

Vermilion district: [specimens] 28500-28641. No. 314 Summer of 1898

Leith, C. K. (Charles Kenneth), 1875-1956 [s.l.]: [s.n.], Summer of 1898

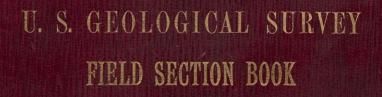
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9-891

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 crosshatching 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 wayy 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 lefthand 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.

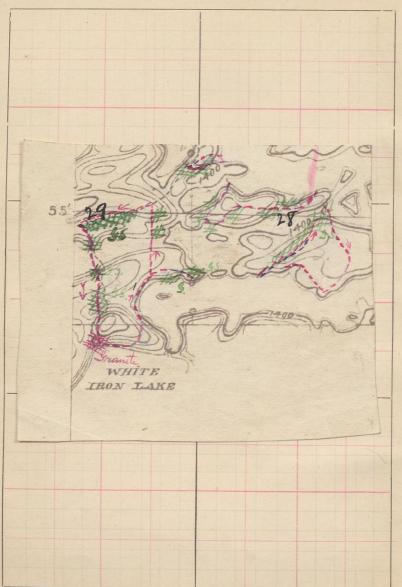
3. Collect a specimen from every ledge, or wherever there is a change of rock on any one ledge, taking care to get fresh material, unless for a special purpose the weathered surface is desired. In case of trips made on foot or in canoes, for long distances, neighboring ledges, unquestionably of one kind 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 21/2 x 4 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.

28500-28641 Notitork 314 Vermilien district Summer of 1898. C. K. Leith Ina Weller, comparsman,



Hade given insteads

Vermilion district, July 4, 1898.

Took course in 28 and 29-63-11 indicated on opposite map, to delimit greenston Throughout the course nothing was found but green schist. This was in rather uniformly but widely distributed are exposures In 28 and to the south in 29, the green schist has little white eyes or lenses, giving the rock an amygdaloidal and scoriaceous appearance. This is the case I believe.

After striking the road in 29 (1000 N) the green stone is much more massive and fine grained, and does not show the amygdaloidal areas.

At White Iron lake the granite was struck. This was not studied or mapped as Dr. Bayley has previously done this.

July 5.

Came back to same sections and entered them from the river above. Rook course indicated on opposite page, to look for jasper said to be there. However, found nothing but the same green schist. Not even a magnetic variation.

Stopped at point on Farm lake indicated on opposite map, and took several specimens. (Following)

R.// т. 63 26 Kawishwi River 6-747

The ledge is hornblende-schist, containing fragments and boulder-like areas of the same material and also of light pink granite. I think Bayley was inclined to call this a conglomerate. But it seems tò me to be clearly a greenstone schist tuff which has caught up fragments of the granite. The granite is never in round boulders, but is always in lenticular and rather angular areas, some of which are several feet long. The fragments of green schist stand out on the weathered surface, and vary from those of minute size to those several inches across. They are mostly lenticular, and at first glance would resemble pebbles, but in breaking the rock they are seen to be identically the same material as the matrix. Search was made for other pebbles or fragments, but none were found. The weathered surface of certain of the larger greenstone schist inclusions is pitted in such a way as to suggest amygdaloidal cavities. To me there is little doubt that the rock is a green tuffaceous schist which encloses angular fragments of t e granite, and the whole has been mashed into a perfect schist, so that the angular fragments of the green

schist and granite now resemble pebbles.

28501-2 are fair specimens of the schist.

28503 is one of the protruding angular inclusions.

28504 shows another, this, however, not on weathered surface.
28505. shows in miniature the general appearance of the weathered surface of the outcrop.

The granite occurs in several cases in long stringers, one of them a half inch wide and several feet long Another such stringer was found which has been proken and folded by the mashing, and now stands out on the weathered surface thus:

This seems to prove beyond a doubt that the granite is not a pebble.

27506-7 are specimens of the granite. The granite contains much quartz as a replacement or vein product, and closely resembles quartzite.

Strike of schistosity is N. 80° E., and the dip is 10° N.

Ran south en-t from the Kawishiwi river on the quarter line of 26-63-11, to find the contact of the green schist and granite. Also into 35 same town and range.

Ran clear through to the lake, and found nothing but green schist in rather frequent exposure, until the lake was reached, 700 south, where a rather small ledge of the granite was found, on its northern edge interleaved with green schist.

Returned, and went down the east section line of the same section for the same purpose. Green schist in frequent exposure was found, with an occasional dike of granite. However, with these exceptions no granite was found. The last green schist was found at 1250 south, and the lake was struck at 1325 south of the river. Therefore the contact was not crossed.

July 6.

Started at the Kawishiwi river at the quarter line of 25-63-11, and ran south to intersect the boundary of the granite.

In running south hornblende schist is f found in frequent exposures, low and moss-covered to 1000 south.

28508. At 1600 south is a specimen of the hornblende-schist. Rather massive.

28509 is another somewhat different specimen of the green schist.

28510. Between the two is granite. Betwee 28509 and 28510 I could find no break, though the exposure was not complete. The strike is N. 27° E. The dip is steep to the north.

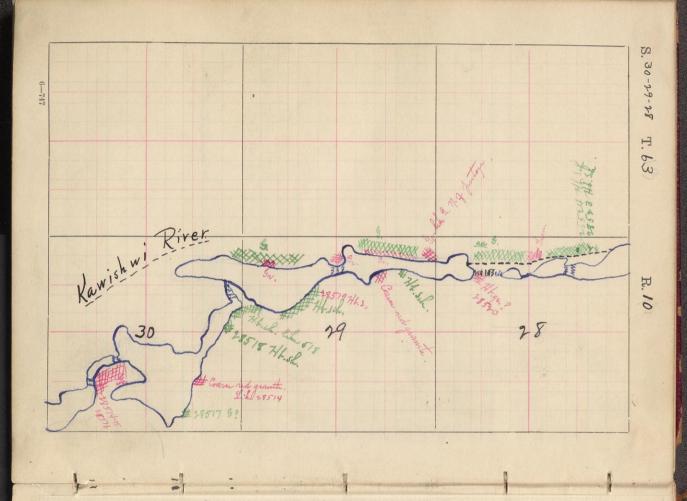
28511. A little farther south on the same gridge is very schistose hornblende-granite?

This continuous in almost continuous exposure for 100 paces. It is exceedingly schistose, and in places shows a decided regular banding. On weathered surfaces many fragments and lenses of lighter colored material are seen.

