8

Spears Ferry p. 9 to
Evans Ferry – p. 71

E. O. Ulrich

Appalachian Valley (1)

Notebook 8

1905, 1906, 1907, 1908

U. S. GEOLOGICAL SURVEY
TRAVERSE BOOK

9–904

From Chambersburg 12th Monday A.M. To F
" P.M. " E, C & D.
13th Tuesday via Greencastle pike To H, G. & G1
14th Wednesday to localities in vicinity of Waynesboro.
15 Thursday A.M. To I at Ft. London
" P.M. To K. " Cowans Gap. pike
16 Friday from Ft. London To L & L' near McConnellsburg, thence S. To M and N. and through Fohl's to Mercersburg.
17 Saturday A.M. to J.
" P.M. to Chambersburg.

17. Saturday P.M. to Martinsburg. W. Va.
18 Sunday at " " "
19 Monday " Cacapon " "
20 Tuesday " " "
21 Wednesday } Strasburg Va.
22 Thursday }
23 Friday } Harrisonburg, Va.
24 Saturday }
25 Sunday } Staunton, Va.
26 Monday }
27 Tues[illegible] Clifton Forge, Va.
28 Wed[illegible] ? Lexington, Va.

INDEX

Page.

Stoses section in 1904. at Loc 4.

144 – 60' [illegible] ls, [illegible]
30' [illegible] ls

143 – 20' [illegible] (Diffuse crystal bed)

142 – 15' Same

141 – 80' M. [illegible] } [illegible]

140 – 120' [illegible] ls [illegible]

see p 29

Stose's section in 1904. at [illegible] H.

144 — 60' [illegible] 15, [illegible]
30' [illegible] 15

143 — 20' [illegible] (Bufferan [illegible] bed) }
142 — 15' [illegible] " " } bed 9 of [illegible]
141 — 80' M. [illegible] }

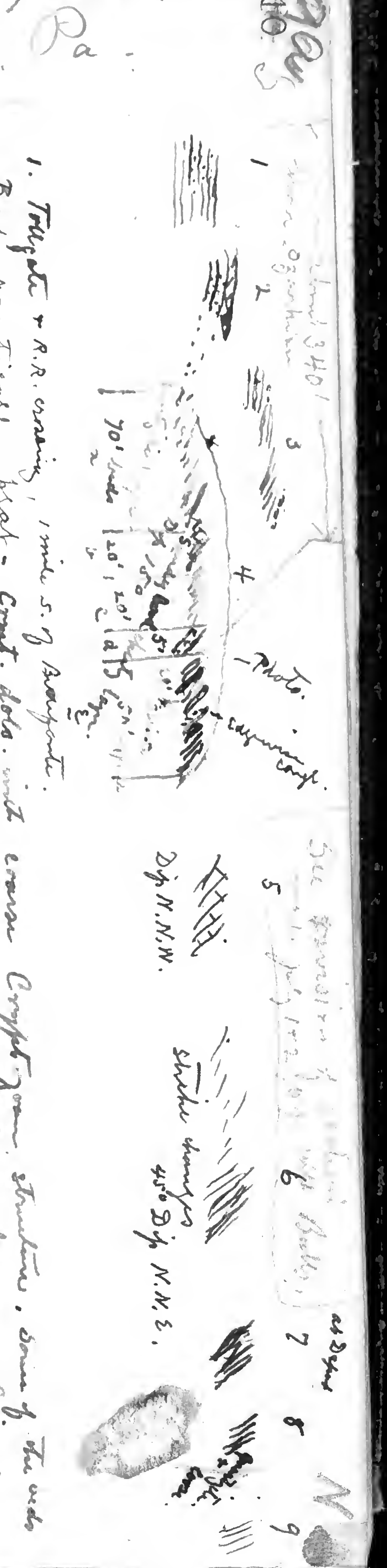
140 — 120' [illegible] 15. Echinosphaerites bed.

