level during the year was at #4 crosscut which was advanced from #2 to #1 dikes, a distance of 170'.

No. 4-A crosscut has been started at a point midway between #4 and #5 crosscuts. This will be a back switch from the North and parallel to the other crosscuts.

Three raises were put up during the year as follows:- No. 271 to the tenth level in ore; #272 in ore 60' where it struck jasper; #273 in ore 75' to the jasper.

In December one contract was employed in extending #4-A crosscut to the Southwest, while two contracts were raising in #4 crosscut.

UNDERGROUND IN GENERAL.

Very little development has been done at the Negaunee Mine for the past several years. During the coming year the shaft should be sunk another lift and the twelfth level development started. This is necessary to keep development far enough ahead of mining to keep our costs as low as possible. Before the shaft can be sunk to a greater depth, both the skip and cage hoists will have to be provided with longer drums as they have reached their capacity with the present depth.

The mine is in excellent condition and more working places can be provided if a larger product is desired. This would mean reopening the workings in #2 shaft pillar where work was abandoned two years ago at the time of the curtailment. During the past year we have tried out a new system of mining which we have termed the Incline System. But one sub level has been worked by this method and fairly good results have been obtained. It is too early yet to forecast whether it will be a success, however, it will be given a fair trial. We are also using five Mayne Leaders in our sub levels. Where these machines are used, we are getting in the neighborhood of 75% more product per man per day than the average of the mine at a saving of about 30% to the company in the price to contractors and at an increased wage of about 20% to the men. A great many visitors have gone underground during the past year to inspect the work of these machines.

WATER.

The average number of gallons of water pumped per minute during the

year as compared with 1921 is as follows:-

	<u>1922</u>	<u>1921</u>
January	875	871
February	916	974
March	817	885
April	877	883
May	875	852
June	950	932
July	990	972
August	1008	913
September	1017	933
October	1026	897
November	983	917
December	982	896
Average -	943	910

The average pumping for the year was 33 gallons per minute more than in 1921 and 23 gallons per minute less than in 1920.

SURFACE.

STOCKING ROOM.

There were shipped from the stockpile during the year, 171,802 tons of Negaunee ore and 24,950 tons of Bessemer ore, leaving in stock December 31st, 7,079 tons of Bessemer and 164,777 tons of Negaunee, or a total of 171,856 tons. With our present production of slightly more than 30,000 tons per month, our stocking trestles will be taxed to capacity by the opening of navigation in the spring.

STEEL STOCKING TRESTLE.

The renewing of ties on the stocking trestles, started a year ago, was completed during the year.

GRADING.

A small area at the East end of the East trestle was graded, so that extra bents can be provided there, if necessary, during the present stocking season.

NEW MOTOR - SKIP HOIST.

During the year it was found that eight coils had burned out on the skip hoist motor. This was due to breaking down of the insulation between the laminations and the copper wire. In order to place new coils in this motor,

it would require shutting down the mine at least two weeks, consequently, a new motor was ordered and is now on the ground. The installation will take place over some week end.

FIRE.

On December 4th a fire destroyed the small engine house to the West of #2 headframe which enclosed the hoist which operates the cage at #2 shaft, which is used for lowering timber. The origin of the fire is unknown. The loss which included an electric hoisting engine, transformers and building amounted to \$1500.00.

ESTIMATE OF PROBABLE ORE IN NEGAUNEE MINE DECEMBER 31, 1922.

On North Foot above 9th level - - - -	41,344 tons,
No. 1 Shaft Pillar - - - - -	1,148,660 "
No. 2 Shaft Pillar - - - - -	<u>113,902 "</u>
 Total above 9th level - - - - -	 1,303,906 tons.
Total between 9th & 10th levels - - -	1,210,781 tons,
Total between 10th & 11th levels - - -	<u>2,641,275 tons,</u>
Total above 11th level - - - - -	5,155,962 tons.

Percentage of Bessemer = 11%.

GRADED AS FOLLOWS:

<u>Bessemer Ore</u>	<u>Trade Name</u>	<u>Tons</u>
Developed	Negaunee-Bessemer	567,156
 <u>Non-Bessemer Ore</u>		
Developed	Negaunee	<u>4,588,806</u>
 Total Bessemer and Non-Bessemer - - -		 5,155,962

ASSUMPTION:

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

ESTIMATED ANALYSIS.

