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## **Marquette iron region, Michigan, vicinity of Goose Lake: [specimens] 17158-17360. No. 107 1890**

Bayley, William Shirley, 1861-1943

[s.l.]: [s.n.], 1890

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Marquette Iron  
Region  
Vicinity of Goose  
Lake  
No. 2

U. S. GEOLOGICAL SURVEY  
FIELD SECTION BOOK

No. 107

July - September, 1890

Marquette Iron Region,  
Vicinity of Goose Lake.

W. A. Bayley

17158-17360

# SURVEY OF THE PRE-CAMBRIAN ROCKS OF THE N. W. STATES.

## INSTRUCTIONS.

1. Ordinarily at least two pages of this book will be devoted to one section. On the left hand page place a map of as much of the section as has *actually been seen*. Denote rivers, lakes, marshes, etc., by the usual topographical signs. Denote the ledges of rock, when no structure is made out, by cross-hatching, making the cross-hatching cover as nearly as possible the areas occupied by the exposures. If the rock is a massive one, but still more or less plainly bedded, use the same sign with a dip arrow and figure attached, showing the amount and inclination of the dip. Denote slaty or other very plainly bedded rocks by lines running in the direction of the strike, with figures and a dip arrow attached as before. In all cases where there is the least doubt about the true bedding directions, indicate it by a query. To each exposure on the face of the map attach the number of the specimen representing it. In mapping the section count each of the spaces between the blue lines as 100 paces, and twenty of these spaces as one mile, or 2,000 paces. Usually the southeast corner will be placed at the bottom of the page, or at the first black line above the bottom of the page, and at the right hand side. If, however, for any reason, it is desirable to show portions of an adjoining section, the southeast corner may be shifted up, or the map may be turned around and the north placed at the left hand side of the page.

2. On the right hand page place the notes descriptive of the exposures. Begin in each case with the number of the specimen, placing the number on the left hand side of the red line, after which give in order on the right of the same red line the position of the ledges as reckoned in paces from the southeast corner of the section, and the dip and strike when observable, for instance: 4025 250 N. 300 W., Strike, N. 6° E., Dip, 50° E. Then follow with as full a description of the ledge as possible.

3. The ruling of the left hand page is also arranged so that a smaller scale can be used. Each one of the black lines may represent a section line and the red lines quarter sections and "forties." The scale of the maps may thus be reduced, if desirable, to two inches to the mile (the ordinary town plat scale.)

4. Collect a specimen from each separate ledge of rock, or wherever there is a change of rock on any one ledge. In case of trips made on foot or in canoes, for long distances, neighboring ledges, unquestionably of one kind of rock, need not be sampled, the position and extent of the ledge being marked on the map, with a note that it is of a rock identical with specimen so-and-so. Under the same conditions small sized samples, trimmed to a uniform size of  $2 \times 2 \frac{1}{2} \times \frac{3}{4}$  inches will be allowed, but in all other cases *large sized specimens*, trimmed to a size of  $3 \times 4 \times 1$  inches, must be selected, in accordance with § 3, chapter IV, p. 44, Regulations of the U. S. Geological Survey. In all cases collect chips for slicing. All specimens are to have numbers painted on them, in white on a black background, in the field.

5. On the last twenty-five pages of the book give, as may seem desirable, a general account of the examination of the region mapped in the previous pages, correlation of observations, sketches, cross sections, etc., etc.

17158 - 17360

except

171707

17303

Maps

sec 23 p 29, 85, 101

24 p 34

22 p 101

Aug 5/90

on this day visited the long hill to the west of that in which were stationed yesterday. Between the two hills is a very level plain from which the wood has been cut. The underlying soil is here sand and with it are many boulders. The hill itself consists of a bare ledge of white quartzite which trends in a long ledge to the N.E. The individual ledges on the sides of this were so numerous and so monotonous in character that no attempt was made to locate them. On the west of the main ridge at its foot is a small ledge in which the rock apparently strikes N.E. and dips <sup>North-</sup>west. This ledge outcrops in a level plain, similar to that on the East of the hill. Off to the west and south-west are small hills or mounds scattered over the plain, but these are drift hills and not rock ledges.

17158

is a specimen of gray quartzite from the top of the main ridge.

It weathers snow white, and as its weathered surface is engraved with glacial scratches

17159 is a red quartzite from the same ridge

17160 a mottled rock from the same place. The quartzite south of these specimens are slightly redder than those north of it and to the south-west they are still darker. The horizon like S.W. portion of the top of the hill is apparently dipping to the S.E. while striking N.E., but this determination is valueless on account of the difficulty of obtaining reliable dips and strikes of this very massive rock.

From the southern portion of this hill went south and discovered a number of quartzite ledges which were located and recorded on the map. Then went across the Sand plain to the little hill in the center of the section to which several sights were taken. This hill was found to be underlain by

T.

R.

quartzite. From this crossed over  
ravine while a few hundred feet S.W.  
and from it took Specimens 14161  
to 14162.

- 17161 mottled red and white quartzite,  
 17162 cut by conglomeratic veins.

In the meanwhile Drummond went to the  $N \frac{1}{4}$  part of the section and west to the NW corner then S. to  $W \frac{1}{4}$  S and back to the hill, finding no ledges.

Aug 6.

On this day went south in stream, starting at Camp which is in the extreme N. W. corner of Sec. 14, and examined the rocks found along its bank.

- 17163 Ledges of red quartzite begin where south line of the section crosses the stream and continue with few interruptions as far south as its forks. At this place both red and white quartzite appear, and a white schistose rock crosses the west branch of the stream a few paces above the fork.

About 50 paces south of the forks, on the west side of the Eastern

me, at 200 paces South of the N.E. corner of Sec. 22 is a test pit, from which some Specular ore has been mined. The pit resembles in its aspects that seen on the West side of Sec 22 (Book 1. p. 102). The ore seems to be from a vein in quartz. Stenatilitic occurs in large flakes and plates, which grow from the sides of cracks inward until they meet in a medial line and so give rise to a vein with the characteristic features of secretion veins. The mineral covers quartz and fills all cracks. In other words it is an undoubted secretion, deposited from watery solutions.

- 171165 is a specimen of gangue  
 171166 " " " " one  
 171167 " " " " a vein.

Continuing South a drift hill is ascended and a swamp crossed over, when at 175 S. of the same corner Exposures of a very beautiful chert are met

with. The Exposures are all very close together forming with each other a little hillock which is separated on all sides by Swamps from the surrounding hills. Where dips could be taken it was found that the layers of the chert strike  $65^{\circ}$  E of N and dip  $30^{\circ}$  to the N.W. Bluish and flesh colored layers are most prominent. The texture varies very slightly, the entire rock being usually very fine grained.

17168 Coarser grained variety?

17169 Finer grained variety -

A little south of this ledge the rock becomes coarser in grain and more like quartzite?

At the S.E. corner of the hill is a ledge forming a precipice with its face to the south. This is chert like the rest of the hill, but in it are patches and bands of conglomerate. This is best seen in the face of the cliff where the band is noticed with a dip and

Strike approximately parallel to those of the chert. The conglomerate itself consists of a ground-mass of chert cementing pebbles of white and dark quartzite in chert and some banded ones of the same material.

17171 Specimen of Conglomerate.

17172 a. Pebbles from same  
b. " " " "

In seams running through the conglomerate are deposits of hematite and around pebbles are also rounded

17173 large masses of the mineral.

In other places in the same bed the cementing material of the pebbles is red quartzose chert (like the red and white-mottled rock found in NW 1/4 of Sec 22, filled with little crystals of quartz).

