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Menominee Iron Ore Range: [specimens 26166-26468]. No. 192 1896

Bayley, William Shirley, 1861-1943

[s.l.]: [s.n.], 1896

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U. S. GEOLOGICAL SURVEY
FIELD SECTION BOOK

9-891

LAKE SUPERIOR DIVISION.

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 number attached, showing the direction and amount of the dip. Denote a shaly or other very plainly bedded ledge by right parallel lines, and a ledge having a secondary structure by wavy parallel lines running in the direction of the strike, with dip arrow and number attached as before. The greatest care must be taken to avoid confusing slaty or schistose structure with bedding, and in all cases where there is the least doubt about the true bedding direction, 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 to 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. The ruling of the left-hand pages is also arranged so that, if desirable, a larger or a smaller scale can be used, eight inches, two inches, one inch, or one-half inch to the mile. With the two-inch scale, the squares outlined in black represent sections, and those in red, quarter sections and "forties," while the space between the blue lines is 200 paces.

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, the latter always being expressed from the north; for instance 4025, 250 N., 300 W., *Strike, N. 78° E., Dip 50° S.* Then follow with a full description of the ledge. When topographical maps are used for locations this paragraph applies only in part.

3. Collect a specimen from every ledge, or wherever there is a change of rock on any one ledge, taking care to get fresh material, unless for a special purpose the weathered surface is desired. In case of trips made on foot or in canoes, for long distances, neighboring ledges, unquestionably of one kind of rock, need not be specimened. The position and extent of the ledges not specimened should be marked on the map, with notes that each is of a rock identical with specimen so-and-so. Under the same conditions small-sized specimens, trimmed to a uniform size of $2 \times 2\frac{1}{2} \times \frac{1}{2}$ 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 section 3, chapter IV, p. 44, Regulations of the U. S. Geological Survey. Specimens should not be placed together without protection in the collecting bag, as the fresh surfaces, important in determining the character of rocks, are thus destroyed. They should be damaged by no temporary mark, but the numbers should be at once marked in at least two places upon the inclosing paper or cloth bags. Specimens may be permanently marked in camp by painting the numbers upon them in white upon a black background, using Silver White and Ivory Black oil tubes for color, with turpentine as a diluent.

4. 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.

5. Forward this note book as soon as filled as registered mail matter to C. R. Van Hise, U. S. Geologist, Madison, Wis.

192

Menominee
Iron Ore Range

Notes

by

W. S. Bayley

July 1st to Sept 13th 1896

W. F. Millard

of Ontonagon

Compassman.

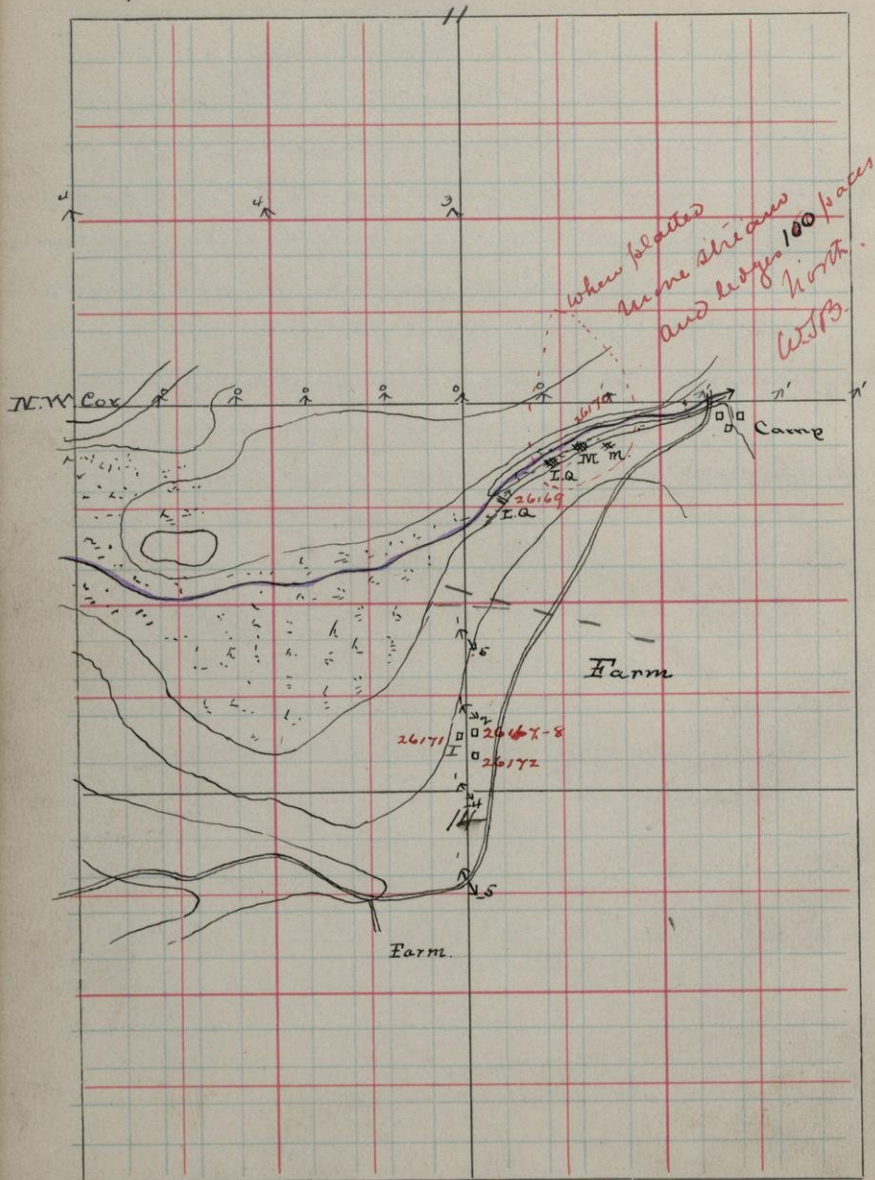
The work in the Membrane region followed very closely the plans followed in the Maquette range. Traverses were made across the range, from N.W. and Exposures were mapped. Magnetic observations, consisting of variation observations and dip needle readings were taken when thought necessary and at many points where it was thought light might be thrown on the folding.

Partly of the season consisted of Dr. J. M. Clements, Louis Weidman and W. B. Bayley, Geologists? W. F. Millard, Chas Oley and Ira B. Weller, Campmen and Oscar J. Weller, Cook.

S. $\frac{11}{14}$

T. 40

R. 30



July 2.

Made a run from the O.E. Cor of Sec 11. T. 40 R. 30, two miles west then North 500 paces and East to road running North from Camp.

The country traversed is devoid of rocks until the S.W. Cor Sec 10 was reached, where found a small ledge of greenstone or green. 26166 Stone outcrop at about 75 paces S.W. of corner. This is the N.E. edge of the hill of greenstone, whose westward extension forms Iron Falls.

July 3.

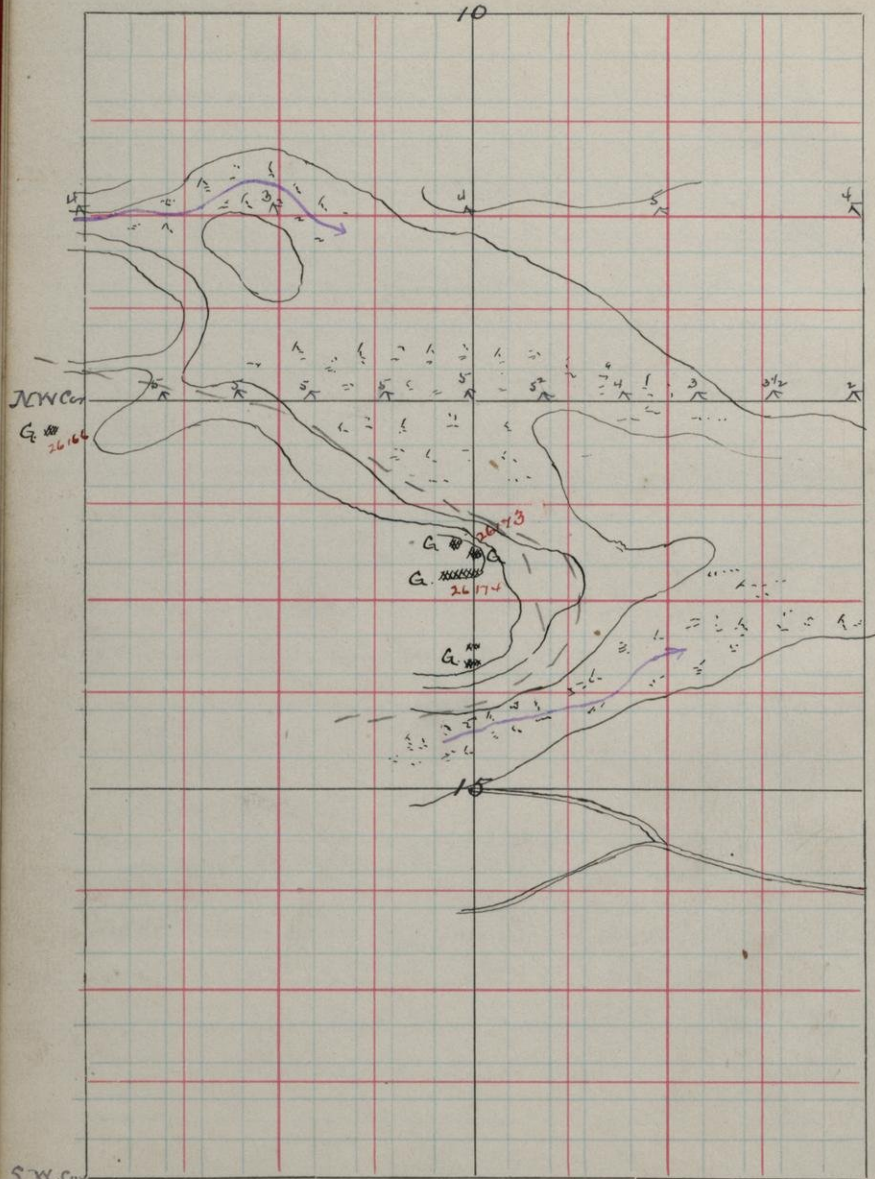
Worked carefully between road and stream in Sec. 14, T. 40 R. 30.

At 157 ft of center of Sec is the first of a series of three pits on edge of field. The rock on the dump is a very ferruginous slate and scattered over the ground in the neighbor- 26167
26168 Road is an irregularly banded rock with lenticular areas and bands of

S. $\frac{10}{15}$

T. 40

R. 30



S. W. Coe

a light colored graywacke-like material. The rock looks fragmental.

At 790 N. 43-90 E of Center of Sec. 14, on the side of the hill overlooking the stream is a large exposure of quartzite striking 15° S of E and dipping 75° N. The quartzite is banded, and is cut by white quartz veins. In many places it is calcareous. Hence it may be the ^{upper} ~~lower~~ portion of the limestone series as in the Maquette region - or it may be the equivalent of the chert-heaps in the same series.

26170 At 1000 N. 250 E of Center of same section is quite a large ledge of white marble in which no strike nor dip is noticeable. S. E. and S. W. of this are two small ledges of calcareous quartzite.

The two additional pits² found upon closer search near 26167-8, are in practically the same rock as this.

- 26171 from the western pit is in a shale that appears to contain the Carbonate of iron, while
26172 is a chert impregnated with ferruginous material.

- 26173 At 1000 W. 340 S. of U.E. Cor Rec 15- is the first small ledge of greenstone to the west. It is probably the Eastern most extension of the Iron Falls area.

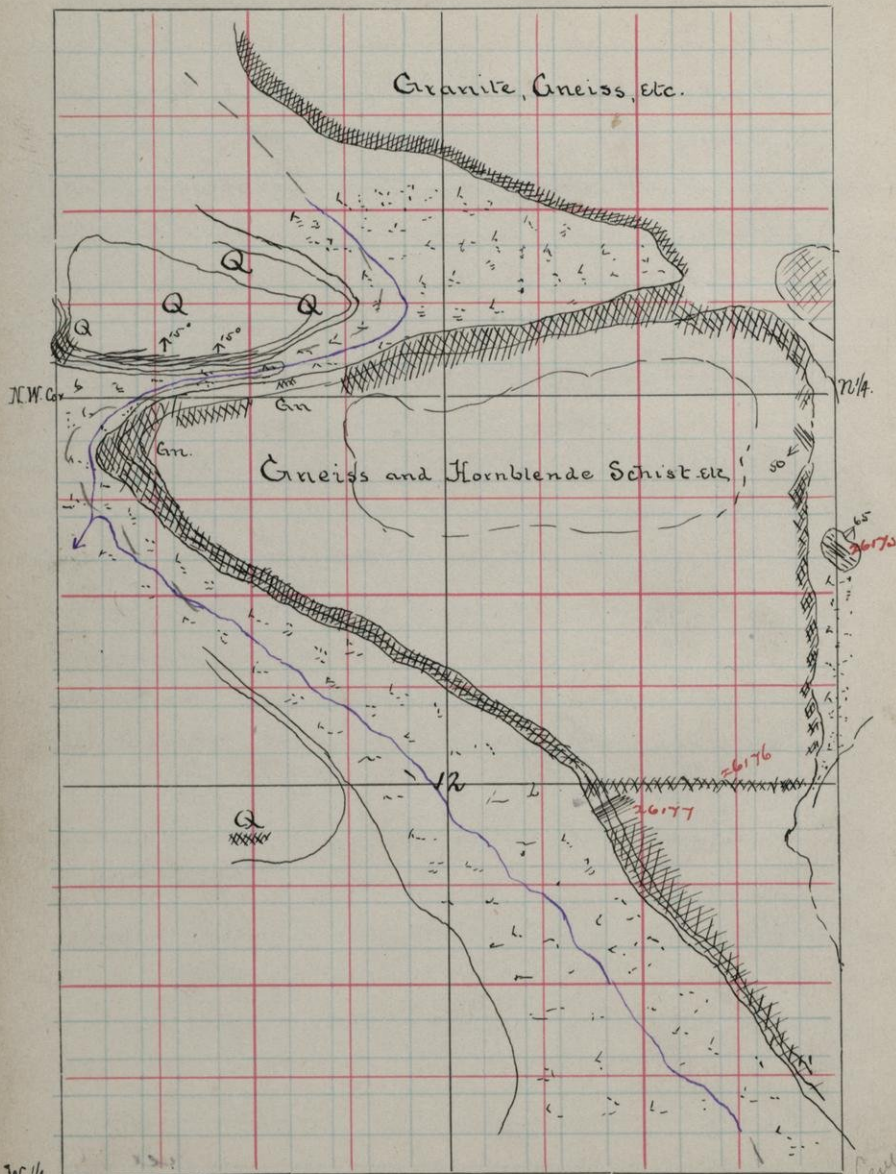
At 100 further South are some large exposures of the same rock showing very well. At one place the gray greenstone is cut by a peculiar

- 26174 granite²-like dyke.

S. $\frac{1}{12}$

T. 40

R. 30



W/4

6-747

Curtis

Made an Examination of Secs. 1 and 12. J. 40 R. 30. to outline the contact between the great bluffs of quartzite and the gneissic granites to the North and East.

The quartzite in the great bluff near the S.W. Cor. Sec 1. is a fine grained, vitreous and cherty rock, very massive looking and heavily bedded. It apparently strikes 10° N of E. and dips about 15° to the N - though am not absolutely sure of these observations.

Both to the north and the south of this bluff are bluffs of gneissic granite, cut by greenstone dykes occasionally - and in some places associated with hornblende schists.

The main mass of the rock is a mediumly fine grained, banded, pink gneiss, which usually strikes S. of W. as indicated on the map, and dipping sometimes to the S.W. and sometimes N.E.

