Michigamme iron district: [specimens 22990-23646]. No. 167 1894

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 ¾ 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.

Oct. 1 1894

#167

J. M. Clements

No. 2

Michigamme

Iron District

more especially

the

Fence & Deer River Regions

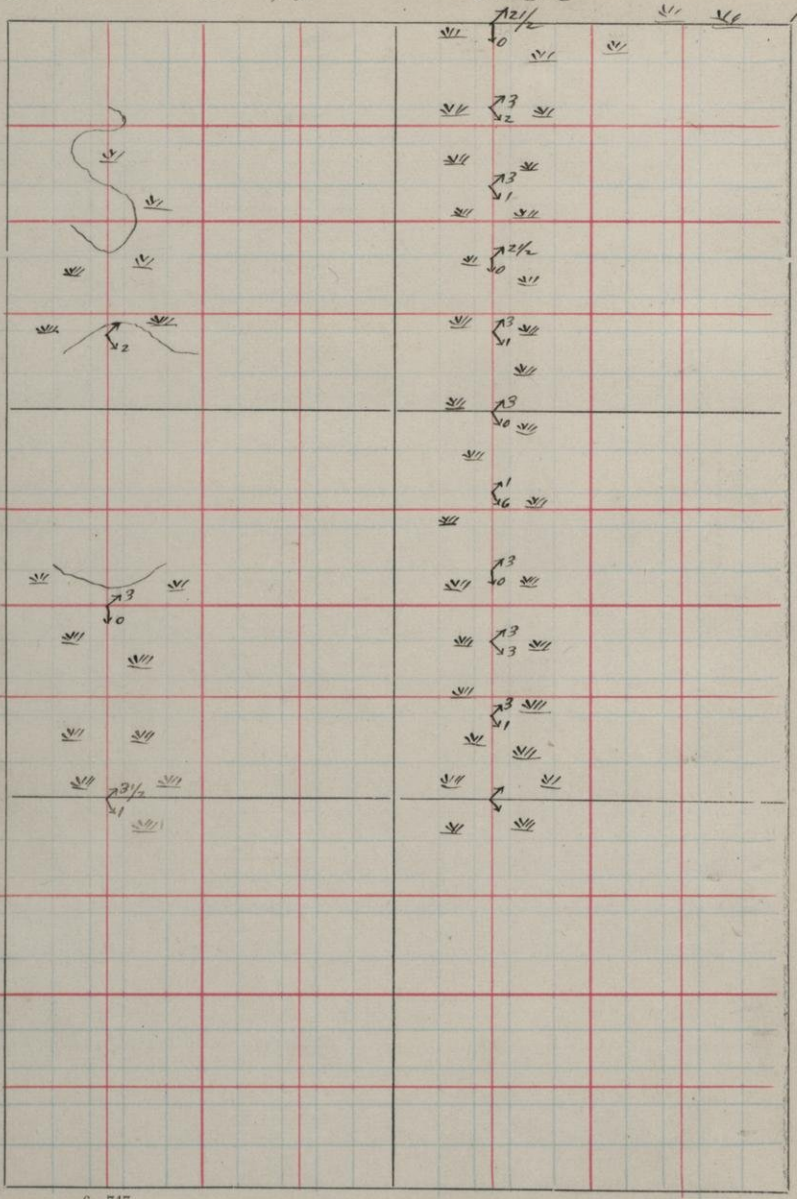
J. Morgan Clements

1894

Chas. Perry,
Congressman.

S. 24 T. 45- R. 32

NW NE

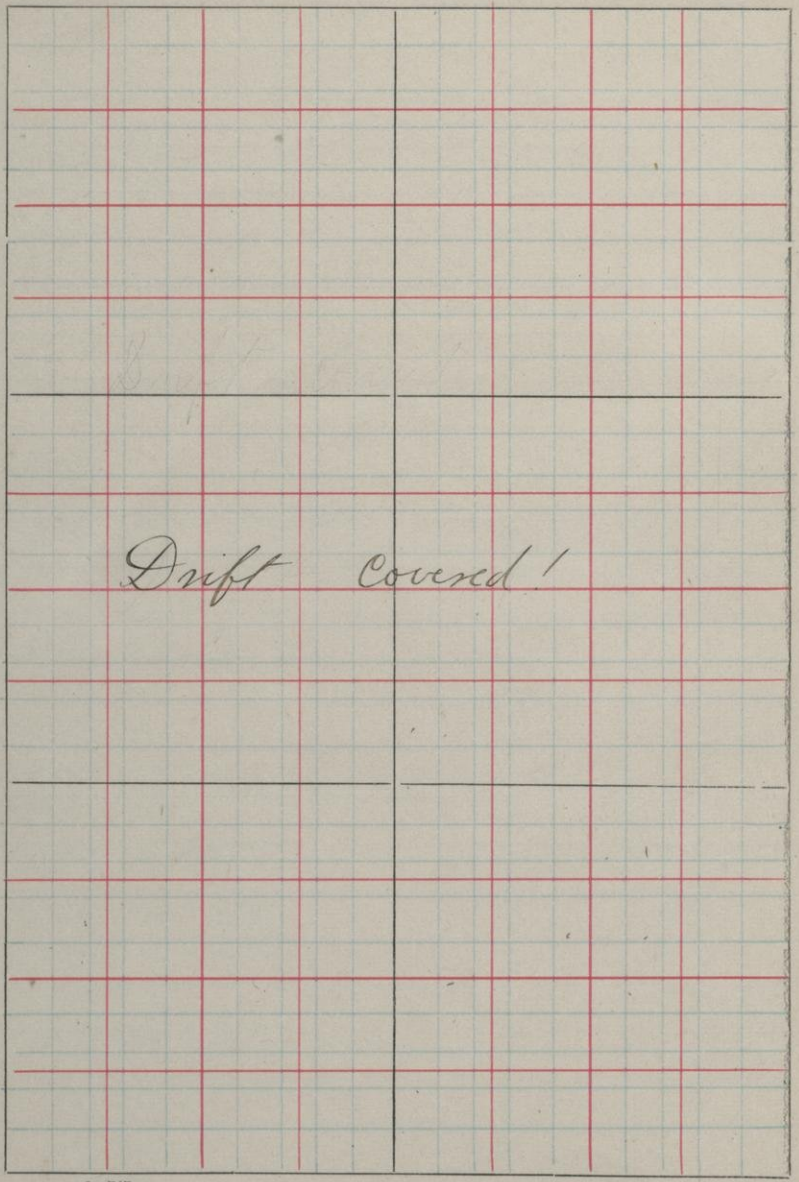


SW SE

6—747

No outcrops show in this section but there are knolls all through the swamps which are covered with heavy moss & swamp growth and on which one sees frequently very large masses of granite boulders some angular and others more or less rounded. It is impossible to be sure that they are in situ but I believe that Sec. 24 & also S. 25 has granite underlying & very close to the surface of the drift.

NW S. 13 T. 45 R. 32 NE

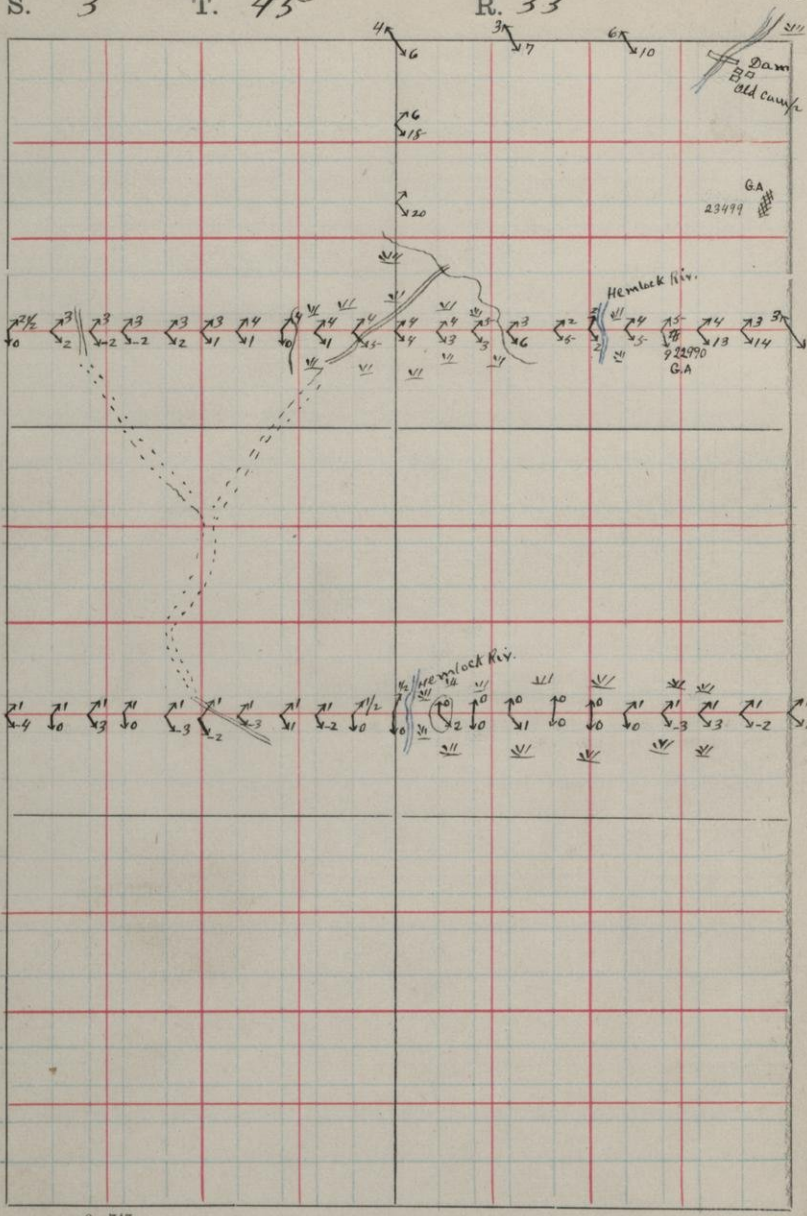


SW SE

6—747

Run was made to 1/4 line of Sec. 13 but no readings could be taken on account of weather. Section heavily drift-covered.

