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Beaver Bay, Minnesota, part 2: [specimens 23075-23152]. No. 168 1891

[s.l.]: [s.n.], 1891

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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 x 2½ x ¼ inches will be allowed, but in all other cases *large-sized specimens*, trimmed to a size of 3 x 4 x 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.

168 (?)

Work began mon July 9 1894

Being alone and without the aid of a compassman I took the topographical notes first. - while doing so I located all important rock outcrops and visited them later for obtaining specimens and for study.

On the following pages are given field sketches on the left-hand page with descriptions on the right hand pages. Later Geological notes are given often being referred to the sketches in the first part

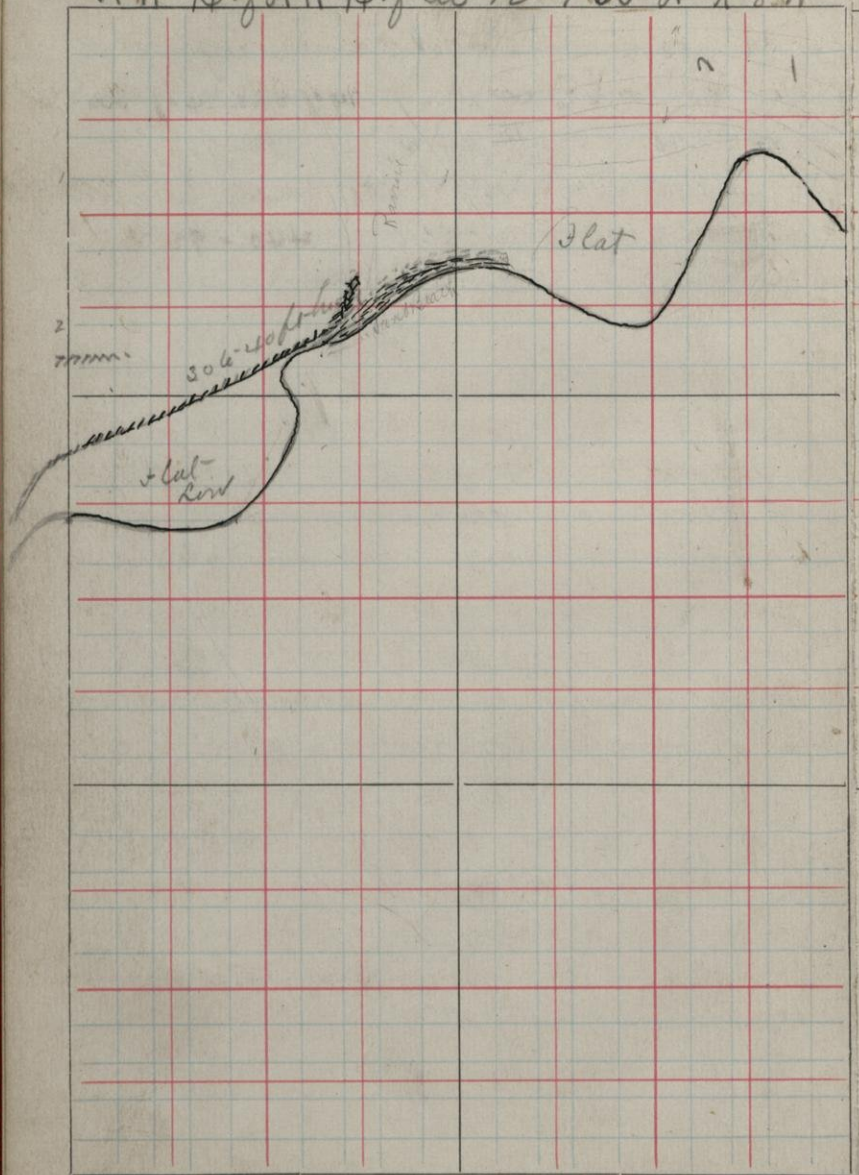
5

S.

T.

R.

$\text{N} \times \text{R} \frac{1}{4}$ of $\text{N} \times \text{R} \frac{1}{4}$ of Sec 12 T. 55 N R. 1 W
 2 1



Going west on south line of sec. 12

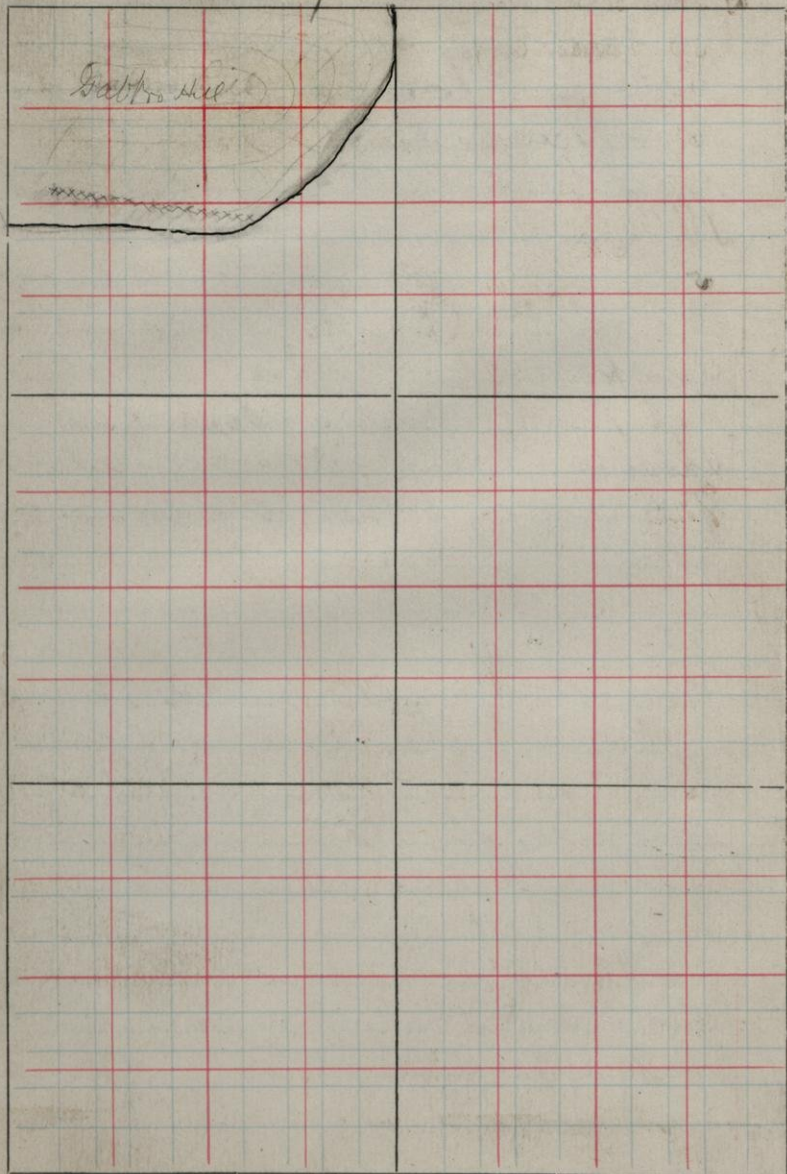
92 - elev 55 max, 194 elev 70 exposure
of Olivine gabbro 248 elev 70 S.E. cor
to S.W. $\frac{1}{4}$ of S.W. $\frac{1}{4}$ of sec 12

100 Elev 70 117 Elev 50 min. 150
Elev 75 max 210 elev 55 small brook
course S. 250 Elev 67 max 300 elev 63
400 elev 80 440 elev 92 max
475 ^{elev} 85 min 500 elev 98 Sec cor
to secs 12-13-11-14

South on west line of sec 13

100 elev 85 200 elev 63 218 elev 63
Ledge Olivine Gabbro with heavy
perfect jointing trend of ledge N75° E
320 shore of Lake Superior