	<u>IRON</u>	<u>PHOS.</u>	<u>SILICA</u>	<u>ALUM.</u>	<u>MANG.</u>	<u>LIME</u>	<u>MAG.</u>	<u>SUL.</u>	<u>IGNI.</u>	<u>MOIST</u>
Negaunee:										
Dried 212°	59.10	.100	7.70	2.64	.324	.900	.306	.009	3.10	
Natural	52.00	.088	6.78	2.32	.285	.792	.269	.008	2.73	12.00
Negaunee-Bessemer:										
Dried 212°	60.00	.048	7.04	2.72	.237	.644	.307	.009	2.07	
Natural	52.80	.042	6.20	2.39	.209	.567	.270	.008	1.82	12.00

NEGAUNEE MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1922.

GRADE	IRON	PHOS.	SILICA
Negaunee Bessemer,	61.56	.046	6.90
Negaunee,	60.33	.093	7.16

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1922.

GRADE	Mine		Lake Erie		MOIST.
	IRON	PHOS.	IRON	PHOS.	
Negaunee Bessemer,	62.66	.048	62.45	.045	11.76
Negaunee,	60.05	.096	59.87	-	11.25

ORE STATEMENT - DECEMBER 31ST, 1922.

	NEGAUNEE BESSEMER	NEGAUNEE	TOTAL	TOTAL LAST YEAR
On hand January 1, 1922,	14,957	205,503	220,460	148,048
Output for Year,	33,267	265,784	299,051	256,635
Transferred,	314	314	-	-
Total,	47,910	471,601	519,511	404,683
Shipments,	40,831	306,824	347,655	184,223
Balance on Hand,	7,079	164,777	171,856	220,460
Increase in Output,			42,416	
Decrease in Ore on Hand,			48,604	

1922 -- 1-4 Hour Shift, 6 days per week, Jan. 1st to June 4th, 1922.
 1-8 Hour Shift, 6 days per week, June 5th to Dec. 31st, 1922.

1921 -- 1-8 Hour Shift, 6 days per week, Jan. 1st to March 25th, 1921.
 1-8 Hour Shift, 5 days per week, March 25th to May 17th, 1921.
 1-4 Hour Shift, 6 days per week, May 17th to Dec. 31st, 1921.

NEGAUNEE MINE

SHIPMENTS FOR YEAR 1922.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Negaunee Bessemer,	15,349	25,482	40,831	30,821
Negaunee,	131,002	175,822	306,824	153,402
Total,	146,351	201,304	347,655	184,223
Total Last Year,	95,595	88,628	184,223	
Increase,			163,432	

NEGAUNEE MINE

COMPARATIVE MINING COST FOR YEAR

	1 9 2 2	1 9 2 1	INCREASE	DECREASE
PRODUCT	299,051	256,635	42,416	
Underground Costs	1.094	1.299		.205
Surface Costs	.152	.167		.015
General Mine Accounts	.097	.103		.106
Cost of production	1.343	1.569		.226
Plant Account	.030	.030		
Taxes	.562	.659		.097
Central Office	.079	.084		.005
Contingent Expense	.011	.012		.001
Cost Adjustment	.006	.066		.072
Cost on Stockpile	2.019	2.420		.401
Loading & Shipping	.020	.017	.003	
Misc. Debits & Credits	.013	.016		.029
Total Cost on Cars	2.026	2.453		.427
No. Days Operating	202	294	8	
No. Shifts & Hours	1-4 1-8	1-8 1-4		
Avg. Daily Product	990	873	17	
<u>COST OF PRODUCTION</u>				
Labor	.811	.911		.180
Supplies	.532	.578		.046
Total	1.343	1.569		.226