S. 3 T. 45- R. 33



6—747

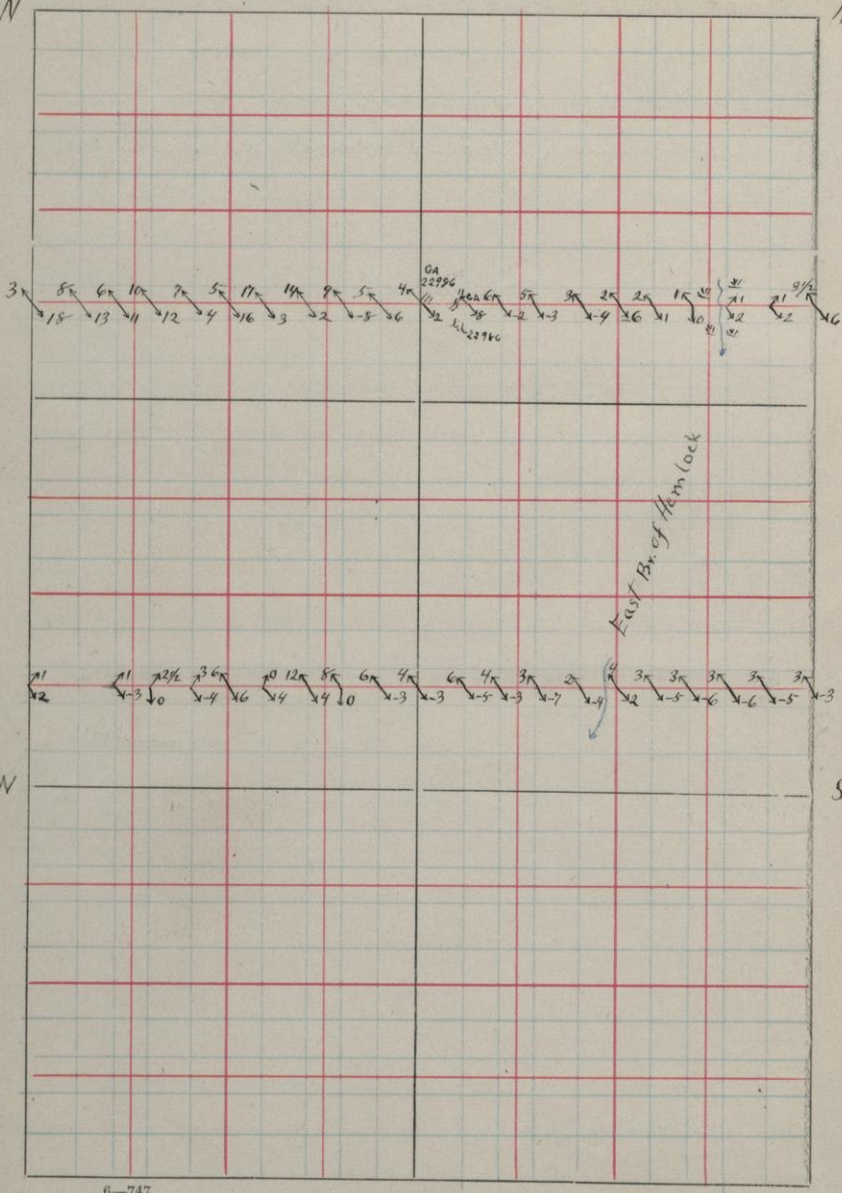
22990 1250 N 280 W. SE Co. Sec. 3-45-33

Small ledge of very much altered amygdaloid. Nearly a chlorite schist now. Weathering however brings out the gas pores.

S. 2 T. 45 R. 33

NW NE

SW SE



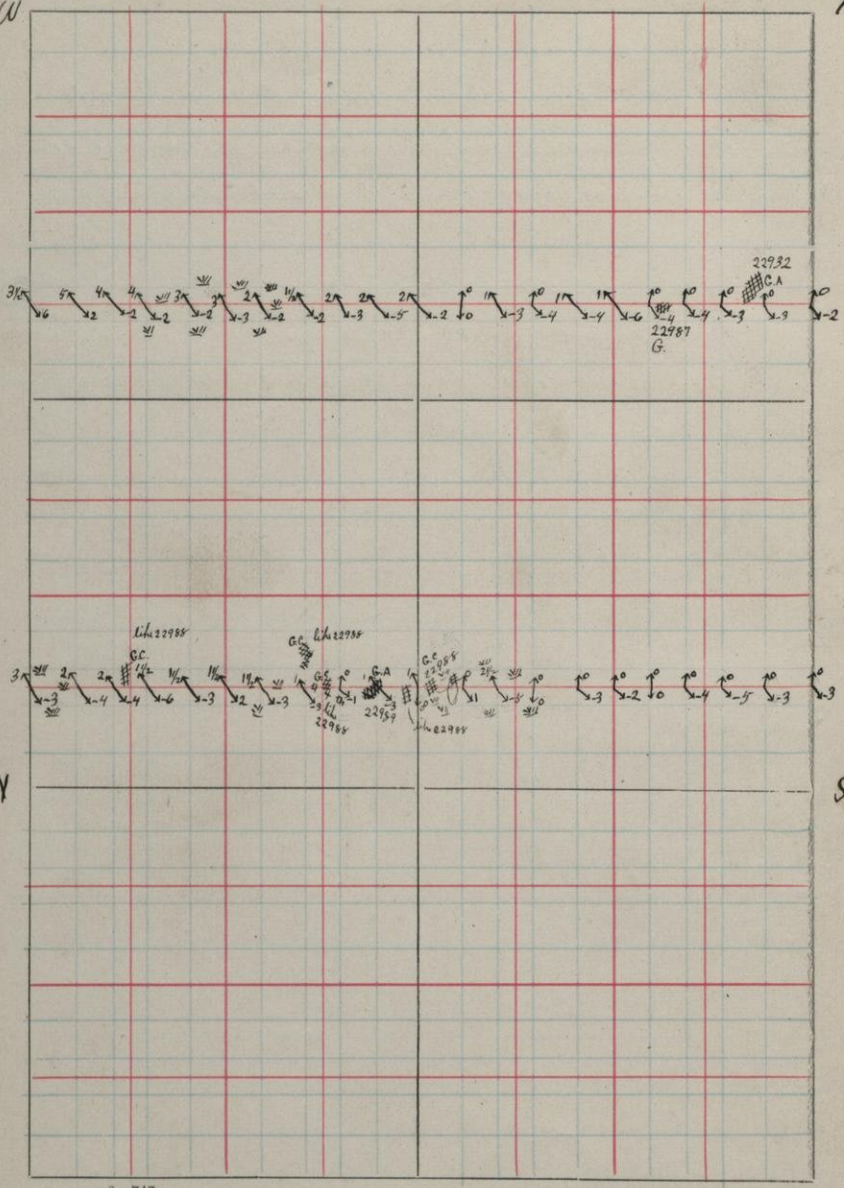
6—747

22986 1250 N. 975 W SE Cor. Sec. 2-45-33
Small ledge of very much altered greenstone amygdaloid. Specimen shows very micaceous phase. All more or less schistose now. Breccia beds show also but are likewise very much altered.

Lib 22986 1250 N 900 W SE Cor. Sec. 2-45-33
Another exposure of 22986 in which the schistosity is better marked. Strike SW, dip 50° NW.

S. 1 T. 46 R. 33

NW NE



SW SE

6—747

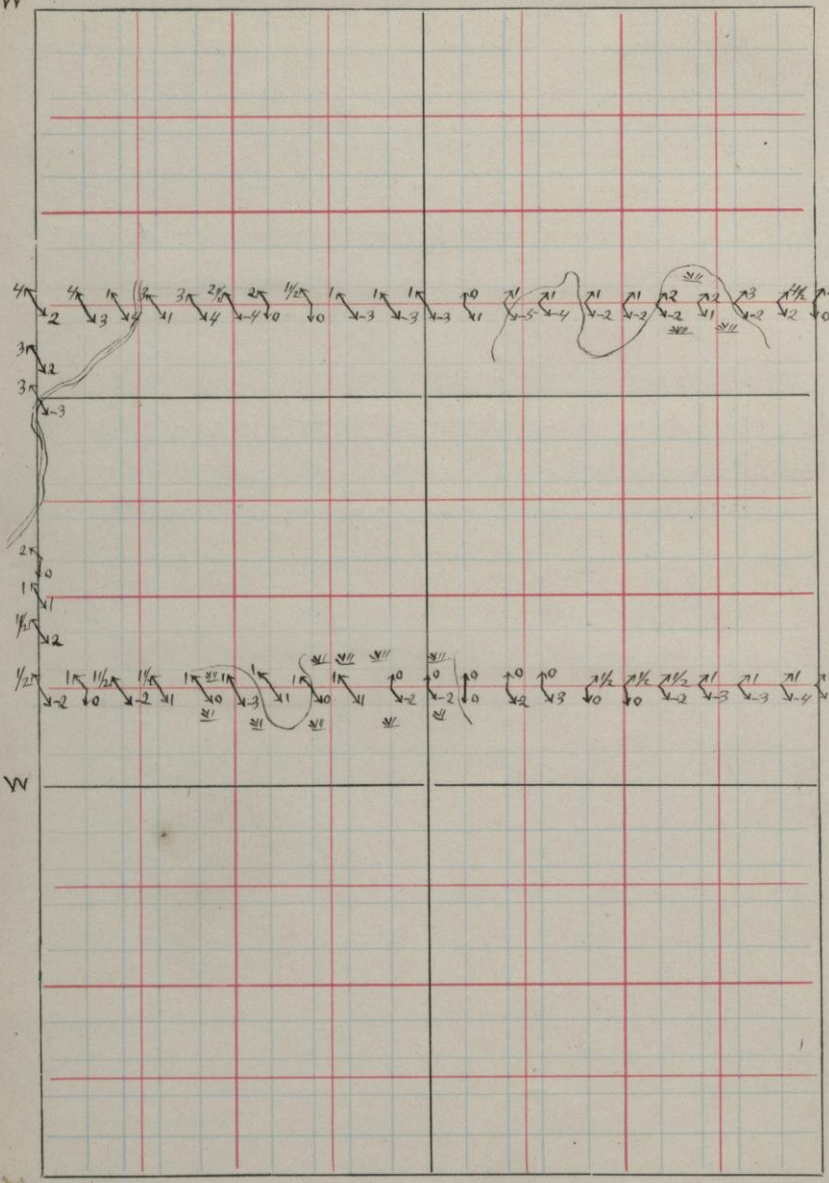
22987 1230N 385W SE Cor. Sec. 1-45-33
Small exposure of much altered rock. Compare with specimens from vicinity of Bone Lake in S. 22-46-32; 22919-20

22932 1300N 1200W SE Cor. Sec. 1-45-33
Outcrop of fine-grained greenstone amygdaloid.