6a

2 C + 2 D

June 8, 1905.

Section at Bellefonte, Pa.



1. Tollgate + R.R. crossing, 1 mile S. of Bellefonte.
Rocks practically flat - Crypt. dolo. with coarse Crypt. zoon. structure. Some of the beds full of rounded grains of quartz which in many instances form nuclei of oölite. The latter often silicified. In a blue layer [illegible] ~~[illegible]~~ [illegible] are also [illegible] [illegible] contain grains of quartz. Specimens (4) taken to show [illegible]. ([illegible])

2. 140 yds [illegible] of R.R. crossing [illegible]. [illegible] 20 ft. of rocks above 1. Here some of the layers consist of [illegible] s.s.; others are [illegible] [illegible] [illegible] parts of the latter [illegible] quartzite. Those containing quartzite [illegible] also contain [illegible] [illegible] fine-grained argill. [illegible]. Up to this point rocks are practically [illegible] [illegible] [illegible] [illegible] to [illegible].

3. [illegible] - 203 (opposite stack of Nittany Furnace, and about 200 yds n. of 2) on Nittany Valley R.R. rocks [illegible] to dip n. less than average of 5°. Top of bluff reaches perhaps 75-90 ft. [illegible] [illegible]. Much of this is like beds at 2, one or two of the quartzite ls. cong. layers however attaining thickness of 2'-3'. Some of the dolomite layers also contain similar ls. pebbles. Occasionally a little, [illegible] brecciated chert, though chert is on the whole very scarce. Upper 25 ft at 3 fine grained and thin-bedded. At 3 dip attains about 12°.

4. In wagon road along Nittany Furnace grounds - 135' rocks [illegible] exposed - all dipping 12-15° northward - section begins with quartzite layers like one of those in 2. Above

this [illegible] [illegible] [illegible] [illegible] in blue + thin layers - [illegible] cherty layer - no chert otherwise.

b 20 ft. fine gr. submarine dolo.
c. 20 ft. thin bedded fine-gr. " (earthy)
d 5 ft. massive laminated bed like c otherwise - upper part of bed with lenticular pebbles
e Variable grained, thick + thin bedded in lower half, prevailingly thin + earthy in upper half. ~~[illegible]~~ Several layers distinct conglomerate - pebbles lenticular - one layer markedly edge wise 28 ft. above base. - 8 ft beneath this thin layer - only slightly magnesian and dark sub crypt - is full of small ~~Ophileta~~ Raphistomina + ? streptorhoid form.

5 Limestone shown in old quarry, 150 - 200 ft. higher in series - Small gastropods like at 4 seen in heavy ~~black~~ dark gray dolo.
< Nittany dol.

6. City Laundry - just above - good exposure mostly pure limestone about 100 ft. with numerous but imperfect fossils. Asaphus canalis marginalis etc horizon. A small Raphistoma? [illegible]

Dip of rocks 45° N.N.E

7. From City Laundry (at 6) to Centr. R.R. of Pa. depot where is good Expos. + rocks dip 45-55° N. 10-15° W. Thickness of beds between two points about 1575 ft.

8 Loose quartzite fragments in road, possibly not far from bed. Locality 300 feet south of first limekiln n. of depot. About 800 ft. of rocks between sta. 7 + 8. Dip 50-60° bet. 7 + 8.

Dip 60-70° bet. 8 + 9.
9 Quarry at limekiln - first 100 ft. of beds above loose quartzite not exposed. First seen thereafter is of Stones River age having the same lithologic features characterizing formation in Ky. River gorge and in Mo. (worm-holed) L. fabulites apparently throughout but fossils more common in upper half. Thickness of Stones River exposed to first layers covered about 350 ft.