17174 The whole mass of conglomerate is gashed with thin veins of red quartz and of hematite, the red color of the quartz being dependent upon the hematite for its stain.

Aug 4.

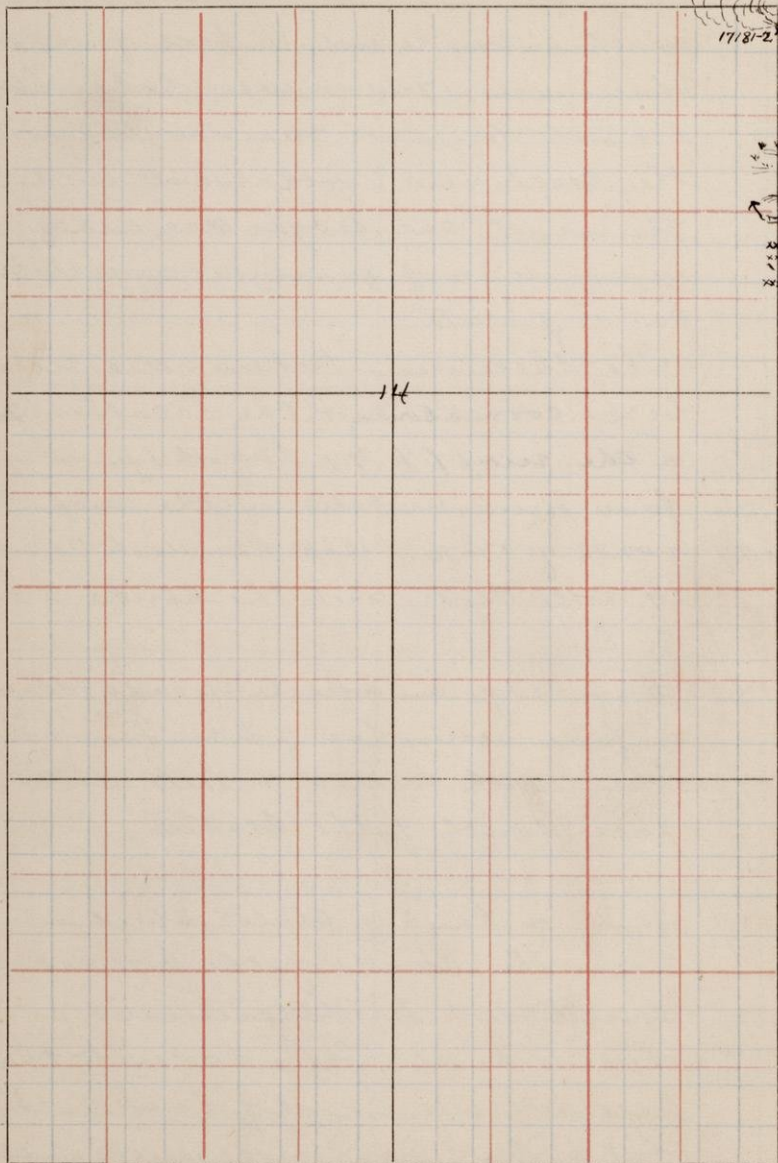
On this day went to hill from which specimens 17161-2 were taken and located from it various ledges to the east and north-west in the plains. These ledges are all of quartzite or of quartzite and thin bands of slate.

The specimens taken were numbered corresponding to the locations given in the map (p. 99 Book 1).

- 17146 from point indicated in the map.
- 17177 north of 17146. Dip seems to be about 20° to the N.W. and the strike to the N.E.
- 17178 Iron ledge on which alidade stood - N.E. from western end of ledge from which <sup>took 17161-2</sup>
- 17179 Iron north side of a hill at 250 paces south of the station.
- 17180 from a band of slate striking N.W. The strike of the bedding could not be determined. Several rights were taken to the hill a little south of east of the station but in consequence of illness work had to be suspended.

T. 47

R. 26



Aug 8/90

Examined the country along the East half of the north line of Sec. 14 and the north half of the East line of the same section.

The north quarter part of the section is in a cedar swamp, about 50 ft from the water's edge. For the entire distance between this quarter part and the N.E. corner of the section the line runs through swamp and thick underbrush on the west slope of a drift hill until finally at the corner it rises on a hill of limestone or chert. A perpendicular ledge of the rock appears at 45 paces south of the corner. The rock is pink. Its bedding planes are contorted, but in the mass appear to dip S.W.

17181 } are specimens from this ledge.

17182 }

Between this point and 750 S. are many ledge of the same bedded rocks. These form rough little hills and bare knolls, with precipitous faces. These were located at 350 S. and

200 E.; at 460 and 506 S., on opposite sides of a small hill and at 600 S. The beds of the ledge at 506 South appear to dip N.W.

17183 At 785 S and 185 E on the top of a high hill, with a perpendicular face to the East is an exposure in which the rocks dip  $50^{\circ}$  S of W.

At 620<sup>S</sup> and 700<sup>S</sup> are other exposures, in both of which bedding planes are very marked; but the ledges are loose and so no observations of dips and strikes were taken.

Aug 9.

Examined rocks at the Eastern end of the range of hills running East along the South side of Goose Lake. At the very extremity of this range, where the hills finally dip under the plains the rocks are exposed in bare ledges of white chert, very like the cherts found in Sec. 22. The specimen was taken from the South side of the road leading from Goose Lake Village to Ganthiers.

17184 At 100 paces N.W. of of 17184, in

17185 the north side of the same road is a ledge of black quartzite, much jointed and cherty. It has but little indications of bedding, but contains small veins of iron ore.

A short distance S.W. of 17185, on south side of the road and about 200 or 300 paces south of the Section house on the railroad, is the extension of the former ledge. At this place, which is on the side of the hill the rocks dip  $55^{\circ}$  to the S.E. and strike  $20^{\circ}$  N. of E. They are

17186 a dark slaty rock containing seams of iron ore and to the East

17187 a pink chert containing red crystals, like those in the chert in the N.E. shore of Goose Lake.

A few paces further S.W. on the strike of the ledge the dip becomes  $20^{\circ}$  and the strike goes more to the North until it becomes N.E.

17190 is a chert from the top of the hill at the bottom of which took specimen 17184.

The hills rise abruptly to the South from this point until they reach

a height of some 200 ft. above the plains and then suddenly declines precipitously in to the plains. This Escarpment, which extend a little S of W, was next followed and examined in detail in search of strike and dip; but none were found that could be measured accurately. The rocks remain very constant in character. They are slaty, cherts dip-  
ping S.E. and striking  $20^{\circ}$  E of N.  
At one place they have been quarried because soft and red, and from the hole a little hard one has been extracted. At this place the strike of the slaty cleavage is E of W and its dip north.

17/188

In the plains, a short distance from the foot of the Escarpment a little 'bubble' of granite and gneiss rises out of the sand. It does not approach the cherts closely enough to allow of the examination of its contact with these, but it is undoubtedly composed of crystalline schists.

belonging to Irving's Archean.

17189 'gneiss' from this hillcock

17190 [See page 19]

17191 granite cutting 17189.

Aug 10 -

Examined the geology along the Cascade Branch of the C. & N.W. road, beginning at the little stream crossing the road at 88 rails west of the section line between Secs. 26 and 27.

at 4 rails (1 rail = 30 ft.) East of the brook, on the north side of the road is a test pit in slate containing thin beds of hematite. The hematite is soft, dark and has a brilliant red streak. The specimen shows a seam in the associated slate. The strike of the slate is N and S as nearly as could be determined and the dip W.

at 6 rails from the brook and a few steps to the north of the road is an outcropping of quartzite. This is a medium grained

17193

gray rock, whose strike and dip could not be determined. The covering of the hill, in the cut through which the rock is exposed, is drift. Exposure in cut 270 ft. long.