NEGAUNEE MINE

COMPARATIVE WAGES AND PRODUCT

	1 9 2 2	1 9 2 1	INCREASE	DECREASE
PRODUCT	299,051	256,635	42,416	
No.Shifts and Hours	1-8hr	1-8;1-4		
Avg.No.MEN WORKING				
Surface	38	37	1	
Underground	194	189	5	
Total	232	226	6	
AVG.WAGES PER DAY				
Surface	3.73	4.49		.76-16.9%
Underground	4.43	5.45		1.02-18.7%
Total	4.22	5.28		1.06-20.7%
WAGES PER MO. OF 25 DAYS				
Surface	93.25	112.25		19.00
Underground	110.75	136.26		25.50
Total	105.50	132.00		26.50
PRODUCT PER MAN PER DAY				
Surface	29.71	30.94		1.23
Underground	6.37	6.59		.22
Total	5.25	5.43		.18
LABOR COST PER TON				
Surface	.126	.145		.019
Underground	.678	.827		.149
Total	.804	.972		.168
AVG.PRODUCT BRK'G & TRM'G	10.41	10.50		.09
" WAGES CONTRACT MINERS	4.40	5.56		1.16
" " " LABOR	4.40	5.56		1.16
TOTAL NO. OF DAYS				
Surface	10,065	8,294 $\frac{1}{4}$	1,770-3/4	
Underground	46,939 $\frac{1}{2}$	38,952 $\frac{1}{4}$	7,986 $\frac{1}{4}$	
Total	57,004 $\frac{1}{2}$	47,247	9,757 $\frac{1}{2}$	
AMOUNT FOR LABOR				
Surface	37547.71	37234.12	313.59	
Underground	202893.00	212340.62		9,447.62
Total	240440.71	249574.74		9,134.03

Proportion Surface to Underground Men:

1922 - 1 to 5.11	1921
1921 - 1 to 5.11	1 -8hr 6 days a week to Mar.26;
1920 - 1 to 5.15	1 -8hr 5 " May 17;
1919 - 1 to 5.35	1 -4hr 6 " Dec.31.
1918 - 1 to 5.10	1922
	1 -8hr 6 days week June 5,1922.

NEGAUNEE MINE

TIMBER STATEMENT FOR THE YEAR ENDING DECEMBER 31, 1922.

KIND	LINEAL FEET	AVG. PRICE PER FOOT	AMOUNT	AMOUNT
			1 9 2 2	1 9 2 1
6" to 8" Timber	35,791	.033	1,181.10	1,462.38
8" to 10" "	53,877	.0645	3,475.07	5,614.05
10" to 12" "	52,180	.108	5,635.44	6,844.03
12" to 14" "	22,400	.127	2,844.80	1,172.75
Total - 1922	164,248	.0800	13,136.41	
Total - 1921	153,291	.0985		15,093.21
	LINEAL FEET	PER 100'		
7' Lagging	823,120	.79	6,502.65	6,681.85
Poles	233,050	1.35	3,144.21	3,618.50
Cover Boards (135,770 sq.ft. '22 103,011 " '21)		14.60	1,982.89	1,891.96
Total - 1922	1,056,170		11,629.75	
Total - 1921	829,232			12,192.40
Total Timber			24,766.16	27,285.61

Product	299,051	256,635
Feet of timber per ton of ore,	.5459	.5973
Feet of Lagging per ton of ore	2.7524	2.3156
Feet of Lagging per foot of timber	5.0114	3.8770
Cost per ton for Timber	.0439	.0588
" Lagging	.0217	.0260
" Poles	.0105	.0141
" Cover Boards	.00663	.00737
" Timber, Lagging, Poles & Boards,	.08282	.10627
Equivalent of stull timber to bd. measure	390,632	261,494
Feet of bd. measure per ton of ore	1.306	1.019

Total cost for timber, lagging, poles & boards -

1922	24,766.16
1921	27,285.61
1920	37,934.19
1919	35,620.73
1918	21,403.96
1917	22,137.51
1916	21,510.67

During 1922 this mine operated as follows:-

January 1st to June 5th, 6 four-hour shifts a week, product about 15,000 tons per month. June 6th to January 1st, 1923, full time, product about 30,000 tons per month.