Base of exposed Stones River about 1500 ft. above the Protozoarthia [illegible] bed (No 6) providing no duplication of beds occurs.

see p 29

130 26 25 24 23 22 21 20a 20 19 18 17 16 15 14

134

9c

Upper Cambrian. C

At Scotland, 4 miles northeast of Chambersburg. Fine exposure in quarry. Fragments of trilobites in the limestone beds at western side. Some weathered slabs exhibited large variety of species of ~~shells~~? & trilobites.

This is above the base of the upper (third) member of the limestone series. The base carries the "edgewise" layers, red stain and shale, wavy and knotted "organic" layers, sandstone and breccia beds, chert, and other indications of shore conditions. These may be seen at D, northeast of Scotland and at E, 1½ miles southwest of Scotland.

On road NW from Scotland, Beekmantown fossils observed on both sides of Greenvillage.

June 12 - 1905. P.M.

Visited loc. C & E - cut out D, going north west through Greenvillage and thence through Beautiful and south over shale hills back to Chambersburg instead.

Examined E first. Here found Edgewise beds and other features mentioned above. Also some thin layers of oolite and in these a few fragments of trilobites. The horizon may very well correspond essentially with "Elbrook formation" of Mrs. [illegible]

Next looked into rocks at quarry at C. Here found some fossils and a 3 ft. [illegible] grain oolite. The horizon is slightly shaly and is nearly equivalent to that at E. Less than 100 ft. beneath found edgewise bed standing vertical along road.

In driving to and beyond Greenvillage over Beekmantown, noted eight to ten outcrops, in every case the rocks dipping ESE. This phenomenon can be explained only (assuming Cambrian [illegible] underlies Beekmantown) by supposing a number of strike faults. An overturned fold however, probably occurs at Scotland, the fossil loc. being near axis. The fossil horizon seems to outcrop again at point about ⅓-½ m. N.W. of quarry.

[illegible] London.
see p 29

ff. London.
see p 29

9c

14

15

1

Drive from Chambersburg to Greencastle on pike & visit contact at several points to west.

Trenton (& ~~Stones~~ River.)

Good detailed section at Utica contact. Triarthus bed.

Chambersburg Pa. (p. 17-19)

[illegible] R.R. [illegible]

bridge

up. Nidulites bed

III

Shale (= Trenton)

50+ [illegible] 65 [illegible]

2 3 4 1a 2b 3a [illegible] 5

Dip 115° N.W. Dip 130° NW to N.

Black River –

1 [illegible] Nidulites [illegible]

2 [illegible]

Dinorthis pectinella?

(Black River = near top of bed 8 of Loc. H)

3 [illegible]

large [illegible] Isotelus Receptaculites [illegible]

4 [illegible] like [illegible] Nidulites bed.

1a Between 4 & 1a a break [illegible]

2b [illegible]

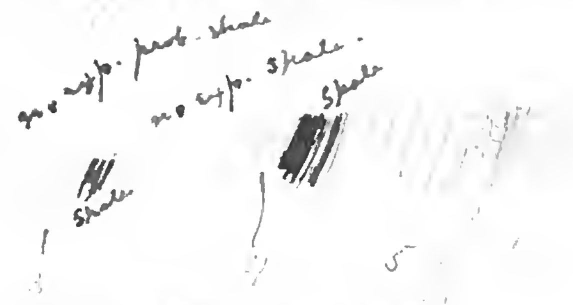
3a [illegible]

4a [illegible] to lighter gray or dove ls. with Nidulites and large celled bryozoan – Same bed as no 1 of section on page 19. (= top of bed 9 of Loc. H) and bed 1 of Loc. F – p 19)

5 Interval with shale and occasional layers of limestone beds belong to Trenton Chambersburg.

[illegible] R.R. cut at Ft. London. see p 29

2 B



280

Black

(Conf. bed II of Strasburg section p. 52) Same bed as bed 43 p. 17.

6-8 ft.

4.

290 (294A)

(or ... or base of 6
cystid (upper Echinosphaerites)

on R.R. cut at Ft. London.
see p 29

May 3, 1906.