22988 250N 975W SE Cor. Sec. 1-45-33.
Exposure of squeezed tuff. Material more or less amygdaloidal.

22989 250N 1100W SE Cor. Sec. 1-45-32
Ledge of greenstone amygdaloid.

NW S. 4 T. 45 R. 33 NE

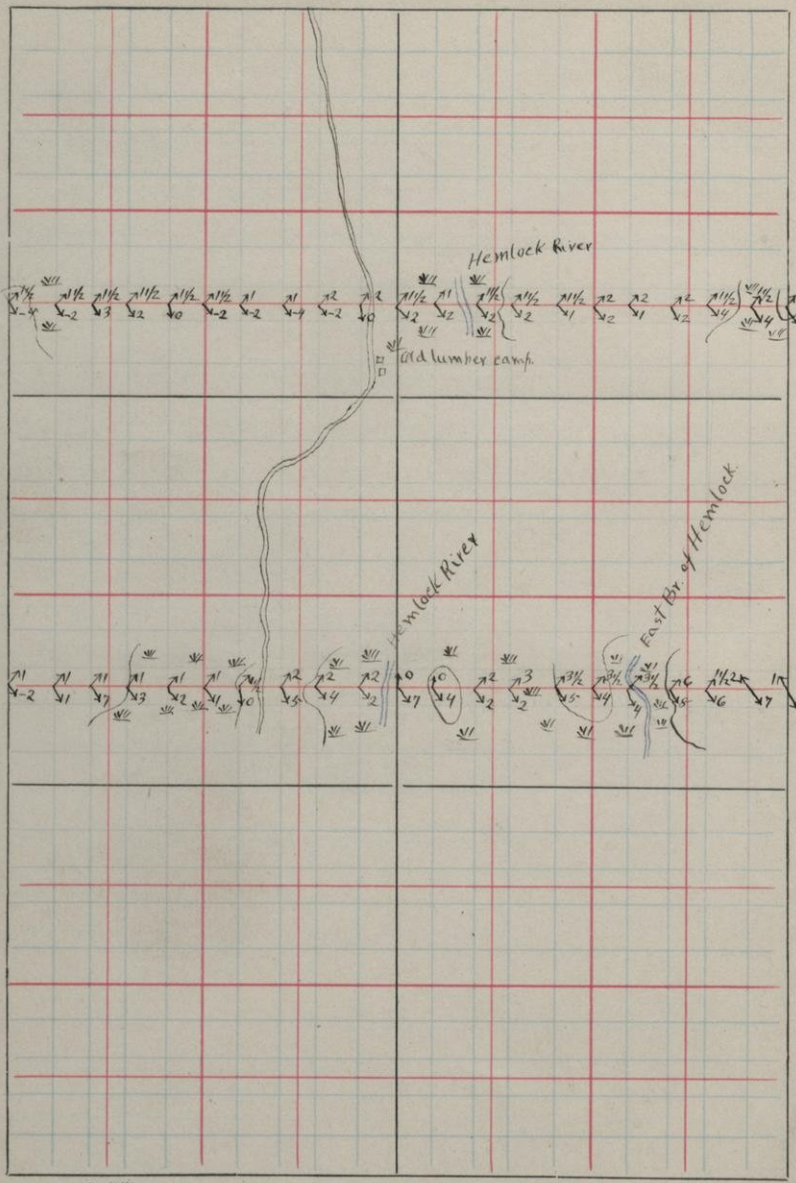


SW SE

6—747

S. 10 T. 45 R. 33

NW NE

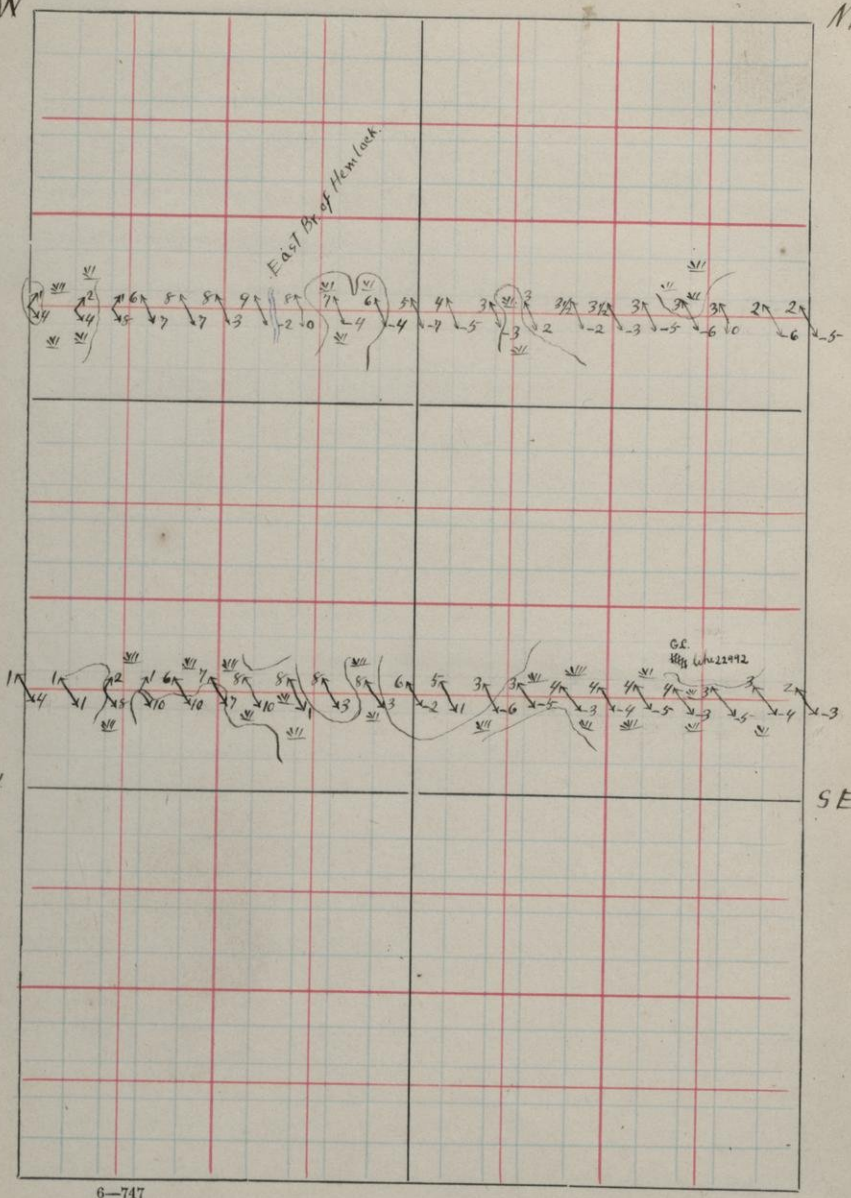


SW SE

6—747

S. 11 T. 45 R. 33

NW NE

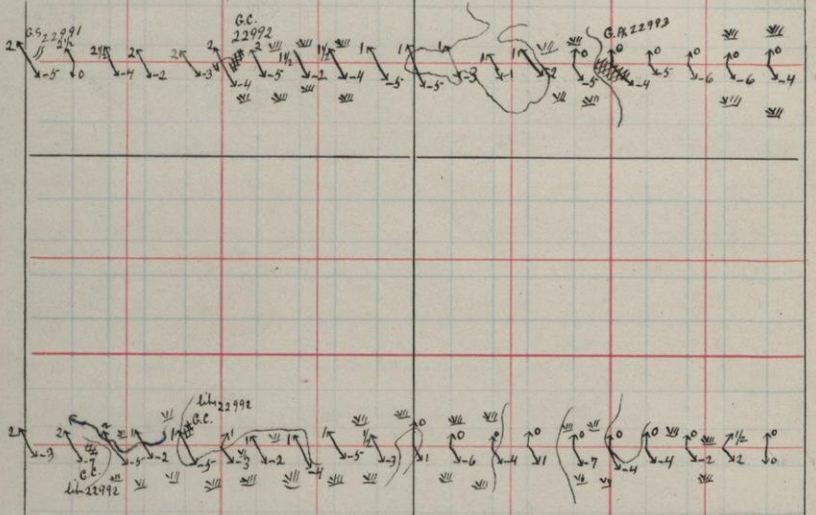


SW SE

6—747

S. 12 T. 45 R. 33

NW NE



SW SE

6—747

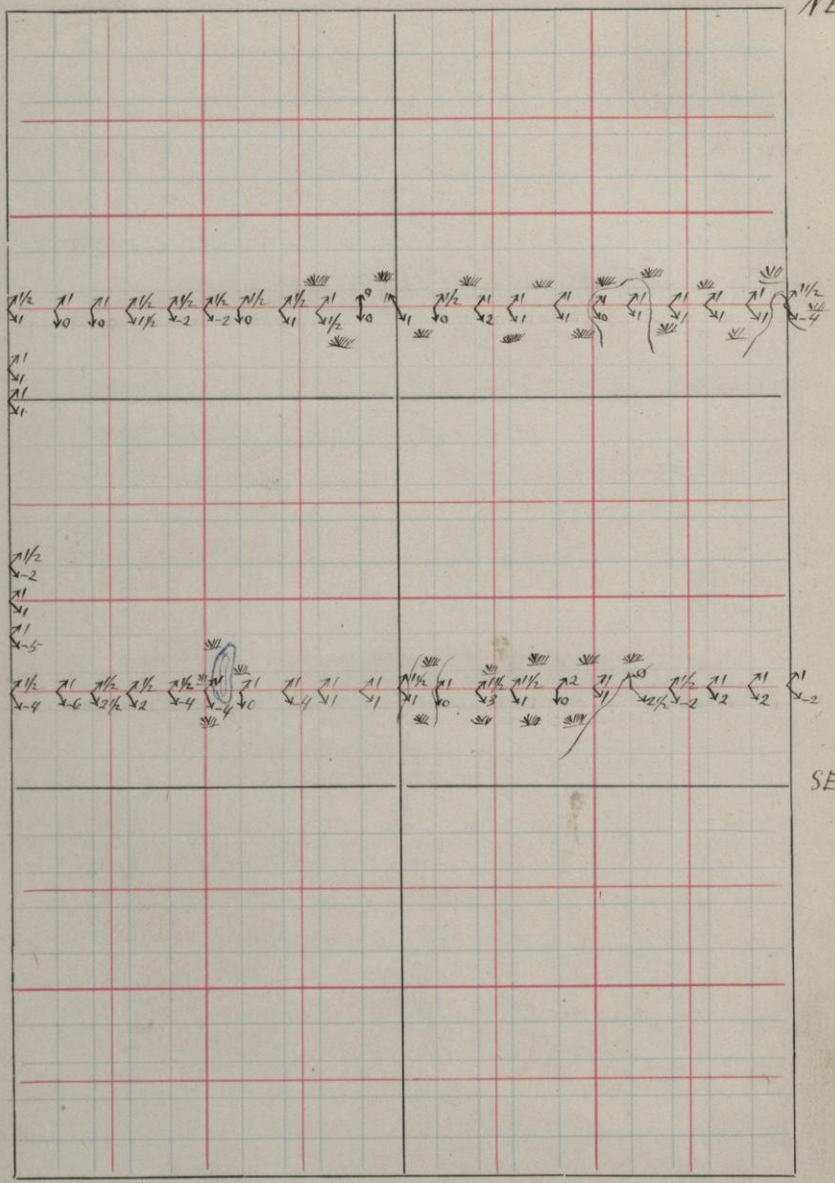
22991 1300N 1960W SE Cor. Sec. 12-45-33
Very small ledge of greenstone Schist Strike N35°E, dip, 60°NW