At 2160 S/ and 200 E. this same material shows a banding of lighter and darker colored bands and lighter fragment like areas. It is found here containing large patches or inclusions of the regular black hornblende-schist

28512. Specimen from t e weathered surface The banding on this exposure is marked, and the pebble-like character is very much so. The specimen shows in a small way how the exposure looks. The fragment-like areas run up to 6 inches across.

Offset and rant east.



M.S. sed.

28513. At 750 E., 2100 S. is hornblende-schist again.

This material continues to 500 N.

At 525 N. Material banded and showing a flow structure, like 28512, appears, and continues of paces.

Visited granite knob on the south side of the Kawishiwi where camp stood. See topographic map on opposite page. This knob is granite, mainly a coarse massive phase, 28514

This is found to be intruded by un-

doubted dikes of

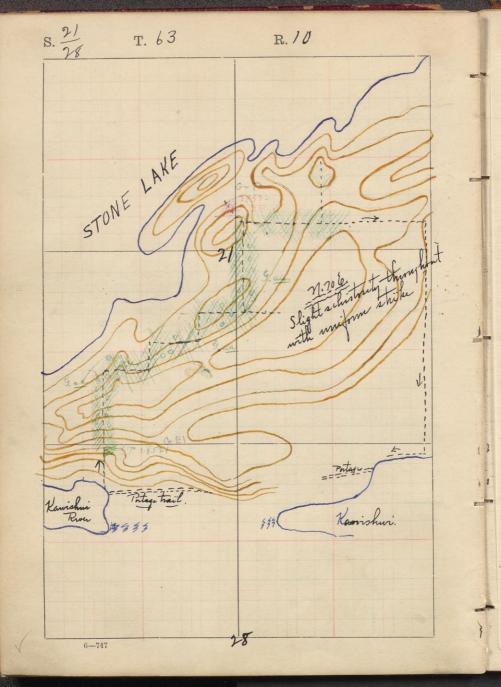
28515, finer grained granite.

In one place the coarse granite was found to contain a rectangular block of hornblende-schists, which is an undoubted inclusion.

28516. From this block.

The exposure is a very massive one, so no strike or dip, or even trend, is obtained.

Worked the south shore of the river east from the camp. Results indicated on topographic sketch on opposite page. This necessary because locations were made by means of the topographic map.



Home

28518 hornblende-schist the same seen on the morning run. Strike N. 80 ° W.

28519. Hornblende-schist.

28520. Hornblende-granite. Rather massive. What is this rock?

July 7.

Started at the Kawishiwi river on the continuation of the west line of 21-63-10 and ran north and northeast to Stone lake, using topographic map and following main ridges.

28521. At 150 N., of the river is a somewhat schistose greenstone tuff (?) The outcrop is very much broken up. The material weathers with a very rough surface due to its brecciated character. But this may be due simply to dynamic action, and the rock be originally a massive greenstone. However, in the exposure are various fragmentary and vein-like areas, which resemble the matrix material of the aa greenstones very much mashed.

A little farther on the aa characters are typically developed, and there is little doubt as to the character of the above rock. This is found throughout the course indicated on the opposite page until the northern limit of the run is reached, overlooking Pine lake, where is found

stone

9. W

28522. Granite-porphyry, close to the greenstone.

28523. Hornblende-schist, on the portage trail near the east end.

28524. Hornblende-schist, on the portage trail about 400 W. of the east end. Contains fragments of basic rock.

Hornblende-schist like the above is fo found until 615 W of the east mouth end of the portage trail was reached, where granite appears. This continues to 800 W. Here the aa greenstone crossed on the north ward run begins to appear, and continues to the west end of the portage trail.

On returing worked the north shore of the river in the little bay just west of the long portage. Results on opposite map Greenstone forms the large knobs rising from the shore, but granite occurs everywh where immediately at the shore. The greenstone is the same as material seen during the morning. At the extreme w west end of the bay the granite forms the high knobs.

In the next bay of the river beyond the rapids, the north shore is covered with greenstone, and as before, with a small

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ledge of granite at one place about the center of the bay. The granite is flanked north and south by greenstone.

July 8.

Ran up the east line of 27, and 15 -63-10 offset 1000 paces W., and then south to the lake.

28525. At the lake shore is a coarse red granite is large exposures. At a depressin in this granite is a small area of horn-blende schist, but whether a dike or an qinclusion I could not tell.

N 28526. At 100 N of the shore the coarse red granite gives way to what I would call the same-material hornblende-schist, but which is really a hornblende gneiss. Tis at first is rather fine grained, but

28527 at 125 N. becomes coarse and more nearly resembles a granite.

28528. At 185 N., the typical coarse red granite-gneiss again comes in. This is more schistose than What I would call the same material far to the west, where we camp.

The general strike of all the above rocks is N. 55° E.

S. 15 T. 63 R. 10 g. aa Fram. P 6-747

At 250 N. this granite is cut by an undoubted dike of the typical black horn-blende schist, with sharp contact. 28529 is a specimen of this.

The corner is 250 N. of the lake, as determined by corrections found alater in

the dayl

Alternations of the fine and coarse granite gneiss, with occasional black hornblende-schist areas, continue to 200 N of the corner.

At 300 N. the aa greenstone comes in, separated from the granite by about two feet. Find no absolute contact.

At \$00 N. the aa greenstone is presumably cut by a coarse labradorite-porphyrite. Yet I could discover no contact, and it is possible that this is a phase of the same rock. My impression is that it is a dike cutting the aa material.

The aa greenstone continues to 490 N. At one or two places phases were seen which resemble 28530.

At 630 N., typical white-eyed granite-porphyry appears.

After this the greenstone again appears and continues in very frequent exposure to 950 N.

At 1540 N. is greenstone schist knob covered with moss. It is believed, however to be the aa. Fine grained.

At 1500 N. same thing

410 N., in sec. 15 O. W. is small ledge of the white-eyed granite-porphyry.

820 N. greenstone, probably aa. Much brecciated.

This is followed immediately by the white-eyed porphyry, - and this again after 150 paces by aa greenstone.

Struck quarter post at 955 N., and road 80 N. of the quarter post.

By direction of Prof. Bayley followed road northwest to the north quarter post of the section.

On the road northwest for 300 paces

typical aa greenstone was crossed.

At 430 NW along the road, on the knoll marked on the topographic sketch opposite, black jasper was struck. This is much crumpled, but has a general strike of N. 80 W. The rock is so crumpled that could not even guess the dip. The belt is not more than 5 paces across where exposed. However, the exposure is poor, and the belt may be wider. Was abbe to follow the belt

east of the road 100 paces, and west of the road 50 paces.

