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Holyoke, Republic and Felch Mountain District, Penokee-Gogebic Region, Michigan: [specimens] 12181-12285,12866-12924. No. 58 July, 1887

Irving, Roland Duer, 1847-1888

[s.l.]: [s.n.], July, 1887

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U. S. GEOLOGICAL SURVEY
FIELD SECTION BOOK

No. 58.

July 1887.

Holyoke, Republic and Felch Mt.
District. Penokee-Goebic Region.

R. D. Irving.

12181-12285, 12866-12924

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 line as 100 paces, and twenty of these spaces as one mile, or 2,600 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 $2\frac{1}{2} \times 2\frac{1}{2} \times \frac{3}{4}$ 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.

6. Forward this note book, as soon as filled, as registered mail matter, to R. D. IRVING, U. S. Geologist, Madison, Wis.

Notes taken in the
Marquette and
Felch Mountain
districts by G. S. Gony
July 1887

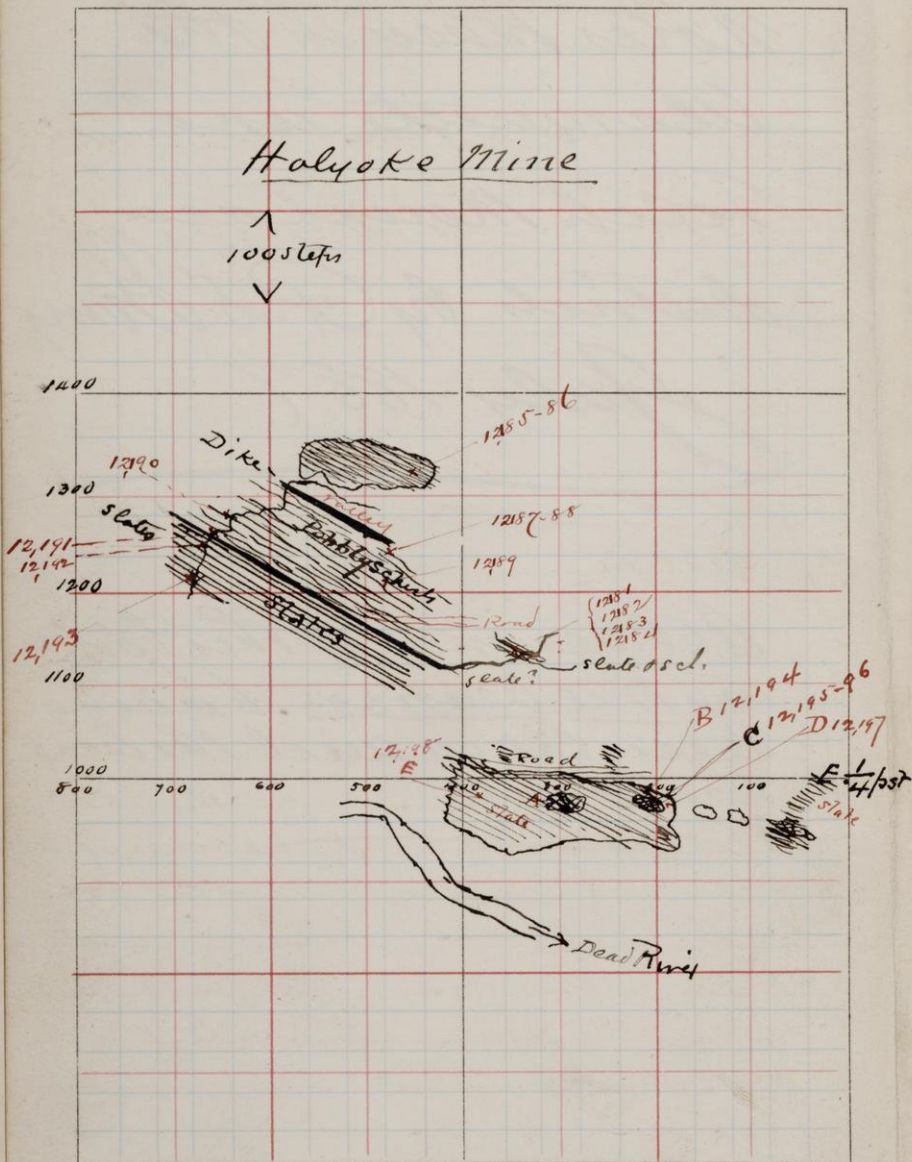
All bearings in this book
are true bearings having
been taken with the theodolite
compass.

Sec. 2

T.

48

R. 27 W.



July 13 /87

Drove out in morning from Marquette to within ten miles of the Hologoke llim, met C. S. Wright, State Geol. of Michigan.

Following at 1130 N. 330 W. Sec. 2, 48, 27, according to the Wright and thence S. and E. for 100 steps.

12,180 Two varieties of schist, standing

12,182 at high angles - 12,181 very slaty,

Green, and 12,182 more schisty flintening etc. These kinds seem confusedly intermingled, but are still ^{are} after sharply defined from one another. Pebbles occur in both varieties, both but chiefly in the latter kind. The pebbles

12,183 are chiefly pinkish felsite (12,183) irregular, elongated, angular, pulled out (?); but there are also angular pieces and masses

12,184 of berruginous schist !! (12,184)

- 12,185 Greenish Schist, from knob west north ofabin Conglomerate after crossing a little creek - and at 1300 N - 442 W. Here
12,186 are whitish veins or areas of felsite (?) Has this furnished the pebbles of the Conglomerate. Kern the ~~pebbles~~ felsite veins the same rock to which just fault it furnishes pebbles !!?

Immediately south of this place, across the same valley, at 1250 N - 480 W, we have a pebbly rock. Pebbles of felsite, rounded.
12,187 The matrix is 12,187. Is it the same as 12,185? 12,185 is cut by large felsite veins 2' - 4' wide. 12,187 holds pieces of felsite; yet 12,187 and 12,185 are seen on top the same knob

- 12,188 There are felsite pebbles. Besides there
~~12,184~~ are iron-banded - pebbles in 12,187.
12,189 is a granite pebble further south on the same ledge. There are even rounded than these of felsite. 12,189 is from 1225 N. 480 W.