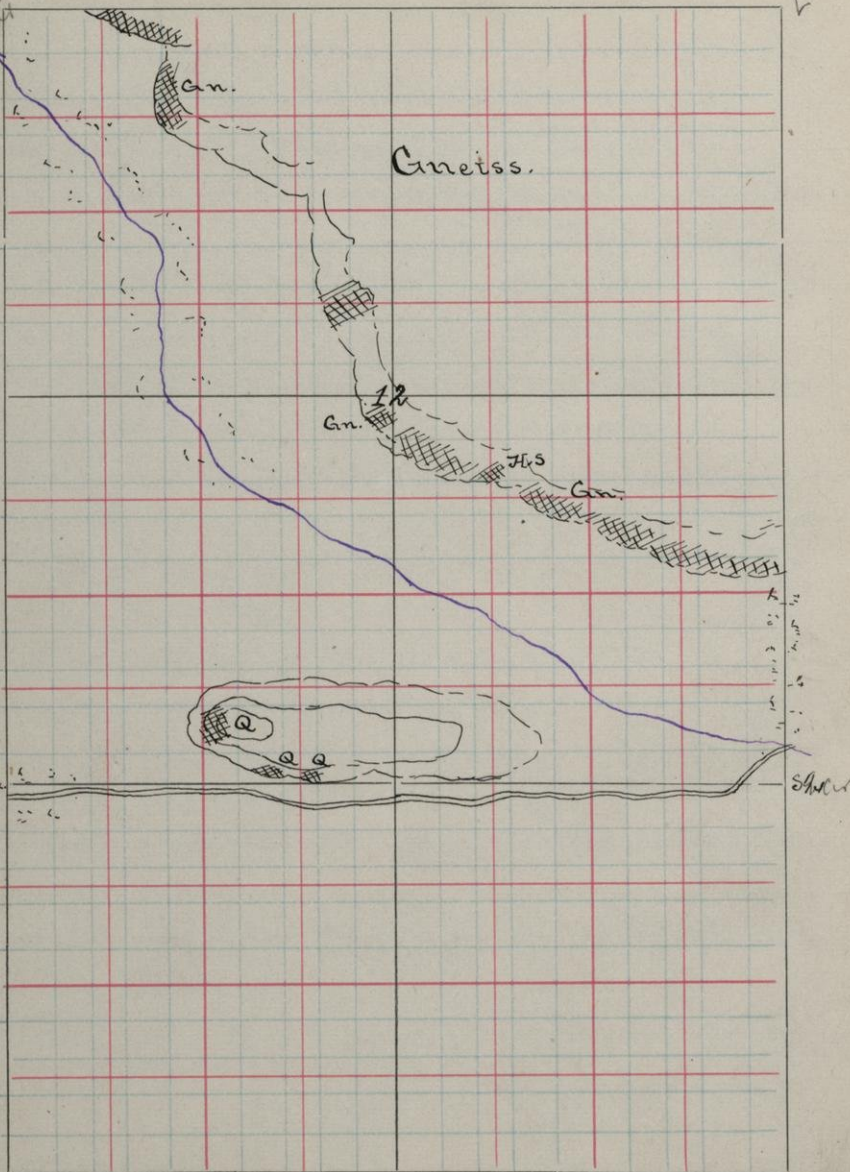
26145 is a specimen from a small knob at 190 S of N $\frac{1}{4}$ post Sec 12.

S. 12

T. 40

R. 30

E. 10

W. 1/4
CreekS. 10
S.W. Cr.

Both the quartzite and the granite^d knobs are devoid of covering - the rock being perfectly bare over most of their surfaces.

In places the banding of the gneiss is distinctly formed by an alternation of light colored gneiss and dark Hornblende schist.

26176 is from about 500 S. 150 W of $U \frac{1}{4}$ post Sec. 12.

To the west the line of granite^d bluffs overlooks a swamp which separates the granite^d from the quartzite^d.

26177 On this face at 600 S. 250 W of $U \frac{1}{4}$ post Sec 12. is a dense Hornblende^d rock resembling a dyke^d mass in the granite^d. It is apparently a dyke or boss. Near this are bands of Hornblende - schist and granite^d striking S.W.

De Weller and Has Vley made two
runs S. from the U. Sec. line of Dec.
13. T. 40 R. 30. going

261
250
132
57

only four specimens were collected
as follows:

26178 1700 U. 500 W. of S.E. cor. Dec 13. T. 40
R. 30. Strike U. 55° W. Dip 75° U.
Quartzite

26179 500 U. 975 W. of S.E. cor. Dec. 25. From
little pit. Sandstone & cherty quartzite

A pit in sandstone was found at
1055 U. of S.E. cor. Dec 25. Rock
said to be like 26179.

26180 1000 U. 35 W. of S.E. cor. Dec. 25.

26181 next page

26192. 750 U. 1950 W. of S.E. cor Dec 18. T. 40
R. 29. Quartzite

Ran south two miles from E $\frac{1}{4}$ post
Sec 15. T. 40. R. 30 along Sec line for
two miles and back 500 W. of Sec
line.

No rocks were seen until reached
Oak hill in Southern portion of Sec
23. Here we found numerous ledges
of Potsdam sandstone and pits in
same.

26181 is specimen from pit near top of hill.
Some specimens show worm tracks
or borings resembling *Candi-galli*.

26182 On the south side of the hill near the
railroad track is a pit in red slates.
They resemble closely some of the slates
in the Marble series of Maquette.

At of Sec 27
is the shaft of the old Indiana Mining.

The dump heap shows fragments of
26183 a very cherty or quartzitic rock, which
26184 in places consists of jasper and iron
band.

26185 The ore is largely a black porous
variety, whose pores are lined with

S.

T. 40

R. 30

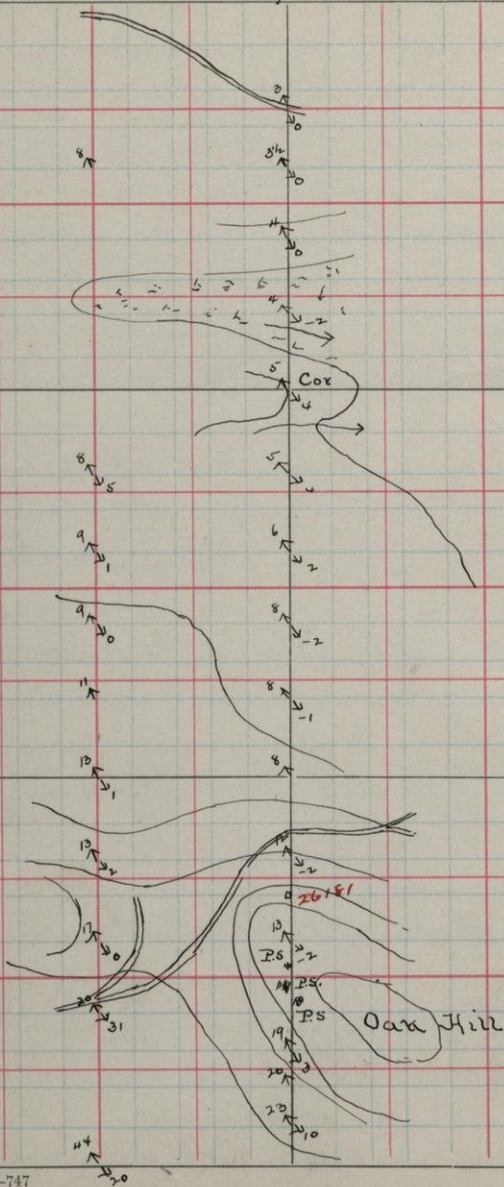
15

1/4

14

27

23



crystals of calcite?

- 26186 A little to the N.E. of the shaft is an exposure of slaty, easily cleavable cherty rocks resembling a gray slate?

All the rocks in the dump heap are of one of the three kinds described, except that in some cases the quartzitic character is pronounced.

- 26187 Fine grained quartzite from dump.

Just west of the old shaft is an open pit in which can be seen several rocks whose relations are somewhat complicated. On the N.W. and S.E. sides are very evenly banded cherts and ones dipping about 30° N.W. on the N.W. side and dipping to the S.W. on S.E. side. This probably indicates a fold pitching not very steeply to the S. of E. (W) all around the pit, except on the N.E. side the rock is as described. On the N.E. side and forming a north face just above the pit are red slates like 26182. The miners say they are

26188

the foot wall of the Indiana ore bed. These slates seem unquestionably below the ore. They probably dip to the S. though no dip nor strike was obtainable. The slate here looks even more like the limestone slates of the Maquokette.

- 26189 In the pit took specimens of the gray ore, which is probably interbedded with the jaspery-quartzites and several pieces of breccia-ore, which the diamond-drill man says is always between the slate and the jasper beds.

- At about 100 W. and 125' N. of the shaft, on the South side of the railroad is
26191 a small ledge of bands of chert and limestone, which apparently strike a little N. of W. and dip N., though of this I am not be positive.

From 500 ft. of O. 1/4 post Dec 16. T. 40 R. 30
ran west two and a half miles to
the west line of Sec 18. of same town.

The country was drift covered. It
was not until reached the west side
of Sec 17 that any rock was seen
and then it was in the dump
heap of several shafts.

There is no old shaft at about 200
ft. 1400 W. of S. E. cor. Dec 17. On the
top of its dump heap are fragments
of thinly bedded sandy slates. On sev-
eral small dumps immediately around
this Old Dan Sandstone is abundant.

26193 It is quite certain that the red
slates are parts of the Sandstone near
the contact with the iron series -
very ferruginous because near this
contact.

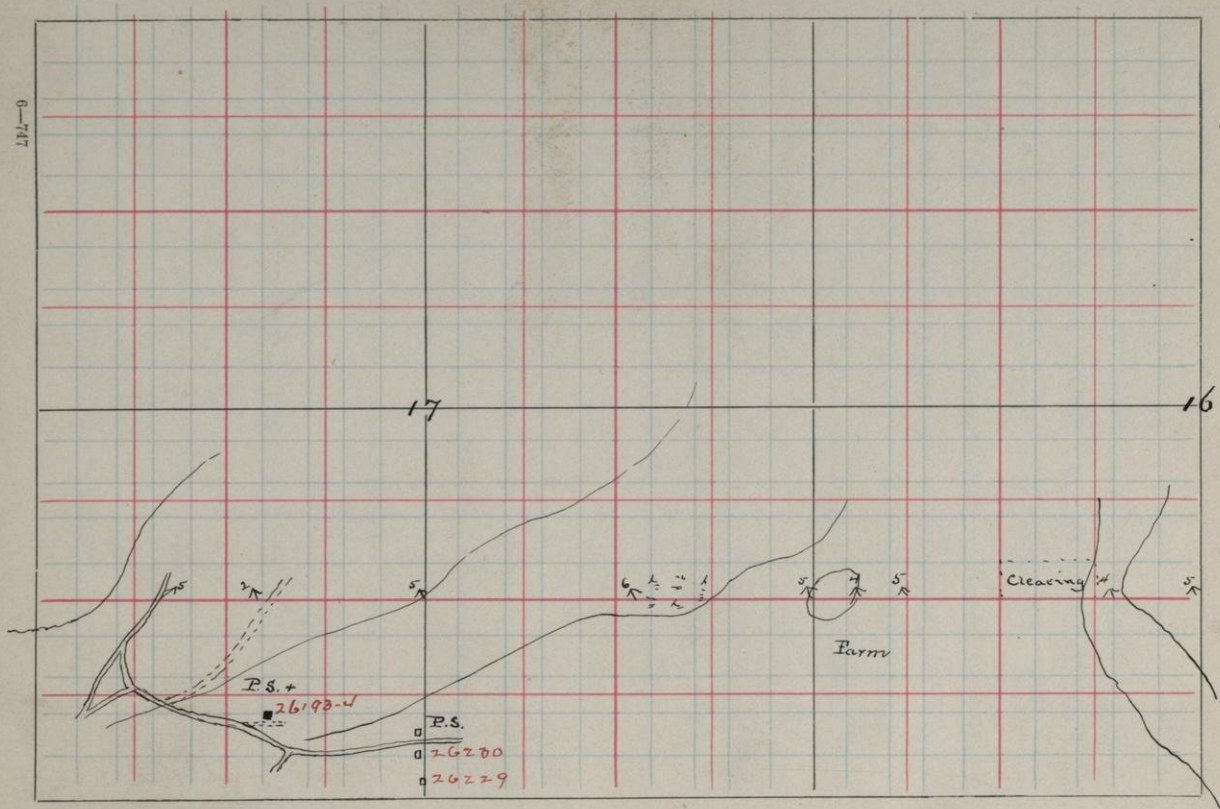
26194 Resembles graywacke. From same
dump.

Graywacke or sandst.

S. 16+17

T. 40

R. 30

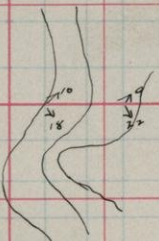


S. 18

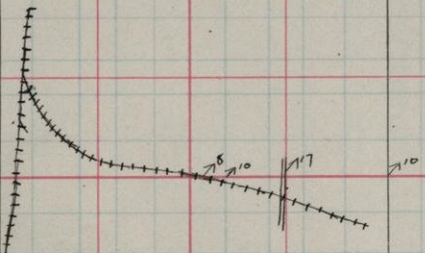
T. 40

R. 30

74.2



18



5.00

Examined the Menominee River banks from the South line of Sec 13, T. 40 R. 3, to Upper Iron Falls.

From 500 to 1500 ft. of the C. & N. W. R. R. bridge is a series of silvery gray scales, with a well marked cleavage dipping very high to the north (about 80°). The dip of the beds at the South end of the exposure were not noted as it was too obscure.

26195 Slate from South end of exposure on Michigan side.

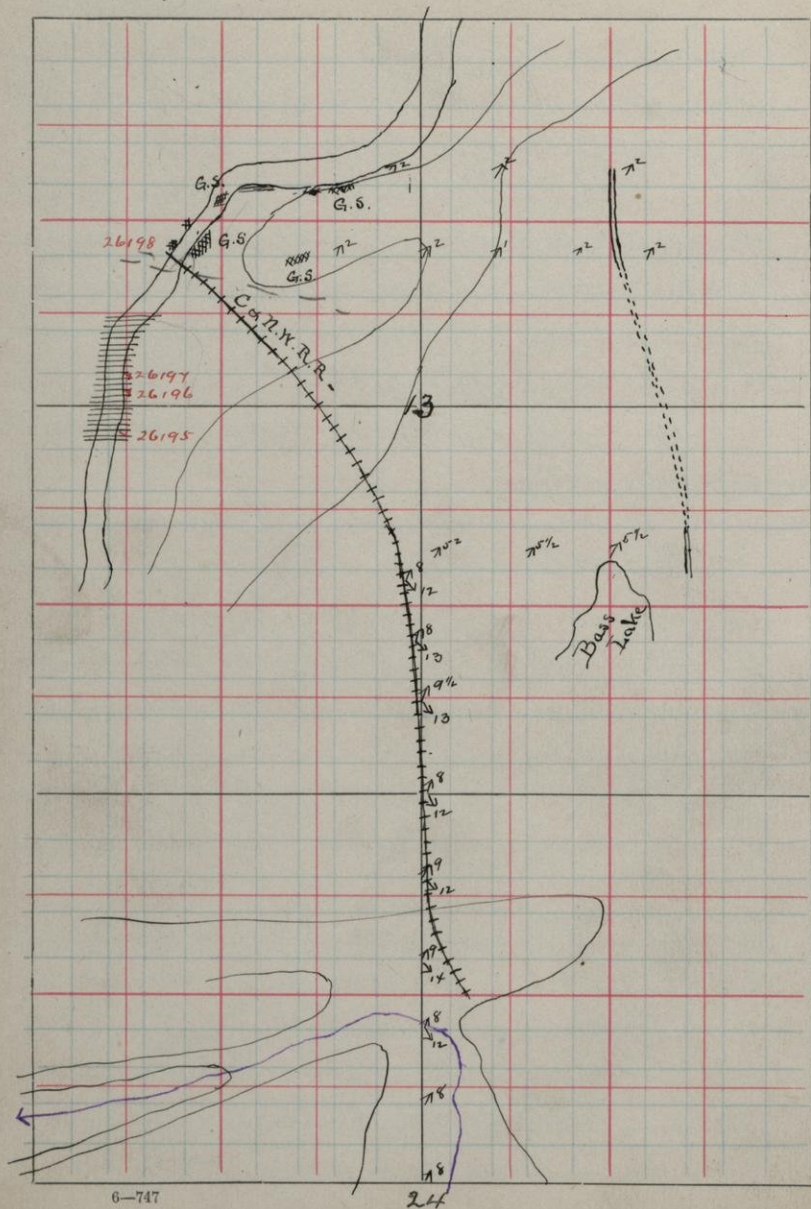
As pass north along bank of river the cleavage of the scales becomes flatter, and there are joints at right angles across it.