7 S. NE 1/4 of T. N 1/4 of Sec 13 R. 55 R. 8 N



South in sec 13 on line from point on N side
250 paces E from N.W. cor
E lev 62 51 elev 43 100 elev 24
167 Beach (small gravel beach line)

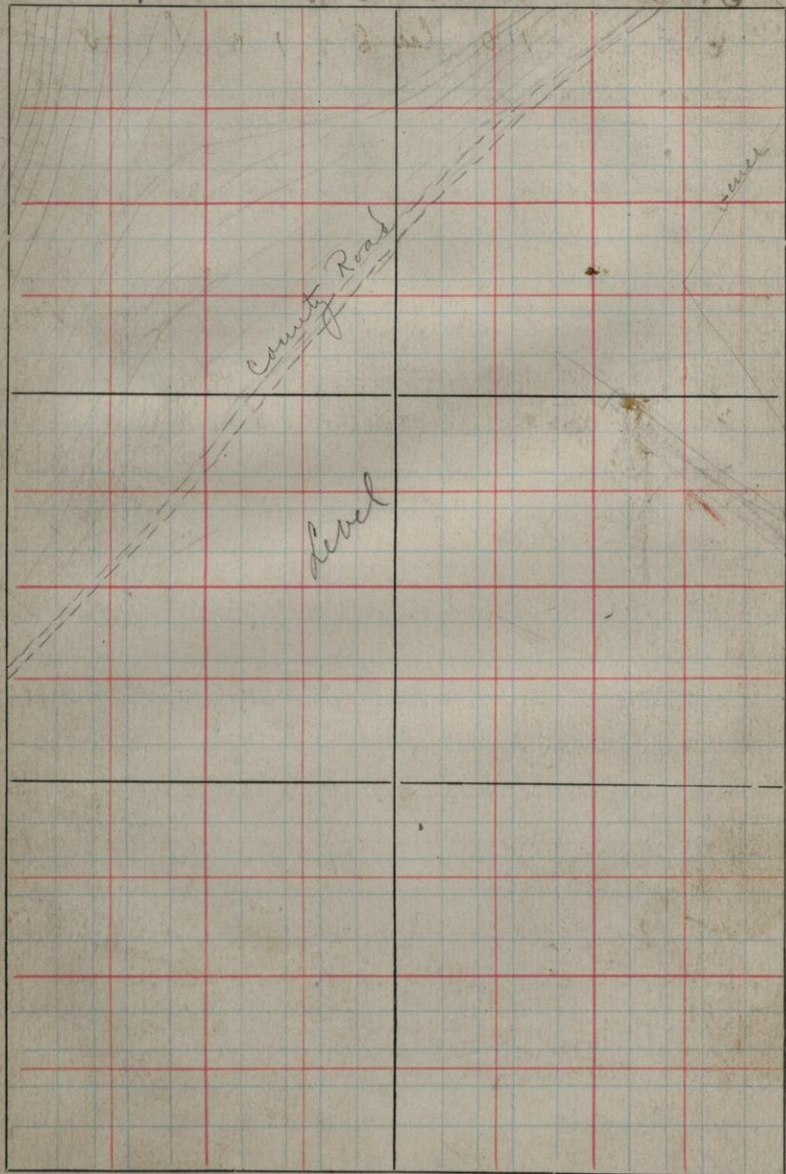
South from S.E. cor of S.W. $\frac{1}{4}$ of N $\frac{1}{4}$ quarter
50 elev 45, 75 elev 30 138 shore
Heavy black olivine gabbro. Shows
stripping areas of dealluga (luster mottling)
on weathered surface

Meander of Chare from meander cor
on N line of sec. 13 — E 100, N 20° E
126 N 64° E 110 gravel beach, at 85
intersects 250 pace line; S 60° E 80; E. 30
N 30° E 134; S 20° E 67 to 500 pace line
E 144; N 60° E 20 N 30° E 100 N 30
to Meander cor of N line of sec. 13

This entire shore is heavy gabbro
with the exception of the small
gravel beaches noted. The gabbro
rises abruptly from the water edge
and forms bold bluffs from 10 to 30 ft
high.

SP

S. N 1/4 of 3 Tr 14 of R 12 E. 55 N R 8 N



North on E line of S.W. $\frac{1}{4}$ of S.W. $\frac{1}{4}$ of sec 12
 Elev 70 100 Elev 82 170 Elev 65 ravine
 225 Elev 95 Edge of clearing level field
 no exposures of rock.

west on North line of above named $\frac{1}{4}$ sec
 Elev. 93 Elev 112 County road bears 85°
 W 170 Elev 155 300 Elev 184 400 Elev
 170 484 Elev 190 573 Elev 204 588
 S line on west side of sec 12
 Continuing west 600 Elev 259 Top
 of ridge no overcrop.

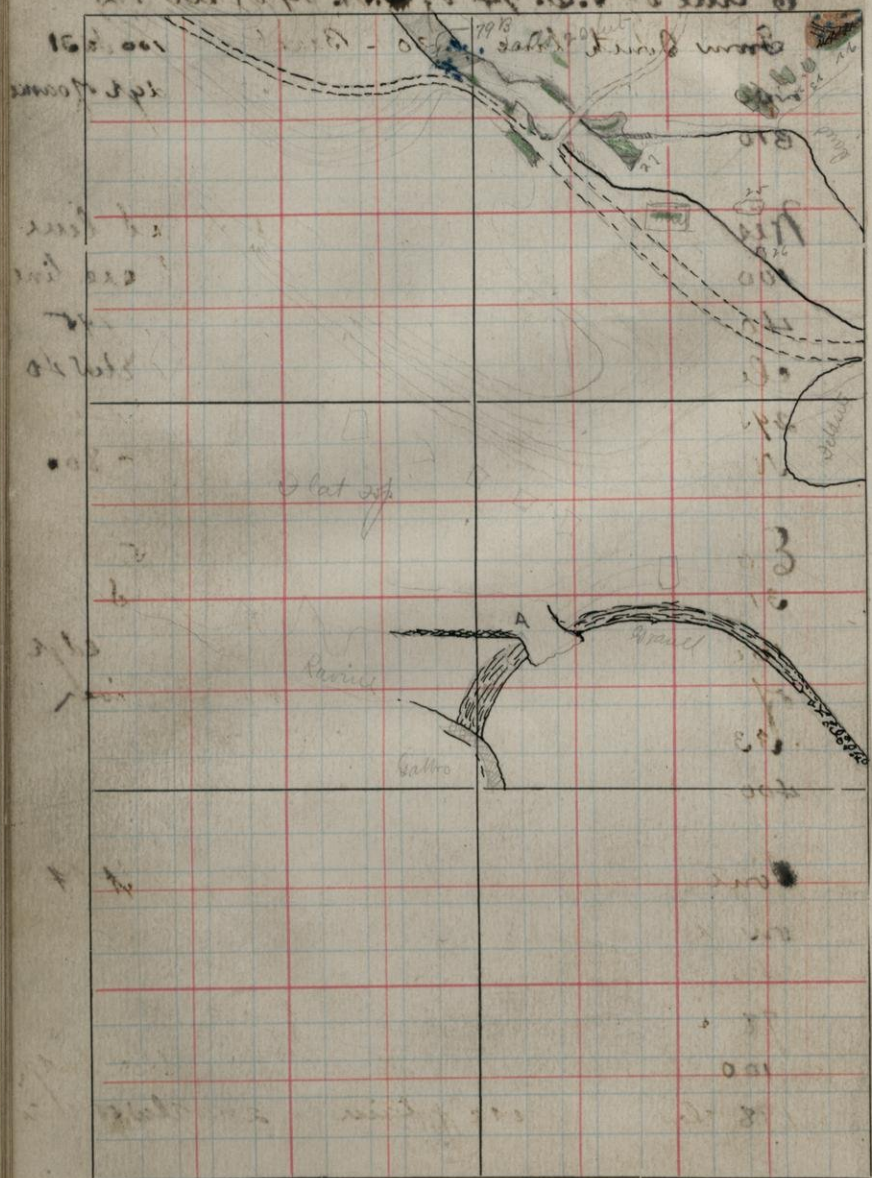
South on N line of above

60 Elev 185 200 Elev 151 400 Elev
 120 County road course $S 35^\circ W$
 485 Elev 90 Bed of creek now dry 490 section
 Elev 98. N 75 Elev 120 County road