17195 At 56 rods East and about 60 ft. north of the roadbed, in the side of a hill is a sandy slaty rock, with a strike varying between N and  $30^{\circ}$  N of U, and a westerly dip. A close examination of the specimen in the field seems to indicate that the rock is a quartzite.

At 175 E of Brook (87 East of Sec-line) in the north of the road, in the side of a hill is a test pit from which a large amount of ore has been taken. It is described by Rominger (p. 61) as the Gilmore Mines. He says that here are quartzite bed of granular and flaggy arenaceous-ferruginous beds, and with seams of iron ore partly in the coarsely crystalline form of granular specular ore and partly in the schistose form of scale ore, all

T.

R.

N.B. As I recall the appearance  
of the pit, two months after its exam-  
ination it appears as though the ore  
seams were between the quartzite  
and the chlorite with the latter beneath.

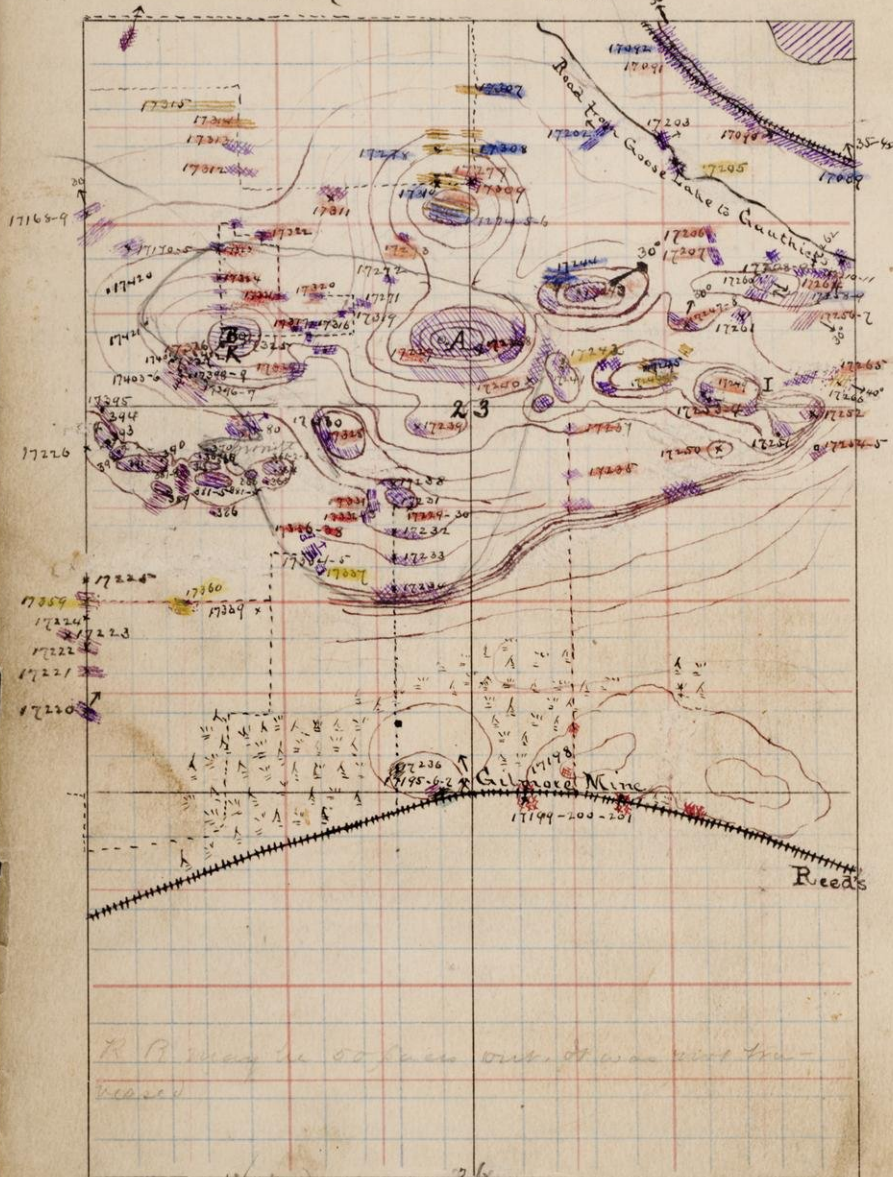
of very bright metallic lustre. In  
 the lower part of this iron bearing  
 rock series, in a nearly vertical  
 position, with northern dip, the ore  
 seams are associated with dark  
 green chloritic schists, enclosing  
 crystals of iron garnets, which rock  
 has much resemblance to the chlor-  
 itic rock found with the ore depos-  
 its of the "Michigan mines".  
 Neither <sup>was</sup> the strike of the rocks, or  
 their dip found to correspond with  
 Rominger's description, nor were  
 the iron garnets found in the  
 chlorite, nor the two kinds of ore  
 discovered. It is probable that  
 a great deal of the material tak-  
 en from hole has been carried off  
 and so was not seen by myself.  
 The strike of the rocks, as determin-  
 ed by myself, is  $30^{\circ}$  E of N (about) and  
 the dip westerly.

The ore is above a quartzite bed,  
 which in turn overlies the chlorite.

17197 Ore from dump heap.

7195 Quartzite below the ore

7196 Chlorite rock below the quartzite.



R. B. may be so close out. It was not in-  
volved.

At 107 rails East of section line occurs the first exposure of gneiss. This is cut in two by the railroad and so occurs on both sides of it.

17198

The specimen is of a fine-grained pink granite that intrudes a hornblende schist, on the north side of the road.

On the south side are chloritic and hornblende schists both of which are cut by granite veins.

17199

is the chloritic rock

17200

a schistose rock from a few feet west of 17199.

17201

chloritic schist, in which is a band of chlorite containing large red feldspar crystals. At 128 and 183 rails East of the sec. line are other exposures in cuts.

Aug 11.

Traversed road from Goose Lake Village, over the hills to Gauthier's, and examined the rocks en route, as well as those some little distance off the road.

17202

is a ledge of dark, rotten rock, weathering rough as if it contained gas-

met. The rock strikes N.E. and dips N.W., but the bedding may be only schistosity and not true bedding.

- 17203 is on the side of a hill and in the middle of the road. It is a kind of soap stone or talcose rock dotted with little red crystals. It appears to be a fresh variety of 17202. Its strike appears to be N.W.; but this observation is of practically no value. Other ledges in the road are low and badly exposed. Their strike in all cases seems to be N.W. and their dip N.E.; but as in other instances this may be strike and dip of slaty cleavage or of foliation.

17204 is a slaty rock

17205 a graywack or quartzite? This is on the north side of the road in the bed of a little brook. In places it is slaty.

17206 is a chip from a ledge 116 paces south of road

At 175 paces south, on line indicated, begins a perpendicular ledge of white chert striking  $20^{\circ}$  N of N. On top of the ledge, which forms the

17207

crest of a hill, directly south of the point in Goose Lake, which lies immediately north of the 'linguiform projection'.

From this place went east to the next high hill, where the rock is of the same character as that to the west, but is a little darker in color and contains brecciated veins and small veins of hematite.

