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Grand Marais, Rove Lake trail: [specimens] 7000-7068. No. 18 1884-08/1884-09

Chauvenet, W. M.

[s.l.]: [s.n.], 1884-08/1884-09

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U. S. GEOLOGICAL SURVEY
FIELD SECTION BOOK

9-891

No. 18

August and September 1884.

Grand Marais, Rove Lake Trail

H. M. Chauvenet.

7000 - 7068

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 2,000 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 $\frac{1}{2}$ 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.

#18

No. 1 - 1884

August and September
Grand Marais -
Pove Lake Trail.

T-65 - R's 4 + 5 - W.

W. M. Chauvenet. —

Left Grand Marais on
Tuesday Aug. 15-1884.

Two canoes, four packers,
three half breeds and one
indian.

500 lbs - stuff - 770 all told
for 35 days trip

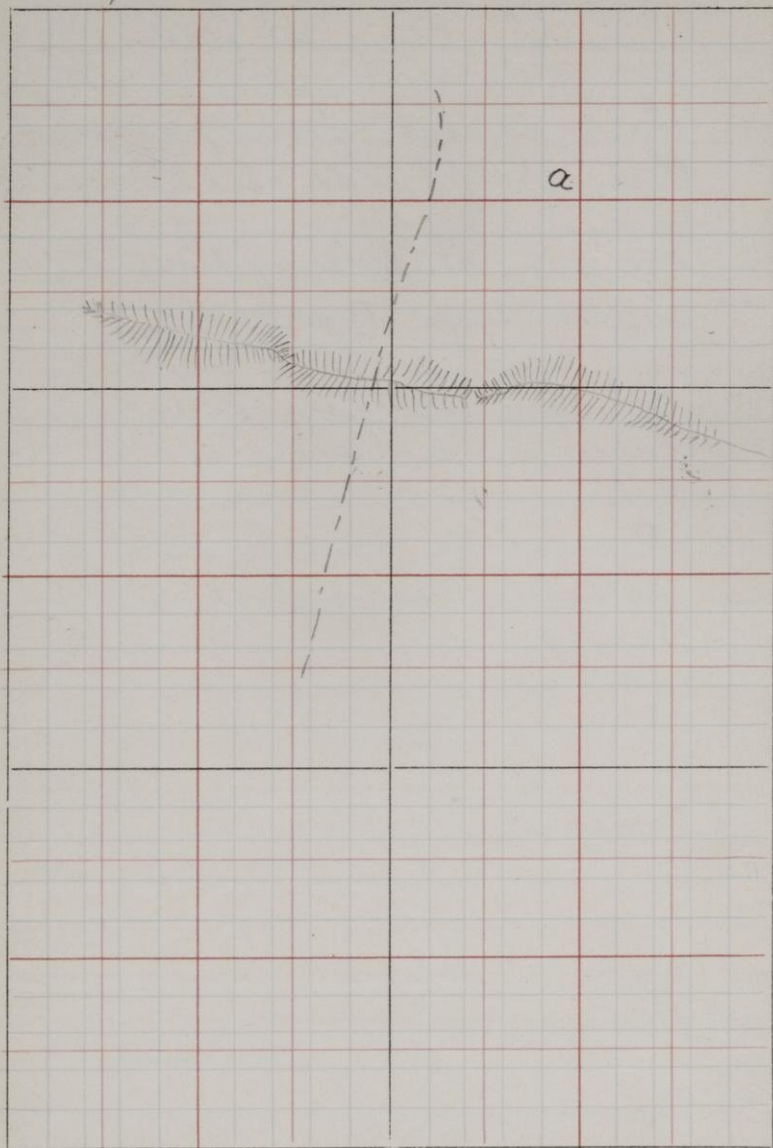
Relay sent forward four
days in advance to
Round Lake. via -
Roue lake trail

Main party left 9 A.M.
Aug 19.

Sec 9

T. 62

R. 1 E

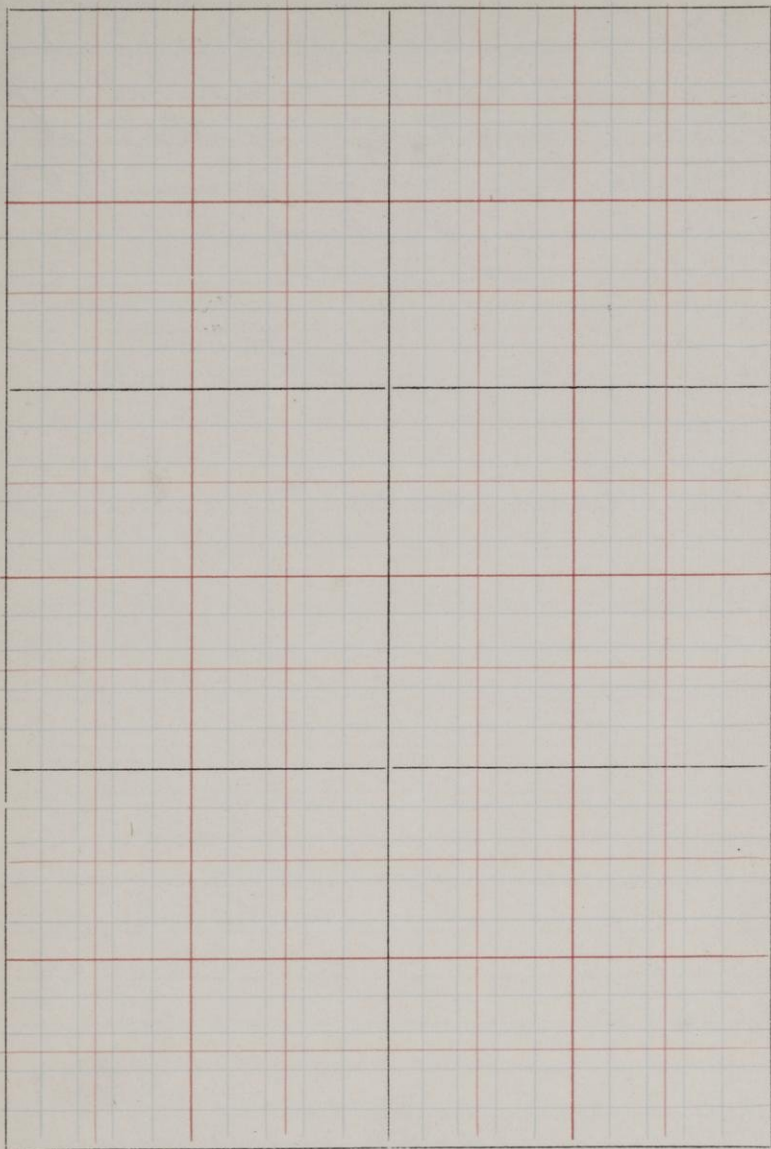


1
Eagle Mt. group. in ridge at
"A". prominent North outcrop
rising 50 ft. to crown of reddish
gray porphyry. weathering
brick red. ridge some 500 yds
on crown striking S. of E on
Roue Lake trail.

Rain on 19th.

Sec 33 T. 63

R. 18.

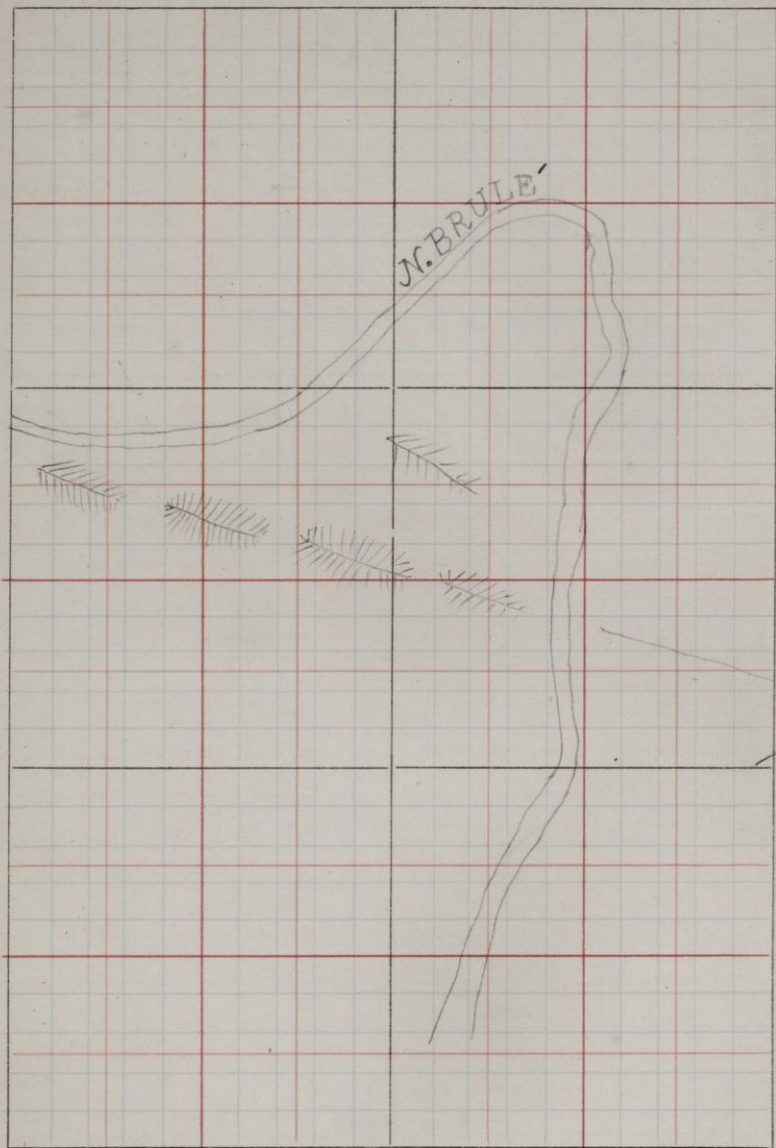


Bare ~~red~~ burnt ridges show
red porphyry in Sec. 33-63-1E
Trend of ridges S. of E. N. of N.

Rain 19th 20th

T.

R.



S. 60°

Section 33 T. 64 - R. 1 E.

Ridges of red porphyry such as is seen at Eagle Mt. cross this section. We now continue in the red rock for some miles. The soil is very thin and covered with drift of red boulders.

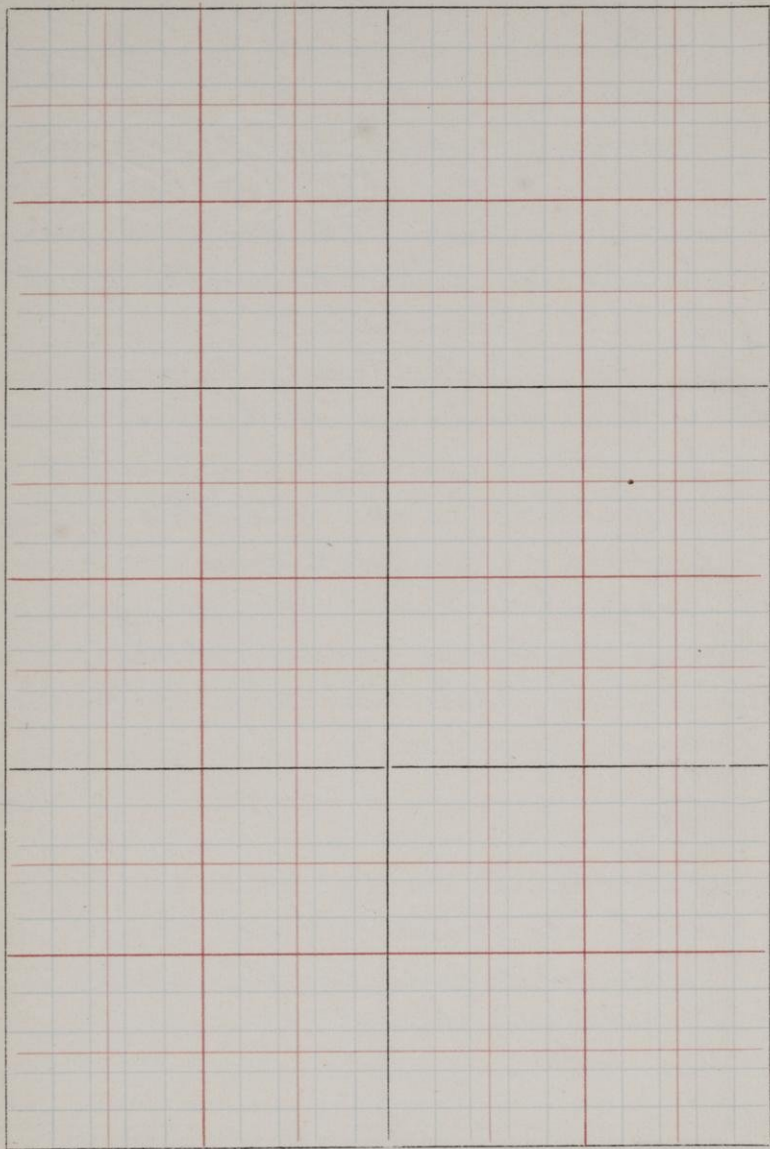
The whole trail between N. & S. Brule is of the red rock formation with exception of one ridge outcrop - showing gray gabbro. This indicates a bed of gray between overlying and underlying red gabbro.

It is seen in massive ridges and walls.

The trail is very marshy and at times very bad. The Indians complain of blistered feet.

Sec 21 T. 64

R. 16.



The section is crossed by prominent (100 to 150 ft. high) ridges of red porphyry - same as preceding. Many exposures but no readings possible.

Where the ridges are long the general trend is S. of E. Domes and cones of some fifty feet are a marked feature in the topography of this section of the country.

The red porphyry seems too far N. here and was not looked for as the S.E. trend of the red rocks in Sec 31-64-1 N. would bring them further south and in that section they have their N. limit or in Sec 30 perhaps, of that T. (see 1883 W.M.B.)

Dec 17 T. 64

R. 16.

R.I.

R.T.

- Co

Round Lake is the first lake on
Rove lake trail.