East on line 200 paces N from N.W. corner
 12 50 Elev 120 100 Elev 87 150
 County road 200 Elev 92 300 Elev
 87 519 N & S line at 234 from
 south sec. line Elev 92

791

S. 3 1/2 miles N. of T. 28 R. 28
 S. 1 1/2 miles W. of T. 28 R. 28



E line of I.E. 1/4 of S.W. 1/4 of sec 12;
 From South line 20 - Beach 100 to 31
 200 elev 50 Edge of Felsite, 275 N edge of same
 310 River

Rest from a point on last named line
 100 paces north from south sec line
 40-foot of decline - 75 Beach, 195
 cliff 20 ft vertically up 220 elev 40
 295 Elev 17 Bottom of Ravine 340 elev 44
 North 100 from 350 ft point elev = 80.

East from N corner. Elev 105
 31 elev 18 ravine 87 elev 84 road
 100 elev 90 166 elev 55 200 edge
 of Beaver River 238 E bank of River
 337 elev 58 325 opposite bridge
 400 elev 35

South on a line from the 300 ft Pt
 on the last named line
 42 bank of River 50 elev 08
 78 S bank of River at Bridge
 100 elev 40 middle of road opposite bridge
 178 elev 80 mesa plain 260 elev 55 ravine

Tuesday July 17

13

25

T

R

Fans Bar

□ n

G. ramboldi

Sloping S.V.

5

6—747

12.
N. 1/4 of E 1/4 Sec 12 T55 N R 8 E
East on the center line of the 1/4, 1/4 sec
Elev at post 55 24 elev 43 55 elev 58
South 10 paces from last mark 64 ft. 210 elev
41 edge of Silite outcrop 235 elev 18
Foot of "Granite" Bluff 300 elev 78
337 elev 80 386 elev 68 420 elev 40
edge of Shur cliff to water

South on line from the 100 ft pt on above
elev 32 100 elev 38 138 edge of
Gabbro 150 elev 61 164 face of outcrop
192 elev 30 - Beach

South from 200 ft pt on first named line
50 elev 45, 40 paces East to granite bluff
154 elev 35 Shur cliff to water
East from 100 ft pt on last line elev 20
108 elev 15 Edge of Anorthosite Boulder

N from 200 ft point on first named line
12 Road 50 Beach
S from 300 ft pt elev 78 - 38 elev 84 cliff
S from 400 " " 66 elev 90 cliff
max on 350 ft pt elev 91

Ned July 18 1894.

16

East line of N.E. 1/4 of D.N. 14 Sec 12 T55N R8W
N from D.E. cor 100 elev 14 Leave shore
195 elev 28 top of spur 205 elev 18 ravine
226 elev 39 north edge of ravine 300 elev 72 max
310 Road from old farm 400 elev 110, 475 elev
120 cor of 1/4 1/4 sec

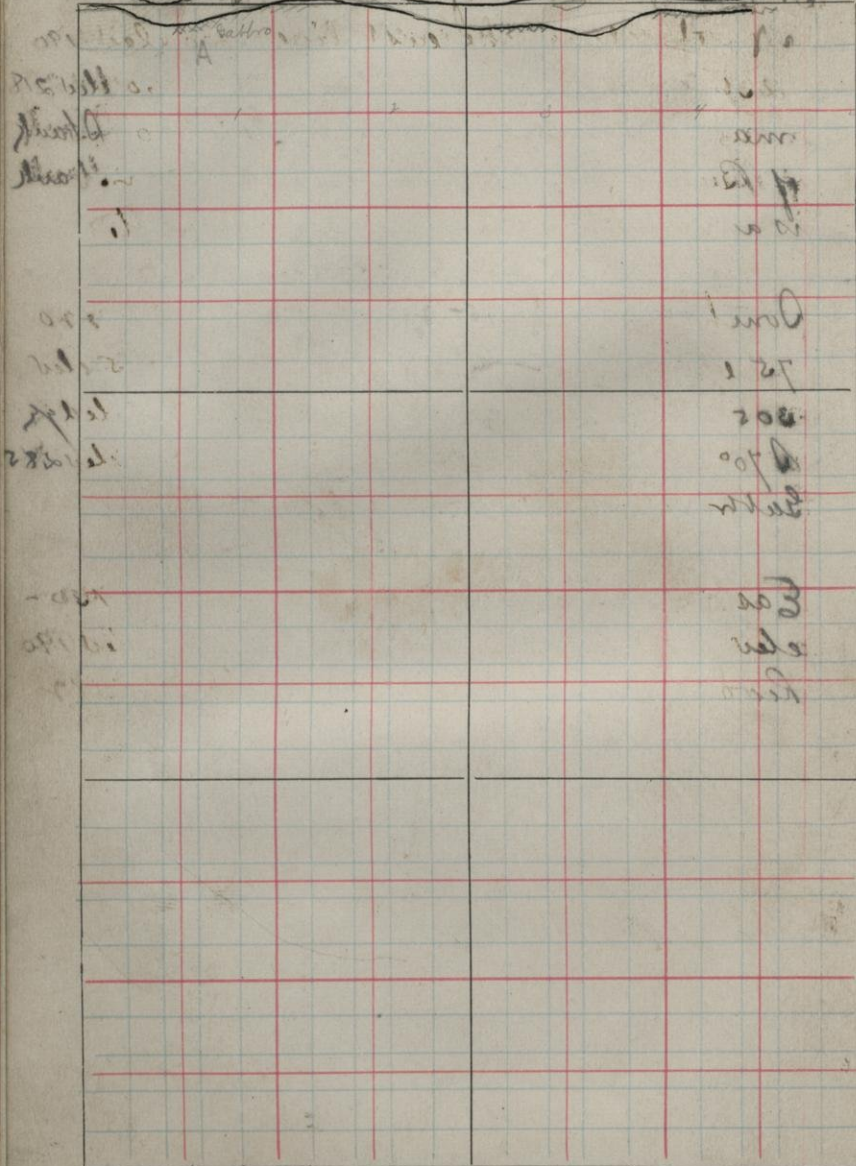
Nest on north line of above 1/4 1/4 sec
100 elev 158 max Gabbro exposure 10 paces south
128 Gabbro exposure 185 elev 185 max 200
elev 178 numerous exposures of gabbro 308 elev
153 County Road 340 steep decline to river
395 elev 85 E Bk of River 426 N Bk of Riv
568 N + S line 48 paces S of cor. elev 235

Nest on lower 125 paces from D.E. cor elev 10 72
elev 53 road. 100 elev 65 155 elev 95 200 elev 100
300 elev 100 old road to farm 375 elev 63 E Bk of Riv
462 elev 81 N Bk of River 493 elev 85 N + S line 140
paces S of cor.

East from pt 250 paces N of Cur on N line elev 120
100 elev 93 115 E bank of Riv 135-128 clay bank
150 road 200 elev 128 300 elev 142 400
elev 110 490 road 524 N + S line 5 paces S of 250 post

Now 375 paces line elev 95 100 elev 135 Gabbro exp.
200 elev 130 300 elev 137 342 elev 145 road
368 top of Riv Bk 410 elev 105 E Bk of Riv 576 N + S line
20 paces S of N 375 paces stake elev 160

S. 1/4 of T. 4 N. 46 E. R. 28 M. 15 A.



S.W. $\frac{1}{4}$ of N.W. $\frac{1}{4}$ of Sec 12 T55 N R8 W
 North along the east line. 100 elev 190
 236 elev 178 400 elev 202 460 elev 218
 max. gabbro exposure. 495 elev. 220 S. bank
 of Beaver River 500 elev 82 bed of river. bank
 is a vertical wall. Falls about 30 ft.