26196 From 160 paces north of the Southernmost end of exposure. Same slate as 26195.

At about the middle of the exposure the scales are fluted by a series of small parallel waves (see fig) and are cut by joint planes at right angles to the general dip of the fluting. Examined along at the joint cracks there has been movement in a narrow shear zone

S. 13+24 T. 40

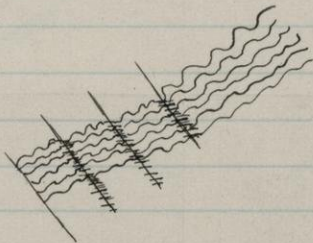
R. 31



Gray, bluish

26197

In this rock are bands of a cherty material, which band is true beds, as they seem to be, indicate a general dip of 45° a little W of N. These bands are inserted parallel to the bedding.



on the Wisconsin side of the river the slates are well exposed. Here also they are evenly cleared, with clearance striking about E.W. and dipping 45° N. Some of the slates are banded in this direction, but whether this banding is original or not, cannot say.

Above the R.R. bridge the greenstones and greenstone schists the form the Fourfoot and the two Iron Falls begin.

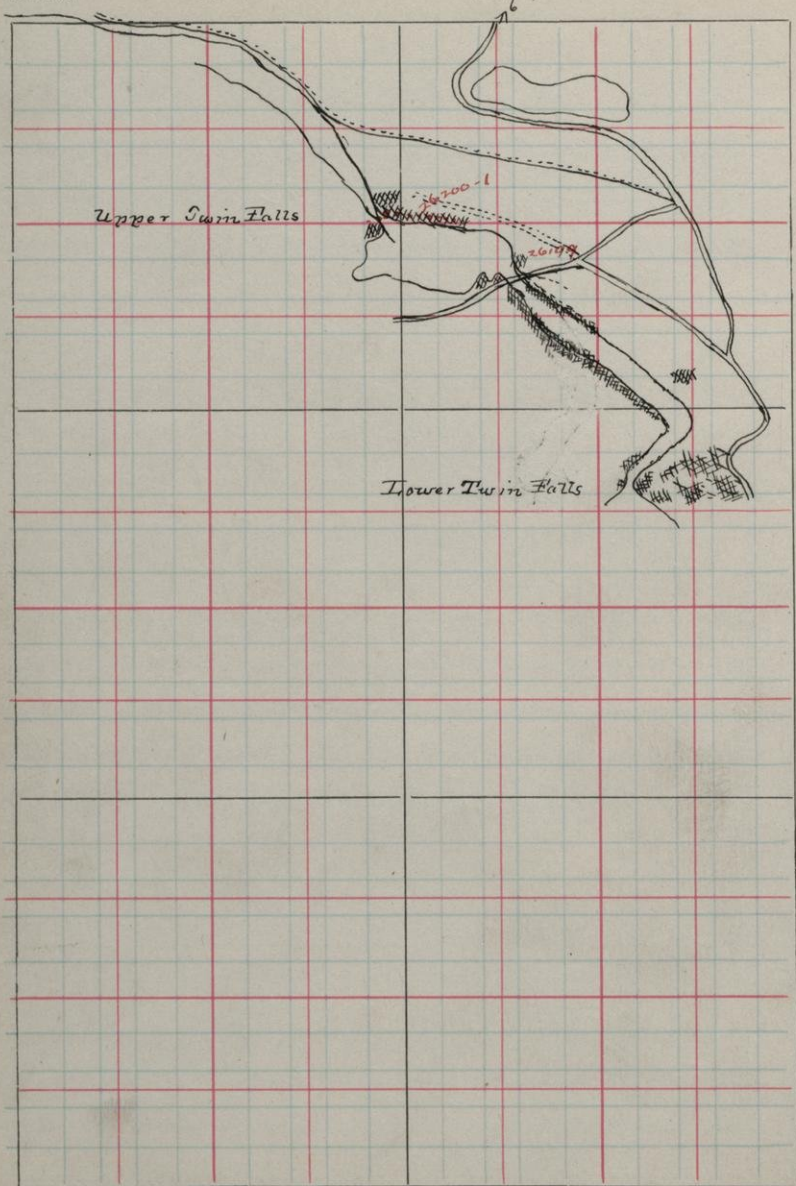
26198

is from ledge on Wisconsin side, in the

S. 12

T. 40

R. 31



North side of the railroad bridge

From this point northward to the bend in the river all the Schists - Exposed strike about E.W.

The rocks at the Lower and Upper Twin Falls have been mapped and studied by Williams.

26199

is a specimen from just above the wagon bridge at the foot of the Upper Falls. It is peculiar in that it contains a few large, lenticles of quartz, which look as though portions of broken quartz veins.

At the barrier of the Upper Falls, and along the East side of the basin south of the Falls is what appears to be a bed of conglomerate in the Schists. It is about 6 ft. wide when first met with toward the East, apparently breaking up to the west into several beds, the largest of which passes over the brink of the Falls.

In the dense green rocks near the

Sec. Line

Cor

C.S.
XXXX

Cor.
Rio

S. 1 & 2

T. 40

R. 31

6-747

2
5

1/4

20

5

1

20

5

foot of the fall were also noticed several bands of a quartzitic like substance an inch or so in width. It is apparently one of the stringers of the conglomerate.

26200 weathered surface of conglomerate

26201 quartzitic band

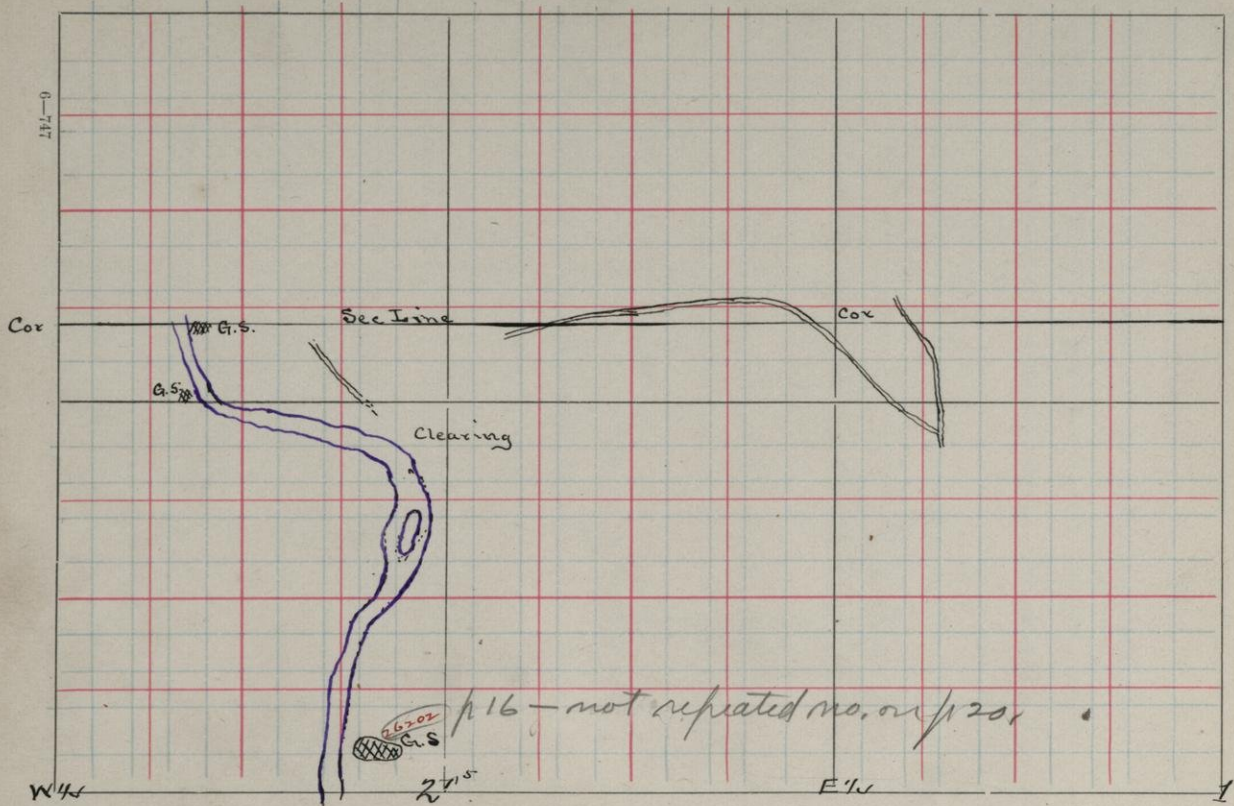
In Secs 1 and 2. T. 40 R. 31 No rock were seen other than a few ledges of greenstone and greenstone schist.

The sections are both 200-225' long N.S.

26202 Greenstone schist from near river

S. 1 and 2 T. 40

R. 31

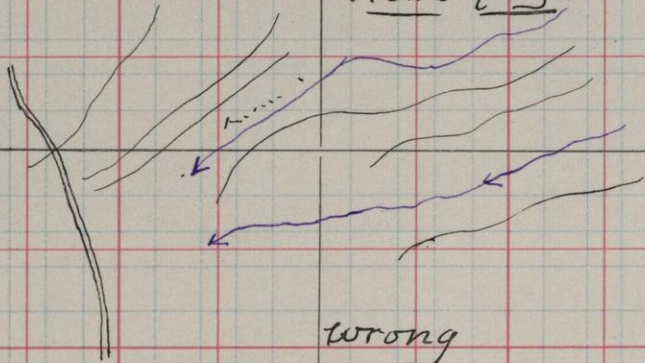


S.

T.

R.

Next page

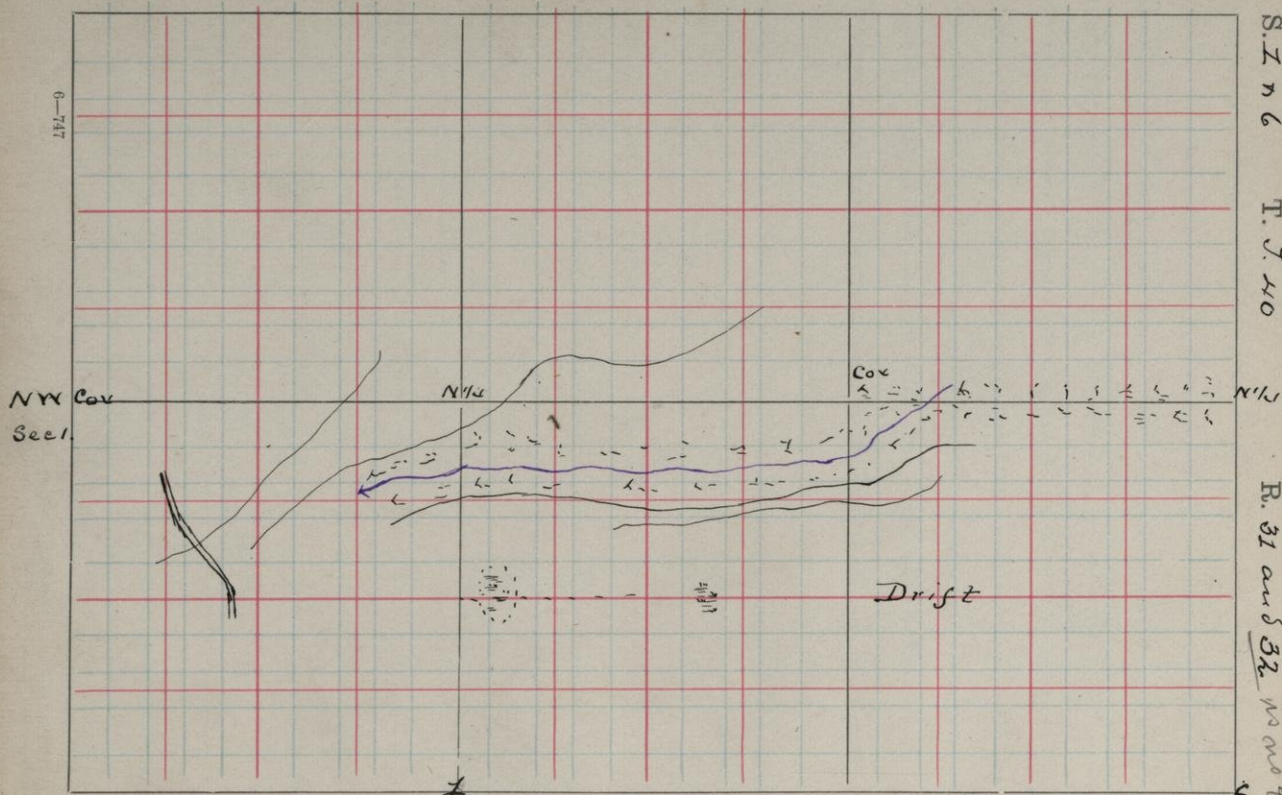


Ran East along the N line of Town
40 to within 500 paces of the U.E. Co
Sec 5 in T. 40 R. 30 without seeing
any rocks, the country being covered
with drift and swamp. When reached
this point ran South 600 paces and
west again to road in Sec 1, T. 40 R. 30

S. 2 n 6

T. 7. 40

R. 31 and 32
no 4032



0-747

Ran south from center Sec 13,
T. 20 R. 31. as far as the Swamp in
Sec 36 then west half a mile and
north to the Menominee River.

The top of the high hill west of Iron
Mountain is covered with Potsdam
sandstone so far as could determine
from small pits and outcrops
observed.

About 400 ft of T¹/₄ Sec 26 is a small
pit in sandstone near the top of the
hill.

As we descend the hill on the south
slope we find a pit in the iron for-
mation.

26202 Specimen of banded iron and jasper
obtained from same.

No other rocks were seen until
reached the terrace west of the city.

Here at 100 ft. 150 ft. of T¹/₄ Sec 36 on
the side of a dry creek is an exposure
of red slates and quartzites, which
strike E W and dip north at 60°.

26203 Quartzite band

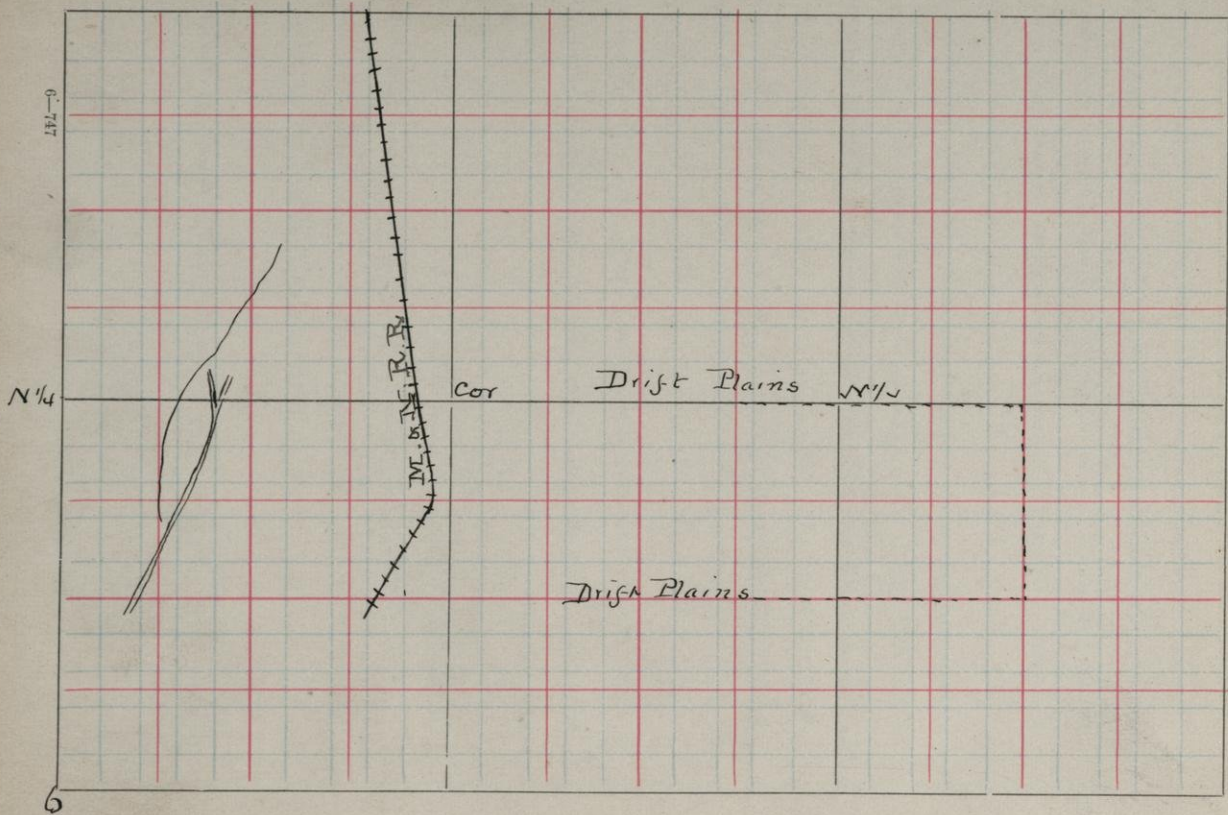
26204 Slate bed

These are the predominant rocks

S. 6 and 5 T. 40

R. 30

20



Called sericite slates to distinguish from others. On the top of the terrace is a number of pits in the red slate. Except for differences in degree of weathering the rock is all alike.