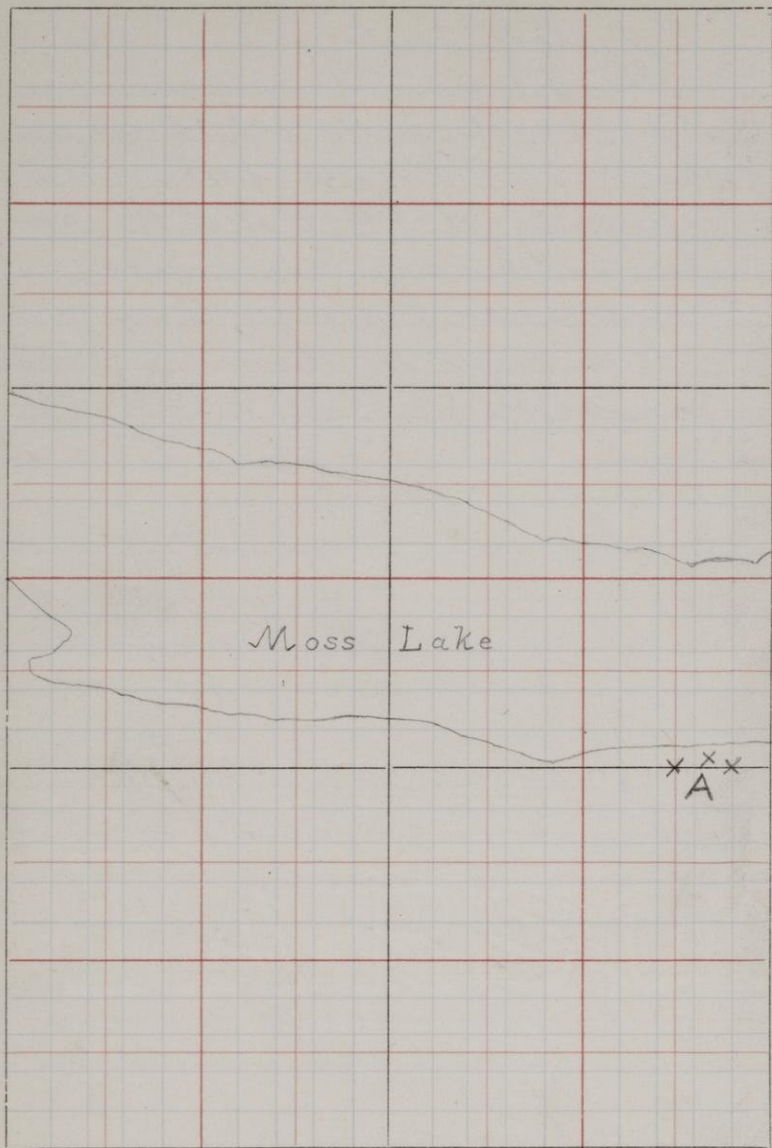
The prominent ridge immedi-
ately south of it which is one of
the main divides of the country
extending S. of E. + N. of W. as
far as the eye can reach is
composed of coarse Gray gabbro
which runs as shown in 1883.
across T. 63. R's 1-2, 3, 4, 5 - 11.

The group is -

Rain all night 21st - 22nd Aug.

Sec 32 T. 65

R. 1 N.



7000

First of series 1884.

A. McLee's location. Here is a vein of Calcite with well defined footwall of gabbro. The vein is 10 ft wide, is for the most part ~~pink~~^{clear} calcite (white) with streaks of greenish quartzite carrying galena in small isolated crystals, rarely cubes, with iron pyrites in center in one instance. Strike of vein E. 5° S. dip to S.

7000

The vein is in gabbro the first wall rock being of a dense gray finely crystalline variety beyond which the high hill is of the coarser gabbro of the region (See Note Book #1-1883 'Chauvenet. T. 64-R. 1-2-3 W.

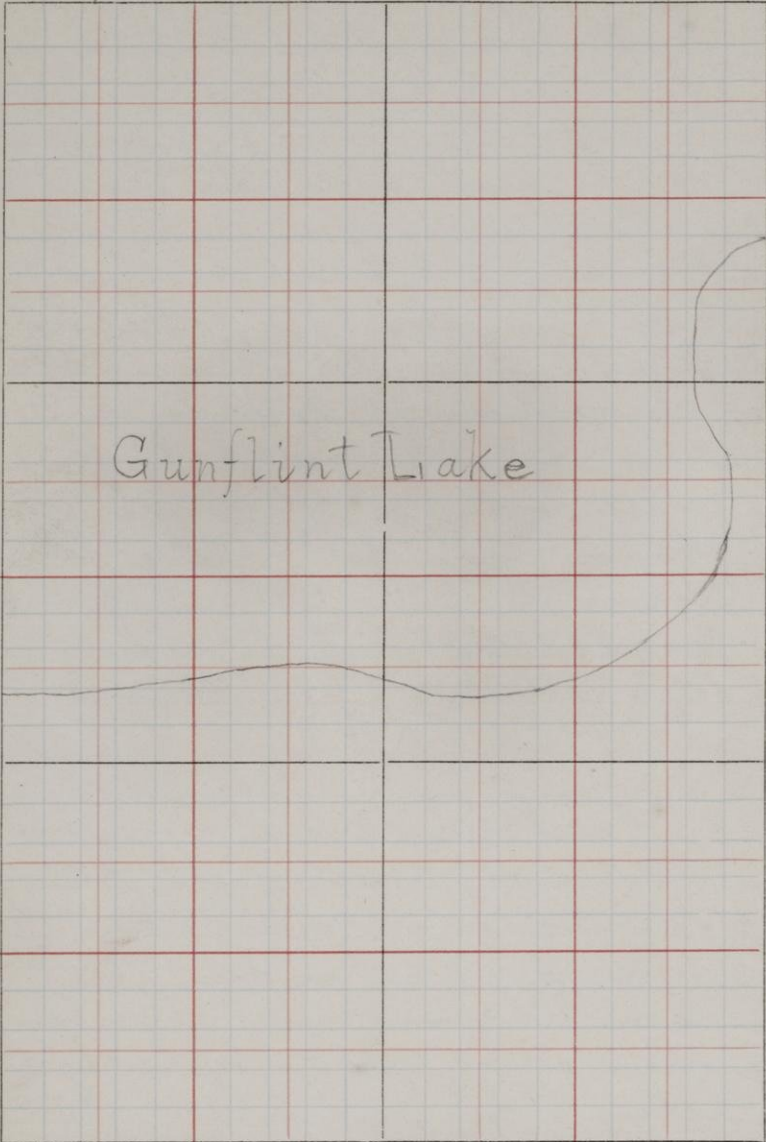
Found men Evans; Downman McKee and Harvey are here located on a claim about ten tons of rock has been taken from the claim vein. The assays show silver + gold - 19 or Ag - 107 Au.

Sec 19

T. 65

R. 2 N.

Gunflint Lake



Rain preventing progress and a high wind making the lake dangerous - a trip was taken N. of Gunflint lake.

Starting from E. end of lake at $\frac{1}{4}$ of a mile a greenish rock with schistose structure was found in a prominent hog-back showing for 100 ft.

7001 shows this rock. $\frac{1}{4}$ mile N. of Gunflint the exposures are large especially on the creek bed. and where quite a gorge is cut by the creek.

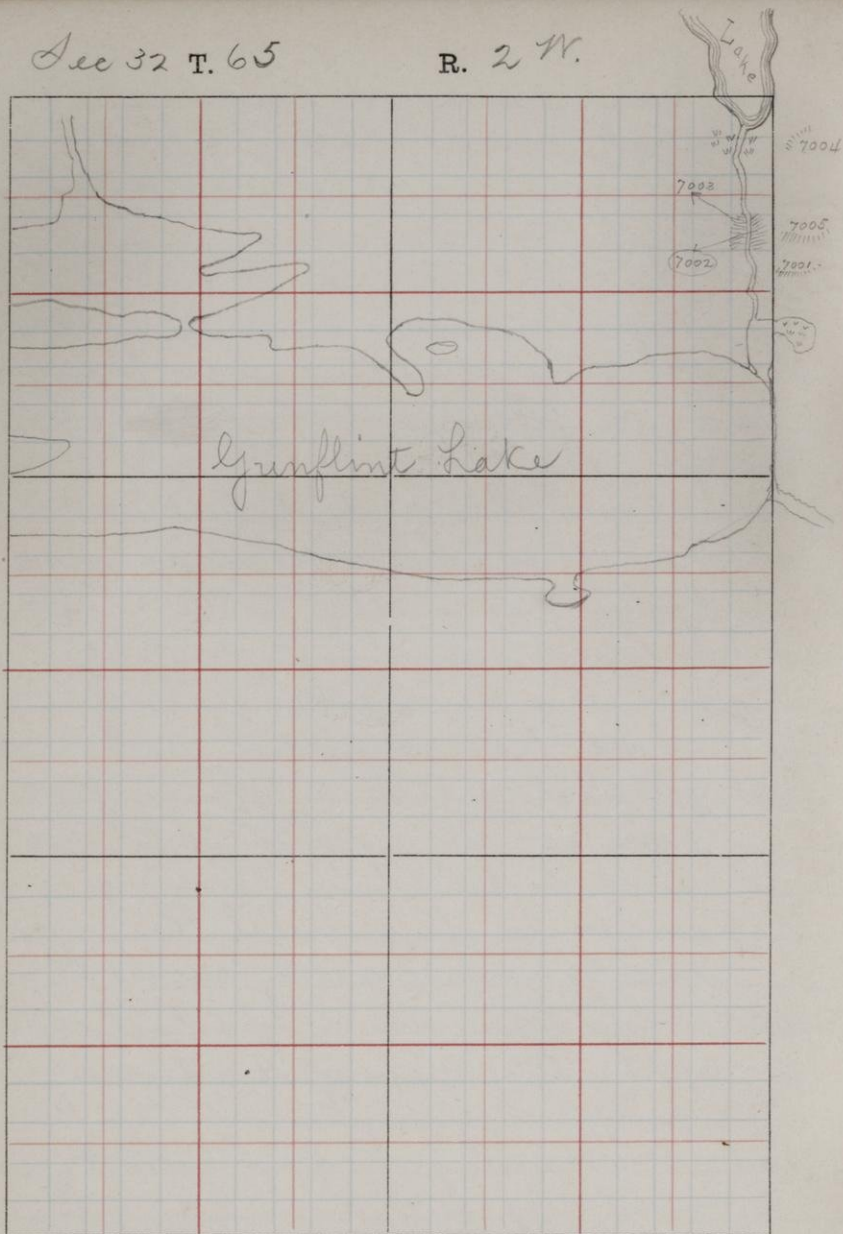
7002 comes from this spot and is a greenish quartzite showing iron pyrites. It rises 25-30 ft on a much broken face cleaving on surfaces of greenish hue quite easily immediately across the creek.

7003 was taken in a similar exposure apparently dipping Southward Purple quartzite.

7004 Continuing N. quartzites + jasper beds crop out in many places until the country sinks into

Sec 32 T. 65

R. 2 W.



a marsh and at length opens into a large lake. 7004 jasper + quartzite a conglomerate appearance is seen in the specimen 7004. The beds seem very flat and dip slightly South.

7005 From range immediately N. of 7001.

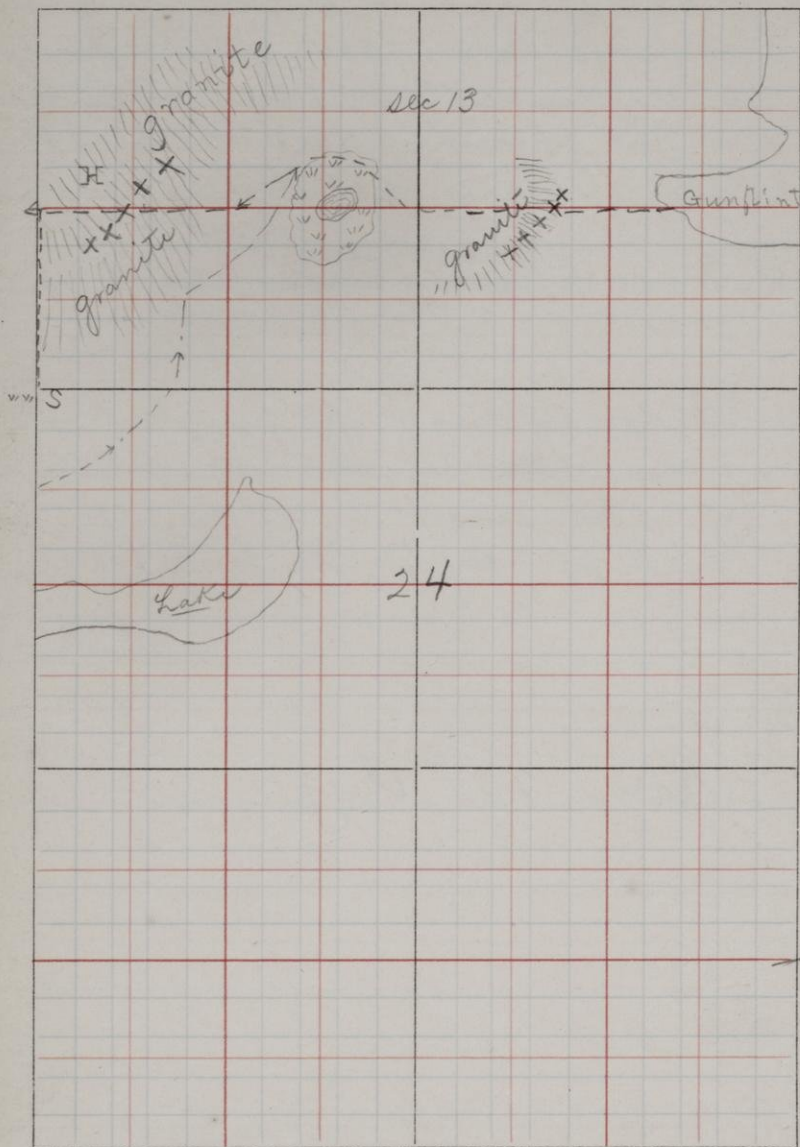
A rough map of Gumplint is given opposite showing location of specimens.

7004 probably $\frac{1}{2}$ mile from lake.

Rain 23rd Aug.

Sec 24 T. 65°

R. 47 1/2



Quartzites N. of Gunflint.

Starting from M. C. between Sec 13 + Sec. 24 at A. ^{N. (?)} Eastern extremity of Gunflint the E. + N. line between Secs 13 + 24 was followed Westward to the corner (13-14-23-24). This corner is marked (13-14-15-16) and the lines badly out of bearing.