[illegible], W[illegible] SE

[illegible]

Several [illegible] quarry [illegible] Marburg [illegible] gastropods and [illegible] [illegible] [illegible] [illegible] [illegible] that could not be [illegible] from Bi[illegible] and other gastropods [illegible] here [illegible] shown.

[illegible] these quarries [illegible] smaller openings out into upper ledges. These ledges are [illegible] mostly horizontal and the rock darker and in some [illegible] granular. Of the latter a [illegible] of blocks was found that [illegible] [illegible] shale, [illegible] and two others, one [illegible] [illegible] and [illegible] like Blackriver [illegible]

[illegible] relations of the two fossiliferous horizons not definitely determinable here, but the [illegible] bed is believed to be the higher. Also that the more southern quarries are near the axis of a fold that flattens out rapidly to the south.

Trenton G. 213

Good fossil locality in small quarry No. 127. Bryozoa, etc.

G.1, ~~Good~~ upper Trenton? fossils, small black gastropods, lingulas, etc. No. 136

June [illegible] 1905.

Loc. G.

[illegible] (South side) upper [illegible] shown in [illegible] the top [illegible] occurs [illegible] 440 ft East [illegible] Going westward something like 150 ft of the latter [illegible] colty lower Chambersburg are exposed, the upper 50' characterize Chambersburg fossils, while the basal 25 ft [illegible] [illegible] all indicating lower Chambersburg.

[illegible] east of mile [illegible]

[illegible] 4 [illegible]

Chambersburg [illegible] 407 [illegible]

[illegible] small nodes of chert in [illegible]

[illegible]

150'	275 ft	132'
Chambersburg	[illegible]	Mid. Stones R.

(182 [illegible].)

