manufacturers had made several changes which were not practical. In addition the heavy parts started to show undue wear on account of poor material. The Cleveland people have endeavored to rectify the defects in their machine but their failure to stay on the job has caused more or less delay. I did not think it advisable to order more machines until we were absolutely sure just what type it was best for us to use. The rock has been quite variable, changing suddenly from hard to very soft. For this reason we have had some short sections of concrete.

Water.

There has been more or less trouble due to water coming into the shaft. This was encountered at a depth of about 150 ft. and so far we have been unable to cut it off. The volume is not great, probably not over twenty gallons per minute, but nevertheless it is sufficient to cause some delay. In November a grouting machine was borrowed from the Swanzy District and we have endeavored to shut off the water. At points where it is coming in we have drilled holes into the concrete and have forced grout in. We have succeeded in shutting it off at the point where it was coming in, but it has found other courses and is now entering the shaft higher up. We will continue on Sundays to force in grout and in time I am sure that the water will be shut off.

Blasting.

In the early part of the work we used the system of blasting employed at the Newport Mine. The fuses are cut at variable lengths and are set on fire by black powder. A small amount of black powder is placed in the bottom of tin cans around the sides of which a number of holes have been punched. The ends of the fuses are placed through the holes in these tin cans. In each can two electric squibs are placed in order to set off the black powder. As soon as the powder in the cans is set on fire it lights all of the fuses. As an extra precaution we use duplicate fuse from each hole. This greatly reduces the possibility of missed holes. This method of blasting worked most satisfactorily until the shaft became quite wet when it was necessary to abandon it. The great advantage of blasting with fuse is that they can be cut so that each hole will

go in its proper order. It also greatly reduces the chance of damage to forms or sets.

After stopping the use of the fuse we commenced to blast with delay action fuses. These fuses have been on the market for several years. From the very start we had more or less trouble with them and it was not unusual to have many missed holes. The powder company seemed to be unable to straighten us out. Considerable experimenting was conducted on the surface and we have finally solved the problem for ourselves. Commencing with the first of December we have had great satisfaction in the use of these fuses and it is now a rarity to get any missed holes. Our round consists as a rule of about forty holes. It was found that by connecting these in series, using a No. 12 lead wire, 220 volt alternating current, that there was not a sufficient amperage to each exploder. For this reason we divided the shaft in half, making two parallel series circuits. On the surface we cut in 20 ft. of No. 20 Nicrome resistance wire. This is sufficient to prevent the blowing of fuses. It has been proven that these exploders can be very easily damaged. It is necessary, in putting them into the powder, to use particular precautions not to bend or force them into the hole. We make an extra large hole through the top of the powder so that the exploder will easily slip in. The paper is then gathered together and tied around the wires with a piece of string. The ends of the connecting wire are polished brightly by the use of a piece of emery paper. This has been found to be very important. It has been demonstrated that it was not practical to tamp on top of the exploder. The stick in which the exploder is contained is placed into the hole on top of the powder. This is not tamped but the balance of the hole is filled with dry sand. The connecting is always done by one man, all others being required to stay on the cage during this work. The connecting wires are very small and if a number of men are walking around the bottom of the shaft they are liable to break the connections by catching them in their feet. Since using these precautions we have had excellent results from blasting. The only instructions issued with these exploders is that they must not be used in connection with the ordinary instantaneous electric exploder.

On one occasion the man making up powder used by mistake a number of the ordinary exploders. This was not discovered until part of the holes had been charged. It has been demonstrated that these instantaneous electric exploders can be used with perfect satisfaction with delay action fuses. They have been used in our shaft for over a month and not a single missed hole has occurred.

CAPTAINS.

On the 1st of November Capt. Jos. Thomas, who had previously been employed at the Maas Mine, replaced W. J. Phillips; the latter going on as a shift boss. Since that time the work has been better organized, showing improvement in the progress and cost.

FATAL ACCIDENT.

On August 14th, at 12:40 p. m., Oscar Larson was killed in the shaft in a most peculiar manner. The miners were engaged in drilling. Battista Titta got on the cage in order to go to the surface for a hose. Before getting on the cage he went to Larson, who was drilling, and got a monkey wrench from him. The cage was rung up by Alfred Haddy. It is customary when the cage is being hoisted for each miner to hold his hose out of the line of the same. The men had been cautioned time and time again to do this, for the reason that we did not want the hoses damaged by coming in contact with the cage. It was never thought that there was any possible chance of a fatality occurring from this cause. It is usual when the cage is rung up for the men to watch it until it passes the point where it could interfere with their hoses. It appears that all of the miners with the exception of Larson were doing this. Haddy heard somebody scream and immediately pulled the signal rope. The cage stopped and almost instantly Larson fell to the bottom of the shaft. A few seconds later the drill machine came down. The conclusion drawn from cross-examining the other four men was that Larson must have been standing with his back to the cage straddling the hose. It is my opinion that when the cage caught the hose that Larson was turned over, his head probably striking the rock and knocking him partly unconscious. He continued to hold on to the cross bar of the machine until the cage reached a point about

25 ft. up in the shaft. At the instant the cage was stopped he probably lost consciousness and fell. The miraculous part of this accident is that Larson could have been pulled up the shaft without being noticed by the remainder of the men. After this accident it could easily be seen that its recurrence could be prevented. It was never dreamed that a fatality could happen in this way and therefore no special precautions were taken. The captain and the men have been given positive instructions that in the future no hoses will be allowed to stretch across the shaft, but that they must be accumulated near the bottom and tied to a plug in the vertical wall. This accident is greatly regretted. In the Athens shaft we have taken unusual precautions to safeguard the men and many of those who have inspected the equipment have declared that it is the safest they have ever seen.

WAGES.

Up to Oct. 1st the miners in the shaft were paid $3.00 for an eight hour shift, the bosses receiving 25 cents additional. On Oct. 1st there was a reduction of 10 per cent. In a wet place $2.70 is small pay on account of the heavy expense in buying oil clothes. On Nov. 1st a bonus system of wages started. The rate for 56 ft. per month, or average daily progress of 2' 3", is $2.70 for miners. Between 56 and 60 ft. there is an increase of 2 cents per foot per day. Between 61 and 65 ft. the increase is 3 cents; 66 - 70 ft. 4 cents; 71 - 75 ft., 5 cents; 76 - 80 ft., 6 cents; 81 - 85 ft., 7 cents. The rate for 60 ft. would be $2.78; 65 ft., $2.93; 70 ft., $3.13; 75 ft., $3.38; 80 ft., $3.68; and 85 ft., $4.03.

PROGRESS.

The following statement shows the amount sunk and concreted each month:

Month	Sunk	Concreted
June,	18' 6"	
July,	41'	
August,	21'	85'
September,	40'	25'
October,	45'	40'
November,	50'	20'
December,	45'	60'
Total,	260' 6"	230'

	Sunk	Concreted
Shaft Completed 1914,	260' 6"	230'
Rock Shaft Completed 1913,	16' 6"	12'
Sand " " 1913,	43' 6"	43' 6"
Original Surface to Collar,	7' 0"	7' 0"
Total Depth from Collar, Dec. 31,1914,	327' 6"	292' 6"

CONSTRUCTION COST STATEMENT.

The following statement shows the cost per foot for sinking in sand and also rock. In the rock section the statement shows the cost per foot for December and accumulated cost to date. For a considerable part of the shaft the ground was of such a nature that it had to be continually trimmed. For this reason the average thickness of the walls is too great. During December this was brought down and naturally decreased the cost per foot for concreting. On account of the large amount of stripping which it has been necessary to do the cost per yard for concreting has been high. The cost for concreting will be still further reduced by making certain changes in the forms which will enable us to shift them more rapidly. In time the water will be cut off. This will greatly decrease the high cost for compressed air. If an attempt is made to check these figures with the statement furnished from Ishpeming it will be found impossible, for the reason that a large part of the cost has been pro rated in this statement. Such work, for example, as "Temporary Surface Structures and Equipment" will apply for the entire depth of the shaft. For this reason the divisor is the total amount to be sunk in rock, or 2016' 6". The same line of reasoning has been used in the other accounts.

CONSTRUCTION COST STATEMENT.

Collar to Ledge - 50' 6"	MONTH OF DECEMBER, 1914 Amount	Per Ft.	TOTAL TO DATE Amount	Per Ft.
Sinking in Sand - 43' 6",			$2,183.58	$ 50.19
Temporary Surf. Structures & Equip't,			20.52	.41
Steel Shaft Frames,			1,148.13	22.73
Concreting - 50' 6",			1,339.24	25.51
Steel Forms,			45.50	.90
Compressed Air,			52.50	1.00
Total, (Forwarded)			$4,789.47	$100.73

	MONTH OF DECEMBER, 1914		TOTAL TO DATE	
Collar to Ledge - 50' 6"	Amount	Per Ft.	Amount	Per Ft.
Total, (Forwarded)			$4,789.47	$100.73
Sinking in Rock - 2016' 6"				
Sinking in Rock - Mo. 45', To Date, 277',	$2,259.93	$50.22	$15,585.55	$56.26
Temporary Surf. Structures & Equip't,	936.95	.46	7,547.10	3.74
Steel Shaft Frames,	489.06	8.15	2,127.03	8.86
Concreting - Mo. 60', To Date, 240',	1,316.19	21.93	6,208.96	25.87
Steel Forms,			2,072.88	1.02
Compressed Air,	630.35	14.01	4,362.39	15.75
Total,	$5,632.48	$94.77	$37,903.91	$111.50
Grand Total,	$5,632.48	$94.77	$42,693.38	

Sand Shaft

No. of Yards Constructed,	133.8
Average Thickness,	15"
No. of Yards Per Foot,	254
" " Bags Cement,	891
" " " " per Yard,	6.6
Cost Per Yard for Concrete,	$9.85
Vertical Feet Constructed,	50' 6"

Rock Shaft

No. of Yards Constructed,	156	885.5
Average Thickness,	14.4"	19.9"
No. of Yards Per Foot,	2.6	3.69
" " Bags Cement,	937	5485
" " " " per Yard,	6	6.19
Cost Per Yard for Concrete,	$8.43	$7.01
Vertical Feet Constructed,	60'	240'

CONCLUSION.

During the latter part of the year there was considerable improvement in the progress. The work has been better organized and I feel that during the coming year we will make a creditable showing. It is our intention to balance the force so that a complete round of operation can be obtained each twenty-four hours. The entire round should be drilled and blasted in eight hours. There should be a sufficient number of men on the two remaining shifts to muck this material in sixteen hours. During November and December the work has been conducted on these lines. The miners have been placed on a bonus system of wages and I feel confident that we are bound to obtain good results. The shifting of forms has been slow and we have made several changes in the latter part of the

year which will increase the speed. We intend to make other changes which will minimize the time lost in shifting forms. This work is naturally slow due to the fact that these improvements have to be made on Sundays.

SOUTH JACKSON AND CRUSHER

CRUSHER.

In the latter part of April a small force from the Mechanical Department commenced to install the new electric equipment. This work was continued during May. On June 18th the crusher was started to handle principally ore from the Chase Mine. No trouble was experienced with the new electric equipment. Previously with the steam plant it was necessary to have two firemen, a brakeman, engineer, and machinist. With the present equipment it is possible to operate with one brakeman and a machinist. The crusher continued to work on a single shift until the 26th of July. On that date, at about 9 o'clock at night, during a severe storm, lightning entered the small controller house on the top landing and set it on fire. The watchman immediately telephoned to the fire department which arrived on the scene in a short time. One of the firemen happened to be an electrician. He telephoned to the Maas Mine, and as soon as the current was off, cut the wires. The fire was then easily put out. The switchboard, controller, and shanty were completely destroyed. The following two days were consumed in rebuilding the small shanty and installing a new switchboard and controller. A duplicate equipment was obtained from Princeton. On the 29th the crusher was again started. Work was continued until September 2d when it was shut down. During this time we crushed 13,028 tons from the Chase Mine; 20,241 tons from the South Jackson; 10,179 tons from the Morris-Lloyd; or a total of 43,448 tons. The total cost per ton for Operating and Maintenance was $.058 for 43,448 tons. In 1913, on a total tonnage of 132,313, the cost was $.072. If the tonnage in 1914 had been increased to the amount of 1913 it would have shown more plainly the large saving which is made by the use of electricity at this plant.

SOUTH JACKSON MINE.

Word was received June 17th to commence operations in the pit and on the morning of the 18th men were put to work. Mining was continued until Aug. 14th

on which date we had shipped a total of 20,241 tons. During the season the analysis from the mine held up well. The iron, as a rule, was above the guarantee. Practically no stripping was done and we were able to mine the small amount asked for without doing any dead work to speak of. If much ore is sold during the coming year it will be necessary to do some stripping.

SOUTH JACKSON MINE

AVERAGE MINE ANALYSIS OF OUTPUT FOR YEAR-1914

GRADE	IRON	PHOS.	SILICA	MANG.
South Jackson Crushed	41.95	.082	31.12	1.91

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR-1914

	Mine			Lake Erie		
GRADE	IRON	PHOS.	MANG.	IRON	MOIST.	MANG.
South Jackson,	41.95	.082	1.91	40.96	7.12	2.14

ORE STATEMENT AND SHIPMENTS FOR YEAR-1914

	SOUTH JACKSON	TOTAL LAST YEAR
Output for Year,	20,241	1,519
Shipments,	20,241	1,519

Mine operated from June 20th to August 14th.

SOUTH JACKSON MINE.

COMPARATIVE MINING COST PER YEAR.

	1914.	1913.	INCREASE	DECREASE.
PRODUCT	20,241	1,519	18,722	
General Expense	.018	.171		.153
Maintenance	.005	.054		.049
Mining Expense	.259	.419		.160
Crushing & Sampling	.137	.035	.172	
Stripping	.004		.004	
COST OF PRODUCTION	.423	.609		.186
DEPRECIATION				
Original Purchase	.200		.200	
New Construction		.064		.064
Plant		.150		.150
TOTAL DEPRECIATION	.200	.214		.014
Miscellaneous		.011	.011	
Taxes	.058	1.201		1.143
Central Office	.018	.026		.008
Sundry Expense	.030		.030	
Fire Loss	.007		.007	
COST ON STOCKPILE	.736	2.039		1.303
Loading & Shipping	.001		.001	
Total Cost on Cars	.737	2.039		1.302
Number Days operating	42	12	30	
Number Shifts and Hours	1-10hr	1-10hr		
Average Daily Product	482	126	356	
COST OF PRODUCTION				
Labor	.252			
Supplies	.171			
TOTAL	.423	.609		.186

SOUTH JACKSON MINE.

COMPARATIVE AVERAGE WAGES AND PRODUCT.

PRODUCT '14 20,241 Tons PRODUCT '13 1,519 "	SURFACE.		UNDERGROUND.		TOTAL.	
	1914	1913	1914	1913	1914	1913.
Avg.no.men working	2	1	26	3	28	4
Avg.wages per day	2.32	2.17	2.26	2.28	2.27	2.26
Avg.wages per mo.25 days	58.00	54.25	56.50	57.00	56.75	56.50
Avg.product per man per day	121.6	31.48	9.85	5.76	9.11	4.87
Labor Cost per ton	.019	.069	.230	.396	.249	.465
Diff. in labor cost per ton	-.050	+.048	-.166	+.159	-216	+.207

	1 9 1 4	1 9 1 3	INCREASE	DECREASE
SURFACE				
Total Number of Days	166½	48¼	118¼	
Average Rate	2.32	2.17	.15	
Amount	386.90	104.96	281.94	
UNDERGROUND				
Total Number of Days	2056-3/4	263-3/4	1,793	
Average Rate	2.26	2.28		.02
Amount	4,654.17	601.62	4052.55	
Total Days	2,223¼	312	1,911¼	
Average Rate	2.27	2.26	.01	
Total Amount	5,041.07	706.58	4,334.49	
Labor Cost per ton	.249	.465		.216
No.Shifts and hours	1-10hr	1-10hr		

NORTH JACKSON MINE.

This mine has been idle for the entire year. During the summer more or less trouble and annoyance was caused by boys breaking windows and entering buildings. A small amount of brass was stolen. In September we finally located three of these boys and they confessed before a Justice of the Peace that they had stolen brass and had sold it to a Jew. The matter was turned over to the Legal Department and I understand that steps will be taken to prosecute the junk dealer who bought the material.

LUCY MINE

This mine is idle and there is nothing of interest to report. Practically everything of value has been removed and if it were not for the fact that a watchman is necessary at the South Jackson, it would not pay to have him visit the buildings at the Lucy.

MORRIS-LLOYD MINE.

The hoist for the year 1914 at the Morris-Lloyd was as follows:

GRADE	MORRIS	LLOYD	TOTAL TONS.
Bessemer,	31,776	34,546	66,322
Non-Bessemer,	5,606	10,100	15,706
Silica,	25,174	84,943	110,117
TOTAL ORE,	62,556	129,589	192,145

PERCENTAGE OF GRADES HOISTED.

Bessemer,	51%	26%	35%
Non-Bessemer,	8%	8%	8%
Silica,	41%	66%	57%

ROCK HOISTED.

From Morris Mine proper.....	3,271
" Lloyd Mine proper.....	845
" 4th Le. Raising & Stripping Lloyd Shaft, Section 6, (Pockets & Plat, all hoisted through Morris.	35,109
" Cutting plats and drifting on 3rd level, Lloyd,.....	12,849
" Sinking Morris Mine winze to 1200 ft. level,.....	3,342
TOTAL ROCK HOIST,.....	55,416
TOTAL ORE HOIST,.....	192,145
GRAND TOTAL HOIST, Ore and Rock,.....	247,561

MORRIS SHIPMENTS FOR YEAR.

GRADE.	FROM STOCK.	FROM POCKET.	TOTAL.	BAL. IN STOCK.
Morris Bessemer,		11,565	11,565	27,246
Morris Ore,		617	617	7,902
Silica,	9,544	7,337	16,881	21,034
TOTAL,	9,544	19,519	29,063	56,182
LLOYD				
Lloyd Bessemer,	5,340	13,376	18,716	25,014
North Lake Ore,	11,496	1,560	13,056	9,338
Silica,	47,047	44,391	91,438	114,467
TOTAL,	63,883	59,327	123,210	148,819
GRAND TOTAL,	73,427	78,846	152,273	205,001

The Morris Mine ore hoist in 1914 shows an increase of 25,314 tons over that of 1913. During all of 1913 and for the first five months of 1914, this mine was being developed for ore production, so that mining was in progress only during the last seven months of the year. The output of Bessemer in 1914 increased 11,553 tons, the Morris 1,693 tons, and the Silica ore 12,068 tons. This shows that fifty percent of the increased hoist is in the Silica grade; this was due entirely to the large amount of Silica ore encountered in developing the ore body for mining.

Of the ore hoisted during 1914, 36,267 tons came from the Chase Lease, and this with the 968 tons hoisted in 1912 and the 15,345 tons hoisted in 1913, makes a total output of 52,580 tons of ore from the Chase Lease since the mine was opened, on which royalty has been paid.

The hoist of ore from the Lloyd Mine shows a decrease of 9,249 tons as compared with 1913. This decrease started in July and continued throughout the balance of the year. It was due mainly to the decreased output of Silica ore from the 2nd level shrinkage stopes, which averaged 2,868 tons per month up to July, and only 1,226 tons per month for the last six months of the year. This was caused by all the ore being drawn from the big stopes near the shaft, so that the only ore obtained during the last six months of the year came from the smaller stopes at the East end of the 2nd level. The decrease was also due in part to the decrease in the area of high grade ore on the sub levels, rendering it impossible to work as many contracts here as before; also the plan adopted in October of only mining the Silica ore encountered in development work, further decreased the product.

The Bessemer hoist decreased 7,545 tons and the North Lake 9,994 tons, while the Silica hoist increased 8,290 tons as compared with 1913. The decrease of high grade ore is due principally to the decreased areas of these grades encountered on the sub levels. Prior to adopting the plan of mining only the Silica ore encountered in the development of the high grade ore bodies, the output of this grade had been sufficiently large to increase the total output of Silica ore above that of 1913. The average hoist of Silica ore dur-

ing the first ten months of the year was 7,715 tons, and the last two months when this plan was in force, the Silica hoist only averaged 3,895 tons per month.