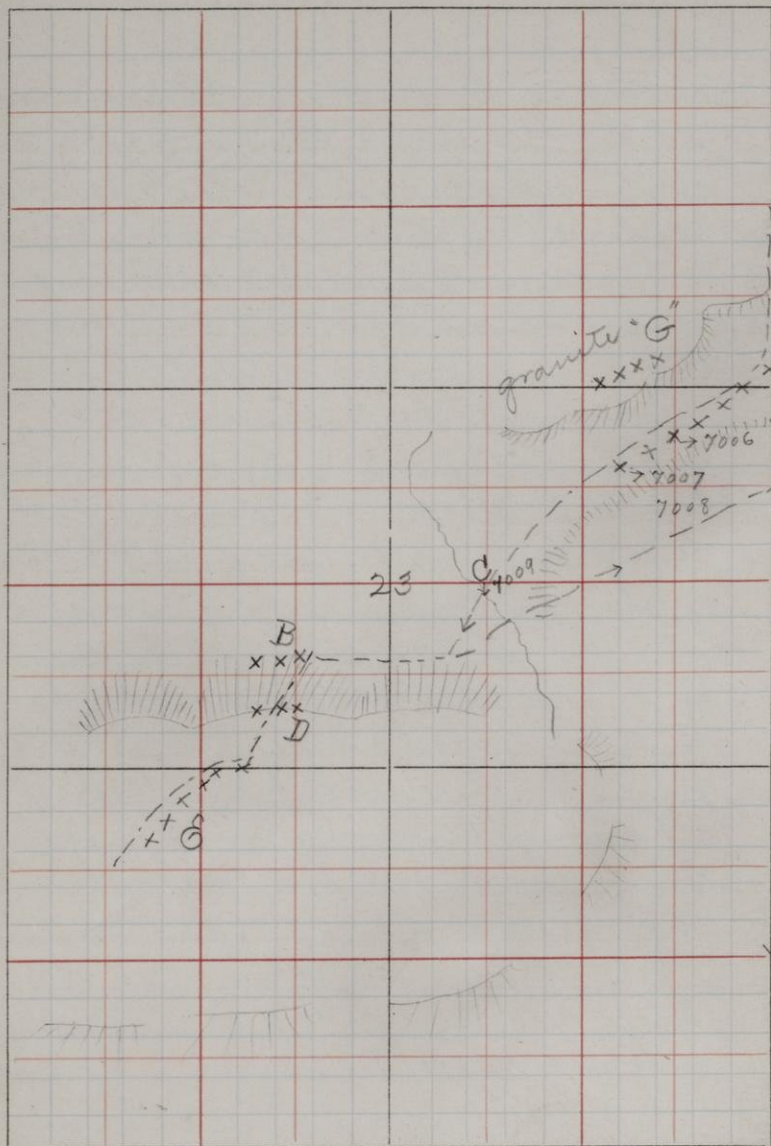
The great hill rising so prominently N. of Gunflint ^{is of granite} was crossed at H the corner post being some distance over the crown of the hill. Turning southward at the above corner (13-14-23-24) a sharp descent was made to swampy ground. at "S" - 500 paces (rather less if any thing) The granite shows immediately N. of the N. + S. line seen at the point →

Rain 24th

Sec 23

T. 65

R. 4 W.



G in great smooth bare domes and shoulders.

100 ft across the swamp to the S.

7006 shows in low ledges dipping slightly southward. It is a bedded quartzite dark green on fresh fracture

7007 is seen some distance W. of 7006

fine 9/5 It is a brittle gray quartzite apparently belonging to a higher bed than 7006 Varieties of it are seen in 7008.

7008. which was taken a little higher

fine 9/5 on the exposed face. The general appearance of which is banded one or two streaks of red jasper white quartz &c. in general exactly like the Gunflint beds seen in the back bay seen (1883.)

The divide between the ridge formed by the granite and that made by the quartzite has a well marked trend S. 40° W. The dip of the quartzite is. S.E. true readings were impossible. Continuing S.W. around edge of hill at "C"

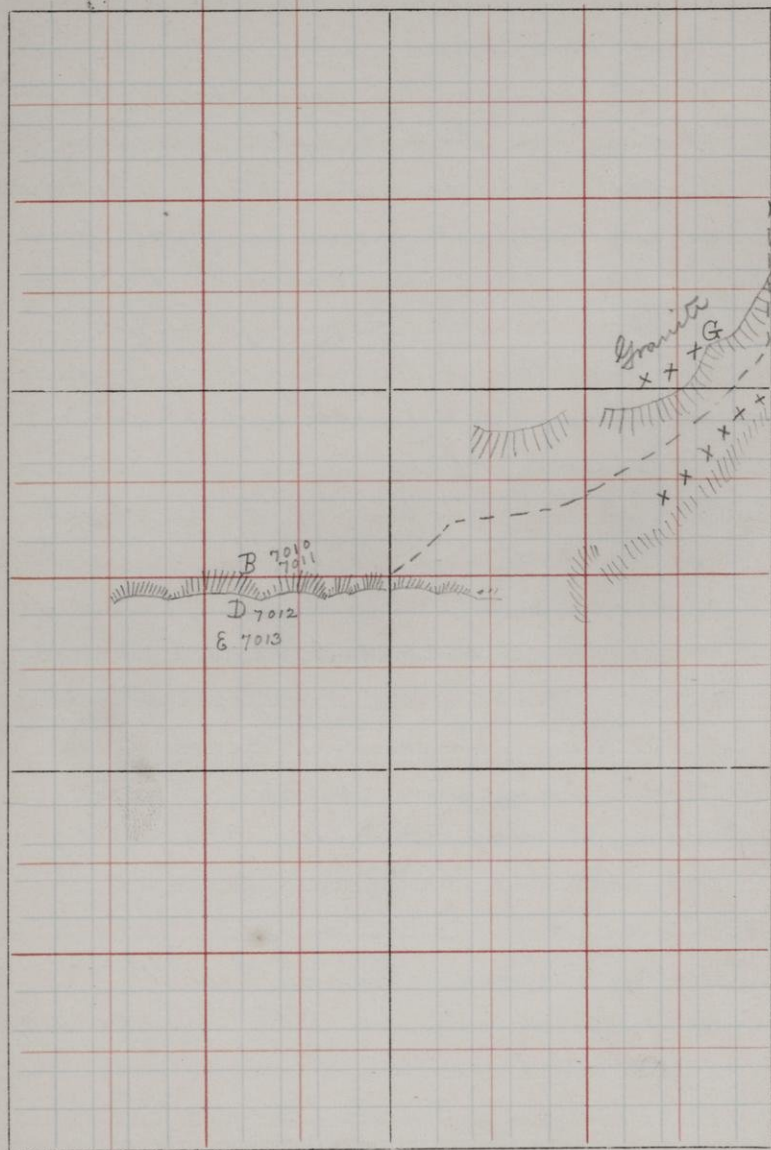
7009

See 5/10

was taken. the whole bed of a small [stream]

Sec 23 T. 65

R. 4 W.



(flowing south) being composed of this rock. Continuing southward the high hill N. of the one marked on the plat is abrupt. At B. were good exposures of thick bedded slates 1-2 ft being exposed.

Above the slate was a dense very ferruginous quartzite. This exposure "B" was at the base of the hill.

7010 Shows the slate

7011 Shows the iron quartzite.

Ascending the hill which is 100-150 ft high. outcropping ledges were found at "D" showing a quartzite shown in 7012.

7012 was taken about 50 ft above 7011

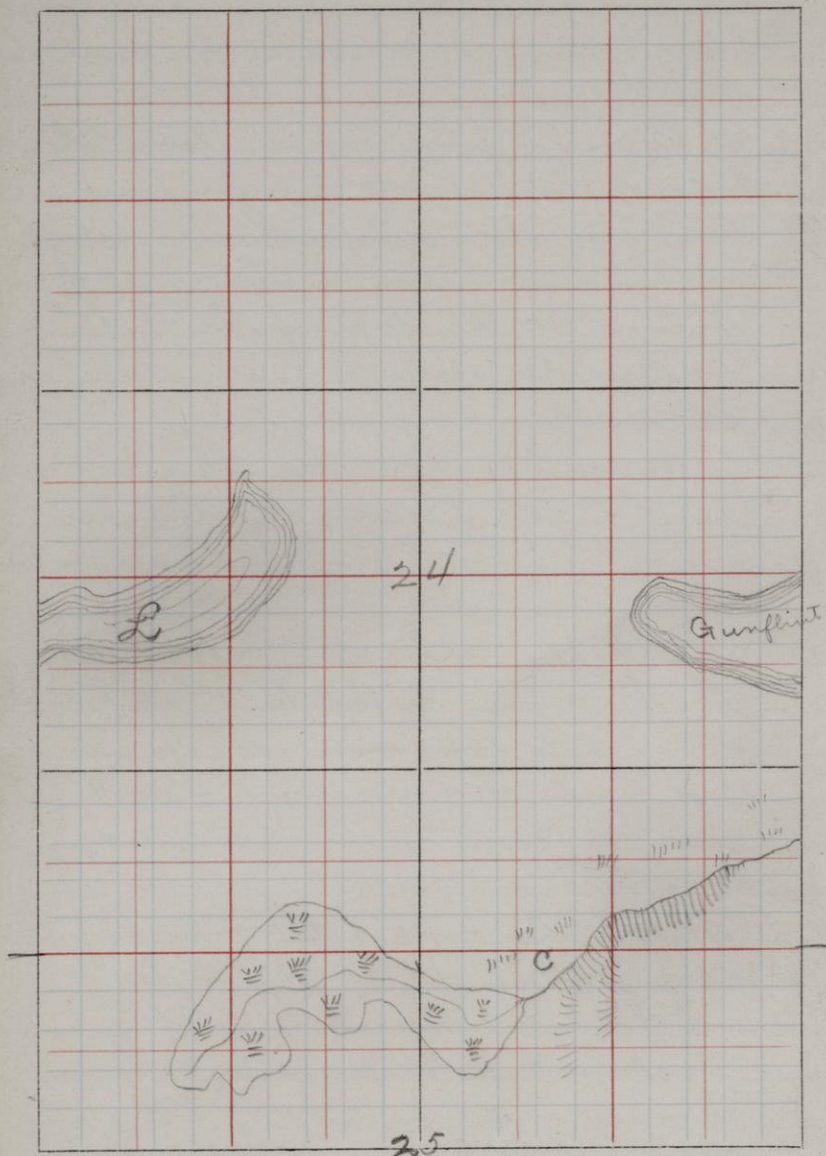
Ague. On the crown of the hill at E. was a marked ~~exposure~~ escarpment 12 ft high showing layers with a general tint to the S. E. and weathering red.

7013. Shows the quartzites forming the crown of the hill. The whole of which is thus seen to be of quartzite. The Arimitikie here making a large showing with apparently few slates. No greenstone was seen in the

Recog. by

Sec 24 T. 65

R. 47W.



section and the trip home to camp was without interest

Going N. from Gunflint by Cross river in Sec 24 - T. 65 - R. 24, the exposures on both sides of the river are large. The country N. of the stream shows a series of low lying outcrops. The greater exposures and in all cases the lowest in the series are the greenstones which can be traced from Gunflint N. to the swamp at "C" Sec 25.

where the greenstone is porphyritic showing the feldspar crystals in great abundance. On the S. side of Cross river the quartzites thinly bedded rise 60 or 70 feet in a vertical wall, crowned by greenstone

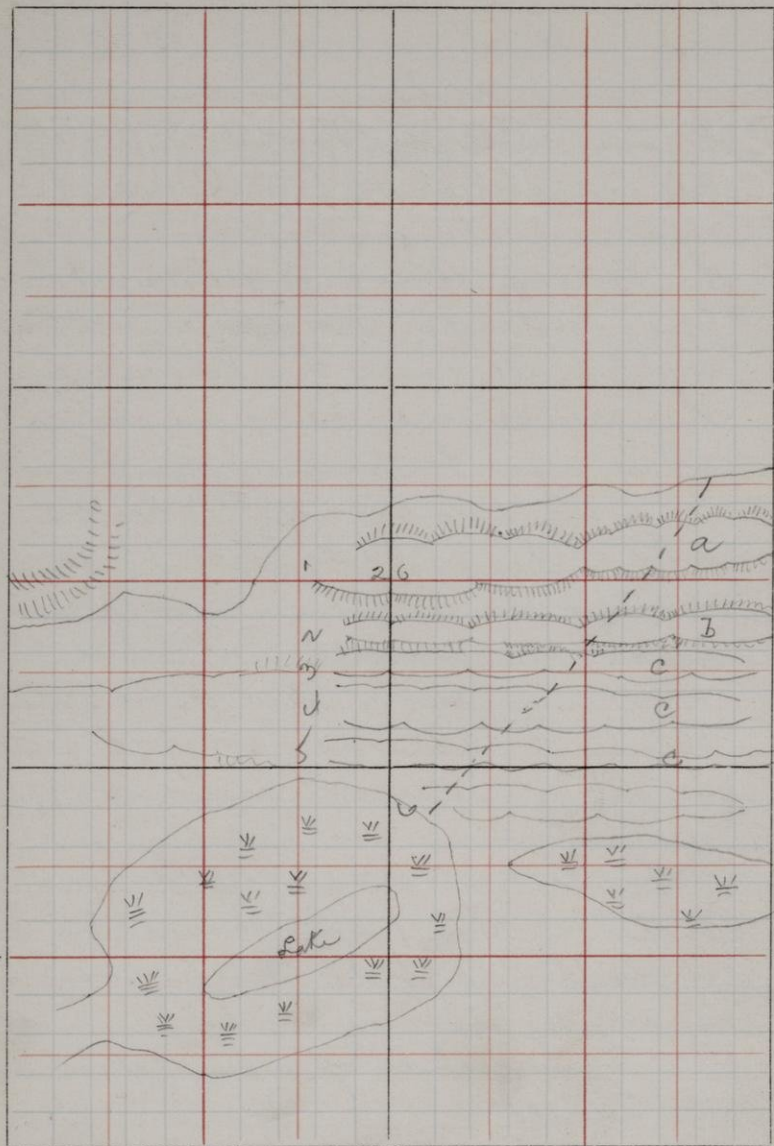
The section shows no true slates at this point though some of the layers of the dense gray quartzite are $\frac{1}{2}$ in thick

Good readings were taken with the needle.