The jasper is followed immediately to the north by a high hill of greenstone. This greenstone is rather massive. Could discover no traces of the aa structure, yet the rock had the general aspect of the

fine grained aa material.

Leaving this ridge and going northwest along the road, greenstone continues, now assuming the aa characters.

Reaching the north quarter post of 15 turned south.

In the entire south run through 15 and 22, greenstone only was found, and this in almost continuous exposure. Its exposure is indicated on the plat. Nowhere did I see undoubted ass- as structures, as most of the exposures are moss covered, but near the lake near the south end of the run the greenstone forms huge knobs, which, while not showing the as forms, show a flowage structure, and what appear to be portions of the matrix material of the as greenstones. In general the greenstone appears to me to belong with the as material.

Within 50 paces of the lake the greenstone takes on a mottled phase, like 28530.

From here to the lake is a coarse red granite, very much brecciated.
28531 shows the precciated character of the weathered surface.

T. 63 R. 10 S. Cov. 6-747

Then worked the north shore in 22-63-10 between the quarter line and the east section line. Results indicated on topographic sketch on opposite page.

In general the greenstone forms high knobs, and the granite occupies the low ground on the shore. The granite is the

coarse red variety.

S. TWIN LAKE. S. 24 т. 63 6-747

Monday, Jan. 11.

Started on the east line of 24-63-10, and ran north to Twin lake. Offset west 1000 paces, and then south to the Kawishiwi river.

At the river is a coarse hornblendegranite, here slightly schistose. This is cut in one place by a fine grained granite, which has been very much squeezed, and contains stringers of the coarse granite. The dikes are parallel to the schistosity, which itself runs N. 80° W. m 28532 is the fine grained granite.

The granite, with frequent dikes of

the finer material, continues to 830 N.

At 900 N. greenstone comes in. This is at first very schistose and brecciated, but soon shows traces of the aa structure.

The greenstone continues to 1200 N. From 1000 to 1200 N. there is a large west variation of the magnetic needle.

1400 N. Greenstone. Poor exposures, but apparently the aa.

There is here a jog in the range line, so that the corner between 18 and 19 of the next range east was struck at 1550 N.

1675 N. greenstone.

1820 N. Greenstone.

T. 63 s.17 28545. Congé. 41.39h. 6-747

The corner between 13 and 24 was struck at 2050 N.

200 N. in Sec. 13. Greenstone, fine grained. Probably aa?
430 N., Same thing.

900 N. Offset west for 475 paces, then south 250 paces to escape lake, and th then so west to the quarter line.

Greenstone, fine grained, continues for entire distance, in very frequent exposure.

Turned south. Greenstone continues in frequent exposure to 1500 south. Toward the south the aa forms are very plainly seen.

At 1500 S. the coarse red granite, slightly schistose, appears. This is interspersed with areas or layers of hornblende schist. or gneiss, like 28533.

They seem to be interbedded. The hornblende rock looks almost tuffaceous in places. Continues to river, 1625 S.

In Sp 28533 to 28548, see end 7 Look, R. 7

18547

R. 7

18547

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July 14.

Ran north from the wagon road on the east line of 9-63-10. Through Sec. 4. Then, on account of the jog in the town line offset west to the southeast corner of 33-64-10, and then north to the marsh. (See topographic map) Offset west to the high hill and then south a little west of the quarter line of 4 and 9.

Along the wagon road in 10-63-10, about 660 west of the quarterpost is a large exposure of jasper.

The road is 200 N. of the SE corner of 99. From here to 1000 N. greenstone is crossed in exceedingly frequent exposure, and much of it showing the aa forms.

At 1000 N. offset west 150 paces to clear clear lake.

At 1100 N. 180 W. is an exposure of the typical white-eyed granite porphyry.

This is immediately followed by greenstone, which continues 1500 N. Has the same aspect as the aa greenstone to soutm but does not show the forms.

In Sec. 33, 80 N. 0 W., the greenstone 28549 appears, and continues to 300 N. Again seen at 400 N.

R. /0 6-747

Offset west 550 paces, then north, and west again to 700 N. 750 W. Greenstone like 28549 here found.

Looked for conglomerate on the hill next to the creek, but found none. This is nothing but a big moss-covered hill, wih no exposure that I could find. Was directed to do this by Prof. Bayley.

Greenstone. This continues s to 50 S. in Sec. 4. When we reached Sec. 4, on account of the jog were 200 paces west of the quarter line.

Greenstone appears at 400 S. in 9 and continues to 800 South.

9 28551. At 1230 S. is an exposure of coarse diabase.

This is immediately followed by the ordinary greenstone crossed during the day, taken to be the aa, which continues to the road 1615 S.

At the road the typical as characters are seen in the greenstone.

CLEAR L. T. 63 R. 10 S. Schistraty N. 80 E. NORTH TWIN LAKE Typical aa & Eastern arm of M. Twin L. in Tand 18-63-9

July 15.

Worked shores of North Twin Lake. See results on opposite map.

\$ 28552. Greenstone, fine grained.

9 pi 28553. Greenstone coarse grained.

The amygdules on weathered surface stand out, and look like white pebbles. In place es they are so numerous, and the rock so schistose, as to give the rock a conglomeratic or tuffaceous appearance.

9.9 28556. Very schistose green schist. Strik

4 28557. Greenstone. Su next page.

M.M.28558. Green schist.

95 28559. Exceedingly fissile green schist

28560. Green schist. Heldspan-Juphyn

28561. Acid schistose porphyry.

The lake is completely surrounded by greenstone, in practically continuous exposure. The ledges are generally very massive, and exhibit no peculiar structural features. At one place, just oppo-

site the camp are aa forms.

28557. Greenstone. This material may perhaps be taken as more nearly typical than any other of the exposures seen on the south side of the lake.

Ran north from North Twin lake, on the quarter line of 9-63-10, and back 500 W., the object being to find jasper.

At 380 N. of the lake is fine grained egreenstone.

28560. 550 N., is coarse porphyritic greenstone, conraining dark fragments.

630 N., Another exposure of greenstone, like that at the lake. Taken to be the aa.

1280 N. fissile green schist like 28559.

Offset west 500 paces and then north to the lake, which was reached at 1600 N. Greenstone identical with that at North Twin is crossed the entire distance. Near the lake shore are several exposures of te greenstone, somewhat brecciated, but probably the aa material.

Reaching the lake, turned south.

T. 63 S. R./0 \$ 28563 CC Sulvitas gran Tiff 000 S TWEN LAKE

During entire run south to North Twin lake, nothing but the typical greenstone is frequent and good exposure was crossed.