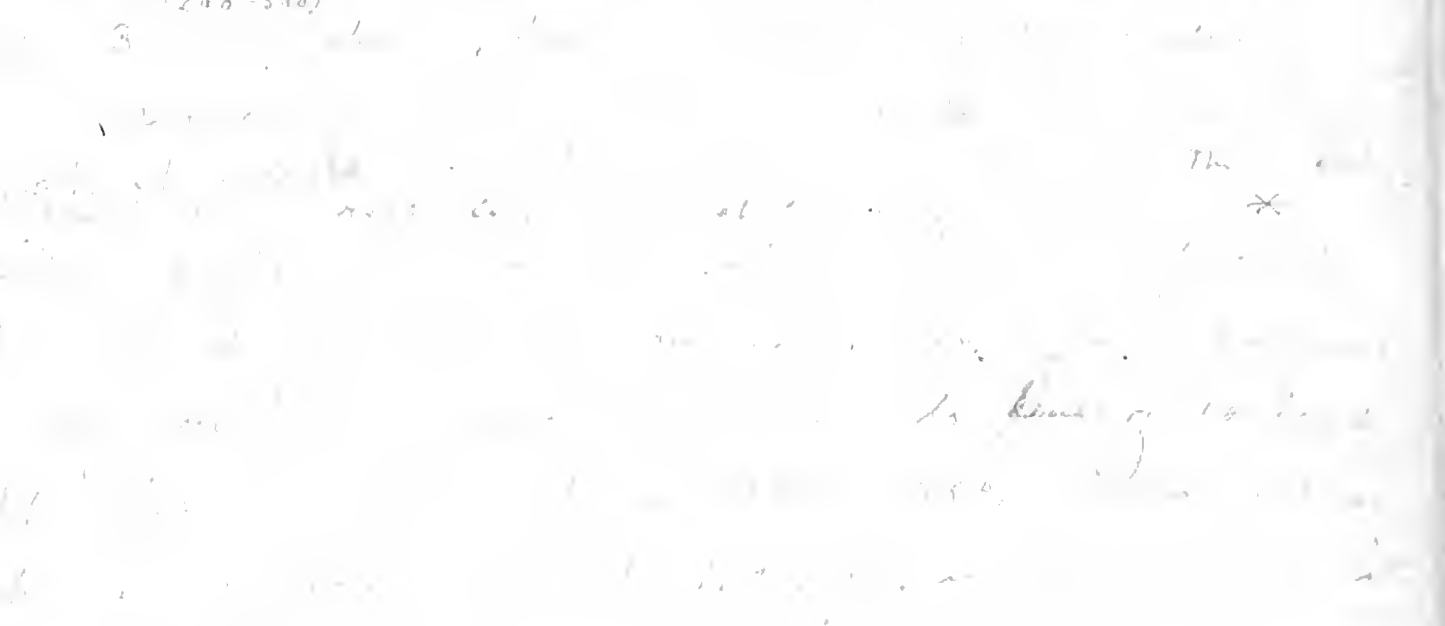
← On RR. cut at Ft. Loudon. see p 29

? Fault

* Important in indicating that Fort London cut beds are low in Chambersburg and that these are [illegible] by a fault from the Trenton Chambersburg [illegible] To west of fault.

10a 10b

94' 50'



Good section of upper beds along RR. Very fossiliferous (Nos. 140 – 144) Contact with shale not exposed in cut.

Ground at fault. Dark grained lower Stones River Ls. same as at Martinsburg.
Fault between 2 & 3, lower Stones River [illegible] Utica shale.

up. part of low. pt 19 = Nicholas Ls.

Remainder not sampled

(102 more ft.)

On RR. east at Ft. London. see p 29

The section on preceding page brings out following facts:

1. There is a well-marked ?thrust strike fault between beds 2 (= Utica - Eden shale) and 3 (= lower Stones River) The throw of this fault amounts to no less than ~~1900~~ 1700 ft.
and [illegible] as [illegible] ft.

2. Assuming that most if not all of bed 1 overlies bed 10, the total thickness of the Trenton ~~cannot~~ be less than 350 - 390 feet.

3. The rocks referred to ~~Black River~~ Chambersburg aggregate a total thickness of ~~210 - 213~~ about 600 ft. This is the greatest development seen. ~~An interesting feature in this connection is the total absence of the Black River and a lesser thickness of the Trenton in the Chambersburg section. It would appear that the Black River basin did not reach as far east as the Chambersburg ?~~ (Bed 9 probably includes Nidulites bed of Chambersburg section. Only upper 20 ft. of this bed was reached at loc. H. July 20th)

? Revised 2-3

4. The rocks referred to the Stones River aggregate ~~800~~ 1100 - 1150 ft. which is 600 ft. more than was exposed in the section at loc. G. It is to be noted however that the lower part of the latter section was recognized in the loc. H. section 500 ft. above its base. ~~It is possible that a part of these lower 300 ft. may belong to the ?[illegible] but at present cannot say. [illegible]~~ Faulting has cut out base of Stones River at G. by 500 ft. more than it has at loc. H. Probably not less than 1200 ft. Stones Riv. in Chambersburg belt.

found [illegible] in [illegible] Stones River, the latter [illegible] [illegible] the [illegible] [illegible] 20°. [illegible] of the rocks [illegible] [illegible] and [illegible] Stones River [illegible] by large numbers of [illegible].

← In R.R. cut at Ft. Loudon. see p. 29

25

Eden. K

2 B

Trenton I

2 B'

South of Ft. Loudon. (Good)

Broad area of flat lying Trenton rocks. Good fossils & exposures in quarry and RR cut. Crinoid plates, etc. No. 332. Shale contact exposed to south. Calcareous shales cover hills to west & well exposed in road cr

... 29

village found
at the S.W. end
... This
upper Castus
filitexta, Raf.
Rhin. nicholsoni
Licrophycus
... above it.
not clearly exposed,
dark gray
18-10 ft. Next
crinoidal
plates of one or two
with these
or Trochiliscus
Other fossils
Columnaria halli
? and a small
with Pachydictya
Bryozoa.
beds beneath

and fossiliferous. Fragments of Illaenus and Isotelus noted.