Strike N. 50° E. Dip (S. 40° E.) 7°

Sec 26 T. 65

R. 4 N.



Fine diabase

7014

The layers of quartzite occupy the bed of the river but on the N. side a heavy bed of greenstone underlies the whole of the above wall & section Shows greenstones from C

Leaving Cross River in the $E\frac{1}{2} N.E. \frac{1}{4}$ Sec. 26-65-4 N., the trail goes S. W. over $1\frac{1}{2}$ miles to lake in Sec 35 passing over six ridges the 1st + 2nd - a & b show no exposures but on the higher ridges "c" large exposures of coarse gabbro are found. This ridge is very prominent and runs to Gunflint probably passing S. of Miller lake in Sec 33-65-3 N. The gabbro is now found continuously along the trail and on the shores of the lake in Sec 35 it rises in smooth domes from the water's edge.

It is probable that the ridges a are mainly gabbro. The exposures on c were high on the crown of the hill and indicate the top layers.

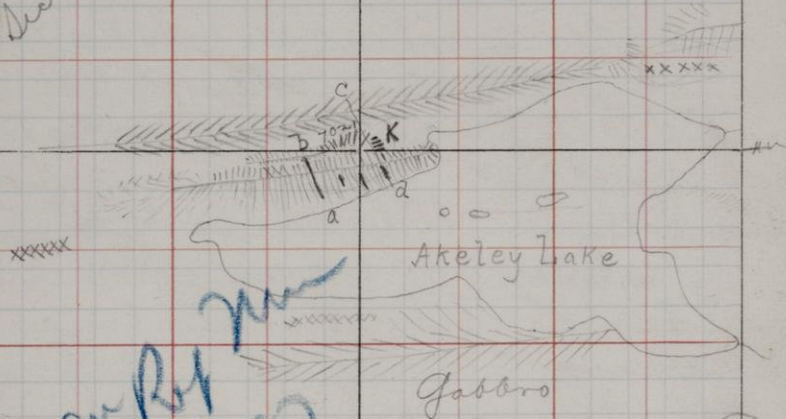
Rain 25th The country N. is described in Book #2.

T.

R.

this is in
Dec 29 - wrong plat.

S 20



of the Bot
p. 82
17 a Bot

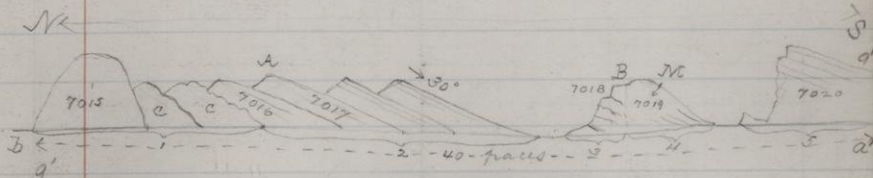
Analysed more
much to the
p. 83

The section on opposite page
covers 40 paces from A to B

Akely (?) Sec-20-29 T. 65-4 N.

From the lake in Sec 35-65-4 N.
a course N. was taken through
secs 34-28 into 29 thence to 20 and
at Akely camp was pitched

On the N side of the lake the
iron ore has been exposed by
a number of trenches which expose
at the N. the following section
- a-b cuts marked thus (-)



Strike 85° N. $N. 5^{\circ}$ S.

at times E & N.

continuation of Sec Lake Dip 30° South.

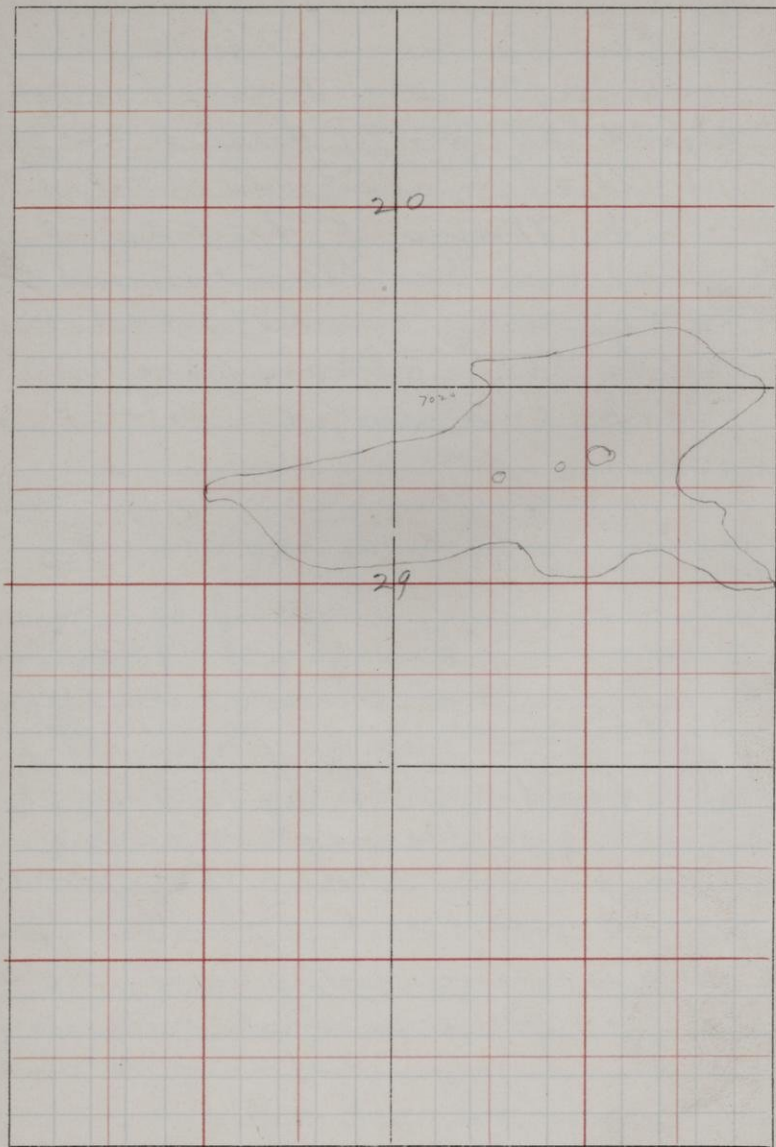
On the N. a wall with out apparent
bedding makes an abrupt ledge
showing face to the N. The rock
is a gabbro and is shown in 7015.

7015 This is massive and unevenly bedded
aug. Gab. at c-c - then a quartzite containing
much iron begins showing alternating
layers of 7016-7017- = A.

7016
7017 There is perhaps 15 ft of this quartzite
7016 & 7017

Sec 20 T. 65

R. 14 N.



7018 At B. a vertical wall of quartzite with veins and bands of iron is exposed giving 7018 (varieties of the wall) (At K. is a sheer end facing E.)
(map on preceding page)

7019 at M is a smooth shoulder of magnetic iron ore giving some clear pieces but being much contaminated for the most part with foreign matter.

7020 At N. is a bedded quartzite giving layers of varying thickness and occasionally ferruginous layers of thinner bedding.

The ridges rise to a great height toward the east end of the lake and the general section becomes greatly thickened. The series of respective beds is lost as the greater ridges expand, and though occasional trenches are opened no iron has been struck North across a deep swampy gorge another yet loftier ridge rises and the whole section across the three main hills is like

this c-d.



The general dip A. + B. of this section corresponding to A + B. of the preceding though the layers are only seen on the vertical face.

7021. The whole mass of the great ridge at R, is composed of 7021. The bedding is not distinct and great masses alone indicate the great Southerly dip. It is all apparently just such a quartzite as is the sample.

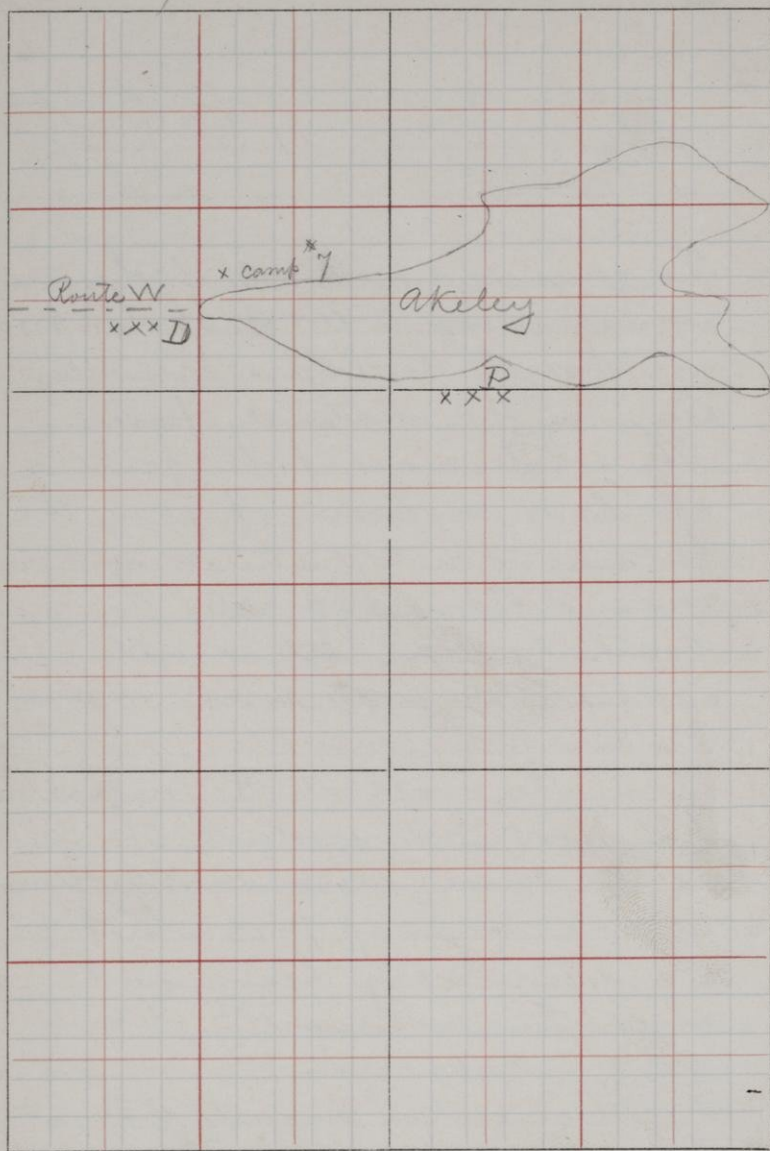
7022. From the wall at A. further east than 7015 but evidently the same as it since immediately beneath

7023 it is a layer of 7023 which is a quartzite very heavy with magnetite and exactly like 7017 in appearance.

This section suggests that at Little Saganaga. (see N. B. 1-1883) and the range of hills seems to be a.

Sec 29 T. 65

R. 4 N.



continuation of that N. of Gunflint.

Starting from
Sec. 29 T. 65 - R. 4 N. a day was
spent in going North to Sea
Gull Lake to connect the granite
of Saganiaga with the section
carried from the south.

The following is ~~the~~ sketch
of the ~~a~~ trip which was fraught
with the greatest difficulties and
made mostly on foot in a
burnt and fallen country
through which the new growth
was dense.

Going N. to the center line
of Sec 30, T. 65 - R. 4 N. we turned
N. through the center of the Section.

The most southerly ridge
of the section about to be crossed
was taken on the S. shore of

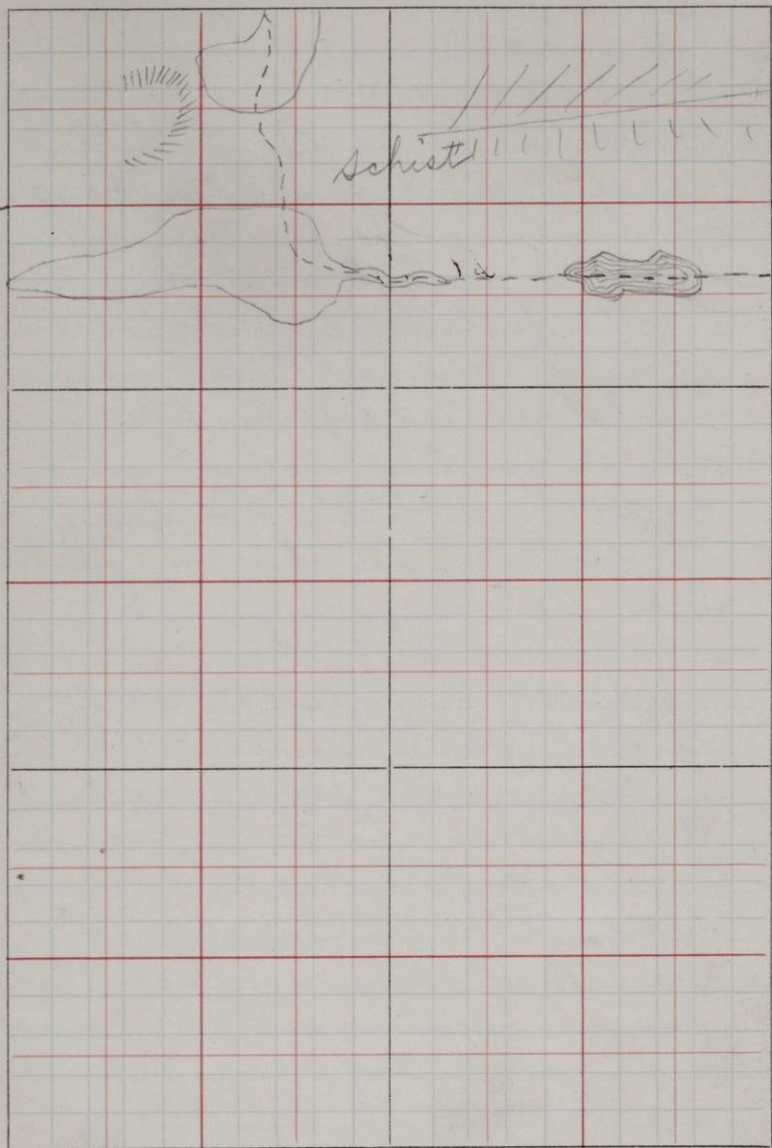
Atkely. lake and is a quartzite
7024 - at D. It forms a high hill
and runs into 7025 on the crown

7025 - is a gabbro taken at P further
eastward

7026 Now the country rises rapidly

Sec 30 T. 65

R. 4 N.



in bold lofty ridges showing many sheer falls mostly facing N + E. some times breaking down to the S. trending S. of W. generally.

