MORRIS-LLOYD MINE.

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 56 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 1926 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 standpipe 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 560 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 126 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 Exselsior 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 40 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, 15 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. 56, 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 60 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 30 ft. above
the 1st level. They had then put in poles on the floor and covered them with
lugging 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 re-
moved and the stopes blasted in, after which the contract moved down and op-
ened 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 a-
bove 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 work-
ing 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 foot-
wall 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-

MORRIS-MINE. 200
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.

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 1915. 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, i.e., 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 holeing to this sub level. On completing
MORRIS-LLOYD MINE.

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.

Rises 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 60% 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 160 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 pillar 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 into 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.

60 ft. SUB LEVEL.

In order to prevent a large open space 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 60 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 60 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 1915 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 trimmed 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.

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 Bessim 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, halting 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.
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 boled 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, 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 10 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 6 x 6 in. hemlock for sets in the winze, with 2 in. hemlock back lath. The winze is 6 ft. x 9 ft. 6 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 dump 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 EXTENT.

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-
Interrupted 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 sump 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 suction. An air pipe was put in near one of the suction, 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 and it was decided that this mud must be removed. In August a wooden dam was built between the suction of No. 1 and 2 pumps, and a 10 in. pipe line put in from the settling basin, to carry the water past the suction 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 suction 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 sump. 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 more. The mud from this cleaning only averaged 45.5 per cent 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 220 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, .165 phosphorous. 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, and 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 57½ ore from a depth of 335 ft. to 345 ft., and from 345 to 380 ft., was in lean ore averaging 50½ 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.