17208 } are both from the top of this hill.  
17209 }

The ledge runs down to the road and was here located. From this

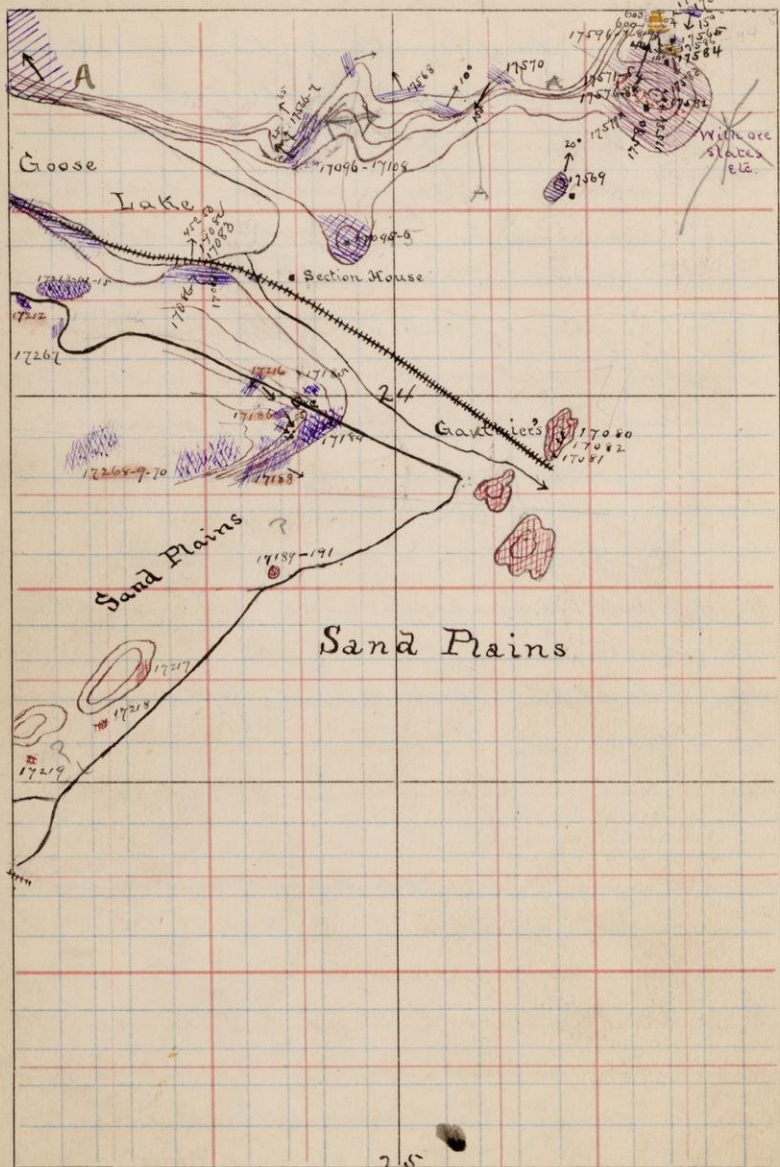
17210 place took 17210

17211 schistose rock from 10 ft. west of 17210.

17212 From continuation of ledge to the east.

These rocks are all too massive to yield strikes and dips, though the former appears to be  $20^{\circ}$  N. of W.

On the north side of the road, a little to the east of 17212 are other ledges of the same white cherty rock, running down almost to the railroad. The principal ledge is 40 paces in



length. It consists of chert, with patches (schlieren) of slate, and veins of breccia. The strike of the slaty cleavage in the slates is E. or W., but the trend of the most prominent ledges is N.E. Veins and irregular masses of pink chert like that on the line between Secs 22 & 23 are quite common.

17213 Slaty rock.

17214 Massive, slightly brecciated.

17215 Brecciated and covered with quartz druses.

17216 Chert from a ledge extending 40 paces along the South side of the road. At 24 paces East of the Specimen is an outcrop in the road where the strike is about N.E. and the dip S.E.

Continued along road to its junction with the road from Sandhills to Reed's on the Cascade Branch of the C. & N.W. R.R. and located a lot of ledges to the N.W. of it. South East and East are the plains, which are level sandy areas extending for a

long distance to the Eastward. The Escarpment whose position is outlined in the map marks the S.E. limit of the Huronian rocks in this direction. Beyond it are small hills and low ledges of gneiss and granite, and hornblende schists.

- 17217 } are specimens of these rocks. Their  
 17218 } locations are given in the map  
 17219 } in page 34.

Left the road at the forks near Reed's and traversed its northern branch as shown in page 28. Here also found granite and gneiss ledges. The Huronian and Archean here come quite close together, but no contact could be discovered, as a swamp forms a valley between the exposures of the two series.

N.B. It will be noticed that the map in page 34 does not agree exactly with other maps in this book, nor does it correspond with the topog. map. The location of the hills in the sections represented varies quite widely from their location

in the topographical map. On the map as given in this book their positions are correct relative to each other and to the N.E. cor of Sec. 24. This was found (or the intersection of two cross lines, each of which is 1000 paces from a quarter post) and the hills were located from it. If it should be found later that the position of this corner is wrong the map may be corrected without much difficulty.

In afternoon ran north from railroad along section line between sections 26 and 27, up a hill covered with hardwood and through brushy country in which are very numerous ledges.

- 17220 At about 200 paces north of the S.W. cor Sec. 23. A quartz-talcose rock with a strike about N.W. and a dip N.E.
- 17221 Purplish quartzite? 300 N of Corner. Strike about E & W. Dip N.
- 17222 382 N. of Corner. Strike about  $20^{\circ}$  N of W.

17223 Quartzite from about 400 ft and  
to west of same corner

17224 from about 445-  
faces N

17225 from about 565-  
faces N.

17226 from about 900  
north, on top of hill. Apparently  
free of pebbles.

All these specimens were taken during a driving rain storm, and therefore rocks very wet.

Aug 14.

Took station at A south of Goose Lake. This is a high hill of bare rock looking like gneiss in some places. It is a red and white mottled chert.

17227 is from the top of the hill.

17228 from the south-east corner of the hill has the gneissic or schistose structure, which strikes N.W.  
The rock is everywhere cut by

quartz veins and by small veins  
of hematite.

17238 Look right to point <sup>from which</sup> Specimen 17238  
was taken (map. p. 28)

17231 At 75 paces south of this point  
the ground slopes from the knob  
on top of which is 17238 and ends  
in a precipice. Here the rock  
strikes N.W. It is gneissic in ap-  
pearance, containing an abundance of  
red feldspar crystals and quartz  
grains. The nature of the aggregate  
could not be determined in the field  
as it is evidently an unusual  
one.

17230 A little to the east of this specimen  
in the same precipice the cherty-  
character of this rock is very ap-  
parent. Here a green talcose  
rock is well developed. This by  
the assumption of red feldspar  
crystals approaches 17231 in ap-  
pearance. Hence the latter is prob-  
ably also a chert.

17232 At 125 paces south of this same  
point the rock resembles a green-

ish gray gneiss, but is probably  
a chert. Another ledge of a similar  
17233 low rock is exposed at 200 S.

17234 is from a precipice facing south.

At 320 South is another precipice  
whose southern face is composed  
of the same rock as occurs in the  
ledges above noted. This precipice  
marks the southern limit of  
the high ridge of chert hills. From  
this point eastward this range  
ends in precipices like those  
abutting against the plains. To  
17235 the west is a gradual slope to the  
next railroad.

page. From this ledge pass down into  
a valley which separates the chert  
hills from the iron bearing rocks  
in which are the Gilmore mines.

At 640 South is a test pit in  
the side of a hill. From it a little  
ore was taken.

At 775 South is the top of the  
hill, in which are other test  
17236 pits? Specimen of ore.

Upon reaching the railroad at 812 South went East 40 rails and then North.