The cost per ton shows an increase of 27.9 cents per ton over that of 1913. The cost is increased for three reasons; first, and most important, on account of the extensive program of development work under way throughout the past year; second, to the small size of the Morris ore body and the decreasing size of the Lloyd ore bodies; third, to the decrease in output of the shrinkage stopes at the Lloyd during the last six months of the year.

MORRIS-LLOYD MINE.
ESTIMATE OF ORE IN SIGHT.
MORRIS MINE.

LOCATION.	BESSEMER	MORRIS	SILICA	TOTAL TONS.
Above 1st level,	100,000	10,000	25,000	135,000
Above 2nd level,	179,000	50,000	46,000	275,000
Probable ore below 2nd level,	47,400	31,600	15,000	94,000
TOTAL ORE,	326,400	91,600	86,000	504,000
Less 20% for rock and loss in mining,	65,280	18,320	17,200	100,800
NET TOTAL ORE,	261,120	73,280	68,800	403,200

PROBABLE
A N A L Y S I S.

Bessemer,	Iron	59.50	Phosphorous	.055	Moisture	15.00
Non-Bessemer,	"	57.55	"	.075	"	15.00
Silica,	"	52.00	"	.054	"	15.00

LLOYD MINE.

LOCATION.	BESSEMER	NO.LAKE-	SILICA	TOTAL TONS
Above 2nd level,	28,000	50,000	47,000	125,000
Probable above 3rd Level,	25,000	275,000	90,000	390,000
Probable below 3rd Level,		5,000		5,000
TOTAL ORE,	53,000	330,000	137,000	520,000
Less 20% for rock and loss in mining,	10,600	66,000	27,400	104,000
NET TOTAL ORE,	42,400	264,000	109,600	416,000

PROBABLE
A N A L Y S I S.

Bessemer,	Iron	58.00	Phosphorous	.053	Moisture	11.50
Non-Bessemer,	"	58.50	"	.085	"	11.50
Silica,	"	51.30	"	.052	"	10.00

SECTION 6 ORE BODY.

LOCATION.	BESSEMER	NON-BESS.	SILICA	TOTAL.
Developed above 4th level,	47,000	611,000	112,000	770,000
Probable above 4th level,		1,500,000		1,500,000
TOTAL ORE,	47,000	2,111,000	112,000	2,270,000

20% for rock and loss in mining already deducted.

PROBABLE
A N A L Y S I S .

Bessemer,	Iron	64.10	Phosphorous	.043	Moisture	13.42
Non-Bessemer,	"	60.80	"	.135	"	13.42
Silica, 86,000 tons,	"	54.04	"	.112	"	13.42
Silica, 36,000 tons,	"	54.28	"	.043	"	13.42

NET DEVELOPED AND PROBABLE ORE - MORRIS-LLOYD AND SECTION 6 ORE BODIES.

	BESSEMER	NON-BESSEMER	SILICA	TOTAL.
Morris ore body,	261,120	73,280	68,800	403,200
Lloyd ore body,	42,400	264,000	109,600	416,000
Section 6 ore body,	47,000	2,111,000	112,000	2,270,000
GRAND TOTAL ORE,	350,520	2,448,280	290,400	3,089,200

The estimate of ore in sight at the Morris Mine shows a reduction from the estimate of 1913 of 297,550 tons. When the 1913 estimate was made, development work had not progressed far enough to permit of establishing an accurate idea of the limits of the ore body. The work done during 1914 has made it possible to make a more accurate estimate. As it is not planned to mine any Silica ore at the Morris Mine, other than that encountered in development work, the estimate of Silica ore for 1914 is based on the amount of Silica ore which it is figured must be produced in order to mine the high grade ore. There is, without question, a very much larger tonnage of this grade, as development work above the 1st level has shown the Silica ore to have a greater width than the high grade ore. If this condition persists down to the 2nd level, it may be reasonably be expected that there is in the neighborhood of a half million tons of Silica ore. In ordinary sub level mining operations, there is no profit in mining this grade at present prices, and as most of the ore mined during 1914-15 will come from the Chase Lease, where there is an additional Royalty of 25¢ per ton, mining of all the Silica ore would entail a considerable loss.

It will be noted that in this estimate twenty percent has been deducted for rock and loss in mining. The deduction of this amount has been made standard for all the mines, and accordingly, the mines in the North Lake District have been brought in line with the rest.

The Lloyd estimate shows a decrease of 102,000 tons as compared with the estimate made in 1913. There is a decrease of over 117,000 tons in the Bessemer, an increase of 118,000 tons in the Non-Bessemer, and a decrease of 103,000 tons in the Silica ore. The Bessemer grade is decreased on account of developments during the past year, which showed that the area of ore of this grade was showing a rapid decrease as the sub levels gained in depth below the 1st level. It is possible that a larger tonnage of this grade may eventually be obtained, but it was not considered safe to make the estimate larger at this time.

There is a large increase in the estimate of non-Bessemer ore due to the opening of the 3rd level. Cross sections made of the ore body after the 3rd level was opened, showed that a much larger tonnage of this grade

could be expected between the 2nd and 3rd levels. If ore is developed between the 2nd and 3rd levels at the East end of the mine, which fact was hardly considered in this estimate, it is possible that the estimate of high grade ore may later be more than doubled.

For the first time an estimate is included for the Section 6 ore body. This estimate allows for a solid ore body between the limits of the crosscuts opened on the 4th level of the Lloyd, and a solid ore body at the East end of the ore trough just below surface, where a number of drill holes were put down. Between these two ore bodies, the only ore estimated, is a cylinder 50 ft. in diameter at each drill hole which encountered ore in this territory. This estimate is certainly conservative, and as these figures represent only the actual developed ore after twenty percent has been deducted for rock and loss in mining, I would, as a conservative estimate say that there was 1,500,000 tons of probable ore above the 4th level in the Section 6 ore body in addition to the developed ore. Even this estimate of probable ore is extremely conservative, and it is possible that three million tons may be developed here.

MORRIS MINE.

The first of the year there was thirteen contracts working at the Morris Mine, all on development work. This number was decreased to twelve in July, and in August dropped to eight. This was the time that all the contracts started mining ore, and eight contracts worked here until the last two months of the year, after that there was only room for seven contracts. It is manifestly impossible to obtain a larger product from the mine unless the working force is increased, but this is, at this time, impossible on account of the small area of the ore bodies where mining is now in progress.

Water has not interfered as much with the development work and mining operations as in 1913, although all the men employed in the mine continue to wear oil clothes. Drain pipes have been put in on every sub level, and the greater part of the water is now piped down to the 1st level. Some water comes in through the cribbing of the raises and causes trouble when loading cars, as the dirt overflows the cars before it can be stopped. The water has increased the amount of ore carried out to the shaft and down to the settling

could be expected between the 2nd and 3rd levels. If ore is developed between the 2nd and 3rd levels at the East end of the mine, which fact was hardly considered in this estimate, it is possible that the estimate of high grade ore may later be more than doubled.

For the first time an estimate is included for the Section 6 ore body. This estimate allows for a solid ore body between the limits of the crosscuts opened on the 4th level of the Lloyd, and a solid ore body at the East end of the ore trough just below surface, where a number of drill holes were put down. Between these two ore bodies, the only ore estimated, is a cylinder 50 ft. in diameter at each drill hole which encountered ore in this territory. This estimate is certainly conservative, and as these figures represent only the actual developed ore after twenty percent has been deducted for rock and loss in mining, I would, as a conservative estimate say that there was 1,500,000 tons of probable ore above the 4th level in the Section 6 ore body in addition to the developed ore. Even this estimate of probable ore is extremely conservative, and it is possible that three million tons may be developed here.

MORRIS MINE.

The first of the year there was thirteen contracts working at the Morris Mine, all on development work. This number was decreased to twelve in July, and in August dropped to eight. This was the time that all the contracts started mining ore, and eight contracts worked here until the last two months of the year, after that there was only room for seven contracts. It is manifestly impossible to obtain a larger product from the mine unless the working force is increased, but this is, at this time, impossible on account of the small area of the ore bodies where mining is now in progress.

Water has not interfered as much with the development work and mining operations as in 1913, although all the men employed in the mine continue to wear oil clothes. Drain pipes have been put in on every sub level, and the greater part of the water is now piped down to the 1st level. Some water comes in through the cribbing of the raises and causes trouble when loading cars, as the dirt overflows the cars before it can be stopped. The water has increased the amount of ore carried out to the shaft and down to the settling

basin of the main sump on the 2nd level, which has been cleaned three times during the past year, whereas in 1913 it was not necessary to clean it at all. Owing to the plugging of three drill holes at the Morris, the average water pumped in 1914 was 692 gallons per minute; in 1913 it was 799 gallons per minute. During the early months of the year there was no decrease, but after the drill holes were plugged in the summer, the water dropped down so that the average during the latter months of the year was in the neighborhood of 625 gallons per minute.

1st LEVEL.

On Jan. 1st, 1914, the breast of the 1st level drift was in 1710 ft. from the shaft, measured along the line of the drift. In January the drift advanced 58 ft. to the West; it was in hard dry jasper and slow progress was made even with two Leyner drill machines. In Feb. the drift advanced 56 ft., in March 73 ft., and the first ten days of April 31 ft. When the drift was stopped, the breast was in 1928 ft. from the shaft, and about 100 ft. beyond the limits of the ore body developed by diamond drilling on the Chase Lease. It was necessary to drive the first 168 ft. of this drift in order that raises might be put up for the mining of the Chase ore body, the last 100 ft. being driven on the chance of striking the upward extension of the ore body shown up in Nos. 4 and 96 diamond drill holes from surface.

From the standpiping done on Section 1, it was evident that there was a fault having a N.E.-S.W. strike in this territory, and it is probable that the ore shown up in holes 4 and 96 was found in the trough along this fault. From the pitch of the ore as determined from these two drill holes, it was figured that the top of the trough would practically coincide with the top of the Chase ore body. It was therefore considered that the chance of finding ore here warranted the expense of driving a drift into this territory for some distance, and then looking for the ore body by diamond drilling from the breast of the drift. It was at first planned to carry the drift in 200 ft. beyond the Chase ore body, but owing to the very hard ground encountered here, it was decided to stop the drift in April and continue it later if the results of the drilling warranted it.

A hole was started here on April 27th, and completed in July at a depth of 580 ft. It did not strike any ore body other than a narrow seam of rich material near the footwall, and was continued considerably deeper, as it was thought it might strike the fault, locating it so that future drilling could be more intelligently planned. It failed to strike the fault or footwall, and was stopped, as it was running nearly parallel with the formation, giving little definite information. No further work was done at this point during the past year, and all development work with respect to this territory will be deferred until the ore body shown up by diamond drill holes 4 and 96 is developed on the 1200 ft. level of the Morris, probably some time in 1917.

This contract cut out for No. 15 raise in January, No. 16 raise in February, and numbers 17 and 18 raises in March. The first of the year No. 14 raise was being put up, and later in the month No. 15 raise was started. No. 14 raise was completed in February at an elevation of 138 ft., No. 15 was completed in May at an elevation of 200 ft., No. 16 raise was started in February and completed in May at an elevation of 200 ft., No. 17 was started in March, and holed to the 110 ft. sub level in June, the upper section of this raise, i.e., that part above the 110 ft. sub, had in the meantime been put up from the 110 ft. sub to an elevation of 200 ft. above the 2nd level. Raise No. 18 was started in April and abandoned early in May at an elevation of 25 ft. above the 1st level, as the development work done on the 110 ft. sub indicated that the ore body did not extend far enough to the West to render it necessary to put up this raise. The first of the year thirteen raises had been completed up to the hanging, in 1914, four more raises were put up, making a total of seventeen raises in ore above the 1st level. Nos. 1, 2 and 3 raises were on the Excelsior Iron Co. land, and Nos. 4 to 17 inclusive, were on the Chase Lease.

In Jan. and the early part of Feb., preparations were under way for installing motor haulage on the 1st level at the Morris. In Feb. a contract drove a drift 25 ft. to the West at a point 1300 ft. S.W. of the shaft, where the main haulage drift had turned to the North, to provide a switch or siding for the motor cars. On completing this siding, this contract was moved in near

the breast of the main drift about 1700 ft. from the shaft, and extended a crosscut 15 ft. further to the South in order to make room for a switch.

No further work was done on the main level until in June, when a contract started to develop the ore shown up by drifting in 1913, at a point 800 ft. South of the shaft; this was the ore discovered by an underground drill hole in 1913. A raise was put up, starting at a point where there was the greatest width of Bessemer ore, which showed high grade ore for the first 15 ft., and was continued above this point in Silica ore averaging from 48 to 54% iron, to an elevation of 50 ft., when work was abandoned here. It is evident that the ore shown up by the drill hole is a pocket or local enrichment; it only extends a short distance above the 1st level, and there is not sufficient high grade ore here to warrant mining operations. This ore body is independent of the main ore bodies in the mine, and it will be possible to obtain some cheap high grade Silica ore here by opening a shrinkage stope at any time in the future when ore of this grade is wanted.

The successful plugging of No. 5 and 13 drill holes encountered on the sub levels near the top of the Chase ore body, warranted driving a drift to try and locate No. 16 incline drill hole from surface, in order to plug it. In July a drift was started at a point 1200 ft. S.W. of the shaft to the South in the line of the drill hole, and work was continued here through August, September and the early part of October, when it was abandoned without finding the hole. A drift was driven in about 70 ft. to the South and a stope opened, which at one point was 20 ft. wide. Some of the ore obtained from this work was of Bessemer grade, the balance was Silica ore. In looking for the hole, the water was followed, and this lead eventually to a vug or water course where the water came up from a point below the level in sufficient quantity to more than fill a one inch pipe. It was figured that the cost of this work was nearly paid for by the ore obtained. Hole No. 16 passed into the ore body at a point either just above or just below the 1st level; it is thought that it will be found later on, and will then be plugged.

In August a contract opened out from No. 11 raise at a point 25 ft. above the 1st level, where they encountered No. 15 diamond drill hole, an incline hole from surface. A raise was put up 107 ft. on this hole, up to

the solid jasper, and 60 ft. of wooden plugs forced up into the hole, effectually blocking off the water. It is figured that this hole made more than 50 gallons of water per minute, so that as a result of the work, the mine water has been reduced 50 gallons per minute. The successful plugging of diamond drill holes No. 5, 13 and 15, has reduced the mine water over 100 gallons per minute. The pump logs show that the average water pumped in 1913 was 799 gallons per minute, in 1914 692 gallons per minute, a reduction of 107 gallons.

In October a contract started a drift at a point 1000 ft. Southwest of the shaft to the South of the main haulage drift in an effort to locate diamond drill hole No. 58, a vertical hole from surface. The drift was driven 40 ft. to the South in jasper, where Silica ore was encountered, in which the drift continued for 40 ft. The hole, from its surface location, was expected to be encountered about 60 ft. South of the haulage drift, but as the surface holes are likely to deviate, it was, of course, a chance if the drift would encounter it. The drift was driven a total distance of 80 ft. to the South, which allowed for a 40 ft. deviation either to the North or South. Considerable water was encountered in the drift between 40 and 60 ft. South, and one side cut was taken to the East in this territory. Shortage of men in the contracts working in ore, caused this work to be temporarily abandoned for the balance of the year. It is planned to continue explorations here early in the coming year in an effort to locate this hole. The above covers all the drifting and raising done on the 1st level during the year 1914.

There are two ore bodies at the Morris Mine above the 1st level, one of which is located on the Excelsior Iron Co. land, and the other on the Chase Lease. Mining has been conducted in both ore bodies during the past year, and this work will be reported under its location.

EXCELSIOR IRON CO. LAND.

During the latter part of 1913 several subs had been opened in this ore body above the 1st level, but not enough ore was found to warrant starting mining operations until the 60 ft. sub was reached the last of the year. The ore body on this sub had a length of 120 ft., with an average width of 25 ft., lying to the North of the three raises, Nos. 1, 2 and 3, which were put up in 1913 in this ore body. At the West end of the sub in December 1913, they had

followed the Silica ore up to the jasper, reaching a point about 90 ft. above the 1st level. They had then put in poles on the floor and covered them with lagging and broken down capping to form a mat here. As the ore to the East of this point was mined out and the floors lagged and the stope blasted in, it was found that the capping caved of its own accord. All the ore was removed and the stopes blasted in, after which the contract moved down and opened the 50 ft. sub 10 ft. below. The sets which they put in were immediately beneath the floor lagging of the sub above, so that no lagging was needed above the sets. One contract continued working on the 50 ft. sub during May, June, July and August. The first week of July a second contract started working here, and from that time on to the end of the year two contracts worked in this ore body. The 50 ft. sub was finished the last week of August, and the contracts moved down to open the 40 ft. sub. On the 50 ft. sub the ore body was 100 ft. in length, opposite No. 2 and 3 raises it was 60 ft. wide, and at No. 1 raise was only 25 ft. The ore body lay to the North of No. 1 raise, but at a point 10 ft. West of the raise it went 35 ft. to the South of the line of the raises into the hanging. As it was not planned to mine any Silica ore at the Morris other than that necessary for the development of the high grade ore bodies, and that encountered in the pillars mixed with high grade ore, which it was necessary to remove in order to lagg the floors, mining was not carried as far to the West as on the 50 ft. sub, the Western limits being 30 ft. East of the boundary line of the Chase Lease.

There was 1945 tons of Bessemer and 1190 tons of Silica ore mined on the 50 ft. sub. The proportion of Silica ore is large, as the high grade ore was banded with Silica, and in order to lagg the floors over the ore area, it was necessary to remove the silica ore.

The 40 ft. sub level was opened in September, and mining practically completed at the close of October. Crosscuts were driven North to the footwall and connections made to all three raises. Slicing was then started on the footwall side, the contracts falling back towards their raises. As on the 50 ft. sub, the ore did not extend to the South of No. 1 raise, but further to the West, opposite No. 2 and 3 raises, it extended 40 ft. to the South. From the 40 ft. sub there was mined about 2100 tons of Bessemer and 900 tons of Sil-

ica ore, indicating an improvement in the grade of the ore as mining operations were conducted further below the top of the ore body.

The 30 ft. sub level was opened here in November, and at the close of the year the ore had been mined back from the North back to the line of the raises. This constitutes a little more than one half of the ore body. It will only be possible to open one more sub level in this ore body, as it will be necessary to leave a 10 ft. pillar in the back of the 1st level drift until the Chase Lease ore body has been mined down to the 1st level, after which the balance of the ore on the Excelsior Iron Co. land can be mined out down to the 1st level. During 1914 there was 6257 tons of Bessemer, 417 tons of Morris and 3353 tons of Silica ore mined here, making a total of 10,027 tons of ore mined on the Excelsior Iron Co. land above the 1st level.

CHASE LEASE.

110 ft. SUB.

This sub level is located near the West end of the mine, and was opened from No. 9 raise at an elevation of 110 ft., the latter part of 1913. It was driven to the West and into the territory above the raises, in order to drain the ground before raises were put up. Drifting was continued to the West and connections made early in the year to No. 13 raise, which had reached this elevation early in 1914. Drifting was continued to the West past Nos. 14, 15, 16 and 17 raises, where jasper was encountered and the drift turned to the North following the jasper. The last 110 ft. of the drift was in high grade ore,ie., in the territory from No. 14 to 17 raises inclusive. The drift to the North followed the jasper for 50 ft., 30 ft. in high grade ore and 20 ft. in Silica ore. Near the point where the jasper was encountered, a raise was put up in order to determine the pitch of the jasper to the East. The raise went up about 25 ft., and showed that the jasper pitched at an angle of seventy degrees to the East. The results of the development work on this sub level in respect to the upward extension of the high grade ore body were very disappointing, as they indicated that the ore body did not extend much further to the West, or in other words, the jasper footwall stood at a steeper angle above this point. As raises No. 14, 15, 16 and 17 reached this elevation, crosscuts were driven to the North holing to this sub level. On completing

work here, the contract which had been doing the drifting was brought back to the line of No. 17 raise, which they continued up from the 110 ft. sub to an elevation of 200 ft. This part of No. 17 raise was completed in advance of the part from the 1st level up to this sub.

190 ft. SUB LEVEL.