- 12,190 Creek bottom, 1285 N. 650 W.
This rock holds granite pebbles,
but must lie very close to the
green non-pebbly schist further
north.

Compare all on Danthous
Pass seen with Deer Lake
Also with the Vermillion Lake
white schists and Conglomeratic
pelites. Large blocks of
banded iron — or are they
lenses, and broken lenses? —
lie in these schists. Compare
island in Vermillion Lake.

- 12,191 Schist on stream at 1260 N. 670 W.
12,192 Immediately south is a slate (?) (12,192)
which shows a great thickness
along the creek
12,193 75 steps south of 12,192 and 75 W. in
stream. All this slate shows
strong cleavage dipping south, but
no bedding.

Resume'

The sketch opposite page 2 is reduced from a map by Mr. C. E. Wright. The numbers are of my specimens. A belt of very slaty (cleared) rock lies south of a belt of schistosity rock. The line between the two is very sharp often, but not very regular. I think Mr. Lingard has exaggerated the regularity in his sketch. Certainly where specimens 12181, 12182-3-4 were taken there is great irregularity & the slate here is quite out of line with that further west as I have indicated on the sketch.

Moreover something which is certainly like the schistosity phase lies in irregular areas in the slate, still further south (A and B of sketch). These are irregular in outline and too large to be in the crevices of pebbles.

The schistosity rocks contain pebbles

chiefly of a felsite, but toward
then of granite when they are worn
welled and less pulled out,
+ smaller. There are also
occasional large pieces 2'-3' across
- of banded ferruginous schist
like that in the iron series. There
pebbles in the schist are in fact
the schist bed itself and in the
isolated areas of schist in the
slate, as above described. The
slates only rarely contain
pebbles, and then only of
granite. The isolated areas
of schist in the slate contain
also angular pieces of a chert
slate, like the slate itself!?

The slates are not banded - show
no sign of fragmental origin -
and I greatly doubt their
fragmental nature.

North of the schist bed, and sepa-
rated from it by a narrow
ravine, are knobs of a schist
with felsite veins and no pebbles

Holyoke Mine continued

7.

See map opp. p. 2.

12,194 Slate at B

12,195 Schist from isolated area
at C

12,196 Cherty angular slate mass in
area C

12,197 Granite pebble at D in Slate

12,198 Granite pebble at E in Slate

Sec 7

T. 49

R. 26 W

1

Republic Mtn

8.

July 15/87

12,199 Specular Banded schist - see map
opp. page.

12,199a Specular schist - see map.

12,200 Diabase (greenstone) many out-
crops - wide belt.

12,201 Banded int. schist Dip high fault
Strike N. 29° W. large ledge. Very regularly
banded, even thin banded. A wide belt.

12,202 Greenstone or diabase, small exposure

12,203 Banded Ferruginous schist

See unmounted map Republic
Mtn. for exact location of Republic
lith. forms -

9

Republic

Saturday July 16 /87

See map

In morning started at $\frac{1}{2}$ past west
Cen. Sec. 7. 46. 29 W and traveled
west 900 steps and south 160 to top
12,204 of granite knob. (12,204) See Brooks
map for this knob. Greenstone dike
12,205 cuts this knob, as Brooks says (12,205)

Now went south across marsh and
12,203 up the mountain to ledge from
which took 12,203, yesterday.

Here examined several ledges of banded
schist and granite as marked
on map.

12,206 Banded gneiss schist top of moun-
tain note the difference between
this and the ^{serpentine} green gneiss, schist

P.M.

12,207 Quarzite from the tongue on Brooks
map - 10 steps wide. Iron schist
shows on each side of the quartzite and
the quartzite holds angular pieces

Reputedly Centereed 10.
of the schist near the contact. Also
mingles with the schist in a ring-
ed fashion. The upper contact
between.

On top of the hill here some 30
steps N.E. This tongue shows finely
and without upper contact in
light. The quartzite not only holds
numerous angular fragments of
the iron schist all through ~~but~~ ^{and} ~~mingles~~
mingles with the iron schist at the
lower contact, but at three
different levels in its middle
there are bands of the iron schist
more or less shattered and enter-
ed into by the quartzite, but
still plainly continuous
bands in their original position,
and apparently due to an
intermingling or rather alterna-
tion of the processes of which form
rise to the different materials.
Is this a tongue? Why not
a band? Could not be
the evidence of its tongue
like character

10,208 A good specimen, reached,

Reparties Continued 11.
from just above one of these
bands.

Erica angle Caucun location 12

July 17 / 87

28-47-30

Following extracted from Rominger's
as to this place.

"Erica is N.E. & N.W. 28. Strike NW-SE -
Dip N. 5"

"Following the descending section

"(1) Q. whitish and thin Cauc. mica-
ceous seams - 200'

(2) Ferreg. Jasper layers 80'

3 Mica schist, thick, and local-
ly shattered into fragments
with inter^{mixing} ~~accumulated~~ of "
quartzose dioritic rock pieces, of granitic
pieces or", Well exposed on dividing
line between Cerro Mines"

12,209 Overlying quartzite on the Caucun
N⁵/₄ N.W¹/₄ Sec. 28 - This is the same
Schist portion must be Rominger's
No 1.

12,210 This is the same quartzose portion of
No 1. There is much irreg-
ularity in the strikes -
The ground must be much
broken up.

12,241 Crack still north of the ore
 of greenstone? Rominger makes
 no provision for it

12,242 Drill core from quartzite ore
 ore.

12,243 Drill core from between quar-
 tite and ore.

12,244 Mica schist at top of the
 brecciated iron schist

12,245 Mica schist from below
 12 - Romingers 3. On line
 between Eric & Cameron, very
 much contorted - this near
 the S.S. cor. of N.E. 1/4. W. 1/4 28. Is it the "Cannon
 Quartzite?"