For the first 300 paces running north the country traversed is underlain by granite and gneiss, ledges of which are exposed at 90 and 200 North. These form a hill, north of which is a swamp which separates it from the Chest hills. At 550 North the ground begins to rise out of the swamp. This incline is very gradual until a point of 775 North of the railroad is reached, where there is the first rock exposure north of the swamp. It forms the Southern side of a precipitous cliff, which is the Southern component of the Chest hills on this North and South line.

17205 Specimen was taken from the top of the hill at 860 North.

17207 is from 1000 North.

17208 from hill to which light was taken, N3: starting point from which

reckoned distances in Southern  
mm.

- 17239 from little hill, midway between  
17238 and Station A.

To the Southeast of the station hill  
are numerous ledges, principally  
of chert, most of which were located.

- 17240 is a cherty rock containing a vein  
of iron ore. The ledge from which  
it was taken extends N.E. for 100 or  
150 paces.

- 17241 is a slaty rock from <sup>a little south of</sup> hill East of  
Station A. (The hill is not repre-  
sented on topographical map.)

- 17242 is a gray cherty rock with gneissoid  
appearance on its dark weathered  
surface, from Eastern side of hill  
from which 17241 was taken.

East of this hill is another one  
which has also been omitted from  
map. The ledges located on map  
(p. 28) are all of chert.

- 17243 is from Southern side of hill a  
little north of East of Station A.  
The strike of the rock in this ledge  
is NW and dip  $30^{\circ}$  to the N.E.

17244 is a black slate with a band of hematite and martite.

The north side of the hill is not as steep as the south side, but like the latter it is almost covered with ledges of chert.

Aug 15.

Took station at F (see map p 28).

17245 This is a bare hill composed of black slate striking  $20^{\circ}$  N of W.

10 paces S.W. of the station, on the south side of the hill is an exposure of

17246 white chert too massive to be able strike and dip to be taken.

The two rocks are cut by veins of quartz, many of which contain in them thin seams of hematite and martite.

The first ledge located from station F was one of black slate, on whose surface are good glacial scratches, one set running  $45^{\circ}$  N of W, and another running  $30^{\circ}$  S of W.

70 paces north of this on the north side of the hill is a limestone well

bedded and containing small beds  
of black ferruginous plates. The strike  
is  $30^{\circ}$  N of W and the dip  $30^{\circ}$  to the N.E.

17247 limestone

17248 plates

40 paces  $35^{\circ}$  N of W of this last Ex-  
posure is another like it and  
20 paces  $30^{\circ}$  N of W is one of white  
chert.

- 17249 at the N.W. corner of the hill S.E.  
of station F is a white chert, which  
like most of the cherts contains veins  
of iron oxides. It forms a perpendic-  
ular face of rock some 50 ft high,  
a little East of South of 17249 is  
17250 a hill from which specimen 17250  
was taken.

Erected a station a few feet South-  
East of 17249 and from it located  
other ledges which could not be seen  
from station F. Called this station **H**.  
Two other ledges occur on this hill.  
One of these at its South-Eastern  
extremity is a chert of dark color,  
as is the ledge in the N.E. corner  
of the same hill, which later used  
as station **I**.

East of station E is another hill, not in top. map. The south west-

17251 ern spur from this is a white<sup>d</sup> chert, while the top of the hill is composed of a darker chert or

17252 quartzite<sup>d</sup>

On the south side of this hill is the perpendicular bluff facing southward and making the cliff which is so marked a feature in the topography of this region, and which is found to extend for such a long distance as the southern limit of the Huronian.

17253 is specimen from station

17254 a darker rock a few paces west of 17253.

17254 Cherly iron ore from a test pit at base of hill, or about  $\frac{2}{3}$  way down the slope of hill, 100 paces south of 17252.

17255 is quartzite<sup>d</sup> from same place.

From station 'I' located remaining ledges sampled this day.

On the south side of a large hill

just north of the Station is a ledge of black and purple mottled quartzite interstratified with clunkery slates with a prevailing north-easterly strike and a dip to the N.W. The beds are much conorted on a small scale, the bedding being even horizontal in places. At other places it appears to dip to the north under a low angle, while the slaty cleavage dips high to the north ( $50^{\circ}$  or more), and strikes about E.W.

The rocks are cut by veins. Specimens

14258 17258 and 17259 are from this place.

17259

About 100 paces south-east of this ledge, likewise on the side of the Hill are ledges trending  $20^{\circ}$  S of W for about 100 paces, striking N.E. and dipping  $30^{\circ}$  to the S.E. The rock is but little different from that above described.

17256 is from this ledge and

17257 " from a little north and west of 17256.

17260 The top of the Hill is white, cherty

quartzite? At this place is a very curious con centric arrangement of the quartzite around a nucleus, like rings around an axis. The ledges extend about 20 paces west of this point and is everywhere the white chert, with strike apparently N.E. and strike very high to the S.E.

Just west of this on the south side of the hill is a ledge of dark chert substance and 40 paces S.W. of this point is a large sloping slaty ledge facing north.

17261

17262

At the N.E. end of the hill the rock is all white chert, as is all the rock along the north side of the hill.

17262

At the East of ~~the station~~ in the valley is a white chert stretching at least 100 paces  $20^{\circ}$  N of E, and containing irregular masses of iron ores.

17263

17264

is a white chert from north-eastern side of the hill.

In the valley to the south and south-east of this hill, hidden in the woods are very many ledges of white<sup>d</sup> chert. These could not be located on account of the very thick undergrowth, except by the method of pacing which was not resorted to because of the similarity of the rocks.

- East of station 'I' however and N.E. of the hill E of this station  
 17265 is a brecciated white<sup>d</sup> chert, in which are bands of black slate with inclusions or concretions of white<sup>d</sup>  
 17266 quartz. The strike of the slate<sup>d</sup> bands is about N.E. and the dip  $40^{\circ}$  S.E.  
 17267 is a white<sup>d</sup> chert N.E. of station I

- 17268 is also a white<sup>d</sup> chert from top of hill some distance East of station I (for location see Map. p. 34)  
 A few hundred paces East is the precipice overlooking the plains and south of it is a range of low hills, beyond which is

- the continuation of the precipice.  
 17268 is a breccia from this hill.  
 17269 breccia with contorted bandy grains  
 & ides.  
 17270 Breccia with surface polished by  
 glacial action.

N.B. The ledges from which 17267-  
 70 were taken are probably not in  
 their correct positions with relation  
 to the other ledges in map p. 24. Since  
 they were located from Station A they  
 bear correct relation to ledges in map  
 p. 28.

Aug 16.

From Station A located a few  
 ledges to the north

- 17271 is a low ledge at the base of the  
 hill to the north of the station. The  
 rock forming the ledge is gneissoid  
 in appearance, and is without  
 strike or dip.  
 17272 is east of above, and is composed  
 of the same kind of rock.  
 17273 is chert from west slope of the  
 hill.

On the top of the hill there is

a long bare ledge 20 paces in width from north to south and 72 paces from E to W. The rocks exposed in it are slates and chert. The slates are well cleaved, and the cleavage strikes about  $20^{\circ}$  N of W, and dips nearly vertical.

17274 is slate from the south, precipitous face of the exposure.

17275 is from fault in same cliff 20 paces East of 17274. Speckled.

17276 is from the edge of the precipice 20 paces west of 17275 i.e., just under 17274. Dark chert.

At 100 paces north of 17275 on the north side of the line is a precipitous ledge, some 20 ft in height

17277 and running 100 paces E to W.

The rock resembles 17275 of which it is probably a fresher specimen. The little spots everywhere on its surface give it a resemblance to attrelite schist.

17278 A similar rock occurs at 170 paces north and at 200 north. The ledges all trend E to W,

T.

R.

N.B. For locations see Book I. p 89.

but dips and strikes were not observed.