Raises No. 15, 16 and 17 were all extended to an elevation of 200 ft. above the 1st level. A sub level was opened in May at an elevation of 190 ft., the back of this sub being 200 ft. above the 1st level. On account of the depth of the quicksand above the ore, it was not deemed safe to start mining operations at a higher elevation. It was decided to use No. 15 raise as a timber raise, all the ore mined here to be dumped into Nos. 16 and 17 raises. The three raises were connected by a drift on the North side; from No. 15 raise over to No. 16, the drift was in jasper, and from 16 to No. 17 raise, in Silica ore. One contract continued this drift along the North side, and one went to No. 16 raise, drifting South into the hanging, then to the West. Along the hanging as the drift advanced to the West, high grade ore was encountered at a point about 20 ft. due South of No. 17 raise. The North drift on the footwall side was continued with Silica in the breast until it struck jasper, then turned to the South and connected with the drift along the hanging. These two contracts then sliced out the ore pillar between their drifts. It was found as the work progressed that this sub had been opened at the top of the high grade ore body. There was a distinct line of break between the high grade ore and the Silica ore, this break coming almost in the back of the drift on the sub level.

During the development work here, No. 5, a vertical hole from surface, and No. 13 an incline hole, were found. About fifty gallons of water per minute was coming in through No. 5 hole, and twenty gallons through No. 13; both holes were plugged, cutting off at least 80% of this water. Mining was completed here in July, and after lagging the floors, capping was broken down to form a mat until all the open space on this sub had been filled. The area of the ore on the 190 ft. sub level was 30 x 40 ft.

The 180 ft. sub was opened the last week of July, 10 ft. below the 190 ft. sub, and mining was completed here the last week of August. The area

of the ore on this sub was 40 x 50 ft. It had made a slight gain to the East, the West side of the ore being vertically below that on the 190 ft. sub level.

The last of August the 170 ft. sub was opened and mining completed on this sub the last of September. This sub also had an area of 40 x 50 ft. While one of the contracts was finishing up the mining of the small pillar remaining here, the other contract went up to the 190 ft. sub through the timber raise and broke more capping, again filling the open space above the ore body.

The 160 ft. sub level was opened in October, and mining was completed here the last of the month. The area of the ore here was also about 40 x 50 ft., the same as on the two subs above. On the 180 ft. sub the timber was dropped down from the 190 ft. sub. On both the 160 and 170 ft. subs connections were made to the timber raise, and the timber was only hoisted to the elevation of the sub levels. On the 160 ft. sub there was a good size jasper horse found near the center of the ore body. All the good ore was removed around the jasper, and the jasper pillars was not mined.

It was decided to open the next sub 15 ft. down instead of 10 ft., this leaving an ore pillar about 5 ft. thick in the back of the 145 ft. sub. By dropping down 15 ft. instead of 10, would permit of again getting in floor lagging over the entire ore area, this being based on the assumption that the jasper did not extend down to the next sub level. The 145 ft. sub was opened in November, and mining was in progress here at the close of the year. For the first time since mining started here, the ore was found to have a larger area. In driving the drift along the hanging, the ore was found to extend to the North and West beyond the jasper which had formed the West boundary on the upper sub levels. The footwall drift also continued in ore into this territory, the jasper being encountered at a point about 30 ft. further West than on the sub above. The ore was followed up above this sub for 20 ft., when it was cut off by jasper. At the close of the year mining at the West end had just been completed, and the contracts were falling back to the East mining out the ore pillar between the foot and hanging wall drifts.

As subs were opened below the 190 ft., the high grade ore gradually gained to the East. On the 160 ft. sub, No. 17 raise was in the center of the ore body, No. 16 being in high grade Silica ore. On the 145 ft. sub both

No. 16 and 17 raises were in high grade ore, No. 15 the timber raise being in Silica ore. The area of the 145 ft. sub was about 100 x 35 ft., which corresponds more closely with the high grade ore areas opened on other subs at lower elevations under the hanging.

From these subs at the top of the ore body on the Chase Lease, 3904 tons of Bessemer, 367 tons of Morris and 4748 tons of Silica ore, making a total of 9,019 tons, were mined during the past year. These figures show that slightly over half of the ore obtained here was of Silica grade. Part of this Silica ore came from the development drifts necessary to drive from the raises to reach the high grade ore bodies, the balance coming from that part of the ore body which was not high grade enough to be classed as Bessemer ore.

60 ft. SUB LEVEL.

In order to keep the product of the Morris up to 250 tons per day, on double shift, it was necessary to provide working places for some of the contracts as they finished development work in the ore body between the 1st and 2nd levels. The small size of the high grade ore body above the 1st level rendered it impossible to work more than two contracts on the Excelsior Iron Company land and two at the top of the ore body on the Chase Lease. It was therefore decided to open another sub level in the Chase Lease ore body under the hanging. In April two contracts started opening out at an elevation of 60 ft. from Nos. 8 and 9 raises. A connection was made to No. 10 raise and also to No. 7 raise. Drifts were driven along the footwall and the hanging, outlining the ore. The pillars between the raises were then subdivided by crosscuts through the centers, after which they were blasted down and shoveled directly into the raises. The high grade ore body at this elevation was mined out for a length of 100 ft., its width averaging about 40 ft. Some trouble was experienced when the sub level was first opened on account of a cave which crushed the drift along the footwall. This cave occurred North of Nos. 8 and 9 raises, extending all the way up to the 110 ft. sub 50 ft. above. As mining was completed, the floors were covered with poles and then lagged and the timber blasted in. As this was done, the cave was found to extend across from the footwall to the hanging, the ground having

broken all the way up to the 110 ft. sub level. This made a block of filling 40 ft. thick above this sub, and it has not been necessary to break any additional mat. Two contracts finished mining the ore on this sub the last of July, and then opened the 50 ft. sub 10 ft. below, mining being completed on this sub the last of October. The ore on the 50 ft. sub extended East to No. 6 raise, having gained about 20 ft. to the East.

A single drift was driven over to No. 10 raise to provide an outlet for the men in case the ground should cave and crush any of the raises within the ore body. The area mined on the 50 ft. sub was 110 ft. in length by 40 ft. in width.

In October the 40 ft. sub level was opened and mining was practically completed here at the close of the year. The ore body on this sub level on the footwall side of the raises, was found to extend a little to the East of No. 6 raise. The area of this sub level was 120 x 45 ft. Each of the two sub levels opened here below the top sub, have been opened directly beneath the floor lagging of the sub above. There is now a fair thickness of timber mat here, but owing to the large amount of broken ground above the subs, there is not yet sufficient timber to prevent crushing on these subs. It will be necessary to continue mining by 10 ft. stages here for some distance down before the timber mat is great enough to permit of dropping down 15 ft., which would give five feet of ore to be caved from the back.

From the 60, 50 and 40 ft. subs on the Chase Lease, there was mined during 1914, 7097 tons of Bessemer and 4100 tons of Silica ore, making a total of 11,197 tons. The greater amount of the Silica ore mined here was obtained on the 60 ft. sub, where it was necessary to cut the ore off below the hanging and to mine some Silica ore. On each succeeding sub the ore goes further to the East, and more territory is cut off under the hanging; the balance of the silicious ore came from this territory.

80 ft. SUB LEVEL.

In order to prevent a large open space forming above this ore body in advance of mining operations further to the West at higher elevations, it was decided to stop operations on the completion of the 40 ft. sub, and in the meantime open a sub further to the West at an elevation of 80 ft. This sub

is almost exactly half way between the sub levels at the West end of the ore body, and the sub levels which were opened 60 ft. above the 1st level. The area to be cut beneath the hanging extended from No. 10 raise over to No. 12 raise, connections also being made to No. 13 raise for a traveling road. A contract started working here early in December, opening out from No. 11 raise, from which they drove a drift to No. 10 raise 35 ft. to the East, and to Nos. 12 and 13 raises 35 and 70 ft. to the West. At the close of the year two contracts were working here, one of which had come from the 40 ft. sub level. Near No. 10 raise the drift holed to the caved ground above the 60 ft. sub level. A crosscut is now being driven parallel to this caved ground, in order that the 80 ft. sub might make connections with the cave beyond.

The other contract here was crosscutting from No. 12 raise South to the hanging. It is planned to fill this sub under the hanging entirely full of lagging, as this will make a timber mat more quickly. It is expected that the ground here will cave through to the 110 ft. sub the same as was the case further to the East, where the distance between was greater than it is here. Several subs will be mined in this territory, when it may be necessary to stop mining operations until the subs at the extreme West end of the ore body have reached a corresponding elevation.

2nd LEVEL.

During 1914 there has been no drifting done on this level. One raise had been put through to the 1st level in 1913 on the Excelsior Iron Co. land 35 ft. East of the Chase boundary line. One other raise had been started to the West of this raise on the Excelsior Iron Co. land, and one further to the West on the Chase Lease, but work had to be temporarily abandoned here on account of water in the raises. In 1914 these two raises were put through to the 1st level, and also one raise was put through further to the East in the same ore body. At the end of 1914 there were four raises from the 2nd to the 1st level, all located in the Excelsior Iron Co. ore body, which however, between the 1st and 2nd levels is carried on its pitch over the boundary line of the Chase Lease; on the 2nd level about ten percent of this ore body is found on the Chase Lease. During the summer two other raises were started on the Chase Lease further to the West, the first 35 ft., and the 2nd 105 ft.

West of the boundary line. These two raises were started in jasper, but the work was only continued here for a short time, as it was decided to defer work here until this territory had been more thoroughly developed on the 100 ft. sub half way between the 1st and 2nd levels. One other raise was started in No. 1 crosscut on the Excelsior Iron Co. land in high grade Silica ore. This raise, however, struck jasper at a height of 20 ft. above the 2nd level, and work was abandoned here.

At a point approximately 2000 ft. West of the shaft, a raise was started the latter part of 1913 to prove up the ore body known to be in this territory. This raise the 1st of the year was up 45 ft. above the 2nd level; it was continued to a height of 100 ft., where a sub level was opened, and the raise was then continued up to the 1st level. From the 2nd level to the 100 ft. sub, it was in low grade Silica ore; above the 100 ft. sub it passed into rock for 20 ft., back into Silica ore for 50 ft., the last 30 ft. being in Bessemer ore. Diamond drill hole No. 12 from surface was in ore from a point some distance above the 1st level practically down to the 2nd level. It was thought that this raise would go up in this Bessemer ore body, and from the sub opened at an elevation of 100 ft., it would be possible to develop and show up the extent of the ore body. From the work done on the 1st level, it was known that the main Chase ore body dipped to the South and pitched to the East, and that the ore shown in No. 12 drill hole below the 1st level, was not a downward extension of the Chase Lease ore body, but was considered as a dropper from it, which might lead at greater depth to another good sized ore body.

This raise was very disappointing, as it indicated that the dropper of ore was of small extend. Aside from being absolutely necessary for the mining of the ore here, this raise greatly improved the ventilation at the West end of the 1st level.

In order to more thoroughly test the ground, another raise was put up in No. 2 crosscut near No. 12 diamond drill hole, about 40 ft. North of the first raise. This raise was put up at an angle of seventy degrees to the East of the crosscut, and for the first 85 ft., was in Bessemer ore, and was continued in Silica ore to an elevation of 110 ft. At an elevation of 100 ft.,

a sub was opened, and the raise was stopped, although it may later be necessary to extend it to the 1st level.

Altogether, there was a total of about 1000 ft. of raising done above the 2nd level during the past year.

In the latter part of 1913 a small shrinkage stope had been opened on the Excelsior Iron Co. land in the narrow seam of high grade ore developed near the footwall from No. 1 crosscut, at a point 700 ft. S.W. of the shaft. Mining was started in this stope in December and was completed the first week of February. The ore was trammed out during January and February, which completed work at this point. There was 1430 tons of Bessemer and 1305 tons of Silica ore, a total of 2735 tons of ore obtained from this stope. The ore in this stope, which was approximately 150 ft. in length by 20 ft. in width on the 2nd level, extended at the East end only 20 ft. above the level, and at the West end 35 ft. In the center of the stope the ore went somewhat higher, the highest point being 45 ft. above the 2nd level. It was, however, much narrower near the top than on the 2nd level.

EXCELSIOR IRON CO. LAND.

100 ft. SUB LEVEL.

Work had been started on this sub level in November 1913 to outline the ore midway between the 1st and 2nd levels, with two objects in view, the most important of which was the determination of the ore area here in order to permit of making a more exact estimate of the ore in sight above the 2nd level, the other to assist in draining the ground. At the close of 1913 the footwall drift on this sub level had just passed over the boundary line of the Chase Lease; the hanging wall drift was then within 15 ft. of the boundary line.

The work done up to this time had shown that the ore body had its greatest width to the East, and gradually narrowed to the West. At the East side it was 95 ft. wide, and at the West end near the Chase boundary line it was only 50 ft. in width. The drift along the hanging passed the boundary line and struck rock after advancing 35 ft. A crosscut was then started towards the N.W. following the ore, in which rock was struck after advancing 20 ft. No further work was done along the hanging, as the limits of the ore

had been reached. The drift along the footwall was continued to the West, where jasper was encountered in the main drift at a point 50 ft. West of the Chase Lease boundary line. A crosscut was driven at this point 15 ft. S. W. following the ore, where jasper was struck and work stopped. The main footwall drift was then continued, where after passing through about 10 ft. of jasper, ore was encountered which continued for 55 ft. The character of the ore had changed, and it was now dry and hard, whereas in the ore body on the Excelsior Iron Co. land, the ore was soft and quite wet. At the point where the ore pinched out, they encountered a small dike on the right hand side of the drift, which from its location was known to be the same dike that was encountered on the North side of the 1st level ore drift. The drift was continued 55 ft. further to the West in jasper, or to a point 155 ft. West of the Excelsior Iron Co. land. From the end of this drift a vertical raise was put up to locate the bottom of the Chase ore body. This raise went up 60 ft. in jasper before striking high grade ore, showing that at this point the Chase ore body only came down 35 ft. below the 1st level. This materially decreased the expected ore area in this territory, and has proven of great value in making an estimate of the ore in sight. No further work has been done during the year at the West end of this sub level.

On completing the hanging wall drift in February, a drift was started to the East near the footwall of the ore body at a point opposite the drift to the West. This drift to the East was driven 125 ft. in Bessemer and Morris ore, about 75 ft. further East than it was expected that the ore body would extend. On completing this drift to the jasper, the contract was moved to the hanging side of the ore body and followed the hanging to the East. Here it was found that the hanging swung around to the North so that this drift was driven about North thirty degrees East, holing to the drift along the footwall at a point 35 ft. East of the crosscut. At a distance of 10 ft. from the drift along the foot, the hanging turned to the East, and it is assumed that there is 10 ft. of ore to the South of the footwall drift. No further work has been done during the year on this sub level, and no further work will be necessary here until the ore is mined out down to the 1st level.

CHASE LEASE.

100 ft. SUB LEVEL.

In July a sub was opened at this elevation from two raises at the West end of the mine, 2000 ft. S.W. of the shaft, in order to develop the ore body known to be in this territory. From the raise that was extended through to the 1st level, a crosscut was driven on this sub 50 ft. to the North of the raise, the first 10 ft. being in high grade Silica ore, the next 25 ft. in Bessemer ore, and the last 15 ft. in Silica ore. From the other raise which reached this territory, a drift was also driven to the West in Bessemer ore, which holed to this crosscut, and a drift was also driven East from this raise 25 ft., which was the end of the Bessemer ore body. Near the North end of the crosscut a drift was driven following the rock to the West and South a distance of 55 ft., when work was stopped, the breast being in jasper.

The work done here showed that the Bessemer ore body was roughly 100 ft. in length by 20 ft. in width, with Silica ore on both the foot and hanging sides. The width at this elevation corresponds very closely with the width on the 2nd level, and it is probable that the length is also nearly equal. Mining cannot be started here until the ore is removed down to the 1st level, so that it was not deemed necessary to do any further development work here.

From the work done above the 2nd level, and also from the work done in the small shrinkage stope, there was obtained 7560 tons of Bessemer, 5972 tons of Silica and 534 tons of Morris ore, a total of 14,066 tons during the past year. All work was completed here in August, some of the contracts being given work above the 1st level, the balance being discharged.

The work of sinking the Morris shaft to a depth of 1285 ft., and opening the 1000 ft. and 1200 ft. levels, was authorized in the summer. On account of safety, and also from the fact that it was thought work could be done more cheaply, it was decided to sink a winze and then raise the shaft.

In the latter part of September this work was started, a point behind the storage pocket being selected as the site of the winze. It is figured that by locating the winze here, ~~that~~ it would be possible to dump the dirt directly into the rock compartment of the storage pocket, which would eliminate

one man from the crew necessary to do the sinking. A room was cut out in rock 18 ft. East of the rock compartment of the storage pocket, and from the back end of this room a raise approximately 12 ft. square was put up 30 ft. above the 2nd level. The brow of the drift back of the storage pocket was also blasted out, as additional room was necessary in order to dump the bucket.

The winze was sunk 5 ft. in September, in October 41 ft., the total depth at the end of October being 46 ft. During the month a puffer was set up and a slide built so that the dirt could be dumped directly from the winze into the storage pocket. It was decided to use 8 x 8 in. hemlock for sets in the winze, with 2 in. hemlock back lath. The winze is 6 ft. x 9 ft.8 in. inside timber, with a 6 x 6 ft. bucket road and a 3 x 6 ft. ladder and pipe road. In November it was sunk 42 ft., and in December 61 ft., the bottom being 149 ft. below the 2nd level on Dec. 31st. It will be necessary to sink the winze to a depth of 485 ft., in order to provide for a skip pit and sump below the 1200 ft. level. Drifts will be driven from the winze to the shaft on both the 1000 ft. and 1200 ft. levels, and also at the bottom of the shaft. It will be possible to raise the shaft in sections instead of in one long raise 485 ft. in height, which will permit of hastening the work materially. It will also be possible to start drifting on the 1200 ft. level towards the ore formation, which at this depth is about 900 ft. South of the shaft. Work will be pushed as fast as possible, as the future life of the mine depends on the developments on the 1200 ft. level.

Preparations for motor haulage on the 1st level were started in January, and a crew of trackmen and electricians worked here bonding and lining up the track, putting in the trolley wires, lights and safety devices at the raises. Motor haulage was started here on Feb. 9th.

PUMPING EXPENSE.

There was so much work done under this account during the past year, that it is given a place in this report. During the latter part of 1913 there was a great deal of trouble with the discharge pipe, owing to the blowing out of gaskets. It was decided to install new gaskets from the bottom of the shaft to a point near surface; the work was started in January, but was in-

terrupted due to the breaking of the chain blocks which were used to raise the pipe. These chain blocks were repaired and work was resumed early in February, and completed the last of this month. New gaskets were put in from the bottom of the discharge line up to a point 300 ft. below surface, which completed this work.

The settling basin of the main sump had become filled with sediment in January, and the last of January and the first ten days of February it was cleaned out. Analysis showed this material to grade high enough for Silica ore, and it was dumped on the Silica pile. On account of the sediment being a semi-fluid material, some of it ran out of the storage pocket, and on completing the job of cleaning the settling basin, it was necessary to clean the sump at the bottom of the shaft. In June the settling basin had again become filled with sediment, and it was cleaned out during July, some 200 cars of mud being hoisted. At this time an examination was made of the suctions of Nos. 1 and 2 pumps, and it was found that the sediment which had settled from the mine water, was 4 ft. deep around the suctions. An air pipe was put in near one of the suctions, and while pumping was being done, air was blown down into the mud. Examination a few days later showed that the mud immediately around the suction had been pumped out, but that just back of the suction it had increased to nearly 6 ft. in depth, so that the caving of this material would completely block the suction and it was decided that this mud must be removed. In August a wooden dam was built between the suctions of No. 1 and 2 pumps, and a 10 in. pipe line put in from the settling basin, to carry the water past the suctions of No. 2 pump over to the suction of No. 1 pump. The work of cleaning around No. 2 suction was then started, and all the mud was taken out here. On completing this work, a concrete dam was built near the wooden dam, and a permanent drain pipe put in, which will enable the suctions to be easily cleaned any time in the future. The suction around No. 1 pump was then cleaned out, the water to be pumped flowing from the settling basin directly to the suction of No. 2 pump. After cleaning up around the suctions, all the sediment was cleaned out of the main sump which lies to the North of the suctions. Sediment had deposited to a point in the main sump fully 100 ft. North of the two suctions. It is thought that no further work will be necessary here for

at least two years.

In November the settling basin had again become filled with sediment, and this was cleaned out, there being between two and three hundred cars taken out ~~here~~. The mud from this cleaning only averaged 45% iron, which was too low grade to be dumped on the Silica pile, and it was dumped on the rock pile.