22992 1250N 1455W SE Cor. Sec. 12-45-33
Large exposure of greenstone conglomerate (tuff)

22993 1260N 520W SE Cor. Sec. 12-45-33
Rounded exposure of porphyrytic greenstone.

S. 9 · T. 45 R. 33

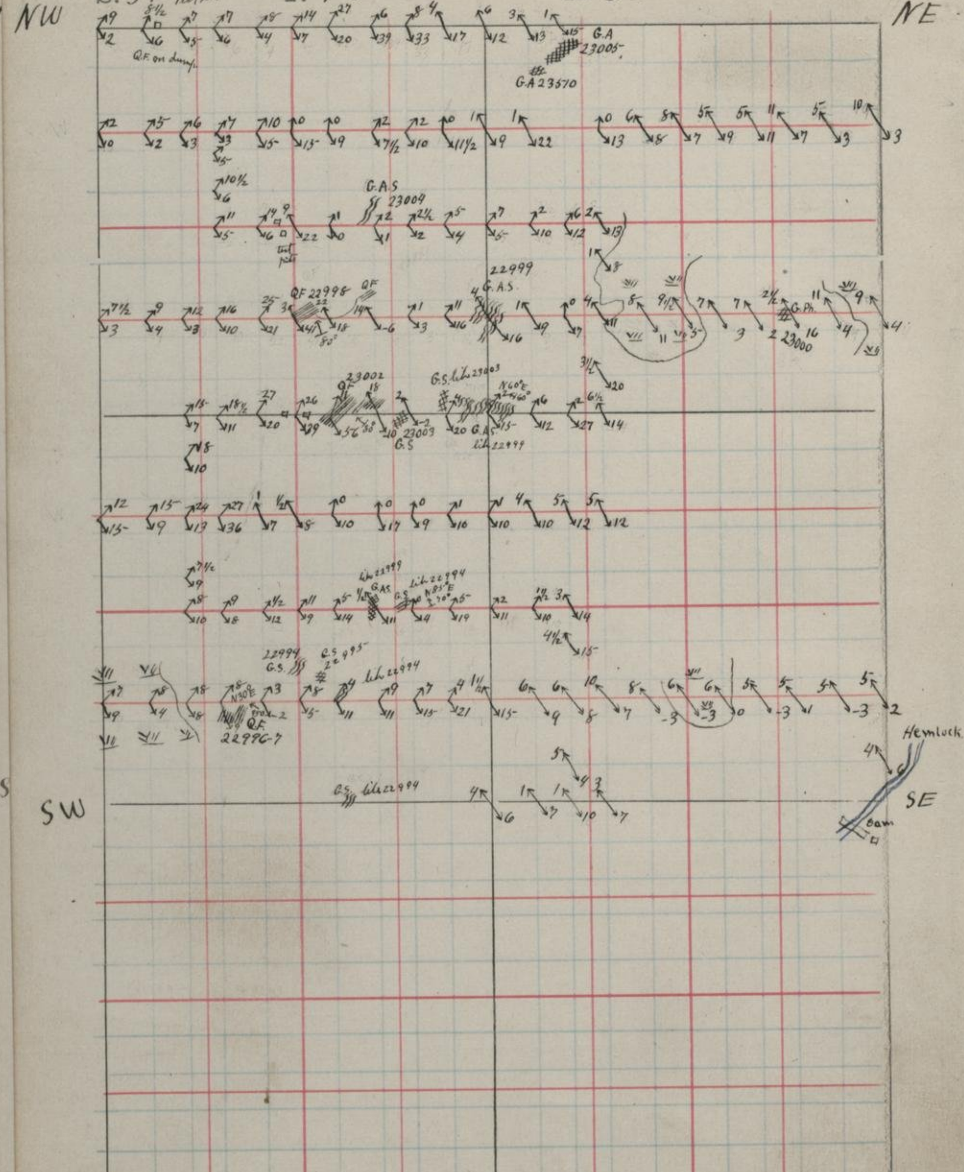
NW NE



SW SE

6—747

S. 34 Tel hut T. 46 R. 33



22994 330N 1500W SE Cor. Sec. 34-46-33
Ledge of schistose greenstone. General strike of schistosity N45°E, dipping about 70°NW.

22995 310N 1460W SE Cor. Sec. 34-46-33
Small ledge of greenstone.

22996-7 225N 1655W SE Cor. Sec. 34-46-33
Outcrop of grey quartzite or graywacke, 22996, with ferruginous bands 22997. Strike N30E, dip 75°W. In places the banding is much contorted.

22998 1250N 1500W SE Cor. Sec. 34-46-33
Outcrop of very ferruginous quartzite. Compare with No. 22997. Strike N75°E, dip 80°NW.

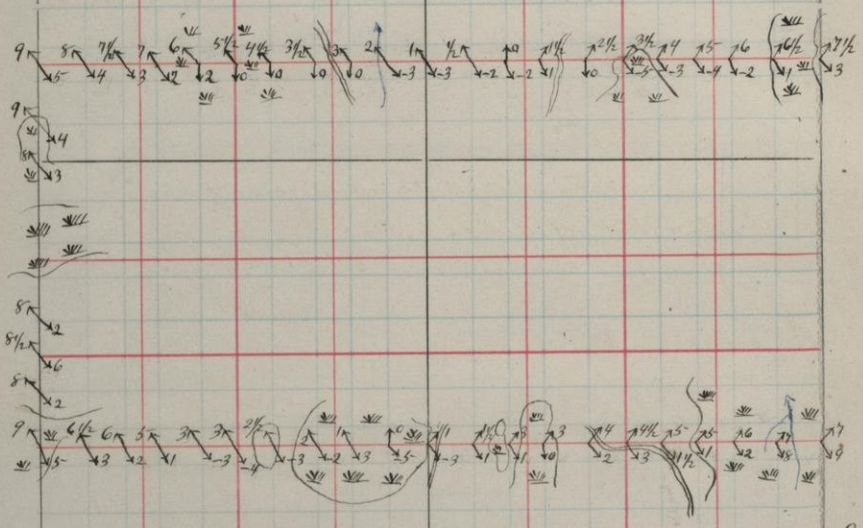
22999 1280N 1000W SE Cor. Sec. 34-46-33.
Schistose amygdaloidal greenstone. Schistosity strikes about N60°E. Not sure of a dip. Epidote fills amygdules of a portion of the ledge.

23000 1250N 320W. SE Cor. Sec. 34-46-33
Small outcrop of peculiar porphyritic greenstone. Poorly exposed & badly decomposed.

23002 1000N 1400W SE Cor. Sec. 34-46-33.
Large exposure of ferruginous quartzite. Bands more or less contorted. Strike N60°E, dip 80°NW.

S. 33 T. 46 R. 33

NW NE



SW SE

6—747

23003 1000 N 1240 W. SE Cor. Sec. 34-46-33

After leaving quartzite and crossing a narrow piece of low ground we find a poorly exposed ledge of a rotten greenstone schist. No. Congl. between Q + G.S.

23004 1525 N 1325 W SE Cor. Sec 34-46-33.

Exposure of greenstone schist. Schistosity very imperfect. Strike N 60 E, dip 85° NW. Seems to be a schistose amygdaloid.

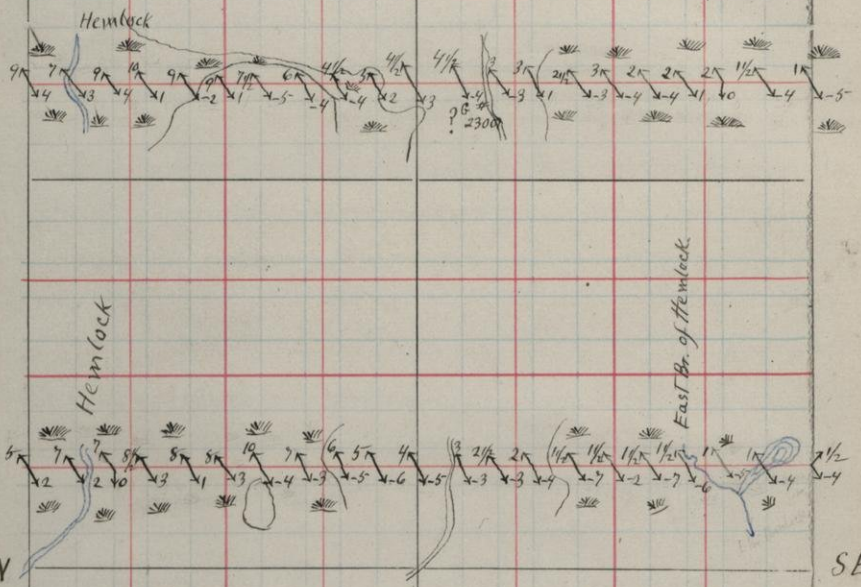
23005 1925 N 800 W SE Cor. Sec. 34-46-33

Large ledge of amygdaloidal greenstone, somewhat schistose. Schistosity strikes N 70° E, dip 65° NW.