In afternoon went to East  $\frac{1}{4}$  pt. Sec 14 and ran south in search of S.E. corner of section. The half mile crossed over is entirely underlain by limestone and chert, of which there is the west of the line strike E.W. and there to the East strike N.E. The change in strike is gradual.

Could not find the corner as wood is chopped and stumps are charred.

Aug 19.

Examined carefully the hill in center of Sec. 22, colored by Rominger as granite (p. 62) and "according to him composed of a very coarse granite breccia in closing blocks of large size several feet in diameter, cemented together by an anhydrous and chloritic interstitial mass of a laminated, evidently sedimentary structure.

"In certain portions of these knobs the granite appears in solid masses, too large to be taken for fragments pertaining to the breccia, which fact induces me to suggest the nucleus of all these hills to be a solid granite mass, whose shatterd surface portions are recemented in the spot by sedimentary debris washed into the interstices".

which exhibits itself plainly in some portions of the rock, in which the rock-fragments are more thinly scattered through the cementing groundmass (see opp. page.)

The top of this hill consists of base rounded knobs of a beautiful conglomerate, composed principally of granite pebbles and boulders cemented by granitic debris. When freshly broken the red granite pebbles are seen to lie in a fine grained, purplish-pink fragmental matrix.

17279 shows much of the more quartzitic cement.

17280 in which the cement is more chloritic.

In some places the cement is quite well banded with the band dipping north and striking  $20^{\circ}$  N of W. Sometimes these banded portions resemble boulders, but at other times they form irregular masses enclosed granite pebbles, hence, the material is probably cementing substance, and

the bands are bedding bands.

17281 Specimen of lighter band, and

17282 sample of darker band.

17283 Banded rock like 17281-2, but is rounded from as if pebbles.

All these specimens are from the S. W. Edge of the hill.

From the top of the hill near the station I took samples of pebbles as follows:

17284 dark granite (3)

17285 fine grained red granite (6)

17286 Coarse grained red granite (3)

17287 Fine grained greenish rock resembling quartzite, but tinged on edges so as to resemble the red granite.

17288 Slightly resembling 17287 but more gneissic.

17289 Gray quartzite occurring in large boulders with gneissic weathering.

17290 a darker portion of the same boulder.

The conglomerate is cut by veins of marble, well crystallized, though frequently the material of the veins is quite

- 17291 massive and includes small granitic pebbles  
 In other cases the vein is marked  
 17292 by brecciated, the fragments, however being very different from those in the brecciated chert veins, for in the former case they are granitic. It seems beyond doubt, that the veins are fillings of fractures during formation of which fragments were torn from the sides of the crack and afterwards the spaces between these was filled with iron oxides.

Much of the granitic material of the conglomerate seems to be in lenses, so that a granitic ground mass appears to replace the fragmental cement in certain small areas. This granitic material is either segregated or perhaps may be altered portions of the granitic sandstone cement.

After examining the top of the line very thoroughly made

T.

R.

At 150 f. are test pits in drift,  
W.S.B.

a run to the south to determine the extent of the conglomerate in that direction.

- From station went west 175 paces then south 250 paces. From this point (250 S.) went 17 paces 230 S of W to a ledge of schistose, cherty rock in the woods. This is mottled yellow and red, and in all appearances a squeezed chert. Ledge 20 paces long, trending 20° N of W. Strike about N.W. Dip high to the N.E. In a few places in the ledge are what look like pebbles of which 17294 (small chips) are specimens.

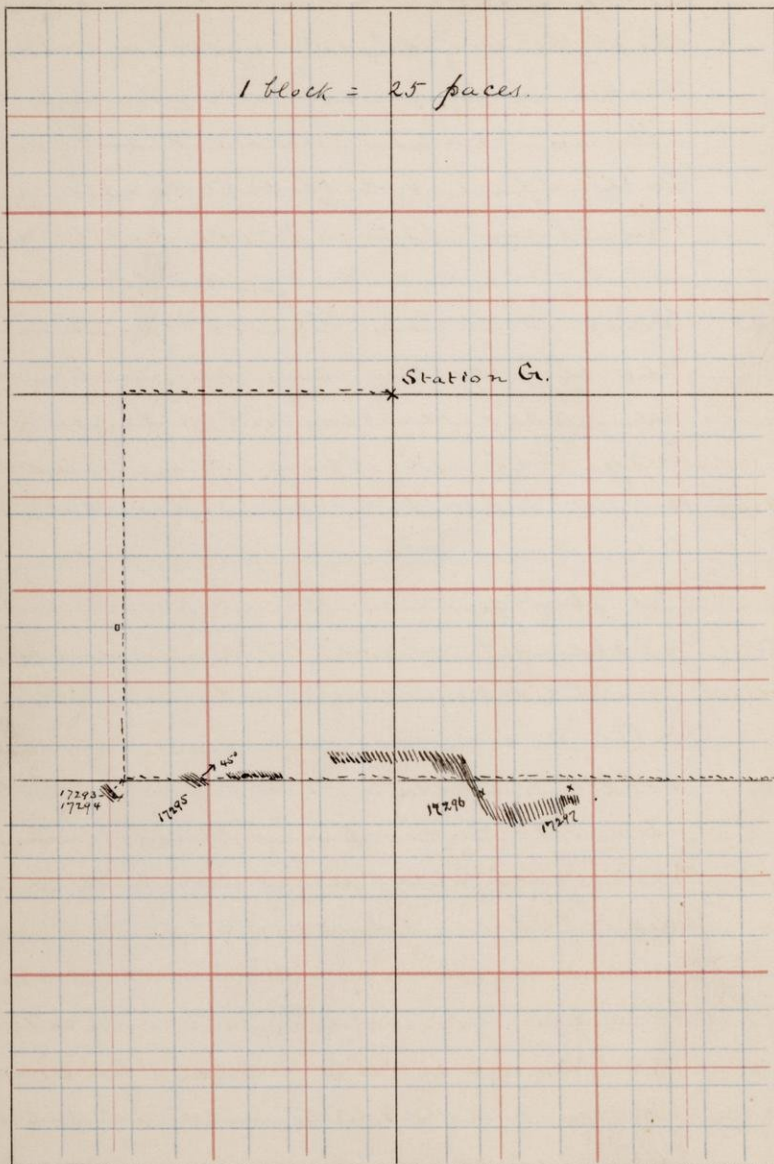
- At 250 south turned east. At 40 E found ledge of black slate, about 20 paces long, trending N.W. and striking about 30° N of W and dipping about 45° to N.E. This is cut by small veins of quartz and has a band of breccia or conglomerate in which the fragments are red granite or quartz. in.

At 68 East and 20 N. is another

T. 47

R. 26

1 block = 25 acres.



ledge of the same black slate,  
cut by brecciated quartz veins.  
Ledge extends East 100 paces.

At 162 East and 20 N is quite  
a large knob of the same rock.  
The ledge practically extends east  
ward to 224 paces, forming north  
side of a hill whose crest is to  
the south. At 224 East the ledge  
turns southward and forms a  
very high precipice facing north.

17296 224 E and 10 S.

At 289 East is a low ledge of  
slate from broken piece of which  
17297 got specimens of a brecciated  
band. The main body of the  
rock is slate.

At 20 paces south is a long  
high ledge of slate very much  
like that enclosing 17297.

At this point pass down into  
a valley and remain in it as  
far as 550 East, when rise over  
17298 ledge of red slaty rock at 600 East.  
The ledge trends N.W and ap-  
parently runs into conglomerate.

ate to the west.

At 600 Easter turned north, faced 100 steps and stopped.

