Mine Water

AGENT'S ANNUAL REPORTS AND STATISTICS

YEAR 1902.

Mines & Mining

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ANNUAL REPORTS AND STATISTICS

DEPARTMENT OPERATIONS

YEAR ENDING NOV. 30, 1 9 0 2

I N D E X

THE CLEVELAND-CLIFFS IRON COMPANY,

ISHPEMING, MICHIGAN.

AGENT'S ANNUAL REPORT,

FOR

Year ending November 30,1902.

I N D E X.

Ishpeming, Michigan, Jany 23, 1903.

Mr. Wm. G. Mather, President,

Cleveland, Ohio.

Dear Sir:

I beg to submit herewith my annual report of the operations and present condition of the mines of the Cleveland-Cliffs Iron Co.

The detailed cost statement, inventory and maps, forming a part of this report have been sent you.

ASHLAND MINE.

SURFACE.

During the year a steel shaft house has been built, and the necessary trestle work erected for a power tram. The cost of the shaft house is given in the history of the shaft sinking, which will appear later on.

The tramming plant, including engine, cost to December 31, 1902.

Tramming Engine with drums complete,	1298.74
Freight, Erection & Foundations,	345.05
Building to house plant	116.47
Four Automatic tram cars	973.40
Ropes, Sheaves and Rollers,	621.90
Total,	$3355.56

A great deal of difficulty was experienced with the engine when first installed, owing to defective work and design.

At the earnest solicitation of the Lake Shore Engine Works, the order was given to them, but owing to delays incident to the causes above mentioned, it has been very expensive to us. The plant is now working satisfactorily, although we cannot handle more than 1400 or 1500 tons a day. It is not likely however that it will be called upon to do more than this.

ASHLAND MINE.

UNDERGROUND.

Much careful study has been given to the geology of the mine by Mr. Elliott, the Engineer in charge, and accompanying this report are two cross sections, showing the positions of the dykes, and their supposed relation to each other. The ore occuring, as it does, on these dykes, makes it extremely important to accurately determine their relative positions, in order to explore economically and expeditiously.

For the sake of clearness, the work will be referred to by contract number, rather than location. It will be noted that the same contract numbers occur in the different shafts, but by referring to the maps, their location is easily distinguished.

Following is description of the mine, and the present condition of the work:

NO.3 SHAFT, 3RD. LEVEL.

Only a small amount of ore was taken from this shaft during the year, all of which came from the 3rd level East of the shaft. The pillar of ore which was reported left at this point was not found, the drift stopping in badly caved ground. So much exploring and dead work was being done in other parts of the mine, that work in this shaft was stopped until the new shaft was finished. It is proposed to start a gain early the coming year.

NO.4 SHAFT, 4TH LEVEL.

Contract No.2 is drifting along the hard dyke beyond the foot wall. In October an open room was encountered partly filled with ore. The breast is at present in rock, but ore is likely to be found both to the East and West.

ASHLAND MINE.

Old contract No.6, which was located to the East of No.2 raise, in the cross cut going North, ran a quantity of ore, shortly after we assumed charge of the mine. This must have come from the hard dyke, although its source could not be traced at that time.

3RD. LEVEL.

The 3rd level between 3 and 4 shafts worked on this dyke, making the wide cave shown on surface.

Contract No.6 is drifting East from the shaft. Just North of the drift is a horse of rock. The foot wall has just been struck 60 feet from the shaft. The drift is in solid ore. The foot wall will be followed East to meet contract No.16 between the 5½ level. If this ore is continuous, the estimate on the 4th level will be considerably increased.

5TH. LEVEL. 4 SHAFT.

Contract 8 on the sublevel, 28 feet above the 5th level, is falling back. Contract 11 is also falling back towards the shaft. The ore at this point is only two sets wide and crushed.

Last year's estimate of this level, taken partly from the old maps and information obtained from Captain King, have been shown by this year's developments to have been excessive. Nothing new has been found on this level, the work having been confined to crushed ground.

5½ LEVEL. 4 SHAFT.

Contract No.16 is on a sublevel 80 feet above the 5½ level and is drifting West to meet the drift at No.6.

Contract No.3 is on sublevel 40' above the main level, drifting East on the main 4th level dyke. The ore here is only two sets wide, but should extend to the 4th level above this raise. To the West of this point the ore was mined to within a short distance of the 4th level.

ASHLAND MINE.

These contracts are working on the foot wall, and while the ore is narrow, it is clean and of high grade.

From the main level a raise has been put up 130 feet on the foot wall all in ore. The ore on this level West of 12 raise was taken out by the old company.

On the 285 foot level, an ore body 280 feet long and 10 feet wide has been opened. At 16 raise the ore is 120 feet high with ore in the back. At 12 raise the ore is 80 feet high.

Contract No.14 is mining on the North dyke, and falling back to the shaft. All ore North of the raise has been mined within 12 feet of the sill floor.

Contract 21 on the 30 foot sub is scramming out a small body of caved ore around No.5 shaft.

6½ Level. No.4 shaft.

Contract 20 drifted 150 feet East along the hard dyke and ran into caved ground. The drift however, was continued, and holed into a raise from the 6½ level 6 shaft. This whole sub is in ore. 20 raise from the 6½ level to the 5½ level 4 shaft came up all the way in ore. Between this raise and the hard dyke to the North a cross cut was driven 25 feet through caved ground. When this sublevel was first opened a drift was carried 200 feet East on the foot wall, all in ore. It was stopped however until the ore above could be taken out. It is probable that this narrow vein of ore extends below the 5½ level to the East.

NO.7 SHAFT. 1ST. LEVEL.

East and West of the shaft on the main level and the sublevels above a large body of ore was developed during the year. That to the East has been mined out, and only a small amount is left to the West.

Contract No.10 is drifting in the shaft pillar toward the foot. This pillar seems to be larger than shown by the old sections.

Ashland.

ASHLAND MINE.

Contract No.1 is working on a sub 15 feet above the main level, and falling back towards the shaft.

Contract No.7 is West of No.1, taking the ore on the sill floor, and also falling back towards the shaft.

2ND LEVEL. 7 SHAFT.

Nos' 3, 8, 5 and 6 and 22 are working on a sublevel 50 feet above the main level. The deposit has been developed for a length of 400 feet. Both the East and West ends of the drift are in ore, and give promise of a considerably greater length.

No.5 and 6 have shown a width of 100 feet, while No.8 is still in ore.

No.15 is drifting East in ore, and is now 225 feet East of the shaft. At the raise the ore is 35 feet wide. The breast of the drift is in ore.

At 33 West of the shaft a raise was started but struck jasper at 18 feet. North on the dyke the ore undoubtedly extends higher.

No.16 just East of the shaft has raised to the first sublevel, all in ore.

3RD LEVEL.

Contract No.12 raising West of the shaft struck the dyke at 35 feet, and a drift was put East 200 feet along the dyke, the ore being about 8 feet wide.

Contract No.13 was driven parallel to No.12, and 40 feet South of it in ore of Ashland grade. At the end of 60 feet rock was encountered. At 13 a raise is being put up in ore and is now 30 feet high. A sub has just been started East and West on top of this raise. It is intended to continue the raise to the second level.

6½ LEVEL. NO.7 SHAFT.

No.16 drifted to the boundary in mixed ore and rock.

Contracts No.17 and 21 are working on the 3rd sub above the 6½ level, drifting West, following the dyke. This is very high grade ore, about 20 feet wide.

Contract No.18 is on the second sub below 17 and is drifting in the ore of same quality. No work is being done at this point at present, awaiting the completion of contract No.17.

ASHLAND MINE.

Contract No.15 is on the first sub, and has been extended 125 feet West of 18, all in ore, and stopped in caved ground. Work here is suspended until the 3rd level ore above is exhausted.

No.20 is scramming West of the shaft.

No.4 is drifting on a sub 30 feet above the level, and in the shaft pillar.

8TH LEVEL. NO.7 SHAFT.

The floor of this level is apparently a large body of ore, and the rooms have only been opened four sets high. The only work done on this level during the year was a drift to the North. Only 5 feet of ore lying against the fault plane was found.

9TH LEVEL. NO.7 SHAFT.

No work has been done on this level during the year.

10TH LEVEL. NO.7 SHAFT.

Contract No.23 is drifting along the dyke on a sublevel 50 feet above the main level. At present the drift is in mixed material, but each blast is showing up better ground. The ore at this point is a new development, and more ore has been shown up than we have previously mined from this level.

Contract No.24 is drifting along the dyke on the main level, trying to cross the bar of rock shown in the sublevel above and reach ore beyond.

Contract No.25 has raised three sets above the main level in ore, but at present the back of the stope is mixed with rock.

Contract No.26 is taking out the floor of the 9th level. Work here will probably have to be abandoned for fear of caving the levels above.

11th LEVEL. NO.7 Shaft.

Contract No.30 is drifting North in mixed ground and is now 128 feet North of the shaft and 92 feet North of the foot wall. East of the shaft ore should be found by drifting along the foot wall. By drifting 150 feet West, the dyke which shows in the shaft should be reached, which probably carries ore.

ASHLAND MINE.

13TH LEVEL. NO.7 SHAFT.

An ore body 80 feet long, six set high and four sets wide in the back has been opened up. The back is all in ore, with the exception of a small part in the West end. By drifting East along the foot wall, it will be possible to get on top of the dyke, which is above the plat of this level.

The drift going West for the new shaft struck ore just before it entered the foot wall. A considerable flow of water at this point is an encouraging sign. By drifting North a short distance the main dyke will be struck. To the East it should carry ore. This level apparently has a promising future. It has been impossible to open either this or the 11th level to any extent, as all the material cannot be handled through No.7 shaft. Even the drift to No.9 shaft has been delayed on this account. Now that No.7 shaft has been abandoned no work can be done on this level until the new shaft is completed to this depth. At present the rock coming from the shaft is being hoisted to the 10th level through No.7 by means of a puffer and trammed to No.9 shaft.

NO.6 SHAFT. FIRST LEVEL.

During the year a body of ore 400 feet long and from 10 to 40 feet wide has been opened West of the shaft. Most of the ore above the main level has been mined. Contract No.1 is taking what ore is left on the sub 12 feet above the main level. On the main level the ore is narrow, being close to the junction of the dyke and foot wall.

Contract No.3 is working on the shaft pillar 20 feet above the main level.

Contract No.4 is taking ore from the same pillar. East of this contract quite a large quantity of ore was mined during the year.

5TH LEVEL. NO.6 SHAFT.

Contract No.5 is drifting to the North in caved ground on the sub level 50 feet above the 5th level. In old No.9 room the ore extended 106 feet above the Ashland.

main level.

Contract No.6 is working in caved ground West of the shaft pillar on a sub 35 feet above the sill floor.

Contract No.7 is on the same sub North of No.6 in the shaft pillar.

Contract No.11 is drifting West on the dyke North of the shaft in a narrow body of high grade ore. This ore should continue to the 4th level.

Contract No.10 is raising for the purpose of exploring some caved ground above.

6½ LEVEL. NO.6 SHAFT.

Contract No.17 is climbing the North dyke 450 West of the shaft. The ore is about 25 feet wide, and mostly of Taylor grade.

Contract No.23 West of 17 is climbing the same dyke, and has ore of the same quality.

Contract No.29 is drifting in caved ground towards the shaft pillar on a sub 30 feet above the main level. We have drifted South in two places on this level, but have found practically nothing.

No new developments have been made.

7TH LEVEL. 6 SHAFT.

Contract 18 is drifting West in ore. The old rooms in the main ore body are beginning to take weight, and the sooner the ore above can be taken out, the better, and the cheaper this ore can be mined.

Owing to the ore that has been developed in the upper levels, much of it in caved ground, it has not been possible to reduce the cost of mining, as expected. As a matter of fact a large part of the ore that has been hoisted this year has been scrammed from places which were left by the old management, and where owing to the ground being crushed a very large portion of rock had to be separated and hoisted, in order to procure the ore. As will be seen however by the estimate a very satisfactory amount of new ore has been developed considering that so little work has been done on Ashland.

the lower levels. When the new shaft is completed to the 13th level, explorations will be vigorously prosecuted from the lower workings.

The policy will be pursued of endeavoring to open up new ore bodies in advance of any possible demands for ore.

Owing to the very hard material and broken condition of the jasper, it has not been found satisfactory or economical to explore with a diamond drill, so that the method used hereafter will be drifting and cross cutting.

From a careful study of the geology of the formation, Mr. Elliott makes the following suggestions in regard to explorations:

PROBABILITY OF FINDING NEW ORE BODIES.