7026

green schist

shows the rock on all these ridges. It is a greenish or grayish schist sometimes showing a purple tinge and always weathering green. It is apparently without bedding rising in smooth bare shoulders and jointed walls yet the masses seem to dip southward and wherever bedding is seen as at the southern margin at Akely the dip is distinctly south the bedding also plainly distinct

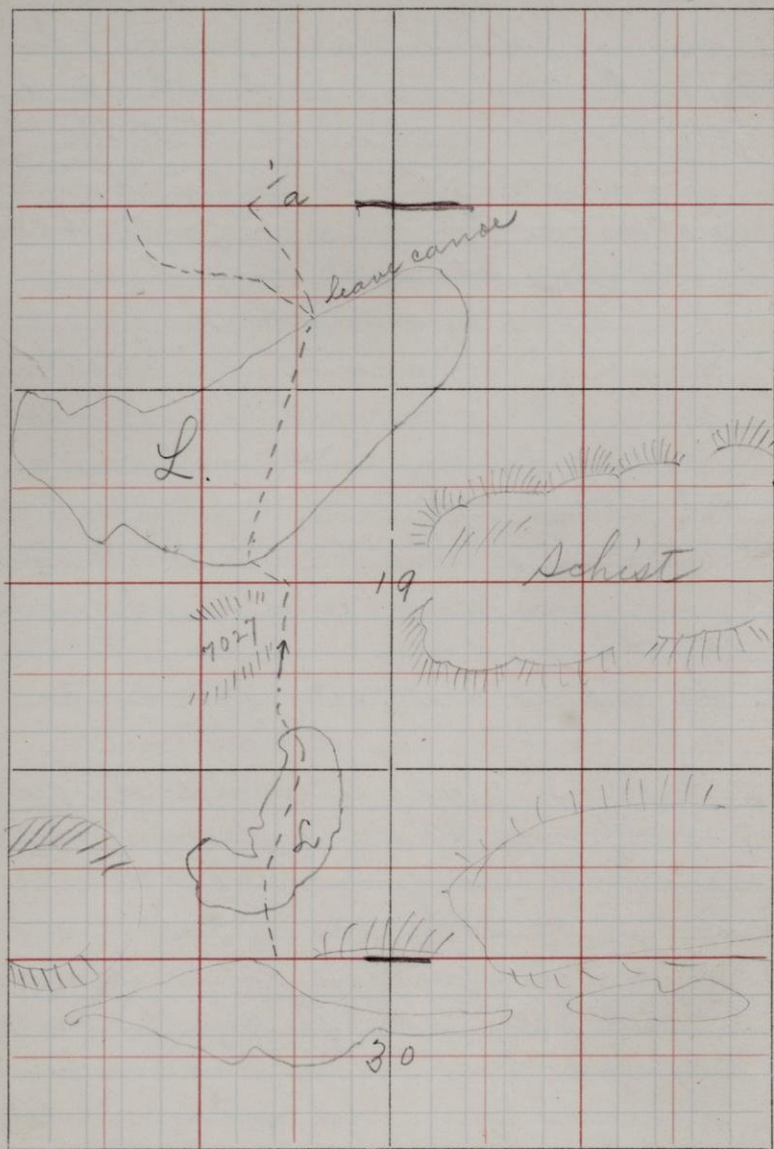
7027

ga. Schist
with calcite

shows a piece to exhibit the green weathering. It is from about the center of Sec 19. - 65 - 4 W. The next ridge N. is the most prominent in the country and from its crown the country to the N. can be studied as on a map. Big Saganaga water is seen and many miles Northward (at least 30) Both E & W. Gull lakes and the divide

Sec 19. T. 65

R. 4 N.



between the green schists and the granite coming South from Sagana-
ga is clearly seen. the granite
country immediately north being
burnt and exposing the shoulders
of pink rock.

7028. Came from this high hill and
alt. greenish was taken upon the bare crown
(there were lodged pieces of granite
and schist such as are on the N shore
of Gumflint).

This ridge is the main ridge
that is seen to run W. toward
southern Kingfisher Lake and
eastward to Gumflint apparently
connecting with the high hill
in Sec 23. - 65 - 42.

It is the prominent range
of high land seen from the north
the most conspicuous feature
of the country.

7029 Descending the north side
fragm. was taken to show a vein in the
main 7028. and continuing to descend
7030 was taken from a ledge in a
qr. sch. marsh quite at the base of the
hill and is nearer a greenstone than any other

Sec 18 T. 65

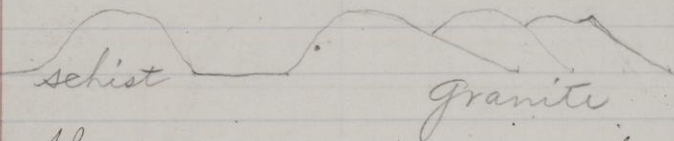
R. 4 N.



anything else

- 7031 As we approach the granite the schists appear little changed and with the exception of a somewhat more irregular massing have no change of appearance, 7031 shows a piece quite near to the granite where many surface have little granite veins running through them as seen in 7031

There is no distinct contact seen here the schist being separated by a gulch some 100 ft wide.



7032. Shows a common quartz banding in the schist
- 7033 Shows the granite all of which is gray here, though many dark red boulders lie about
- 7034 is a piece of schist taken close to the granite.

7035

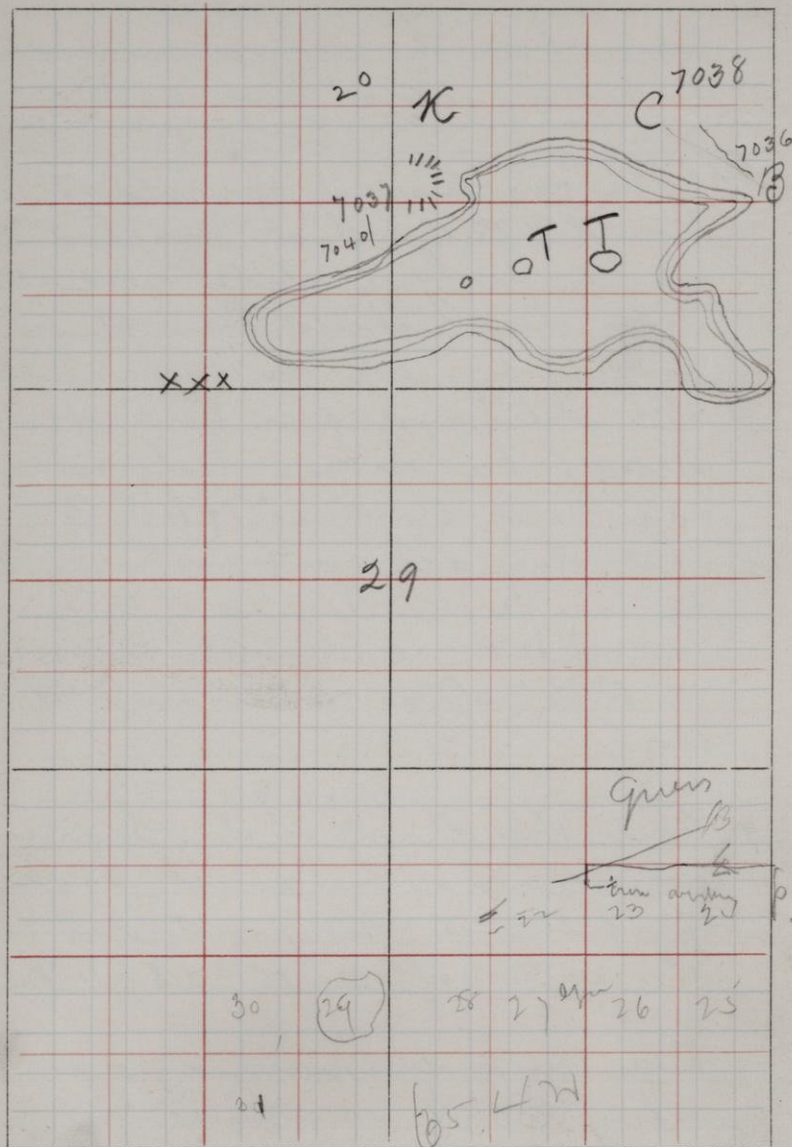
Other pieces of the green schist taken from the ridges crossed in the region under discussion.

- The conclusions arrived at from this trip which reached the granite on Gull Lake are as follows:
- 1st That these schists, are not in any way the continuation of the slates and quartzites of Kingfisher Lake which are on edge and striking $N 40^{\circ} E$.
 - 2^d That they are continuations of the range in Sec 23 of this T65-R4W. is probable though no true slates were anywhere seen.
 - 3^d That the limit of the Saganaga granite is as far south as Sec 18 probably at this point reaching the center of Sec 18, - 65-4W.

The trend of these ridges is nearly $E. 5^{\circ} N$ sometimes more nearly $10^{\circ} N$ of E .

Sec 29 T. 65

R. 4 W.



700

Returning to Sec. 29 and Sec 20 we have more observations. The high hill was ascended in Sec 20 and sample 7036 taken from lower part near the base at B. on the line between Sec 29 and Sec. 28. -

7036

7037

was taken at A, near the shanty where the bluff shows sheer wall to the E. The sample shows heavy iron but is full of impurities and yellowish scales.

7038

was taken higher on the hill top than 7036 at C. and is much like 7021 taken at K. lower on the hill.

7039

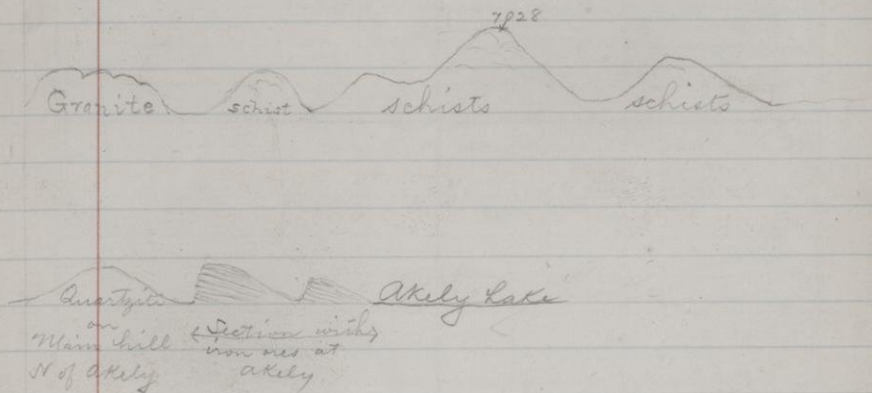
Is gabbro from islands at T, T', and

7040

is a second piece of Quartzite from the layers immediately over the most ferruginous beds from which 7019 came.

Everything south of the lake seems coarse gabbro and no layers are discernible

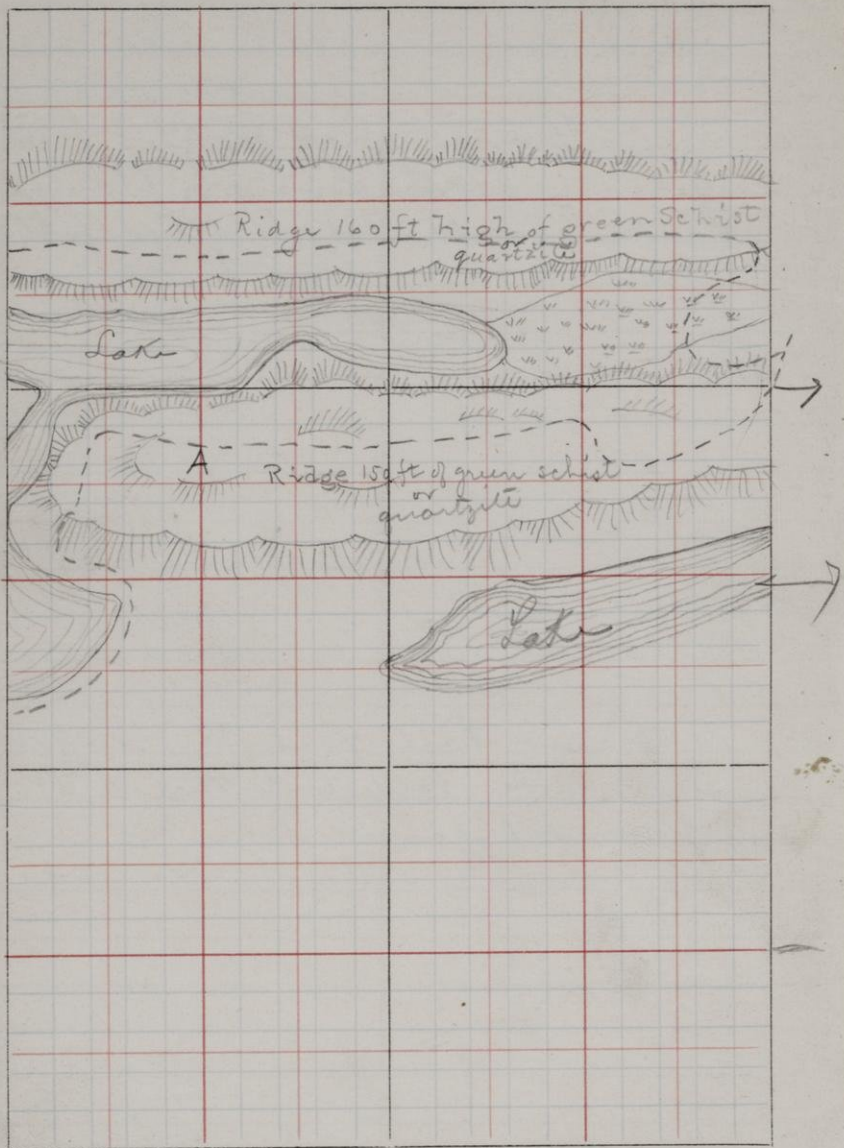
General grand section from granite south through Akely lake would look about as follows



From hill 7028, the ranges seem to be boldest to the S.W. passing Agemok lake &c.