Most of it is massive, but some schistose, striking N. 80 E. Could find no aa forms but the whole reminded me of this material.

No jasper, nor any magnetic variation was found in the section.

July 16.

Worked shore of South Twin Lake. Results on plat.

28562. Greenstone. This material is very massive, and the outcrop shows no structure

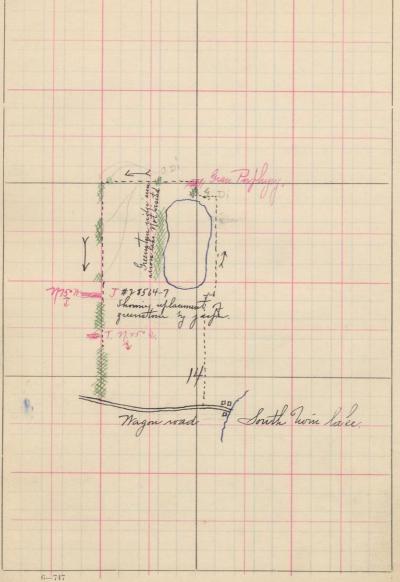
1 28563. Schistose greenstone tuff.

From South Twin lake ran north in Sec. 14-63-10 to look for jasper in the north-west quarter of the section. Dr. Clements has previously run down the west line, and crossed no jasper.

At 940 N. of the lake is greenstone, like 28562. Coarse grained and very massive

Continues to 1150 N., where we strike the section line.

s. 14 T. 63 R. 10



At 1150 N. is typical white-eyed granite porphyry. The exposure is small, and I could not be absolutely stre that the exposure was in place, but I think it is.

On the section line offset west 500 paces.

At 200 W. greenstone, like 28562.

At 450 W., the same thing.

At 500 W. turned south. For fist 100 paces greenstone like above is arossed.

At 200 S. is an enormous blowout of the same material. Fontinues for 100 paces.

At 500 south is the same thing.

At 590 S., 1530 W., in Sec. \$\frac{14-63-10}\$ strike jasper, or rether heavily ferruginous chert. In places it is a banded dirty gray chert, and in places it is ferruginous, and in still other places it is a true jasper, strongly effecting the needle. The jasper seems here undoubtedly to be the result of silicification and ferrugination of the greenstone. Quartz is seen intricate associated with the greenstone, as a result of alteration or replacement, and this in places becomes impregnated with the iron. The following set of specimens shows the gradation very

nicely.

- M 28564. Shows beginning silicification of the greenstone.
- 1'28565. Shows the same thing.
- 28566 shows the silica somewhat colored by the iron.
- 15 28567. shows the true jasper.

The ledge runs from 1530 W. to 1610 W. The belt is about 5 paces wide, and is in good exposure. Everywhere it is so thoroughly intermixed with greenstone as to show conclusively its origin.

On the south greenstone in typical exposure immediately follows. T

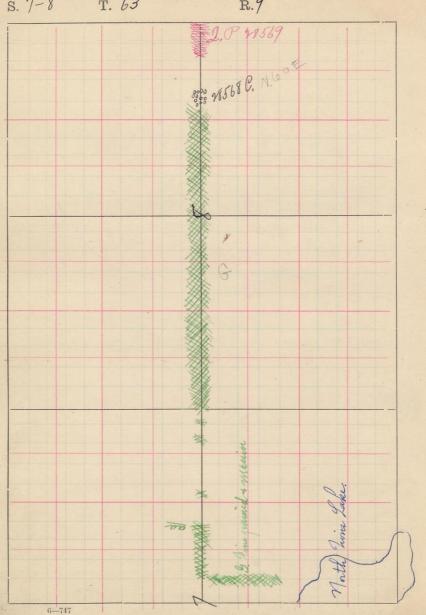
The strike of the jasper belt is and associated greenstone is N. 75 W., and the dip almost vertical to the south.

The greenstone continues to 800 S. and 1515 W., where another belt of jasper appears. This belt is typical black and red jasper. It is fully 25 paces wide.

The strike is N. 25° E., and the dip almost vertical to the southeast. It

was traced along the strike for 50 paces each side of the course.

Greenstone immediately follows, and continues south to the road, 1115 south.



July 18.

Started from the east arm of North Twin lake, and ran north to the center of Sec. 7-63-9, then east along the quarter line to the center of Sec. 9-63-9.

100 N. of the lake shore and 100 paces E. is greenstone like that at the lake shore. Fine grained and massive.

This continues in frequent exposure to 450 N.

In running east from the center of the section greenstone is found in very frequent exposure to 400 W. Here the aa forms are for the first time seen.

At 580 E. Fine grained and massive greenstone. Similar to the aa.

800 E. Same thing.

900 Same thing.

Struck section line, and had to offset 60 paces north to find the quarter post.

Then ran east on the true quarter line.
The greenstone is in continuous exposure
for practically the entire distance to 1
1575 E. in Sec. 8. Here in the greenstone
is what I would call a large fragment of

s. 9 R. 9 т. 63 985774. E. sulvistan 145 W 6 - 747

conglomerate, 28568

The relations seem clear, but there is just a possibility that the entire ledge is erratic. Still the fact remains that the conglomerate is entirely surrounded by the greenstone, and apparently encl sed in it.

The conglomerate was followed in broken and irr gular exposure for 100 paces, and further observation seems to indicate that it is a belt, closely infolded with the greenstone. Large fragments of true jasper occur in it.

The strike is N. 60 E.

At 1850 E. is a large ledge of the quartz perphyry. This continues to 2000 E, where a specimen is taken, 28569.

This seems to grade at 250 E. in 9, into what I would call a finer grained and schistose phase of the same rock.

28570 is a specimen of this rock.

Strike. N. 45 W.

28571. This soon becomes coarses again, and at 600 E. becomes like 28571. Occasionally also it takes on a reddish tinge on weathered surface, so that it resembles granite.

The norphyry is cut in numerous places

by narrow dikes of coarse black dolerite.

At 860 E. green schist comes in and continues to 975 E., where a conglomeratic schist, 28572, appears, striking N. 45 W. 28572.

28573. This material has bands of fine banded material in it. Looks like a horn-blende-schist.

R. 10 6-747

July 20.

Worked shores of Jasper Lake, and the portage south into Mud lake, and the big hill along the south side of Jasper lake. Results on opposite plat.

h.M 28574. Massive greenstone.

M.M 28575. Greenstone, a little coarser.