26205 Slate from dump pit near Dry creek.

The series of pits extend all the way to the D. W. On Dec 25, the line trending a little N. of W. Near this corner is a knob of greenstone on the face of the terrace. Though no relations can be seen between it and the slates, it is believed that it is intruding in the latter.

26207 At 140 N. 20 E of W 1/4 post Dec 25 is a pit ^{from} which a large quantity of red slates has been taken. This slate is different from 2623-5. It is not as micaceous as the latter, but appears to be more like the marble slates.

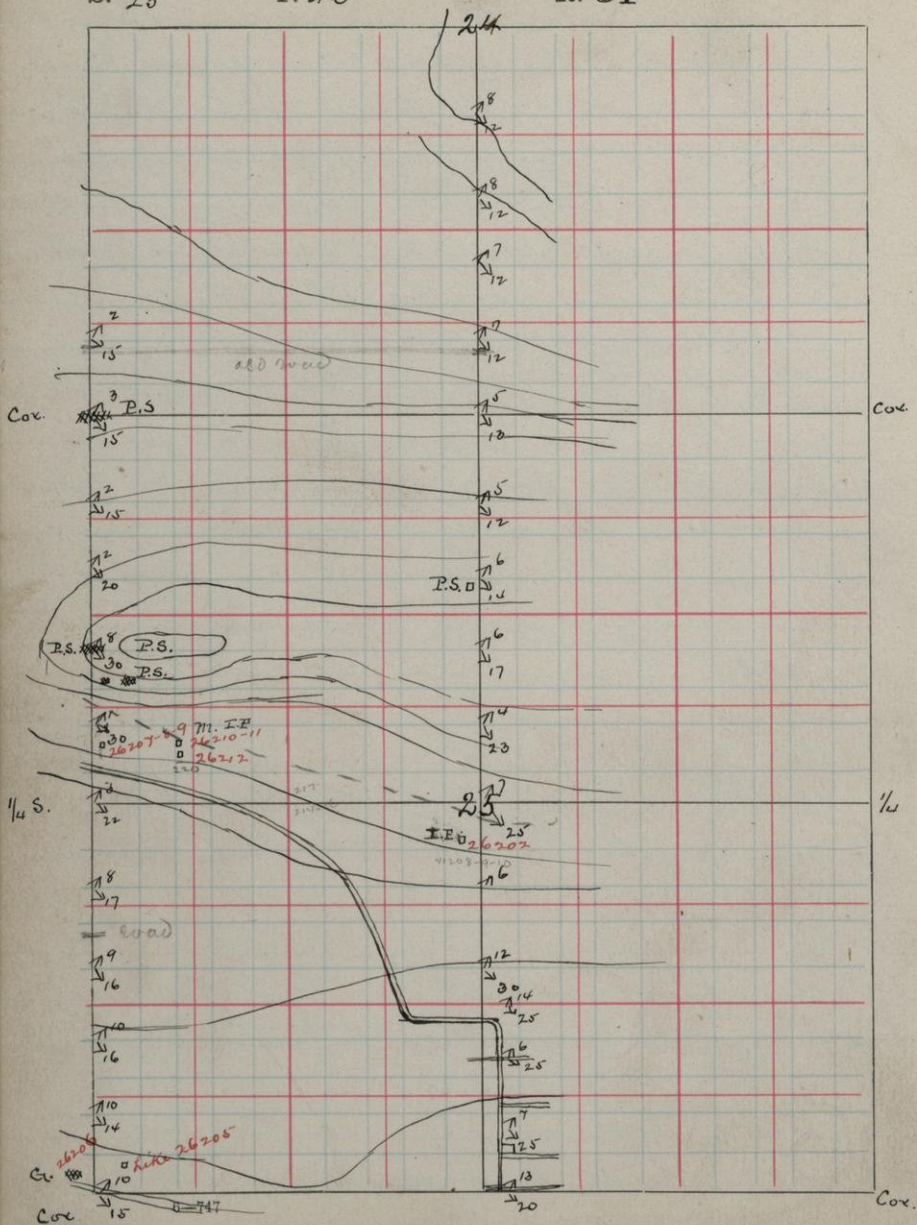
26208 Some of the pieces in the dump are light colored.

26209 At the bottom of the dump heap are fragments of banded ones and gaspers that do not look like lower gaspers,

S. $\frac{24}{25}$

T. 40

R. 31



Nevertheless I believe that it is from the lower formation and that the slates belong with the marble series.

At 130 N. 2006 of the W. Sec 25, T. 40 R. 30. are a pit and a drift into the hill side. The drift shows gaspery slates, capped by Potsdam sandstone. The slates and gaspers strike a little to the N of W. and dip about 40-45° to the S. Could not get into the drift so could not obtain strike and dip more accurately.

26210 In the dump heap of the pit and drift is a Jasper and iron fairly evenly banded.

26211 In places it contains what are apparently layers of chert or pebbles of this substance about which the layers of the rock wrap. The rock looks very much like a conglomerate in some places. It is probably a pseudoconglomerate produced by pressure.

26212 The 2" pit is a little south of the drift. On the dump heap are many fragments.

26212. of poor one, of which specimen is a fair sample. The main rock is gas-
per slate?

From a point 500 W. of U.E. cor. Sec 23. T. 40 R. 31. Run South three miles, then west 750 paces and north to Menominee River.

On the run South crossed below end of Iron Mountain Hills, finding it to consist of Ottodam Sandstone. On the terrace west of the hill proper the sandstone is worn away and has brought the one formation near the surface. At 325 S. 500 W of U.E. cor. Sec 26 is an old shaft in what I regarded as upper ores - but from my present knowledge (while copying notes) I regard as lower.

26213

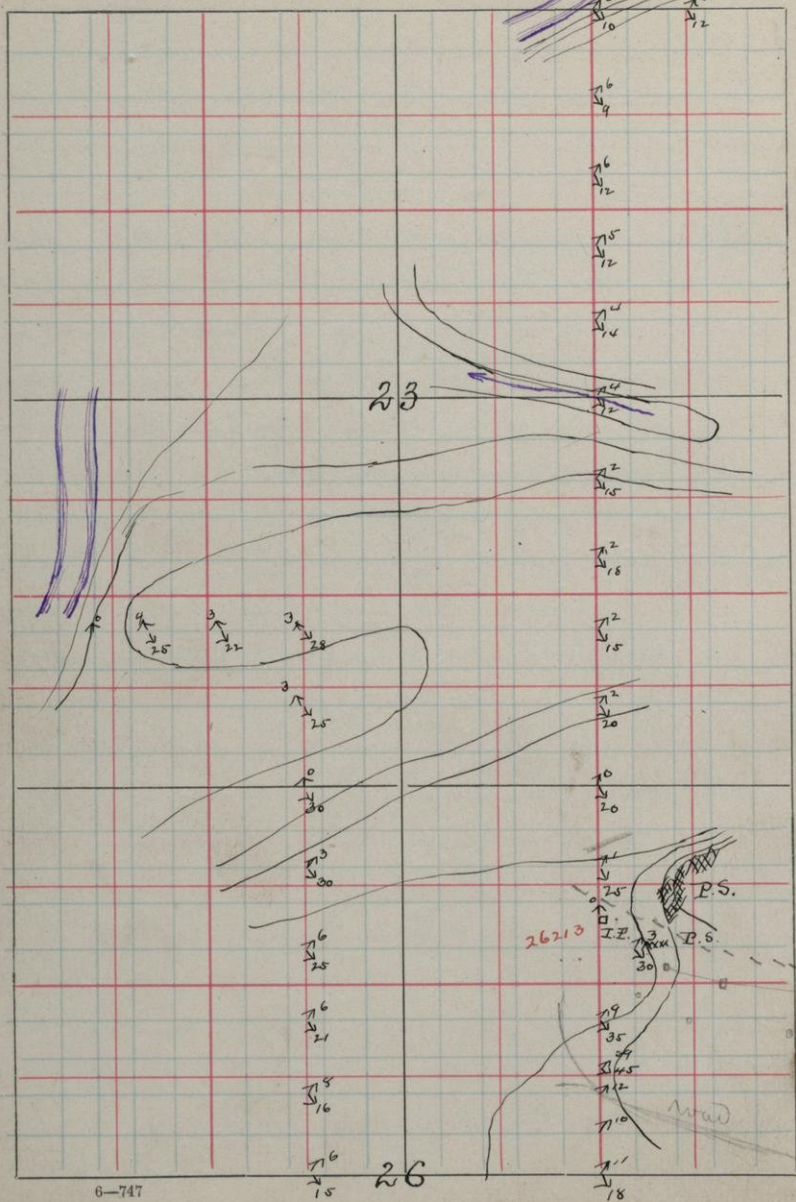
From Dump Heap.

No other rocks were seen on South run until reached South line of Sec. 26, where is a little knob of greenstone very like the greenstone 26206.

S. $\frac{23}{26}$

T. 40

R. 31



$$\begin{array}{r} 150 \\ 26 \\ \hline 150.0 \end{array}$$

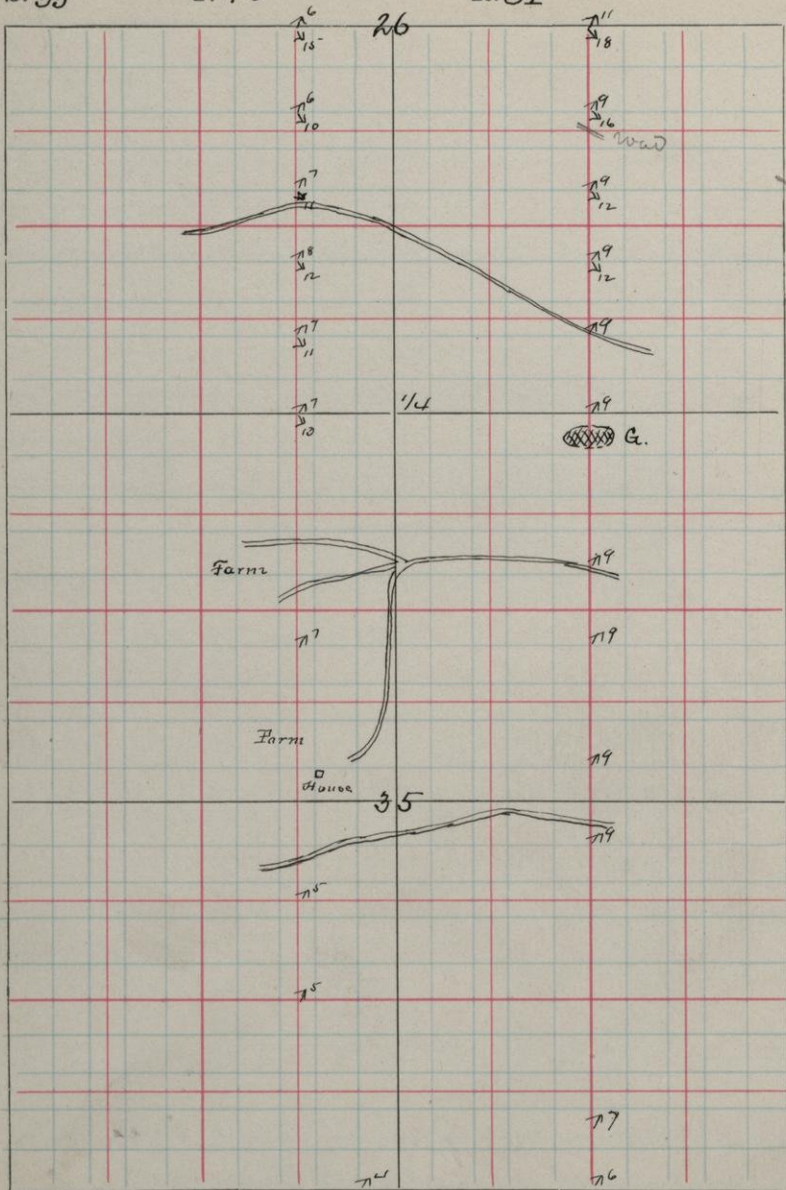
S. $\frac{26}{35}$

T. 40

R. 31

Cor.

Cor.



Made several traverses at different intervals across Secs. 20 and 21. To R. 30. to discover if possible the contact between the iron formation and the rocks to the north.

Within the area examined are the Graders, Clifford and Cornell mines. All these are open pit workings. Now have Dave Gentry's underground exploring to yield results of value concerning the relationships of the iron formation to other rocks.

The N.E. $\frac{1}{4}$ Sec. of Sec 20 and the N.W. of Sec 21 is dotted with pits most of which are located on maps. All those in which rock occurs are located so far as they are known. A large additional number that did not reach below the drift were examined but not located.

The little pit at 100 S. 500 E. of NW cor Sec 20 has quite a little dump heap from which the two following specimens were taken viz:

26214 Black slate?

26215 Quartzite?

[These were thought at the time to be upper. The black slate elsewhere appears to overlie the one formation]

At the southernmost shaft of the Cornell mine there was taken from the pit a small quantity of ore. This was largely a soft limonite. The main portion of the rock in the dump is a fine grained, black ferruginous quartzite.

26216

26218 A few fragments of Conglomerate are also strewn over the dump. These I think are Potsdam.

26217

Besides these two rocks there is also present a considerable quantity of a finely banded rock resembling somewhat an actinolite schist.

26219

Lean ore from dump.
Is this all upper?

At the more northerly shaft is a large pit in which the rocks are well exposed. They consist of quartzites

and ones interbedded and striking
 25° W of N. Their dip is 55° D.W. except
 where occasionally there are buckles
 or minor rolls. The one which is a
 soft red one appears to have come
 mainly from these buckled places.

26220 Quartzite and one interbedded
 At the NE end of pit is a small mass

26221 of greenstone schist that appears to be
 a dyke running with the strike of
 the rocks

26222 Porous one from the pit
 The Clifford mine has been studied
 by Dr. Clements

26223 In the little pit N.E. of the Clifford
 at 1875 N. 1000 W of SE cor Sec 20
 are what the miners here call
 blue slates. If the dip is as in the
 other rocks, these slates are under
 the ones.