NEGAUNEE MINE

STATEMENT OF EXPLOSIVES USED FOR STOPING AND DEVELOPING IN ORE
-1922-

KIND	QUANTITY	AVERAGE PRICE	AMOUNT 1922	AMOUNT 1921
40% Powder	19,650	.1469	2,888.52	2,644.68
50% "	72,850	.1630	11,877.13	9,963.13
60% "	30,650	.1774	5,438.88	6,119.17
Total Powder	123,150	.1641	20,204.53	
Total Powder - 1921	94,800	.1975		18,726.98
Fuse	326,500	.6838c	2,232.66	1,979.68
Caps	60,600	1.158c	702.19	605.74
Cap Crimpers	48	.875ea	42.00	26.00
Tamping Bags	18,000	2.267m	40.82	41.65
Connecting Wire	20#	.377#	7.54	7.99
Electric Exploders	54	7.27c	3.93	1.80
Powder Bags	28	1.16ea	32.48	4.64
Total Fuse, Etc.			3,061.62	2,667.50
Total All Explosives,			23,266.15	21,394.48
Product			299,051	256,635
Pounds Powder per ton Ore			.4118	.3694
Cost per ton for Powder			.0676	.0730
" " Fuse, Caps, Etc.			.0102	.0104
" " All Explosives			.0778	.0834
Avg. Price per Lb. for Powder			.1641	.1975

During 1922 this mine operated as follows:-

January 1st to June 5th, six one-half shifts per week, product about 15,000 tons per month.

June 6th to January 1st, 1923, full time, product about 30,000 tons per month.

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MAAS MINE - 1922.

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

Bessemer,	49,348 tons,
Maas,	167,252 "
Total,	216,600 "
Rock,	3,148 "

This product was 22.8% Bessemer and 77.2% Maas as compared with 29.5% Bessemer and 70.5% Maas for the year 1921. During the coming year the proportion of Bessemer may be somewhat smaller as several contracts have been taken from beneath the hanging in the South end of the mine which is our Bessemer area.

The curtailed production which went into effect in 1921 - the mine operating one-half shift per day - was continued until June 5th, 1922. From this date until the end of the year the regular eight-hour day shift has been in force. No new contracts have been added. Our estimates for the coming year are based on this schedule, but a larger product could be obtained if the underground force were increased. The operations during the year were in territories previously opened, no new ground being developed.

UNDERGROUND.

SUBS ABOVE THE SECOND LEVEL.

645' SUB LEVEL.

The only mining done at this elevation started in September when two pillars at the West end of the sub level near the Northwest boundary of the Roman Catholic Cemetery were taken from the 630' sub level. The remaining pillars will also be taken from the 630' sub level. These are along the foot wall in the Cemetery plat.

During December two contracts were employed mining the pillars in the West end of this sub level on the foot wall side.

630' SUB LEVEL.

This sub level was opened in 1920 in the East end of the mine in the Roman Catholic Cemetery Tract and in the Railroad pillar. This ore body is cut in two by a dike which runs to the Northwest and Southeast. Mining continued during the past year on both sides of this dike in the Cemetery Tract and the Railroad pillar, also in the territory along the foot wall to the West of the Cemetery where it connects with the old workings. The pillars that remain are in the vicinity of the tops of the raises from the second level and mining should be completed during the coming year.

During December four contracts mined here. All were in the Cemetery Tract, two to the North and two to the South of the dike.

618' SUB LEVEL.

This sub level located in the East end of the mine was originally developed for mining in 1919, the work being confined to the Northeast end, i.e., in the Cleveland-Cliffs and American Mining Company strips and the adjacent Cemetery Tract. In 1922 the pillars along the foot wall in the Northeast end were taken and the ore body on the Southeast side of the dike developed from #67 and #68 raises. In the West end near the Northwest boundary of the Cemetery development work was carried East and West from #42-A raise. No. 75 raise from the second level was continued to the height of this sub level during the year. The territory West of the Cemetery will be mined through this raise.

During December four contracts were employed here, three in the Cemetery Tract, developing; one in the Cleveland-Cliffs strip, stoping.

550' SUB LEVEL.

During the year the remaining pillars were taken through #70 raise, the mining being completed in August.

535' SUB LEVEL.

This was opened at #70 raise during the year. A foot wall drift was driven East to the mining limit and West to the old workings. Mining has started at these limits and is retreating toward the raise.

From the East foot wall drift a crosscut was driven to the Southeast through a lean area to the isolated body in the hanging where we are at present mining. This small ore body was originally opened by square sets on the second level which extended to the 550' sub level.

During December five contracts were engaged in mining on this sub level, two to the West of #70 raise, three to the East of this raise, one of which is in the small deposit in the hanging.