Sec 25 T. 65

R. 5 W.



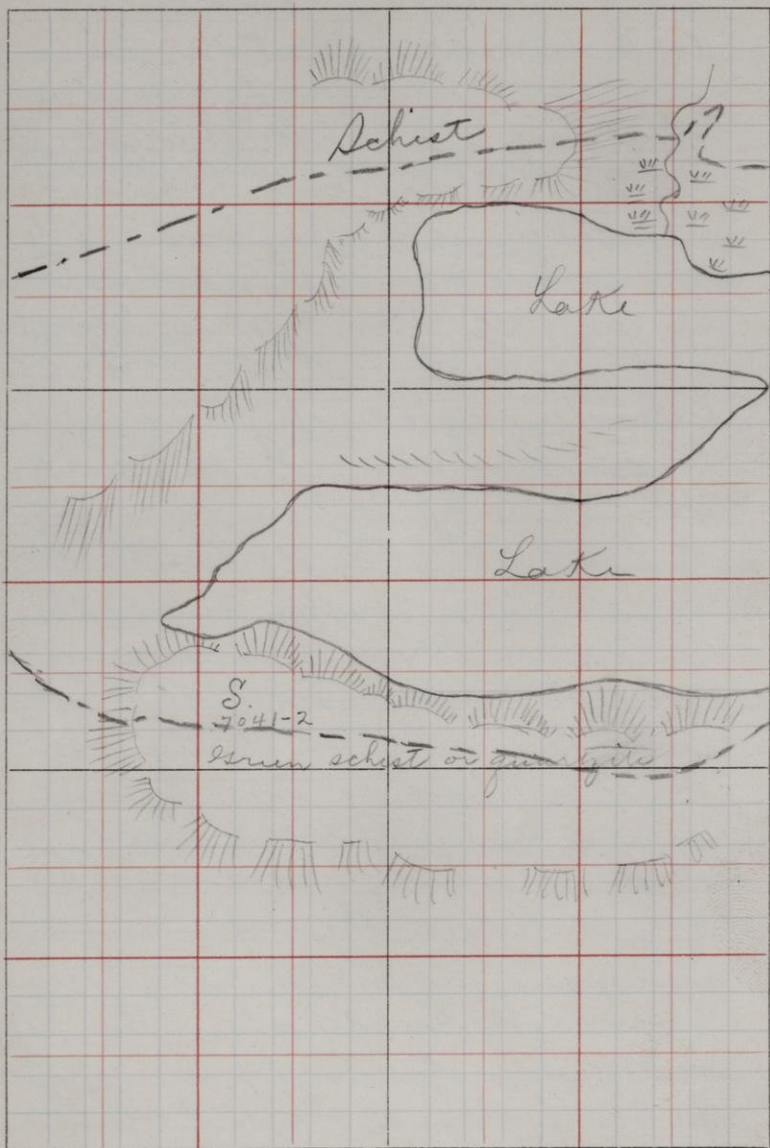
Trip westward. from Sec 29 T65
R4 N. to Sec 27-65-5 N.

This trip upon foot through a country of lakes and high ridges was taken with the view of learning more about the schists crossed in going N. from Sec 29. T65-5 N.

The high hill N. of the Ately section ends gradually and is no longer prominent W. of Sec 29. The ridges coming in from the N. of this bluff. go off. westward and slightly South. No map of the town was in my possession so that the ~~to~~ topography and general geography may be greatly out. since no packing was possible in a densely wooded country of small growth, and continual abrupt ledges. The following maps accompanying maps may serve however to locate when the plat is obtained. Certainly since the greater portion of ~~the~~ a day was occupied in continual walking occasional delays only being made

Sec 26 T. 65

R. 5 W.



by the party for worth berries
At least four miles west was
made and the center of Sec 27
reached. From the ridge in Sec 25,
at A. the country to the S. W. could
be seen and it was evident that
the masses of the ridges bearing
S. of W. would pass between.

Ogitchie Munchie lake and the
lake known as Cross lake or
Gobogitchiegamog

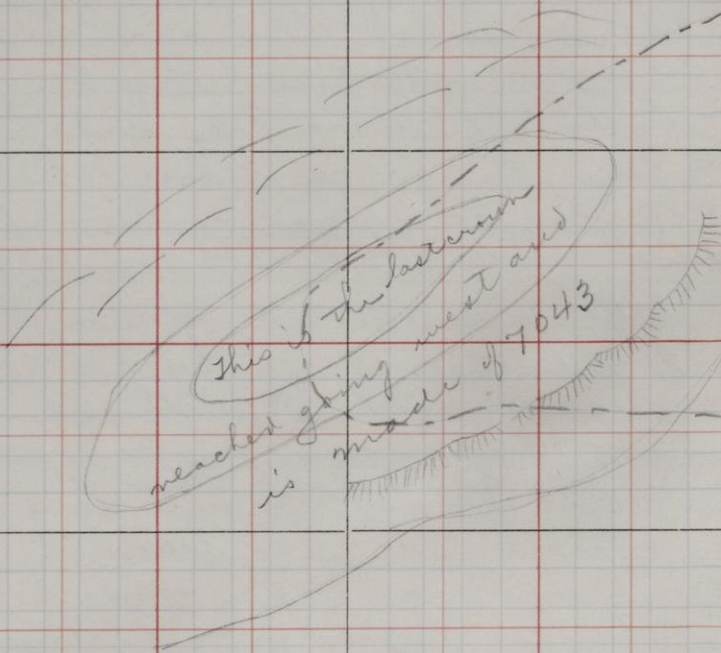
With the exception of a
little tendency to blotches on the
weathered surfaces the rocks are
identical with those shown in
T. 65-4 N. shown in preceding samples
On the crown of the hill at S.

sample 7041 was taken.

7041 To show some of the causes of
det. quartz. blotched weathering which at
times looks conglomeratic but
this appearance is only on
weathered surfaces. The quartz
seen in the sample is in scales
and blotches crossing and weather-
ing so as to stand above the
weathered surface

Sec 27 T. 65

R. 5 W.



This is the last corner
reached going west and
is made of 7043

7042 This sample also taken at S, is
 alt. 9mth. the mass of the ridge and was struck
 to. 1000. as often as 7043.

The ranges have a slightly greater tendency to S.W. strike.

7043 was taken on the crown of the
 alt. 9mth. most western point reached, at
 M. It is as 7042 the common rock of
 the country. 7042 + 7043 often
 lie close together though 7043
 is more common than 7042.

7041 is not so common though such
 are found on the bare crowns
 and weathered domes

In returning the ranges N.
 of the chain of lakes were followed
 but 7042-7043 composed them all

Paul Morrison from the high
 hills pointed out Cross lake
 and little Saganaga also
 Lacagrabie and these great
 hills here are no doubt the same
 range as those S. of Ogitchie
 Nunee or Kingfisher

Rain on 28th Aug.

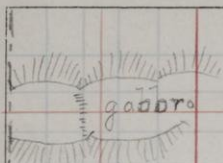
Trip north on line between sections 27 + 28 - 21 + 22 - T 65 - 42N.

We have seen that the ridges on the plat running E. + W. through Secs 14 + 15 of this town are of granite.

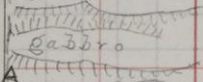
It was our object in going N. in the center of the town to get a third complete section from N. to S. across the town from the coarse easily recognised gabbros on the S. to the granite on the N. This is now accomplished after innumerable vexations and a great deal of almost impassable country. The ridges at the center of the town are so numerous the irregularly broken faces so confusing and the general topography so hilly and uneven that more systematic work will be required to determine the various leads. However the N. + S. line was followed to the center or $\frac{1}{4}$ post between Sec's 27 + 28. and the E. + W. line located between 21 - 28 and 22 - 27 where it was lost in a deep defile swampy

Sec 34 T. 65

R. 4 N.



← Corner standing
gabbro



Bear Lake

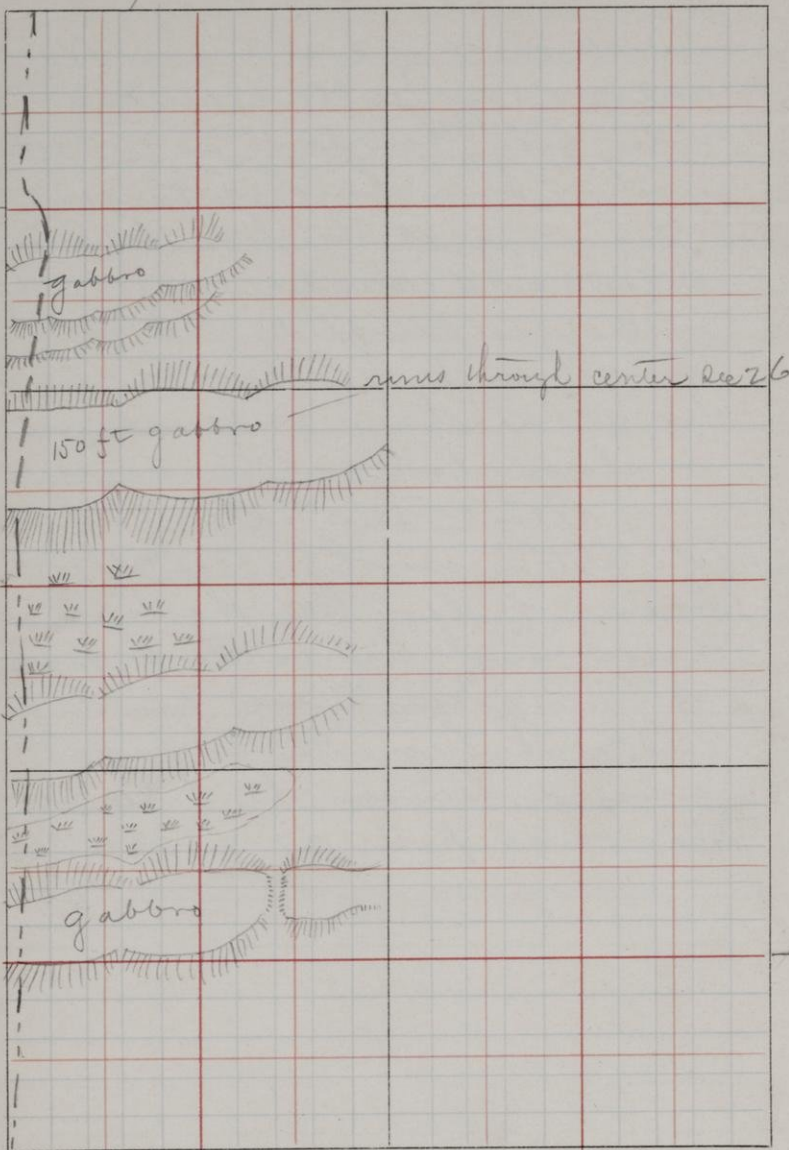
and dense with tangled alderbrushes yet a true N. course was still kept and the notes may ^{scarcely} be read as correct within some hundred paces.

Beginning at the lake between Sec's 33 + 34 (Bear lake) (no. 100) the gabbro was sampled. This variety runs through Sec's. 33. + 32. - 29 as far N. as shown above - it will be shown last in this series

Start there at A. (near opp.)
 (The plat is much out as to the location of Bear lake. The line passes much nearer the E. end.
 2 G. Two gabbro ridges prominent and with frequent ledges are crossed, between the lake and the corner post 27-28-33-34.

Sec 27 T. 65

R. 4 N.



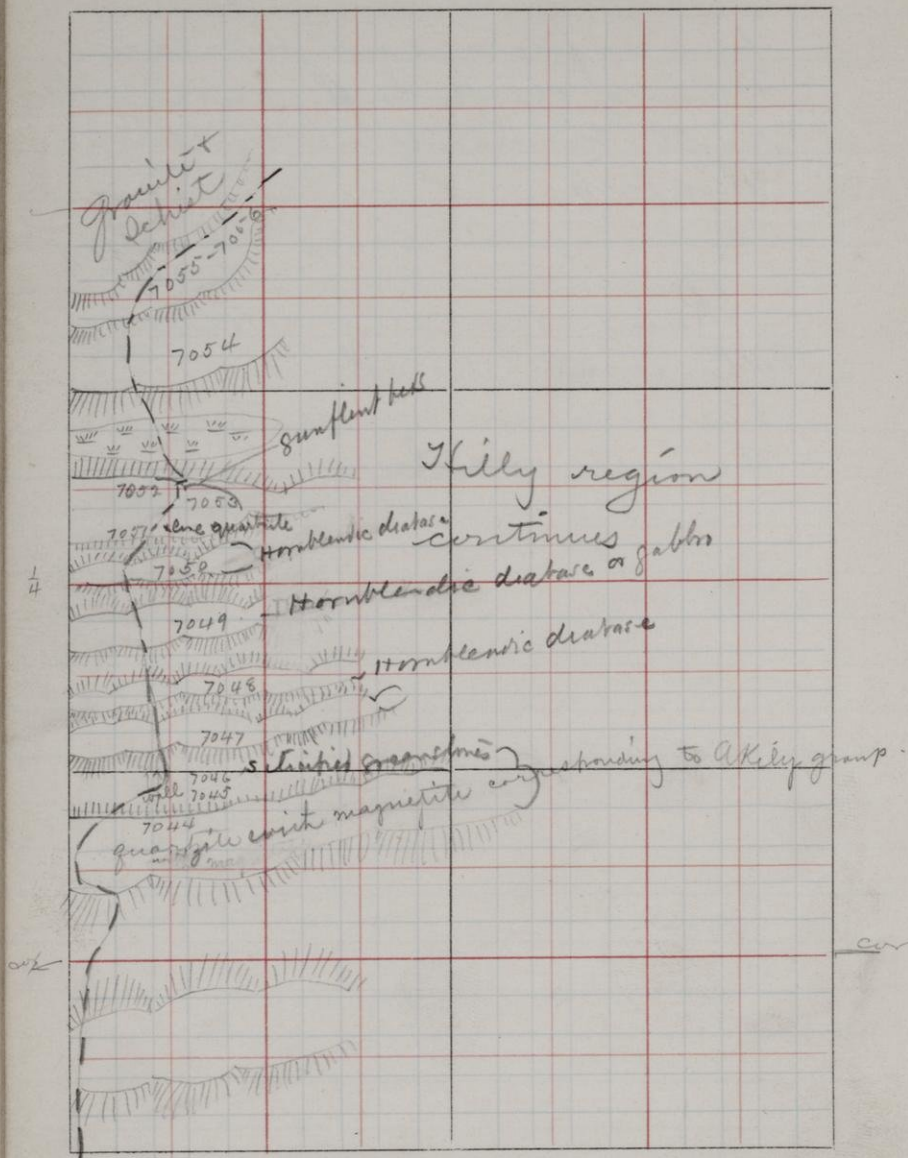
1/4 P.