In RR. cut at Ft. Loudon.
see p 29

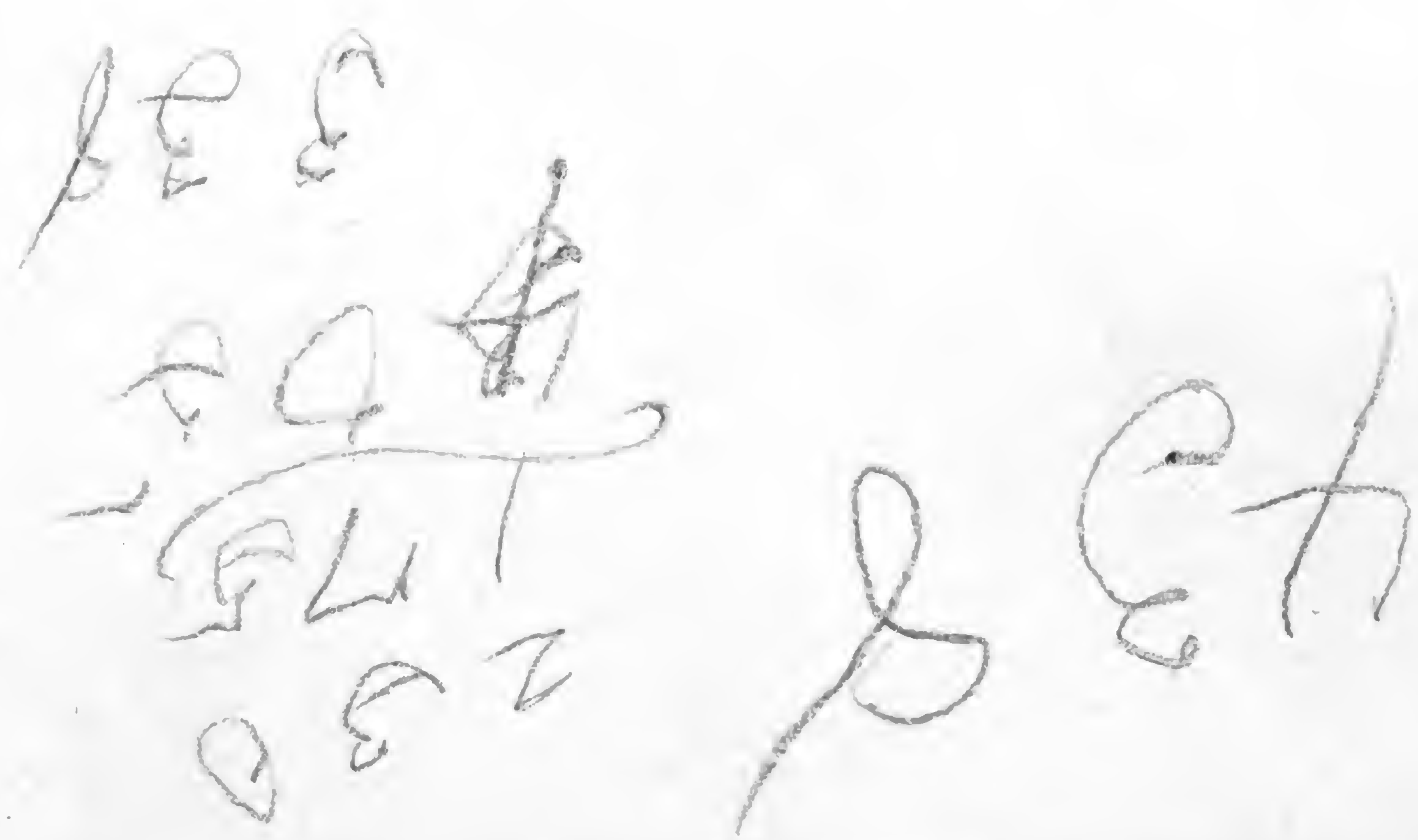
Chas. Simms

2089 Thos. Field Agent

Cir. [illegible] Plate Att'y

Mineral Point Wis.