S. 35 T. 46 R. 33

NW NE

SW SE



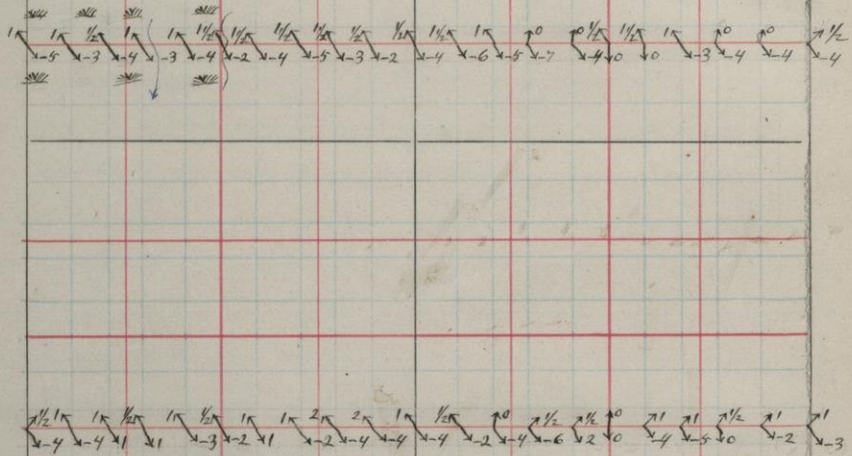
6—747

23001 1200N 840W SE Cor Sec. 35-46-33

Very small outcrop of granite. Am very doubtful of its being in situ.