SECOND LEVEL.

From the East end of the hanging wall drift, in the extreme Southeast end of the mine, a connection was made with the Negaunee Mine Tenth Level drift to provide a traveling road. When this was completed the old foot wall drift traveling road was abandoned.

The hanging haulage drift in the East end was retimbered early in the year immediately following the fire which occurred there in January. Repairs were made between #59 and #67 raises.

No. 75 raise which was started in 1921 was continued to the 550' sub level. At this point an off set raise to the East was started and pushed through to the 618' sub level. The ore from the off set raise feeds directly into the regular raise. Mining will shortly start at the top of this raise.

SUBS BETWEEN SECOND AND THIRD LEVELS.

355' SUB LEVEL.

WEST END.

During the year the few pillars remaining along the foot wall were taken from #82 raise. The sub level was completed in that area during the month of March.

EAST END.

The remaining pillars in this section near the Negaunee boundary were taken from #4-G raise early in the year, and this end also completed in March.

345' SUB LEVEL.

The pillars around #106 and #108 raises were taken during the year,

completing the sub level in May.

335' SUB LEVEL.

WEST END.

This sub level was opened in 1921 when the hanging wall drift was driven 500' East from the top of the fourth level winze. During 1922 mining was completed on the hanging side of this drift, near the limit of mining, which is the 400' West coordinate line.

Four raises were put up to this sub level from the foot wall drift. The tops of these raises were connected by a drift which extends to the West along the foot wall. Six crosscuts were driven from this drift toward the hanging. The pillars between these drifts are now being mined. Mining to the West of the winze was completed during the year.

In December eight contracts mined pillars in this area between the winze on the West and the limit of mining on the East.

EAST END.

This end of the sub level was opened in 1921 when development drifts were driven and considerable mining done. During 1922 this area was completed with the exception of a few pillars between #106 and #108 raises. This territory is cut up with the old square set rooms which run North and South from the foot wall drift to the hanging, making difficult mining.

In December four contracts were engaged in taking pillars between #106 and #108 raises.

325' SUB LEVEL.

This sub was opened at #3-E raise during May and development drifts were driven to the South from this raise, also from #2-E raise. Mining is now in progress along the Negaunee boundary.

In December four contracts were mining in this territory, one to the Southeast of #21 raise, one to the Northwest of #2-E raise and two to the South of #3-E raise.

THIRD LEVEL.

A new main level drift was driven South on the 200' West coordinate line to connect the new foot wall drift with the old haulageway. This permitted the abandoning of the old haulageway between #82 and #93 raises which had been extremely hard to maintain on account of crushing. Wood pillars were built in this old drift to support the ground so as to prevent caving on the 335' sub level above.

The Eastern end of the foot wall drift was retimbered over a space of 300' extending to the Negaunee boundary.

Raises #1 to #4 were put up from the South side of the rock foot wall drift to the 335' sub level.

Raises #3-E and #6-E from the 245' sub level (new tramming sub level) were holed to the third level. From this tramming sub level #16 raise was put up in ore to the elevation of the third level, at a point 100' South of the old square set rooms between D and E crosscuts. Development has been started in this area. This ore was found by development drifts and stub raises from the 270' sub level in 1919.

The third level pumphouse was enlarged during the year. A detail of this work is given later under "pumphouse".

SUBS BETWEEN THIRD AND FOURTH LEVELS.

300' SUB LEVEL.

This sub level was opened in 1921 from #705 raise to the Southeast along the Negaunee Mine boundary. Mining continued here until April when it was completed.

285' SUB LEVEL.

This was opened to the Southeast of #705 raise along the Negaunee boundary in 1919. During development it was found that ore existed at a higher elevation necessitating the opening of the 300' sub level mentioned above. Development work was again taken up in 1921 and some mining done that year. During the past year the ore limits to the Northeast were established and stoping

is now in progress near #705 raise. To the South the pillars along the Negaunee boundary were mined.

At a point 50' Northeast of #705 raise a drift has just been driven 150' to the Northwest to the jasper. Ten feet back from the breast a drift is being driven at right angles to the Northeast to find the jasper in that direction. Early in December this drift had advanced 60' in ore.