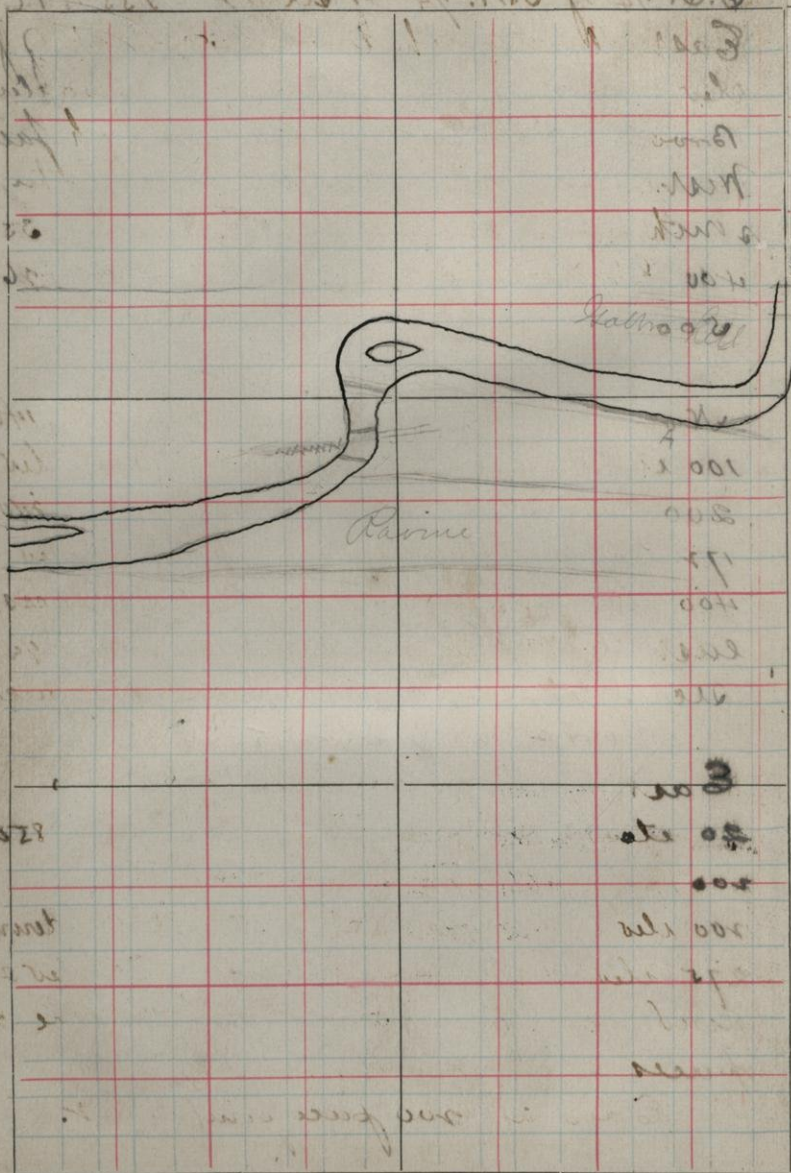
South on west line of above. elev 220
 75 elev 265 128 elev 280 175 elev
 305 ledge of gabbro 18 ft up. Crest of ledge
 N 70° W 200 elev 320 max 300 elev 285
 gabbro outcrops 500 elev 262.

East on north line elev 220 130 -
 elev 215 200 elev 208 400 elev 190
 head of Falls 425 N 40 line elev 182

S.

T.

R.



Scale
20 ft

S.E. $\frac{1}{4}$ of N.W. $\frac{1}{4}$ of Sec 12 T55 N R8 W
 East along north line 50-foot of falls
 elev 170 75 bank of river 100 elev 200
 Brook 122 gabbro ledge 10 ft high facing
 West. Found N.W. 160 elev 235 max. higher to
 southward 300 elev 208 310 road 350 to
 400 Gabbro exposures 400 elev 195 426 road
 500 elev 175.

North along east line of above elev 140
 100 elev 154. max about 50 paces West elev 180
 200 elev 130 222 foot of hill 290 elev
 172 max gabbro exposures 300 elev 170
 400 elev 168 484 E & N line 67 paces
 east of our fence west line of $\frac{1}{4}$ Sec
 is too far west by about 75 paces

East on 450 pace line elev 290
 20 elev 65 Reverse elevation 170 85 elev
 200 178 gabbro ledge 10 ft down
 200 elev 212 235 gabbro ledge 20 ft down
 275 elev 176 bottom of Ravine 327 elev 212
 Road 400 elev 215 560 N & S line 225
 paces N of corner
 Elev at 200 pace point 192.

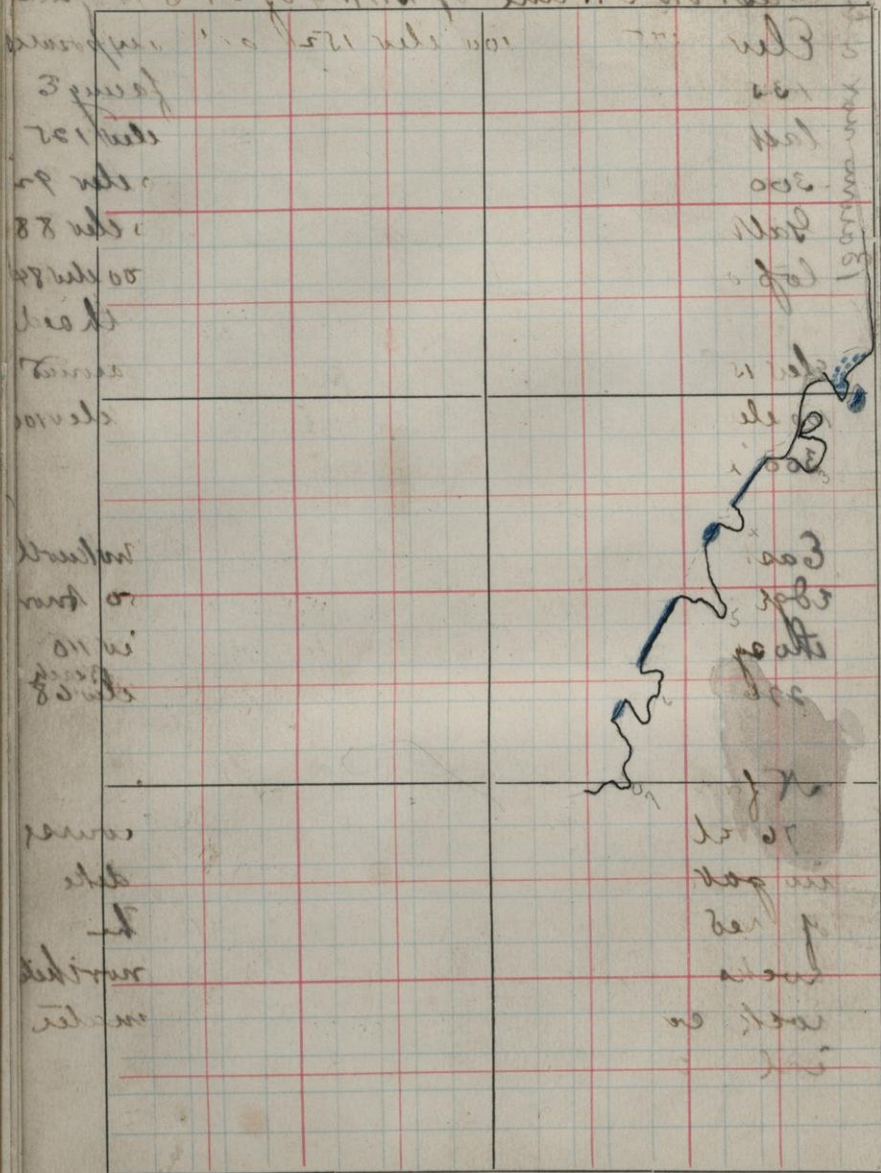
73

XII

S.