UNDERGROUND DRILLING.

In order to gain more knowledge of the downward extension of the Morris Mine ore body below the 2nd level, it was decided to drill a hole which would crosscut the ore body at depth below the 2nd level. It was assumed that the ore body on the Chase Lease continued on its pitch to the East, and would be found below the 2nd level to the East of the main ore body, which on the 2nd level was on the Excelsior Iron Co. land. This diamond drill hole, No. 16, was started on Jan. 12th, and finished on February 12th. It was located at a point 1060 ft. S.W. of the shaft on the South side of the main haulage drift. It was laid out to be drilled pitching 60 degrees to the North, and it was figured that it would strike the ore 100 ft. below the 2nd level, and the footwall at a depth of 200 ft. This hole started in jasper and continued in this material to a depth of 195 ft., where it encountered lean ore, with some good ore to a depth of 225 ft., then back into jasper for 15 ft., to a depth of 240 ft. From 195 to 205 ft., there was 10 ft. of lean ore averaging 50.35 iron, .050 phosphorous; from 205 to 225 ft., there was 20 ft. of ore averaging 55.90 iron, .168 phpsphorous. From its location, it was known to be the narrow seam of ore lying near the footwall. It was the same ore body that had been mined in the small shrinkage stope above the 2nd level.

A survey of the hole showed that it had flattened considerably, and there is a bare possibility that it may have passed above the ore, but it is probable that the fault which was found in the Morris shaft, and which if it continued to the S.E. on its strike, would cross this territory, ~~has~~ cut off the ore to the East. It is now assumed that the downward extension of the Morris ore body will be found further to the West, in other words, this ore body, which on the 2nd level was found almost entirely on the Excelsior Iron

Company land, will at depth on its pitch be carried over on the Chase Lease.

No further drilling was done here until the last of April, when hole No. 17 was started from the West end of the 1st level drift, this point being 2000 ft. from the shaft. This hole was started on April 27th, and completed on July 6th, being drilled North, thirty degrees West from the North side of the drift. It was planned to explore this territory in order to determine if the ore shown up in surface holes 4 and 96 continued to the East on its upward pitch. The hole was unsuccessful, as it did not encounter any ore except a narrow seam of rich material near the footwall. It passed through 10 ft. of 57% ore from a depth of 335 ft. to 345 ft., and from 345 to 380 ft., was in lean ore averaging 50% iron. The hole was stopped at a depth of 580 ft. in jasper, the last 100 ft. being drilled in the hopes that it would strike the fault which is known to pass through this territory, and in the trough of which holes No. 4 and 96 struck ore. The footwall which has a general strike of due East and West, turned more to the North in this territory. As the drill hole was drilled North thirty degrees West, it was running nearly parallel with the footwall, almost on the strike of the formation, so that it was not deemed advisable to continue it to a greater depth. For the above reason, little significance can be attached to the ore here, as it may only be a seam 2 or 3 ft. in width. The results of the drill hole were negative, and it was not considered advisable to do any more drilling, but to wait until this ore body was developed on the 1200 ft. level of the Morris, after which it might be possible that further work would be done in this territory, either on the 1st or the 2nd level.

LLOYD MINE.

The first of the year there were thirteen contracts employed at the Lloyd Mine, but later in the year it was necessary to lay off several ~~of them~~, so that during the latter months of the year there was only nine contracts engaged in mining ore. Owing to development work on the 3rd level as well as the fourth, the actual number of men employed here is larger than at any time since the mine was opened.

1st LEVEL.

There were two ore bodies at the Lloyd, the one at the East end of the mine has been termed the Southeast deposit, and the one at the West end of the mine the Southwest deposit. The Southeast deposit refers to the ore found in the trough between the slate footwall and the fault, having a SW-NE strike, while the Southwest deposit refers to a similar ore body between the slate footwall and the fault, having a SE-NW strike.

Mining was completed in the S.W. deposit above the 1st level the latter part of 1913, but was still in progress in the S.E. deposit above the 1st level at the close of the year. During January and February 1914, two contracts worked in the S.E. deposit above the 1st level. One of these finished mining all the ore on the 40 ft. sub level, the other worked on this sub level for a few weeks and then opened a sub level 25 ft. above the 1st level, on which they drifted to the South, holing early in February to the top of No. 5 shrinkage stope from the 2nd level. The open cave at the top of the S.E. ore body was downcast in the winter, and as some water came in this territory through the caved subs, considerable difficulty was experienced here on account of ice in the chutes and on the 1st level. It was decided to stop work here and resume work again in the summer after all the ice was out of the chutes.

The ore mined here was only a narrow strip lying to the East of the shrinkage stope which had been mined out above the 1st level during the previous year. This Bessemer shrinkage stope, which was brought up from the 2nd level, was carried to a point 25 ft. above the 1st level. This left 15 ft. of ore between the top of this stope and the 40 ft. sub level above, where all the ore had been mined out, also to the North of the top of the shrinkage stope there was a strip of high grade Silica ore about 6 ft. wide extending from the 1st level up to the 40 ft. sub, this being the only ore remaining here when mining was stopped in February.

An examination was made of this place in September, and it was found that the floor of the 40 ft. sub had caved down into the shrinkage stope, as also the strip of Silica ore on the North side of the stope. It was decided that it would be possible to blast down some of the 1st level floors directly

into this stope. A contract was brought here on Sept. 20th, and worked until the 1st week in November, blasting out the 1st level floors, the broken dirt falling directly into the shrinkage stope. The floor of the 1st level drift at the East end was only 15 ft. thick, and after removing the tracks and timber on the 1st level, the floor was all blasted out by drilling one set of holes. Further to the West the floor became thicker, being about 25 ft. thick to the back of the shrinkage stope. Here it was necessary to take two cuts to break the ore all the way through. The floors were removed to a point about 60 ft. West of the shrinkage stope, when it was found that the grade of the material in the floor was too low for Silica ore, and work was permanently abandoned in this part of the mine.

Ore tramming stopped on the 1st level on Feb. 7th, since which time the only tramming done on the 1st level, has been the timber which has been trammed in from the shaft to the timber slide to the subs below the 1st level in the ~~xxx of the~~ S.W. ore body.

2nd LEVEL.

Practically all of the ore mined during the past year, has been hoisted from the 2nd level, the greater portion of it coming from the sub levels in the S.W. deposit. A little mining has been done in the S.E. deposit near the East end of the 2nd level. The ore mined in the S.E. deposit, with the ore obtained from the shrinkage stopes, amounted to 27,000 tons, of which over 20,000 tons came from ore broken in the shrinkage stopes in the previous year.

S.W.DEPOSIT, (Sub Levels)

In 1913 mining had been completed on the 1st level, and several sub levels had been opened below the 1st, on four of which mining was in progress at the end of the year. At the East end of the deposit on the 1st level, the ore had gone nearly 100 ft. to the East under the hanging. This ore had been mined out above the 1st and down to the 130 ft. sub 20 ft. below the 1st level in 1913. Subs under this part of the deposit were being opened 10 ft. apart, each coming directly beneath the floor lagging of the sub above, it being necessary to follow this system in order to quickly get a timber mat here. Further to the West under that part of the deposit which extends up to the

sand, the subs were being opened 15 ft. apart, as the timber mat was sufficient here to permit of caving some ground from the back of the sub level. At the East end of the ore body work was finished on the 130 ft. sub the last of April.

The 120 ft. sub which was opened 10 ft. lower down, the latter part of 1913, was finished the last of May. To the West mining was in progress on the 138 ft. sub level. Mining was completed on the 138 ft. sub the 15th of March, and on the 125 ft. sub the 21st of July. The 110 ft. sub was opened in February over the entire deposit; at the East end it was opened directly beneath the floors of the sub above, while at the West end it was 15 ft. below the upper sub level. One gang of miners started working here in Feb., and in March there were two, in April three, this being increased to six in May and June, five worked in July and August, four in September, and one finished mining here the last three months of the year.

The ore areas on the upper subs correspond very closely with that on the 1st level, but when the 110 ft. sub was reached, it was found that the area had decreased at both the East and West ends. For the first time, it was found that jasper had come in on the fault near the hanging, materially decreasing the width of the ore at this point. At the West end of the sub in the trough between the foot and the fault, the ore had narrowed up so that at the extreme West end it was only drift wide. About 100 ft. East of the West end of the ore body there had always been a horse of jasper, but on the 110 ft. sub it was larger than it had been on the subs above. As mining was completed on this sub, the contracts dropped down to mine the subs below. The 100 ft. sub had been opened in 1913, and the ore outlined on the hanging wall side by drifts. As the contracts finished on the 110 ft. sub, they dropped down and outlined the ore on the footwall side of the 100 ft. sub, after which they started slicing out the ore back to the North from the fault. Work was started here in July, and at the end of the year two contracts were still working here, slicing out some small pillars left near the two raises. The decrease in the size of the ore body, which had first been noted on the 110 ft. sub, was even more noticeable on the 100 ft. sub. The amount of Bessemer ore obtained from this sub did not show a large decrease, but the area of Silica ore showed a decided decrease. It was also noticed here that all the ore along

the fault to the West was of Non-Bessemer grade, while on all the subs above it has been of Bessemer grade. The ore area on this sub showed approximately a twenty percent decrease from the area on the subs above. As mining was finished on the South side of this sub, the contracts dropped down and started mining on the 85 ft. sub level 15 ft. below. This sub had been opened in February, when a drift was driven on the North side of the deposit to the West end of the ore body. Mining started here in September, and at the end of the year four contracts were working here. The ore at this time had practically all been mined out back to the line of the raises. The ore area had shown a still further decrease from the area on the subs above, and the percent of non-Bessemer ore had materially increased, resulting in a decreased output of Bessemer ore. It will be several months before mining is completed on this sub level, but the number of contracts working here will soon be decreased.

The 70 ft. sub, 15 ft. below the 85 ft. sub, was originally opened in February. One contract drove a drift to the West along the North side of the deposit, opening up this sub level. At the East end the ore was found to extend under the hanging more than on the subs above, so that it was decided to mine out this section instead of waiting until the balance of the ore body had been mined out down to this elevation. One contract has worked at this point the balance of the year, where they have mined out an area 70 x 40 ft. under the hanging.

In this part of the ore body, the 60 ft. sub was opened 10 ft. below, and a drift driven North at the West side of the area which was being stoped out above the 70 ft. sub. From this drift several chutes were put up, so that this ore could be drawn off directly into sub level cars. This practically made a shrinkage stope of the area being mined under the hanging on the 70 ft. sub level. Work was completed in this stope under the hanging at the end of the year, but there is still some ore to be drawn out, after which capping will have to be broken in order to make a mat above the ore which will be mined out further to the East on the lower subs.

In addition to the stope which was opened under the hanging on the 70 ft. sub, a drift was driven 100 ft. back into the footwall, and a raise

put up at an angle of 45 degrees, which holed to the 1st level 80 ft. above. This raise provided a timber slide, and all timber used on the sub levels has been taken down through it since it was completed in August. At the end of the year the main part of the 70 ft. sub had only been developed by one drift along the footwall to the Western limits of the ore.

The 60 ft. sub was opened in August at the East end of the ore body under the hanging directly beneath the 70 ft. sub level. Drifts were driven along the hanging, where it was found that the Silica ore extended much further to the South than on the subs above. This corresponds with the conditions shown on the 2nd level, where the ore makes a big swing to the South. Work was continued on this sub throughout the balance of the year, and it has now been all opened preparatory to mining the ore under the hanging. Mining in this section will have to be carried on at 10 ft. intervals until a timber mat is made here, after which it will be opened at the same elevations as the subs further to the West, i.e., at 15 ft. intervals.

At the close of the year, two contracts were finishing mining on the 100 ft. sub level; four were mining on the 85 ft., one on the 70 ft., and one on the 60 ft. sub. During the year the ore was mined out from the 1st level down to the 100 ft. sub, this block of ground being approximately 60 ft. thick by 300 ft. long, with an average width of 80 ft.

SOUTHWEST SHRINKAGE STOPE.

This stope was opened at the close of 1913 in the pillar on the 2nd level between the S.E. and S.W. deposits. It was opened under the hanging, where the S.W. ore body reaches the 2nd level on its pitch to the East. Mining started here the 1st of the year, and the stope was completed in February. It has an area roughly 40 x 40 ft. in size, and was 30 ft. high at the East end up to the jasper, and 45 ft. at the West end. About 2000 tons of Silica ore averaging 51% iron was broken in this stope, and was hoisted during the past year. As the sub levels approach the 2nd level, they will hole to this stope, and when mining has reached this elevation, it is planned to break mat to fill this stope in order to prevent the loss of ore here.

SHRINKAGE STOPES AND SUBS-S.E. DEPOSIT.

Ore was drawn from these old stopes throughout the entire year, the largest product being obtained during the shipping season. All the ore had been mined out above the 2nd level in the stopes during 1912 and 1913. Near the East end of the mine there was an area about 120 ft. in length, where the ore was so narrow that a shrinkage stope had not been opened. A sub level had been opened here 40 ft. above the 2nd level, and a drift driven East and West on this narrow seam of ore. A contract started working here in February, cleaning out the ore on this sub at the West end, which had run in from one of the old shrinkage stopes. On completing this work they widened the drift, removing all the ore, and then stoping out the ore in the back of the drift up to the jasper. They then started underhand stoping out about 8 ft. of the floor, all the broken dirt going into the shrinkage stope. At first it was blasted directly into the stope, but as they worked to the East, it was necessary to put in a tram car and tram the dirt to the shrinkage stope.

In April a second contract was brought here, which started to drift near the East end of the 40 ft. sub to the South in the pillar just West of No. 10 contracts' old shrinkage stope. They continued to drift until they were South of the line of the stopes, and then drifted to the East past No. 10 stope, holing to No. 5 stope. They then blasted down considerable Silica ore that had been left on the footwall of this stope, which completed all mining on the 40 ft. sub level.

The contract that was mining the ore in the floor of the 40 ft. sub, finished working here in April, and moved down to open the 20 ft. sub level. They removed all the ore in the back of this sub level up to the 40 ft. sub, but did not attempt to take any ore from the floor, as it was barely drift wide here. On completing this work they drifted to the East and South of the old shrinkage stopes at the East end of the mine, where they broke down a lot of Silica ore that had been left on the footwall of the Bessemer stope at the East end of the 2nd level. They continued working here through the summer on day shift only, and completed mining all available ore in this territory in October. Some of the masses of ore which had fallen from the 1st level, were very large, and they were able to reach these masses from their drift

in the footwall and drill and blast them. All the ore broken here has gone into the shrinkage stopes, and the most of it required no tramming, as it was blasted directly into the stopes.

During the past year there was 2156 tons of Bessemer ore obtained from the Bessemer ore shrinkage stope at the East end of the mine. The latter part of the year Silica ore was obtained from this stope, and this with the Silica ore obtained from the other shrinkage stopes during the year, amounted to 24,690 tons. About 2000 tons of this, however, came from the S.W. shrinkage stope, this ore being mined in 1914. A grand total of 26,908 tons of ore was obtained from the shrinkage stopes during 1914.

The last of November a contract started drifting in Silica ore on the 2nd level at a point near the East end of the South shrinkage stopes. This drift is being driven to come in under the South side of the shrinkage stopes above the 2nd level at the East end of the mine. The drift was driven due East for 60 ft. in Silica ore, then started gaining to the right, or to the N.E., where it struck Bessemer ore, in which it was being driven at the end of the year. The Bessemer ore was only drift wide, and is undoubtedly a narrow seam near the fault line from which it is separated by a narrow seam of jasper. The seam of ore will be developed by a drift, after which the ore in the back will be stoped out up to the shrinkage stope above.

This covers the mining work of 1914 in the Lloyd ore body. To sum up the years operations, the S.E. deposit has practically all been mined out down to the floor of the 2nd level, and 60 ft. of ground removed below the 1st level in the S.W. deposit. There now remains a block of ground 90 ft. thick to mine in the S.W. deposit above the 2nd level, and a few thousand tons of ore at the East end of the 2nd level.

SINKING LLOYD SHAFT, 2nd to 4th LEVEL.

This work was started in 1913 by putting up a raise from the 4th level, which holed to the bottom of the shaft in October 1913. Stripping and timbering was then started, and at the end of the year had reached the elevation of the 3rd level, where the plat was being cut. In January 1914, they finished cutting out sufficient ground on the plat so that sinking could

be continued. At the end of the month they had stripped 30 ft. below the 3rd or 600 ft. level, and had removed the greater part of the ground for the eighty-ton storage pocket. In February they stripped 94 ft., finished the pocket and timbered to a point 115 ft. below the 600 ft. level. On March 23rd they had finished stripping to the 4th level, after which they tore out the old pocket at the bottom of the raise, and started sinking the shaft and cutting out for the storage pocket on the 4th level. At the end of the month they were down 10 ft. in the shaft, and had removed 6 ft. of ground for the pocket. Work was carried on here at a great disadvantage, as all the dirt had to be shoveled up out of the shaft and on to the plat before it could be loaded into the cars. In April they sunk 16 ft. in the shaft, and removed ground for the storage pocket to a depth of 24 ft. They also put in a bearer on the 4th level and two sets of timber beneath, after which they set up a puffer and the dirt was then hoisted and dumped from the bucket directly into the motor car. At the end of May they were down 51 ft. below the 4th level, and had finished cutting out for the storage pocket and the auxiliary pocket below it. At the end of June they were down 82 ft. below the 4th level, and also at a depth of 67 ft., had cut out a drift 8 ft. to the West of the skip roads and drifted 22 ft. to the North. This work was done so that a car could be taken off the cage here for loading material spilled from the skips. Previous experience with the North Lake ore had shown that it would be impossible to load it directly from a pocket at the bottom of the shaft into the cars. The floor of this drift was planked and a slide put in in the skip road, so that all the dirt which spilled, accumulated on the planks in the drift West of the skip road, where it could readily be shoveled directly into a car, after which it could be hoisted on the cage and dumped into the storage pocket.

In July they took one more cut at the bottom of the shaft, which carried it to a depth of 85 ft. below the 4th level, finished timbering the shaft to the bottom, and then moved up to blast out the pentice and make connections with the upper section of the shaft. This work was started on July 3rd, and was completed on July 17th, the Lloyd Mine being closed down during this period. A heavy timber pentice was put in just below the rock pentice, and the work of blasting out the rock pillar at the bottom was started.

On completing the work of removing the pentice, they started timbering the shaft. The timber at the bottom of the old Lloyd shaft was in bad condition, due to one of the skips running away and breaking several sets near the bottom. It was necessary to remove these sets and put in new ones and block them, also to finish the timbering in the shaft to make connections to the timber below the pentice. Runners were then put in, and hoisting was resumed on the 17th of July. This work was done on eight hour shifts, working continuously from July 3rd to the 17th, with as many men as it was possible to work to advantage. There was a heavy decrease in the hoist for this month, and a large increase in the costs.

3rd LEVEL.

The work of opening the 3rd level was started the last of July after the shaft was connected. At the end of this month the plat had been cut to full width for a distance of 35 ft. to the South of the shaft. Beyond this point it was decided to drive a drift South from the line of the storage pocket, and afterwards strip the East side of this drift to form the plat. It was necessary to hoist all the rock during the month of July and for a part of August, on cars on the cage to the 2nd level, where it was trammed and dumped into the storage pocket. This was necessary as it was impossible to install the 3rd level storage pocket until the shafts were connected. This storage pocket was completed the middle of August, after which the work on the 3rd level advanced more rapidly. They continued cutting the plat in Aug., first driving a drift to a point 100 ft. South, then stripping the East side to form the plat. The plat at the shaft is 45 ft. wide, and gradually grows smaller to drift width at a point 100 ft. South; the main haulage drift on the level is carried South from the storage pocket, so that the haulage road leads directly across the top of the pocket. All work done here during July and Aug., was charged to account No. 154, "Sinking and Shaft Repairs."

During the month of September the drift advanced 250 ft. to the South, reaching the point where it had been decided to turn the drift to the East. When the curve was finished, the cross cut to the S o u t h o f t h e shaft, was extended about 25 ft. further. In October the drift advanced 146 ft. the first half, and 179 ft. in the second half, making a total of 325 ft. for the month. In addition to this advance, they also cut out on

the side of the drift for No. 1 crosscut. The average advance was 15 ft. per day, or 7½ ft. per eight-hour shift. In November, with twenty three working days, the drift advanced 321 ft.