These gabbros occupy the next four or five ridges. The ridge B. being 150 ft high probably the most prominent are crossed on this trip.

Rain is greatly retarding the work though the work has been continued through the wet weather.

Sec 22 T. 65

R. 4 W.



We now begin crossing a number of parallel ridges. The number represented on the map is correct at the point crossed yet they are perhaps slightly too wide at times so that the whole would read somewhere too far north.

7044 This is identical with the wall in Sec. 29 at Akely and there can be no doubt of its identity the quartzites and magnetic bands are interbedded though no signs of the larger magnetic bed were seen in the wall near the top of which 7044 was taken showing the heavy magnetic quartzite dip 25° E. of S.

7045 was taken lower on the wall than the above (7044) It is an fine grained quartzite - pinkish weathering red and brown - Strike S of W. dip 25° E. of S.

7046 was taken at the bottom of the wall (and at once suggests 7036. from hill at Akely).

7047 Comes from the next hill 160 paces N. and is a schist expected here but not continued any distance N. as it is on the W. line of the tower.

- 7048 From the next hill a speckled
gne. schist quartzite somewhat like 7021.
- 7049 Is a closer grained schist or quartzite
gne. schist from the next hill N.
- 7050 This is a greenish fine grained
gne. schist refractory schist from the next hill
at a ledge on N. face the exposure
is prominent.
- 7051 This rock when freshly fractured
is very white with a gray speckled
appearance weathering a dark brownish
red, some inches deep and rising facing
the south in bare ledges and well
defined masses. It is unlike anything
heretofore seen in the region and
seems somewhat like a sandstone
when it crumbles while wet.
7052. The now come to one of the most
fragm. precipitous walls in the country
act. jumping down 100 ft and showing
a vertical face to the N. with.
It is the N side of the hill
showing 7051 and is composed of
heavy layers of quartzite distinctly
banded on weathered surfaces heavy
close grained almost an ore of iron
at ~~some~~ times where the layers are thinnest

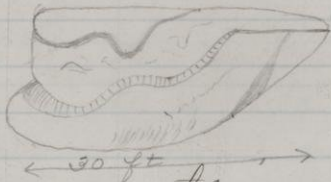
The dip is 5° to 10° E. of S.

7053 shows more of the wall which shows no variation from top to bottom in general aspect. This seems to be composed of exactly the material sampled in Sec 23 (samp. 7011) though no thin bedded states are anywhere found on the face of the cliff.

7054

Green sch.
etc.

The next hill shows huge smooth boulders of green schist without bedding or apparent dip. crossed in various directions by veins of pink granite sometimes straight sometimes tortuous in their course.



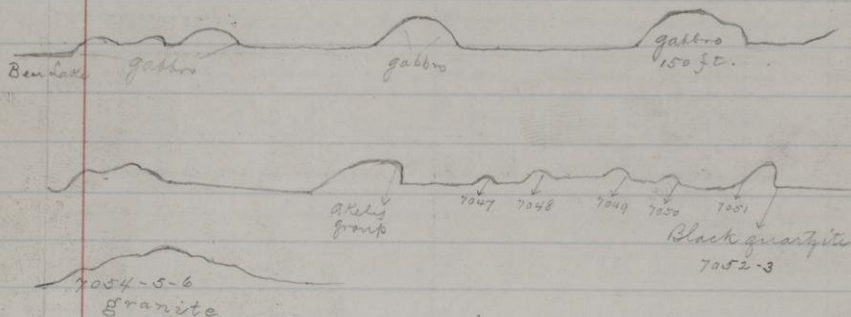
Such forms as this were seen a-a showing the granitic veins. The same pictures are here seen as where the schists approach the granite at the West line of the town as shown in 7031.

7055

Is a gray granitic rock not unlike the schists N. of Gunflint

lining the shore (1883) This outcrops in a bold hill the continuation of that upon which 7054 is found 7056 and the granite further N. 100 paces or more.

As regards the section just described the following is the general sect



REMARKS The great gabbro marked 150 ft is too wide a hill though its southern limit is fixed by pacing. The samples were all of them taken from ledges in place of this no doubt exists.

Magnifying of my watch broken some days ago so I am at a loss to locate strike exactly but the general direction is carefully noted. The needle is worthless on the magnetic rocks

7057 is the gabbro from Bear lake the last sample to the S. in foregoing section

We now go westward across two towns in gabbro all the way as shown in the same route last year. (1883) and are now in camp on last years camp ground, near the exposure of ore + quartzite in Little Saganaga lake.

The position of this great ledge or wall of iron + quartzite so suggestive of the Akely section is peculiar as it lies south of the immense thickness of gabbro that must come between it and Akely. It is seen again in Sec 11. T. 64 - R. 5 N. and is so shown to be persistent at this pt.

Such outcrops to the S would help the conclusion that the great coarse gabbro was part of the Animikie group. flowed between layers. The hummocks of the gabbro in this part of the town - Sec 7 + 8. - T. 64 - 5 N. differ from the ridged further E. + north. where the invariable south slopes

north facing vertical walls are main features

Note. The quartzite formation seen on Little Saganagag is found in good exposures in Sec 11. T 6 N - 6 W.

Rain on 29th.

Rain on ~~the~~ morning of Aug. 30th Little Saganaga

3

Note. for others about to go into N. Minnesota. Do not take a wall tent as it is often impossible to stake it down where the camp is pitched on thin soil. The A tent can be held in place by stones.

Upon leaving Little Saganaga we go north and west into a lake almost as large named Gobogitchiganog or Cross lake.

The gabbro occupies the S. shores and continues eastward. Attention was now directed to the N.E. shore where a trip inland was made over a burnt country covered thickly with fallen timber and debris, and almost impassable. Hours were spent in going short distances but fortunately it was not necessary to proceed far, as the great bare crowns of greenish schist (or quartzite for we can not decide upon a name) rise above the fallen timber and the hills are prominent.

From the highest tops the general trend of the ranges seems to be N.E. and to present similar bare greenish surfaces outcrops as far as the eye reaches.

As nearly as we can locate the hill upon which our observation was taken is in Sec 32-65-5 N.

T.

R.

64-5

66

65-5

32

7058 was here taken. It is a greenish gray rock close grained and brittle with rare crystals of iron pyrites. It weathers green and shows veins of quartz. and granite like veins at places.

The whole N. shore of Gitchigamago is of this granite quartzite and the hills increase in height as they go west.

On the shore jutting into the lake to the extreme N. and on the extreme S. end of the long point between the two arms of the lake is a somewhat different quartzite shown in the next three samples.

7059 was taken from the above point

7060 from the same point in close contact with 7059.

7061 from the same point the relation between the three could not be determined they are only different varieties of the same mass.

At the extreme N.E. end of the of the northern arm of the lake
7062 was taken. a gray quartzite

with purple tinge, which forms the foot and outlyer of the hill from which came 7058.

The whole shore was now coasted with no new rock, and finding quartzite coming down to the waters edge all the way.

There is a very prominent (250-300 ft) hill in sec 35-36 T65-6 N. This was ascended. From its crown the country was seen beneath to the N. E. and E. & S. Little Saganaga and the whole of Gobi-jitchiganog were visible and many other lakes over a wide tract of country.

With the exception of the general rolling nature of the topography nothing definite as to the long continuous ranges or groups of rocks could be made out, until the quartzite group north of the great gabbro beds was made out, followed, when the great round hills were seen to have a trend or range, toward the N. E.

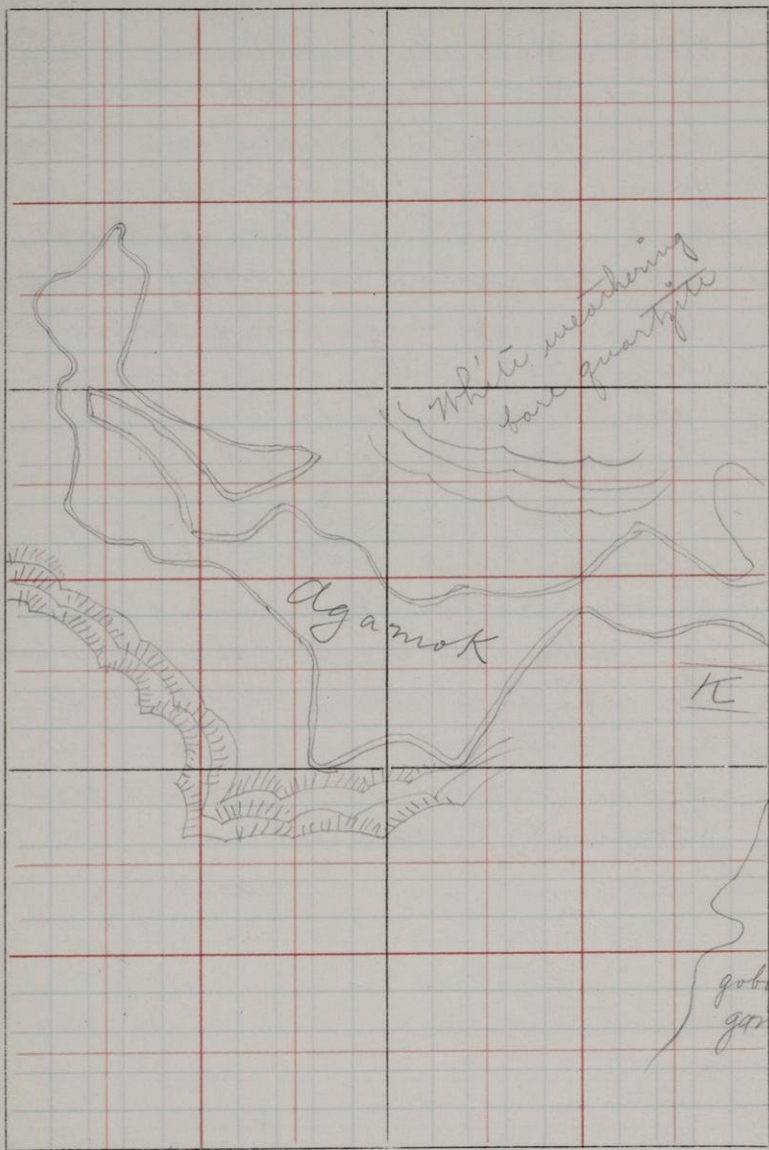
- 7063 was taken on the crown of this hill where the weathering is similar to that on all other of these quartzite crowns and showed quartz veins and some spots of red weathering flaking rock.
- 7064 Shows another variety of 7063. The greenish micaceous mineral shows frequently on fracture.
- 7065 shows red weathering from the same hill top.

Directly south of this hill rises another prominent crown probably in Sec 2-64-6N. while the whole country to the west and southwest seems a continuation of this formation for some miles at least.

Sec 36 T. 65

R. 62h.

←



We are now about to cross that region of distinctly banded quartzites given in detail in (Book #1. 1883 N.M.B.)

Some further observations were taken for the samples representing the varieties found here and on Ogishke Muncie lake see list 6000 and following 1883 Note book 1 & 2.

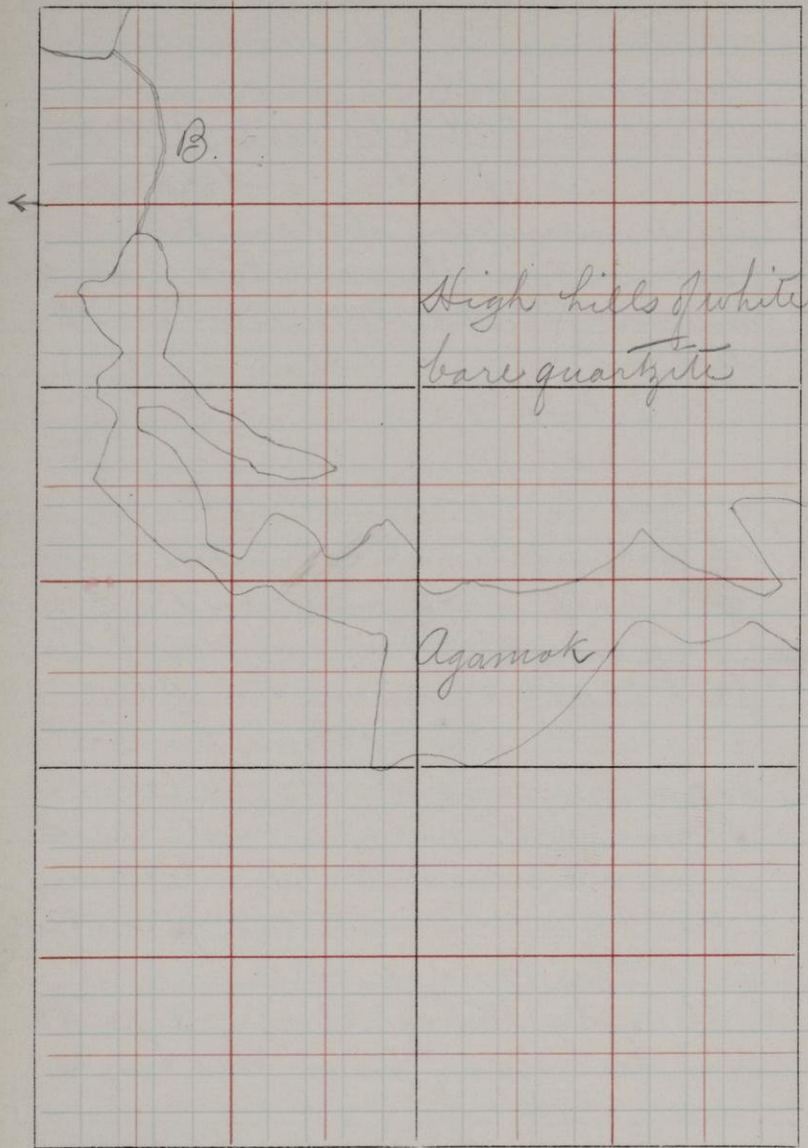
There is no change in the quartzites of Gogabitchiganog until we get half way over the 1st portage going west. Here in Sec 36. T 65 R. 6 W. close upon the S.E. corner of the section possibly upon the range line. The banding begins with no apparent cause and no demarkation between the former unmarked quartzites and the banded ones.