Along the portage trail from Jasper to Mud lake, at 160 paces from the Jasper lake end is a very fine grained greenstone, like 28562, here, however, somewhat fissile The strike is N. 55° E. This continues in poor and rather infrequent exposure to 245 S. along thetrail.

At 460 S. is the same thing.

started from the trail at 100 north of the Mid lake end, and ran east on to the big ridge overlooking the south shore of Jasper lake. See opposite plat

T. 63 S. / R. /0 Jaspa Lake 4-80-1-2. Variolitie as green Sec. 1-63-10. 6 - 747

Started from the Jasper-Mud lake trail at 100 north of the Mud lake end, and ran east on to the big ridge overlooking the south shore of Jasper lake. See opposite plat.

At 160 E. of starting point strike ridge of fine grained greenstone. Somewhat fissile. Strike N. 40 E. Continues to 200 E.

At 475 E. Greenstone, more massive, and a little coarser. Continues for 100 paces.

At 650 E. and 100 N. of the starting point is the same thing.

28576. 660 E. and 160 N., is greenstone tuff or conglomerate, containing hasper and quartz fragments. Most of the fragments are angular, but some are distintly rounded.

2857 . Same thing.

At 660 E., 200 N. comes in a beautiful aa greenstone, showing rost beautiful varioles. These are exposed for 50 paces north and south in a most beautiful manner. Some of the variolites run up to several inches in diameter, and the spheroidal

partings reach a size of 18 inches in diameter.

28578 28579 28580 28581

28582

Specimens of the spheroidal green stone, with variolites.

Greenstone continues to 300 N. 660 E., to the edge of the ridge overlooking the lake. Here, however, it takes on a different form, being the ordinary fine grained somewhat fissile schist.

Running west slong the crest of the ridg the same material continues, striking N. 80 E. In places the variolites are to be seen. These are particularly well developed at 325 E. 400 N. In places also the schistose material passes into the massive. All of these green stones are clearly phases of the same flow.

The greenstone, principally a schist, but showing massive phases, continues to

the portage trail.

Following along the lake shore of Jasper lake, at the foot of the ridge, 100 paces east of the portage trail, and 15 paces from the shore, is a narrow belt of jasper, not more than 10 feet thick, dipping south 35° and striking N. 80° E.

The exposures are poor, the largest being only 5 paces long. The jasper is the ordin ary black and red jasper, and dips under the greenstone forming the rdiege-ridge. The immediately adjacent greenstone is a massive porphyrite, of which I took a specimen, but this specimen has been lost in shipment.

Debris from the jasper is found at the portage trail, and sparingly at the lake shore, but one might pass along the ridge a few feet from the jasper and not discover

it, as it dips under the greenstone.

T. 64 R. 9 6-747

Ran north from Wind Lake. on the east line of 18 and 7-64-9.to interesct boundary of granite.

No exposure was found until 25 N. O W. in Sec. 7 is reached, where appears a coarse hornblende rock, 28583.

This continues in frequent moss covered exposures to 680 N.

Satisfied that the main granite area was reached, turned eas-west and ran to the quarter line. The entire offet was made in a tamarack swamp, until a low ridge at 900 W., 680 N. is reached. This ridge is red granite, like 28584.

Ran south on the quarter line.
At 180 N. of the south line of Sec. 7 is a low moss covered knob with much granite debris. I think this is really a granite outcrop in place, but could not be sure.

At 280 S. 1000W. in Sec. 18, is a small low undoubted exposure of the same granite.

28585. At 450 S. is a heavy black hornblende schist. Here again I could not be absolutely sure that the rock was in place, but I think it is. Search for 100 paces on each side failed to reveal any more.

% 28586. At 500 S. in 18. Granite.

28587. On the lake shore is a kind of coar coarse hornblende granite or gneiss.

The strike is N. 45 E.., and the dip 10° to the south.

R.+0 9(3) T. 64 S. 6-747

July 22.

Worked shores of Moose lake. Results on plat.

28588. Slate, very fissile, Strike N. 70 E Dip vertical. Perfect cleavage.

28589. Sericite schist. In ledge appears more fissile than in hand specimen. Looks kike a sheared quartz porphyry.

28590. Greenish quartz porphyry. This is evidently the unsheared form of 89.

28591. Green schist, striking N. 70 E. This seems to be a less sheared form of the slate to the east. This rock looks to mevery seimilar to the schistose eruptive greenstones which I have previously seen in the district.

28592. Green schist. Strike N. 80 E. Continuation of the same belt.

28593. Massive fine grained greenstone.

28594. Acid porphyritic schist.

Just around the point is a true sericite which which is evidently a more metamorphosed phase of 28593. 28595. Green schist.

knob 100 paces from the shore. This seems to be the aa material, although I could see no spheroidal parting.

28597. Green schist on island, showing wavy schistosity.

1 28598. Typical sericite-schist. Strike N. 50 E.

4 28599. Green schist. Very even lamination

9 28600. Rather massive fine grained greenstone. It has a slight rift in the general direction of the strike of the rocks of the lake, but in general is very massive.

28601. Porphyritic schist. This occurs close to the shore. Just south of it is 28602, another porphyritic schist. This may be simply a more altered phase of the other, but of this I was not sure. Could find no contact.

28603. Sericite-schist from island.

94 R./0 S. 10 2860 38606 9.5. 7.706. = 9.5. like 606 = 8.5. 30 = 3.5. 9550 = 5.5. N70 € = 5.5. SQ \$ 3.28604 6604 # 6.8. 36 aspu Lake 6 - 747

July 23.

Ran north on the east line of 25-and-25--- 36 and 25 - 64-10, from the Jasper-Moose portage trail, west 1000 paces, and south to Jasper lake.

At 300 N. of the portage trail is green schist, like 28593, perhaps more schistose. Strike N. 80 E. Dip vertical.

Continues to 400 N.

At 1100 N. is the banded slate seen on the north shore of Moose lake. Strike N. 75° E.

on the north bank of the river, 100 paces south of the north line of 36 and 2

On the north bank of the river on the north line, and 250 west of the corner, is the same slate.

The corner is struck at 1225 N. of the portage.

28604. At 65 N. O W. in 25 is the black

massive hornblendic greenstone.

28605. At 215 N. O W. in 25 is a ledge of very siliceous rock which resembles a quartzite. May be some vein formation.

325 N. is slate again. It here has a more greenish tinge, and shows undoubtedly that it is an eruptive.

560 N. is green s schist, with wavy lamination, resembling 28591.

1580 N., O W. is banded green schist, like 28606.

28606. 1640 M., 300 W. in 25. Green schist. Strike N. 70° E. Dip almost vertical, perhaps 5° to the south. This continues to the line and 375 W.