S. 36 T. 46 R. 33

NW NE

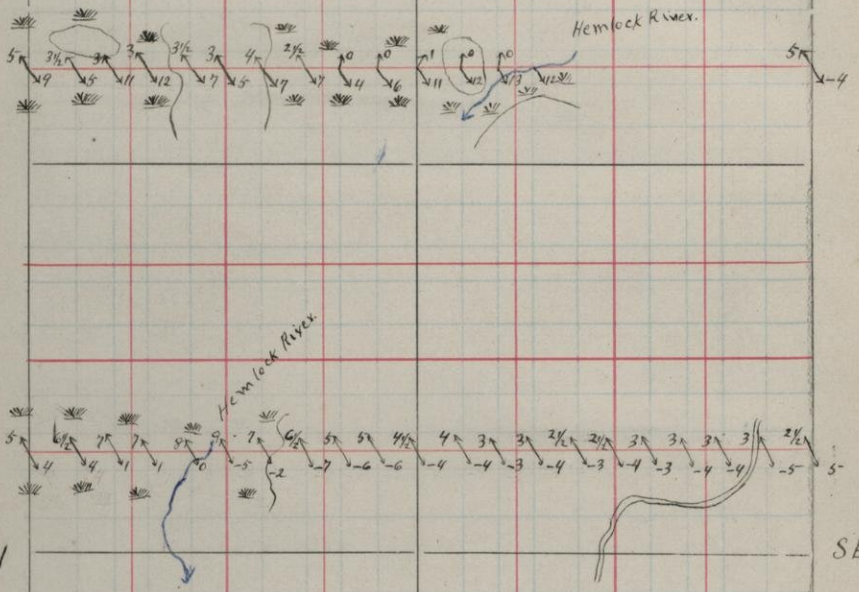


SW SE

6—747

S. 26 T. 46 R. 33

NW NE

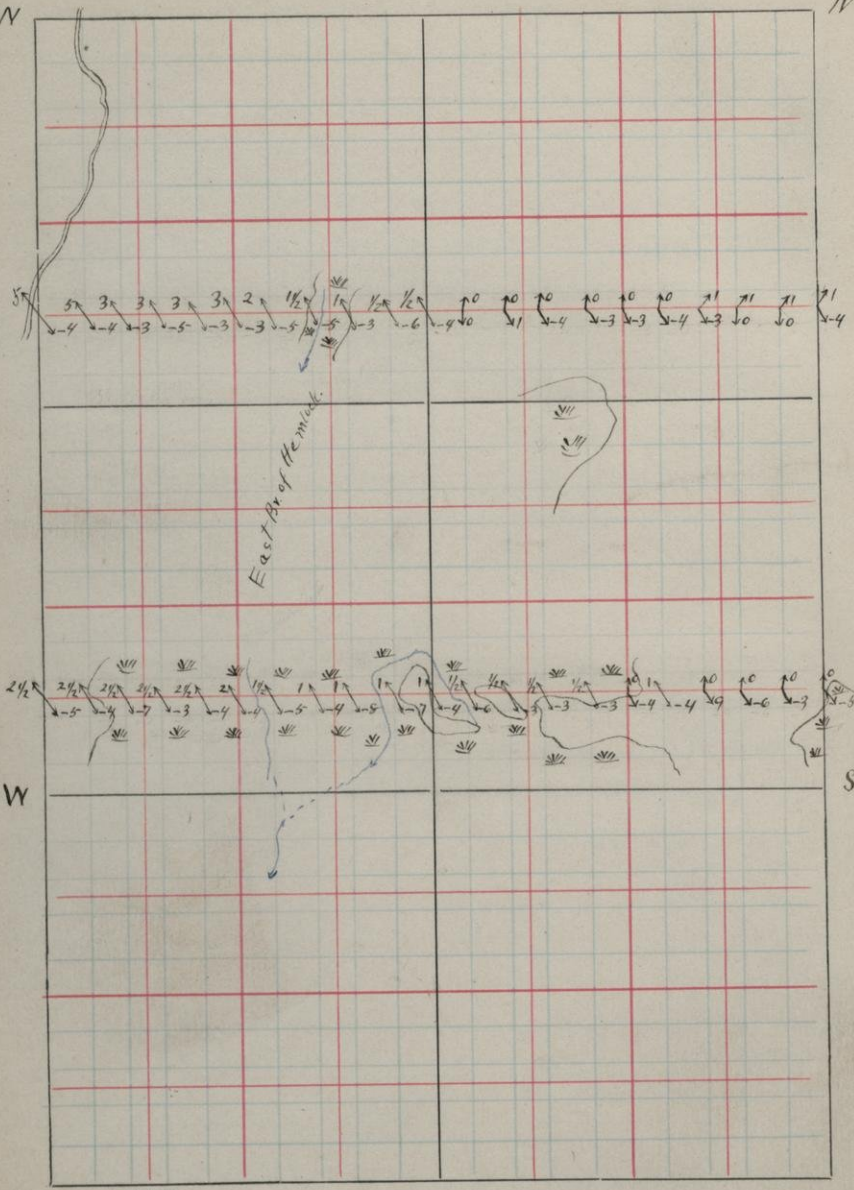


SW SE

6—747

S. 25 T. 46 R. 33

NW NE



SW SE

6—747

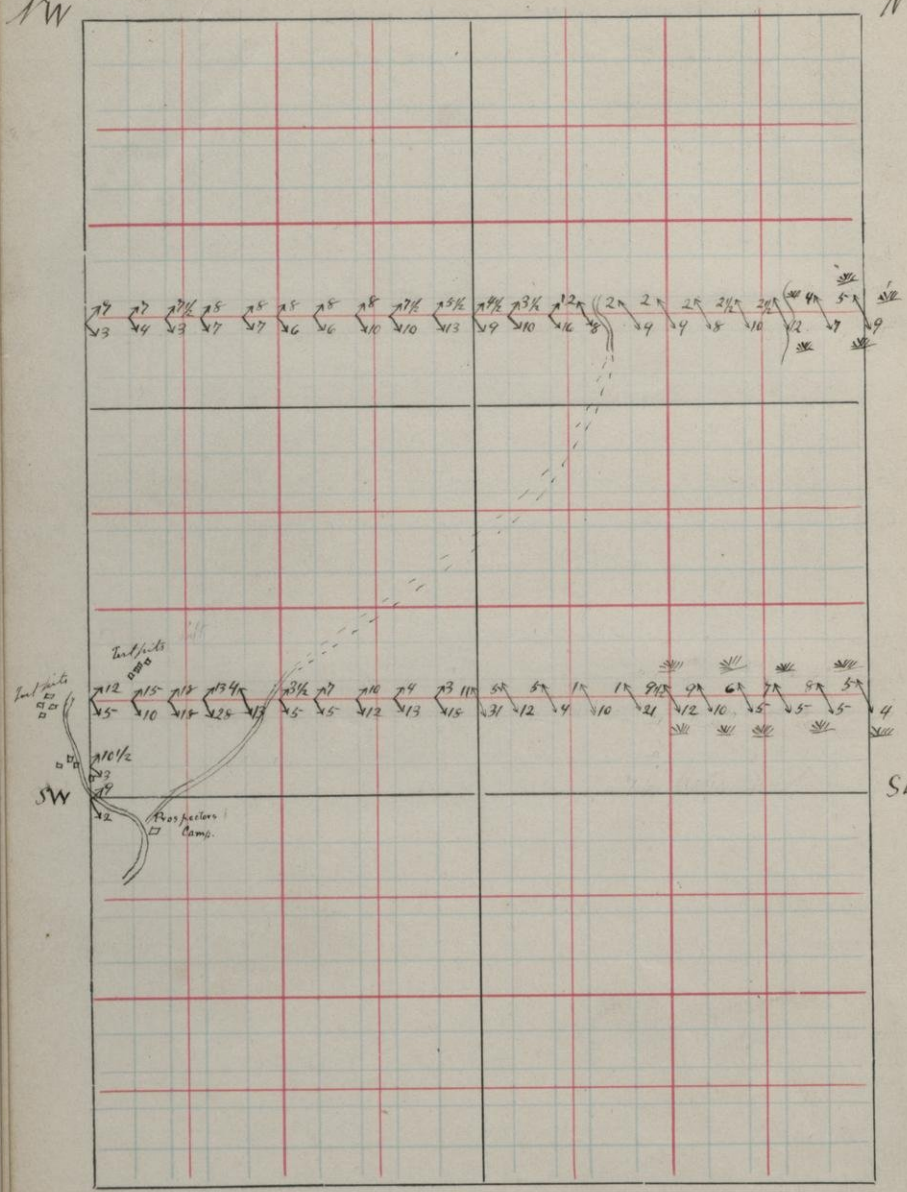
S. 27 T. 46 R. 33

NW

NE

SW

SE

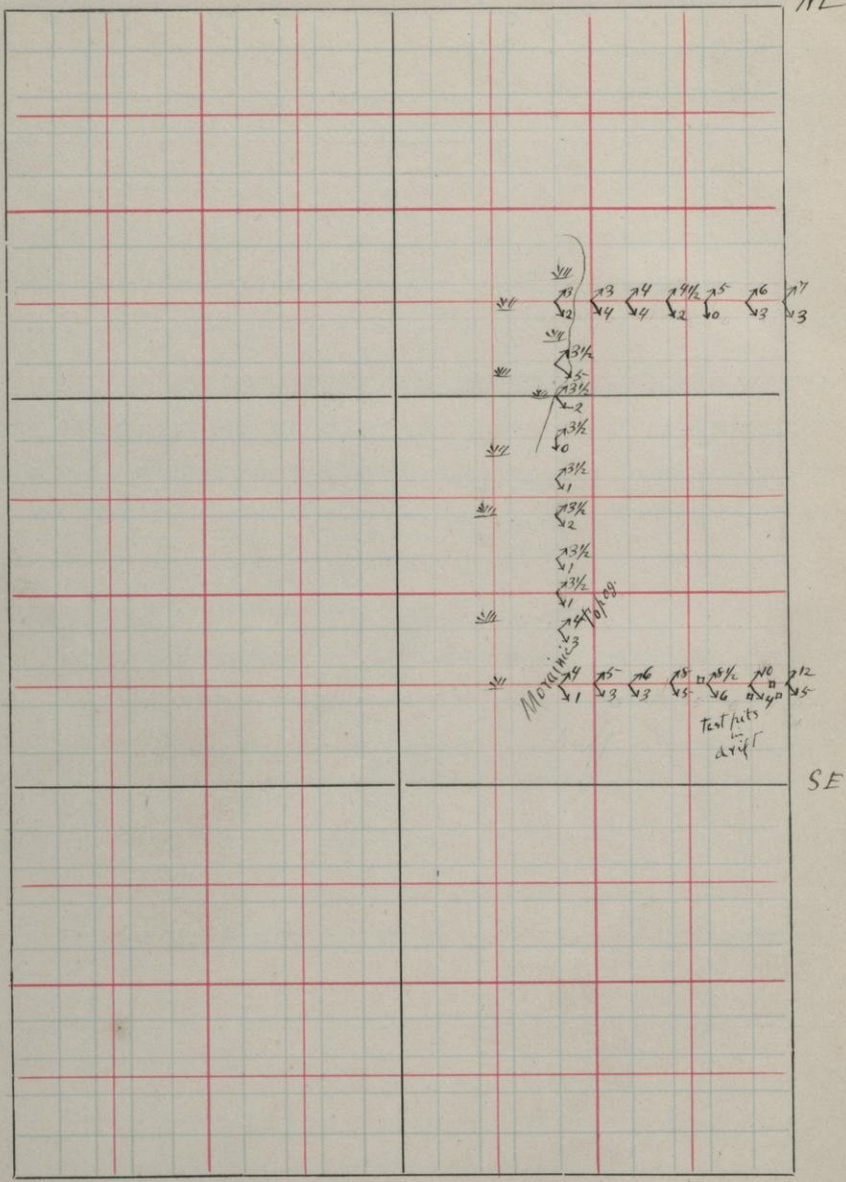


Near SW corner of S. 27-46-33 are numerous test pits, in none of which can one now see ledge. The most of them seem to have been altogether in drift. Some of them may however have gone to ledge as we find some ferruginous (f. 22997) quartzite on a few of the dumps.

S. 28 T. 46 R. 33

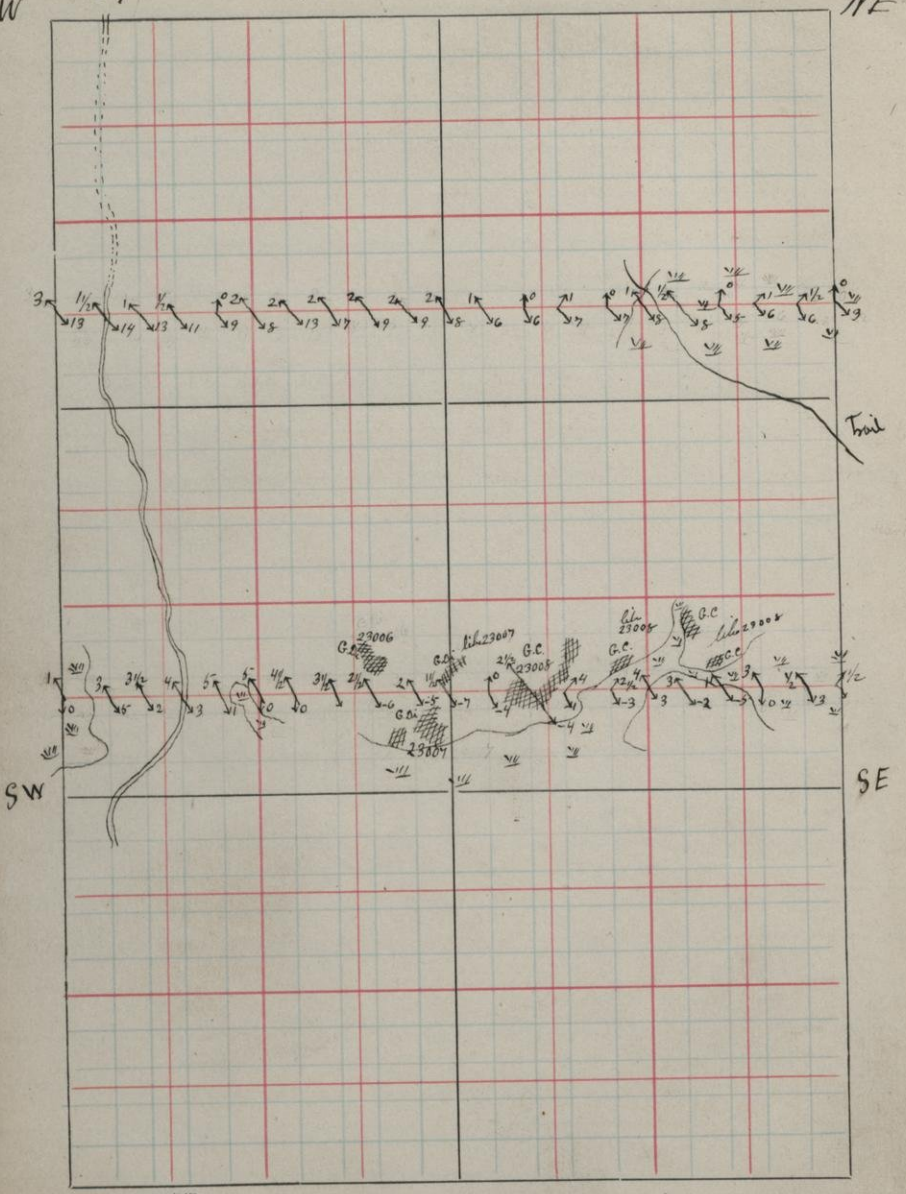
NW NE

SW SE



6—747

NW S. 24 T. 46 R. 33 NE



6—747

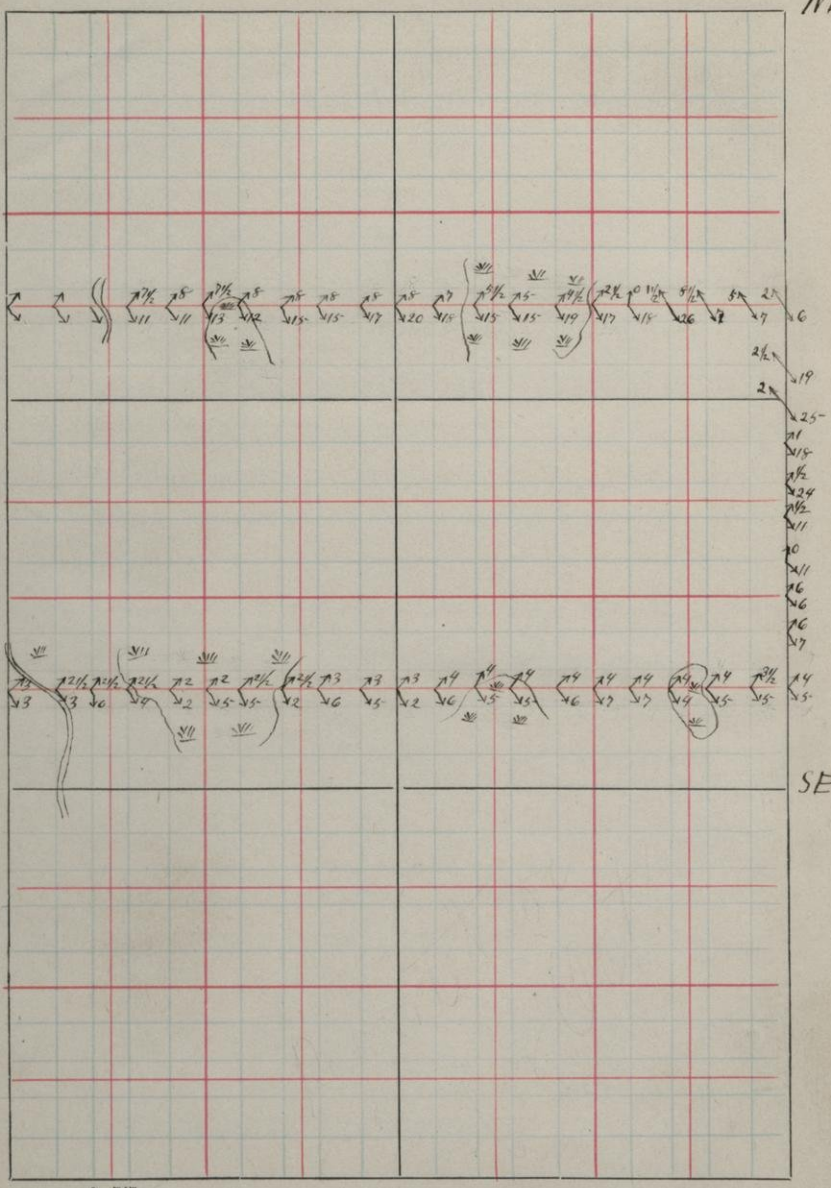
23006 310N 1200W SE Cor. Sec. 24-46-33
Ledge of coarse grained diabase.

23007 150N 1050W SE Cor. Sec. 24-46-33
Large exposure of coarse grained diabase.