The advance of 325 ft. in October and 321 ft. in November, constitutes a record for the North Lake District. The drift is 10 ft. wide at the bottom and 9 ft. wide at the top, and averages 9 ft. in height, about 881 cu. ft. of ground being removed per foot of advance. In October 286,325 cu. ft. or 10,605 cu. yards of ground was removed. There was no mechanical aid in loading out the broken dirt in either October or November, two ton hand tram cars being used, as the tram to the shaft was less than 1000 ft. long.

Early in the month they encountered ore in theback of the drift, which gradually came down so that they had a full breast of ore after advancing 20 ft. This ore is the bottom of the Lloyd main ore body, and came in after they passed through the fault, which has a NE-SW strike. The fault dipped at an angle of forty one degrees to the N.E. The ore continued on the North side of the drift for 60 ft., when they struck a small dike, which gradually gained across the drift, cutting the ore off after they had advanced 60 ft. Behind the dike there was a narrow seam of ore about 1 ft. wide, and then jasper. The ore continued on the South side of the drift for a distance of 145 ft. The drift was continued in jasper beyond the ore for the balance of the month; at one point slate came in on the North side, this slate being the footwall of the ore body. It was not expected that ore would be encountered in the 3rd level drift, and the discovery indicated that the footwall between the 2nd and 3rd levels did not flatten as was expected from the surface drilling. The dip of the footwall between the 2nd and 3rd levels was evidently steeper than between the 1st and 2nd levels.

There was no timber put in this drift through the ore in November, as the ground seemed solid and not likely to cave. It was found, however, that after the air had been in contact with the ore for a week or ten days, that the sides slabbed off. This became so bad that it was decided the drift would have to be timbered, and this work was started the 1st of December and completed in the middle of the month, about 200 ft. of the drift being timbered. As this timber was being put in, No. 2 crosscut was turned off in the

ore, and timbered in a distance of 18 ft. on the curve. On completing this work the main drift was continued, and advanced 143 ft. the last two weeks of the month. This carried it beyond the fault at the East end of the Lloyd, which has a S.W. strike. The ground was quite soft near the fault, and a progress of 16 ft. was made here on some days. Beyond the fault the drift passed into quartzite, and slow progress was made the last week of the month. The occurance of quartzite in the slate was not expected, and if it continues for any distance, it will prove a serious hindrance to the rapid progress of the drift. Nearly 1200 lbs. of 1¼" hexagon hollow drill steel was made up into drills the last half of the month, as it required five times as many drills to drill and blast a cut as it had been necessary when the drift was in slate.

Motor haulage started on the 3rd level early in December, and the loader was used here for the balance of the year. The loader referred to, is the machine designed by Mr. McClure in 1913 to elevate the broken dirt to the motor cars. It consists of scrapers working over an inclined plate, the trammers shoveling the dirt on the plate at a point 2½ ft. above the floor of the drift. It was first used on the 4th level in July, when an advance of 311 ft. was made. It was re-designed during the past summer, and was used during December. It worked much better than before, and will doubtless prove a great help in loading the broken ground from the drift. With its aid, it is hoped to make an average advance of 300 ft. per month in the drift to the Section 6 ore body.

At the end of the year the drift was in a distance of 1140 ft. from the shaft. One hundred ft. of this distance belongs to the plat, the balance of 1040 ft. was driven from Sept. 1st to Dec. 31st. In addition to this, two crosscuts were turned off by this contract, and 200 ft. of the drift timbered through the ore. After passing through the fault at the East end of the Lloyd Mine ore body, at a point about 80 ft. from the end of the drift, the charges for drifting here, appear under Account Number 177; up to this point, or for a distance of 1060 ft., the charges appear under account No. 155, "Rock Drifting," and Account No. 156, "Breaking ore;" in other words, the drift beyond the fault is being driven on account of the Section 6 ore body, and would not be necessary for the development of the Lloyd ore body. The breast of the haulage drift on the 3rd level is now 1800 ft. from the location of No. 1

crosscut in the Section 6 ore body; it is 2100 ft. West and 100 ft. South of the location of the raise to surface on Section 6, and is 2600 ft. West of the point to which it is now planned to drive this drift.

In October a contract started driving the tail room haulage drift North of the pocket at the shaft, on the 3rd level. This drift was carried in 85 ft. North of the pocket, after which a pit was cut near the end of the drift to permit of repairs to the motor. On completing this work early in November, the contract was brought to No. 1 crosscut under the Lloyd ore body, which they continued to the South for a distance of 114 ft. from the main haulage drift. This crosscut was in slate, this being the slate which is encountered South of the West fault at the Lloyd Mine. On the West side of this crosscut they have cut out for three raises, which will later be put through to the 2nd level of the Lloyd in order to mine the West end of the ore body below the 2nd level. Cross sections show that these raises should strike ore at an elevation of 100 ft., and should continue in ore through to the 2nd level, a distance of 150 ft. On completing this work the last of the year, the contract moved to No. 2 crosscut 200 ft. further East, which they have started to drive to the South in ore. It is planned to continue No. 2 crosscut to a point at least 170 ft. South of the haulage drift.

No. 22 diamond drill hole from surface showed ore at the elevation of the 3rd level, about 170 ft. South of the haulage drift, and it is assumed that this ore body is independent of the ore body shown up on the 3rd level, which lies between the two faults. It is thought that the ore in hole No. 22 lies on the true footwall South of the two faults, and No. 2 crosscut will be continued into this territory in order to prove up this ore. From the strike of the West fault encountered in the haulage drift, it is thought that No. 2 crosscut will pass out of the ore at a point 50 ft. South of the main drift. It will then probably be in the slate for a distance of 100 ft. or more, depending on the deviation of Hole No. 22.

During the coming year raises will be put up from the two crosscuts through to the 2nd level in preparation for mining the ore here. It is probable that a third crosscut will have to be driven in order to mine the ore at the East end of the Lloyd Mine. There was a grand total of 1384 ft. of drifting done on the 3rd level since it was opened the last of July.

MORRIS-LLOYD MINE.

4th or 800 FT. LEVEL.

This level was opened by a drift from the Morris shaft in 1913, the plat cut and a drift started for the ore body on Section 6. At the close of the year this drift to Section 6 was in a distance of 1706 ft. from the shaft. In January it advanced 246 ft., in February 231 ft., in March 245 ft., in April 206 ft., the breast of this drift being 2634 ft. from the shaft at the end of April. A crosscut was turned off in April to strike the Section 6 ore body, which was shown by the cross sections to be 70 ft. South of the main drift. The contract drove the crosscut in May, where they struck ore after advancing 70 ft. They drifted 75 ft. in ore, and also cut out for a switch and timbered the ore drift. During the month of May there was 1116 tons of ore taken from this drift, which averaged 60% iron, .125 phosphorous. In June the drift was continued, rock being struck after advancing 115 ft. further in ore. This rock is the fault on the South side of the Section 6 ore body. The ore was 190 ft. wide in this crosscut, and extended from the slate footwall across to the dike or fault. About 100 ft. North of the fault, they passed through a 6 ft. dike, the strike of the dike being parallel to the fault, which has a NE-SW strike. Beyond this 6 ft. dike, the ore was of better grade, averaging over 62% iron, and for a distance of 20 ft. was of Bessemer grade. The ore here is softer than in the Lloyd ore body, and in physical characteristics resembles the ore in the Lake Mine. The complete analysis of the 190 ft. of ore in this crosscut is as follows:

Iron	62.30
Phosphorous	.122
Silica	3.47
Alumina	2.10
Manganese	.195
Calcium Oxide	1.02
Magnesium "	.31
Sulphur	.009
Loss on Ignition	3.25
Titanium	Trace.

The middle of May another contract started driving the main haulage drift again, which advanced a distance of 132 ft. for the month. When the crosscut in ore was completed about June 20th, this contract returned and continued the main drift, advancing 140 ft. for the month. In addition, they turned off the second crosscut at a point 200 ft. East of the first, and con-

tinued this 40 ft. to the South, where ore was encountered. It was decided, in view of the large tonnage of ore above this level, that it would not be advisable to drive this crosscut any further at this time.

The main drift was continued in July, advancing 301 ft. for the month. They also turned off the 3rd crosscut, which advanced 10 ft. for the month, making the total distance drifted by this contract, 311 ft. for the month. Just beyond the third crosscut they turned the drift to the North on an easy cruve, and turned back again to the East after the line of the drift had been thrown forty ft. to the North. This curve was made at a point about 2400 ft. East of the shaft, or measured by the line of the drift, 3000 ft. from the shaft. After advancing a short distance to the East in July, a curve was started to the North and the drift driven 140 ft. to the North to the site of the raise to surface. It was necessary to go back into the footwall for this raise in order to keep it in slate through to surface. The location of the raise was reached on the 20th of August, and the drift then gained to the West so as to pass on the West side of the raise, being continued 40 ft. to the North beyond the raise, in order to provide room for the motor cars to load the dirt broken in the raise. The last of the month they started cutting out for the raise, in which it was decided to leave a rock pillar in order to support the heavy weight of the material which would be in the raise by the time it reached surface 850 ft. above. The raise was completed early in September up to a height of 20 ft., after which they built a loading pocket and chute. The chute was lined with 3/8 in. plate, as also the bottom of the pocket above the rock, and the chute opening was made 3 ft. square in order that there would be no possibility of blocking it by large chunks which might be broken in the raise.

The work was started with four men on a shift; the crew of miners was then increased to five, and later to six. At the end of the month the raise was up 77 ft. above the 4th level. It was found that with six men on a shift, operating six drill machines, that it was possible to drill and blast a cut on a shift. The following shift would draw out the dirt, put in the cribbing and bar the back. The raise is being carried full size, 12 x 13 ft., this will make room for a standard cage and ladder road, the

cage road being 6 ft. x 10 ft. 10 in. inside timber, and the ladder road 3 ft. 1 in. x 10 ft. 10 in., the same as in the standard shaft. It is planned to use a regular cage here to hoist timber, men and other supplies from the 4th level up to the subs, which will later be opened from the raise. This raise is absolutely necessary for ventilation, as the ore body is over 3000 ft. from the shaft; it also provides a permanent second outlet.

In October the raise was put up 120 ft., the back being up 197.ft. at the end of the month. In November it was put up 80 ft., the back being up 276 ft. at the end of the month; in addition they also put in bearers for the cribbing at the elevation of the 3rd level, and drove a drift 19 ft. to the South of the raise. Allowing for a 3/4 percent up grade on the 3rd level drift from the Lloyd shaft, makes the distance between the 4th and 3rd levels at the site of the raise, 208 ft. In December the raise was put up 104 ft., the back being up 381 ft. at the end of the year. The ground in the raise is very dry and dusty, and it has been necessary to provide the men with respirators. Six miners on a shift, with one pufferman, constitute the crew here.

The last of July a contract started driving the third crosscut to the South, where they encountered ore after advancing 25 ft. in rock. This crosscut was continued across the ore, which proved to be 55 ft. wide at this point. Twelve feet North of the fault, the drift passed through a 6 in. dike, which may possibly be the same dike as was encountered in the first crosscut driven across the ore. The ore in this crosscut did not average quite as high in iron as in the first crosscut, and the phpsphorous was also higher. This was to be expected, however, as this crosscut was located much nearer the bottom of the trough between the slate footwall and the fault. The contract timbered the drift across the ore and cut out for a raise on the East side of the crosscut in about the center of the ore body. It had been decided to put up a raise here to the elevation of the 3rd level, and to drift North from the top of the raise to the line of the 3rd level haulage drift, then drive a section of the haulage drift to the East and North to hole to the raise to surface, and if time permitted, to continue the main haulage drift to the East. The contract started raising in Sept.,

and at the end of the month was up 101 ft. on a 66 degree incline to the North. The raise was in ore averaging 59.50 iron, .150 phosphorous. In October they raised 81 ft., the back of the raise being up 182 ft. on an incline at the end of the month. At an elevation of 134 ft. they struck a dike on the footwall side of the raise, which continued for 34 ft., after which the raise passed into ore. In November the raise continued in ore for 6 ft., making a total distance of 20 ft. that the raise was in ore on an incline above the dike, it then passed into jasper and continued in this material until it reached the elevation of the 3rd level the latter part of December. The back of the raise was 230 ft. above the 4th level on an incline, or 216 ft. vertically. At an elevation of 208 ft., they started a drift to the North, which at the end of the month was in 23 ft. in jasper. The line of the 3rd level drift is 64 ft. North of the foot of the raise, and during the coming month it is expected that they will reach the line of this drift, and start drifting to the East. They will drift 150 ft. due East, and then start to curve to the North to the raise to surface, the raise being 80 ft. North of the line of the 3rd level drift. The actual length of the 3rd level drift to the raise is 258 ft.

The crew of men which had installed the 3rd level storage pocket, on completing this work were moved down to the 4th level to install the storage pockets here. This work was done on day shift only, and was completed the last of the year. During November no work was done on the pocket, as there was a shortage of men, and this crew was used to fill vacancies in other contracts. The rock on the 4th level, as also the ore encountered in the crosscuts, has all been trammed to the Morris shaft during the year.

During 1914 there was 35,109 tons of rock trammed to the Morris shaft, all of which came from finishing the Lloyd shaft and from the drift to Section 6, also from the raise to surface. There was 3683 tons of Non-Bessemer ore obtained from the work on Section 6, which was also trammed to the Morris shaft, and which was reported as part of the Morris hoist, as Morris grade. During the past year there was a total of 1837 ft. of rock drifting done here, this being the advance of the main 4th level haulage drift to the Section 6 ore body, and the rock work done in the three cross-

cuts turned off; 381 ft. of rock raising in the raise to surface, and 76 ft. of rock raising in the raise to the 3rd level, a grand total of 2294 ft. of rock work. There was also 245 ft. of ore drifting in the two cross-cuts, and 154 ft. ore raising in the raise to the 3rd level, a total of 399 ft. of ore drifting and raising. The grand total of drifting and raising in ore and rock during the past year on the 4th level of the Lloyd Mine, is 2693 ft.

SINKING SECTION 6.

On account of the great height of the raise to surface, 850 ft., as well as from the fact that the early completion of this raise would permit of the more rapid development of the Section 6 ore body, it was decided to sink from surface to meet this raise. Preliminary work was started the last of October, the second growth being cleared away from the site of the raise. In November a four inch air line was put in from the 6 inch air line to the Cliffs Shaft Mine, a distance of 900 ft. to the North, over to the site of the raise. The material was assembled on the ground early in December, a derrick was put up and the temporary engine house built. A small hoist with a 4 ft. drum, was obtained from the Lucy Mine; the foundations were put in early in the month and the hoist set up. The ground was excavated down to ledge by a surface crew, the ledge being encountered 7 ft. below surface. Sinking in rock started on Monday December 21st, and at the end of the month the shaft was down 21 ft. in rock, a total depth of 28 ft. from surface. In a few days bearers and timbers will be put in and the work pushed as rapidly as possible; it is expected that the raise coming up from the 4th level, will hole to the shaft from surface sometime in March. At the end of the year there was 441 ft. of ground between the raise and the bottom of the shaft.

The work of the miners here is charged to Account 177, "Extraordinary Drifting," but the engineers operating the hoist is charged to account 152, "Hoisting," and the two landers to account No. 162, "Landing." Three of the seven men employed here on each shift, are charged directly to operating accounts and four to extraordinary drifting, Account No. 177, which does not appear against the cost of production.

FATAL ACCIDENT.

There was one fatal accident in the North Lake District, which occurred at the Lloyd shaft, on Feb. 12th, John Peperen, a Finn losing his life. He was one of the crew of miners engaged in stripping down and timbering the Lloyd shaft. At the time of the accident, they were working at a point about 100 ft. below the 3rd level. One man was engaged in lowering down blocking and plank used in covering over the raise in the center of the shaft, while the other four miners were at the bottom receiving and placing this material in position. They were in the act of lowering down some 9 ft. planks in a sling, and the plank had nearly reached the point where the men were standing, when Piperen was hit by a piece of plank 2½ ft. in length, causing instant death.

It will never be known where this plank came from, as the man on the 600 ft. level claims that he had not put it in the sling, nor had he knocked it into the shaft. It was thought that possibly this plank may have been left on one of the timber sets above the miners, and that the plank lowered in the sling had accidentally struck it, knocking it into the shaft.

The men working at the bottom of the shaft guard themselves from accident by standing under the timber when material is being lowered from above. Piperen's body was under the timber, but he had moved his head out to see if the material was coming, at the time he was struck. This accident was undoubtedly due to the carelessness of the men employed here, but as there is no way of determining where the plank came from, it is impossible to class the accident other than as a trade risk or unavoidable accident due to the hazard of the work.

Piperen was an old miner, having been employed in the North Lake District for three years, during which time he had worked both as a shaftman and as a miner.

ACCIDENTS TO EQUIPMENT.

The first accident of the year occurred on January 6th, at 9:30 P.M., when the South skip of the Morris shaft caught in the shaft at some

point near the 1st level, causing the hoisting rope to break, the skip falling to the bottom of the shaft. At the point where the accident happened, three runners were broken, also two dividers and the timber was broken up at the bottom of the shaft. There was no hoisting through the Morris shaft from 9:30 P.M. Jan. 6th, to 8:00 A.M. Jan. 8th; it was estimated that the product lost due to this accident amounted to 240 tons. The actual cause of the accident is unknown, but it is assumed that it was due to the severe cold weather which had caused ice to form on the runners.

On Jan. 27th, the rope on the cage hoist at the Morris was changed end for end, as it was noticed that there was a number of broken wires at a point about 300 ft. above the cage. After using this rope for forty eight hours, the number of broken wires had increased, and it was decided to put on a new rope, as it was not considered safe to use the old rope longer.

On January 17th, the cage hoist motor broke down due to the burning out of four connections on the rotor. It required thirty six hours to make repairs, but there was no product lost, as the skips continued to operate.

On Feb. 3rd and 4th there was slight accidents to the Nordberg compressor, making it necessary to shut it down for repairs. Both of these accidents were caused by excessive vibration of the machine, due to its light construction.

On Feb. 11th there was an accident to the top tram engine at the Lloyd Mine, when the Idler sheave axle bearings were pulled from the base and broken. The cause of this accident is not known, but as the weather was very cold at the time, it is possible that ore froze to the rope, causing it. No product was lost, as it was possible by extra hard work to handle all the ore on the North tram.

On Feb. 13th, at 4:00 A.M., the North skip at the Morris Mine caught in the shaft 200 ft. below surface, breaking a number of runners and several dividers. The skip tipped over into the cage road and wedged in the shaft, which prevented a much more serious accident, as the rope broke loose from the skip. One divider between the skip and cage road was pushed

out into the shaft, and it fell on top of the cage, which was badly damaged. Ir required one day to make repairs to the shaft and resume hoisting.

On Feb. 21st, at midnight on Saturday night, a crew of men started putting in new runners on the South side of the North skip road from the 1st level up towards surface. Two hundred feet of the worst worn runners were replaced here, also several runners were put in on the South skip road near the 1st level. The runners had become rounded, due to ice which formed on the shoes of the skips, which rapidly wore away the corners of the runners. Later in the summer these two skip roads were repaired from the 2nd level up to surface, new runners being put in over the greater part of the distance.

On April 29th, at 3:00 A.M., the transmission line broke at a point about a half mile West of the Cliffs Shaft Mine. The current was off from 3 A.M. to 9:20 the same morning, when repairs were completed and the current was on for forty minutes, when it again went off until 2:00 P.M. There was no work done at the Morris-Lloyd on the afternoon of the day shift, but one half shift was worked in the morning, with no ore hoisted at the Morris, and very little at the Lloyd; operations were resumed at the Lloyd Mine on night shift of the 29th. It was impossible to start working at the Morris at this time, as the water had filled the shaft up to the 2nd level, so that it was impossible to operate the skips. During the night of the 29th, both the 1000 gallon pumps on the 2nd level were operated, and the skips were used as bailers. The water was out so that hoisting could be resumed at the Morris at 11:00 A.M. April 30th. It was figured that the loss of product due to the accident to the transmission line, was 550 tons.

On June 30th, one of the castings holding the air brake on the cage hoist at the Morris, broke, and it required ten hours to repair it. There was no loss of product due to this accident.

During the early months of the year, a small surface crew was kept at the mine, principally engaged in unloading lagging and mine timber. In April other surface work was undertaken, the steam shovel being repaired during this month, on which there was two men engaged the entire month, and part of the month five men were necessary in order to do the rivetting.