The sections and map of the foot wall dykes are admitted to be only approximate in some respects. The size of the dykes is often not knownn except at intervals of several hundred feet. The exact limits of ore on the old levels is not known accurately.

The sections were made particularly for the purpose of matching the different dykes throughout the mine. It will be noticed that the map of the foot wall dykes, show that they are quite regular, not branching as shown on previous sections. This is an actual map of the foot wall. The only way that I can account for the great difference between this map and the old one made for the former owners of the mine, is that dykes found beyond the footwall were projected against it at the elevation where they were encountered instead of first tracing them to the foot wall by cross sections, thus eliminating the possibility of using the same dyke several times.

In No.3 shaft by picking between the lathing, four dykes have been located. The dyke below the 5th level is not on any old section. It is probable that this is the dyke upon which the ore found in No.1 shaft rests. This may be seen on the map of the foot wall.

The exact limit of the 4th level west is not known. There is a large room, which is partly open at the present time, the road to the breast being blocked by timber.

Old maps show a considerable ore body at No.1 shaft. This could be gotten at either by retimbering the old 4th level and drifting West, or by starting a drift at about the 3½ level. This territory is large and has never been explored.

Dyke No.3 in No.4 shaft probably joins dyke No.2, near No.3 shaft. The ore in the floor of the 4th level must rest on the dyke below. At the 4th level it is about three sets wide and 3 high. There is room below this level for quite a large ore body. To explore this territory the 5th level west could be opened up.

The 5th level apparently has ore in the back although a thorough examination was not made, the old timbers being extremely rotten, and dangerous to climb on.

The largest ore body was on the 7th level. I could not find out if all of the ore had been mined from the back. The dyke in the breast was climbed for probably six sets.

The Captain tells me that there is ore in the breast on the 8th level west.

The 5th or 6th levels if driven far enough west would explore a territory through which several large dykes must undoubtedly pass.

We could also raise up through dyke No.4 from the 8th level, No.3 shaft East, and explore the territory below the 7th level. The floor of the 7th level just to the East of No.3 shaft is in ore.

I do not believe that No.3 shaft has been systematically worked. By exploring we should certainly find ore.

I was not able to find out much about No.4 shaft in the levels below the 7th, the openings are all blocked.

Dykes No.3 and 4 have not been explored between No.4 and 5 shafts. At No.6 and 7 shafts they carry ore.

ASHLAND MINE.

The most probable places for the finding of ore in the other shafts have been mentioned.

There is more ore in sight at the present time than when we took charge of the property with a very encouraging prospect of finding other ore bodies.

The work of sinking the new shaft was so expeditiously and economically done that I have thought it worth while to incorporate a history of the work, which was furnished by Mr. H. F. Ellard, Superintendent of the Mine.

NEW SHAFT SINKING.

The location of our No.6 and No.7 shafts, as well as their condition, made the sinking of a new shaft at this property a necessity, in order to win a large body of high grade ore tributary to the above mentioned old shafts. To this our attention was directed by you immediately upon assuming charge of operations here on the 11th of June of this year.

As soon as sufficiently acquainted with the property and the location of the ore bodies, etc., our efforts were directed towards determining the nature of the ground in the location most desirable, and accordingly on July 15th, a test pit was started, and the ledge was reached at a depth of 22 feet, at a point within a few feet of the location finally selected, namely 155 feet South of No.6 shaft.

On July 27th the diamond drill crew was put to work to test the ground at various depths, by boring at right angles to the formation into the foot wall. This was done from surface immediately west of No.6 shaft, and from the 3rd, 8th and 10th levels of this shaft, the results proving the foot wall to consist of a layer of quartzite, uniformly 75 feet thick overlying strong silicious slates, both cut, however at different points by dykes of diorite, which when encountered in the unaltered form proved extremely hard material. The dip of the foot wall was shown to be very regular, 60° from the horizontal N.- and this incline was adopted for the shaft.

ASHLAND MINE.

Upon your approval of the site and plans, September 21st the ground was cleared of lumber etc., and immediately Monday morning September 23rd, ground was broken.

September 25th a temporary head frame was raised and a drum brought into position for hoisting the material. This was piped off, and sheaves and ropes placed in position and a bucket started to work Monday morning September 30th.

Work during this and the preceding week was extremely disagreeable, rain fell in torrents beginning on the 26th of September at night, filling the shaft to the brim. September 28th it rained several hours; September 29th, 30th, October 1st, 2nd and 3rd rain and snow fell at intervals, making work in the wet clay and sand very tedious, and on October 4th having the bearing timbers placed, also five sets of shaft timbers, we were able to raise and bank around the shaft collar and cover the shaft to prevent further inflow of surface water.

The thoroughly saturated condition of the ground was a source of considerable trouble for the following two weeks, and was aggravated by the unstable character of the slates, which on the hanging side were very difficult to hold. On the night of October 19th, after a round of holes had been blasted, fully six feet from the hanging side, a run was caused, which brought down over 100 tons of sand and rock, and extended up to the surface, a distance of 40 feet.

As in all such cases delays were moreor less frequent and annoying, and will be noted in the weekly summary of progress. But on thw whole the work has advanced satisfactorily, considering the size and incline of the shaft and the number of men at work.

It was decided to attack the shaft at different points, and accordingly a cross cut was put in from No.6 shaft on the 3rd level, and a riase driven to meet the sinking crew which was successfully accomplished on November 14th, after raising 126 feet.

The second party drove a cross cut on the 5th level and raised to the 3rd in very hard ground, completing their work December 7th, raising 143 feet.

The final blast was withheld in this raise to prevent the water from going to the lower levels, as well as to allow this party to sink a winze for a short distance below the 5th level, as it was calculated that the party, who, upon completion of their work in the 3rd level raise, had moved to the 7th level, would be unable to complete their cross cut and raise to the 5th level by the time the party stripping down and timbering the new shaft, would reach this (the 5th) level. This winze is now 10 feet deep and a cross cut on the 7th level has just reached the line of the shaft. Raising at this point has commenced.

Greater speed in preparing this portion of the work was impossible, for the same reason that now prevents our pushing work more rapidly in the sinking, namely; the rock from all these points, as well as ore and rock from this portion of the mine is handled through No.6 shaft, and the hoisting capacity of this skip determines the speed that may be attained. For this reason only two machines and four miners are employed on a shift in the shaft, although there is ample room for more.

Miners in the shaft work eight hour shifts, and are paid $2.50 per day. Miners in cross cut and raises work ten hour shifts, contract work.

About thrirty gallons of water per minute is making in the new shaft. This was handled in the ordinary way while sinking, a No.5 Cameron Pump being used. Since holing the pump has been stationed on the 3rd level and handles water through No.6 shaft to the surface.

Ingersoll-Sargeant Rock drills size "E" 3¼ inch cylinders are used exclusively, and with an air pressure of 80 to 90 lbs they do excellent work.

The timber used was 14 x 14, white pine, until the shaft was well into the solid ledge, since which time 12 x 12 pine has been used. Tamarack is used for dividers as much as possible, but this is difficult to obtain.

The timbering has been carefully done, and the shaft so far presents a thoroughly workmanlike appearance.

Plans and elevations will be furnished you, showing the size and spacing of the timbers.

Good progress was made during December 1901, although we were troubled considerably by the freezing of the air from the Compressor. We also lost more than the usual amount of time at Christmas, as a third of the crew was off duty for the whole week.

The winze below the 5th level was sunk 20 feet, and upon its completion the process of holing from the raise to the 3rd level was completed. This allowed the tramming of the rock to be done on the 5th level, and the cross cut of the 7th level was completed and raising commenced; also the cross cut on the 8th level was started during the month.

This was completed, and after holing from the 8th level raise, we diposed of the rock from the stripping of the shaft by filling a number of old rooms, some of which were badly caved in the territory between No.6 and No.7 shafts.

The cross cut on the 10th level was begun by a party having completed a raise from the 7th, and the work at all points pushed as rapidly as possible at all times, although in this part of the work as with all work done in the lower levels of No.7 shaft, serious delays were met with, owing to the crowded and poor condition of No.7 shaft, through which this rock was hoisted to surface.

The stripping down and timbering of the shaft was completed to the 8th level early in May, and we at once commenced to prepare the shaft for the hoisting of ore. Rails, runners etc., were placed, signal lines provided and pockets prepared for receiving ore on the different levels.

These are an improvement over the old method of dumping the mine cars directly into the skip, and were not contemplated in making the estimate of cost.

Ashland.

At the same time foundations for the head frame were prepared, and the grading for the railroad tracks etc., pushed to completion. The rails were laid and tracks completed as far as the shaft by the time the material for the head frame arrived, and as soon as the erection of this was sufficiently advanced, the railroad trestle forming an over crossing for the loading track at the pockets was put in place, and the carpenters worked with the structural iron men to prepare the pockets chutes etc., for the handling of ore on July 1st.

With the exception of sinking a skip-pit at the 8th level, no sinking was done in June nor July, but this was resumed August 20th upon the completion of the raise from the 10th level, and the shaft was completed to the 10th level on October 23rd.

After cutting out a passage way for pipes etc., to the East, and removing the pentice which remained below the skip compartments at the 8th., level, the placing of rails etc., for skips and cage was completed, and the shaft has done all our hoisting from the 10th level since November 26th., on which day the rope was transferred from No.7 shaft to the east skip of No.9 shaft.

The work on the 13th level has been very tedious, but the cross cut is now completed and raising will be started at once. As this rock is trammed across and hoisted to the 10th level through No.7 shaft, it became necessary to provide a hoist and a small cage for this work. The rock is then trammed back to No.9 shaft on the 10th level and hoisted to surface. This makes the work quite expensive, as the material is necessarily handled several times.

This brings the year to a close with a cross cut on the 13th level just completed, and the shaft complete in all compartments to the 10th with a skip-pit 14 feet below that point.

Ashland.

ASHLAND MINE.

A chronological record of this work to date is as follows:

July 15, 1901	Commenced exploring for location by test pitting.
27,	Commenced exploring for location by diamond drill.
Sept 21,	Site and plans approved.
23,	Ground broken.
25,	Temporary head frame erected.
30,	Commenced using hoist and bucket.
Oct, 4,	Banked and covered opening to prevent inflow of water.
19,	Caved on hanging side, extending to surface.
24,	Holed raise from 2nd level.
Dec. 7,	Holed raise from 5th level (blast withheld)
10,	Commenced sinking winze below 5th level.
17,	Completed cross cut on 7th level and commenced to raise.
24,	Holed raise from 5th level.
Jan, 8, 1902	Sinking reached 2nd level, 212 feet.
Feb, 11,	Holed raise from 7th level.
19,	Completed cross cut on 8th level and commenced to raise.
Mch, 13,	Holed raise from 8th level (this is our record raise,112 feet in 20 days, 62 feet in 11 days in March)
21,	Sinking completed 450 feet.
26,	Sinking completed 475 feet.
31,	Sinking completed 500 feet (Record mo. sink 130'-26 days)
Apr, 25,	Commenced grading R R tracks.
30,	Commenced excavation for Head Frame foundations.
May 5,	Commenced to place concrete for foundations.
17,	Sinking completed to the 8th level.
26,	Material for head frame arrived.
28,	Commenced the erection of head frame.

ASHLAND MINE.

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26,	Material for head frame arrived.
28,	Commenced the erection of head frame.

May 31,	Completed cross cut on 10th level, and commenced to raise.
June24,	Steel work on head frame completed.
26,	Hoisting rope placed on Head frame.
30,	Skip placed in service.
July 1,	First ore hoisted.
29,	Cage placed in shaft.
Aug 5,	Cage in regular service, handling men.
21,	Holed raise from 10th level and resumed sinking.
Oct 23,	Sinking completed to 10th level.
Nov 26,	East skip (2nd skip) placed in service, throwing No.7 shaft out of commission.

The following statement shows our progress weekly, and in most cases the causes of unsatisfactory work are noted.

Week Ending.	Feet sunk.	Total Depth.	Hours delay and causes.
Sep 28	7	7	13 - Rain.
Oct 5	15	22	12 - Water
12	10	32	6 - Water, sand and pump.
19	8	40	21 - Moist air, pumping and cave.
26	6	46	11½ Do.
Nov 2	7	53	5 - Pumping.
9	11	64	18 - Moving pump,Piping,Engineering.
16	10	74	7 - Holing.
23	13	87	8 - Blasting out Chute
30	22	109	4 - Blasting.
Dec 7	22½	131½	2 - Moist air.
14	22½	154	
21	18	172	
28	9	181	6 - Moisture, Mine idle.
Jan 4	18	199	
11	13	212	Cutting out Plat & plac. (Bearers & C. 2nd Lev.)
18	19	231	
25	20	251	
Feb 1	25	276	20 - 7 hrs,Rep, Timb. 13 Hrs,Mst. & Air.
8	20	296	
15	25	321	
22	28	349	
Mch 1	26	375	12 - Cutt. Hitches & Plac.Bear 5" L.
8	25	400	
15	25	425	

ASHLAND MINE.