Here the bands strike N. 76° W. and the layers forming the bands dip N. 14° E.

200 yds further N.W. the bands strike N. 60° W. and the dip is S.W. at 7° .

Sec 36 T. 63

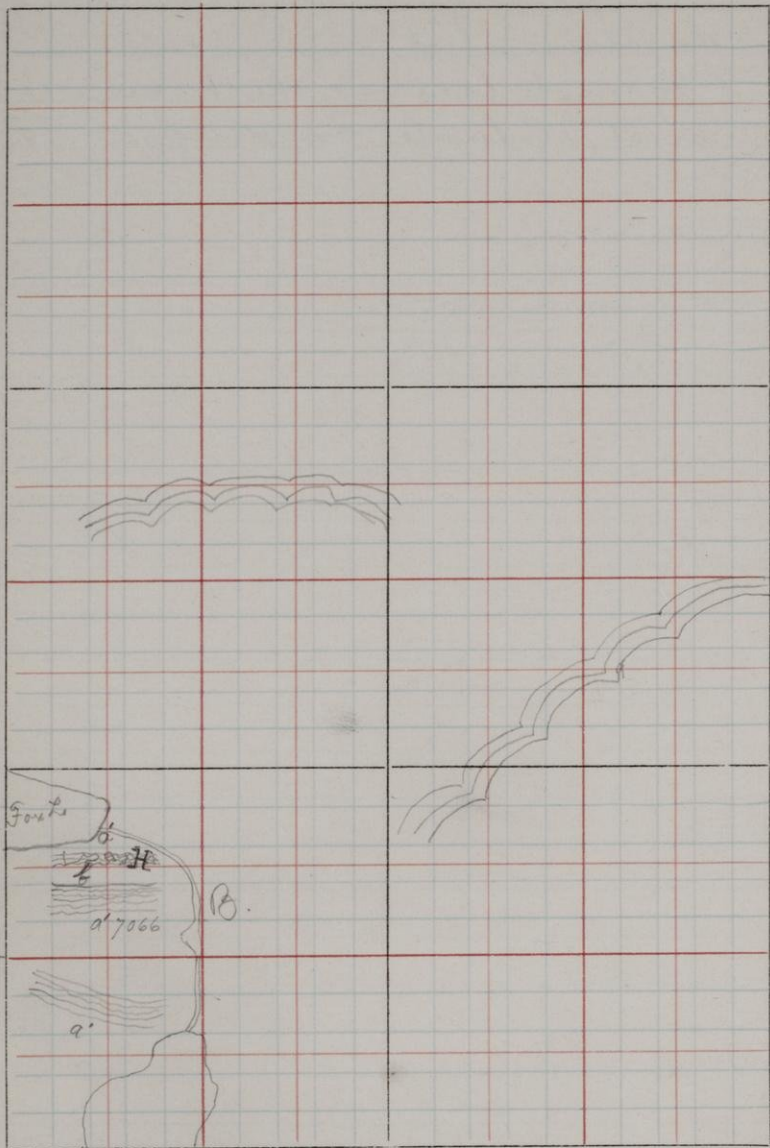
R. 6 W.



The passage to for lake along the stream "B" running from Agamok lake is the region of most elaborate banding.

Sec 25 T. 65

R. 6 W.



At a'-a'-a' the banding is continuous and prominent sometimes giving E. + W. strike at times N. 60° W. sometimes N. 30° W. dipping generally toward the South.

None but magnetic or needle readings were possible.

7066 Shows the great mass of the rock showing the cause of banded weathering at C' - (map opposite)

Immediately W. of this the bands cease a coarser open grained rock - greenish - comes on in heavy masses with no bedding or bands at HC

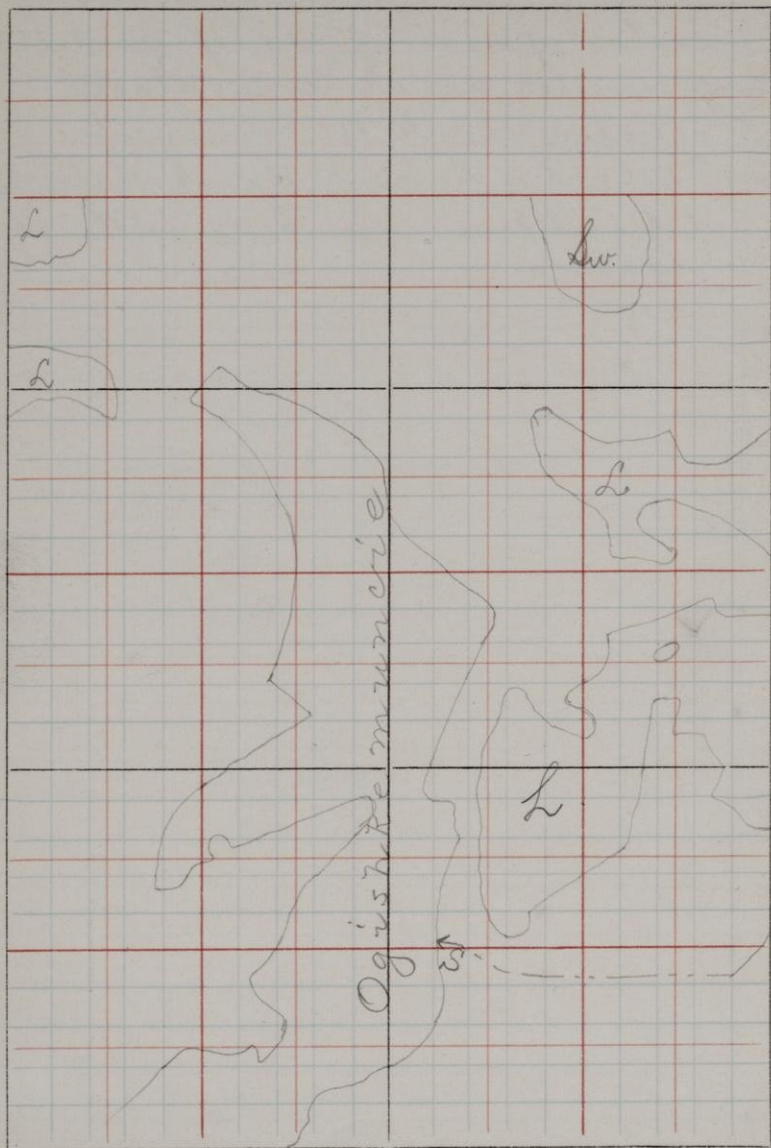
7067 Shows this rock which covers large areas from this on to Ogishkemuncie Lake

The bands are plainly marked again near to Ogishke Muncie and show a strike N. 30° W.

This area of banded quartzite seems possibly one of greatest pressure as at this place between the N.W. corner of T64-R.5 N. and the conglomerate of Ogishkemuncie the width is least.

Sec 1 T. 65

R. 67h.



Trip east from the north end
of Ogishkenuncie lake
Over the quartzite.

Starting in Sec 13. T65-R6W.
at S-map opposite - a burnt
country + windfall was crossed
for $\frac{1}{4}$ mile. Then following the N.
shore of a well defined lake
in a green moss covered country
for about $\frac{3}{4}$ miles.

Over,

The limestone group seen on the
east shore of Ogishkenuncie
answers in general appearance
to the limestone No. 5 of Logan's
section on the Huronian which
weathers a yellowish brown

Dec 19 T. 65

R. 5 st.

Trip East →

Quartzites - greenish

called Schists further East

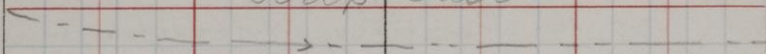
Some evidence of banding was seen in Sec 19 but the rock though much of it like 7066 in fracture was nowhere characterized by banded weathering.

The country throughout is rolling and presents many ledges and some high faces no trend could be made out and the hills being cut through in many directions but the deepest defiles and longest ridges strike as on Ozarkite nuncie N. E + S. W. This breaking up of the ridge formation and the making of many uneven cliffs and knobs is suggestive of the bending and twisting.

Sec 20 T. 65

R. 5th.

Trip East



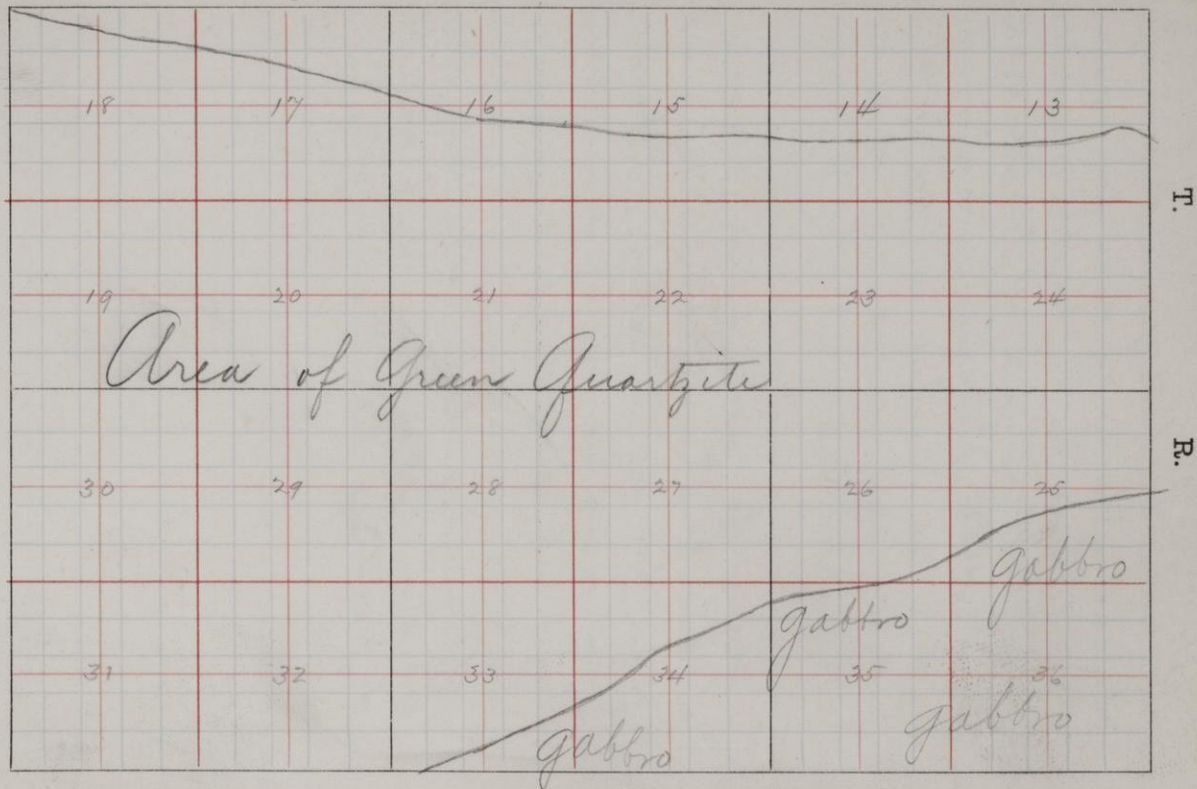
Quartzites Greenish

Probably the last point E. was in Sec 21. The way here for some hours was in a burnt wind fall and the dangers at length became such that progress was impossible a hill top reached in Sec 21. showed schist and no change of rock N.E. or E.

7068. shows the green schist crossed on this trip some varieties are less green but all are such as have been sampled many times during the past few days.

Many of these rocks have a schistose structure in place but a fracture like a quartzite.

T65 - R. 5 W.



We have thus covered over $\frac{1}{2}$ the town with observations enough to conclude as to the other half.

The map opposite is of T65R51N.

We know that beyond this that the following sections are in granite Sec. 1-2-3-4-5-10-11-12- and upper $\frac{1}{2}$ of 13-14 possibly 15.

When the map of the town can be seen further information ~~can~~ may be had.

It is worthy of note that no sign of the jasper layers of Gunflint and North lakes have been anywhere met with west of Gunflint lake. In fact nothing identical with the slates and quartzites of Gunflint and only faint suggestions of anything like the great greenstone flows have been seen in this region just covered.

Notes.

The quartzites and schists of T65 R. 5 W. pass north to Island lake in the N. W. portion of the town where they come against the granite or further N. & S. against the conglomeratic schist and the jasper conglomerate of Ogishkenuncie Lake.

In passing Eastward they go south of the middle of Sec 18. T64-4 W. and from that point to Gumflint Lake their northern limit runs somewhat S. of E.

The trend of the Gumflint beds is nearly E. & W. inclining S. W. & N. E.

The strike of the beds in Sec 20-64-4 W. is about the same only a few degrees S. of W. and N. of E.

No marked tendency toward a S. W. strike is seen until the region N. E. of Gobiigitchigamog is entered when the great hills to the N. E. & S. W. seen in line and on the E. shore of Ogishkenuncie the N. E. & S. W. strike is well marked especially by the slates and the calcareous group (18 & 3 N. B. * 1.)

There is then a probable cause
 for the irregular nature of the country
 in the N.W. part of T65-R5N.
 since the whole north margin
 of this schist formation is
 pressed against the granite
 and in this place changes its
 trend quite suddenly.

For continuation of this region
 toward the S.W. + Cacaguabic
 lake see

Book #2 1884.

(over)

Conclusion of Book #1.

Throughout the region gone over in this book those rocks called schists which are all greenish or grayish, fine grained, subcrystalline or granular, & distinctly crystalline seem to belong to one great group of rocks.

The samples from the extreme E. and the furthest west seen, are much the same in appearance and do not differ at all in external characteristics.

Full samples of the Huronian on Knife & Otter Track lakes were taken in 1883 and the note books of that year W.M.C. describe the country.

As regards the disappearance of the Gneiss beds more will be said in another Volume.

(over)

Glacial Scratches

In Sec 23 - T65 - R6N.

on the smooth conglomerate of the island in Ogishkemuncie lake the scratches are clearly defined and strike 10° - 15° N. of S. 10° - 15° E. of N. They are an inch wide in place

At Grand Marais on North shore of Lake Superior on Diabase porphyrite the scratches are very deep. $1\frac{1}{2}$ inches deep striking E. of N. 15° - 20°

The above observations were not made on the ground but from memory only. The directions are approximate only.



36

4

10

10

—————

40

360



49 a.m.

P.m.

4