12,246 Granite 300 steps south of 12,245

House of the Conglomerate of
Rominger found in the corner
Mica schist.

12,247 In the quartzite above there
 are benches of a greenish
 chloritic material

124.

Is it possible that Rominger's
breccia is in the Copper Gr.?

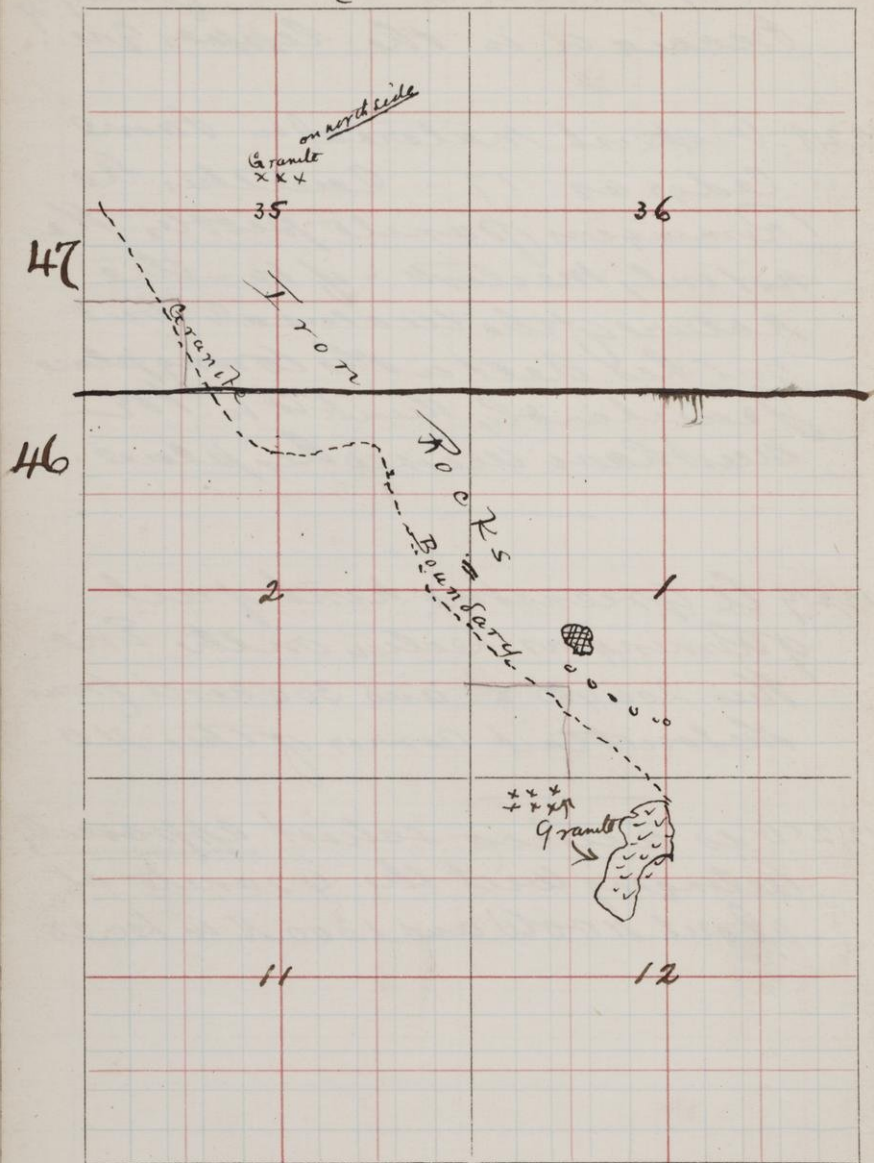
12,248 - Pinkish material in same
beds as -17 - Contains the
Rominger's pumice pebbles - the
not only material - if so - the
nature of the material - but
put his feet in the wrong place
I can hardly think it so - He
must have missed his place.

12,249 A Greenstone lent fuel
of Rominger's section on the Erie
This 200 yds E. and 300 feet from
the southeast corner of the 40.

12,250 is a mica schist apparently
belonging with the Granite at
about 1100 W and 1300 N. in loc. 28.

T.S. H. and H.

R. 30 W Mich



Map opposite is from Mr
C. F. Wright

Michigan

July 19 / 1887

12,220 Outcrop of Granite Range North of ^{Lake} Michi-
gan. Where we ascend the range
we find many blocks of a singular
breccia-like rock (12,220) Outcrop
the range this seems to be the main rock
the apparent fragments - pretty uniform
in size, are probably merely rests of horn-
blende. They are very angular, and
weather dark green or black, stand out
very prominently from the ground mass
which weathers nearly white, or pinkish
white.

Granite veins, ~~some~~ some small, others
much larger, intersect this weathered
rock. Some of them mingle confu-
sedly with the rest of the rock. Is
all of this rock intrusive? The
black spots being remnants of
an intruded rock ?? or are they
rests in an eruption?

12,221 is from a broad granite-area as

Michiganme cont.

17

as one descends the hill southward. Here again the braccia-like rock is exposed - by intermingled

12,222 Here also, on the south face of the range, which is a bold south-facing cliff, is a diabase dike, coursing nearly with the face of the cliff. It probably 10'-12' thick, & often salutire. In part it forms the face of the cliff. On the south side of the dike, near the foot of the cliff is more of the ~~diabase~~ braccia-like rock, with also much reddish or pinkish granite.

Pacing southward now from the foot of this cliff 225 steps or just 40 steps we strike a broken ledge of quartzite, which forms a low ridge through here. The quartzite is lustrous (enlargement?) in seams or layers 1" to 6" thick

12,223

Michigan me Cont 18

interleaved with greenish-black
every slaty or shaly layers,
somewhat thinner (Green-
blance to Quinickie?). The
ledge is a broken one mostly -
but in one place a high point
ere dip was seen

12,224 70 steps west and 50 across of
12,223 - Part of same ledge or
ridg

From last point (12,224) 225 steps
south ~~trips~~ west creek flowing
eastward, through cedars - But ^{only}
^{first} 75 steps of approx distance is over
the same slate and quartzite, the
slate increasing southward. The
whole seems to be over a broken
down ledge -

12,225 is one of the slate fragments picked
up in this distance

12,226 From stream 175 steps south to a
ridg of arenaceous and mi-
caceous quartz - talint. Compare

Michigamme continued

19

south the Penrose mesa sch.?