Week Ending	Feet Sunk	Total depth	Hours delay and cause.
Mch 22	30	455	
29	30	485	
Apr 5	24	509	Cutting out & Plac.Bear. (& C. at 7th level)
12	23	532	Do.
19	30	562	
26	20	582	
May 3	20	602	
10	14	616	Cutting out plat 8th level.
17		616	
24		616	
31		616	
June 7		616	
14		616	
21		616	
28	13	629	Sinking skip pit
July 5		629	
12		629	
19		629	
26		629	
Aug 2		629	
9		629	8 - Making pentice.
16		629	
23	8	637	Worked one shift of 8 hours.
30	10	647	Do.
Sep 6	6	653	Do. Labor Day.
13	15	668	
20	20	688	
27	15	703	
Oct 4	30	733	
11	20	753	
18	20	773	
25	15	788	Cutting out Placing Bear etc.
Nov 1		788	
8	14	802	Sinking skip pit.

The following statement shows the cost of the work per month under the various heads.

NO.9 SHAFT.

Date.	Sinking from Surface.			Raising			Dr. to L. Shaft			Timbering	
1901	Ft.	Rate	Amount	Ft.	Rate	Amount	Ft.	Rate	Amount	Rate	Amount
Sept	8	18.44	145.14				176	4.46	784.54	14.99	119.22
Oct	42	29.06	1220.43	137	6.18	847.09	30	3.21	96.28	15.75	661.84
Nov	59	18.04	1217.27	89	6.54	585.50	80	3.72	297.93	11.96	705.85
Dec	81	11.66	1024.22	81	6.57	532.37	84	4.07	342.14	13.90	1126.09
1902											
Jan	86	14.24	1313.27	83	5.91	519.83	88	5.98	513.28	14.47	1245.04
Feb	94	11.74	1285.18	41	7.39	302.90	152	4.15	630.47	12.46	1171.47
Mch	130	9.59	1335.02	73	5.64	412.26	107	4.42	473.09	10.91	1418.37

ASHLAND MINE.

Date	Sinking from Surface			Raising			Dr. to L. Shaft			Timbering	
1902	Ft	Rate	Amount	Ft	Rate	Amount	Ft	Rate	Amount	Rate	Amount
Apr	102	10.73	1184.67				83	9.69	804.21	11.17	1139.31
May	14	38.60	640.64				82	6.20	508.63	25.27	353.89
June	13	14.83	231.93	46	12.42	571.11			150.35	28.19	366.58
July				69	9.36	646.13			61.95	76.89	
August	8	44.93	359.44	49½	8.03	397.86				25.09	200.72
Sept	86	13.90	1194.45				25	7.85	196.32	8.82	758.42
Oct	65	18.18	1181.73				58	12.31	716.02	10.00	650.46
Nov	14	38.55	539.78				72	6.88	495.23	25.61	358.62
Total,	802	16.05	12873.18	668½	7.20	4815.05	1037	5.85	6070.44	12.91	10353.47

Ashland.

ASHLAND MINE.

Detail of cost No.9 shaft, from Sept, 1st, 1901 to Nov, 30th,1902.Area of shaft 212 sq.ft. Dip 60°.

SINKING,			
Surface to 10th level, including cost for cutting plats,802 ft,		12873.18	
RAISING,			
From Different levels 668½ ft. Average cost 7.20		4815.05	
Total sinking and raising 802 ft, avg.cost 22.05 per ft,			17688.23
Compressor,	272.35		
Hoisting	425.72		
Pumping	158.18		
Total, - Cost per foot, 1.06			856.25
TIMBERING,			
Including work on plats, Cost per foot, 12.91			10353.47
Total cost for 802 feet of shaft, including timber and handling material, Air for drills and pumping exp, Cost per foot, 36.03			28897.95
DRIFTING			
To line of shaft including work on 13th level, 1037 ft Average cost 5.85 (Not to be figured in cost of shaft sinking)			6070.44
SINKING,winze for filling old rooms with rock from from shaft,			476.02
Diamond drilling for location of shaft			847.93
Total			36292.34
SHAFT EQUIPMENT.			
Skip roads and ladderways,		5575.26	
Skips, cages, cars, Wire rope and Sheaves		3606.40	
Steel shaft house and attachments,			
Shaft house per contract	5000.00		
Equipment, Pockets etc.,	2302.81	7302.81	
Automatic Top Tram Plant, (Not completed)		1018.87	
Installing pumping plant in mine, (Not completed)		1413.22	18916.56

ASHLAND MINE.

SURFACE EXPENSE.

Moving old pump house from near site of shaft,	1101.95	
Grading, Changing track etc.,	4476.51	
		5578.46

SUMMARY.

Sinking shaft, Drifting, Diamond drilling etc.,	36292.34	
Shaft Equipment	18916.56	
Surface Expense	5578.46	
Total		$60787.36

Ashland.

It will be noticed that the timbering is a very expensive item, and I give herewith the cost of materials for one complete set.

Cost of material for one set of timber for No.9 shaft.

	Feet	Price	Amount	Total		
2 Pcs 12 x 12 - 18	432					
2 " 12 x 12 - 12	288					
	720	19.00	13.68			
1 " 12 x 12 - 16	192	19.00	3.65			
2 " 10 x 12 - 10	200	13.50	2.70			
1 " 6 x 12 - 12	72	13.50	.97			
1 " 4 x 12 - 5	20	18.00	.36			
545 ft. 2 in hemlock	545	11.50	6.27			
2 in tamarack	180	14.50	2.61			
250 Wedges		.01¼	3.13			
1 Cd Soft wood			2.25	25.62		
65 lbs 1¼" iron,		2.00	1.30			
35 " 1¼" Washers		1.85	.65			
15 " 1¼" Nuts		.04½	.68			
10 " Spikes		2.45	.25	2.88	$38.50	

To this we have to add the framing, teaming and shop labor, amounting to approximately $10.00 per set. making a total charge on surface of $48.50 per set.

There are 152 sets of this size, and 17 sets of 14 x 14" timbers in all, the heavier timbers being used in the more treacherous ground close to surface.

Some of the charges which were quite heavy are not especially enumerated but are included amount Drifting, Sinking, Timbering and Ladderways. These include cutting out at the plats, and at the end of the shaft for pipes and passage way to ladders etc.

The following is a list of the sub-accounts to which charges have been made in this connection.

Revised list of accounts covering work on new No.9 shaft (commenced September 1901) General Account, New No.9 Shaft.

Sub-accounts.

A. Drifting to line of shaft, including cost of handling rock.

B. Sinking from surface, including top landing.

C. Raising, from different levels, including cost of handling rock,tramming etc.

D. Compressors, piping for air, cost for air.

E. Hoisting on basis of No. skips hoisted from shaft and drifts for new shaft, also for lowering material, if done overtime, also hoisting from new shaft.

F. Timbering, Cost of shaft timber, framing, putting in etc.

G. Skip roads, Ladderways, also including temporary hoisting, equipments etc, and underground ore pockets.

H. Moving old pumping engine house, and tearing down No.6 shaft house.

I. Surface equipment, Grading, changing tracks. New stocking grounds etc.

J. Shaft house and Ore Pocket, whether new or moving old one.

K. Diamond drilling, Exploring ground for new shaft.

L. Pumping, Including pipe and fittings etc.

M. Surface expense. Alterations.

N. Winze.

O. Skips, Cages and cars, Wire rope, Sheaves.

P. Installing pumping plant in No.9 shaft. Water columns from No.4 and No.7 shafts, and cutting out for pump house underground.

Q. Wire ropes etc., for transfer.

ASHLAND MINE.

A triple expansion pump of 900 gallons capacity has been contracted for, to be delivered by the first of May.

By that time No.9 shaft will be completed to the 13th level, and this pump installed at that point.

The saving by the use of this pump, which will cost $7500, as compared with the present plan of pumping, will be nearly $20,000 per year.

The following estimate of ore in sight was prepared by Mr. S. R. Elliott, our Mining Engineer.

The first table shows approximately the ore mined from each level from December 1st, 1901 to December 1st, 1902. The mine tally from each level was multiplied by the percentage of overrun which is approximately 8.1%. On some of the old levels where the ore is extremely loose the overrun will be smaller than on levels where it has not been caved.

Ore mined from December 1, 1901 to December 1, 1902.

Levels	3	4	7	9	
1			57640	30001	
3	754		9828	2845	
4		31027			
5		18638		9844	
5½		35130			
6½		5029	21665	30574	
7				21791	
8			815	9204	
8½				430	
9			5981		
10			13097		
13			5312		
Total	754	89874	114374	104789	309541
Total output of Mine					309699

My estimate of December 10, 1901 was very conservative. At that time I was not very familiar with the shapes of the ore bodies and the location of the dykes. At the present time with much more complete sections, a better knowledge of the mine, and the developments shown by the work during the year, I feel confident that the present estimate is not excessive.

Ashland.

ASHLAND MINE.

This estimate with a few exceptions shows the amount of ore actually in sight. It will be noticed that the amount of caved ore in some of the old levels has been greatly reduced. The work on the 5th level No.4 and 6½ No.9 indicate that the percentage of clean ore in the old workings is small.

ESTIMATE OF ORE IN SIGHT.

Shaft	Level	Tons		Developed in 1902.	
3	3	1000	Pillar		
3	4	1500	"		
3	5	1500	"		
3	7	7000	" & floor.		
4	4	25000			
4	5	29000			
4	5½	77000		48000	
4	5½ 7th	50000			
4	9 & 10	10000			
9	1	10000			
9	3	126000		126000	
9	5	32000		14000	
9	6½	76000			
9	7	116000			
9	7	32000	Floor		
9	8	22000	West	22000	
9	8	50000	East & Sublevels		
9	8½	20000			
7	1	54000		11000	
7	3	28000		28000	
7	6½ & Subs	145000		1000000	
7	7	30000			
7	8	49000			
7	9	20000			
7	10	32000		15000	
7	13	14000		14000	
Total		1056000		478000	

On the 4th level No.4 shaft we have mined 30000 tons and we can safely count on 25000 more. The old 4th level did not mine the ore against the foot wall, and the present indications are that we will open up an ore body of several hundred feet in length.

On the 5th level No.4 shaft the estimate has been greatly reduced. The same may be said of the 5½ in No.4 shaft and the 6½ in No.9 shaft.

ASHLAND MINE.

On the 3rd level in No.9 shaft the indications are that it will certainly go to the boundary as the level now is opposite the cave in front of No.8 shaft, but to the North of it, with no indications of caved ground. The vein is getting wider as we go East. At contract No.6 it is 80 feet wide, with ore still in the breast.

On the 6½ level No.7 shaft, in the new sublevels, I have not assumed that the ore will extend any farther East or West than it did on the main sub, and have assumed that it would run only 25 feet above and 25 feet below the top and bottom sublevel.

The indications are that we will have a larger body on top the sublevel than on the main sub. The dyke is at least 60 feet to the North of our present working, and the rock on the North side of this top sub may be only a few feet thick. This may be seen by referring to the cross section through No.8 shaft.

In conclusion will say that there is much more ore actually in sight at the present time than there was at the time of the last estimate with much better prospects for opening up new ore bodies.

ORE SHIPMENTS YEAR ENDING NOVEMBER 30th, 1902.

	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR	
Ashland	164299	95641	259940	244384	
Taylor	15603	21167	36770	40348	
Globe	292	1060	1352	2600	
Total	180194	117868	298062	287332	
Increase - 3.7% -			10730		

AVERAGE ANALYSIS MINE SAMPLES FOR 1902.

	Iron	Phos.	
Ashland	60.10	.043	
Taylor	57.30	.052	

ASHLAND MINE.

ORE STATEMENT NOVEMBER 30th, 1902.

	ASHLAND	TAYLOR	GLOBE	TOTAL	LAST YEAR 1/1 to 12/1,11Mo.
On hand December 1st,1901	8278	26580		34858	42444
Output for year	261451	46898	1352	309701	279746
Total	269729	73478	1352	344559	322190
Shipments	259940	36770	1352	298062	287332
Balance in stock,	9789	36708		46497	34858

AVERAGE CARGO ANALYSIS FOR 1902.