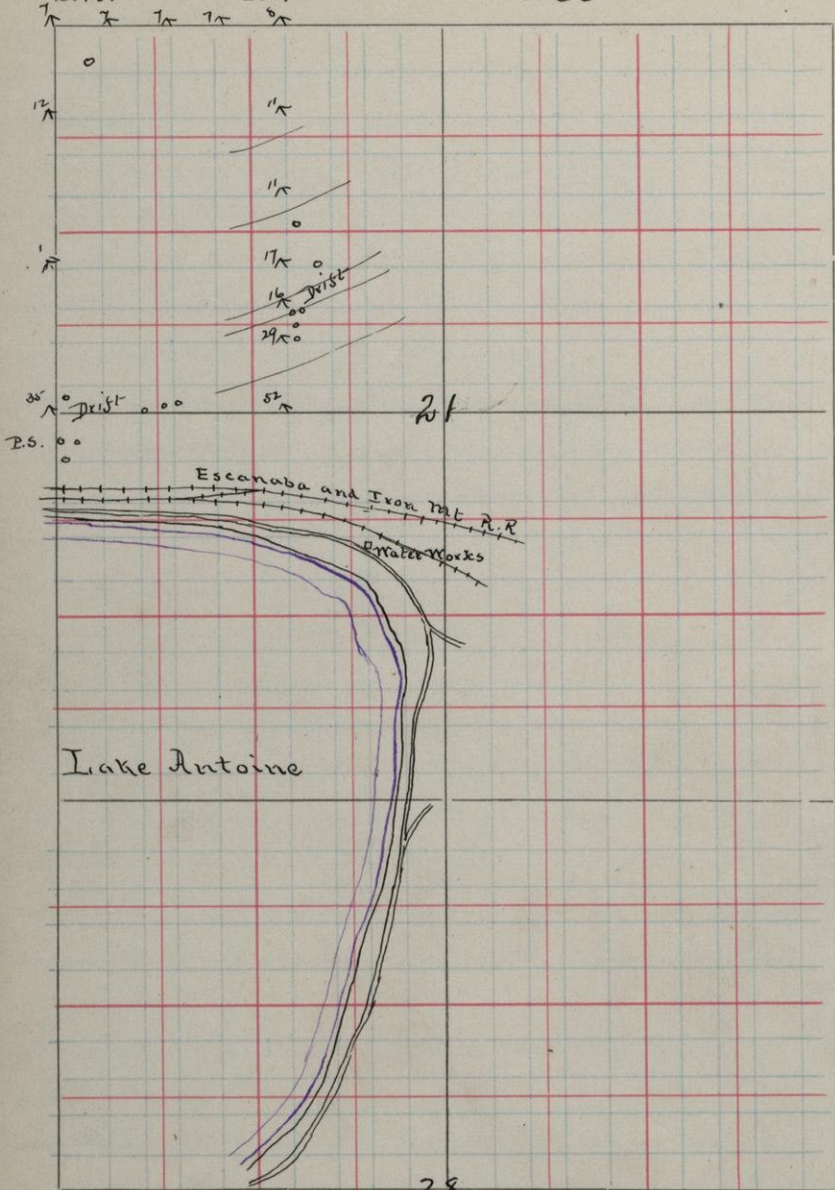
At the Traders mine are again
 evenly bedded ones and quartzites
 striking about 5° W of N. and dip-
 ping 55° N.

26224 The one shipped from here is a spec-

S. 21

T. 40

R. 30



lav.

Toward the ferruginous quartzite?
 26225 Associated with it is about midway
 in appearance between a squeezed
 chert and a squeezed quartzite?

Toward the north ^{East} side of the pit is a
 26226 bed of breccia or conglomerate, the
 thickness and relations of which
 were not determined because the
 pit stops at it, and

26227 north ^{East} of this is a ferruginous shale?

26228 On the N.W. corner of the mine, one
 and red quartzite appear, the latter
 in lenticular bands, which may be
 a phenomenon that explains the ex-
 istence of the conglomerate?

North of the Trades are several small
 pits - in addition to the old pit located
 a few days ago (p. 11).

26229 In one of these, at 25 N. 1000 W of S.E. cor-
 ner T. the rock is an evenly banded
 one, not very unlike the Trades ex-
 cept that it is not lenticular. It
 is covered with Potsdam sandstone.

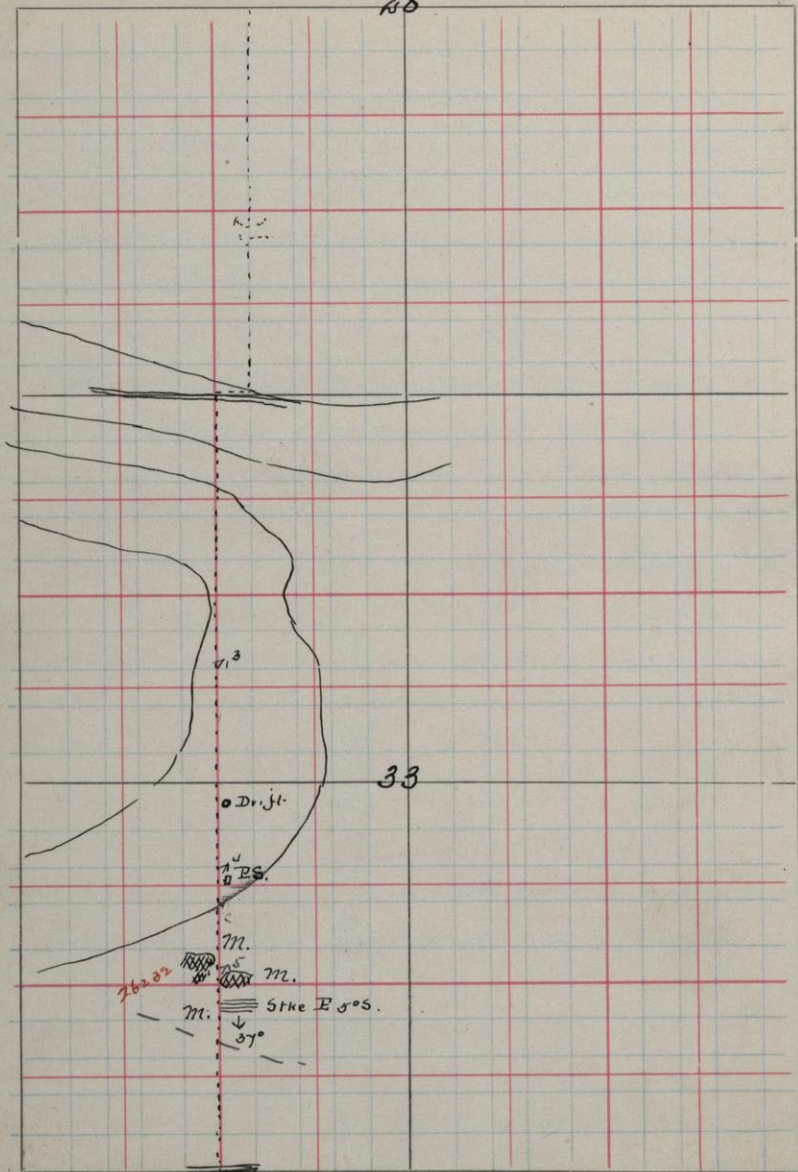
26230 Ochreous one, probably, Potsdam

S. $\frac{28}{33}$

T. 40

R. 30

28



from old shaft just north of last mentioned pit.

26231. At about 100 S. 50 W of E 1/4 post Sec 20 is a pile of limestone in the side of the R. R. track. This pile according to Mr. Johnson was taken from a drift in the hill at this place. The group of pits near this 1/4 post is in Potsdam are conglomerate and drift.

In Sec 21 T. 40 R. 30. no rocks were seen. A number of pits occur here but they are all in drift or Potsdam. When reached N 1/4 line of Sec 21 ran south to center line of Sec 28 then west 400 paces, South half a mile, west another 100 and South through Sec 33.

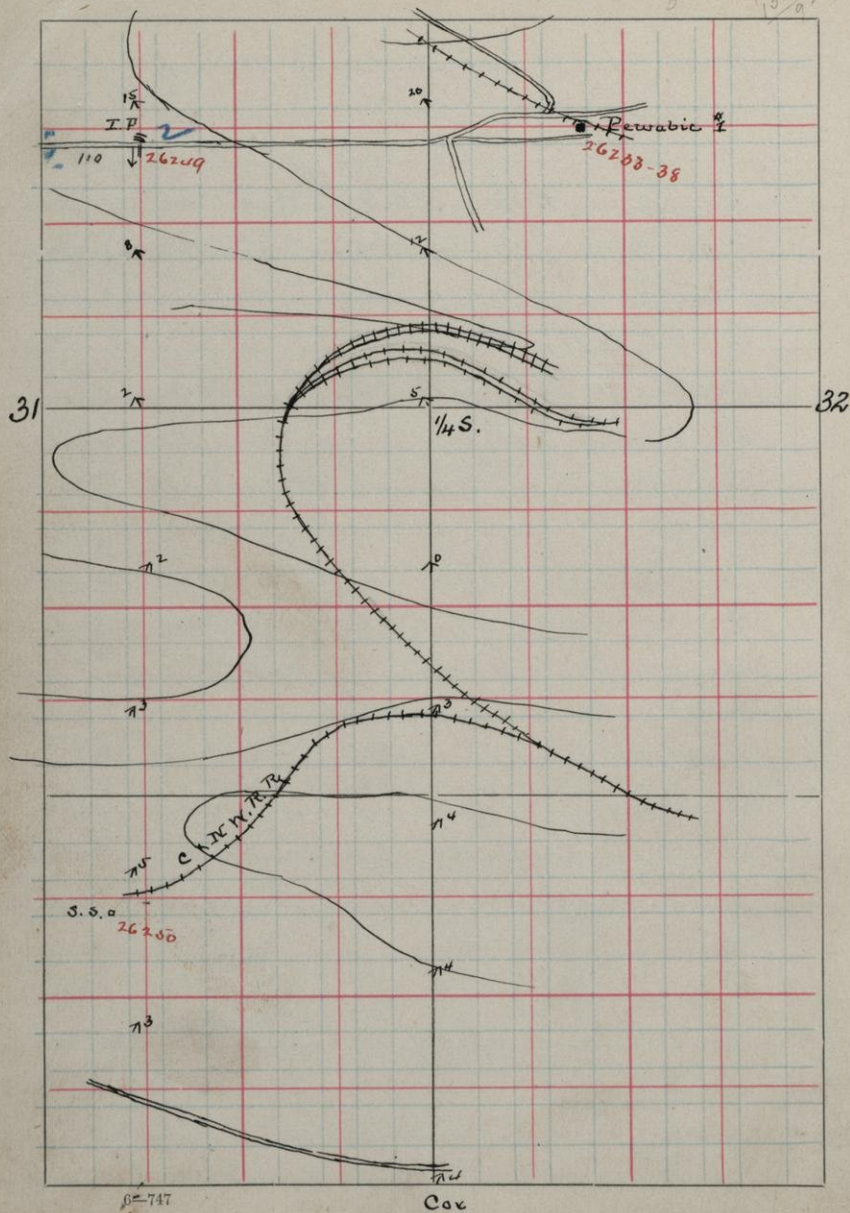
A little pit in drift was encountered at 950 N. 1490 W of S. E. cor Sec 33 and one in Potsdam at 750 N. 1490 W of same corner.

At about 590 N. 1500 W. of same corner is a group of little knolls of lime-

S. 31 & 32

T. 40

R. 30

$$\begin{array}{r} 26 \text{ J} \\ 66 \\ \hline 330 \end{array} \quad \begin{array}{r} 26 \text{ J} \\ 311 \\ \hline 792 \\ 132 \\ \hline 922 \end{array}$$


stone. The Northern Knobs are composed
 26232 of a very micaceous rock in which Dip
 and Strike are not noticeable, but
 in the Southern Knob the strike is dis-
 tinctly $E. 50^{\circ} S$ and the Dip, $37^{\circ} S$.

From S.E. cor Dec 31. T. 40 R 30 ran
 north two miles and a half - west
 400 and South.

In north run no rocks were seen
 until passed the Pewabic mining
 shaft No. 1. This mine produces the
 Pewabic and Genoa ores. The foot-
 wall is said to be of red slates and to
 be in the north of the ore.

For details see Special Maps sent
 by Mr. Brown.

26233 is a specimen of these red slates.

The rocks associated with the ore are

26234 are well banded quartzites and
 ores, which in some places show

26235 Contortions

26236 Pewabic ore

26237 Thick band of quartzite or chert.

26238 Ore conglomerate, or breccia. Probably
 crushed ore and gaspe cemented by

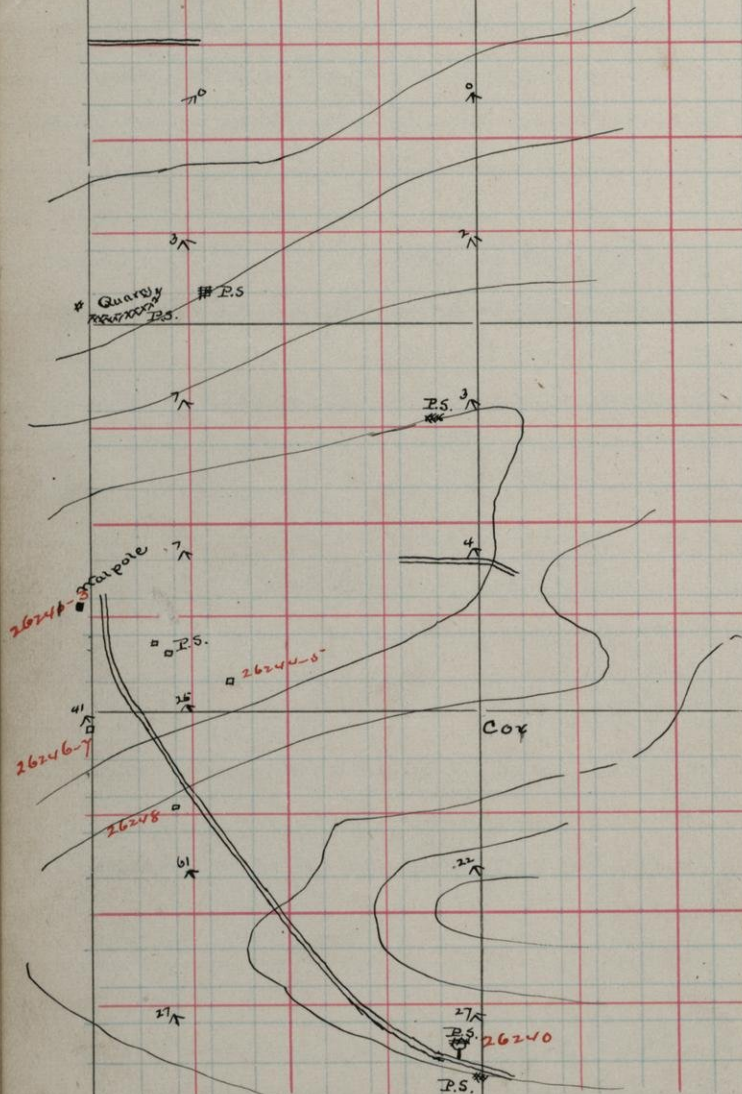
S. 30029
31 32

T. 40

1/4 5

R. 30

29



Calc. etc.

26239 Genoa ore.

Beyond the shaft near the top of the hill is a drift in sandstone. It has a peculiar pinkish tinge, as though it were formed largely of the debris of marble.

No other rocks were seen in this run except a ledge of Potsdam sandstone at 400 ft. to W of S.E. cor Sec 30.

On run south passed over Potsdam sandstone at 500 ft. 500 W of S.E. cor Sec 30 - in which is the Chapin sandstone quarry.

At the Waipole shaft the rock is very similar to that of the Plewabic.

26241 Specimen banded quartzite etc.

26242 The ore however is more slaty and

26243 there is also a greater quantity of the ore conglomerate or breccia.

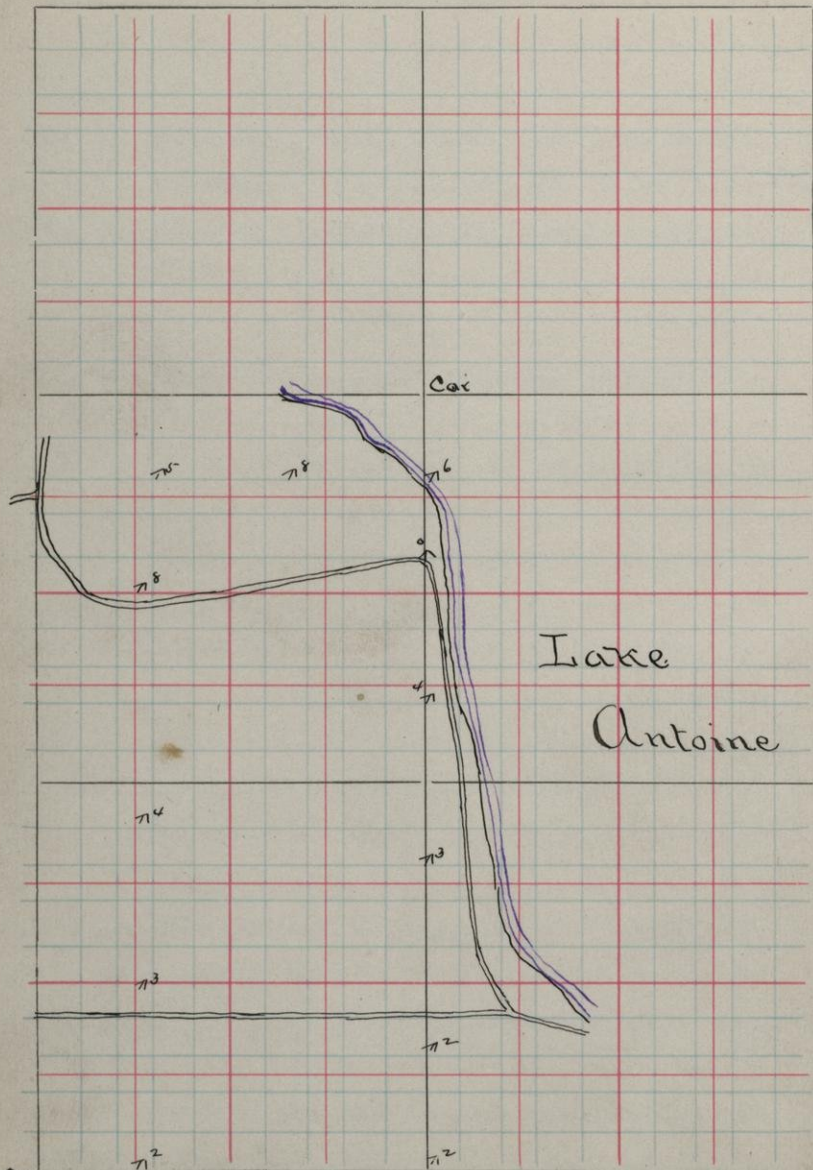
There is an old shaft at 320 W. 40 ft of S.E. cor. Sec 30. From its dump heap obtained two specimens - one

26244 evenly banded ore and quartzite?