During the month of December three contracts were employed on this sub level, two mining to the South and East of #705 raise, one developing to the North of this raise.

270' SUB LEVEL.

This sub level was opened prior to 1919 for exploratory purposes from #224 raise when a drift was driven due South to the American Mining Company pillar, a distance of about 550'. Lateral drifts were run to the Southeast and to the East. Raises were put up from the South drift, also from the laterals to determine the height of the hanging.

During 1921 work was in progress on this sub level in the vicinity of #425 raise and during 1922 the remaining pillars around this raise were removed, completing the mining in that area. A drift was then driven Southeast from #705 raise to the Cleveland-Cliffs strip where crosscuts were driven to the Northeast and Southwest for mining purposes. Stopping has commenced at the end of the Southeast crosscut, the ore being taken between this crosscut and the Negaunee boundary.

In December two contracts were employed in this sub level, one to the South of #705 raise in the Cleveland-Cliffs and American Mining Company strips, the other to the Northeast in the Cleveland-Cliffs strip.

255' SUB LEVEL.

This sub level was opened in May at #425 raise. The territory to the West of the raise was explored for 80' where a small bunch of ore was found surrounded by jasper. This small area has been mined. To the Northeast of the raise, a drift was driven to the supporting pillar line and stopping is now

in progress along the East mining limit South of this line.

In December one contract was mining North of #425 raise in mining area #3.

245' SUB LEVEL (TRAMMING SUB LEVEL).

In the foot wall drift to the East, #5-E and #6-E raises were completed to the elevation of the third level.

In #1 crosscut to the Southwest #16 raise was put up to the elevation of the third level. This is a two compartment raise and will be used for transferring ore to this tramming sub level.

No. 2 crosscut was stopped in jasper in 1921. In November of this year it was continued and after drifting 30' in jasper the breast is again in ore. The drift will be continued to the Southwest.

No. 27 raise was put up to the 325' sub level from this crosscut.

In December the only work on this sub level was in #2 crosscut, which penetrated the jasper and is now continuing to the Southwest in ore.

240' SUB LEVEL.

A connection was made from #425 raise North to the main traveling road in #2 supporting pillar. This provides another traveling road to the 260' sub level other than through #425 raise.

230' SUB LEVEL.

The remaining pillars here were taken through #502 raise and the mining completed in April. This was in the Southwest end of the mine in the Bessemer area near the Negaunee boundary.

215' SUB LEVEL.

This sub is also in the Southwest end of the mine and directly under the 230' sub level in mining area #3. Mining was started in 1920 and has been in progress since that time. During 1922 stoping continued in the Southwest and Northeast ends.

To the Southwest the jasper was reached at a point 220' to the West of #604 raise. The ore at this point is cut off to the South by a dike. An

exploratory drift was driven 20' to the South through the dike into lean formation. This was tested for a distance of 40' but no merchantable ore found. Along the North side of this mining area, a development drift was driven to the Southwest in ore for 270' from #602 raise. No jasper was found. It was then decided to establish a limit at this point and to retreat towards the raise. At present this work is in progress - more than one-half of the area to the West of #602 and #604 raises having been stoped.

On the Northeast side the ore has been stoped back to a line within 30' of #600 and #604 raises. This sub level should be completed about the middle of the present year.

In December five contracts were working on this sub level, three taking pillars around #603 raise and two in pillars to the West of #602 and #604 raises.

200' SUB LEVEL.

This was opened in 1916 and 1917. During the past year mining was conducted in the area between the South supporting pillar and the Negaunee boundary in the following places:-

To the Northeast of #610 raise, where the remaining pillars are being mined.

To the Southwest from #610 raise where a drift is being driven which will connect this raise with #608, #606 and #604. It has at present advanced as far as #606 raise.

At #604 raise a drift was driven Southwest which reached the dike 145' from the raise, and now, 30' back from the breast, a crosscut is being driven to the Northwest to hole to #603 raise. This latter raise from the fourth level was put up during the year to this elevation.

During December five contracts were employed on this sub level, one stoping to the Southwest of #604 raise, one drifting Southwest from #608 to connect with #606 and three mining pillars North and East of #610 raise.

185' SUB LEVEL.

In mining area #2 the pillars to the East and South of #406 raise