On the line ran west, and found the same thing to 700 W. Here open tamarack swamp comes in.

At 480 S., 1000 W. in 25 is green schist exactly like 286064

At 800 S., 1000 W. is typical green schist.

1400 S., 1000 W. Rotten green schist.

1515 S. 1000 W. Green schist, very fissile. So fissile that it approaches in appearance

the slate on the north shore of Moose lake. Strike N. 70 E.

1650 S., 1000 W. True slate, with wavy laminae, identical with Moose lake slate.

28608. 1830 S. 1000 W. in 25. Very silic ous sericite schist. This I should call a metamor hosed phase of 28605.

28609. 200 S. 1000 W. in 36 is green schist with wavy laminae. Possibly slightly fragmental.

290 S. 1000 W. in 36 is greenstone like 28604.

Strike river at 325 S.

At \$ 780 S. is typical very fissile, bright green, schist. Debris of this material has been crossed over for last 100 paces.

900 to 1000 S. 1000 W. in 36 is typical br bright green schist. Continues to 1200 S.

Then ran east to the portage. The green schist continues east for 600 paces, and then takes on the massive form of the greenstone seen on the Moose lake portage.

R. 70 T. 64 S. Wind Lake Lake toundaries med hart taken from toprographic map. 6 - 747

July 25.

Ran north from Moose lake on the west line of 29-64-9, to Wind lake, and then several short cross sections between the two lakes east to the portahe trail.

100 N. of the lake on the W. line of 29 is wht white weathering slate or green schist of the north shore of Moose lake.

300 N. More of the same material.

450 N. Normal green schist.

The quarter post is struck at 570 N.

Strike creek at 1720 N. of the SW corner of 29.

At 1800 N. Typical slate.or green schis

Strike corner at 1170 N of quarter post.

80 N. O E. in Sec. 20 is very fissile green schist, striking N. 80° E. However, it is here very much contorted on weathered surface, and very rough, as though a fragmental greenstone of some kind, possibly a conglomerate or the aa form, had been mashed into this form.

28610. Specimen from weathered surface.

480 N. O E. in 20. Fissile green schist, resembling 28610.

28611. A few paces farther on in the same exposure the rock becomes a typical greenstone conglomerate, showing that my diagnosis of the rock 28610 was correct.

At 600 N. Again the fissile slate or green schist.

From 770 to 900 N. is typical green schist. Very green and very fissile. At 700 It seems to show something of the fragmental character of 610.

Reaching high ridge overlooking Wind lake, ran east 800 paces.

For the entire distance the green schist is seen in very frequent exposure.

From 900 N., 800 E. in 20, ran south. For the first 100 paces is the typical green schist.

At 130 S. the schist begins to show the fragmental forms like 610. Is every-evidently a very schistose phase of 611.

At 680 S. is typical green schist.

At 300 S., 800 E. in 28, strike water. This may be an arm of the lake, and may be a widening of the stream. Could not tell from map. (hownship plat. I.k. a top graphic map.

At 250 S. in 29, offset east 5 00 paces, and then north to the portage trail

At 50 paces south of the N. line of 29 and 1300 E. is typical green schist, bri bright green.

At 40 to 100 N. , 1300 E. in 20, is exceedingly fissile green schist.

300 N., 1300 E., same thing.

28612. 400 N., 1300 E. in 20 is schistose greenstone showing very slightly a conglomeratic character. This is immediately followed by the typical white-weathering slate.

570 N., 1300 E. is green schist showing fragmental forms like 28610.

700 to 900 N., 13 OOEis an almost continuous exposure of typical white weathering green schist, with no trace of the fragmental character.

Wind lake was struck at 1100 N., 1300 E

S. 20 T. 64 R. +0 9 Wind Jake

Offset east 150 paces along the shore to the Wind lake end of the portage trail. Thus the location of the Wind lake end of the Portage Trail is 1100 N., 1450 E. in 20. Aunding to Mellis paging, Consular from Sk. come of 20. Upographic man different.

Now worked the portage trail between Wind and Moose lakes, beginning at the

Wind lake end.

quarte

1.5 28613. Just south of the trail, about on the section line is green schist. This has a very rough weathered surface, which may indicate a fragmental character I was not sure whether or not it was a squeezed conglomerate.

100 paces southeast from the line along the trail is a big blowout of conglomerate.

28614-15. This conglomerate to the west of the trail apparently contains nothing but granite bowlders, some of which run up to a foot in diameter. On fresh fracture this conglomerate seems to be a fine grained greenstone conglomerate.

28616. On the east side of the trail the conglomerate contains a great deal of masper in fragments and in lenses.

28617 shows some of the japer. On the weathered surface of this specimen is also a minute fault cleavage.

28618 is another specimen of the conglomeratic material containing jasper. It looks to me as though the jasper was secondary after the conglomeratem instead of included in it as fragments.

All of the above material is very rotten

. and it is hard to get good specimens.

The strike is N. 40° E.

The granite-looking pebbles seem really to be a bluish red quartz porphyry, somewhat discolored by epidote on the weathered surface.

This ridge was traced 60 paces NE and 125 paces SW., where in each case it is cut off by a swamp. On the southwest, along the strike, is a hill of green schist which I crossed in the morning.

The entire conglomerate is squeezed so a as to have a very pronounced schistosity striking as above.

200 paces southeast of where the portage crosses the line, 100 paces south of the above ridge, is another ridge of identical material. Here however, the jasper is comparatively rare.

The jasper seems sometimes to be in true fragments, and in other cases occurs interbanded with the greenstone, like stringers, here being evidently a replacement.

28619 a specimen showing jasper.

28620. This is what I would call a fair average specimen of the matrix material of this conglomerate. This is extremely sparse, and I was a little in doubt as to whether this was really matrix material, but I think it is

285 southeast from where the section line crosses the trail, and 85 paces south of the last ridge, is another ridge of conglomerate. A large part of this ledge is a greenstone, with a peculiat mottled weathered surface.

28621. The greenstone.

The jasper is here the best exposed of any place yet seen along the trail. Here it is almost entirely in stringers and fragments. One band several feet wide can be followed for 50 paces. It is everywhere in shred through the conglomerate.

28622 shows its relation to the pebbles of the conglomerate. It is to be noted that

the granite or porphyry pebbles are well rounded throughout, and are almost never drawn out, while the jasper is always in stringers, as if following flow lines and layers as a result of the alteration of the greenstone. It looks to me as though we had here a greenstone conglomerate which has been intruded by a liquid gr basic magma parallel to the schistosity, and the whole squeezed together. From this secondary greenstone the jasper has entirely developed. This later greenstone is also in wavy stringers like the jasper, and evidently is a later intrusion.