The Easternmost exposure of the conglomerate of this hill is finer grained than the others, and looks much more like granite? Its

17299 pebbles are smaller and more numerous, and comprise large numbers of quartz pebbles. The specimen was taken from a little hillock separate from the main hill by a ravine.

The S.W. edge of the hill is very steep and to the East becomes vertical. On the top are the usual conglomerates, while just beneath there, well exposed on cliff side are reddish sandstones, evidently made up of granite debris, and beneath these slates. 17298 is one of these sandstones.

17300 are slate and quartzite beds from the western end of the cliff. The contact of the slates and quartzites was not seen. The latter strike

30° W of U. and dip very high to the U.E.

- 17302 on the top of the hill <sup>South</sup> East of  
 of 17300-1 the conglomerate dif-  
 fers somewhat from the predom-  
 inant conglomerate in that the  
 cementing material is black  
 quartzite or slate?

South of 17302 low down on the  
 southern slope of the hill is a ledge  
 of light colored slate with a dip  
 to the U.E. and a strike U.W.

- 17304 On the second hill, just across  
 the ravine East of Station G the  
 rock is conglomeratic as in G.  
 On the north the hill slopes  
 somewhat abruptly to the valley  
 and on the south ~~the~~ faces  
 perpendicularly down 50 ft.

The conglomerate is comprised  
 of a granitic <sup>fragmental</sup> matrix cementing  
 granitic pebbles. Both are red  
 from weathering and since both  
 have approximately the same com-  
 position their weathered surfaces

So closely resemble each other that the mass looks like a homogeneous mass of granite?

The top of the southern cliff of this hill is, as has been said, composed of conglomerate. At ten ft. from the top, underlying the conglomerate is sandstone and slate as in the hill to the west.

- 17305 The sandstone is above the slate  
17306 which may be only a slaty phase of the former rock.

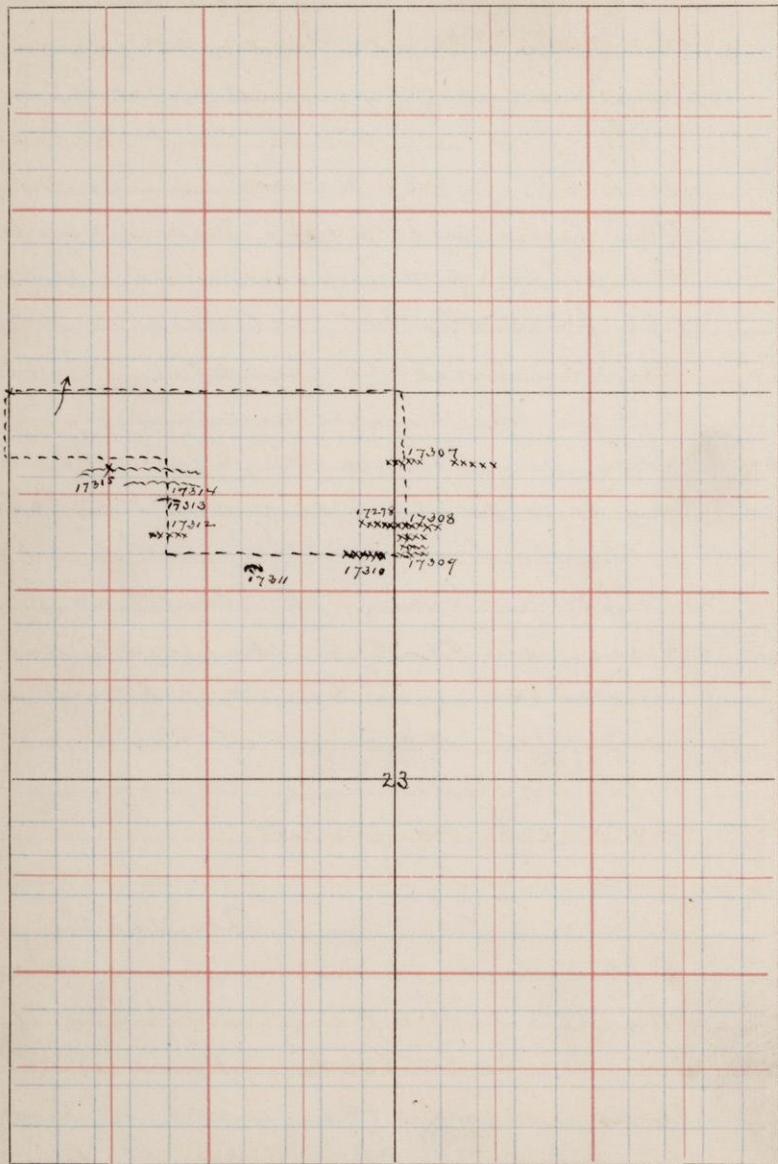
Midway down the cliff occur greenish slaty rocks, with interbedded small bands of black slate and a few veins of iron ore. The rock is evidently a phase of the granitic sandstone.

Aug 22"

After a day and a half of rain started in afternoon from N.W. Cor. Sec 23 and ran East to where supposed was the north  $\frac{1}{4}$  part of this section, then south 400 paces, west 200, north 250 and west

T.

R.



400 to west line of section.

On new East kept along the north slope of a hill covered with drift. At 121 paces East crossed stream in bed of which are quartzites or cherts (17163), but saw no other ledges until began to run South.

At 153 South from the quarter post is a perpendicular ledge 10 ft. high. It is a soft, slaty rock mottled with oval, dark red patches or crystals of feldspar. The ledge extends 20 paces W and 40 E. At 105 paces further East from the Eastern edge of the ledge begins another trending like this one 50 N. of E.

17307

17308

At 325 S is another steep ledge of the same kind of rock, which, about 50 paces west joins the ledge from which took specimen 17278. 17308 has mottlings of red color which look like freudenbergite, altered.

From 325 to 400 South is over an almost solid ledge or a sec-

T.

R.

17309 is much finer than quartile?

ies of E.W. trending ledges, from  
17309 which took 17309 at 400 South.

At 400 S and 400 W met with a  
17310 ledge of the same novellized rock  
less altered than any collected dur-  
ing the day. For 100 paces travel  
along the ledge and at 370 W and  
200 S line of travel find ledge of  
17311 white chert near the top of a hill  
which is to the South.

At 600 W. turned North and  
17312 collected Specimens from high  
cliff of chert. This rock is a little  
darker than 17311 and contains  
veins of iron oxides.

17313 At 135 N. is another ledge. This  
is of a slaty rock, and is evidently  
an extension of the rock further  
East.

17314 At 170 North crossed an East &  
west trending ledge of hard, chert-  
slate.

At 250 went west following ab-  
along the north side of a cliff which  
was about 25 paces distant from  
us to the South. At 150 W. went

17315 up to the cliff and took specimen  
of slate.

Aug 23/90

17316 Located several ledges to the East  
of Station B. of these one (17316) is  
of a fairly red looking rock, with  
porphyritic crystals of red feldspar  
and a strike about E.W. on the  
map it is colored as chert. Its true  
nature can not be determined un-  
til a microscopic study of it has  
been made.

The other ledge is to the South of  
17316 and is of the same kind of  
rock.

Then made a little run from  
Station as follows: went 300 East,  
100 N and 100 West, when were in-  
terrupted.

17317 On this run found a ledge at  
138 paces East and 20 North of Sta-  
tion from which took specimen 17317.

At 180 E. crossed ledge of rock like  
17316.

17318 At 320 W and 60 N. is a ledge of  
coarser rock of the same general

character, with larger areas of feldspar.