23008 250N 835W SE Cor. Sec. 24-46-33
Large knob of a very much altered greenstone tuff. Schistosity strikes NE-SW, dip 40°NW
Large angular boulders now drawn out to a lenticular shape were seen in it. No evidences of deposition by water were found.

S. 13 T. 46 R. 33

NW NE



SW SE

6—747

S. 11 T. 46 R. 33

NW NE

Did not work!

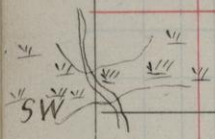
SW SE

6—747

S. 12 T. 46 R. 33

NW NE

Did not Work!

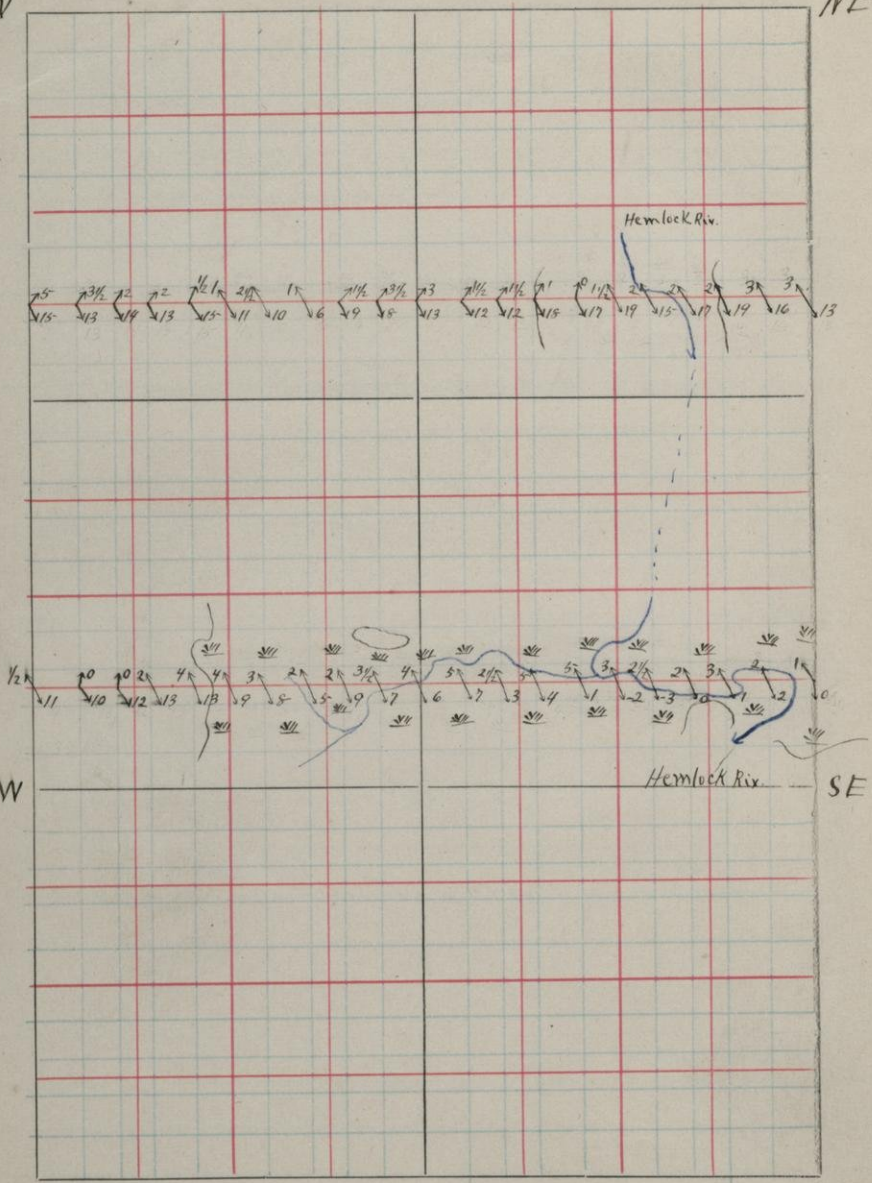


SW SE

6—747

S. 23 T. 46 R. 33

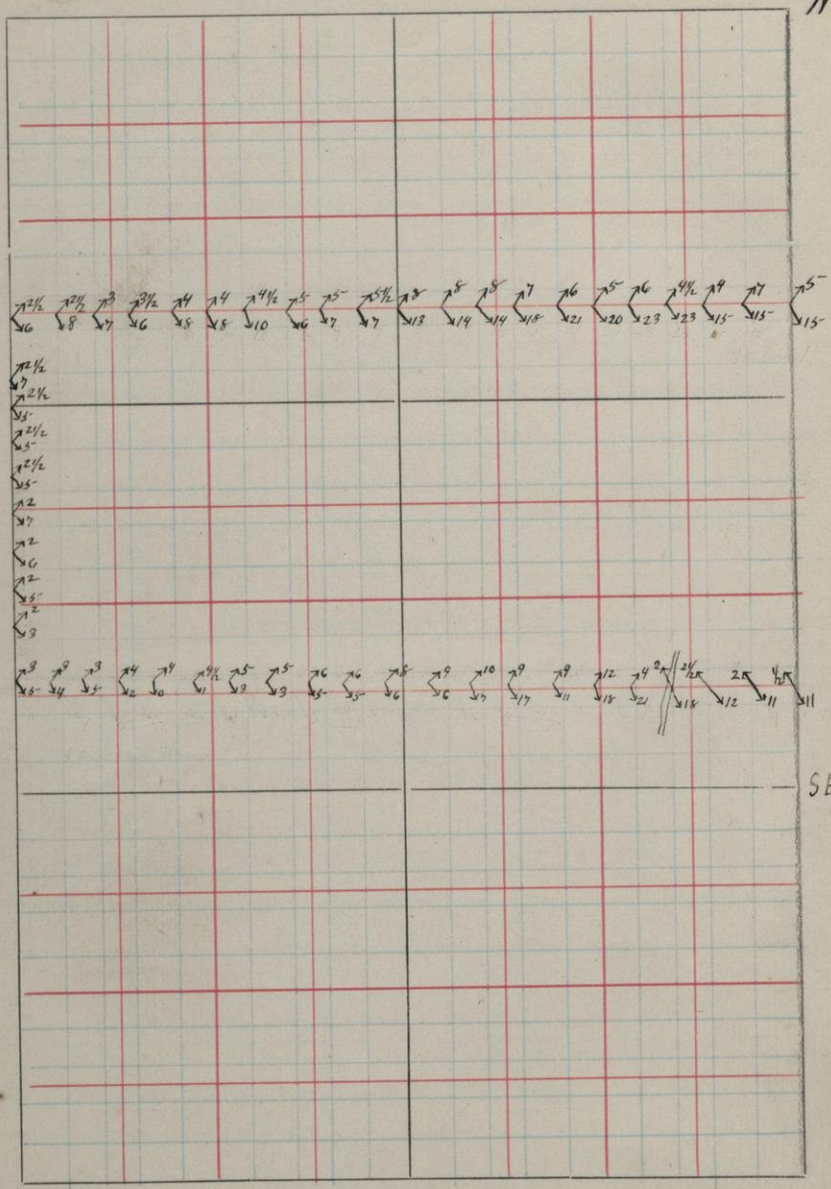
NW NE



SW SE

S. 22 T. 46 R. 33

NW NE



SW SE

Specimens No. 23637-23646 incl. were taken from ledges which had already been studied & specimened by Merriam et al. These specimens which were taken and the notes written are supplementary and intended for my use especially in the petrographical studies of the rocks of this region.
When notes were written, but no specimens collected, the location and ledge will be referred to under the old specimen numbers of Merriam, Mauker, et al.; but when new specimens were taken they will have their number attached but under them will be written the numbers of the specimens previously taken, so that the old notes may be easily found and, corresponding specimens conveniently compared.

32111-2-3. 1900 N 1375 W SE Cor. Sec. 15-44-33
Perhaps a lava flow, top and bottom of which was decidedly amygdaloidal, now upturned. Smallest amygdules near dense greenstone. In some places the

ledge is dark bluish. What is cause of this? Study it on No. 23640-1

32140-3 1600 N 800 W SE Cor. Sec. 5-43-32

At above location occur very great masses of volcanic tuffa. I could find no evidences in it of water action during deposition. Fragments are angular and amygdaloidal and dense in about equal quantity. Flows of amygdaloidal greenstone alternate in places with the tuffa. In two instances did I find finely banded ashbeds + some more or less slaty material though I could not say it was a true water deposit.

Nearly all of the very fine grained, dense rock of this region has the surface covered with small shallow depressions which make the rock look as though some one had gone over it striking it with some sharp pointed instrument + thus chipping out small fragments of the rock. Is this caused by contraction as is the case with the chips which spring out of the glaze on stove iron?

Rosser & Goldschmidt's article
in Tschermaks Min. & Pet. Mit. II Heft 1 4 Bd.

23642 1600 N 475 W SE Cor. Sec. 5-43-32
Limestone tufa like 32142-3 but taken
from ledge farther S E.
Fragments are for most part not
amygdaloidal (macroscopically at least)
but are very dense and light grayish.
Weathered surface shows tuff or ashbed
character best of course. The larger
fragments in the tufa are crossed with
fractures but no main direction
was noticed.

Photograph

32384-5 1250 W 40 N SE Cor. Sec. 7-43-31
The amygdules are just about as
common on the other sides of the
spheroids as on the west and
also occur in the centres though
not to the same extent as on the edges.

23637 1000 N 650 W SE Cor. Sec. 32-44-32
(32726) Large exposure of a quartz porphyry. The porphyry
cuts the tufa 32702-10-11-12 but whether all
of the porphyry is an intrusive or part of

it a surface flow I can not tell from the exposure.
The rock is very much jointed and the joints in many cases filled with secondary quartz. The porphyry weathering leaves the quartz ridges standing giving the mass the appearance of a conglomerate. The porphyry has been cut by a newer porphyry like 23639. This may be the one which cut the tuffs and the one forming the main mass may be a flow. It is ~~porphyritic under the microscope~~.

23640-1 (32908-9-10) 250 N 380 W SE Cor. Sec. 18-43-31.
Specimen No. 23640 illustrates different varieties of the dark bluish matrix all grading into each other as can be seen also in the photograph
The very porous phase is the weathered rock corresponding to the dark spotted unweathered rock no. 23641.