S. 30

T. 40

R. 30



26245 The other a specimen showing the
mark of one of the larger bands of quartz-
ite.

Another old shaft is at 500 W. 400 of
the U.E. Cor. Sec. 31. On its dump heap

26246 are red scales and

26247 banded red and black scales.

26248 A little pit at 400 W. 130 S. of U.E. Cor
Sec 31 is in a rock resembling at
actualish Schist
and a banded one and slate.

26249 On the side of the street leading up to
the Pewabic mine is a small ledge
of iron schist striking 15° N. W.
and dipping vertically. This has
been drifted into from beneath
the street. At the south end of the
drift the dip is slightly to the north
a little further north it becomes
vertical.

26250 The last rock seen to the south was
from a little pit at 350 N. 450 W.
of S.E. Cor Sec 31. It is a red sericite
slate.

W. H. M.
Apr

Raw north from 300 W J.V.E. cor Sec 3, T. 20 R. 30 one mile and a half, then west 400 paces and south.

On rail road at 310 N. 750 W J.V.E. cor Sec 31 found a cut in red Seneca^d shale whose general strike is E & W. and dip 75° N. In one or two places there are minor folds with anticlinal axes dipping a little less steeply to the north.

26401 Seneca^d shale^d

26402 Graywacke-like rock apparently interbedded with 26401.

At 1575 N. 800 W of this same corner is an old shaft in dump of which
26403 are evenly banded quartzites and ore

South and South-East of this are numerous small pits^d with dump heaps.

26404 In that at 1500 N. 700 W. the quartzite bands are very wide - otherwise the rock is like 26403

26405 All the pits in the ^{310 N. 700 W.} N.E. 1/4 Sec 31 are in the same rock except a couple of the Southern ones which are in red

slates, that way, however, only the
slaty jaspers.

The strike of the iron formation in
Pit X. is $E. 40^{\circ} S.$ Dip not determined
but probably about $60^{\circ} N.$

At 1630 N. 780 W. of S.E. Sec 31 on side
of the hill, on opposite side of which
is the Miller's property, are exposures
of iron-quartzite banded rocks striking
 $E. 25^{\circ} S.$ and dipping vertically,
or very nearly so.

26406 About 15 steps S and E of this is a
little slate exposure in which slate
strikes in same direction

The Miller's property consists of a
number of open pits, a number of
abandoned shafts and one working
shaft.

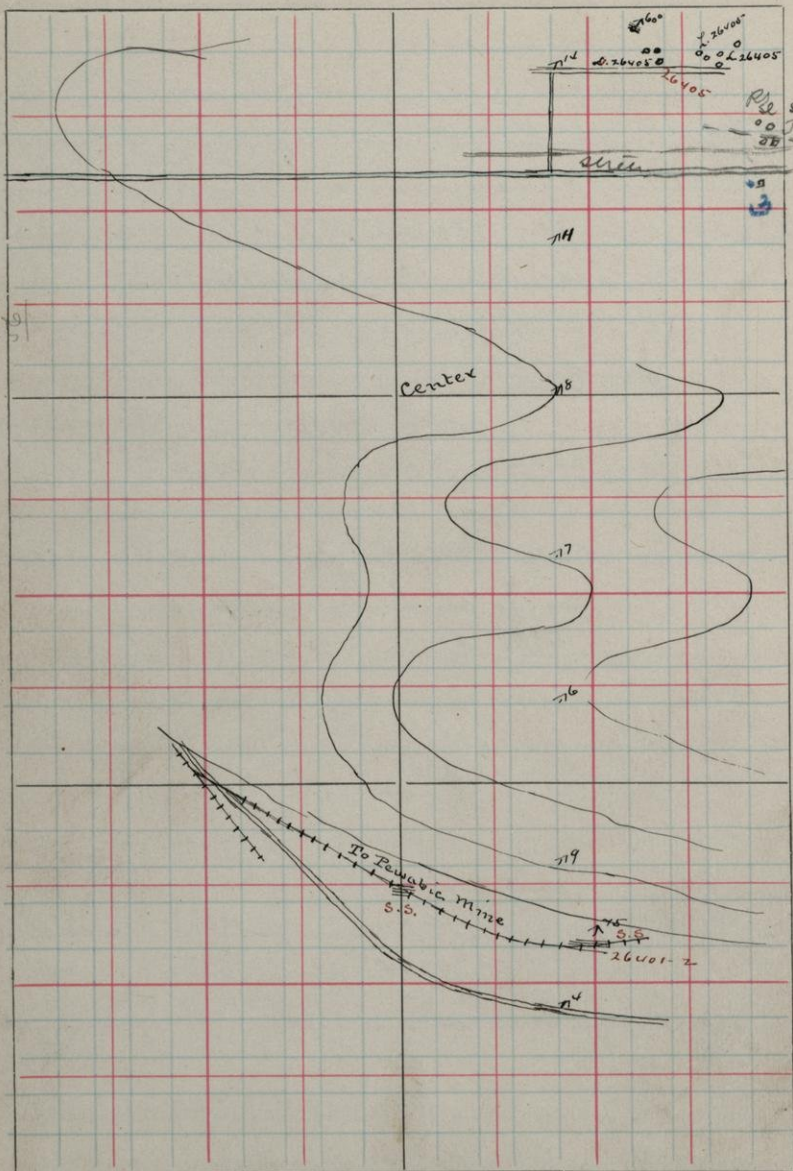
26407 At the Easternmost Miller's shaft the
the banded one seems to be more like
chert than like quartzite. All the
Eastern pits are in this same ma-
terial

At the middle shaft (C) which is the
working shaft the dump heap is
very large. It contains a very

S. 31

T. 40

R. 30



26408 large amount of one conglomerate, which consists of fragments of ore cemented in the material and quartzite? This was originally regarded as a true conglomerate, but now think it only a breccia, since so far as I can learn, it is found only at the ends of troughs.

The major portion of the rock is banded one in which the siliceous beds are more cherty than they are in the other mines examined.

26409 Specimen of banded ore.

26410 one from shipping cars.

The open pit East of the "C" shaft is limited on the E. by a wall ^{50 feet} of

26411 the iron formation, whose strike as nearly as could be determined is N. 21° W. The dip varies but is generally N. perhaps about 45°.

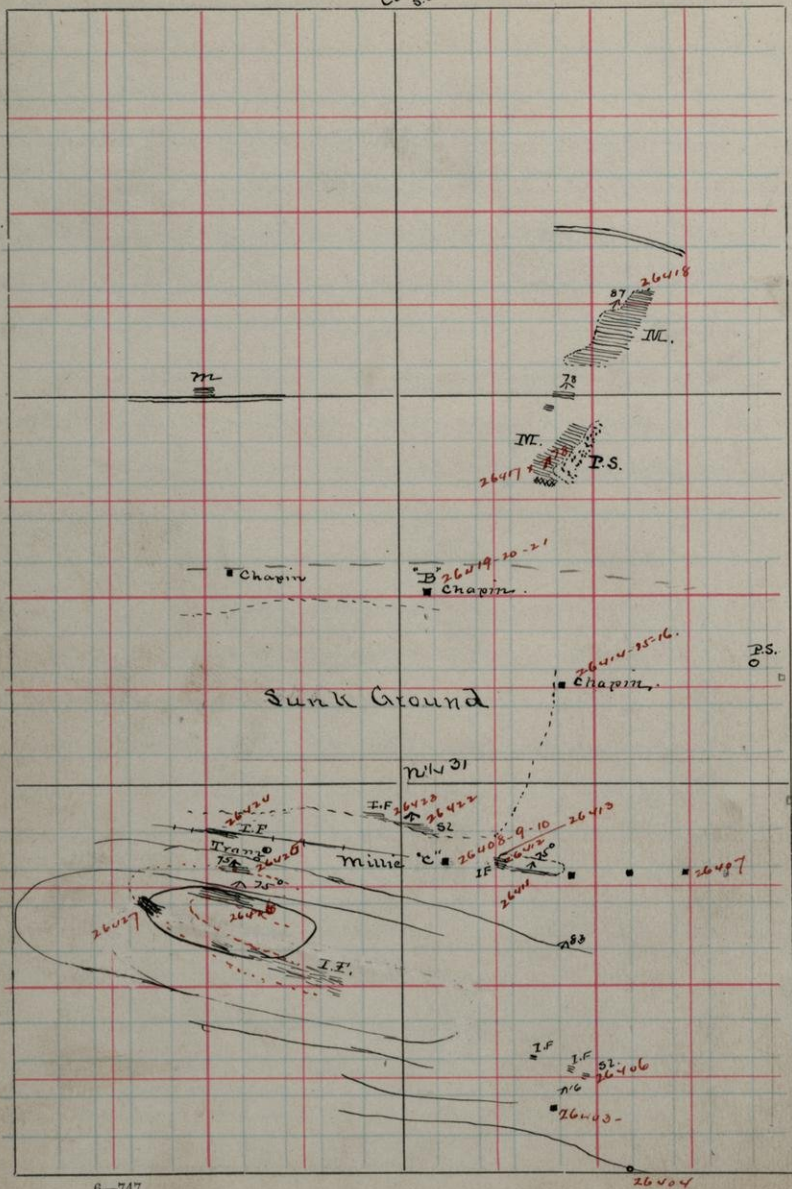
On the ends of the pit it is noticed that the dip is a trifle less in the ^{northern} ~~southern~~ beds than it is in those that lie ^{below} ~~above~~ it. There is not enough difference, however, to afford a basis for any generalizations.

S. $\frac{30}{31}$

T. 40

Center
S. 30.

R. 30



Handwritten calculations on the right margin:

$$\begin{array}{r} 260 \\ 200 \\ 13200 \\ 528 \\ 660 \\ (110) \\ 26000 \\ 260 \\ 260 \\ 100 \\ 100 \\ 100 \\ 260 \\ 100 \\ 100 \\ 260 \\ 100 \\ 100 \end{array}$$

Between the lower and the higher dipping beds is a 6 ft wide bed of compact ore conglomerate. The rock above the conglomerate is represented by

26412

specimens

In the extreme N. W. corner of the pit the rocks are much broken, so much so that the true nature of the rock here is difficult to determine.

26413

It looks very much like a greenstone.

Could not determine whether the rock above and below the conglomerate were the same or not, nor could I detect any unconformity here.

Passing north came upon the large sink hole or "cave in" in the Chapin property. On the dump heap of the old shaft at the E. end of the "cave in" found the rocks indicated by specimens

26414

The banding is much finer and

26415

were even than in the Guelig rock

26416

but this is the only difference I can detect. There are also in the dump

red shales in great quantity?

At 430 N. 800 W. of S.E. Cor Sec 30 the Potsdam Sandstone in a quarry lies horizontally in quarries, which strike W. 15° N and dip 78° N. Near the contact with the Sandstone the limestone shows nodular weathering, when it resembles a great conglomerate? No difference can be seen in texture of nodules and matrix.

26417 a Nodule

26417 b matrix.

26417 The large limestone ledge

The large limestone ledge at and of Hill north of Chapin Shaft. Extends from 670 - 780 W and 560 - 680 N.

It is made up of evenly bedded layers striking W. 16° N and dipping 85° - 87° N, interbedded with layers in which the concretion is very complicated, sharp folds following each other in rapid succession. No general structure can be worked

not from the relations of the folds, most of them possessing axes that pitch almost perpendicularly to the north. The bed evidently was a plastic one within several hundred and resisting ones.

26418 The northernmost ledges of the limestone are very thin, bedded. On weathered surfaces they show distinct, projecting ends of chert layers, or of bed of siliceous clay.

Another ledge of limestone is found on the side of the street at 500 N. 1200 W. of S.E. Cor Dec 30.

The material at the B shaft of the Chapin mine looks a little unlike that of the mines south, but not very much so. The ore seems more different than the rocks associated with it.

26419	Cherty material from dump
26420	One " " "
26421	Soft one " " "

The big "Cane run" consists of two parts an eastern and a western. Clements studied western.

26422 The south face of the eastern end of the pit is a face of black slate that dips very high to the north. Nothing of importance can be learned from it.

26423 Above this (to the north), in the pit is a ledge of ore and jaspers. This is best seen in the west end of this portion of the pit. The rock dips high to the south.

In the western portion of the pit the slates and jaspers are again exposed - at one place showing an anticlinal fold pitching steep to the west.

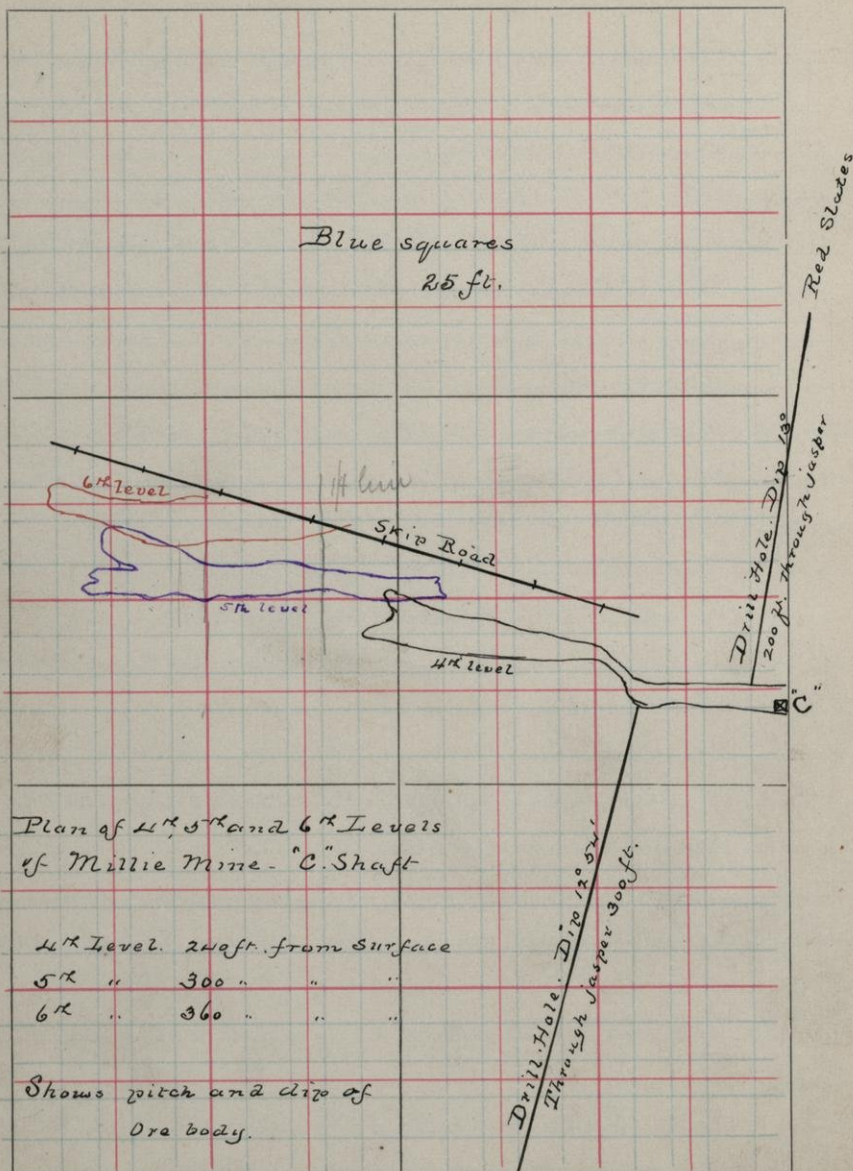
26424 was taken from the little ledge along side of the railroad to the Millie mine, at about 1200 W. of U.E. cor Dec 30. Strike W. 150 N. Dip vertical.