Strike N. 75° E true

Much more of a similar
rock shows on this same ridge
Particularly at 40 foot and
107 west of 12,226

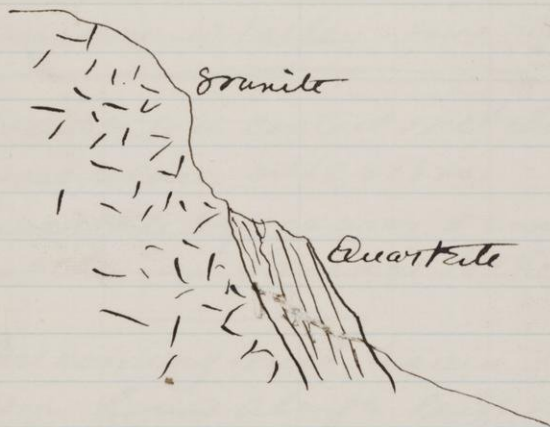
12,227 155 steps south and 75 west of
12,226. A greenstone which
stretches to a width of 200 steps
from west to south. This meas-
urement probably $\frac{1}{4}$ too large
on account of abruptness of
the ridge, which is the great green-
stone ridge just north of the Michi-
gamme and Spur mines.

From the foot of south face
of this ridge runs off a bench
35 steps more. At south edge
of this a cliff of banded gneiss
specular sch. which shows
a width of 45 steps to railroad
track, at a point 46 rails
west of the 37th mile post ^{from the mouth} on the
M.N. track. This point is on the
bridge crossing the Drough in $5\frac{1}{2}$
sec. 20, T. 48 R 30 W., at which place

Michiganmo Cont. 20
the freestone courses right down
to rail road track.

July 20 1887

Returned this day to Michiganmo
in company with Professors N.H.
Winchell and Alexander Winchell.
Next first I brought road from
mine to the granite range. Here
12,228 found Quartzite (12,228) directly
in contact with granite. Dip
south, high, as shown by Conglomeratic
seam in Quartzite clinging to
the granite



12229 is quartzite at contact
12,230 is granite at contact

- 12,231 is granite 3 feet from contact
 12,232 is Conglomerate seen in the
 quartzite (12,228) of which some 10-15'
 in thickness is seen. This seen
 indicates southern dip to quartzite.
 Pebbles white quartz, brown quartz,
 green schist - no granite seen -
 The brown quartz is like certain
 nests in the granite just behind
 12,233 is the contact rock at another
 place 20 rods further east.
-

- 12,234 The greenstone nigg just north of Michi-
 jammi mine.
-

- 12,236 Quartzite nest west of the above
 greenstone - in talley - same nigg as ^{12,223}
_{12,224}
-

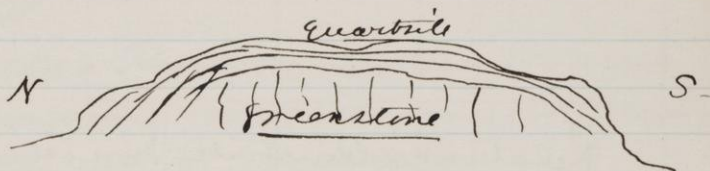
- 12,235 Quartzite in contact with the granite
 same place as 12,228 etc. These
 quartzite exposures remain bare
 and there as facing to the granite
-

On coming back again from the
 above found a large ledge on conglomerate
 west of nigg of 12,226 - This
 is talley. A greenstone intrusion(?)

muchefamme cont

22

seems here to form a sort of
core to the quartzite ridges - thus:



This place needs further examination,
but plainly there is here a roll
in the q. so that all the beds be-
tween the granite and the ore in
the mine do not dip regularly
south. There may be a general
southerly dip, but there are at
least subordinate rolls.

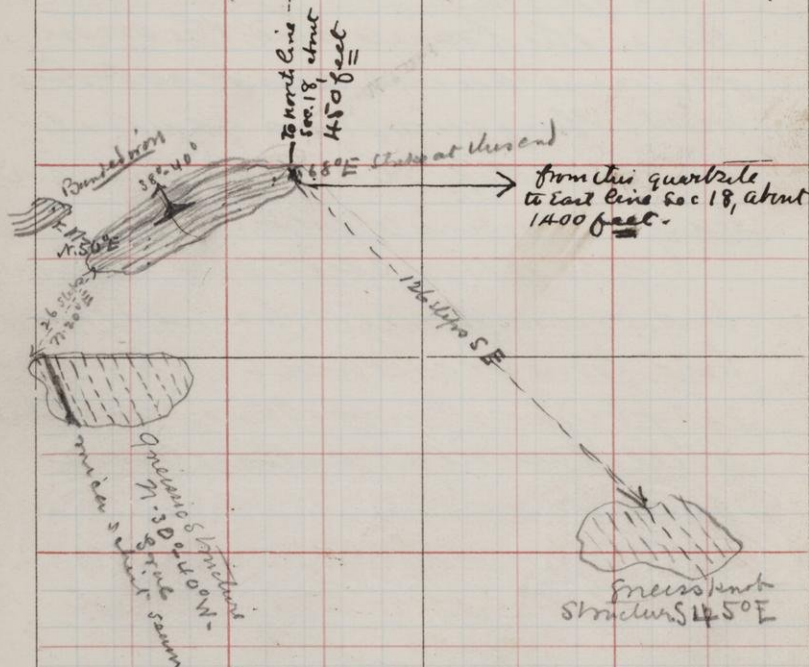
(The above sketch is extremely
diagrammatic, being drawn
here from recollection, after an inter-
val of between ten and three months.
Still I am right as to the main
facts)

Sec. 18 T. 46

R. 29W.

North end Sec. 18, T 46, R 29W

Relations of Quartzite, Iron Schist
and gneiss. Republic Mountain N $\frac{1}{2}$
N.E. $\frac{1}{4}$ Sec. 18, T 46, R 29W.
R. Pumpelly and R. D. Irving July 22/87



Small Squares 10 clips -

Republic Mich

23.