T.

R.



Reduce distances by
75 paces

Barn not reliable

22

East on N. line of N. N. $\frac{1}{4}$ of NE $\frac{1}{4}$ of sec
Elev 175 100 elev 152 gabbro exposure
135 Va 12° N 170 ledge 10 ft facing E
last of Gabbro exposure here 200 elev 125
300 elev 110 312 road 400 elev 92
Gabbro ridge 30 paces north 480 elev 88
top of gabbro ridge trend 30° E 500 elev 84
East on line 125 paces from south side
elev 155, 62 elev 135 Gabbro exposures all around
100 elev 105 151 elev 110 186 road 700 elev 100
300 elev 64 384 elev 40 Beach

East on 200 pace line Elev 150 gabbro north
edge of gabbro ledge 75 paces east 50 know
the right ledge 100 elev 130 200 elev 110
226 "corner" road 300 elev 90 400 elev ^{Beach} 68

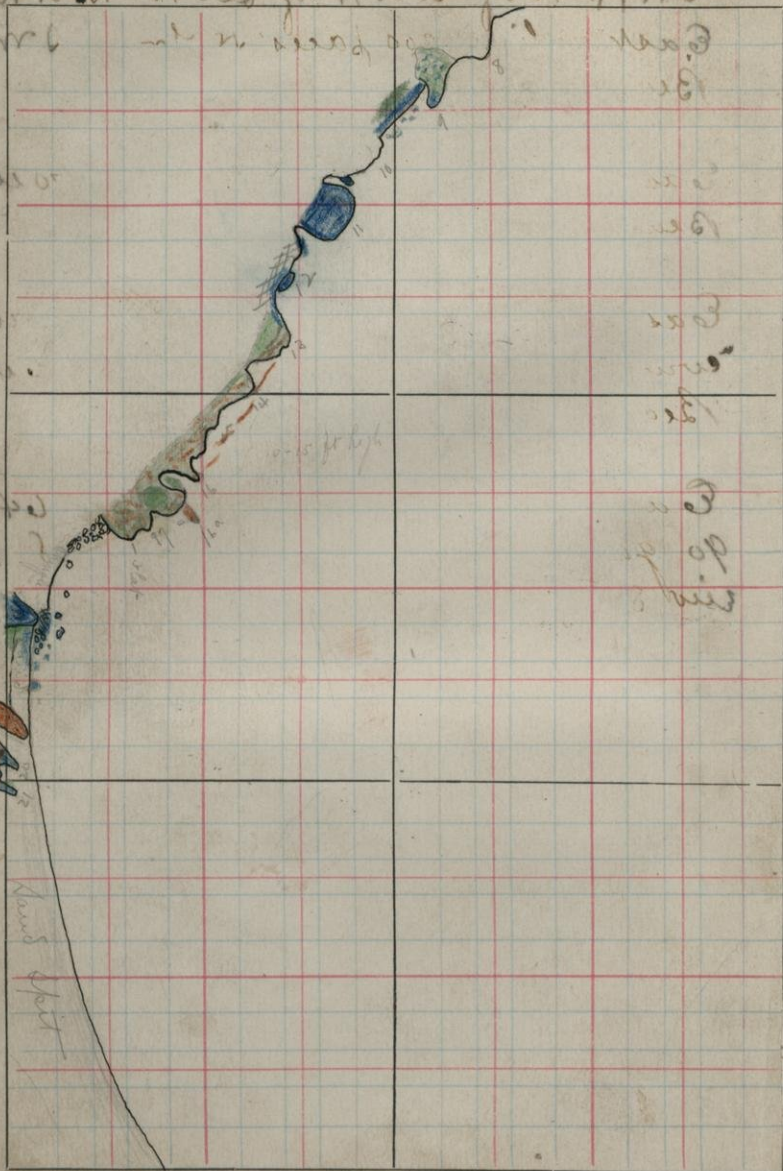
N from 400 pace point on last line
76 elev 42 bottom of dry water course
in gabbro. Gorge is faced on south by dike
of red rock seeming to cut all other
rocks 100 elev 66 150 elev 86 know the
rock containing considerable red material
200 elev 100

28 XIII

S.

T.

R.



26

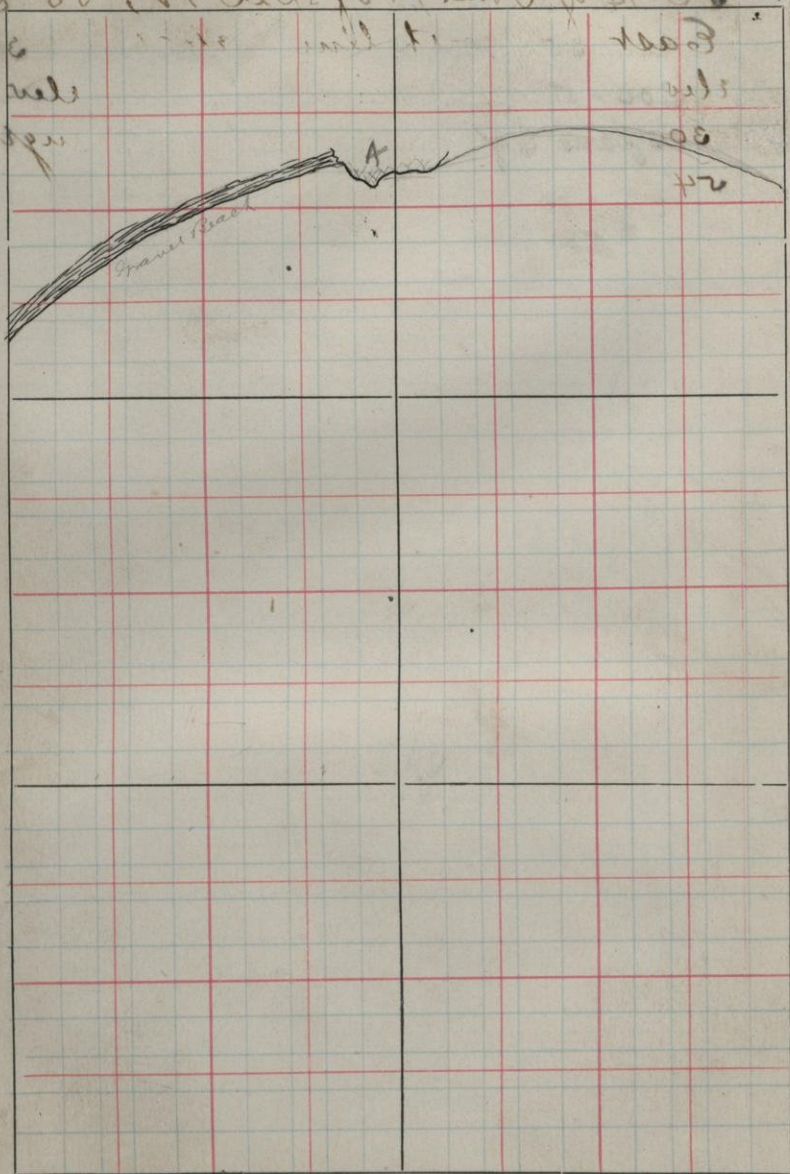
N.W. $\frac{1}{4}$ of S.E. $\frac{1}{4}$ of Sec 12 T55 N R8 W
East on line 200 paces N from S.W. corner
Beach along line elev 74

East on 300 paces line elev 55 170 elev 14
Beach

East on 400 paces line elev 94 40 elev 67
"county" road 100 elev 50 216 elev 30
Beach

East on north line of above 64 elev
90 700 elev 110 90 county road 100
elev 80 200 elev 55 320 elev 15 Beach