The hill south of the Millie, i.e. the large hill E of Iron Mountain is composed of iron formation stuff.

S.

T.

R.



26425 On the north side of the hill near the top is a ledge of Jasper and one striking E 10° S and dipping 45° U.

26426 Near the top of the hill on the north side the Anticline Knob is covered with information rock striking E 20° S. and dipping 45° U. Here and there the rock is squeezed the chert or quartzite bands being broken and a pseudo conglomerate being formed.

26427 At 1320 W. 15 S. O. of U. E. Co. Sec 31 on the extreme top of the hill the rocks are again well exposed. Here the strike E. 35° S and dip vertically.

Other Exposures are noted in the map.

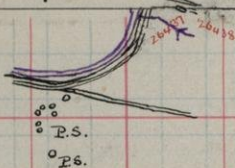
No other rocks were seen in the South run.

S. ²⁹32/33 T. 40 m

R. 30

29

1/4



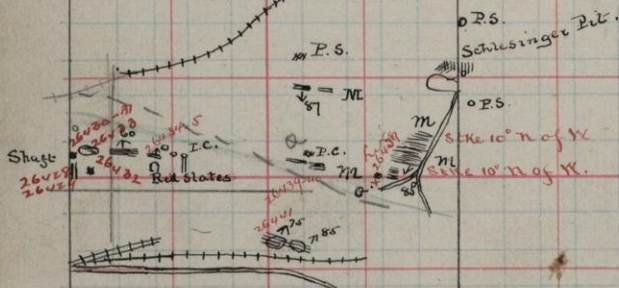
1/4

Cor

32

1/4

33



S 1/4

6-747

Cor

S 1/4

211

From 800 W of S.E. Cor Sec 32. T. 40 R.
R. 30. Run north blake Anthony then
East 400 paces and South.

A large number of Exposures were seen
in the S.E. $\frac{1}{4}$ Sec 30 at the Keel Ridge
workings.

At the drift on the South side of the
26428 Hill at 1000 W. 525' N of S.E. Cor Sec
30 are evenly banded red slates - that
are probably jaspers. From dump.

26429 And also a sericite^o slate like the
slates further west.

Further up the hill is an old shaft
26430 on whose dump are 'red slates' which
are nothing but fissile iron forma-
tion stuff, embedded in place.

26431 and banded rocks with thick cherty^o
layers.

West of the shaft about 100 paces is a
pit in red slates ^{with} and East is an open
pit in which the rocks are well exposed.

On the N.E. face of this open pit the
rocks show plainly that the iron for-
mation here is much folded and greatly
corrugated. On the whole the rocks dip
to the ^{5 mi - to the N.W. corner of sec. 32} north, but they are folded into ^{67° S}

one measured pitch was 17° W.

Synclines and anticlines of very small size, but whose constant pitch seems to be westward.

On the South side of the pit are the red slates, which too are contorted. They appear to be fissile portions of the iron formation materials.

26432 From S.E. side of pit.

26433 Specimen from syncline

For 50 paces East of the open pit there are exposures of the iron-formation with red slates to the South. The rocks near the pit are badly contorted, but further to the East they become generally flatter until the dip about 150 paces East of the shaft is only 70° N.

At 800 W. 535° N. of the S.E. corner of the
 26434 Dec. ³² are several pits. In the Southern
 mountains are the red slates that seem to be fissile Jasper, and in the north.
 26435 are one harder Jasper, with strike
 W. 5° N. and dip 58° N.

Just above the railroad track as we run north on the line 500 paces W. of the East line of the section is a

Large boulder of marble, whose strike like No. 31 shows that it is not a ledge.

No other rocks were discovered in this run until it reached the lake. There are a number of test pits some of which are in Potsdam sandstone.

At 400 W. 1000 N of the S.E. cor. Sec 29 are several ledges of marble in a hillcock near the lake shore. The marble is interbedded with quartzite. The rocks are both well exposed in a ledge 100 ft. long, in which they strike W. 15° N and dip vertically at the west end of the ledge and at its East end strike 19° N of W with the same vertical dip.

- 26436 is the predominating marble.
- 26437 from one of the interbedded Siliceous layers that stand out prominently in weathering.
- 26438 Quartzite bed 2 ft. thick. Beautifully cross bedded.

At (1464 S) 536 N. 400 W of S.E. cor Sec 32 is a precipitous ledge of marble and

Calcareous quartzite; resembling very closely the Mesnard quartzite in some of its phases. It is a pink, cherty rock that appears like some of the marble, as more typical marble appears in the top of the hill a little back from the face of the cliff. The strike, determined from the marble, is $W 20^{\circ} N$. Dip almost vertical.

- 26439 The typical quartzite.
Much of the quartzite is brecciated, some of it being a breccia of chert fragments in a red matrix. This I take to be the base of the Potsdam resting upon the upturned chert layers. Here and there are veins of the red sandstone cutting through dense cherts.

26440 Spec of the conglomerate.

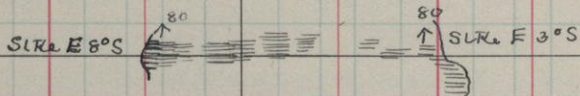
At 300 N. 400 W. of E. on Dec 32 is the open pit and the shaft of the Keel Ridge mine.

- 26441 The one formation here is slaty. It is represented by specimen 26441. The strike is $W. 24^{\circ} N$. Dip $45^{\circ} N$.

S.

T.

R.



Outcrops of Limestone on Island
in
Lake Antoine

At the Desinger pit at 0000 W.
 750 ft of S.E. Cor Sec 32 the basal
 Conglomerate of the Potsdam is being
 worked. The one is obtained from
 boulders in this conglomerate and
 from thin beds of one, composed of
 coarse & detritus of the underly-
 ing formation.

Examined Island
 in Lake Antong. At its East end
 are limestones, apparently a con-
 tinuation of those on the main
 land, that dip ^N at from 78° - 85° and
 strike E.W. ^{NE}

The main height of the Island is
 made up of these rocks, which out-
 crop almost continuously along
 the crest.

26442 At the west end of the island the
 same rocks occur. Here they strike
 80° S of E and dip 80° N.

Although the beds are very evenly
 bedded, nevertheless individual
 beds show contortions within them-
 selves.

S.

T.

R.

On the main shore, at the boat house
just west of the island there are sev-
eral ledges at the water's edge, which
are green bedded and which have
24443 Corrugated surfaces.

The rocks are about vertical and they
strike $N. 82^{\circ} W.$ the strike passing
exactly along the N.W. cor. of the island in
the lake.

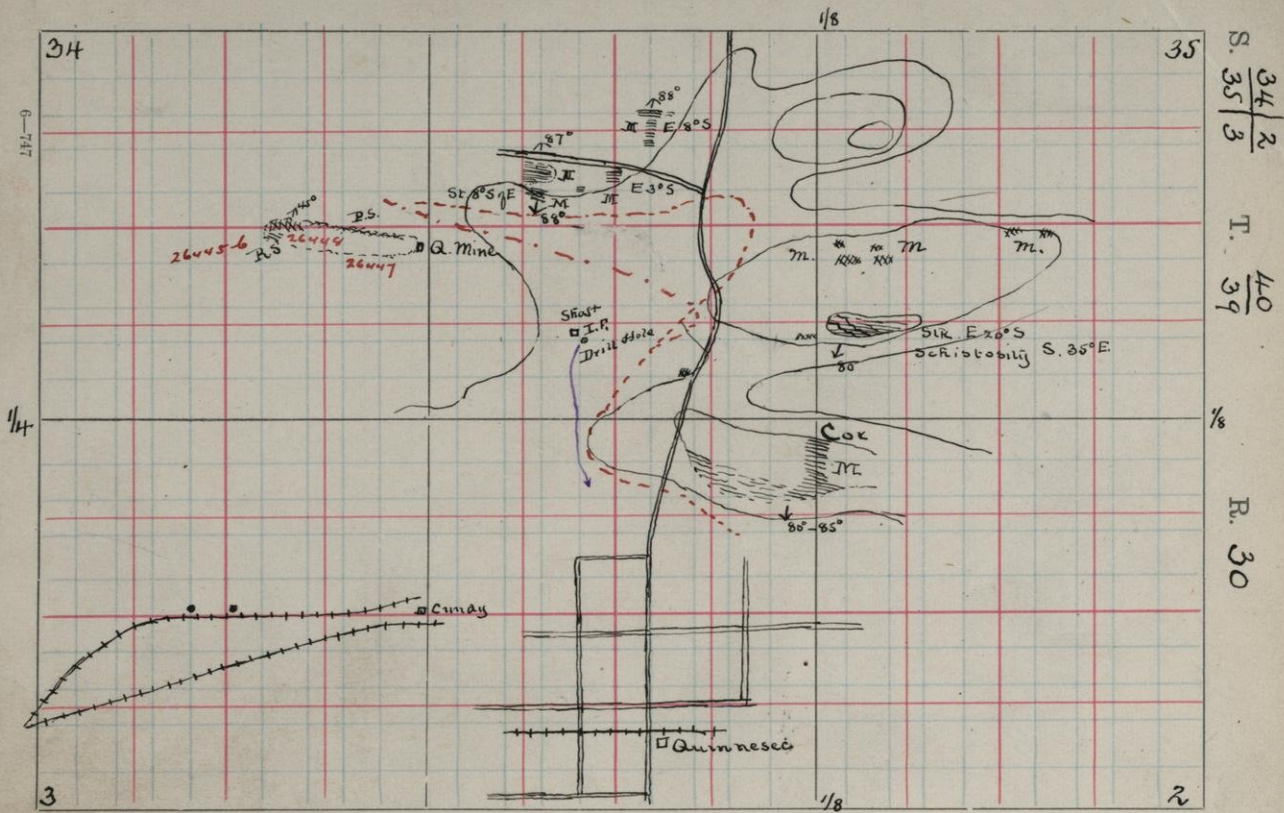
26444 Red slate, south side open pit 2
Lindquist mine

26443-4- on opposite page.

At the Peewabig mine obtained a great deal of information concerning the relation of the iron-formation to the limestone. The mines are in a trough pitching westward, but at a low angle in the center of the trough. On the north side of the trough the dip of the rocks is toward the south, on the south side toward the north. At the east end of the trough the rocks are much shattered the slates associated with the ores being crushed to a powder. The limestone is in all cases older than the iron formation.

Limestone is shown by drill holes to exist all along the center ^{N 1/2} of Sec 32 between the center line and the north section line of the Sec. The same rock is said to occur in the N & S center line of Sec 29 about 250 ft of the S 1/2 part of the section.

The conglomeratic ores of the Miller and Walpole are said to occur in any portion of the formation, where



the rocks have been crushed.

Camps for the Walpole and Pe-
wabes Mines are promised.

Made an examination of the
Quinnes and Cuddy locations
in search of fossils in the limestones
to explain the occurrence of the org.
The results are shown in the accom-
panying map.

A few specimens were taken as
follows:

- | | | |
|-------|---|----------------------------|
| 26445 | Black slate | } from S.W. side of
pit |
| 26446 | One | |
| 26447 | Ottawa Conglomerate in contact
with one formation. | |
| 26448 | Greenish gray sandstone from S.E.
side of pit. | |
| 26449 | Rock from pit 300 paces W of the
Cuddy shaft. | |

Ran north from main road at 1600 W of E line Sec 6. T. 39 R. 29 and returned at 1400 W of this line.

No rocks were seen until had reached the north side of Sec 31. T. 39 R. 29. Here at 160 E of the U.W. Cor Sec 31 is a calcareous quartzite full of pebbles and boulders in a matrix that looks arenaceous.

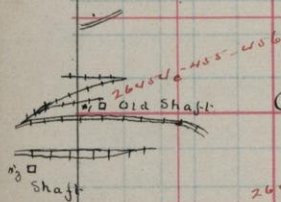
The ledge forms a little knoll, that is cross covered on the west side. Under the run is an exposure a few feet high. The southern portion of the ledge is a well marked Potsdam conglomerate, in which the principal boulders are chert. A little further to the north the chert and various ferruginous boulders are so thick strewn through the rock that the matrix is scarcely perceptible. This conglomerate resembles strongly a Bonanza one. A few feet further north the rock looks like a cherty quartzite. From the number of cherty-quartzite pebbles present in the rock, assume

S. 8

T. 39

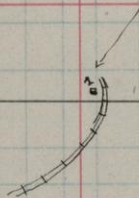
R. 29

N. W. Cor.



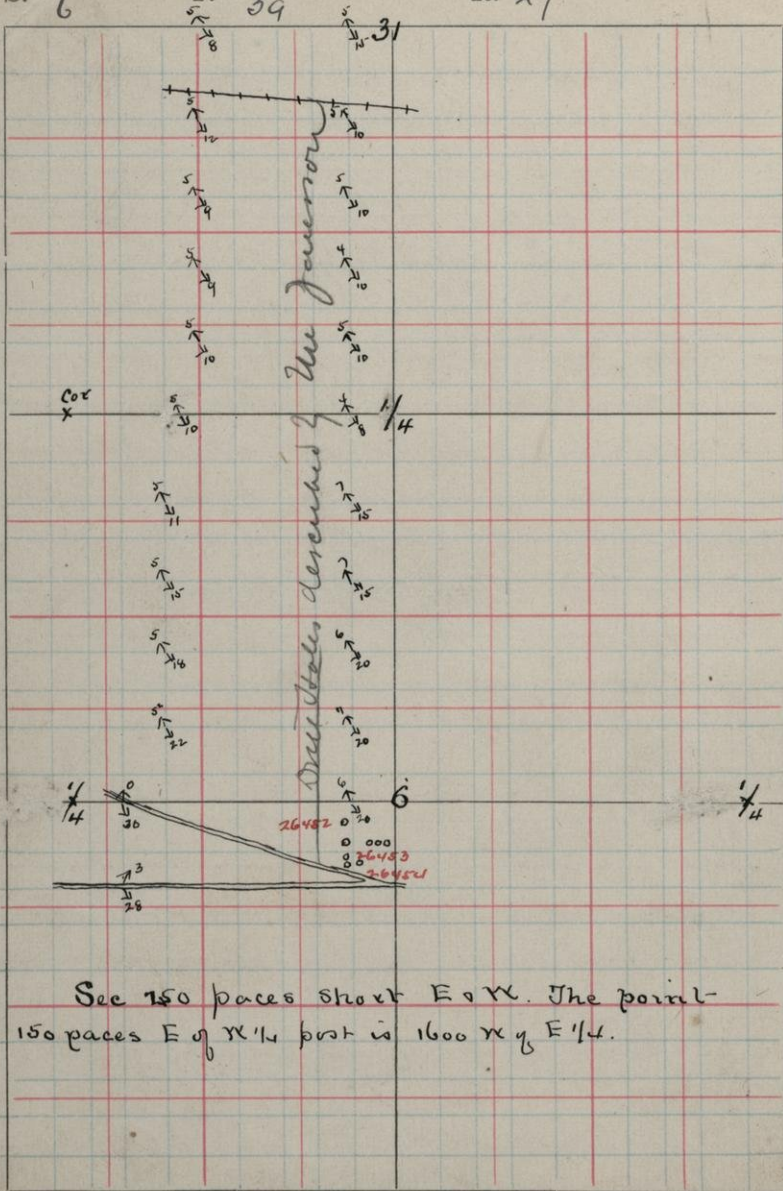
Aragon Mine

26457



S. $\frac{31}{6}$ T. $\frac{40}{39}$

R. 29



Sec 150 paces short E & W. The point-
150 paces E of N'W post is 1600 x of E'W.