	Iron	Phos.
Ashland	60.60	.043
Taylor	58.21	.053

AVERAGE WAGES AND PRODUCT.

Product, 309701 tons, 1902	SURFACE		UNDERGROUND		TOTAL	
Product, 162638 tons, 1901	1902	1901	1902	1901	1902	1901
Average no.men working	98	85	389	353	487	438
Average wages per day	1.97	1.98	2.19	2.11	2.15	2.09
Average wages per Mo.25 days	49.25	49.50	54.75	52.75	53.75	52.25
Average product per man per day	9.82	10.51	2.55	2.55	2.04	2.05
Labor cost per ton	.189	.189	.837	.827	1.026	1.016
Diff in labor cost per ton			+.010		+.010	
Aver. Prod.Breaking & Tramm.			5.69	4.54		
Average wages for miners			2.47	2.38		
Average wages for trammers			2.11	2.04		
Average wages for contractors			2.35	2.25		

Ashland.

ASHLAND MINE.

The mining cost for the year is as follows:

	1902	1901-7 Mo.	Increase	Decrease.
Product	309701	162638	147063	
General expense	.055	.057		.002
Maintenance	.055	.079		.024
Mining Expense	1.109	1.115		.006
Cost of Production	1.219	1.251		.032
Exploratory	.027	.031		.004
DEPRECIATION				
Inventory	.020	.036		.016
Improvement	.016	.015	.001	
New construction #9 shaft	.168	.054	.114	
Total Depreciation	.204	.105	.099	
Taxes	.052	.105		.053
Central office	.039	.022	.017	
Cost on stockpile	1.541	1.513	.027	
Loading & Shipping	.018	.032		.014
Total cost	1.559	1.545	.014	

Average product per month 25808 23234 2574 per Mo.

Taxaes for year 1901 figured on tonnage for 7 months.

Ashland.

ASHLAND MINE.

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE.

KIND	QUANTITY	AVG PRICE	AMOUNT	AMOUNT 1901, 7 Mo.
27% Powder	62525	.092	5752.30	3736.70
30% "	14400	.095	1368.00	47.50
35% "	1050	.100	105.00	
40% "	12900	.108	1374.25	719.25
50% "	2450	.122	299.50	
Fuse	206050	.425	876.46	432.89
Caps	25300		359.15	198.20
Total			10134.66	5134.54

	1902	1901
Product	309701	162638
Pounds of Powder per ton of ore	.301	.295
Cost per ton for explosives	.033	.032
Increase 1902	.001	

STATEMENT OF COMPARATIVE WAGES.

	1902	1901	Increase or decrease 1902.
SURFACE			
Total number of days	29659½	15473	
Average rate	1 .97	1.98	Dec .01
Amount	58548.83	30644.48	
UNDERGROUND			
Total number of days	118334¾	63681	
Average rate	2.19	2.11	Dec .08
Amount	259245.16	134510.87	
Total days	147994¼	79154	
Average rate	2.15	2.09	Inc .06
Total amount	317793.99	165155.35	

ASHLAND MINE.

STATEMENT OF TIMBER USED YEAR ENDING NOVEMBER 30th, 1902.

Feet Timber.	Price	Amount.	
232180	3.29	7635.46	

LAGGING.

KIND.	FEET	PRICE	AMOUNT	
4 ft.Cribbing	84596	.006	651.87	
7 fT.lagging	421676	.007	3206.95	
8 ft. "	178151	.008	1374.63	
10 ft "	4580	.007	32.06	
Poles	4686	.002	73.11	
Total	693689	.008	5338.62	

Feet timber per ton of ore,	.749	
Feet lagging per ton of ore	2.24	
Feet lagging per foot timber	2.99	
Cost per ton for timber and lagging	.042	
Equivalent of stull timber to board measure,	301834	
Feet Board measure per ton of ore	.975	
Total product	309701	

Ashland.

ASHLAND MINE.

FATAL ACCIDENTS.

There have been three fatal accidents during the year. Michael McCarhty was killed April 12th by falling ground. A cap broke hitting him on the head and stunning him, and the sand from the surface ran in and buried him. Shortly before the accident the Captain visited the place and found everything in good condition. In order to make the drift strong, the dimensions were made smaller than usual being only five feet wide and six feet high.

May 9th., William Carlson was killed by falling into the shaft. He and his two partners were dumping a car of rock on the 8th level, when the car overbalanced and fell into the shaft, carrying him with it.

On June 6th. Frank Prattia was killed by being struck on the head by a piece of ore. His two partners were working on the second set, using a rope and block in order to hoist timber, when Prattia came into the room underneath them, and a piece of ore which was loosened, fell, striking him and crushing his skull.

IMPERIAL AND WEBSTER MINES.

Both these properties have been closed down since October 1900. The rooms below the open pit at the Imperial are full of water, and in case the mine is to be operated this season, it will take about 30 days to pump it out.

At the Webster mine the workings are only a few feet below water level, and there is consequently only a small amount of water to pump when the mine starts up again.

TITAN MINE.

The lease of this mine has been sold to Rogers, Brown & Co. No work was ever done at this point, as the demand for limonite ore is limited, and all that could be sold, could easily be obtained from the Imperial and Webster.

Ashland, Imperial & Webster.Titan

VOLUNTEER MINE.

32,736 tons of ore have been shipped from this Mine during the year, leaving in stock 9316 tons.

All the ore from "C" shaft has gone forward, and what remains of "B" shaft would not average over 54% in iron, but will be somewhat lower in phosphorus than the ore from "C" shaft, although not within the Bessmer limit.

MAAS MINE.

On February 10th the work of sinking the shaft was begun, and on November 30th, it had reached a depth of 140'1½".

Since reaching the quick sand the work has been extremely difficult, and has progressed very slowly, at the same time, no piece of work of like magnitude has ever been undertaken on the Lake Superior Ranges, the greatest depth heretofore sunk being 80 feet. In many cases it would take two years to accomplish this, so that we are very well satisfied with the progress of the work. There is only 17 feet yet to sink, but it will be attended with great difficulty, owing to the very heavy pressure and large amount of water.

The work would have progressed more rapdily, had it not been that the iron shoes on the NorthEast and North West corners of the shaft broke off, after reaching a depth of only 75 feet, and this has left openings through which the sand and water have had a chance to come in.

It is impossible to fix a definite time for completing the work of sinking the shaft to the ledge, but we hope to have it finished by the first of May. After reaching the ledge the sinking will progress at the rate of at least 75 feet a month.

The cost of the work to date has been as follows:

OPENING MAAS MINE.

	Labor	Supplies	Total	To date
General Expense				
General Expense	281.55	3.01	284.56	3842.08
Insurance		73.13	73.13	74.41
Relief Fund		14.40	14.40	208.80
Taxes		6524.62	6524.62	6524.62
Propn.Central Office, 13%,	107.65	42.35	150.00	1800.00
Total	389.20	6657.51	7046.71	12449.91
PLANT.				
Temporary Buildings				1476.46
Hoisting Plant				3137.97
Boiler Plant				8295.24
Unldg.& Teamg Material				478.45
New Baldwin Kiln Road	118.32	17.00	135.32	2219.73
Drainage, Launder & Ditch		2.55	2.55	3071.59
Tools in General use				460.75
Heating "Steam"	14.30	100.01	114.31	1833.74
Shop Equipment				755.32
Piping to shaft	7.14	8.35	15.49	1993.26
Fire Equipment				526.85
Installing Compressor,				77.00
Total	139.76	127.91	267.67	24326.36
NEW NO.1 SHAFT.				
Sinking to ledge	1270.04	125.33	1395.37	15434.82
Hoisting & Top Landing	348.38	121.46	469.84	4816.00
Pumping & Cleaning Launder	518.95	2899.10	3418.05	22725.26
Piping in shaft	144.00	29.81	173.81	3063.32
New Derrick				266.62
Setting Derrick	151.65	17.62	169.27	837.57
Rock trestle				994.58
Wire Rope,Shvs & Pulley stnds				432.32
Timbering (X)		2109.12	2109.12	9664.50
Ladders & Guides				118.50
Tram cars				60.86
New Skip Roads				299.51
Depreciation Inventory		267.82	267.82	267.82
Total	2433.02	1352.02	3785.04	58981.68
Total Opening Maas Mine	2961.98	8137.44	11099.42	95757.95

(X) Credit for timber not used. Carried over on Inventory.

BARASA MINE.

On the 30th of September, an option for eleven months was secured from the Barasa Iron Mining Company, on the S E ¼ of the S E ¼ of Section 32, 48-26. For the terms of this option and lease reference is made to the copies on file in your Office.

It was decided that the most effective and economical method of exploring would be to pump out the mine, and attack the work from underground, rather than by diamond drilling from surface. It is known that some ore has been developed, and it is possible that enough can be mined in the process of exploration to pay for the work. The machinery has been overhauled, and a new portable boiler of 50 H P capacity installed, to take the place of one of the old ones, which was worn out. Pumping began on November 4th., and on December 1st the water had been lowered to 195 feet 5". As soon as the mine is dry the work of exploration will be started.

LUCY MINE.

On September 8th the lands owned by the Pendill estate situated in section 6 and 7 Town 47 Range 26, containing about 60 acres of land, were purchased. This property includes what was formerly the Macomber, but later known as the Lucy Mine. This mine contains a manganiferous ore running about 54% in iron 40% manganese, and 06 in phosphorus. Ore of this composition is very desirable for charcoal furnace practice.

The reports in regard to the property were very conflicting, some persons stating that there was still a considerable tonnage left in the old workings, and others that the mine was exhausted. The preponderance of evidence however is in favor of their being considerable ore left, and it was decided to reopen the mine for the purpose of reaching this ore, and also for exploring.

The ore bodies at this point all occur in small lenses, and the cost of mining will consequently be greater than if it was in one large deposit.

Barasa & Lucy.

LUCY MINE.

It would appear, however, that there is a good chance of finding bodies of merchantable size and quality, that will probably pay for the cost of reopening.

Work had not begun at the close of the year, but arrangements were under way to purchase the necessary machinery.

MESABI RANGE.

In January it was decided to enter the Mesabi Range, and acquire properties for the purpose of exploration.

This work has been entirely conducted by Mr. J. E. Jopling, our Mining Engineer, and to him belongs the credit of developing what ore we have discovered on this range.

Following is his report of the work done during the year:

When it was decided last January to begin explorations on the Mesabi Range, the Company had had no experience in that District, nor had the writer even visited it.

It was realized that there would be a great deal of work to be done, to familiarize ourselves with the local conditions and geological condition of the ores and rocks, and also with the ownerships of land and discovered ore bodies.

A start was made in February, with an examination of a property, which was not afterwards bought, near Hibbing, where the methods of exploring were studied, and much information given by Mr. E. J. Longyear, the Consulting Engineer of Hibbing.

This was followed up by correspondence with Mr. Louis W. Hill, President of the Eastern Railway of Minnesota, part of the Great Northern Railway system. In order to gain traffic contracts for this railway, Mr. Hill had already bought much land on the Range, and had invested money in acquiring and exploring other lands under option. A long list of lands, some already showing ore, was furnished us, and Mr. Philbin the General Manager kindled loaned his private car so that q quick examination could be made. I made a trip in April staying at the different sidings of the Railway Mesabi.

on the Range, and was able to acquire considerable information. After that Mr. E. J. Longyear accompanied me for forty miles along the Range between Hibbing and Grand Rapids visiting several exploring camps on the way.

As a result of this expedition the Company took from Mr. Hill, the exploring options on Section 11, 56-23, Section 18, 58-19 and Section 36, 58-18. Later on it also acquired the land on section 10, 56-23 from him, all with traffic contracts with his Railway.

The Crosby, Section 30, the Rock, the Vivian and the Daniels were taken from other parties and without traffic contracts.

During the summer the prices asked for ore bodies shown up, and the terms of exploring options advanced steadily with more rigid requirements from the fee owners. The list of the sales of ore properties and the prices paid for the same certainly exceeds thatof any previous year.

Many of these properties were offered to this Company, and including some low grade ores, would cover nearly 100,000,000 tons. Over half this amount was in well proved up properties in the Hibbing district, nearly all fine in structure, and requiring underground mining. Most of the rest were scattered between Hibbing and Virginia, but had disadvantages, either of deep surface or structure, or else were low in iron.

Very little was offered, not over five millions, at the East end of the Range.

There was some low grade sandy ores at the extreme West end, towards Grand Rapids.

It may be here remarked that as only part of the ore found was offered to us, and that as Mr. Longyear estimated as a conservative figure the total of 600,000,000 tons discovered up to a year ago, the total proved to date must exceed 800,000,000 tons, over one half of which is in the Hibbing-Buhl District.