July 22 1887

Visited Republic again today in company with Professor A. Brewster and W. Trelease.

12,237 Gneiss near the Lower quartzite Republic - See opp. map. Dip of structure $74^{\circ} \text{N}^{\circ} \text{E}$ Strike $\text{N. } 30^{\circ} \text{ to } 40^{\circ} \text{ W.}$ Strongly gneissic, including even a layer of mica schist with same structure. Good exposure N. $\frac{1}{2}$ W. 4.5° Sec. 18, 46, 29 W. Mich.

12,238 The mica sch. in the gneiss

12,239 Quartzite 26 steps N. 20°E from the west end of the abn granite knob. This distance brings us to the west end of a knob of the quartzite, which strikes N. $50^{\circ} - 53^{\circ} - \text{E}$ (true) and dips to the west $38^{\circ} - 40^{\circ}$ - a very excellent observation. The ledge as a whole has its course, i.e. its long axis, with the strike. From the East end of this ledge

Republic Cont

24

126 steps S.E. Takes one to near
gneiss (Pumppeely) local strike
N. 45° W or S. 45° E

At the east end of the quartz-
ite ledge the strike is N. 68° E
This quartzite ledge is 62 paces
long. Probably 25' - 30' in thick-
ness is seen. From west end of
quartzite 17 steps 35° W. of quartz
to beautifully banded magnetic
12,240 schist.

12,241 see p. 25

12,242 see p. 26

12,243 magnetic schist from level road
north from 12,240 - freestone
comes between - Republic

12,244 from same exposure as 12,240

12,245 from same exposure as 12,243

Clarksburg Chil 25

12241 shows on west side railroad. It is
much exposed Sep S.E. Lay 30° .

Sterling Mine Mich.

26

S.W. 1/4 Sec. 32, T. 48 R. 28

12,252 Quartzite overlying the ore at the Sterling contact. Not here. A basal granite range lies $\frac{1}{3}$ to mile further north - distance estimated. No corras rocks exposed between ore and granite. No fragments seen in the quartzite. Dip south.

12,243

12,244

12,245

} From Republic - See p. 24

12,246

12,247

} From test shaft 1500 feet deep south of Sterling Mine shaft.

Reported as dipping south

12,246 is pyritiferous and black slaty. It underlies 12,247 which is banded. Are not there carbonaceous, and carbonaceous.

12,248 No specimens taken

Dexter Uline Urich ²⁷

near cent sec. 3 T. R.

12,249 Quartzite under the ore at the
Dexter Uline. The mine lies at
hard foot of bluff ^{quartzite} dipping west.
Ore does so also, lying on the
Quartzite for 300 feet ~~horizontal~~
in depth. Miners consider it
an ore?? Quartzite is
just of iron ore? infiltrated -
Urich is a rock reported as
showing banded iron.

12,270 See page 14.

28

Felch Mountain Country

July 27 1887

- 12,251 S.W. $\frac{1}{4}$ Sec. 31, T. 42 - R. 29 W. Unit.
A narrow granitic dike in ferruginous schist. The granite is coarse grained and beaky - not more than 6" wide. Probably water formed. Width irregular. Very coarse feldspar, flakes nearly all flat. Rest of white mica are present.
- 12,252 F. Schist near above run
- 12,253 Same vein as 12,251 with schist attached - not more than 4 feet at most of length of vein seen. Looks as if a mere nest.
- 12,254 Epidote(?) vein in same schist and nearby to 12,251

29

Felch Mountain Country
continued

13,255 Crystalline Limestone. West
side road, Sweet face trail
ridge - near S. Line Sec. 35, T42
R. 30W. Several specimens.

21
30

Felch Mountain Crests
cont.

12256 Quantite on road to metropoli-
tan area with rest of
Singing of Sturgeon River.

12257 Feldspar x ls on iron ore - Sec. 1/4 loc
32, T. 42, R. 29W.

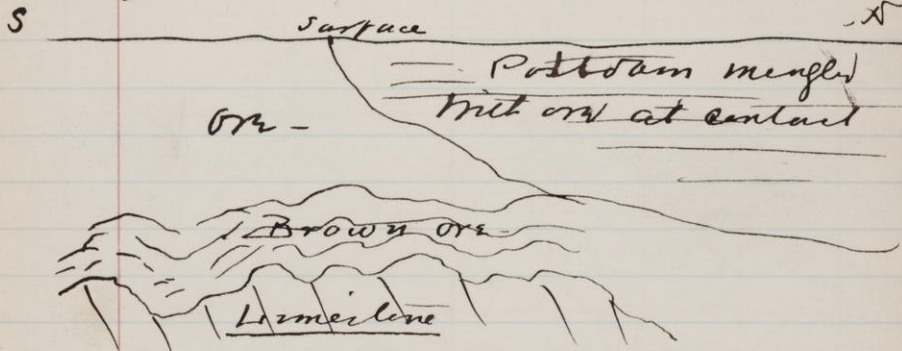
31

Felch Mt. Country Cont.

Metropolitan Mich
June 27 1897

Observations made in conjunction
with Professor R. Pumpelly.

12,258 Limestone just west of metropolitan
Outcrop of this is a brown
ore. The limestone has a
most singular corrugated
surface, apparently removed
with a uniform northern dip,
thus: -



Section of pot

The top of the L. Stone is taken to be
residuary

32

Helch Mt Country Cont.