264
1648

that the limestone formation is immediately beneath.

26450

Pebble from conglomerate 160 East of
N.W. cor Sec 31 T. 40 R. 29.

26451

Potosi sandstone phase.

All the country is drift covered except the sides of the hill in the center of Sec 30.

On the north side of this hill is a long drift ridge the hill and an old shaft - all in Potosi sandstone. On the south side about $\frac{1}{2}$ way down the hill are exposures of the sandstone.

The pits in the center of Sec 6. T. 39 R. 29 are all in red slates and one formation.

26452

The slates are most common in the northern pits, and

26453

one and jasper in the southern ones.

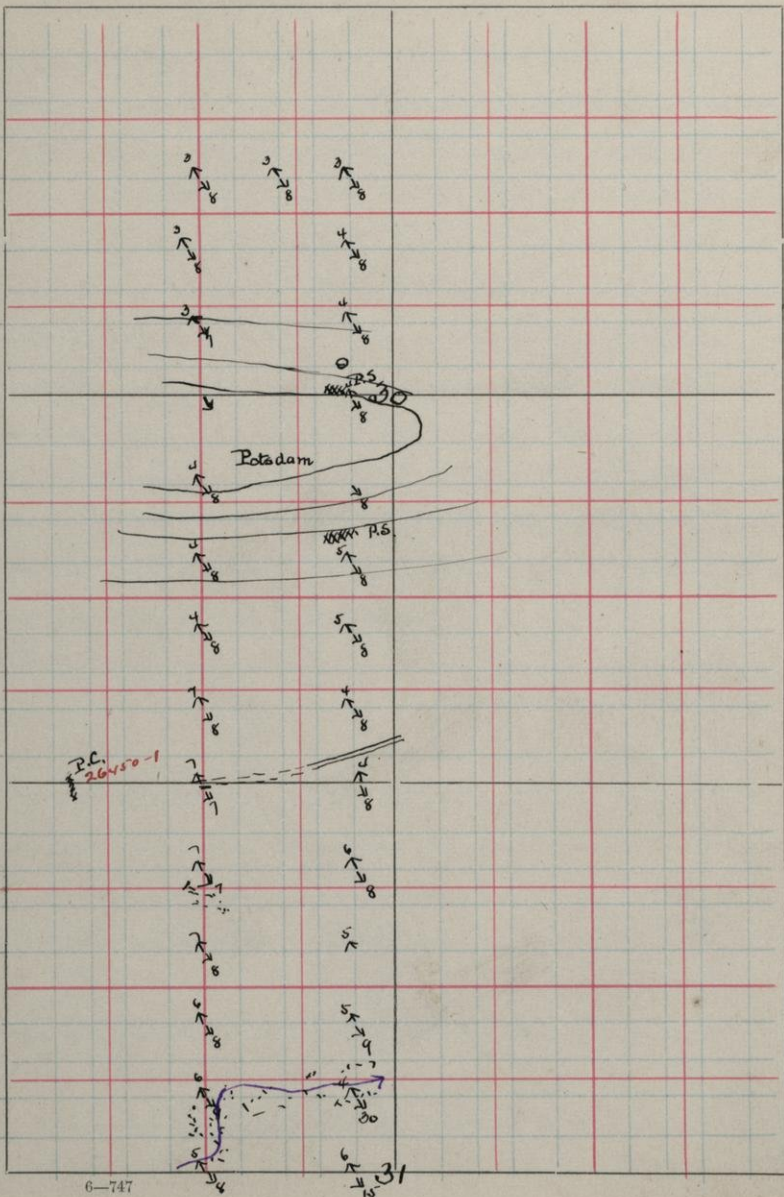
26454

The best defined jaspers appear in the dump heaps of the southernmost of all the pits.

S. $\frac{30}{31}$

T. 40

R. 29



Examination of S.W. 1/4 Sec. 5.

Made several traverses across the S.W. 1/4 Sec 5. T. 39 R. 29 in order to map location of all exposures and pits. The only rocks observed were those belonging to the river formation and certain sericitic schists or shales south of these.

In the pit at 1600 W. 75 ft of the S.E. cor Sec 5. are red sericitic shales and schist-like those west of Linn Co. and south of Iron Mountain.

There are also present in the dump heap, fine pit mottled red and green sericitic schist.

26452_a Red shale

26453_b Red and green sericitic rock.

At the old Aragon shaft (see p. 49) in the N.W. 1/4 Sec 9 is in jaspers and ores.

26454_c Specimen normal rock

26455 showing thicker band of Jasper

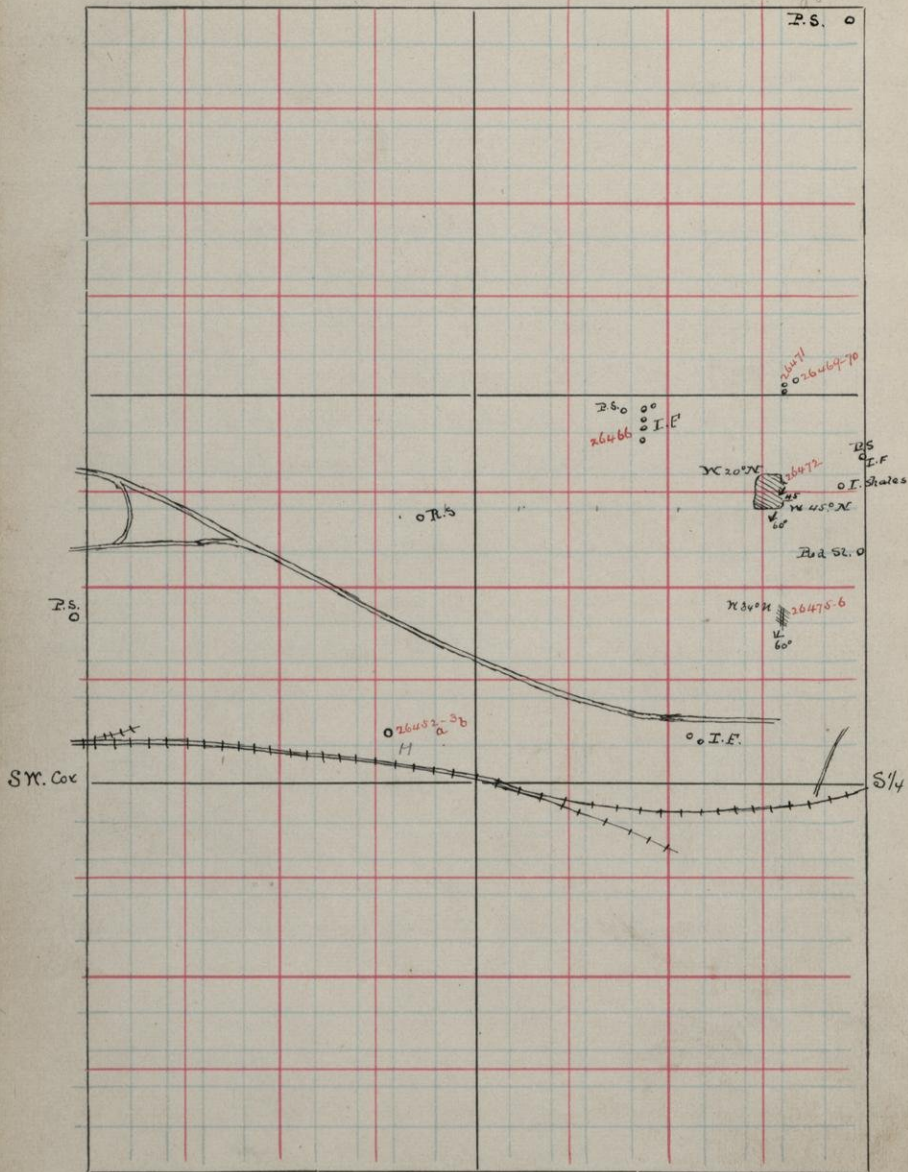
26456 Very thick band of Jasper

26457 Ore from Eastern shaft.

26458-65. p. 54

450
20
2700

P.S. 



A number of ^{pits} ~~slates~~ at 1300 W. 450-500
 U. SE Cor Sec 5 show red siliceous
 slates in the dump - and also iron
 26466 cherts.

All the pits show either these rocks or
 Potsdam Sandstone.

26467-8 p. 55

- At 530 U. 1070 W. of SE Cor Sec 5. is another
 26469 or group of pits in iron cherts. In
 the dumps of some of these pits are
 26470 fragments of yellow slate.
 26471 Iron cherts (or red slates) from little
 pit immediately west of 26470.

At 350-400 U. 1070-1110 W of SE Cor 5.
 is a large open pit in cherts. In it
 the rocks strike U. 20° W. on north
 side of pit and U. 45° W. on S.E. side.
 The dips vary between 40°-45° S. on
 the north side of the pit, reaching as
 high as 60° S. on S.E. side. In a
 little cross cut East of the pit the
 layers dip this.

This is a
 characteristic outcrop  in this
 portion of the iron belt.

26472 In the dump heap is much breccia.

S. 5

T. 39

R. 29

NW 1/4

NE 1/4

W 1/4

E 1/4

26468

26490

Red Stairs

S 60° W

26467-8

led and conglomeratic rock.

26473

26474

} see page, below

At 200 N. 1100 W. J.S.E. Cor Sec 5 is a drift in the hill to the north, from which a large quantity of rock has been removed. The rocks at the south end of the drift are mottled red

26475

or gray slates or graywacke-like rocks that are finely banded. Their strike is $E. 34^{\circ} S$ and dip $60^{\circ} S$.

North of this rock a few feet and grading into it are the red slates, actinolitic(?) rocks dipping and striking like 26475.

26476

26473

Red and gray slates 300 N. 975 W. S.E. Cor Sec. 5.

26474

At 300 N. 850 W J.S.E. Cor Sec 5. is a small shaft worked by horse power. Nearby is a small open pit with a soapstone (26474) on the north side and iron-formation rocks on the south side. The ore comes mainly from the contact between the two. On the south side of the pit is evidence of a well good pitching

S. E $\frac{1}{4}$ 5

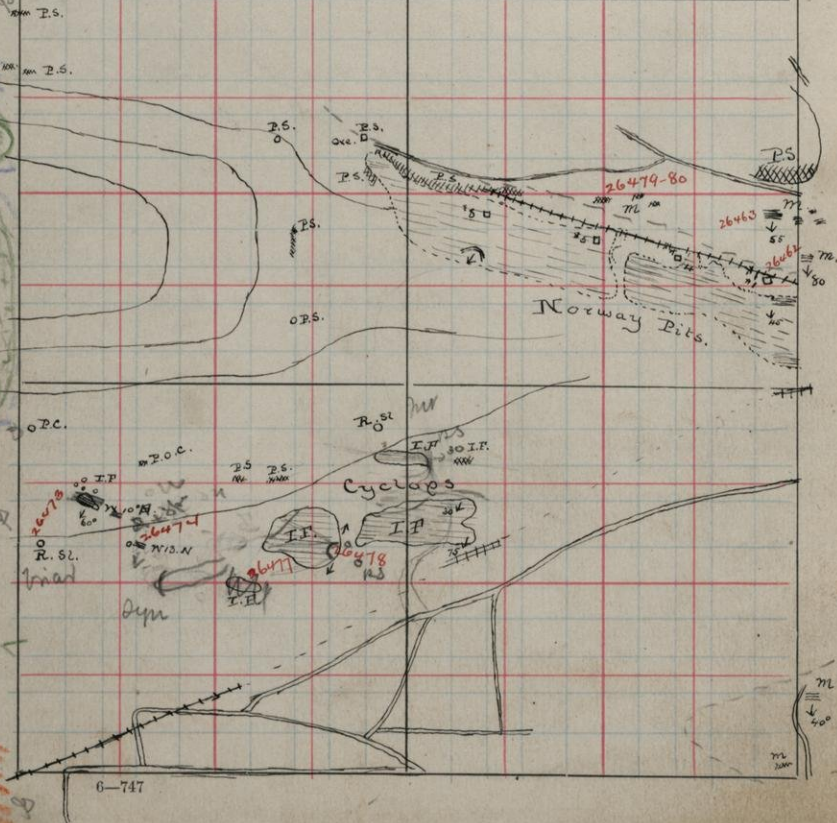
T. 39

R. 29

To be listed by plat
and by ledge
green corozo and asphalt
mostly unconformity

Boye
2sh. = 9"
Reganua = 11"

26467-8



6-747

SW $\frac{1}{4}$ 4 & SE $\frac{1}{4}$ Sec 5.-

Norway and Cyclops

At the Eastern of the old Norway pit,*
at the East End near Shaft No. 1. The
26458 rock is chert and one striking N 10° E
and dipping 80° S.

At the South side of the pit the rock
26459 at the East End is red slate, the bedding
of which appears to be flat. All the rock
along this South side seems to be slate,
which towards the west becomes more
and more cherty and harder. Apparently
grades into the chert.

26460 Slate full of martite crystals.

26461 From side of pit, near E line Sec. 5.
Dip and strike as before.

26462 Red brecciated one from dump heap
Norway Shaft #1.

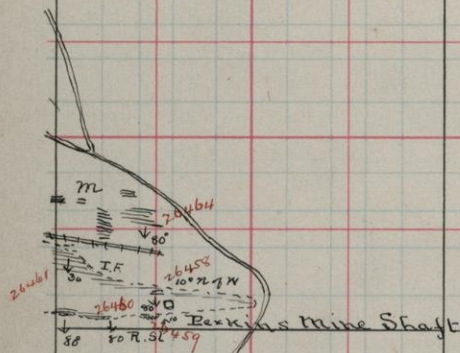
On the South side of the pit about where
the section line crosses the dips are
high to the South, while on the northern
side they are as low, sometimes, as 35° .

* Perkins pit, once the Perkins mine
was operated by the Norway people.

S.

T.

R.



At one place the dips are seen to change suddenly as though had by a local anticline



North of shaft #1 of Norway mine are several ledges of marble in which the rock strikes E 70° S. and further to the East E 130° S. At the Northeasternmost ledge the limestone is inter laminated with thin layers of a red cherty rock, which seems to be a local replacement of the limestone.

The rocks may mark a gradation between the limestone and the iron formation.

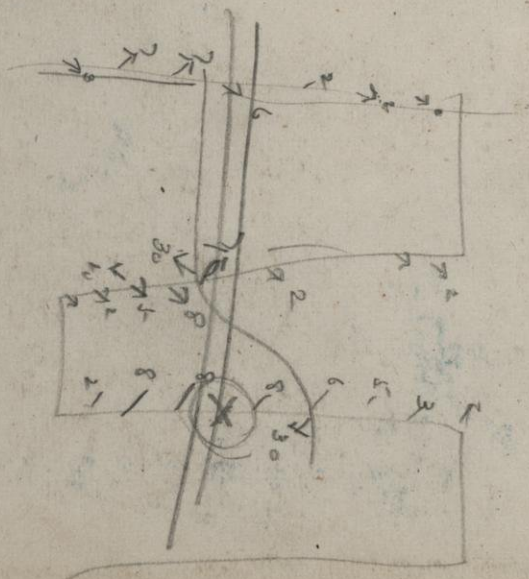
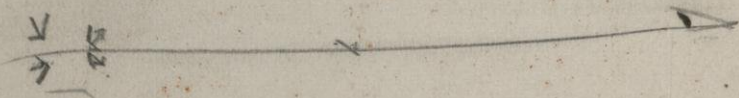
26464 In the Easternmost ledges chert veins cut through the limestone

26465 Red slates from pit at 90 paces W. of U's pit Section

26466 p. 52

26467 Red slate } from pit 1030 U. 900 W. of SE
26468 Gray slate }

See Sec 5. From old pit where dump heap contains these rocks, Potsdam sandstone. Some of the red slates look like the shales at the base of the Potsdam.



8-

Can sh 305

Mr. Arnold

Janssen

Helberg

Kelly

McNanghan

Lawrence

U. 40 E. Ore

Bottom

Hardening

Incense

Sp

Ore

Sp

Sp

Sp

Sp

Sp

Sp

Sp

Sp

Sp

Sp

Sp

Sp

Sp

Sp

Sp

Sp

Sp

Sp

Sp

Sp

(50w track, 1/2 ft)

30 ft R5

25 ft Ore

1530 250 ft Ore