The relation of 28621, the mottled green stone, to the conglomerate, I cannot make out. It seems to grade over into it. However, some of the probles of the conglomerate seem to be identical with the material of 621. If the peobles like 621 in the conglomerate were to be explained as inclusions caught up by a later greenstone, this would be a satisfactory explanation.

At one or two places greenstone like 28621 was found to contain large rounded fragments of material exactly like itself, as will be seen by comparing with 28623

It may be possible that the greenstone 621 is really a later intrusion than any of the others. This would explain the presence in it of the jasper and conglomerate pebbles.

Just to the north of this belt is a true slate, in the process of going over into jasper.

28624 shows the process. My guess is that the slate is a water deposited volcanic fragmental, which has been squeezed, and is being replaced along certain bands by jasper. The specimen shows some interesting fracturing. Under pressure the shaly layers have yelded by flow and the harder siliceous and partially jasperized layers have yielded by fracture along the shorter diagonals of the sheared figures, i. e., by stretching.

In the field this material has been subjected to such pressure that the exposures are little more than a mass of rubble. Not a solid hand specimen is to be obtained.

This is immediately followed by

28625, a typical banded slate.

This is followed immediately by 2

1 /2w 28626, and this by

51 28627. There are all green schists, and apparently phases of the same rock.

A little farther on, at 340 from where the trail crosses the section line, and 175 paces from the Moose lake end of the portage, is a very siliceous acid porphyry. It is composed largely of quartz which looks like vein material, and a smaller proportion of green porphyritic material.

VP 28628 . Two specimens of this rock.

From 420 from where the portage trail crossed the line, to the shore, are several exposures of rotten green slate or schist. This is here so schistose as to be almost a sericite slate.

Strike Moose lake at 540 SE from where the portage crosses the line.

T. 63 R. 9 S. 56.28629 My.387 33 9 28 633 S.C. g. ac S. le. con. 4. g.C. 3guded 7.65

July 26.

Ran south on the east line of 33 and 4, and 9, T. 63 and 64, R. 9. from Flask lake.

100 S. of the lake is an exceedingly fine grained and massive rock, weathering white, a like the fine grained part of 28629.

28629. Banded rock at 170 S. of the lake. This I think is sedimentary. The coarser bands are distinctly fragmental.

The banded rock was followed to 400 S., with a varying strike, but in general almost due north and south. Here I took another specimen, in which the coarser bands have a little different aspect. 28630.

At 500 S. The coarser bands become more distinctly conglomeratic, some of the fragments reaching two or three inches across.

I think there is here a later eruptive greenstone cutting thes conglomerate and infolded with it in a most complicated manner. Much of the material appears in

irregular areas and fragments, and in one or two cases they appear to be eruptive. From one of these fragments I took 28631, which seems to be a greenstone conglomerate or possibly a variolitic greenstone. 28631.

The strike are rather uniformly 30° W. of N.

In places the banded material is evenly banded with a coarse greenstone in very narrow bands. 28632 shows a weathered surface.
28632. 760 S.

-)This band was very uniform for som
These bands are very uniform for some
distances, and give the rock almost the
appearance of jasper. The specimen was
taken at 760 S.

The banded material, now striking nearly N. and S. was followed to about 800 S., where we entered a marsh.

At 950 from the lake is

28633, a massive greenstone porphyrite, wh which on the weathered surface sometimes resembles a conglomerate.

At about 1200 S. it loses its porphyritic character, and takes on a tuffaceous or conglomeratic character.

From 1200 to 1500 S. it is a regular greenstone-conglomerate. The fragments are for the most part entirely of the same kind of greenstone, and are but imperfectly rounded. In one or two places jasper and white quartz fragments were also found. This series of exposures seems to me to sow beyond a question that the jasper and quartz are but alteration products of the greenstone fragments in the conglomerate, and that the conglomerate, rather than being a basal one is really eruptive. This series of fragmental greenstone exposures is an immense one, and extends east and west as far as the eye can see.

At 1500 S. apparently the same greenstom takes on undoubted as characters, and a little farther on the tuffaceous characters again appear in the same rock. It seems to me that there is no doubt that the two are the same thing. This rock continues to 1900 S., which we estimate to be the south line of the section.

Greenstone, sometimes massive, sometimes coarse grained, sometimes very fine grained and sometimes showing fluidal characters

continues to 430 S. in Sec. 4. At 430 S. it shows the conglomeratic phase. Here there are large fragments and bowlders of greenstone, jasper, and white quartz, but they do not differ feom those seen to the north. From here on the greenstone is more massive and coarser grained, resembling a coarse dolerite. It may possibly be here a later intrusion.

From 430 to 1000 S. in Sec. 9, are frequent exposures of the greenstone, showing various phases, sometimes banded, and sometimes showing the aa forms, but all evidently a part of the same mass.

The south line of Sec. # is reached at 1000 S.

From 0 to 440 S. in Sec. 9, 400 W. (on account of the jog in the town line) is frequent exposure of greenstone. The aa forms frequently appear, but not the conglomeratic forms. It may be noted that when the aa greenstone is mashed, it has a banded structure which resembles that of the conglomerate seen far to the north.

At 440 S., 400 W. in Sec. 9, little areas and fragments of reddish quartz porphyry are to be seen in the greenstone, as though caught it. Whether later or

older than the greenstone I do not know.

At 500 S. struck marsh, which continues to 1000 S. Then ran west.

At 1000 S. and 500 W. of the line, in the marsh, is a knob of

28634 green slate or schist

At 800 west is the same thing.

At 1400 W., 1000 S. in Sec. 9 we ran north.

From 1000 S. to 500 S. is almost continuous exposure of the banded material, resembling slate and graywacke described in the morning. The strike is N. 65° W.

At several places this banded rock is cut by distinct dikes of coarse greenstone which may be of the same age as the aa.

At 600 S. of the line the rock is cut by a large dike of quartz porphyry, weathering white.

The green- banded material runs to 120 S. of the line, where the first greens stone conglomerate appears. The conglomerate is here cut by dikes of coarse doler-

ite. The greenstone of the conglomerate is porphyritic, like 28633. This is followed immediately by the typical banded material, which continues to 325 N. in 4.

At 325 N. in Sec. 4, is more of the banded material mixed in a very intricate manner with greemstone. I could not make out their relations. The greenstone in places shows a very slightly conglomeratic phase.