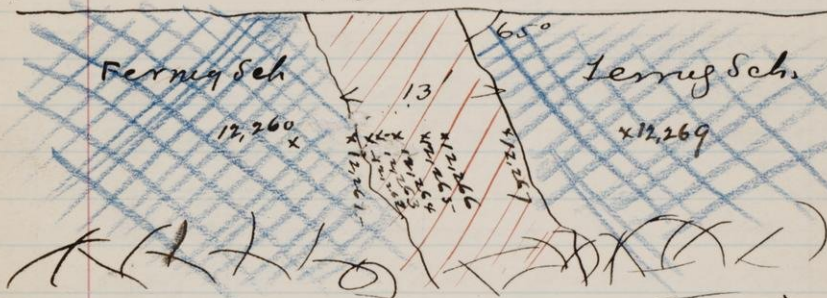
Dike of granite. Metropolis
Town.

Course of dike on flat top of hill
due N.S. dip of rock to ^{EAST} ~~west~~ 65°
width horizontally measured
across vertical exposure of
dike $13\frac{1}{2}$ feet.

12,260 Ferruginous schist 3 feet
West of dike.

12,260 Ferrug. schist at contact with
granite on W. side of dike

W. cliff faces south E



cliff showing dike elliptical

12,262 Granite from west side dike in contact
with sch. Here the granite includes

numerous nests of metallic luster
red iron-oxide

12,263 granite two feet east of western Contact

12,264 granite 4 feet east of W. Contact

12,265 " 6 " " " " "

12,266 " 8 " " " " "

12,267 " 1 foot west of eastern Contact

12,268 granite, core was foot of cliff

12,269 ~~diabase~~ - 10 feet east of eastern Contact

We could not trace the
dike any distance ^{not more than 25' - 30'} on the
strike -

Is this granite waterformed?
Of light of rocks some 20 feet seen
Quartzite nests like cavity of
caves of rags - with feldspar xls

12,270 Greenstone forming low ridge
near hotel - Metropolitan South
Green ore and north of limestone

Farm Pumpelly

Aug 30, 1867. After very hard trip through swamp and windfall through 22, 15 & 10, 42: 28 camped in S. of 3.

A little north of $\frac{1}{4}$ line of 15 found hornblende rock nearly massive in rather large black prisms. 1200 paces N. of S. line of 10 came to a remarkable series of gneissoid conglomerate rocks. Where the beds were of medium grain they had all the appearance of a gneiss containing mica, talc & chlorite associated with red orthoclase and grey, white and bluish quartz.

Beds of a coarser grain show more of a conglomerate character having flattened pieces of quartz arranged parallel to the bedding. Other beds, however, are true conglomerates containing in the gneiss mass rounded fragments of opaque white quartzite several inches in diameter. Strike about N. 70 E (mag) vertical.

Aug 31st. Ran W 1000 paces to W. line of 3. Found S. on this crossed a bed of marble of over 100 paces exposed width; showing only traces of stratification seemingly NW, and an uncertain dip S. Prevailing colors grey & red; very ugly; associated with it is a bed of a greenish grey and pink rock which strikes fire readily and is rich in talc associated with quartz and lime. It is massive and compact.

Moved W. through S $\frac{1}{2}$ of 384 and along S. line of 5 to S $\frac{1}{4}$ state of 6. Just S. of line in NW $\frac{1}{4}$ of 8 about 500 paces E. of cor. are large outcrops of a series of rocks resembling in many respects those of 10 seen yesterday excepting that here chlorite takes the place of the talc of 10.

The gneiss is here chloritic with red orthoclase though in the beds it consists of only orthoclase and quartz. The conglomerate character is also here represented; beds of

Felch Wet Country Cont.

12,271 Ambleton Sch., large exposure,
S. $\frac{3}{4}$ SW $\frac{1}{4}$ Sec. 8 T. 42, R. 28

12,272 Pinkish bedded sandstone
12,271

12,274 Predominant pebbles of a conglomerate
on the south line Sec. 8 T. 42 R. 28 W. The
conglomerate being with the
Ambleton Sch. (12,271) with
which it is interbedded. Large flint
surfaces of this conglomerate show
striking nearly E. W., standing
vertical. The rock looks like
a pebbly gneiss. Pebbles are flattened
i.e. drawn out in the direction of
the strike, only rarely lying obliquely
to it. The prevalent pebble is a chert
to pink, chert (?) looking material

12,273 chips from various pebbles in Ambleton
Conglom.

All these congl. specimens are from
330 E and 25 S, of N.W cor Sec. 17—

Pieces in the conglom run up to 10
inches in length. Usually smaller

chlorite are interstratified, - indeed in different beds each of the three ingredients of chloritic gneiss appear separately to the exclusion of the other two and again in all transitions. The strike varies but is probably nearly E & W?

Sept 1st. Went west on line 17 miles. of Town line. The rocks seen yesterday were found forming a low ridge of outcrops just S. of line all the way to near 3/4 estate of Dec 1-42-29.

Felch Mt Country Cont. 35

12,275 Matrix of this Congl. This specimen shows rather the prevalent character.

12,276 is a more labile phase of the matrix interbanded with 12,275

Note that the granite-like matrix is the first we have found in one of these ancient conglomerates. We have ^{seen} greenstone-like and felsite-like matrices, but not granite-like ones

This conglomerate is all distinctly interbedded with the greenish rock 12,271 - ~~which~~ showing in one or two narrow bands and one great one.

12,277 is from one of the narrower Congl. bands

12,278 the interbanded schist rk. also seems Conglomeratic

12,279
12,280
12,281
12,282
12,283
12,284
12,285

} Same Conglomerate as 12,274-5 etc.