27
 S. 22, T. 22, R. 34
 22
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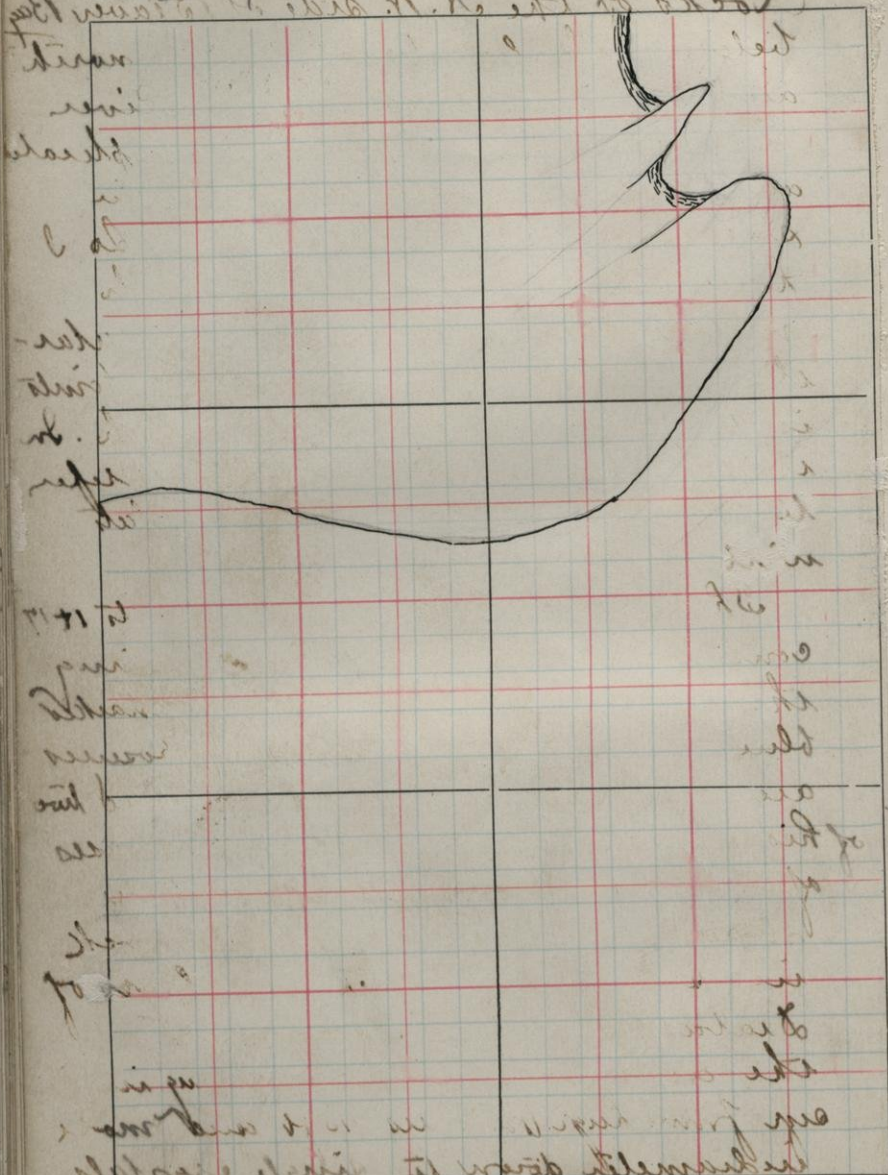
NE $\frac{1}{4}$ of N.E. $\frac{1}{4}$ of Sec 12, 55-8
 East on north line 265 35
 265 water course S.E. 100 elev 35
 300 elev 51 524 540 or Range line
 54 paces South of $\frac{1}{4}$ Sec cor.

29

S. E. 1/4 Sec.

T

R.



Rocks of the N.W. side of Beaver Bay
between the long beach on the north
and the mouth of Beaver River.

The exposure is extremely complicated
and can not well be described in
succession from either end so I
have made the sketches with
much care as to minor irregular-
ities and have numbered the points
in succession from the north. In
the following description I will refer
to them by their numbers. Plate
will be found on pp 23 & 25.

The exposures between the points 1 & 17
consist of Anorthite rock forming
the backs of the coves. These are marked
blue in the plate. These exposures
are described by Prof. Lawson and two
of his cuts were taken here. The bases
of or backs of the coves seem to be
made up of the anorthite rock
in situ, over this is a layer of
Diatase containing fragments of
the anorthite rock, varying in
size from large boulders 10 ft and more
in diameter down to single crystals
and minute patches. In places

the rock enclosing the pure white boulders seems merely a greener phase of the anorthitic rock. This is always more altered and resembles the banded phase cited by Prof. Lawson near the "Shingle Cove". Prof. Lawson ascribes the greenish tint to the presence of minute augites or pyroxenes. Points 18-20-21 are composed of hornblende rock that shows a very marked horizontal jointing, also sets of vertical jointing nearly at right angles. These joints make point 21 resemble a dyke. In point 18 the vertical jointing is not regular and does not pass the horizontal joints unconsciously. Along the vertical joints desulfuration has truncated the edges and corners to give the appearance of ball and socket columnar structure. The color is a dirty greenish gray.

Point 18 is flanked on the south side by a medium grained diabase which is different from anything observed anywhere except in connection with the rock exposures. It flanks the point

which has vertical sides about ten ft high. Around this is a low flat surface exposure of the diabase containing boulders of snowwhite rock varying in diameter from 1 in to 5 ft. Especially here does the weathered surface present a perfectly green surface.

23075 From the freshest part of point 18

23076 Same more altered

23077 Snowwhite rock from boulder imbedded in diabase in front of pt 18

23078 Freshest of the diabase

23079 Altered diabase

Diabase and snowwhite rock alike is cut by a dyke of reddish granular rock. The thickness of the dyke varies from mere threads to 3 ins. Near the dyke the snowwhite rock shows a net work of bright red inclusions.

Points 20 & 21 may be big blocks of the snowwhite rock yet they have much the appearance of being in place. pt 21 especially shows the marked jointing already described. The snowwhite rock is in associated and in contact with some of the green grey diabase as at point 18 already described.

a red porphyritic rock and the whole cut by dikes of a dense aphanitic brownish grey diabase. The red porphyritic rock seems to be made of a phase of the Quartz porphyry of which pt 19 is composed. Same will be described later.

23080 Contact between Anorthite rock and diabase from pt 21

23082 Phases of Anorthite rock from pts 2 taken from boulders in bedded in diabase as follows -

23083 Diabase from pt 1

23084 Altered form of last from pt 2

23085 Similar to above from ~~pts~~ core between pts 5 & 6. Here as usual so closely associated that a specimen across the contact between anorthite and diabase can readily be drummed.

23086 Anorthite rock from core between pts 9-10. Same shows much red coloring along weathered surfaces.

23087 Diabase here associated with Basal Anorthite rock - core between pts 9-10

Of all the exposures observed thus far this has the most decided appearance.

here carrying boulders of a red granular rock and much cut by thin dykes of a similar red granitic rock. In places as D in sketch fine diabase is found without inclusions and in such places it assumes a very marked vertical jointing bearing almost parallel to the shore line.

In places the diabase has an open porous structure resembling amygdaloid. But same can not be traced so as to form distinct bedding. A sort of jointing exists which imparts an appearance of bedding but the joints seem to cross rather than separate similar zones. Between the zones containing aurochite rock and ~~that~~ certainly red rock no structural difference whatever can be detected. Similar relations to those here described exist in every case where aurochite is found.

23088 Coarse Black rock from "B" in sketch. The red rock may be

due to a single intrusion and the boulder like appearance in part is by a second intrusion of diabase. The difference of the red rock may be due to the varying thicknesses and the effect of the second diabase which generally flanks the exceedingly irregular veins and dikes of red rock in places cutting the same and giving the appearance of Boulders. The rock at D in the sketch in all respects resembles that at B except that it is very fine in grain and has a very marked vertical jointing.