23638-9 1800 N 400 W SE Cor. Sec. 32-44-32
From this location I collected a specimen from the bedded rock 23638 dipping steeply to the SW. Quartzite (?)
23639 is from a ledge near the granite

Same as 32736+7 Hermiston

as located by Merriam's map at the above location. The granite seems to grade into the rock like specimen to the NE. At least no sharp line of contact could be traced.

23643 This is a specimen of tufa from the first R.R. cut on M & N. R.R. to the west of Balsam. That is the one named Balsam between Balsam & Amasa.

23644-5-6 These specimens represent different varieties of greenstone tufa, from very fine to moderately coarse. They were all collected from the comparatively fresh exposure in the second R.R. cut to the west of Balsam on the M & N. R.R.
23644 is the coarsest grade of tufa.
23645 is somewhat finer.
23646 is the finest. A banded material weathering very much like a sedimentary and very probably an aeolian sediment. The finest ashes & comenet dust from an eruption which formed here a deposit about 1½-2 ft in thickness.

Summary of field work for season of 1894.

The area examined lies in the Michigamme District between the Menominee District on the south and the Marquette district on the north, and would be approximately included between the Fence river on the east, Hemlock river on the west, Shank and Long lake on the north and Dunbar lake and Deer river on the south.

On the map in the back of the note book the sections covered in the course of the work are numbered.

The greater part of the region examined during the season is heavily covered with glacial drift, and consequently exposures of rocks in situ are rare. Especially interesting to the glacial geologist would be the area included in Secs. 13, 14, 22, 23, 27, 29, 34 T 45 N R. 32 W

and Secs. 25, 26 T 45 N, R 93 W. These sections are covered with such a heavy growth of timber that it would be very difficult, however, at present to do very satisfactory glacial work there. Glacial striae were observed in only three or four instances, and were found to run almost due NE-SW. The general trend of the hills in regions of morainic topography also indicates that the approach of the ice was from the NE. Some of the features of the drift are well shown on the topographic map.

The point where work was begun was in Secs. 5, 6 T 45 N., R 31 W., where the work begun by Smyth was ended in 1892. A few east-and-west runs were made through Secs. 5, 6, the object being to find the zone of magnetic disturbance traced to this location from the SE by Smyth, and follow it out.

The line of magnetic maxima of this zone was designated by Smyth as the "C" line, and was by him connected in Secs. 16, 21

T 45 N., R 31 W., with outcrops of Michigamme Mt. Jasper, striking N and dipping to the E, and underlaid by greenstone conglomerate. The zone of magnetic disturbance, having been located, was followed to the NW. through Sec. 31 T 46 N. R. 31 W., and Secs. 36, 25, 23, 14, 15 T 46 N., R. 32 W. Continuing, it was found to change its direction, and run nearly E-W through Secs. 16, 17, 18 T 46 N., R. 32 W and then bend around to the SW through Secs. 13, 23, 22, 27 T 46 N., R. 33 W and end in Sec. 34 T 46 N., R 33 W, having been connected there, however, with several outcrops of a bed of ferruginous gray quartzite, dipping in general 80° N.W. and striking about N 60° E.

This "C" line probably corresponds to the line of magnetic attraction traced by Merriam in 1892 from the SW, and which he found connected with ferruginous beds at Amasa in Secs. 4, 9, T 44 N., R 33 W, and Sec. 20 T. 45 N., R. 33 W., and ending

in Sec. 16 T. 45 N., R. 33 W, two miles S the south of where it was last found this season. The area thus enclosed by the "C" line is in general semicircular.

Kinds of rocks and their distribution.

Proceeding from this "C" line, connected with the Michigamme Mt. Jasper, the youngest formation known in this immediate vicinity, towards the center of the semicircle enclosed by it, we cross the following rock formations in descending order of age, i.e. from youngest to oldest.

4 Michigamme (Mountain) Jasper.

The only outcrops found were those of the ferruginous gray quartzite in Sec. 34 T. 46 N., R 33 W., its exposed thickness there being about 250 ft. Test pits have been sunk along the line of outcrop, but no glazing or lode has been found.

3. Fence River Volcanics. Greenstone conglomerate.

Typical development is not along the Fence River but to the west along the Hemlock and south and south west along the Michigamme and branches of the Paint river, outside of the region examined this season.

These rocks outcropping next to the Michigamme Jasper are volcanics, greenstone amygdaloids, tufas, etc., for the most part very much altered, and in some cases bearing no outward resemblance to volcanic rocks.

While not immediately in contact with the jasper they underlie it, and the nearest outcrops of the two rocks are only separated by a short distance, as in Secs. 16, 21 T. 45 N., R. 31 W., (Smyth), and in Sec. 34 T. 46 N., R. 33 W.

These volcanics occur in a belt, which is narrowest at the SE in Sec. 36 T. 46 N., R. 32 W. Here the outcrops are also the least characteristic, having undergone very great alteration. As we follow

the belt & the NW, it rapidly broadens, and continues broadening as we turn & the SW, until it reaches its maximum in T. 45 N., Rs. 33, 33 W., where it is over four miles in breadth. At this narrows come and joins the volcanics in the area near Amasa and Crystal Falls, studied by Merrian in 1892. The great breadth of the volcanics along the SW end of the belt does not represent their true thickness, as this has probably been caused by minor undulations of the beds.

The volcanic rocks forming this belt in the W and NW are for the most part well defined as such. Near Bone Lake Sec. 21, 22, 16, T 46 N. R. 32 W, however, while true amygdaloids are found, most of the outcrops are of hornblende and mica schists, which in the field at least give no indication of an eruptive origin, but from their association with the amygdaloids are judged to be altered greenstones.

No well marked bedding

planes were found, but the strike and dip of the schistosity agrees perfectly with the course of the belt, that is, at the SE the strike of the rocks is NW and the dip NE, gradually changing then, as we go to the NW to an almost E-W strike and N dip, and then in the SE to a NE strike and NW dip.

To the SW in T. 44 N., R. 32 W, the place of the volcanics is taken by coarse grained eruptive rocks, which are probably the desaturated equivalents of the amygdaloids and tufas, which we find lying above the quartzite. They probably indicate the centre of volcanic activity for this region.

In Sec. 10 T. 44 N., R. 32 W., there was found in this area of coarse eruptive rocks several exposures of grayish slate, striking nearly N 25° W with either a vertical or a slight westerly dip. The relation of this slate to any other sedimentary rock in the region could not be made out.

I wish to call attention to the specimens collected in the SW. 1/4 of Sec. 4 T 44 N., R 32 W. They represent, I think, an ancient acid lava flow. From their present structure as observed only in the field, they would probably be classed with the porphyroids.

2. Inside of the belt of volcanics there is a zone from 3/4 to two miles in width, in which almost no outcrops are found, the country being for the most part quite level, or only gently rolling, and heavily drift covered.

In Sec. 19 T 46 N, R. 32 W., Prof. Culver observed an exposure of dark gray quartzite. He was, however, doubtful as to its being in situ. Then, in Sec. 1 T. 44 N., R. 32 W., Smith found a small exposure of rotten quartzose limestone, and likewise in Sec. 12 T 44 N., R. 32 W. This zone is probably underlaid by the belt of quartzitic limestone found by Smyth underlying the volcanic belt to the E

in Secs. 16, 21 T. 45 N., R. 3 W. He says of it "The limestone is sometimes full of rounded quartz grains. In Sec. 16 T 45 N., R 3 W., on the Fence river, the rock is so friable, from the amount of quartz it contains, that it crumbles between the fingers." He suggests that the lack of outcrops to the south of this point for some distance may be due to this fact, that the limestone disintegrates so easily, and it seems that this conjecture might hold good for the region to the NW, where we get no exposures of the rock.

1. Crossing this belt, the first rock outcrops which we find are of granite and gneiss, cut by dykes of basic rocks, now much altered. The area covered by the granite and gneiss outcrops is approximately an ellipse three miles wide and seven miles long, with the long diameter extending almost due NW-SE, from

the centre of Secs. 19, 20, 21 T. 44 N., R. 31 W, with Secs. 33, 34 T. 46 N., R. 32 W.

Structure

The structure of the region can be best explained by assuming the existence of a great anticlinal fold, the axis of which runs NW-SE, and which brought to the surface the above described oval area of granite and gneiss.

Around this Archean core we find arranged like the layers of an onion, first, a belt of quartzitic limestone, then a belt of volcanic rocks, and last a narrow zone of magnetic disturbance, which, having been connected both to the SE & SW, respectively in Secs. 16, 21 T. 44 N., R. 31 W., and in Sec. 34 T. 46 N., R. 33 W., with a bed of ferruginous quartzite is considered to indicate that it is found all around the northern portion of the area,

though then covered by drift. The strikes and dips of the various strata agree nicely with the distribution of the beds around an oval core, as shown in the sections accompanying the map in the back of the note book.

Correlation.

No representatives of deposits other than those observed by Smyth were found this season, and wherever he had given a name & a series it has been retained.

The correlation of the rocks of this region with the rocks of the Marquette District was undertaken by Smyth,[1] but rather premature[ly]. Since then, however, the examination of the Marquette Iron Range has been completed, and the correlation of its rocks with those in the Menominee

[1] Am. Journ. Sci. 3rd Series Vol. 47 Jan. 1894 Pgs. 214-223

	Marquette Dist.	Michigamme Dist.	Menominee Dist.
		Fence River Region	
R.	Lower Marquette		Lower Menominee
	Mesnard quartzite, 100-670 ft.	Quartzite, limestone 1500- ft.	Basal Quartzite, 700-1000 ft.
	Kona dolomite, 550-1375 ft.		Crystalline dolomite, 700-1000 ft.
T.	Wewe slate, 550-1050 ft.	Volcanics at least 1500 ft. but in places 4 miles wide covered with outcrops. Probably enormously increased by minor folding.	Slates and altered volcanics, maximum thickness, 2000 ft.
	Ajibik quartzite, 700-900 ft.		
	Siamo slate, in places including interstratified amygdaloid, 200-625 ft.		
S.	Negaunee iron formation 1000-1500 ft.	Michigamme Jasper	Slates bearing rich ores. Michigamme Jasper.

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and Michigamme Districts has been undertaken by Van Hise[1] with the following result. The series being arranged in parallel ascending succession, as taken from the Annual Report above refered to, with the succession found in the region examined this season, which region lies between and connects the two districts, in the middle column. See opposite page.

1) 15th Ann. Rep. U.S.G.S., pp. ---- 189-