Specimens 12,275 and 12,276 are not found - 94 in quantity other 12,277 and 12,280 are very scarce - only 12,275 and 12,277

Sec 33 T. 4 2

R. 28 W.

33.

xxx

$\frac{1}{4}$ pt

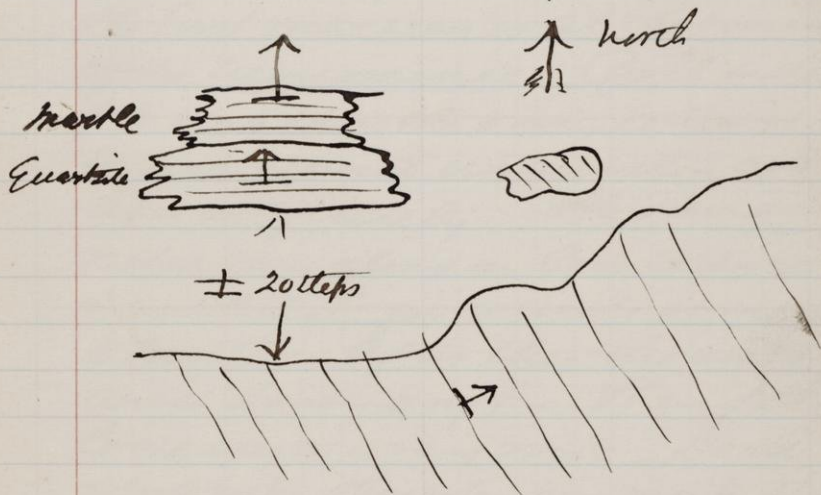
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Felch Mt Country Cont.

Following notes by R. Pumpselly
July 28/87

Sec. 33, T. 42. R. 28 W. S. E. $\frac{1}{4}$

At about 400 steps west of true line
of Sec. 33 exact location was not
known, but supposed in S. W. $\frac{1}{8}$ E. $\frac{1}{4}$ - feeling
Sketch made by R. Pumpselly -



This on road from Metropolitan
to Norway.

37

Notes on the exposures on the line
of the Milwaukee and
Northern Railway, on
the west side of the track.
Taken from the train,
July 29/87.

Between Iron Mountain Mich.
and Beaver, Wis

After leaving Iron Mountain Depot,
the first rock seen is at the crossing
of the Menominee. Both sides
of the river show the rock, which is
largely exposed naturally - and
also artificially. The same
rocks run along in low ledges
in cuttings for a mile or more
to south. After this the cuts
are in sandy drift - then fol-
lowed by grey rock - Dark
colored rocks then extend from river to $3/4$ S
the way from Iron Mountain to Pembine.
Then ^{light} grey massive rock - then pinkish
granite with some schist, where
almost at Pembine. Practically
the exposures run all the way from

of Pine, on going)

Towards $2\frac{1}{2}$ miles south from Pembina, nothing
 but sand. Then to Pine several rock
 cuts partly dark colored rock, partly
 pinkish granitic rock

Just south of Pine, a stream
 shows rock, and just beyond stream
 large ledge of granitic rock
 with some dark colored rock
 is quarried.

Rock continues in ceilings
 for three miles south of Pine.
 Then ~~no~~ no rock seen
 until at four miles north
 of Wausaukee. then rock
 at intervals for one mile, then
 no rock to Wausaukee

From Wausaukee to Middle
Inlet no rock seen, or none
 seen further south than this.
 Watched for it as far as Beaver

Aug 15, 1887

39

- 12866 Greywacke. Cut on Wis. Central R.R.
near N. quarter post of Sec 28, T46N., R2E, Wis.
Penokee Range.

Same place as Van Kise's #12797-98-99 of
this year.

This is one of the massive layers of this great
greywacke section. See Van Kise's notes.
A whole series of cuts - beautifully bedded,
regular - alternating massive greywacke
and thin lean gray to black slate. No
slaty cleavage. Structure all parallel to dip.
Have fashioned, muddy surfaces to layers

- 12867 Same place as above. Shows banded
greywacke

- 12868 From cut on M., L.S. & St. short distance
12869 south and east of above cut.

- 12870 Soapstone. Ashland Mine dump. Decomposed
diabase. Similar material to many of the
mines - desilicified diabase. Have seen it
today at Ashland, Horrie and Aurora.

- 12871 Iron. Ashland ore heap. Shows chert and
ore mixed.

- 12872 Horrie ore pile — peculiar.
- 12873 Granite-Knob. back of Aurora. Photo.
from here.

12874 Peculiar ore — hydrated? Aurora pile.

These ore samples don't represent ore
generally.

12875 Strawberry property. Ferruginous schist
from pit in SE corner Sec 13, T.47N.,
R. 46E. Mich.

12876 Ore, same pits.

- 12877 Soapstone. From same pit. Showing
12878 gradnation from diabase to soapstone.
12879 Much of this soapstone here apparently
12880 struck first. Does this always
accompany the ore? Is it decalcified
granite?

NOTE. That this pit must be very high up
in the formation. Black slate only half a mile

back on road.

East Branch of Polk River.

12881 Large specimen of Carbonate South bank East Branch Black River. — Short distance West of East Line Sec 13, T47N., R. 46W., Mich., Minor and Kelle property.

12882 Greenstone from dike or sheet in 12881.

12883 Apparently parallel to strike.

12884 Specimens from shaft 100 steps south of

12885 main shaft of Minor & Kelle. Sec 13, T. 47N.,

12886 R. 46 W. Mich.

Rotten greenstone has been brought up in quantity from the main Minor and Kelle shaft.

12887 Carbonate. Cut on spur of Palmer mine

12888 NW ^{1/4} Sec 14 - 47-46 - Very regularly bedded in places - reddened. Strike nearly E-W. Exactly like 12881 exposure on E. Branch Polk River. This Cut is four rail lengths long. Strike cuts track 45° Dip 70 N. Twisting back on this track to eastward

are higher layers of cherty reddened material

12889 17 rail lengths along spur from West End this cut, — the R.R. curving rapidly southward vitreous quartzite is exposed

12890 At 21 rail lengths from same point quartzite becomes much more slaty and thin bedded — less vitreous — finer grained and arenaceous. Slate continues to show to 25 rail lengths (above all on spur AB) 38 rail lengths takes to junction of Spur AB with Spur BC. 28 steps south of point B is granite. From B to F is 9 rail lengths. Then from F to G 3 rail lengths. road runs along north edge of granite, clinging to which are here and there pieces of a cherty breccia, which at times is jaspery

12891 Equivalent of the white quartz, limestone & chert.

12892 is the granite. Railroad has cut into it. This not the most usual kind. See Van Hise's specimens. This shows the cherty jaspery material in seams. Also breccia of green schist? in

granite.