In Sec. 4 we are now again on the quarter line, because of the jog.

At 325 N., 1000 W. in 4 strike a lake, and offset west 300 paces, then north to 700 N., and then back again to within 275 paces of the quarter line.

At 650 N., 1300 W. is typical greenstone conglomerate containing a few fragments of jasper. This is very intricately associated with greenstone of at least two ages, but the exact relations I was unable to make out. Up to this point the typical banded slate and graywacke material prevait

From here to 700 N., we meet with greenstone, occasionally showing as forms, and varying greatly in texture and structure. At 800 N., 1000 W. in Sec. 4, is a belt of jasper, about three paces across, in the massive greenstone. It is very much contorted, so that no strike is obtainable. This occurs on a neck between two little lakes indicated on the plat.

Ran east 100 paces so as to offset the lake to the north. In this distance there are a half dozen small lenses of jasper, pinched out at the ends, and but two or three feet wide. Their general strike is N. 45° E. At the east the jasper is in close association with the typical band d material. However, in general it is connected with the greenstone intruding this material.

From 800 N., 1000 W. in 4 to 400 N., 1000 W. in 33, is almost continuous exposure of massive greenstone, frequently showing the aa forms. I think the whole is without doubt the aa material.

28635. At 400 N. in 33 is the greenstone conglomerate.

This is followed immediately by massive greenstone, mostly showing the aa forms. This continues in almost continuous exposure to 1275 N.

28636. At 1275 N. is a big blowout of conglomerate. The pebbles here reach the size of six inches, and jasper fragments are very numerous. With the exception of the jasper fragments, this conglomerate seems to be the same as that collected to the south, 28635.

28637. Another specimen of the conglomerate.

This rock is a true conglomerate, and the jasper fragments have an entirely different aspect from those which are believed to be alteration products of the intruding greenstone. The jasper here is always in subangular forms, sometimes partially rounded, and are never in shreds or stringers.

The belt trends N. 45 W, - the slight

schistosity.

This is followed immediately by massive greenstone, -which-I-think-is--

At 1400 N. in 33 another belt of the same conglomerate appears, here also with jasper fragments.

This belt is 75 paces wide, and trends NW and SE.

This is followed immediately by the banded material seen in the morning, and this at 1600 N. by coarsely crystalline porphyritic greenstone like 28633.

This is followed immediately by banded material, typical, which continues to the creek., 1700 N., and for loo paces beyond, to 1850 N.

From here to the portage trail, 150 N., in 28, is frequent exposure of very massive greenstone, in a number of places with large porphyritic phenocrysts like 633, In general this-weathere weathering pink. There can be down on doubt as to its character.

At 750 N., in 28 massive fine grained greenstone appears, and continues to 950 N., where the greenstone conglomerate of Moose lake appears

s. 78 T. 64 R. 9 An remainder of Sec. 28, see following note book, Mo-3/5 6 - 747

Worked the Moose lake-Flask lake portage trail from where we struck it, 150 N., 1000 W. in 28 to Moose lake.

For the first 150 paces there is the porphyritic greenstone, like the specimen.

28638. At 150 NW is what I would call a typical green schist if found alone, but at 185 paces it apparently passes into banded material similar to that described this morning. However, here the coarser and finer parts are not in even bands, and they cannot be shown in a single hand specimen.

4 28639 shows a fine band

1t may be that we have here a true sedimentary intruded by an eruptive.

At 230 NW is typical greenstone-conglomerate, with no jasper fragments. This var ing in coarseness continues to 500 paces NW.

QP 28641. At 570 is a white-weathering quartz porphyry. This continues to 640, and takes on a reddish tinge, resembling granite on weathered surface.

At 640 is green schist, rather coarse grained and massive. At 690 it contains several large round fragments of another scoriaceous greenstone.

From 700 to 890 are a number of small exposures of the typical greenstone conglom erature

Strike Moose lake at 1000 paces, with a black storm down upon us.

July 12. See maf opposite p. 15.

Started north from the Kawishiwi river on the east line of 17-63-9.

28533. 100 paces from the river, is Hornblende-gneiss?

At 200 N. apparently the same rock takes on a conglomeratuc phase. On the weathered surface may be seen round or oval areas of the same kind of rock as matrix, though occasionally they are colored greenish yellow by epidote. In places they are also somewhat silicified, resembling quartzite.

28534 28537 28538

Phases of the conglomerate.

Some of the pebbles are several inches across.

This material continues in frequent exposure and typical development to 50 paces beyond the quarter post, which was struck at 700 N. from the river.

At 1420 N. the first undoubted greenstone was found. This is a dark massive areanstone

greenstone, showing faint traces of the aa forms.

A little farther on these forms are

seen typically developed.

28539. At 1830 N. in an exposure of the greenstone showing aa forms, is found a tuffaceous phase, 28539. Fragments small and angular.

At the NE corner of 17, offset west for 1000 paces, and then south to the river.

Greenstone is found all the way from 1400 N.. O W. north and west on the offset. and south again, to 875 S. Same material

as that showing aa forms.

At 875 S. 1000 W. is a true conglomerate, containing fragments of granite .--quartzite?-jasper-and-possibly-also-green-stone, the peculiar greenstone which weathers like granite. This is the typical greenstone conglomerate seen about Moose lake.

28540 28541

Specimens of the conglomerate.

28542 28543

In going on the conglomerate assumes an aspect similar to the conglomerate seen on the north run. Frequent and good exposures to 1200 S.

28544. At 1200 S. undoubted jasper pebbles were found in the conglomerate. Undoubtedly the same conglomerate.

The conglomerate, without jasper pebbles, continues south to 1750 S. Here we pass on to a conglomeratic hornblende gneiss, with apparently no break.

28545, the gneiss. At one place this is seen to be infolded in a most intricate fashion with a coarse black hornblendeschist. The relations of this hornblendto rock to the conglomerate will bear further study. The relations are obscure, and are not to be made out by a single traverse.

28546. At the shore is a hornblendic rock, which I cannot name.

Worked along the north shore of the Kawishiwi river in 20-63-9, from the quarter line west to the section line.

28547. From the quarter line to 150 paces along the shore, the rock is a hornblende schist or gneiss.

At 300 W. on little point, is the same thing.

In the next bay is some of the conglomerate crossed on the morning run.

From here on to the west section line the shore shows but phases of the greenstone conglomerate (like 28534-8)

In some places it is very schistose, but there is little doubt as to its identity.

<u>28548</u>. Peculiar conglomeratic hornblende schist or gneiss, from little island about 1/4 miles west.