In a general way, the ores at the East end of the Range are coarser in structure, but occur in smaller bodies. Some of the most valuable ores have been found in the Virginia and Buhl Districts, in point of structure and analysis, while at Hibbing, most of the ore is fine and covered by a greater depth of sand.

It is claimed by some explorers that these immense bodies of low grade ore are found to contain ores fully equal in grade to the best, but that these have not been found without persistent search.

At the West end of the Range there is much lean ore, consisting of broken taconite mixed in the deposit.

The U S Geological Survey have made a preliminary report on this Range, which will be followed in a short time by more complete maps.

Although simpler in structure than most ranges, there are still many points yet to be studied. Roughly speaking the formation consists of an iron-silicate more or less impure, lying on a quartzite, which dips South at an angle of say10°, and the whole covered with glacial sand and ground from 10 to 200 feet thick. The sand being lighter on the North side.

Now the main point for the explorer to determine is the depth to which it is profitable to drill in this iron silicate or taconite, as it is locally termed. The ore while being a local decomposition near the top of the formation, is frequently found under as much as 25 or even 50 feet of solid taconite. Many properties have been partly explored and abandoned only to reward a more diligent search at greater depth.

The ore bodies are extremely irregular in shape, both in horizontal and vertical section, and there seems to be no rule by which they can be found or traced. More often than not the largest bodies lie in low ground or a small stream may traverse them, caused by the more rapid cutting away of the ore which is softer than the surrounding rock.

Mesabi.

However much finding of ore may be attributed to luck, there are rules, which have proved the best way to explore and measure up the ore when found. Mr. E. J. Longyear of Hibbing is generally recognized as a most scientific, accurate and conservative Engineer in determining these faatures.

Messrs. Cole & McDonald of Virginia are also well known for the same qualities.

The placing of test pits or drill holes at stated distances, about 300 feet from each other, the method of collecting samples in drilling, and the arbitrary rules xxxxx for measurement have all been proved by a long seriaaes of tests and mining.

The contract prices of about $3.00 a foot for digging or drilling in soft material and $6.00 for drilling in hard ground can only be approved by Company account work when there is enough to pay for the equipment, and by the employment of thoroughly competent men. As far as can be learned the contractors have made more by taking interests for their work, which have developed mines, than by regular business.

The ownership of lands on the Range is a study for the new comer. Abstract books can be bought and show certain ownerships very plainly, but many of the titles are involved, or recent transfer or leases have not been recorded, or else as in the case of State Lands, the present holders of options are not on record. The Range being 80 miles long and sometimes over two miles wide, it is too big a work to begin by surface examinations. Most of the land is cut over pine country, and the soil covers the rocks, and it is remarkable only for the sameness of its scenery, being different to most other mineral districts.

From the first visit a constant stream of people interested in exploring came to offer me lands, which they held under option, or thought they could get from friends. Maps were prepared to show these offers, most of which were never

looked into. Upon some of these lands, ore has already been found, but with so many duties it was impossible to give more than passing attention to them.

Although there was a usual condition of 25¢ royalty and $25,000 bonus on taking lease on a single forty, yet there were nearly always other conditions, making the option undesirable, besides which the business in them was so brisk that only a few days could be obtained for consideration.

Accompanying this report is a map, showing the position of the various options described. The blue prints furnished by Mr. Longyear and Cole & McDonald are supposed to give the detailed information of this work.

The following is a description of the various operations of the Company during the year.

The following are the descriptions of land explored in this section under an option obtained from Mr. Louis W. Hill of St Paul:

S W ¼ of N W ¼
N W ¼ of S W ¼ Section 10, 56-23.

The terms of the option which will be found at length in the contract can be sumed up as follows: $5,000 cash and $45,000 payable on taking the lease, and also 2½¢ additional royalty with a minimum of $2500 a year to Mr. A. M. Chisholm. The land belongs to the State and has the usual conditions of such leases.

Upon an examination of the land being made it was found that the quartzite lying to the North of the ore crossed the land a little South of the West quarter post of the section, leaving only a small portion of the south forty on the ore formation. The explorations shown on the accompanying blue prints were made by Messrs. Cole & McDonald of Virginia, who were consulted as to carrying on the work. Their represntative collected the samples and they were analysed in the usual manner under serial numbers given to their own chemist.

In their opinion the land has now been thoroughly explored, and the following is their estimate of the ore discovered.

MESABI RANGE.

179,136 tons,	60% and over.
179,136 tons,	58 to 60%.
111,960 tons,	56 to 58%.
223,920 tons,	50 to 56%
44,784 tons,	under 50%.
Total, 738,936 tons.	

This estimate does not take into account the results of a drill hole put down on the land to the South East under Mr. Hill's direction. This hole showed 44 feet of ore, and my amended estimate to include this corner of ore would show in a general way that there are 940,000 tons analyzing about 57% iron and .031 phosphorus.

It will be noticed that the surface is light enough to enable us to take out the ore by open cut or milling.

Negotiations are now in progress with Mr. Hill to obtain the lands to the south and east, as the ore is known to extend in those directions. If these lands can be obtained at a reasonable figure, it looks as though the Company had acquired a valuable possession at this end of the range.

The drilling was all done under contract at $3.00 per foot for surface ore and broken taconite and $5.50 per foot for solid ledge. Only one drill was employed as results of a hole were needed before laying out more work. The exploration is now considered complete by Messrs. Cole & McDonald.

The railway must be extended 5 or 6 miles to reach this land from Nashwauk, the present terminus. It is not settled at this time when this line will be built. Considerable ore has been found adjoining the land, but they mostly belong to Mr. Hill.

Mesabi.

MESABI RANGE.

SECTION 11.

This is the land belonging to Warren and others of St Paul, and among the first options taken through Mr. Hill. The descriptions

S W ¼ of N E ¼
E ½ of N W ¼
N ½ of S W ¼
N ½ of S E ¼

All in section 11, 56-23.

Blue prints showing the explorations completed up to October 16th when the work was abandoned accompany this report. No merchantable ore was found on this land.

Owing to its position 20 miles both from Grand Rapids and Hibbing, and the bad condition of the roads this work was very hard to get started and expensive to carry on. Captain John Mallman, one of the oldest explorers on the Range, was engaged to take charge of the work, and he began at the end of May with three test pit crews. In June three drills were taken out to the property, and during August two diamond drills were added to the equipment. A camp of tents had to be established and all provisions bought at Grand Rapids and hauled out, making the board of the men very expensive, as we could only charge them $18.00 per month.

The sand and gravel on the land was found from 30 to 100 feet deep, and below this in most cases was found the taconite very hard to drill. That on the South part being a very hard black material apparently without any signs of being near an ore body. Some lean ore was discovered in eoms of the drill holes, but it was mostly a limonite running less than 50% in iron on the average.

The Company spent a large sum of money exploring this land and Mr. Warren, one of the owners, told me that he wished to thank us for the thorough manner in which we had carried on the work. Mr. E. J. Longyear of Hibbing had a representative on the ground to lay out the pits and watch the progress of the work and take samples. Mr. Longyear gave it as his opinion that more work should have been done to thoroughly and completely test the land, but the fact that the ore was alimonite and the surface in most places too deep for stripping decided the Company to suspend operations.

The cost of the drilling and test pit work proved to be higher than the usual contract prices near Hibbing, which is accounted for mainly by the purchase of new mahhinery, and the cost of hauling it so far over bad roads, and also the high cost of provisions. The nature of the ground was such that a contractor would probably have lost money at the usual prices charged.

Captain John Mallman left the Company's employ before the completion of the work, believing he said, that we were wasting our money exploring such worthless land. He was hardly justified in saying this as so many of the important finds that have been made recently were brought to light only after persistent search in land that had been abandoned by men regarded as good explorers.

I wish to say that Captain Mallman worked very hard during the time he was with us, and his experience on the Range was very valuable in many ways, and that his camp was spoken of as a model one in point of order and cleanliness. While around us there was a great deal of typhoid fever, there was hot a single case of sickness in our camp during the season. The only accident befell a teamster, whohad the misfortune to break his leg, while loading a heavy stick of timber. It was Captain Mallman who introduced us to Mr. George H. Crosby, from whom the Company bought the Crosby Mine.

Mr. John Engstrom of Ishpeming who was sent to run the diamond drills took charge of the explorations after Captain Mallman's departure.

Mesabi.

MESABI RANGE.

CROSBY MINE.

This property comprises seven leases of eighty acres each on land owned by the Mississippi Land Co., of Minneapolis, and issued on a basis of 20¢ royalty and 50,000 tons minimum to the East Itasca Mining Company, comprising Senator E. B. Hawkins O. D. Kinney, Geo. H. Crosby and Captain Pearce, all of Duluth.

They are situated at the town of Nashwauk, 15 miles West of Hibbing and are as follows:

Lease No.1.

W ½ of S W ¼ Section 31, 57-22

Lease No.2.

W ½ of N E ¼ Section 31, 57-22

Lease No.3.

N E ¼ of N E ¼ Section 31, 57-22
N W ¼ of N W ¼ Section 32, 57-22

Lease No.4.

S E ¼ of S E ¼ Section 31, 57-22
S W ¼ of S W ¼ Section 32, 57-22

Lease No.5.

S E ¼ of S W ¼ Section 32, 57-22
S W ¼ of S E ¼ Section 32, 57-22

Lease No.6.

N E ¼ of S W ¼ Section 32, 57-22
N W ¼ of S E ¼ Section 32, 57-22

Lease No.7.

S E ¼ of N W ¼ Section 32, 57-22
S W ¼ of N E ¼ Section 32, 57-22

These are part of a block of land on which explorations have been conducted by the East Itasca Co., for some two years. They had discovered and sold the Hawkins Mine to the Deering Harvester Co early in the present year, where they had proved up a large quantity of ore.

Mesabi.

MESABI RANGE.

CROSBY MINE.

Some time in May Captain Mallman had introduced me to Mr. Crosby in his office, when he offered these lands to me at 5¢ additional royalty. At the time no ore had been found.

In June I called again upon receipt of a telegram from Mr. Duncan telling me to do so, and find out his latest offer, and it so happened that the drill had just struck ore in hole 107.

He showed me a sample of the ore, part of which I took to Ishpeming, and realizing that it was high grade, as well as coarse structure, I immediately asked for a refusal which was granted.

Mr. Crosby was going away, and made an appointment for a week later. On calling again he showed me the results which ran about 64% in iron and low in phosphorus, with only 20 feet of sand above it. I telegraphed to Mr. Duncan, and secured an option on the basis of 7¢ additional royalty, the 7¢ to be paid as the ore was found. A visit to the land on July 2nd confirmed my high opinion of the property, as hole 110 had just struck the same grade of ore.

On July 8th at a meeting of Mr. Mather and ourselves with the East Itasca Mining Co's representative, the contract to take the property was entered into. The only change of importance being that the royalty on leases 1, 4, 5, 6 and 7 should be 5¢ additional as the ore was mined.

Explorations have continued to the present time, as shown in the blue prints attached to this report. The work is being conducted under the direction of Mr. E. J. Longyear, whose representative collects the samples and directs the work.

Mr. Gus Carlson has the contract of doing the work, and has had as many as 8 gangs of test pitters of three men each sinking pits on the land, and also has on the ground six churn drill outfits, and either four or five diamond drills, as he is able.

Mesabi.

MESABI RANGE.

CROSBY MINE.

The ground being so hard the work has proceeded more slowly than was anticipated, and the amount done is really controlled by the rapidity of the diamond drilling, which is done to complete each hole. As usual in such work there are constant delays and mishaps besides the difficulty in keeping men at work in out of the way places.

From the latest reports it seems that leases 4, 5, 6 and 7 do not cover any merchantable bodies of ore, and as far as our Company is concerned, it is felt that the sooner this work is stopped,&the expense of royalty payments cut off the better. Our contracts are to explore them to the satisfaction of Mr. Longyear, and it is expected that this work will take at least two months longer.

Lease No.1 has shown up some 55% ore under a shallow surface of sand. There is still an area unexplored, and we are in hopes of finding a body of merchantable ore on the land.

Leases 2 and 3 have been proved to contain, according to the estimate of Mr. Longyear the amount of 2,392,961 tons containing iron 56.89, Phosphorus .041, and this was paid for on January 9th, 1903 at the rate of 7¢ per ton.

With the Great Northern Railway within a few hundred feet of the land, and only an average depth of 20 feet of sand over part of the ore, we ought to get a fairly large product during the year of 1903.