- 12893 Large piece of chert containing granite pebble dark colored granite, or is it a piece of the granite mass attached. However, we found the granite in place precisely like this
- 12894 This chert at times has the jasper rounded white quartz into the irregularities of the granite.
- 12895 Large piece of iron impregnated quartzite, from cut near east end of Spur DE. Same place as Van Hies's 12510 which is exactly located. This cut shows quartzite on north side dipping north circ. 60° at most. On south side siliceous slate shows at W. end — and just south, parallel to this cut, not more than 10 steps away, a new cut is making through the slate for a new subsidiary spur.
- 12896 Another specimen from same cut as 12895. The striking way in which this quartzite is impregnated with; i.e., on joints is most noteworthy feature of this occurrence.

12897 At B slate shows. Then going from B eastward it comes in again at 3 rails from B and runs along track to 9 rails from beginning. At 7 rails a peculiar massive graywacke-like place. A slate cuts track at small angle dips 60° N.

On spur DC at 28 rail lengths from B slate begins to show - along cut and runs to 49 rail lengths from B. The spur curves southward through the slate - very slaty, mostly grayish in character.

About 10 rail lengths further E (not measured) slate comes in again for short distance.

A short distance south of here is the W.C.R.R. spur on granite.

12898 Colby pit. North side north pit. Rotten Soapstone.

12899 Slaty ore or ferruginous slate (all carbon?) North side north pit, south of 12898

12900 Fragmental quartz. Specimens from J.P.

12901 Charnium. From $5\frac{1}{2}$ NE $\frac{1}{4}$ Sec 15, T 47 N., R. 43 W.,

12902 Mich. Trap lies 1525 paces N. 500 W.

12900 is 1494 N. 500 W. fine arranged quartzite.

12901 is 1454 N. 500 W. Coarser sandstone or quartzite.

12902 is 1400 N. 500 W. Red clay shale.

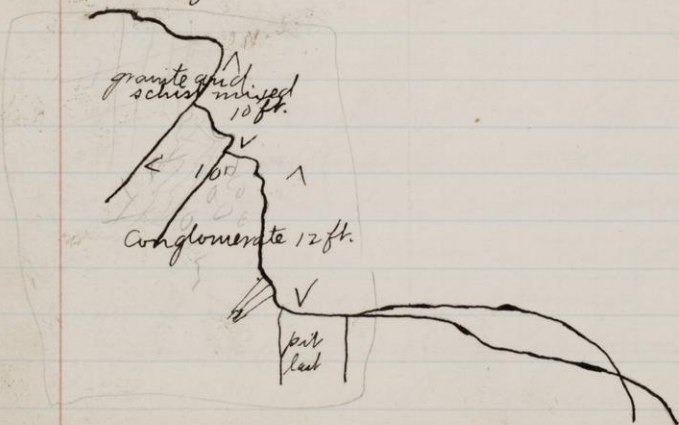
Aug 18, 1887.

12903 First point visited today. Three pits running on a line about S.W. This is schist from middle pit - Pit below this; i.e., No. is the conglomerate pit.

Above on hill is another schist pit - then granite ledge. the granite here seems a gneiss.

12904 Is this gneiss?

Next went to pit lying S.E. from above. Here Van Hise got 12607-8-9. &c.



Granite overhang conglomerate. Conglomerate seems to dip under granite - and to have a secondary structure parallel to it.

- 12905 Is this conglomerate? Is it ~~Keweenaw~~ Keweenaw?
 12906 or Huronian? Pebbles reddish granite? fine grained green schist - and rarer chert. See large specimens.

The rock immediately behind the conglomerate is a schistose gneiss? 12909. It is seams with red veins and strings of granite. 12908 shows the gneiss and granite seams. 12907 is the red granite - but none of this granite looks to me like true granite. It is rather an infiltrated material. 12907 comes from large vein - several feet under, large nests of white quartz in it.

Returning now to first row of pits above noted. Northeasternmost one was sunk through dirt, then through a hard conglomerate typically Keweenaw - This did not go all across pit. It was 6 feet through, however, then 12 feet of red sandy clay through which were scattered small boulders.

12910 Is this red matrix?
 Query, was the hard conglomerate a drift
 boulder? or a boulder in this red stuff? or
 part of the red rock conglomerate? This red
 material was so hard it had to be drilled.
 Is the red material earlier sandstone? or
 Keweenawan?

The pebbles are much rolled chert-granite-
 banded jasper-quartzite-vc. same as Van Hise
 Las at other parts.

Traveling N.W. now from this pit, come soon to a
 ravine with spring in it. Here is granite, and up
 the ravine a schistose rock which Van Hise
 thinks a quartzite. It is his 12816. but it
 looks to me more like a felsitic schist.

12911 Is this felsitic schist?

a line of 3 new pits starts off north from the
 pit from which Van Hise got his 12819-20. The
 first of these is 15 steps north of pit referred to.

12912 A cherty light colored rock. Is least
 fragmental looking.

12913 Picked by Van Nieu as fragmental looking. Is any
12914 of it fragmental? To me it looks not.

2nd pit is 13 steps north of last. It is in a
gray-rock quartzite-like but schisty. Is it
fragmental? Some of the rock is like the
last pit

12915 Represent this rock. 12915 & 12916 the more
12916 common phases. Are they fragmental?
12917

3rd pit is in water without ledge.

Went next to pit where Van Nieu took 12624 to
12628. Here found a singular looking cherty
breccia? conglomerate? At times certainly
very fragmental in appearance.

12918 } From here
12919 }
12920 }

12921 Granite? 20 steps south of this pit. Bold
hill inclining south.

12922 Pit - 20 steps A.E. of last gray quartzite?

12923 15 steps A.E. of 12920 in trench took 12923 -
Fragmental?

12924 is piece of conglomerate. Eastern sandstone
conglomerate from deepest Potsdam pit. See
Van Kise's old note-book.