New siding was put on the barn in April, also new doors were made and the building primed ready for painting. In May the drive shed which had been erected near the barn in 1913, as also the barn, were painted, which greatly improved the appearance of these buildings.

Some further planting was done in May around the laboratory and other buildings, and the surface improved, this work being continued through June and into July. The ground around the laboratory was leveled off and grass planted here; also an oval grass plat was made in the center of the driveway at the rear of the office. In addition to planting shrubbery, several hundred pines were planted in front of the dry and on the sloping ground West of the office and also in front of it. The majority of these trees lived and have made good growth during the summer. No further work was done until in the fall, when all shrubbery was mulched and tied to prevent breaking down by snow.

The largest surface job of the past year, comprised the work done on the trestles and stockpile grounds. The ground was leveled off for an extension to the Morris North stocking trestle, which was extended nine bents or 234 ft. further to the East. Plank was laid over this area, and this work was not entirely completed until early in November. Some new work was also done on the East stockpile grounds at the Lloyd Mine, where for a time it was thought that it would be necessary to erect a single track trestle paralleling the double track trestle to the East, which would permit of stocking about 40,000 tons of ore to the North of the present piles. However, sales made the latter part of the year, rendered it unnecessary to built this trestle. The ground was filled and leveled off to the North, material for the fill being obtained to the North of the East end of the stockpile ground, where there was a ridge of ground left between the stockpile grounds and the

main line of the L. S. & I. Ry. This ground was taken out by the steam shovel and loaded in three yard dump cars, and was then pulled by team to the area to be filled. This ridge was entirely removed by the steam shovel, and the ground roughly graded back to a point near the Lloyd engine house.

The temporary dry which was erected when the Lloyd Mine was opened, was located on this ground, and it was sold, torn down and removed in October. The old diamond drill shanty which had been set up in the rear of the temporary dry as a change house for the Captain and bosses, was moved over to the temporary engine house just South of the Lloyd shaft and set up here to be used as a storage house for salt.

In order to provide additional stockpile room on the East stocking grounds at the Lloyd, a strip of plank 12 ft. wide was put in the entire length of the stocking grounds on the North side of the trestle, this making the planked area on the North side of the trestle about 70 ft. wide, which would permit of side dumping along the entire length of the trestle. It was figured that with this additional stocking room, it would not be necessary to erect the single track trestle.

In order to permit of loading out the West end of the Lloyd Silica pile, which was really stocked on the Morris stockpile ground, eight bents of trestle were torn out here, and this ore was all loaded during the shipping season. The trestle was then re-erected, and will be used for stocking the Silica ore hoisted at the Morris during the winter of 1914 and 1915. The cost of this work was charged to account No. 163, Stocking Ore, and if the mines had not been consolidated, would have had to have been paid by the Lloyd Mine.

Late in the shipping season eight bents were torn down near the East end of the stockpile grounds at the Lloyd, and the Silica ore stocked here cleaned up. This trestle was re-erected early in December, and provides additional stocking room for the Lloyd Bessemer ore pile.

During the year there was 7700 ft. of fir timber used on extensions to trestles, and 127,672 ft. of 3 in. hemlock plank laid on the stockpile grounds. There was 13,000 lbs. of 40# rail used on the extensions to trestles. The total cost of material used on the stocking grounds during the past year,

was $2,626.45. It is figured that there is now sufficient stockpile grounds prepared at the Morris-Lloyd to take care of the maximum outputs, provided that all the ore in stock is cleaned up during the shipping season.

SAFETY.

An inspection of the surface equipment of the mine was made by the Mechanical Inspection Committee in 1913, and their recommendations were authorized early in 1914. The work of installing the various safety devices which they recommended was taken up in April, and was completed in the summer. The cost of this work for materials alone, amounted to nearly $400, and with the labor to about $700. It consisted of additional guards around the machinery in shops and engine houses, additional protection on the ladder ways leading to the pulley stands and ladderways to the top of shaft house, as well as additional safety guards on the top trams.

WATER SUPPLY.

The spring which furnished water for the location, as well as for the mine buildings, was not able to provide sufficient water, and it was decided to put in a small electric pump in the shop, with a storage tank, which would furnish an independent water supply for the dry and for the water cooling system of the compressors. From the new pump which was located in the shop, a 4 in. pipe line was carried through the tunnel of the dry, through the upper part of the dry to the East end, and was dropped below surface and continued underground to the tank which was located behind the laboratory, this being a wooden tank of 10,000 gallons capacity, which is set up on concrete piers about 4 ft. above surface. An electric light signal system was installed, which indicated to the compressor engineer when the tank was full, and also when it had been emptied down to a certain point. It is only necessary to operate the electric pump for a few hours on day and night shift in order to provide plenty of water for the compressor and dry house.

The spring provided sufficient water for the location, as also drinking water at the mine and laboratory until in the fall, when owing to the very dry weather, it was necessary to pump some water at the mine from the Carp River into the water system.

For the first time the location houses are nearly all occupied, and at the end of the year it was necessary to provide water for seventy four families. Since the typhoid epidemic in one of the Finnish boarding houses near the North Lake location, all water pumped into the tank both from the spring and Carp River, has been treated with calcium chloride, in the proportion of 7 lbs. per 1000 gallons.

LOCATION.

In the spring the alleys of the location were all cleaned up, and throughout the summer, the garbage was removed every week. Minor repairs were made to the Company houses after the inspection in April, but as the location is new, these repairs were slight.

GENERAL WELFARE.

Once a week passenger train service to North Lake was continued until in the fall of 1914. It did not prove to be a paying proposition, and was finally discontinued after it had been given a fair trial. A personal investigation shows that the main element against its success, was the lack of provision made by the railway Company for a shelter at the tracks. The uncertain schedule in winter rendered it virtually impossible for women and children to stand out in the weather waiting for the train.

The awarding of prizes for the best kept premises, vegetable gardens, window box gardening and vine planting in 1912 and 1913, showed better results in 1914 than before. More people endeavored to win prizes, and the appearances of the location showed a further improvement. More lawns were graded, and more walks laid out, shrubbery, flowers and trees planted, and what is of more practical value, viz., vegetable gardens, showed an increase of fifty percent over the previous year. The tenants were astonished themselves by the yields they obtained from their work, especially in potatoes. The interest is general, and next year even better results are anticipated.

MORRIS-LLOYD MINE.

COMPARATIVE MINING COST PER YEAR.

	1 9 1 4	1 9 1 3	INCREASE	DECREASE
PRODUCT	192,145	176,080	16,065	
General Expense	.070	.067	.003	
Maintenance	.157	.077	.080	
Mining Expense	1.318	1.122	.196	
COST OF PRODUCTION	1.545	1.266	.279	
Exploratory	.186	.108	.078	
DEPRECIATION				
Plant	.253	.258		.005
Equipment	.008	.006	.002	
New Construction	.001		.001	
Total Depreciation	.262	.264		.002
Taxes	.058	.035	.023	
Central Office	.093	.063	.030	
Sundry Expense	.038	.085		.047
Ore produced in development (opening mine)		.039		.039
COST ON STOCKPILE	2.182	1.860	.322	
Loading & Shipping	.037	.042		.005
Total Cost on Cars	2.219	1.902	.317	
Number days operating	299	300		1
No.Shifts and Hours	2-8hr	2-8hr		
Avg.Daily Product	643	587	56	
COST OF PRODUCTION				
Labor	1,009	.867	.142	
Supplies	.536	.399	.137	
Total	1.545	1.266	.279	

MORRIS-LLOYD MINE.

COST DATA FOR YEARS 1914 - 1913.

	YEAR 1914.	YEAR 1913.	INCREASE	DECREASE.
Shifts and hours,	2 - 8hr.	2 - 8hr.		
Product,	192,145	176,080	16,065	
Average Daily Product,	643	587	56	
Number days operated,	299	300		1
Number days idle,	14	13	1	
Number Men, Surface,	44	36	8	
Avg. Rate Surface,	2.39	2.90		0.05
Tons per man, Surface,	13.86	15.74		1.88
Number men, Underground,	199	146	53	
Avg. Rate Underground,	2.85	2.90		0.05
Tons per man, Underground,	3.10	3.87		0.77
Total Average men,	243	182	61	
Total Average Rate,	2.77	2.82		0.05
Tons per man per day,	2.53	3.10		0.57
General Expense,	.070	.067	.003	
Maintenance,	.157	.077	.080	
Mining Expense,	1.318	1.122	.196	
Cost of Production,	1.545	1.266	.279	
Avg. Daily cost, Labor,	648.00	508.40	139.60	
" " " Supplies,	345.00	234.00	111.00	
" " " Total,	993.00	742.00	250.00	

COST OF PRODUCTION.	LABOR	PER TON.	SUPPLIES	PER TON	TOTAL	PER TON.
Year 1914,	$193,822.98	1.009	103,064.08	.536	296,887.06	1.545
" 1913,	152,596.97	.867	70,189.15	.399	222,786.12	1.266
Increase, 1914,	41,226.01	.142	32,874.93	.137	74,100.94	.279

WAGE RATES.

Increased February 1st, 1913. Decreased Oct. 1st, 1914.

LLOYD, (No. 2 Shaft) started on operating basis April 1st, 1911.

MORRIS,(No. 1 Sahft) " " " " May 1st, 1913.

Combined Cost Sheets commenced on May 1st, 1913.

ANALYSIS OF COST SHEETS, EXPLAINING INCREASE OR DECREASE IN VARIOUS ACCOUNTS BETWEEN YEARS 1914-1913.

GENERAL EXPENSE.

ENGINEERING:	Year 1914,	$1,164.95	Cost per ton	.006
(Acct. NO. 27)	Year 1913,	805.82	" " "	.005
	Increase 1914,	359.13	" " "	.001

The increase is in the labor charge, and is due to more engineering work on account of the development of the Section 6 ore body, sinking the Lloyd shaft from the 2nd to the 4th level; also to the mid-monthly surveys of the sub levels.

ANALYSIS:	Year 1914,	$3,540.34	Cost per ton	.018
(Acct. No. 28)	Year 1913,	3,428.94	" " "	.019
	Increase 1914,	111.40		---
	Decrease 1914,	------	" " "	.001

The increase in cost for 1914 is very small, but the cost per determination in 1914 shows an increase of .021. There were 21,549 determinations in 1914, costing .164 each; in 1913, 23,984 determinations costing .143 each. The decrease in the number of determinations is due to the decrease in the number of contracts working in ore at both the Morris and Lloyd mines. The increased cost per determination is due to a regular sample bucker having been employed during 1914, while in 1913, he was employed for only seven months. The cost of chemicals also increased the latter part of 1914. The increase in wages in February, also was a factor in the increased cost per determination.

DISTRICT OFFICE.	Year 1914,	$8,466.90	Cost per ton	.044
(Acct. No. 30-b)	Year 1913,	6,992.73	" " "	.040
	Increase 1914,	1,474.17	" " "	.004

The increase is due to the Morris-Lloyd Mine standing a larger proportion of cost in 1914. During 1913, "Opening Morris Mine" was charged $1,643.12.

SUMMARY OF GENERAL EXPENSE.

	LABOR	SUPPLIES	TOTAL	COST PER TON.
Year 1914,	$10,972.15	$2,588.24	$13,560.39	.070
Year 1913,	9,325.31	2,464.61	11,789.92	.067
Increase 1914,	1,646.84	123.63	1,770.47	.003

Of this increase, 87% is due to increase in District Office charge.

MAINTENANCE.

TRACKS AND YARDS.	Year 1914,	$1,206.74	Cost per ton	.006
(Acct. No. 125.)	Year 1913,	1,900.98	" " "	.011
	Decrease 1914,	694.24	" " "	.005

The decrease is due to extraordinary charges in 1913 in this account, due to ground improvement work around mine buildings. About $1,000 of the 1913 charge is for the stone wall enclosing mine buildings, gates for five entrances, etc. The 1914 charges include additional improvements to grounds, such as grading, seeding and planting of shrubbery and pines.

MAINTENANCE EXPENSE - CONT'D.

DOCKS, TRESTLES & POCKETS: (Acct. No. 126.)	Year 1914,	$3,965.60	Cost per ton	.021
	Year 1913,	223.41	" " "	.001
	Increase 1914,	3,742.19	" " "	.020

The increase is due to charging out more stockpile plank, trestle timber and supplies than in 1913, also to grading of new stockpile grounds. In 1913 all work on extensions of Morris trestles was charged to "Opening and Equipping," Morris Mine, while in 1914, 234 ft. of new trestle was erected at the Morris, and charged to this account: 127.672 ft. of stockpile plank were laid in 1914, costing $2168.92. Trestle timber, rail, etc., brings the supply charge up to $2921.38 for 1914. The labor charge of $1044.22 covers cost of erecting 234 ft. of new trestle at the Morris, laying stockpile plank and grading work done on both the Morris and Lloyd stockpile grounds.

BUILDINGS: (Acct. No. 127.)	Year 1914	$1,027.09	Cost per ton	.005
	Year 1913	401.17	" " "	.002
	Increase 1914,	625.92	" " "	.003

The increase in this account is due to three new items in 1914. The repairs to the barn, including painting of barn and drive shed, amounted to $233.22; the temporary engine house on Section 6, cost $210.70, and the alterations in warehouse $195.41.

BOILER PLANT: (Acct. No. 129)	Year 1914	$39.65	Cost per ton	.000
	Year 1913	117.02	" " "	.001
	Decrease 1914,	77.37	" " "	.001

The 1913 charge of $117.02 covers the cost of covering the hot water tank in dry house with asbestos. The 1914 charges cover the cost of minor repairs to the boiler in the heating plant.

HOISTING MACHINERY: (Acct. No. 130.)	Year 1914	$3,365.86	Cost per ton	.018
	Year 1913	832.67	" " "	.005
	Increase 1914,	2,533.19	" " "	.013

The very large increase in 1914 is due almost entirely to new equipment necessary on account of sinking the Lloyd shaft from the 2nd to the 4th levels. A new gear was put in on the Lloyd skip hoist, increasing the speed of hoist from 500 to 900 ft. per minute. New ropes were necessary on the cage and both skip hoists, and the rope on the cage counter balance was spliced. Four hundred fifty feet of 12 inch pipe was put in the shaft in lengthening the counter balance pipe. There is also a charge of $311.76 for erecting the temporary hoist and derrick on Section 6. The 1914 charges also include the cost of 1300 ft. of 1½" hoisting rope used in replacing a worn out rope on the Morris cage hoist.

COMPRESSORS & POWER DRILLS: (Acct. No. 131.)	Year 1914	$2,108.56	Cost per ton	.011
	Year 1913	1,668.78	" " "	.010
	Increase 1914,	439.78	" " "	.001

The increase in this account is due to charging out more drills in 1914. In 1913 the charge for power drills was $1,193.50, and in 1914 $1,377.84, an increase of $184.34 in 1914, also to 4 in. air line to the Section 6 shaft $168.72, also on account of increase in cost of repairs to the Nordberg Compressor.

MAINTENANCE EXPENSE - CONT'D.

PUMPING MACHINERY:	Year 1914,	$2,234.23	Cost per ton	.012
(Acct. No. 132.)	Year 1913,	2,696.10	" " "	.015
	Decrease 1914	461.87	" " "	.003

The total expenditures show a decrease for the current year. The 1914 charges cover the cost of repairing discharge line in Morris shaft, high pressure gate valves for priming 1000 gal. pumps, putting in drain pipe from 2nd to 4th level, Lloyd shaft, to carry the Lloyd mine water to the Morris sump, and the cost of inclosing the underground pump houses. A concrete dam was built to separate the suctions of the two 1000 gal. pumps, also three concrete dams were built, two on the 2nd level and one on the 1st level of the Morris, to be used to hold back the water in case of accidents to the pumps or power lines. The 1913 charges were high due to the purchase of a set of herringbone gears for one of the 1000 gal. pumps at the Morris, also four cast iron pedestals, a set of transformers, switchboard and meter for the Morris pumps. There were also charges of about $600 for cutting a ditch on the 2nd level of the Morris over to the 4th level of the Lloyd to carry the Lloyd water to the Morris sump.

TOP TRAM ENG. & CARS.	Year 1914	$748.44	Cost per ton	.004
(Acct. No. 133.)	Year 1913	635.02	" " "	.004
	Increase 1914	113.42	" " "	.000

There was a small increase in this account for the year 1914. The charges for maintenance of top tram equipment for the two years were about equal, the increase in 1914 charges being due to new equipment for the 234 ft. extension to the Morris trestle. There was 2950 ft. of 5/8 in. wire rope charged out during the year, for one new rope for the Morris tram, the other rope was lengthened by splicing.

SKIPS AND SKIP ROADS:				
(Acct. No. 134.)	Year 1914	$809.37	Cost per ton	.004
	Year 1913	211.06	" " "	.001
	Increase 1914	598.31	" " "	.003

The increase is due to more repairs to skips, and to putting in new runners in the Morris shaft skip roads from the 2nd level to surface.

U.G. TRACKS & CARS:	Year 1914	$2,135.29	Cost per ton	.011
(Acct. No. 135.)	Year 1913	2,221.74	" " "	.013
	Decrease 1914,	86.45	" " "	.002

There is a small decrease in this account for the current year. The 2nd level, Lloyd Mine, was the only hand tram level operated during 1914, while in 1913, both the 2nd and 1st levels, Lloyd, were operated. The opening of sub levels at the Morris has offset the decreased charges at the Lloyd. More sub level cars went into operation in 1914 at the Morris, and more repairs were necessary on the Lloyd sub level cars, which had been in commission for nearly two years.

ELECTRIC TRAM PLANT:				
(Acct. No. 136.)	Year 1914,	$9,141.54	Cost per ton	.048
	Year 1913,	979.15	" " "	.011
	Increase 1914,	8,162.39	" " "	.037

The large increase in 1914 is due to the development of the Section 6 ore body on the 4th level of the Lloyd, and to the opening of the 3rd level. Electric haulage went into commission on the 2nd

MAINTEANCE EXPENSE - CONT'D.

ELECTRIC TRAM PLANT:(Cont'd)
level of the Morris and the 4th level of the Lloyd on May 1st, 1913, on the 1st level of the Morris in Feb. 1914, and on the 3rd level of the Lloyd in Dec. 1914. There was 2082 ft. of drifting on the 4th level of the Lloyd during 1914, and 1240 ft. on the 3rd level, a total of 3322 ft., all of which has been equipped for electric haulage. There was also some expense incurred on the 1st level of the Morris, where track and electrical work was done in Jan. 1914. About 87% of the 1914 charge is due to the development work. The following table gives the detail of charges for 1914 and 1913.

	1914.	1913.
Locomotives,	$408.33	$117.94
Wiring,	1,610.45	3.26
Main Line Tracks,	6,355.59	1,400.35
Main Line Cars,	767.17	457.60
TOTAL,	9,141.54	1,979.15

TELEPHONES & SAFETY DEVICES: (Acct. 137.)	Year 1914,	$2,235.96	Cost per ton	.012
	Year 1913,	370.57	" " "	.002
	Increase 1914	1,865.39	" " "	.010

The increase is due largely to the purchase of additional equipment for fire fighting,rescue work and First Aid work. This comprised one lung motor, four breathing apparatus, four mouth breathing attachments, ten hot water bottles, three oxygen cylinders, potash cartridges and first aid supplies. Two overwind devices and two release attachments for the hoists were charged out in 1914, also one telephone booth for the Morris engine house. The safety devices recommended by the Mechanical Inspection Committee, were installed at a cost of about $700.

VENTILATION:

Year 1914	$826.13	Cost per ton	.004
Year 1913	------		---
Increase 1914	$826.13	" " "	.004

This is a new account opened in December 1914 for ventilating equipment only. The charge of $826.13, covers the cost of new fan and motor purchased for ventilation on the 3rd level of the Lloyd, in the drift to the Section 6 ore body. It also covers cost of 500' 10 inch pipe and some 10 inch fittings.

SUMMARY OF MAINTENANCE CHARGES.

	LABOR	SUPPLIES	TOTAL	COST PER TON.
Year 1914,	$11,538.58	18,561.68	$30,100.26	.157
Year 1913,	4,941.58	8,550.12	13,491.70	.077
Increase 1914,	6,597.00	10,011.56	16,608.56	.080

Practically all the increase with one exception, is due to purchase of new equipment on account of sinking the Lloyd shaft, opening new levels and drifts to Section 6 ore body. The exception is account No. 137, "Telephones and Safety Devices," where the increase is due mainly to new equipment for fire fighting and rescue work.