- 23089 Specimen of rock at D in sketch
23090 From cone between Pts 13-14 near this and grading into it is the fine grained like 23089. The fine grained predominates on this Pt. and in the cone, it here has a very marked vertical jointing and is cut by dikes of red rock but there are few and regular in width and direction.

S.

T.

R.

Sketch pp 67

The ends of points 13 & 14 are made up of the most confusing mass of red rock, green much altered diabase Aphantitic diabase in small dikes and diabase like 23090. The green much altered variety seems to be like 23089.

The dykes of ^{red rock} ~~diabase~~ here broaden out into neck like masses 4 to 6 feet in diameter, and dykes from 12 to 18 inches in thickness can be seen under water reaching from point to point.

23091 Is a fine grained diabase amygduloid which caps the N.E. tip of point 14. Only about 10 sq ft of this rock is here left exposed and from its position it is not at all clear what it may represent.

23092 Quartz Porphyry from dike in diabase of point 14.

23093 A different phase of last taken from a boulder like inclusion a few feet from 23093.

23094 Similar to above from an undoubted dyke in pt 15.

S.

T.

R.

OK pp 67

23095-23096 Red rock similar to above from edge of a mass about 4 x 6 ft exposed near pt 16.

23097 Very fine diabase from pt 15 has in structure the appearance 23089 & 23090 but is here much cut by red rock hence probably the fine grain

23098 Diabase from pt A in sketch on opp page

23099 Quartz Porphyry from fragment of B, this is clearly quartz porphyry. The east face which is flat and vertical about ten ft high presents the appearance of a volcanic breccia in which the intrusive material is a fine grained diabase. On the N.E. face very little of the diabasic material appears. On the west side is a solid mass of diabase ^{containing rounded boulders of red rock} and these grad into each other by imperceptible changes. This point is very interesting. The quartz porphyry is probably a part of the same as the larger mass farther south on point 19 and at first sight appears intruded by diabase. as the diabase

appears in wedge shaped areas between the angular fragments of the red rock. Undoubted dykes of the diabase can be seen in the red rock at the same time equally marked inclusions of diabase occur in the red rock. Some of the small dykes of the red rock in the diabase markedly present an appearance very different from the large masses. All of the rock except the dykes of red rock in the diabase are much jointed and cracked and trimmed specimens are hard to obtain.

In some places the contacts between diabase and red rock appear with knife edge precision while at others the quartz porphyry grades over into diabase as though the diabase had been melted and fused with the porphyry magma in varying amounts. This intermediate rock weathers more readily and on the surface shows a green color while on fresh surfaces it appears more like the porphyry. In weathering it leaves the porphyry in rounded boulders.

like forms

- 23100 Boulder like mass about 10 ins in diam from the west side of I in sketch on preceding page
- 23101 Fragment showing inclusions of red rock. Such are rare. This one was taken from a boulder like mass about 2 ft in diameter in the neck connecting the point I with the mainland.
- 23102 Coarser diabase from A with veins of fine diabase zig zagging through it. Such are seen to a depth of about 3 ft on the east side of mass A
- 23103 Fine grained diabase having appearance somewhat of an amygduloid from the mass B. In the sketch (E) is the same except that it is more massive. The whole baylet about B in sketch is the same rock which here has a marked vertical jointing splitting it into slabs from 2 to 6 inches thick. The trend of the jointing corresponds in general with that of A. No red rock is here mingled with the diabase either as dykes or inclusions. All around it

however as indicated in the sketch
is the mass of mixed rock
in dikes and inclusions with diabase
Here the fine grained diabase does
not show the amygduloidal appear-
ance that it does in the mass B. It has
however everywhere the appearance
of being intrusive. While the
coarser diabase seems rather
more block like or fragmental
North of this mass the confusion
begins description. Point 15 is
possibly the worst and here are found
in addition to the rest inclusions
of a white rock. I find difficulty
in understanding
the relation of the diabases to
each other. At times they seem
to be all of the same kind and
present merely finer and coarser
phases. Yet if this be so it is
hard to see why such sharp contacts
should exist between the fine and
the coarse kinds.

93604 Presents a contact between fine and
coarse diabase from pt 15. The
fine variety forms a shell around a mass

of the coarse about one foot in diameter.

Many dikes of red rock can be seen in the water near pt 15

- 23105 From fragments or boulder like inclusions in diabase under pt 19. The inside of these boulders are little altered Quartz porphyry. These specimens were taken from outer edge

- 23106 Fragments of the diabase under point 19. Same is so much jointed that full sized trimmed specimen could not be obtained

- 23107 From main mass of porphyry of pt 19 at contact with diabase

- 23108 From main mass of Porphyry near center

Point 19 is composed of Pink weathering quartz porphyry and is described as being so much jointed that trimmed hand specimens could not be procured. It shows no indications of flow in the way of laminations that I can see. The walls of the block are sheer and rise to a height of 20 ft. On the

South and east sides the porphyry extends into the sand of the beach. But on the north side there is exposed near the beach about a foot of diabase. On removing the drift to a depth of 3 or 4 ft it is found that the diabase is much less dense than at the contact where it is aplastic. However to a distance of 5 ft from the contact it remains a very fine grained diabase. This diabase contains numerous boulder like inclusions of the Porphyry and at a distance of about 3 ft from the contact there was found an inclusion of aorthitic rock. The diabase is affected by 2 sets of very marked joints one parallel and the other at angles to the plane of contact.

The contact is sharp and straight dipping about 45° from the vertical in the direction $N 40^{\circ} E$ no inclusions of diabase in red rock appear unless the inclusions in the boulders be regarded as such.

As will be seen by other specimens

from near the contact the Quartz
porphyry seems to have been
much affected by the intrusion
of the diabase. Next to the contacts
the quartz porphyry presents
an appearance very similar to
the red rock of the small dikes
north east of here. The diabase
of the mass shows the peculiar
weathering in which rounded
ball like inclusions of apparently
unaltered rock are surrounded by
a mass of unaltered material
of about the same degree of decomposi-
tion throughout and separated from
the unaltered part by rather sharp
lines of demarcation.

Points 20 and 21 are another
rock cut by red rock similar to
that of point 19. Though it is not
so much jointed and weathers to
a red surface. While no so much
jointed as pt 19 it is even here
very difficult to get a good hand
specimen. On the north side
of point 21 there appears in con-
nection with the red rock a gray

medium grained diabase already described under 23080

23109 Is a contact or inter mingled mass of this diabase and red rock from point 21

23110 Red-rock from west side of pt 20. Only a very small bit of this rock was sent in the anorthosyte. In general the exposure has more the appearance of large masses of the anorthosyte imbedded in the red-rock. Point 22 pt 11 is made up of large anorthosyte boulders in a mass of red porphyry similar to that of point 19. The difference between this porphyry and that of point 19 is probably due to the presence here of that anorthosyte. It should have been noted that point 19 is entirely without inclusions or cutting dikes. Here on pt 21 the porphyry has the appearance of having flowed in a thick pasty condition.

23111 Quartz porphyry described above, from point 22. On the south side point 22 is

flanked by diabase of a medium to fine grain regularly jointed into courses of about 1 foot on an edge

23112 Diabase described above from the south side of point 22 Exposures 23 and the east side of 24 are the same medium grained diabase as on 22 but the west side of 24 is finer in grain, very irregularly jointed and fractured and shows traces of red rock similar to a band in point 16

23113 Peculiar band making up western part of point 24

Point 25 is made up of the exceedingly dense fine grained, conchoidally fracturing diabase mixed up with red material exactly like point 16. On the east edge is a ledge of porphyry

Thin med specimens can be prepared only from the more compact portions

23114 Fine grained diabase from pt 24 Most of this point is made up of much more fine grained and more fractured material

23115 From red rock dike in point 24

Point 25 in the river consists of diabase of two kinds. On the north west side near the water's edge and rising to a height of 20 or 3 ft is a medium to fine grained homogeneous conchordally fracturing regularly jointed grey diabase. Vertical jointing is very marked and trends somewhat south of south west. Over this comes what appears to be fragments of this lower diabase imbedded in a somewhat different diabase. Part of this exposure has been blasted away so that comparatively fresh specimens of the latter rock could be procured. This presents merely a mottling of slightly pinkish grey and light green colors. The weathered surface however presents the appearance of inclusions with dark or red surfaces while between them is a light grey material presenting streaks which wind about the inclusions, exhibiting vividly the flow structure described by Dickie.