17319 At 75 North and 200 East is a brecciated talcose rock like that at top of Station A+B.

17320 At 100 N and 200 East is a ledge of white chert.

On return to work started at 100 E and 100 N of Station, where 17321 found a ledge from which took specimen 17321.

From this point went North 150 paces, west 30 and North 25, where found another exposure of chert.

From here went west again 75 paces (105 in all) and 25 North (200 North in all), where there is another Cherty ledge from which no specimen was taken.

Then went west to 150 paces in all and South 300, then 50 East to Station.

17323 At 70 South found another ledge of the Trochiloid rock, and at

17324 165 South a ledge of fine Schistose rock. At 185 is another ledge of the

same kind of rock and at 260 is  
 one of material like 17316.

17325 is a gneissoid or porphyroid-like  
 rock from Station B.

17326 } Are both from the South-western  
 17327 } part of the top of the hill. Position  
 afterwards used as Station K.

SE of the Station hill is a little  
 rise of the ground which is 17328.

17328 There found a very schistose gneis-  
 soid rock like that found South  
 of Station A. Its strike is  $35^{\circ}$  W of  
 North and dip about vertical. It

contains veins of coarse feldspar  
 $30^{\circ}$  N of N of this, on South-East

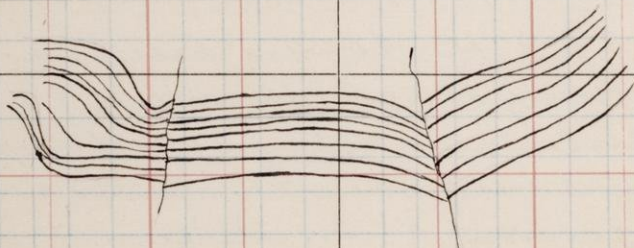
17329 side of the Station B. is a large ex-  
 posure of talcose rock resembling  
 very closely that of Specimens 17168-9.  
 It forms a broad ledge in the side  
 of the hill and strikes about ~~E~~ W.

Between this ledge and that  
 on the hill (17328) is a small val-  
 ley.

17330 is a few paces north west of 17329. Its  
 position was located by the Station.

T.

R.



The hill of which these rocks form the north-western escarpment consists principally of drift. It gradually declines to a level toward the East; but to the west it is very steep, and precipitous, and consists principally of bare rock. A large ledge on the SW side of the hill is 26 fathoms  $30^{\circ}$  E of S of 17328.

A little East & South of these rocks on the extreme south-western slope of the hill are other exposures as follows

17331

Rock very like 17328, but less gneissic and more cherty. The strike of the schistosity is  $20^{\circ}$  N of W. To the East the hill is quite elevated and contains ledges of the same rock. The bedding, like the schistosity, strikes about  $20^{\circ}$  N of W, but is continued in places between joint cracks as sketched on opposite page.

17332

On the side of the hill, part of the way down to the plain or valley, is a vein of coarse feldspar in a gangue that looks brecciated. This vein is bordered by selvages

17333

of green talcose rock containing a few feldspar crystals. The natural conclusions from the various observations made as to the effect that the schistosity of these rocks is due to pressure.

17334

17335

SW of this hill lies a very low one, in which are exposed low ledges of rock differing materially from those in the hill just described. The rocks on the small hill have a strike to the N.W. and a dip almost vertical but inclining to the N.E. Two rocks are here interleaved, and of each one specimen was taken. 17335 somewhat resembles the Cherty limestones north of Goose Lake.

17336

17338

35 paces 20° W of U is another small ledge showing two rocks, viz: A light pink and a dark slaty rock. The former (17336) appears to have been squeezed into the latter (17338). This has cut out bedding planes and in it

are keys of 17336.

42 paces S.E. of 17335 is a flat  
17337. ledge from which both 17337

Aug 26/90

After two days of hard rain, on  
the morning of Aug 26, started  
at ledges from which 17334-5  
were taken. From this point  
went west 100 paces then  
south, where at 165 S and 132  
west occurs a small hill on  
eastern face of which is a bluff,  
some ten ft. high. From the  
face of this bluff took speci-  
men 17339

Continued south 435 paces  
became a swamp, then west  
100 when again struck swamp,  
then went 165 S and 393 west,  
when struck west line of the  
section 140 paces S. of corner,  
which is 305 N of RR track.  
In this running it is very  
evident that weered to the  
south in the swamp. As  
no ledges occur there and

as new bearings could be taken from the corner, did not attempt to correct facing, but started fresh at S.E. cor Sec. 22.

From this corner went west 400 faces and then north 500 and East to point of beginning.

At 153 west of the corner ran into a cleft some 25 ft high, with its face turned to the S.E. It is probably the ~~Western~~ Extension of the ledge from which specimen 17220 was taken. The rock is apparently a quartzite. No other rocks were seen in the western run.

17340

At 400 west turned north and at 220 north ascended a hill consisting principally of quartzite (Specimen from high up the side of the hill at 225 ft.)

17341

At the bottom of the ledge is a band of breccia whose relation to the quartzite could not be deciphered. It is probably, however, merely a narrow

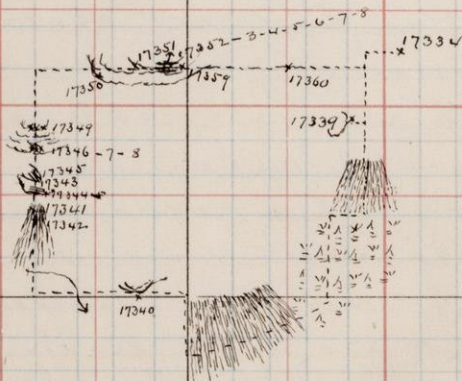
17342

T. 47

R. 26

22

23



bed in the quartzite?

17343 In the north the hill rises to quite a height. At 255 north the rock is <sup>a</sup>Schistose Chert with a strike  $10^{\circ}$  N of W and a dip high to the north.

17344 From same ledge a little to the east of 17343. More slaty and talcose.

17345 At 285 north is a jutting ledge in which the rock is similar to 17344. Strike about N.W. Dip  $45^{\circ}$  to N.E., but whether this strike is that of the true bedding or of only the schistosity was not determined.

At 388 north is another ledge about 20 ft. high, forming an overhanging cliff, principally of quartzite with schistose bands interbedded.

17346 is a serpentinous or talcose variety of the schistose rock, taken from same block as 17346.

17347 was obtained 10 ft. East of 17347 from the face of the same cliff.

At 445 N. on the opposite side

of the same hill is another precipitous ledge, in this case facing north. The rock here is a gray quartzite.

17349

At 500 ft. turned East and at 130 East again crossed a hill

17350

of gray quartzite. Specimen was taken from 5 paces S of line of trace.

Continued up this hill, crossing many ledges of the same rock until reached 260 paces East, near the top of the hill,

17351

where found a pink quartzite.

At 325 East reach apex of the hill. Then occur light and dark red quartzites, <sup>in</sup> the latter of which are certain ~~obscure~~ evidences of bedding, striking E & W and dipping about  $75^{\circ}$  N. In places the rock contains pebbles some of which are granitic and others talcose.

17352

Lighter rock with pebbles

17353

Darker " " "

17353a

Pebble from 17353.

|       |   |           |          |
|-------|---|-----------|----------|
| 17354 | } | Pebbles - | Granitic |
| 17355 |   |           | "        |
| 17356 |   |           | "        |
| 17357 |   |           | Talcose  |

17358 Large red granitic pebble.

At 360 is another ledge of  
 17359 396 East it becomes more  
 schistose but still contains  
 pebbles. Its strike here is about  
 EOW.

17360 At 660 East is a small knob  
 of black slate, which like the  
 quartzite contains many pebbles.