MINING EXPENSE.

AIR PIPES: (Acct. No. 150.)	Year 1914	$3,611.40	Cost per ton	.019
	Year 1913	2,351.97	" " "	.013
	Increase 1914,	1,259.43	" " "	.006

The large increase in this account is due to the 6 inch air line put in the Lloyd shaft from the 4th to the 3rd levels, also 800 ft. of 6 in. air line on the 3rd level of the Lloyd, On account of the Section 6 ore body being 4000 ft. away, it was necessary to put in a 6 in. air line here. There was also considerable 1 inch pipe used on the new sub levels opened at the Morris. There was also 1470' of air hose costing $461.01 charged out. On the 4th level of the Lloyd, the 4 inch air line was extended nearly 2000 ft. during 1914.

COMPRESSORS: (Acct. No. 151.)	Year 1914	$14,720.95	Cost per ton	.079
	Year 1913	9,183.88	" " "	.052
	Increase 1914	5,537.07	" " "	.025

There was a large increase in this account, due entirely to the development work under way during the past year. Three 8-hr. shifts were worked sinking the Lloyd shaft during the first 7 months of 1914, the extra shift being started on Dec. 7th, 1913. This increased the average air consumption 483 cu. ft. per minute in 1914, or from 1060 cu. ft. per minute in 1913 to 1543 cu. ft. in 1914. Part of the increase is due to more rock work in 1914, which increased the air consumption due to the use of larger drill machines and more hours operated.

HOISTING: (Acct. 152.)	Year 1914	$9,707.41	Cost per ton	.051
	Year 1913	7,726.47	" " "	.044
	Increase 1914,	1,980.94	" " "	.007

The increase is due primarily to the consolidation of the Morris and Lloyd mines on May 1st, 1913. For four months of 1913, the charges for hoisting at the Morris were taken up under "Opening and Equipping," Morris Mine, so that the 1913 charge covers twelve months hoisting at the Lloyd and eight months at the Morris. The 1914 charge covers twelve months hoisting at the Morris and twelve months at the Lloyd. The charge for power in 1914 is increased somewhat on account of the increased hoist, also to hoisting from greater depth due to opening the 3rd level of the Lloyd Mine.

PUMPING: (Acct. No. 153.)	Year 1914,	$15,701.49	Cost per ton	.082
	Year 1913,	12,714.94	" " "	.072
	Increase 1914,	2,986.55	" " "	.010

The increase is practically all in the supply charge, and is due to more electric power used in 1914. In April 1914 the Lloyd Mine pumps were stopped, and all the mine water was then handled by the main pumping plant on the 2nd level of the Morris. This increased the lift of the water coming from the Lloyd Mine about 450 ft., resulting in an increased consumption of electric power for the last eight months of the year. The settling basin of the Morris sump was cleaned 3 times in 1914, and the suctions and main sump was cleaned once, this work costing $1127. The actual labor charge for pumpmen in 1914 was $2899.35, in 1913 it was $3919.96, which shows a saving in labor cost of $1120. in 1914 due to handling all the water at the Morris. This saving does not apparently offset the increased cost, but in reality several other factors must be given consideration. On the Cost Sheets the Morris pumping plant was operated eight months in 1913, and twelve in 1914, the Lloyd plant 12 months in 1913 and three and two-thirds in 1914, this accounts for a portion of the increased power cost. The cleaning of the

PUMPING, (Cont'd.)
Morris sump and settling basins also increased the power cost above normal during this period, owing to the necessity of keeping the water low in the sumps, which increased the length of suction.

SINKING & SHAFT REPAIRS: (Acct. No.154.)	Year 1914,	$24,477.30	Cost per ton	.127
	Year 1913,	18,063.96	" " "	.103
	Increase 1914,	6,413.34	" " "	.024

There was a very large increase in this account in 1914, due entirely to development work. This work included sinking and timbering the Lloyd shaft from the 2nd to the 4th levels, cutting the 3rd level plat, cutting out the ground and installing the 80 - ton storage pockets on the 3rd and 4th levels. It also includes the cost of sinking winze at the Morris shaft from the 2nd or 800 ft. level to the 4th or 1200 ft. level, which work was started in Sept. The 1913 charges are for work done on sinking the Lloyd shaft from the 2nd to the 4th levels, and includes a large amount of supplies used here in 1914.

ROCK DRIFTING: (Acct. No. 155.)	Year 1914,	$14,591.42	Cost per ton	.076
	Year 1913,	3,001.45	" " "	.017
	Increase 1914,	11,589,97	" " "	.059

The large increase in 1914 was due to more drifting. The main haulage drift on the 1st level of the Morris Mine was extended 268 ft. farther to the West in very hard jasper. The raises from this drift were in very hard ground also. The main increase, however, is due to the opening of the 3rd level at the Lloyd, where 1100 ft. of rock drifting was done. In 1914 there was 1735 ft. of drifting done at a cost of $8.41 per ft., in 1913 443 ft. at a cost of $6.77 per ft. All main level drifts in 1914 were full size motor haulage drifts; the cost per foot for the years work is excellent considering the size of drifts and very hard ground encountered on the 1st level of the Morris.

BREAKING ORE: (Acct. No. 156)	Year 1914,	$79,757.74	Cost per ton	.415
	Year 1913,	73,858.54	" " "	.420
	Increase 1914,	5,899.20		---
	Decrease 1914,	--------	" " "	.005

There is an increase of $3962.30 in the labor cost, and $1936.90 in the supply cost, but owing to the increased output of 1914, there is an actual decrease of $.005 in the cost per ton. The cost per ton was .419 in Jan. 1914, it reached a maximum of .493 in April, declined to .393 in June, advanced to .471 in July, then declined, the average for Oct. Nov. and Dec. being .358. The Morris was being developed for ore production until in August, and from this time on, better results were obtained. During the first six months of the year the output from the Lloyd shrinkage stopes was large, this then declined to a small output the latter months of the year. The shrinkage stopes helped to reduce the cost during the development of the Morris for ore production, and when both mines were producing, the cost declined even in the face of a decreased product from the shrinkage stopes.

In the following table is a comparison of the contract work for 1914 and 1913:-

BREAKING ORE. (Cont'd)

	YEAR 1914	YEAR 1913.
Feet Ore Drifting,	7,725	6,912
Average Rate,	$4.96	$5.47
Feet Ore Raising,	1,548	1,371
Average Rate,	5.32	4.58
Feet Ore Stoping,	470	2,080
Average Rate,	3.76	3.51
Cars Ore Stoping,	37,782	30,992
Average Rate,	.941	.91

The rate for ore drifting in 1914 shows a decrease of $.51 per foot, this being due to better labor conditions and to more work in main ore body at the Morris, where cost is low. Rate for ore raising in 1914 shows an increase of $.74 per foot due to greater height of raises put up at the Morris, which increased the cost per foot. Rate for cars, ore stoping, shows an increase of $.03 per car in 1914, due to greater number of motor cars, whose capacity is greater. The cost per ton for 1914, if the cars could be reduced to actual tons, is considerably lower than in 1913.

The following table gives the explosives charged to Breaking Ore for both years:

	YEAR 1914	YEAR 1913
Total Cost, all explosives,	$12,510.29	$11,444.38
Lbs. powder per ton of ore,	.5893	.6444
Cost per ton for explosives	.0576	.0676

Decrease in 1914, 1¢ per ton.

TRAMMING: (Acct. No. 157.)

YEAR 1914	$31980.23	Cost per ton	.166
Year 1913	30284.88	" " "	.172
Increase 1914	1695.35	" " "	----
Decrease 1914	-------	" " "	.006

There is an increase of 884.30 in labor cost due to more ore trammed, and an increase of $811.05 in the supply cost, due to the use of more electric power, with an actual decrease of $.006 in the cost per ton. Hand tramming is used on the 2nd level of the Lloyd, and electric haulage on the 1st level of the Morris. The equipment and men on the 1st level, Morris, could handle three times the ore that is now produced with only a slight increase in power cost. The cost for the last three months of the year is about .135¢ per ton, due to the decrease in number of trammers employed at the Lloyd, and an increase in the output at the Morris.

FILLING: (Acct. No. 158.)

Year 1914,	$ 838.66	Cost per ton	.004
Year 1913,	247.20	" " "	.002
Increase 1914,	591.46	" " "	.002

The increase is due to breaking down capping to form a mat on the new sub levels opened at the Morris. Some capping was also broken at the Lloyd on the sub levels as they gained to the East under the jasper hanging.

TIMBERING: (Acct. No. 159.)

Year 1914,	$38,823.86	Cost per ton	.202
Year 1913,	24,407.37	" " "	.139
Increase 1914	14,416.49	" " "	.063

There is a large increase in this account, which is due mainly to two causes, First: Opening sub levels at top of Morris ore body and starting mining under the caving system, Second: To more sub level mining at the Lloyd, and less shrinkage stoping. Detailing the first cause, shows employment of regular timbermen on both shifts at the Morris during the latter part of the year,

MINING EXPENSE - CONT'D.

TIMBERING, (Cont'd)
purchase of two timber puffers and employment of two men on each shift at the Morris to hoist timber to the sub levels, use of an extra amount of lagging to make a timber mat on new subs under the hanging. The second cause, the number of timbermen employed at the Lloyd, and the largely increased consumption of timber and lagging. In addition to the two causes outlined above, the increase was due partly to the large consumption of cribbing timber in the raises at the Morris, and also to the fact that timber used at the Morris prior to May 1st 1913, was charged to "Opening and Equipping," Morris Mine.

CAPTAINS AND BOSSES:	Year 1914	$8,443.74	Cost per ton	.044
(Acct. No. 160.)	Year 1913	7,467.27	" " "	.042
	Increase 1914,	976.47	" " "	.002

The increase in 1914 is due to two causes, first, to the employment of an extra shift boss at the Lloyd Mine on Sept. 7th, 1914. One boss on each shift now looks after the development work on the 3rd and 4th levels, Second, to the fact that prior to May 1st, 1913, a portion of the mining captain's time, and all of two shift bosses' time, was charged to "Opening and Equipping," Morris.

DRY HOUSE:	Year 1914	$2565.89	Cost per ton	.014
(Acct. No. 161.)	Year 1913	2442.41	" " "	.014
	Increase 1914	123.48	" " "	---

The increase in this account is due to there having been no charge for dry house to Morris Mine prior to May 1st, 1913.

TOP LANDING & TRAMMING:	Year 1914	$6538.14	Cost per ton	.034
(Acct. No. 162.)	Year 1913	4539.81	" " "	.026
	Increase 1914,	1998.33	" " "	.008

The main increase is in the labor charge, which is due to twelve months time for landers at the Morris and Lloyd shafts in 1914, while prior to May 1st, 1913, the Morris landers were charged to "Opening and Equipping," Morris Mine. The power cost increased in 1914 due to the increase of 28,475 tons in ore stocked, and the increase of 13,581 tons in the rock hoist.

STOCKING ORE:	Year 1914	$614.70	Cost per ton	.003
(Acct. No. 163.)	Year 1913	758.60	" " "	.004
	Decrease 1914,	143.90	" " "	.001

The decrease is due to less trestle having been torn down for loading out ore on stockpiles in 1914. The cost of tearing down and re-erecting the old trestles is charged to this account.

SORTING ORE:	Year 1914	$685.67	Cost per ton	.004
(Acct. No. 164.)	Year 1913	414.61	" " "	.002
	Increase 1914,	271.06	" " "	.002

The increase is in the labor charge, and is due to more time spent in 1914, in picking timber and rock from the ore stocked. There are three grades of ore hoisted at each shaft, making six separate piles, all of which must be looked over every day during the stocking season.

MORRIS-LLOYD MINE.

ANALYSIS OF MINING COSTS FOR 1914-1913.

	YEAR 1914.	YEAR 1913.	
Product,	192,145	176,080	
Average Daily Product,	643	567	
Number of shifts and hours,	2-8hr.-299.	2-8hr.-300.	

	1914. AMOUNT	PER TON	1913. AMOUNT	PER TON	PER TON YEAR 1914. INCREASE	PER TON YEAR 1914. DECREASE.
MAINTENANCE.						
150-Air Pipes,	$3611.40	.019	$2351.97	.013	.006	
166-Cave-in,	70.19	.000	6.53	.000	.---	
TOTAL,	3681.59	.019	2358.50	.013	.006	
SUPERINTENDENCE.						
160-Captains & Bosses,	8443.74	.044	7467.27	.042	.002	
161-Dry House,	2656.89	.014	2442.41	.014	.---	
TOTAL,	11100.63	.058	9909.68	.056	.002	
POWER.						
151-Compressors,	14720.95	.077	9218.49	.052	.025	
152-Hoisting,	9707.41	.051	7726.47	.044	.007	
153-Pumping,	15701.85	.082	12714.94	.072	.010	
TOTAL,	40129.85	.210	29659.90	.168	.042	
MINING.						
156-Breaking Ore,	79757.74	.415	73858.54	.420	.---	.005
157-Tramming,	31980.23	.166	30284.88	.172	.---	.006
158-Filling,	838.66	.004	247.20	.002	.002	
159-Timbering,	38823.86	.202	24407.37	.139	.063	
164-Sorting Ore,	685.67	.004	414.61	.002	.002	
TOTAL,	152086.16	.791	129212.60	.735	.056	
DEVELOPMENT.						
154-Sinking & Shaft Rep.	24477.30	.127	18063.96	.103	.024	
155-Drifting,	14591.42	.076	3001.45	.017	.059	
TOTAL,	39068.72	.203	21065.41	.120	.083	
HANDLING OUTPUT.						
162-Top Landing,	6538.14	.034	4539.81	.026	.008	
163-Stocking Ore,	614.70	.003	758.60	.004	____	.001
TOTAL,	7152.84	.037	5298.41	.030	.007	
Ventilation,	6.62	.000	34.61	.000	---	---
TOTAL MINING,	253,226.41	1.318	197,504.50	1.122	.196	

DRIFTING, "EXTRAORDINARY."
(Acct. No. 177.)

Year 1914	$33,759.54	Cost per ton	.176
Year 1913	16,162.65	" " "	.092
Increase 1914	17,596.89	" " "	.084

The following table gives the detail of these charges:

	1914.			1913.		
	AMOUNT.	FEET	PER FT.	AMOUNT	FEET	PER FT.
Drifting,	14,008.61	2,136	6.56	10,084.97	1612	6.25
Raising,	8,230.30	600	13.714			
Sinking,	240.76	15	16.05			
TOTAL,	22,479.67	2,751	8.17	10,084.97	1612	6.25
Tramming,	7,007.19	2,751	2.55	3,355.91	1612	2.08
Ventilation	2,217.44	2,751	.81	884.71	1612	.55
Elect.Haulage	2,054.34		.74	1,229.33	1612	.77
TOTAL COST PER FT.	33,759.54	2,751	12.27	15,554.92	1612	9.65

Increased cost per ft. 1914, $2.62.

The increase in cost per foot for drifting in 1914, is $.41, due to greater speed made in drifting. The cost of raising is high on account of size and length of raise to surface on Section 6, the contract price to miners is $16.00 per foot. The cost of raising is below this figure on account of including the raise from the 3rd to the 4th level, in No. 4 crosscut on the 4th level, where the contract price was $5.00 per ft. for the first 100 ft., the balance of 130 ft., price was $5.50 per ft.

The charges for sinking are for shaft on Section 6, sinking to meet the raise from the 4th level.

The increase of $.47 in the cost of tramming per ft. drifted, is due to greater length of tram which increased the power cost, and to faster drifting, which increases the labor cost slightly.

MORRIS MINE

AVERAGE MINE ANALYSIS OF OUTPUT FOR YEAR-1914

GRADE	IRON	PHOS.	SILICA
Morris Bessemer,	58.99	.051	
Morris,	58.88	.105	
Morris Silica,	52.26	.054	18.27

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR-1914

GRADE	Mine			Lake Erie	
	IRON	PHOS.	SILICA	IRON	PHOS.
Morris Bessemer,	All Mixed				
Morris,	No Shipments				
Morris Silica,	All Mixed				

AVERAGE ANALYSIS OF MIXED CARGOES OF NORTH LAKE SILICA AND MORRIS SILICA BILLED AS NORTH LAKE SILICA ORE.

GRADE	Mine			Lake Erie.	
	IRON	PHOS.	SILICA	IRON	MOIST.
North Lake Silica and Morris Silica,	50.37	.052	19.46	50.41	9.07

ORE STATEMENT - DECEMBER 31ST, 1914

	MORRIS BESSEMER	MORRIS	MORRIS SILICA	TOTAL	TOTAL LAST YEAR
On Hand Jany. 1st, 1914,	7,035	2,913	12,741	22,689	3,841
Output for Year,	31,776	5,606	25,174	62,556	37,242
Total,	38,811	8,519	37,915	85,245	41,083
Shipments,	11,565	617	16,881	29,063	18,394
Balance on Hand,	27,246	7,902	21,034	56,182	22,689
Increase in Output - 68%				25,314	
Increase in Ore on Hand,				33,493	

2 - 8 Hr. Shifts during 1913 and 1914.

MORRIS MINE

SHIPMENTS FOR YEAR-1914

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Morris Bessemer,	11,565		11,565	14,092
Morris,	617		617	1,060
Morris Silica,	7,337	9,544	16,881	3,242
Total,	19,519	9,544	29,063	18,394
Total Last Year,	18,394		18,394	
Increase - 58%			10,669	

LLOYD MINE

AVERAGE MINE ANALYSIS OF OUTPUT FOR YEAR-1914

GRADE	IRON	PHOS.	SILICA
North Lake Bessemer,	57.80	.053	
North Lake,	58.60	.073	
North Lake Silica,	51.31	.049	17.49

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR-1914

GRADE	Mine			Lake Erie	
	IRON	PHOS.	SILICA	IRON	PHOS.
North Lake Bessemer,	All Mixed				
North Lake,	"	"			
North Lake Silica,	51.10	.054	17.58	No Lake Erie results	

ORE STATEMENT - DECEMBER 31ST, 1914

	NORTH LAKE BESSEMER	NORTH LAKE	NORTH LAKE SILICA	TOTAL	TOTAL LAST YEAR
On Hand January 1st, 1914,	9,381	12,097	120,962	142,440	139,348
Output for Year,	34,349	10,297	84,943	129,589	138,838
Total,	43,730	22,394	205,905	272,029	278,186
Shipments,	18,716	13,056	91,438	123,210	135,746
Balance On Hand,	25,014	9,338	114,467	148,819	142,440
Decrease in Output - 7%				9,249	
Increase in Ore on Hand,				6,379	

2 - 8 Hr. Shifts during Years 1913 and 1914.

LLOYD MINE

SHIPMENTS FOR YEAR-1914

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
North Lake Bessemer,	13,376	5,340	18,716	44,604
North Lake,	1,560	11,496	13,056	17,916
North Lake Silica,	44,391	47,047	91,438	73,226
Total,	59,327	63,883	123,210	135,746
Total Last Year,	72,727	63,019	135,746	
Decrease - 9%			12,536	

MORRIS-LLOYD MINE

CONSOLIDATED ORE STATEMENT - DECEMBER 31ST, 1914

	MORRIS BESS.	MORRIS	MORRIS SILICA	NO. LAKE BESS.	NORTH LAKE	NO. LAKE SILICA	TOTAL	TOTAL LAST YEAR
On Hand Jany. 1, 1914	7,035	2,913	12,741	9,381	12,097	120,962	165,129	143,189
Output for Year,	31,776	5,606	25,174	34,349	10,297	84,943	192,145	176,080
TOTAL,	38,811	8,519	37,915	43,730	22,394	205,905	357,274	319,269
Shipments,	11,565	617	16,881	18,716	13,056	91,438	152,273	154,140
Balance on Hand,	27,246	7,902	21,034	25,014	9,338	114,467	205,001	165,129
Increase in Output - 9%							16,065	
Increase in Ore on Hand							39,872	

2-8 Hr. Shifts during Years 1913 and 1914.