There is an exploring camp upon the land, but none of the work preparatory to mining has been begun.

A small stream will have to be diverted and more exploring done to determine just where to put the stripping without covering other ore, and also to complete the contract to prove up all the ore.

The land lies well and is not wet except in the spring.

MESABI RANGE.

SECTION 30.

This is the South East ¼ of Section 30, 57-22, and lies just North of leases 2 and 3 constituing the Crosby Mine.

The option was purchased from Messrs Sweeney and Chesebrough of Duluth last July for the sum of $10,000 with a contract to pay $10,000 for each million tons shown up after the first million.

The option is from the Mississippi Land Co., and the leases are to be given on the South ½ and the North ½ separately, at the rate of 25¢ per ton and a minimum of 75,000 tons per year.

This land was obtained at a time when it was expected that the Crosby ore extended as far North. Explorations have been disappointing. The North part is practically all quartzite as the dip is flat, and so far the results on the S W ¼ of the S E ¼ have not shown ore. There is still an area on the S E ¼ of the S E ¼ which has not been drilled. Test pits shown on the blue print and others sunk by former explorers all show taconite, consequently a stripping mine is hardly to be expected.

Drilling on the North part of the Crosby has lessened the chance of finding ore on this land. Explorations would take at least two months longer.

SECTION 18.

Lots 2 and 3 of Section 18, 58-19.

These are state leases obtained through Mr. L. W. Hill of St Paul with a general condition in the option of drilling a number of holes to a certain depth in taconite, but without a forfeiture clause in case of non-performance. The parties who transferred the option to Mr. Hill have expressed themselves satisfied to grant us an extension under the condition that we put down several holes to the best of our judgment. The work of test pitting this land, as shown on the accompanying blue print, was begun last May and finished some time in August. As will be seen the land is fairly Mesabi.

dotted with pits which will average about 25 feet deep, striking a floor of hard taconite every time. Only in the extreme North East corner of the land is there any decided indication of the proximity of an ore body, and it is my intention to have one hole drilled in that part of the land at least.

Messrs. Cole & McDonald have been asking for more time before beginning the work, although they promised to take charge of it some time last fall. It is uncertain just when they will commence, but the work should not be very difficult or expensive. Considerable ore has been found on the adjoining land, very often capped with a thin layer of just such taconite as we have encountered. I consider that we have a very good chance of discovering some ore on this land, andthink it would be advisable either to bring our equipment from Mesabi station or else buy some more, rather than failt to live up to our contract and lose the land. However, I trust that neither of these things will be necessary, and that Messrs. Cole and McDonald will se their way to commence operations in a short time.

SECTION 36.

This land consists of a State Lease on the S E $\frac{1}{4}$ of Section 36, 58-18, an lies two miles West of Eveleth. It was obtained through Mr. L. W. Hill of St Paul, to whom we paid the sum of $5,000 for his interest. A few test pits were sunk during May and June in the clay but in no case was the ledge reached. The land had been partly explored several years ago, and there is a row of pits East and West across the center of the land. It is uncertain just what they found in these pits, and while the land is situated rather too far from the known ore formation to offer much chance of discovering ore, yet it would be well at some future time to drill a few holes and test the formation at this point. As I understood it at the time of purchase it was recommended by Mr. Mr. Hill more in the light of a possible discovery, and was taken from the low price offered..

MESABI RANGE.

SECTION 36.

As the State requires only a small amount of work to be done annually there is no immediate hurry in completing these explorations.

The Superintendent of a Mine on the Range told me he had traced an ore deposit to within a short distance of the land and that he considered it worth while exploring, especially near the North East corner.

ROCK OPTION.

The following lands are included under the terms of this option although our operations have been confined to the first two descriptions:

S E ¼ of S E ¼ Section 28
N E ¼ of N E ¼ Section 33
N W ¼ of N E ¼ Section 33
N E ¼ of N W ¼ Section 33, all in 59-15.

The option on this land is in the form of a contract that requires us to spend $5000 in exploration or drill four holes on each of the first two descriptions to a depth of 100 feet below surface. In explanation of this I wish to state that I advised the Company to accept this proposition on account of the low rate of royalty which was 25¢ per ton without a bonus, and because the land is close to ore bodies which have been discovered on adjoining properties. This option was taken out early last summer before I had as much experience on the range as I since acquired, and the stipulations are such that I would not now think of submitting to this Company. These parties had but lately forced Mr. Edward Sweeney to pay them the sum of $3000 for non performance of a similar agreement. It was represented to me by Mr. Hollister that all they wanted was a thorough exploration of the land, and that in the ordinary course of events we should certainly drill to that depth. Mr. Hollister took the trouble to accompany me to the Court House and show the evidence brought in the suit by Mr. Sweeney which showed the meagre reports which he had turned in.

MESABI RANGE.

ROCK OPTION.

Upon trying to get the drilling done by contract, it was only after a long time that I could persuade Messrs. Cole & McDonald to do the work for us. The finally took it, but told us we might be compelled to pay higher than the usual rates for drilling on account of the very hard taconite which had been encountered in that part of the District. Until November all they did was to sink 14 test pits in all, to the ledge, as they claimed they were unable to provide a drill. I finally had to give them a churn drill from section 11 equipment to which they added a diamond drill. The test pits had not shown any place where the taconite was richer in iron or easier to drill, so we started in pit 11, in which some water had been struck. At that time it was impractical to haul water and the rest of the pits were dry. Here we drilled to a depth of 60 feet passing through nothing but lean and banded taconite. I stopped the hole at this depth leaving the casing pipe in it so as to finish in case we were compelled to drill to 100 feet in depth. We are now drilling in hole No.4 and expect to drill two more holes in the North East part of the land nearest to the known ore bodies. Since the snow has fallen the work of hauling water to the drill will be less expensive. Messrs. Cole & McDonald have now concluded they are willing to take the contract at the customary rates of $3.00 and $6.00 and we expect the work to progress without further difficulty.

The position of the East boundary is in litigation, and I have limited our explorations to the line claimed by the opposite parties. The evidence at the trial is mostly in favor of our lessees, and if they win their suit it will restore to our side a strip of land 200 feet wide lying nearer to a known ore body. This decision is expected in January. The parties interested in the lands have expressed to us that they are satisfied with our work as far as we have gone, and I think that after continuing the work for some time further they would be willing to modify the drilling both as regards depth and number of holes on both descriptions, leaving the matter of exploring more to our judgment.

At present however, it would not be advisable to approach them in this matter.

On the whole while regretting having tied up this Company to the work stipulated I still think the exploration is favorable in many respects, and think that we are justified in spending more money on the land.

DANIELS OPTION.

This is an option for the purchase of the fee of 160 acres at a price of $20,000 upon completion of the explorations. The lands are situated as follows:

N W ¼ of N W ¼ Section 29, 59-14
E ½ of N E ¼ section 31, 59-14
N E ¼ of S E ¼ Section 31, 59-14.

Only the land in section 29 and the first description in 31 are supposed to be on the ore formation, although the line of the slates to the south have not been accurately determined. These lands have been explored twice. The last time by Mr. E. J. Longyear who put down four drill holes in section 29, showing 60 feet of sand and about 20 feet of hard taconite in each hole. It is thought that possibly one more hole near the center would be all that should be drilled to test this forty. This work must be done in the winter as the land is in a swamp. The lands in section 31 have several drill holes, five in all I think, and all of them close to the small stream. The results of these holes are not known, but the water rising from them now, show considerable impregnation of ore. The first drill hole by our Company was put down in this area and showed nothing but lean taconite. We are now drilling in other parts of the land. A few test pits have been sunk, but most of the land is so wet that little depth can be reached on account of water. Ore bodies are likely to occur on this land the same as those described in the Vivian section of this report. The fact that they are small in this district makes the work of exploring harder and more expensive.

Mesabi.

MESABI RANGE.

DANIELS OPTION.

Mr. E. J. Longyear is also looking after this work, and his advice will be taken as to continuing the explorations up to a certain point, but care will be taken not to exceed a cost greater than is reasonable. Mr. John Engstrom is in charge of the men for this Company.

VIVIAN OPTION.

At the close of explorations on Section 11, 56-23, it was decided to take the three drill outfits to the East end of the Range.

In a report dated October 6th I indicated the best of the recent offers on the Range showing in it the lands offered at the most reasonable terms. After further investigation we bargained for and took exploring option on the following lands.

S E ¼ of N E ¼ section 22
N E ¼ of S E ¼ section 22
N W ¼ section 23
N ½ of S W ¼ section 23, all in 59-14.

These are State Leases, and the usual terms of 25¢ per ton with a low minimum, and were transferred to us by an option from J. G. Vivian of Duluth at a purchase price of $50,000 on completion of explorations if the results showed sufficient ore.

Explorations were begun in the month of November with one drill and one test pit gang under John Engstrom. The work was put in charge of Mr. E. J. Longyear who advised the position of pits and drill holes. Mr. Longyear has a camp at Mesaba station, and as he is exploring on adjacent lands he gave us the benefit of his experience. He has had a survey made of the land locating the boundaries and also laying out lines on the ground for work. Our men board at his camp, saving the expense of maintaining one of our own.

MESABI RANGE.

VIVIAN OPTION.

This part of the range where the D & I R. Ry to Tower and Ely crosses it, is where the first ore was discovered, and the entire territory has been explored to a certain extent. All the pits I could find on these descriptions were too near the north line which showed a lean and banded streak of taconite, which was magnetic. The land slopes very rapidly towards the south to the junction between the taconite and slates. It is toward this low land we have bent most of our energies in exploring. The slate has been found in a couple of pits, and our explorations are mainly along the softer rock near the junction, as will be seen by the blue prints a number of test pits have been sunk striking taconite which has proved in almost every instance to be very lean and hard. In some cases, especially towards the north, it is magnetic, while towards the South it is more apt to consist of a lean iron carbonate.

The ore found on the adjoining lands appears to occur in small deposits irregular in shape and separated from each other. The depth of glacial sands, gravel and clay is usually less than 25 feet on the hills, and about 60 feetin the swamps and low ground. While ore bodies are smaller and less frequent, and therefore harder to find at this end of the range, the ore itself is usually of coarse structure running 58% on the average, and rather lwo in phosphorus.

Explorations up to date have shown nothing of any value on this land. Further exploration is recommended on lines laid down by Mr. E. J. Longyear. The sand so far has been very light, not over 15 feet on the average, so that the cost of digging test pits is small. It is not expected that we shall do much deep diamond drilling, but possibly one or two test holes will be put down further than the rest. This work will be watched very closely with the object of stopping it as soon as we feel reasonably certain that no ore exists, or that none can be found without a large expenditure of money. The land is as well situated as others upon the range where ore is being found.

Mesabi,

VERMILLION RANGE.

During the year a number of visits were made to examine properties on the Vermillion range.

The famous Section 30, East of Ely and the Silverman were the most important. Prof. H. L. Smyth made the examination in both cases, and I accompanied him. There were also other properties examined.

No explorations were made by this Company during the year, as the chances for discovering ore were supposed to be too slight. Much money has been spent and no discoveries of late have been reported.

I think that with a more careful survey of certain localities that we might plan explorations with greater chance of success. This would of course take time and money. As far as I can learn, and when I had opportunity to see it, the drilling now being done is without any particular system or study, and consists of drilling deep holes straight down somewhere in the vicinity of a jasper outcrop.

It is a big territory andthe geology is exceedingly intricate. As far as offers of land go, there is no dearth, almost every one in Duluth and Superior owns an interest in land on the Range and is willing to have it explored.

Vermillion

Vermillion.

MICHIGAMME MINE.

On September 1st., 1901 the lease to this mine was cancelled. The only work done during the year was a shipment from the stockpile amounting to 10432 tons, leaving a balance in stock of 646 tons.

Most of this ore is in the rills left by the steam shovel, and will have to be loaded by hand.

AVERAGE ANALYSIS OF SHIPMENTS FOR 1902.

	Iron	Phos.
Michigamme	59.40	.111

Michigamme.

I beg to transmit herewith the report of our Master Mechanic on the the operations of his Department for the year.

Respectfully submitted,

Agent.

THE CLEVELAND-CLIFFS IRON CO.

49. 2M. 1617.

CLEVELAND IRON MINING CO.
IRON CLIFFS CO.

M. M. DUNCAN, AGENT.

ISHPEMING, MICH., 12th Feby 1903.

IN YOUR REPLY PLEASE REFER TO FILE

SWANZY REPORT.

ash

RECEIVED
FEB 1 1903

Mr. Wm. G. Mather, President,

Cleveland, Ohio.