While the lower rock weathers evenly and smoothly the upper presents that exceedingly irregularly fractured hummocky appearance seen on plates 15-16.

The upper part of the lower diabase has an amygdaloidal appearance the amygdules being drawn out, and arranged in more or less parallel positions. At the depth of one foot they are from $\frac{1}{4}$ to $\frac{3}{8}$ ins in length but they decrease in size and increase in numbers very decidedly as the contact is approached. These may be Pimpelly's Pseud amygdules since they seem rather to be due to exhalative action than surface flow. They appear most marked in the inclusions of the upper rock in the lower.

23116 From lower part of lower diabase

23117 Same near contact with inclusive ^{pt 25} dike

23118 Upper rock fairly fresh

23119 Fragment of upper rock showing weathering. The dip and the strike of the contact could not be clearly made

out. The dip however was in the
neighborhood of 45° in a direction
about $S 30^\circ E$.

Point 26 consists of a very much
weathered diabase. The exposure is
isolated and no structural relations
can be discerned. Much of

23120 Much altered diabase from 26
showing peculiar alteration

23121 Freshest procurable specimen
from point 26.

Beaver River section

The rocks here are much varied and
are hard to describe. The sketch on
the opposite page represents the south
wall of the river east of the bridge.
The rock at A is medium grained
and massive, in color intensely
black. In places however it is
mottled with flesh colored feldspar.
I think this is Irving's ortho-class gabbro.
The mottled and the black rock look
quite different but are so closely
associated that they must be vari-
eties of the same rock.

23122 From A in sketch at point marked

(1) Black gabbro

23123 From point in sketch marked 2 (Mottled)
Mottling here is not nearly as coarse
as usual

23124 From contact between A & B

23125 Fine grained diabase from B

23126 Diabase from C

23127 Dike rock D

The diabase at B is fine grained
conchoidally fracturing and mass-
ive & homogeneous. Unfortunately
the contact between it and the
diabase of C. can not be observed
From the relations between A & B
it is impossible to say which is the
older and which is intruded into
the other. Possibly microscopic
examination of the contact may
throw some light on this matter.
C is that same peculiar "curly" diabase
as at points 25 and 16. Here however
it seems to be impregnated with
dike rock. The dikes are very irreg-
ular and are composed of seemingly
of the same material as A. Their
connection with A can however not be traced.

E is a coarse diabase or fine grain
ed gabbro which is exposed under the
mill. It is massive and has cross
columnar structure. The blocks
are two to three feet on an edge.
It is the same as that on the south
side of the road opposite the bridge.
The trend of the major joints is very
nearly south.

23128 Gabbro from under mill

23129 Gabbro " south of road opposite bridge.
Here as under the mill this rock
is jointed into blocks of 3 to 4 feet
on an edge. One set of joints trend
 $030^{\circ}E$ in both places.

East of this exposure is an exposure
of the "curly" diabase, this is low
and flat to be seen in the gutter
of the road. It is in every respect
like that of C in the River east
of the bridge and from its loca-
tion it is probably connected with
the latter.

East of the bridge on the north
side of the river we find conditions
as sketched in sketch IV on the
next page. The diabase marked B.

is not as "curly" as that of pt 27
It approaches very nearly that of sketch
III at B. From relations here it is
impossible to determine the relations
here of the fine and coarse diabase
to each other. What I have here
called coarse diabase is I think
Prof Inwings orthoclase gabbro.
Point 27 of the flat is the same
curly diabase as C of sketch III
and being here low and flat the
dike of coarse diabase is seen in
horizontal exposure.

23/30 Dike in point 27.

23/31 C of sketch IV

23/32 B " " "

23/33 Contact of B & C of sketch IV

The coarse diabase of A & C on
sketch V is seemingly the same
as on top of hill near road opposite
bridge, also found in the south
wall of the gorge. Here it is not
where seen to reach the water's edge. It
rests upon a very irregular surface of
coarse gabbro and it is massive
coarsely jointed and nowhere shows
distinctive flow or dike features.

At C it carries over the ~~ry~~ to
Boulders. The fine grained diabase
cuts and veins the coarser rock in
all directions

23134 Gabbro from E under bridge

23135 Gabbro from middle of river about 30
feet west of bridge

23136 Coarser phase of B

23137 Diabase from C of plat V

23138 B of V at point marked 1. Fine gabbro

23139 Contact of last with fine grained diabase
point 1.

23140 Coarse diabase from A of V

While from field relations here ex-
hibited it is impossible to tell the
order of these rocks and their relation
to one another, the most plausible
order is that the Heavy basal Gabbro
is one of the usual flows. That
what I have supposed to be ortho-
clase gabbro viz B of sketch V is
intrusive and is the same as the
dikes east ⁱⁿ of the river and that the
fine grained "curly" diabase may be
intrusive or may be bedded as
a surface flow over the gabbro
flow. The coarse diabase C

while its relations are complicated has not much the appearance of a dike. Its complication is explained if B & D are intrusive and intersected.

- 23141 From A on opposite page
- 23142 From B indicated in sketch
- 23143 " B " " " " " Orth gottro
- 23144 " C " " " " " "
- 23145 " D " " " " " " (Dammgottro)
- 23146 Fine grained diabase marked on sketch
- 23147 From E on sketch same as 23143
- 23148 From what may be a dike yet not distinct by so
- 23149 From 3 ft west of above as indicated in sketch seems to be part of a flow
- 23150 From contact
- 23151 From H. as indicated in sketch

it will be seen this exposure is somewhat complicated. The two vertical exposures of it are peculiar and would lead to a belief in a fault on the eastern side of each. The eastern side of each of these areas are straight and in one plane while the western limits are irregular both areas are wedge shaped and underlain by def-

ferent rock. The most westerly exposure is bordered on its eastern side by a dike or vein of reddest taline material which stands very nearly vertical to near the waters edge where it bends east ward. and can be traced no farther

The lower rock of the whole exposure seems different from the upper yet they so grades into each other or are so mixed at the contact that the same can not be located. The lower rock seems coarser slightly more greenish and seems more massive than that above. It is possible that faults exist at the points mentioned and that these account for the repetition in sections A B & C of about the same succession of rocks, dipping from 12° - 20° about S. S. E. The lower parts of the exposure are much more massive than the higher parts. The latter are jointed quite regularly in two directions. While in the western vertical exposure of it there are several sets of joints producing angular blocks.

The anorthosite in this exposure has with few exceptions the appearance of included masses. While some might possibly be in place. The masses are usually very fresh some of the larger ones however are very much disintegrated. An instance is at the top of the 1st falls at the left hand side of the river. The dip is here very irregular the falls are caused by huge sheets of Gabbro with very steep dip (about 27° - 30° S 35° - 40° E) While the exposures below while retaining the direction of the dip the same is much flatter. The presence of the anorthite rock may in some way account for this irregularity. The diabase of the upper portions on both the north and the south side of the river are beautifully striated by glacial action.

The most beautiful examples of "pot holes" are very numerous here. They are often arranged in series and intersecting have caused the detaching of huge masses of rock.

23152 From contact of anorthosite and coarse diabase at a point over F sketch VI

While the dip of the Galero at the falls
is steep as has been indicated, between
the falls it seems to be very flat