CONSOLIDATED STATEMENT OF SHIPMENTS FOR YEAR---1914

	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR	
Morris Bessemer,	11,565		11,565	14,092	
Morris,	617		617	1,060	
Morris Silica,	7,337	9,544	16,881	3,242	
North Lake Bessemer,	13,376	5,340	18,716	44,604	
North Lake,	1,560	11,496	13,056	17,916	
North Lake Silica,	44,391	47,047	91,438	73,226	
Total,	78,846	73,427	152,273	154,140	
Total Last Year,	91,121	63,019	154,140		
Decrease - 1.2%			1,867		

MORRIS-LLOYD MINE.

COMPARATIVE AVERAGE WAGES AND PRODUCT.

PRODUCT '14 192,145 Tons.	SURFACE		UNDERGROUND		TOTAL	
PRODUCT '13 176,080 "	1914	1913	1914	1913	1914	1913
Avg. no. men working	44	36	199	146	243	182
Avg. wages per day	239	2.48	2.85	2.90	2.77	2.82
Avg. wages per mo. 25 days	59.75	62.00	71.25	72.50	69.25	70.50
Avg. product per man per day	13.86	15.74	3.10	3.87	2.53	3.10
Labor Cost per ton	.172	.157	.920	.751	1.092	.908
Diff. in labor cost per ton	+.015	+.034	+.169	+.103	+.184	+.137
Avg. product breakg. & trmg.			5.62	5.70		
Avg. wages for miners contr.			2.93	2.97		
Total avg. wages for contract			2.93	2.97		

	1914	1913	INCREASE	DECREASE
SURFACE				
Total Number of Days	13,861	11,198-3/4	2,662¼	
Average Rate	2.39	2.48		.09
Amount	33,107.04	27,722.41	5,384.63	
UNDERGROUND				
Total Number of Days	62,055¼	45,502	16,553¼	
Average Rate	2.85	2.90		.05
Amount	176,785.58	132,125.25	44,660.33	
Total Days	75,916¼	56,700-3/4	19,215½	
Average Rate	2.77	2.82		.05
Total Amount	209,892.62	159,847.66	50,044.96	
Labor Cost per ton	1.092	.908	.184	
No. Shifts and hours	2-8hr	2-8hr		

Tons per man per day, SURFACE DECREASE 1.88 Tons - 11.9%
UNDERGROUND " .77 " - 19.7%
TOTAL " .57 " - 18.4%

Proportion Surface to Underground Men: 1914 - 1 to 4.48
1913 - 1 to 4.05
1912 - 1 to 4.37
1911 - 1 to 4.06

Decrease Wages per Day: Surface - .09 - 3.6%
Underg. - .05 - 1.7%
Total - .05 - 1.77%

MORRIS-LLOYD MINE.

TIMBER STATEMENT FOR THE YEAR ENDING DECEMBER 31,1914.

KIND.	LINEAL FEET.	AVG.PRICE PER FOOT.	AMOUNT 1914	AMOUNT 1913
6" to 8" Timber	127,066	.021	2,670.01	1,657.90
8" to 10" "	42,226	.042	1,790.73	1,317.17
10" to 12" "	35,035	.06	2,138.81	1,075.03
12" to 14" "	13,765	.08¼	1,135.62	667.83
Total 1914	218,092	.035	7,735.17	
Total 1913	140,737	.0335		4,717.93

	LINEAL FEET.	PER 100'	1914	1913
5' Lagging	504,900	.477	2,410.33	2,264.00
7' "	37,888	.55	208.39	110.88
8' "	147,412	.56	983.15	854.18
Total lagging	690,200	.52	3,601.87	3,229.06
Poles	103,852	.96	998.07	447.17
Total 1914	794,052	.579	4,599.94	
Total 1913	700,904	.525		3,676.23

	1914	1913
Feet Timber per ton of ore	1,135	.799
Feet Lagging per ton of ore	3.59	3.71
Feet Lagging per foot of timber	3.16	4.64
Cost per ton for timber,lagging,poles	.064	.048
Equivalent of stull timber to board measure	394,709	243,390
Feet board measure per ton of ore	2.05	1.38
Total Product	192,145	176,080

Total cost of timber and lagging - 1914	12,335.11
Total cost of timber and lagging - 1913	8,394.16
Total cost of timber and lagging - 1912	6,634.06
Total cost of timber and lagging - 1911	6,001.30

MORRIS-LLOYD MINE,

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE.

KIND.	QUANTITY.	AVERAGE PRICE	AMOUNT 1914	AMOUNT 1913
40% Powder	104,160	.096	9,995.25	8,098.50
50% "	5,450	.10½	583.25	1,892.00
80% " Giant	3,612	.14	506.00	300.69
Total Powder	113,222	.0975	11,084.50	10,291.19
Fuse	270,290	3.84	1,037.49	847.66
Caps	61,500	6.11	375.85	284.97
Cap Crimpers	48	25	12.15	9.15
Fuse Lighters				1.00
Electric Exploders				.75
Tamping Bags				5.28
Connecting Wire	1	.30	.30	4.38
Total fuse,etc.			1,425.79	1,153.19
Grand Total			12,510.29	11,444.38
Product			192,145	176,080
Pounds Powder per ton Ore			.589	.619
Cost per ton for Powder			.058	.058
Cost per ton for fuse,etc.,			.007	.007
Cost per ton for explosives			.065	.065
Avg.price per lb. for powder			.0975	.0944

CHASE MINE.

The hoist for the year 1914, was as follows:

Chase 1st Class,	65,638 Tons,
Chase 2nd Class,	6,767 "
TOTAL ORE,	72,405 "
Rock,	10,270 "
TOTAL HOIST,	82,675 "

SHIPMENTS.

From Pocket, 19,708 tons, Balance in stock, 60,934 Tons.

The total output of the mine to date is 133,572 tons. The grade of the product shipped during 1914 is above the average of the shipments of the previous year, but the grade of all ore now in stock, is lower than that shipped from the mine. A large proportion of the rock has been picked from the 2nd class ore pile, so that it is safe to assume that it will average almost equal in grade to the 1st class ore; the average of all ore in stock at the close of 1914, is about 56.50 iron.

ORE ESTIMATE.

Above 3rd level,	18,750 tons
Less 20% for rock and loss in mining,	3,750 "
NET TOTAL ORE IN SIGHT,	15,000 "
Add for ore left in pillars to support capping,	10,000 "
TOTAL ORE,	25,000 "

The developed ore added to that which has already been mined, totals 158,572 tons, of which 148,572 tons will be mined. There is a slight possibility of obtaining a few thousand tons additional from the small ore body now being developed between the 2nd and 3rd levels, but the development work has not yet progressed far enough to permit of increasing the estimate.

The estimate made by the Geological Department in January 1911, showed 350,000 tons of 1st Class ore; the actual ore obtained from the mine will be approximately 200,000 tons short of this estimate. As has been explained in previous annual reports, this is due to jasper and dikes which

run parallel to the ore chutes, materially reducing the ore areas, and of which no idea could be gained from surface diamond drilling.

Based on the ore now in sight, mining will be completed in April 1915, unless ore in siffucient quantities to warrant development work is discovered on the hard ore contact, where standpiping and drilling is now being done from surface. At a point about 600 ft. S.W. of the mine, 17 ft. of high grade ore was discovered in November 1914. It is planned to drill some additional holes in this ore to follow it up on its dip and also along the strike, and if sufficient ore is found to warrant a drift into this territory, the Chase Mine will continue in operation beyond the month of April.

Some additional ore has been developed during the past year above the 2nd level, but the lenses were small, and only a small tonnage was obtained from these new bodies. The greater part of the ore mined during the past year, has come from the territory between the 1st and 2nd levels. Practically all of the big shrinkage stopes in this territory were finished during the year, and the broken ore is now nearly all hoisted. During the last months of the year several gangs of miners have been engaged in scramming out ore in these old stopes.

At the Southwest end of the mine near the fault line, a drift was driven 95 ft. to the S.W. towards the old Dexter Mine. This drift was in dike and rich jasper, but failed to show any ore. It was thought that additional ore might be found in the territory adjacent to the fault, but from the drifting which was done here, as also from the drilling on the 3rd level, it was decided that it would not pay to drift further in this territory.

During the past year the 3rd level has been opened to the West beyond the limits of the openings of the 2nd level 100 ft. above. This drift was in progress at the close of 1913, and during 1914 it was extended 400 ft. further to the West. One crosscut was driven to the North beneath the 2nd level stopes, but only 3 ft. of ore was found here. Diamond drilling was done from the West end of the 3rd level drift in an effort to discover the downward extension of the 2nd level ore bodies. These holes were blank, indicating that all the 2nd level ore bodies were cut

off before reaching the 3rd level. Several raises have been put through from the 3rd to the 2nd level, and from one of these raises a sub level has been opened midway between the two levels. While drifting directly beneath the ore lenses on the 2nd level, two small ore bodies were discovered. Mining has just been started in one of these bodies, and it is expected that they will both be mined out during the next few months. Results here were very disappointing, as it had been thought that a fair sized ore body would be found in the territory between the 2nd and 3rd levels. From present indications, the total yield of ore from this territory will not exceed 16,000 tons.

1st LEVEL.

During the past year there has been practically no work done on this level. In April and May a contract drove a drift to the South in the ore body East of the crosscut to the shaft, cutting out one more ore pillar. This work was done preliminary to extending the shrinkage stope beneath up to the 1st level, in order that the outline of the pillar might be kept intact. A considerable amount of the 1st level floors have been mined out, all this ore going directly into the shrinkage stopes. As the majority of this work was done below the level of the 1st level floors, it will be reported under the 2nd level.

2nd LEVEL.

At the close of 1913, a new shrinkage stope was being opendd in a body of ore which had been found near the fault at the S.W. end of the 2nd level. The work done here gave a line on the direction of the main Chase-Dexter fault, which has a NE-SW strike. In order not to delay the possible development of other ore bodies in this territory, it was decided to drive a drift parallel and about 50 ft. North of the fault into this territory. On the 1st of the year, a contract started drifting to the S.W., this drift being extended 95 ft. in dike and rich jasper. Work was stopped at this point early in February, and the contract removed to work elsewhere. At that time it was thought that it would be advisable to continue work at this point, but from information gained from the 3rd

level drift, and later in the year from opening the old Dexter Mine, it was decided that chances of finding ore in this territory were not good enough to warrant extending the drift. As soon as drilling is completed at the Dexter, it is planned to drill two or three short holes from this drift in order to thoroughly prospect this territory for ore.

In addition to the drift referred to above, about 245 ft. of drifting has been done in order to mine the ore in the S.W. shrinkage stope, and also in the small lense of ore discovered between the main shrinkage stope and the S.W. stope. In order to use the shrinkage stope system of mining, it is necessary to have a tramming drift located directly beneath the ore body. The ore body is first developed by raises and its general direction and width determined. After this information was available, it was possible to locate the tramming drift beneath the center of the ore body.

MAIN SHRINKAGE STOPE.

This stope, 375 ft. in length, was opened in 1913, and at the close of the year, practically all of the high grade ore had been mined here. At the West end there was nearly 100 ft. of territory that had been opened by raises, in which the ore was badly mixed with small dikes, and here only a small quantity of ore has been mined. At the East end of the stope there was 25ft. of back left between the stope and the 1st level, some of which has been obtained during the past year. It was estimated that there was 20,000 tons of broken ore in this stope on Jan. 1st, 1914, and it has not yet all been drawn out.

In February a contract started work at the West end of this stope, cleaning out as much as possible of the rock before starting to mine the ore. They worked here for four months mining the ore up to the rock in the back, whose average height was 50 ft. above the 2nd level. At the extreme West end of the stope jasper was encountered in the back about 25 ft. above the 2nd level, and as work was continued further to the East towards that part of the stope which had already been mined out, the ore was found to go higher, so that the point where they joined with the old stope, it was about 60 ft. above the 2nd level. All the ore broken in this part

of the stope has been hoisted during the past year, and the latter part of November a contract started blasting out the arches which had been left between the chutes at the bottom of the stope. When the raises were originally put up from the 2nd level, they holed to each other at a point fully 20 ft. above the level on account of the miners using stoping drills, which cannot be operated at a flatter angle than 45 degrees. There was considerable ore left in these arches, and one contract was still working in this end of the stope at the close of the year.

The main stope further to the East was nearly filled with broken ore the first of the year. In this same territory considerable dirt was also dumped into the stope, which came from a sub level which was opened to the South parallel with the main stope, in a narrow lense of ore. As the broken ore was drawn from the stope during the shipping season, a contract started working here cleaning down the ore off the flat footwall on the North side of the stope. They also barred down all loose pieces from the pillars in order that when the stope was emptied, it would be safe to go in and blast out the arches between the raises. It was decided that a considerable part of the base of the pillars which had been left on the North side of the stope, could be blasted out, and in this way leave a better arch to support the jasper back. By this method a considerable tonnage of ore was obtained, as a wedge of ore 20 x 20 ft. at the base, with a height of fully 15 ft., was removed. This contract started in August and has continued working in this territory for the balance of the year.

At the East end of the main shrinkage stope, which is about 100 ft. East of the crosscut from the shaft, a contract started in May, carrying up a stope clear across the ore body. The ore pillar which it was necessary to leave above the 1st level, had already been outlined on the 1st level, and a raise put through in the ore from the shrinkage stope, in order that the miners might keep the correct line of the stope which they were opening up from below. It required two months to complete this work, which again filled this end of the shrinkage stope with ore. During the shipping season and the latter months of the year, this ore was drawn out, and as it was lowered in the main stope, the sides were trimmed and all

loose ground barred off the pillars. At several places it was possible to put in a few holes and obtain some ore which had been left on the sides when the stope was put up. Quite a large quantity of ore was dumped into the East end of the main shrinkage stope during the past year; this ore was obtained from stoping out the floors down to the jasper of the old 64 ft. sub at the East end of the mine, and also from the floors of the stopes which were driven through the pillars at other elevations below the 1st level.

The ore obtained during 1914 at the West end of the main stope, will not average over 54% iron; further to the East the ore improved in grade, and will average about 57% iron. At the extreme East end the ore obtained both from the work done in the stope and from the floors in this part of the mine, will average close to 60% iron. The greater part of the ore mined during 1914 at other points in the mine, will not average over 56% iron. It has been possible, however, to keep the grade throughout the year in the neighborhood of 57% iron by mixing in some of the high grade ore from the main shrinkage stope. At the close of the year there was about 8,000 tons of ore remaining in this stope, which will be drawn out and hoisted along with the ore from other parts of the mine.

SOUTHWEST SHRINKAGE STOPE.

At the close of 1913 three contracts were engaged in putting up raises in the body of ore which had been developed at the S.W. end of the 2nd level. A number of raises were put up on the East side of the crosscut, which had been driven in this territory, and these raises were later connected and a stope opened here. Dike was encountered in the back at a distance of 25 ft. above the level, which pitched to the West at a fairly steep angle. The work done here indicated that the main part of the ore body lay to the East of the crosscut on the 2nd level, and accordingly a drift was driven to the East on this level beneath the ore body. In this drift four raises were put up, which showed that the ore body did not extend far to the South, but that the main part of it lay to the North of the drift. Another crosscut was then driven North and South beneath this

ore, and from this crosscut three raises were put up which struck ore at an elevation of 45 ft. above the 2nd level. The work done here during the early months of the year showed that this lense of ore ran almost due East and West with a jasper footwall, which dipped to the West at an angle of about 35 degrees, and with a dike or slate hanging wall which dipped to the West at an angle of about 65 degrees. In order to render it safe for the men to work here, and mine the ore, it was necessary to leave a fair sized ore pillar in the center of the stope, which would act as a support for the hanging wall. The stope was opened entirely around the pillar, and was carried up to the East until it reached the elevation of the back of the 1st level. This was as high as it was considered safe to mine the ore, as there was only 25 ft. of ground from the back through to the quicksand, which was 95 ft. thick at this point. A drift was then driven near the top of the stope to the East, which continued in ore for 40 ft. The surface drill holes showed that the capping was not so thick at this point, and it was decided to stope the floor of this drift out for 6 ft., and when this stope reached the breast of the drift, to continue the drift, but at an elecation 6 ft. lower than the previous drift. This was done, and rock was struck after advancing 10 ft., which was followed to the N.E. for 20 ft., where the ore pinched out. The drift was then widened to the full width of the ore, which averaged about 16 ft., except at the East end, where it was only drift wide. During the latter months of the year, the ore was stoped out down to the jasper. Each succeeding stope was shorter on account of the jasper dipping to the West, but it was possible for one contract to continue working at this point until early in December, when work was completed here. In the early part of the year three contracts worked here, but when the main stope was finished and the ore was being mined by drifting and underhand stoping, it was only possible to work one contract.

On Sunday, November 1st, a large fall of ground occured in the main stope. Considerable ore had been left to support the dike over the stope; this fell, and with it a large amount of the dike. Fortunately, all the ore had been removed from the stope to the East during the shipping season, and all the ore obtained from the stope to the East was

dumped into one raise, and this raise was far enough East to escape the fall of ground. There was no loss of ore here, and no interference with mining operations. Careful examination of the back was maintained throughout the balance of the year, and there has only been one more slight fall of ground since. When work was completed here in December, all the ore had been obtained which it was considered safe to take from this part of the ore body.

There were three connections, other than the shrinkage stope raises connecting this S.W. shrinkage stope with the 1st and 2nd levels. At the close of the year bulkheads had been built in two of these, completely shutting off the other part of the mine, and as soon as the ore is drawn out of the small stope which lies parallel with the S.W. stope and between it and the main shrinkage stope, a third bulkhead will be built, and this part of the mine sealed off.

Part of the ore obtained from this stope has averaged 57% iron, but the average of the total output will probably not be above 56.50 iron.

SMALL WEST SHRINKAGE STOPE.

This stope lies about 50 ft. Southwest of the main stope, and 30 ft. North of the S.W. shrinkage stope; it is a comparatively narrow stope, about 80 ft. in length, 10 ft. wide in the bottom and 20 ft. wide half way up, growing narrower towards the top, which at one end is 110 ft. above the 2nd level, and the other about 80 ft. The latter part of 1913 a drift was driven on the 2nd level beneath this territory, the drift being in ore for 60 ft., the last 10 ft. being in jasper. Early in 1914, four raises were put up from this drift, and from the most Eastern raise it was found that the ore extended further to the East above the jasper. The drift on the 2nd level was then continued 30 ft. further to the East, and one more raise put up which struck ore 30 ft. above the 2nd level. A stope was then opened and two gangs of miners worked here for several months. At the West end ~~of~~ the stope was carried up to the elevation of the 1st level, where mining was stopped, as it was not deemed safe to carry it any closer to the quicksand. At the East end of the stope work was stopped at the elevation of the 50 ft. sub level until the Southwest

shrinkage stope was finished.

When work was completed in the S.W. stope early in December, a gang started working here mining the ore out to the East. As they gained in elevation above the 50 ft. sub level, the ore was found to be narrower, and when they reached an elevation of 85 ft. above the 2nd level, work was stopped, as the ore was only 4 ft. wide in the back. A small ore pillar was left on each side of the stope opened in December at the East end, as the fall of ground in the S.W. stope which lies parallel with this stope and 30 ft. distant, made it imperative to take extra precautions in removing ore in this vicinity. At the bottom of the stope the ore was only about 10 ft. wide, with a 6 in. seam of dike in the center. As the stope gained in elevation, the dike disappeared and the ore became wider, reaching a width of 20 ft. at the elevation of the 50 ft. sub level.

At the West end a horse of jasper came into the stope, and for a time decreased the length of the stope fully 20 ft. The ore, however, was then found to gain back over the jasper. Owing to the dike which was in the lower part of the stope, and to another dike which formed the North hanging wall, the ore in this stope will not average over 55% iron. Considerable of the rock slabbed off when it was exposed to the air, and was taken out of the stope by the miners; a large proportion of the remaining rock was picked out when the ore was dumped on the stockpile. Work in this stope was entirely completed on the last day of the year, and the ore will now be drawn out and hoisted. All the raises put up in this stope will then be covered over with timber, and some rock blasted down on them to form a mat, this being done as a precautionary measure in case the S.W. stope shoudd ever break through to surface. It is estimated that there was about 3,000 tons of broken ore in this stope at the end of the year.

SMALL SOUTHWEST STOPE.

When the main S.W. stope was opened up in 1914, it was found that the ore body did not connect with the 40 ft. of ore shown up in surface diamond drill hole No. 21. In August a contract put up a raise near the end of the 2nd level drift in rock, near No. 21 diamond drill hole.