Dear Sir:

I have yours of the 5th., returning the plan of the Swanzy District, which accompanied Mr. Jackson's report.

In accordance with your request I have had holes 14, 15 and 16 shown on the map. Hole No.13 has not as yet been definitely located, and we have not sufficient data at hand to show its probable location at this writing.

Yours truly,

I map under separate cover.

M. M. Duncan
Agent.

Feb.5th,1903.

Mr. W. M. Duncan, Agent,

Ishpeming, Mich. --- SWANZY REPORT ---

Dear Sir:-

I have yours of the 2nd, enclosing Mr. Jackson's report on the work in the Swanzy district. It is well made out and the maps are interesting. I return to you however, herewith, the plan of the district, so that you can show thereon Holes Nos. 13, 14, 15 and 16.

Yours truly,

WOM-EWB

President.

THE CLEVELAND-CLIFFS IRON CO.

49. 2M. 1-03. 1617.

CLEVELAND IRON MINING CO.
IRON CLIFFS CO.

M. M. DUNCAN, AGENT.

ISHPEMING, MICH., 2nd Feby 1903.

IN YOUR REPLY PLEASE REFER TO FILE

Mr. Wm. G. Mather, President,

Cleveland, Ohio.

Dear Sir:

I enclose Mr. Jackson's report of the Swanzy explorations, together with maps and photographs of the location.

Yours truly,

M. M. Duncan

Agent.

SWANZY EXPLORATIONS 1902.

On March 19th, 1902, Mr. Duncan received an option on all of the lands of the Escanaba River Land & Iron Co, which were not already under lease, near the town of Princeton in T 45 N, R 25 W Michigan.

These lands included lots 1, 2, 3, 4, 5 and 6, the North ½ of the S W ¼, the West ½ of the S E ¼, and the S E ¼ of the S E ¼ of section 20, and lot 5 section 28, all in T 45 N R 25 W.

These lands lie to the South East of the present Princeton Mine and are nearly directly in line with the direction the Princeton ore trends.

The shaft of the Princeton is on the S E ¼ of the S E ¼ section 18, and they had begun a new shaft a little North East of the center of the N W ¼ of section 20. They also have control of the N E ¼ of section 19 and the N W ¼ of section 20.

Most of the land included in the new Escanaba River Land & Iron Co's option had been explored to some extent by J. Q. Adams of Negaunee and others.

On the lands of the Escanaba River Co., during the previous exploration, several shallow shafts and innumerable test pits had been sunk, and at least one drill hole put down, while on the Stephenson land, standpipes show that there must have been some drilling done. I understand this was done by John Maas and Lobb of Negaunee, but I do not know positively.

At the base of the hill just West of the "Nancy Hanks" Shaft, the test pits showed good blue ore underlying the jasper of the hill. (See map attached.)

Under the conditions of the option it was necessary to begin work before May 1st, 1902. Mr. Jopling was instructed to go to Princeton, and select the most favorable spot for drilling. He selected a place on the high ground in the N E ¼ of the S W ¼ of section 20, a point about 500 feet West of the Nancy Hanks exploration. This was in April and a diamond drill was sent down immediately.

Work preparatory to setting it up was started on April 24th, and the drilling began on May 1st., with a standpipe of nine feet through the surface. The drilling started in jasper, and progressed very slowly on account of the caving of the hole. On May 14th at a depth of 111 feet from surface ore was struck, and drilling was ordered stopped by the writer, in the absence from Ishpeming of Mr. Duncan and Mr. Jopling. The reason for stopping the drill is obvious. The land immediately South was the 80 acre tract of the I. Stephenson ~~xxxxx~~ Co., which had been under option by J. Q. Adams. Adams had not complied with the terms of his option, and we had brought the fact to the attention of the I. Stephenson Co, and applied for an option ourselves. Up to May 12th, the time of the expiration of Adams option, we had been able to do nothing, and now in order to excite no suspicion of our finding ore at No.1 hole, we started the drill men at work test pitting off to the North and West of the drill and at a considerable distance. It was thought in case we did not get an option on the Stephenson tract, we would not for the present at least run any risk of exploring for other people's benefit, and thus make it harder to get the option. As it was there were a great many applicants for the option in question, and it was not unil June 17th that arrangements were made that practically insured it to us.

On April 14th., we had got a one year's option from the Chicago & North Western Railway Co., covering the N½ of sec 29 and the E ½ of the S E ¼ of Section 19. Test pit crews were started on section 19 to show the depth, material and nature of the ledge. These test pits, a number also being sunk on E R L & I Co's lands, were started May 1st., and carried on until June 17th.

When ore was struck at hole No.1 we applied for options covering the W½ section 19, the W½ of the S E ¼ section 19 and the S½ section 29, 45-25. These we received from the Chicago & Northwestern Ry on June 4th.

Swanzy Sheet No.3.

With the Stephenson it was different, on account of the number of applications for the option on this S½ of the S W ¼ of Section 20. It was finally granted to F. J. Kipp, of Milwaukee, dated June 16th, 1902, and to run to December 16th 1902. Kipp for a consideration of $1,000, assigned to M. M. Duncan, and Mr. Duncan then assigned to the Cleveland-Cliffs Iron Co. This option has since been renewed to March 16, 1903.

On June 2nd., hole No.2 was started on section 19 of the C & N W Co, and on June 11 work was resumed at hole No.1. On the 18th of July work was started on the Stephenson at hole No.5. Since then to the present time drilling has gone on uninterruptedly on all these properties with very gratifying results, on the E R L & I Co, and on the Stephenson, and the outlook is bright on the C & N W lands.

Escanaba River Land & Iron Co's Land.

At hole No.1 on the E R L & I Co when work was resumed, there was found that the top of the ore was 111 feet from surface, and the bottom 140 feet, the ore lying under jasper. The top ten feet ran high in iron and low in phosphorus, a good bessemer ore, but from there to the bottom the percentage kept up in iron but the phosphorus ran from ½ to ¾ of 1%. Under the ore was ablack slate 25 feet thick and below that granite.

Since then holes 3, 6, 7, 10 and 14 have been drilled on this land and ore found in all with the exception of No.10, which hole is 800 to 1000 feet West of the others. From data gathered from the drilling, it shows that the ore body is thin and quite flat dipping to the South West at an angle of about 15°; that there is a capping over the jasper of Pottsdam sandstone of varying thickness.

The land explored thus far is high and has little surface to ledge.

Swanzy No.4.

C & N W Ry Co.

The first work done here was on the N E ¼ of the S E ¼ of section 19, where test pits were dug to determine the ledge. As the work progressed to the South, this had to be abandoned, on account of the surface getting too deep, 90 feet of sand in the one farthest South and water at that level and no ledge. In one near the center of the forty granite ledge was struck at about 80 feet. The pits at the North varied from 6 to 17 feet, and showed jasper or sandstone.

Hole No.2 was drilled on one of these at the contact of the overlying sandstone with the jasper. This hole was not at all satisfactory, as it went down principally in dike material. When this was finished No.4 hole was started on section 29 near the North line and then followed No.8. These two holes while more encouraging than No.2 showed only rich jasper but no merchantable ore.

On October 15th, hole No.11 was started but the great depth of surface of sand with boulders lying on the ledge has hampered the work of sinking the stand pipe to the ledge. We are in hopes that this or No.15 which is to be started midway between No.11 and No.8 will show a continuation of the ore body.

I. Stephenson Company.

This land lies at the foot of the hill South of our explorations on the E R L & I Co lands. It is comparatively level and covered with sand.

Hole No.5, the first one we drilled on this option had 109 feet of standpipe, and then struck the ledge of Pottsdam sandstone, following this came the jasper and ore was struck at 363 feet, the bottom of the ore at 440 feet. By some means or other when the rods were pulled washings must have gotten in the hole, for the analyses showed ore to 503, while the core shows slate at 440 feet and granite at 500 feet. The iron in the hole ran in the neighborhood of 60%, while the phosphorus ran very high, towards the bottom of the hole it was nearly 1%.

Swanzy Sheet No.5.

Hole No.14 on the E R L & I Co shows that the ore found in No.5 runs to this line and hole No.12 and 16 both show ore, although the samples from No.12 were badly mixed, it can be safely stated that there is from 18 to 20 feet of ore there running Bessemer grade. The analyses from No.16 are just coming in and show a good thickness of low phosphorus ore in this hole.

Summary.

From the drilling thus far carried on, it shows that there is a thin sheet of considerable area on the lands of the Escanaba River Land & Iron Co., and a lease has been taken on these lands.

On the Stepehenson the ore body is evidently a continuation of that on the E R L & I Co., but it is considerable thicker. We have asked for the lease on these lands.

On the Northwestern to date, nothing has been shown up, but it is hoped that No.11 and 15 will prove up a portion of that area. Nothing has been done lately on the C & N W lands in section 19. When ore was discovered on the Escanaba River and Stephenson, it was thought best to explore in areas, not too widely separated, that enough ground might be proved up to warrant sinking a shaft, if it was deemed advisable.

It has now been decided to sink a shaft somewhere near No.6 hole, and the timber, machinery, fuel etc have been ordered.

Surveys were made in July showing outcrops, roads, location of drill holes etc, and the work has been extended from time to time to show the location of the new holes and their respective elevations.

At present a typographical map of the ground about No.6 hole is being prepared, which will assist in arranging the surface plan for shaft tracks, engine and boiler house, office etc.

Swanzy Sheet No.6.

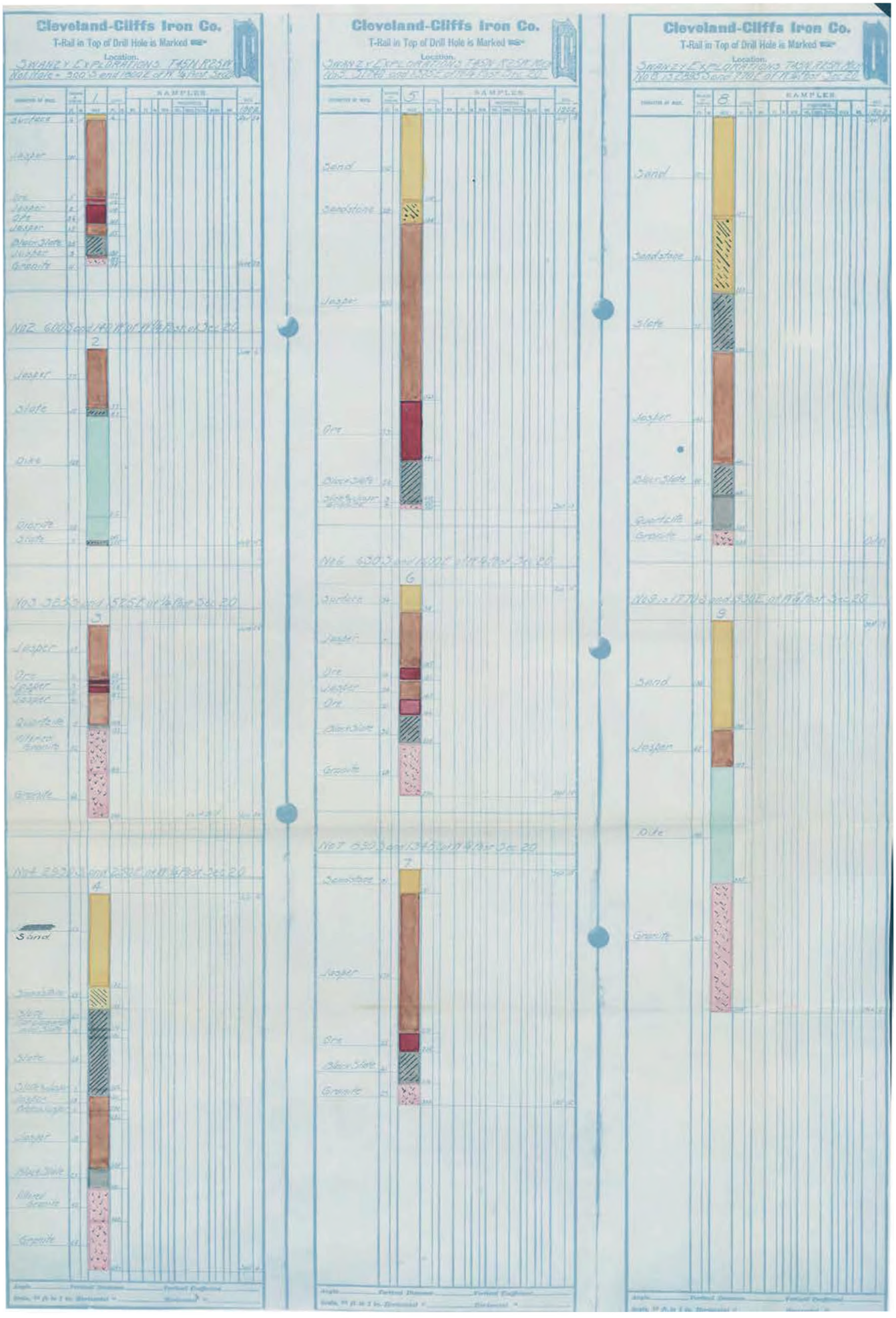
It is expected that work will be begun on surface for the new shaft about Janury 20th, 1903.

Prints,showing drill holes and records, cross sections and general plat as well as photographs of surface are attached.

Yours truly,

Geo. R. Jackson

Assistant Mining Engineer.



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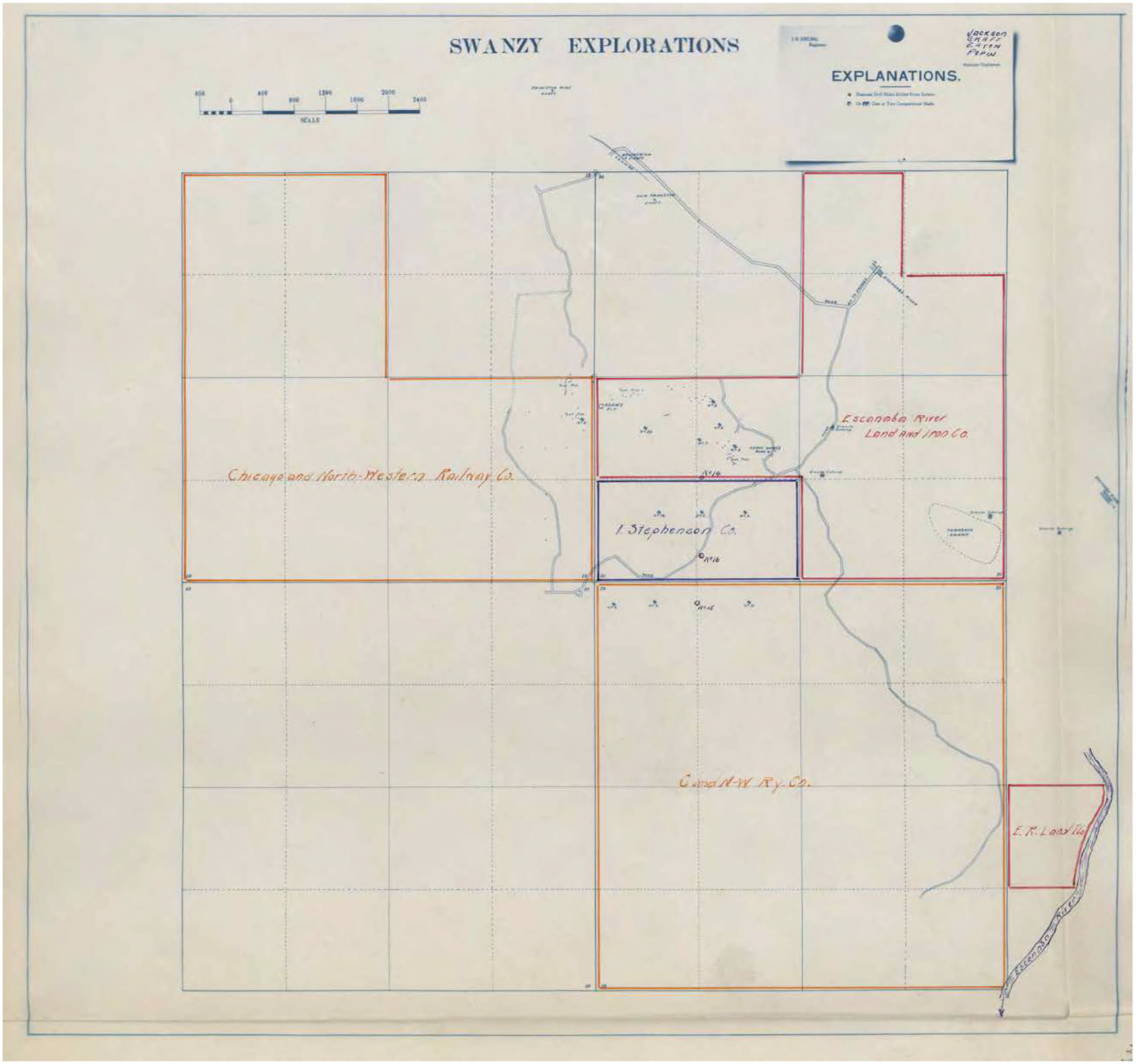
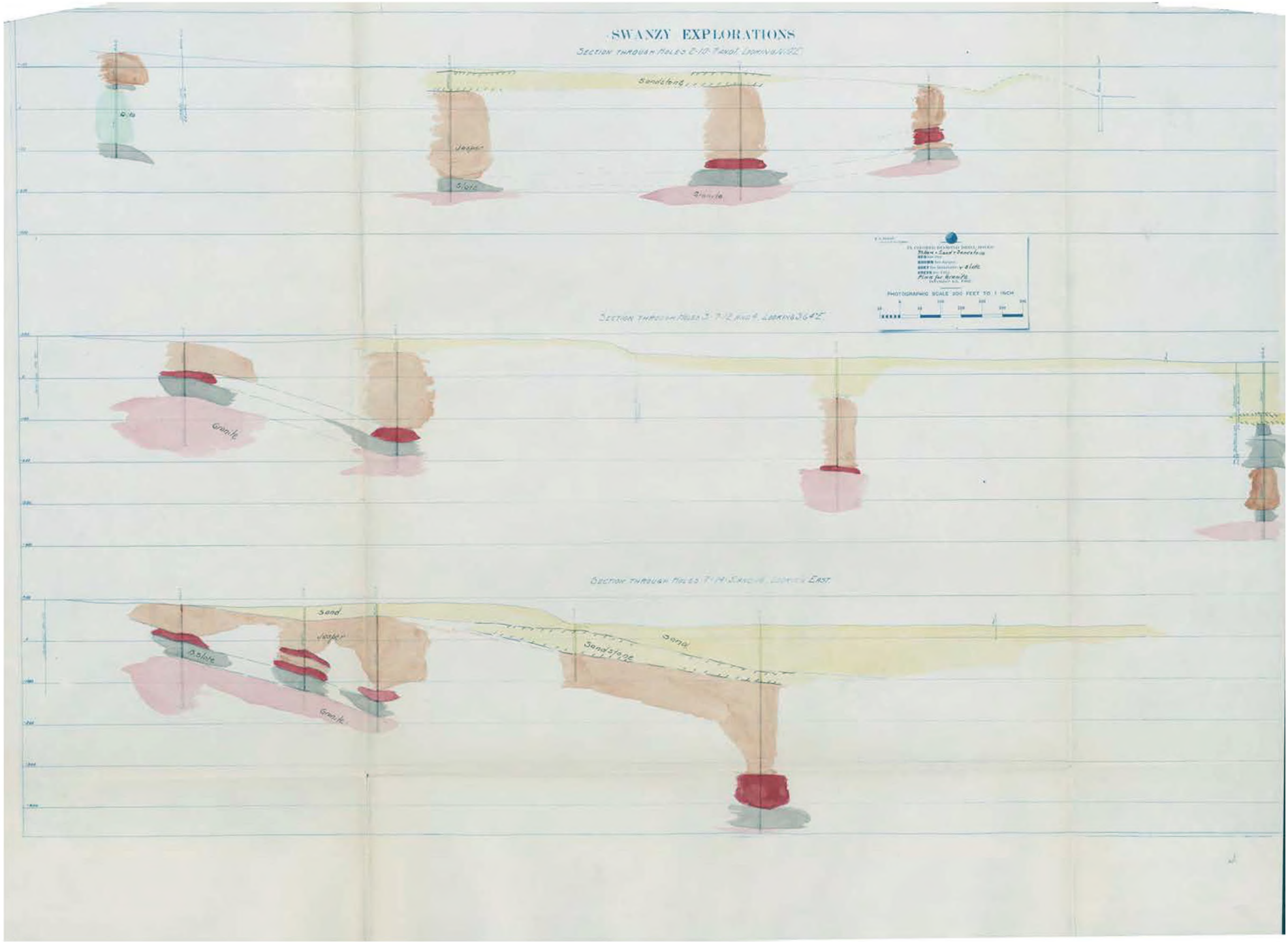
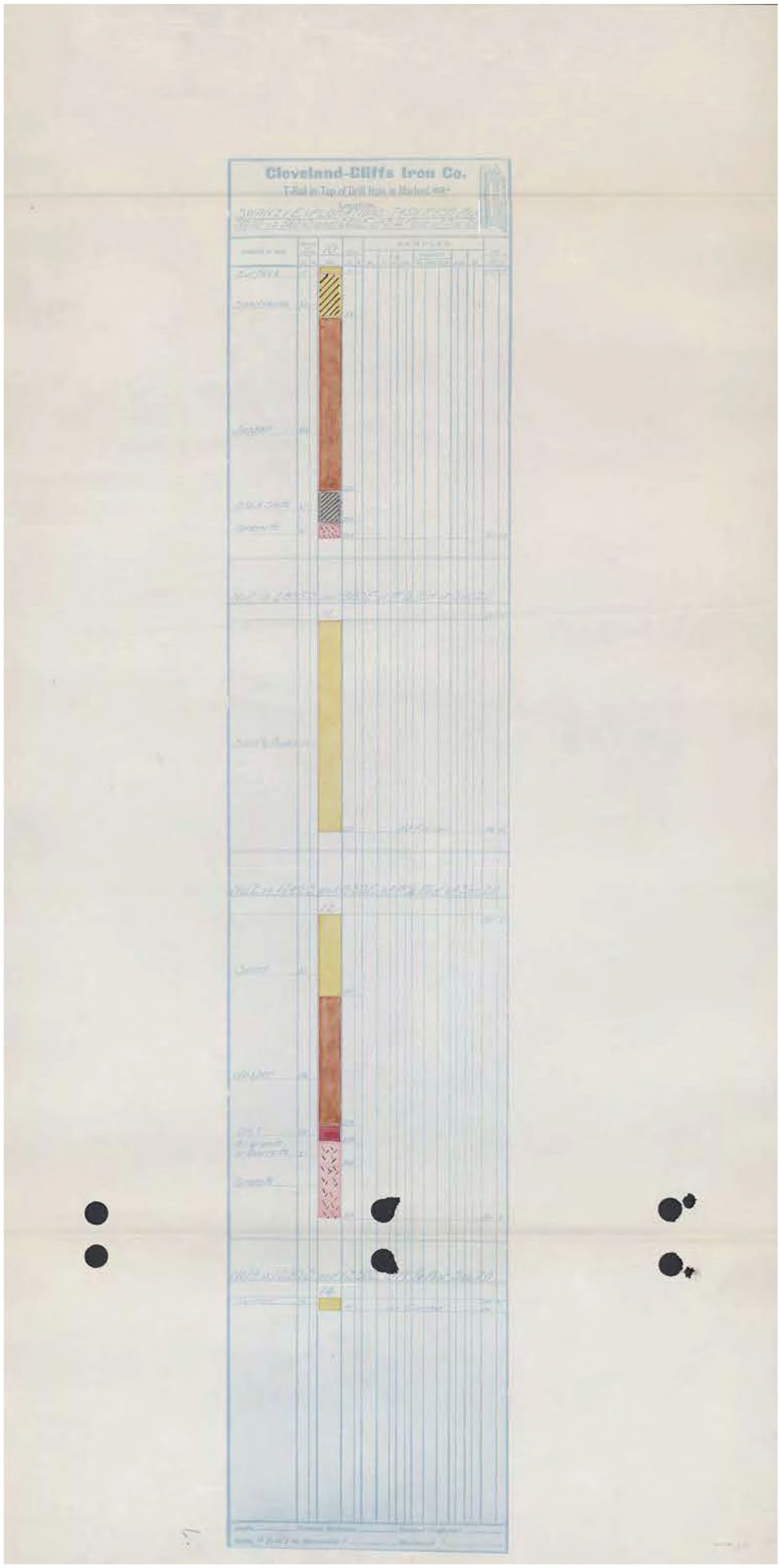
Swanzy Explorations (View West from point back of Company's new Boarding House Nov. 1912.)





Swanzy Explorations (looking So. East towards Companys new Boarding House. Nov. 1902.)


Cleveland-Cliffs Iron Co.