Study supposed "Ottawa" at Lone Mt. for comparisons with upper shale member of the Thompson Valley formation.



452 12 - 9/2 mi S of London

#52 R

Where is material for Marlborough.

237 & 91

Eden. K

2 B

2 B'

Trenton I

South of Ft. Loudon. (Good)

Broad area of flat lying Trenton rocks. Good fossils & exposures in quarry and R R cut. Crinoid plates, etc. No. 332. Shale contact exposed to south. [illegible] shales cover hills to [illegible] [illegible] exposed in road crossing hill [illegible]

Fort Loudon Loc. I. See also p. 29

In railroad cut + small quarry just south of village found basal 30 ft of Black River and at the S.W. end of cut about 8-10 ft of upper Lowville-Bl. Riv. displaced in fault (Tr. [illegible]) ~~Stones River~~. This doubtfully placed bed is thin-bedded and of the usual upper Castle mottled type. Contained Strop. filitexta, Raf. minnesotensis var., Esch. ramosa? complanata, Rhin. nicholsoni (?), very good specimens of Chiocrinus, Lecrophycus & other fucoids. Same general fauna as beds above it.

The true Black River, though contact not clearly exposed, begins with finely granular sparsely fossiliferous blue-ish dark gray ls. This type prevails through first 8-10 ft. In next 10 ft. ~~[illegible]~~ a more or less crystalline, crinoidal ls. predominates. These contain plates of one or two new cystids. Dark layers interstratified with these contain trilobites, a large Leperditia or Isochilina and Dal. pervota & other brachiopods. Other fossils in this bed deserving mention are Columnaria halli, Tetradium columnare, Beatricea? and a small Isochilina occur in lower 10 ft, with Pachydictya foliata, Stictoporella cribrosa and other bryozoa. Upper 10 ft. more earthy than beds beneath and less fossiliferous. Fragments of Illaenus and Isotelus noted.

Thaleops. May 8, [illegible]

8' 10

← In R.R. cut at Ft. Loudon. see p. 29

a layer near base full of [illegible]. [illegible]
at top with Beatricea.) Cystid plates, Rhy. plena
O. costalis, Tetradium columnare, Columnaria alveolata etc
4. Bluish subgranular with Lepiditia and dark gray rather compact and irregularly bedded ls. with Isotelus and Illaenus. (Much less except at base) fossiliferous than no. 3.
5. Conglomeratic dove ls., pebbles very small, (resembles oolite) and of same general character as matrix. Contains Tetradium cellulosum fasciculata, [illegible] Utica rather lime — probably near base of formation. Same indicated by slabs (out of place) containing Trinucleus.

29

In reply please refer to E.W.P. and date of this letter.

Address all communicati
"Director, U. S. Geologic
Washington, D. C.

SUBJECT: Coal tests at the St. Louis Exposition.

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

WASHINGTON, D. C., April 15, 190

To the Coal Operators of the United States:

An act of Congress approved February 18, 1904, authorize the United States Geological Survey to make use of certain exhibits at the Louisiana Purchase Exposition for analyzing testing the coals of the United States, in order to ascerta as far as possible the most economical method for their uti ization. The law especially provides, however, that all co to be tested must be delivered at the testing plant in the

28

Stose - section at Fort Loudon above Ulrich's bed 5 in R.R. cut section

[illegible] = Utica.

4' [illegible]

Bed 9 [illegible] Trenton etc.

288b Bed 8 (Fine [illegible] subgranular [illegible] [illegible] (288b) = B6 of St. Thomas

Partly exposed [illegible]

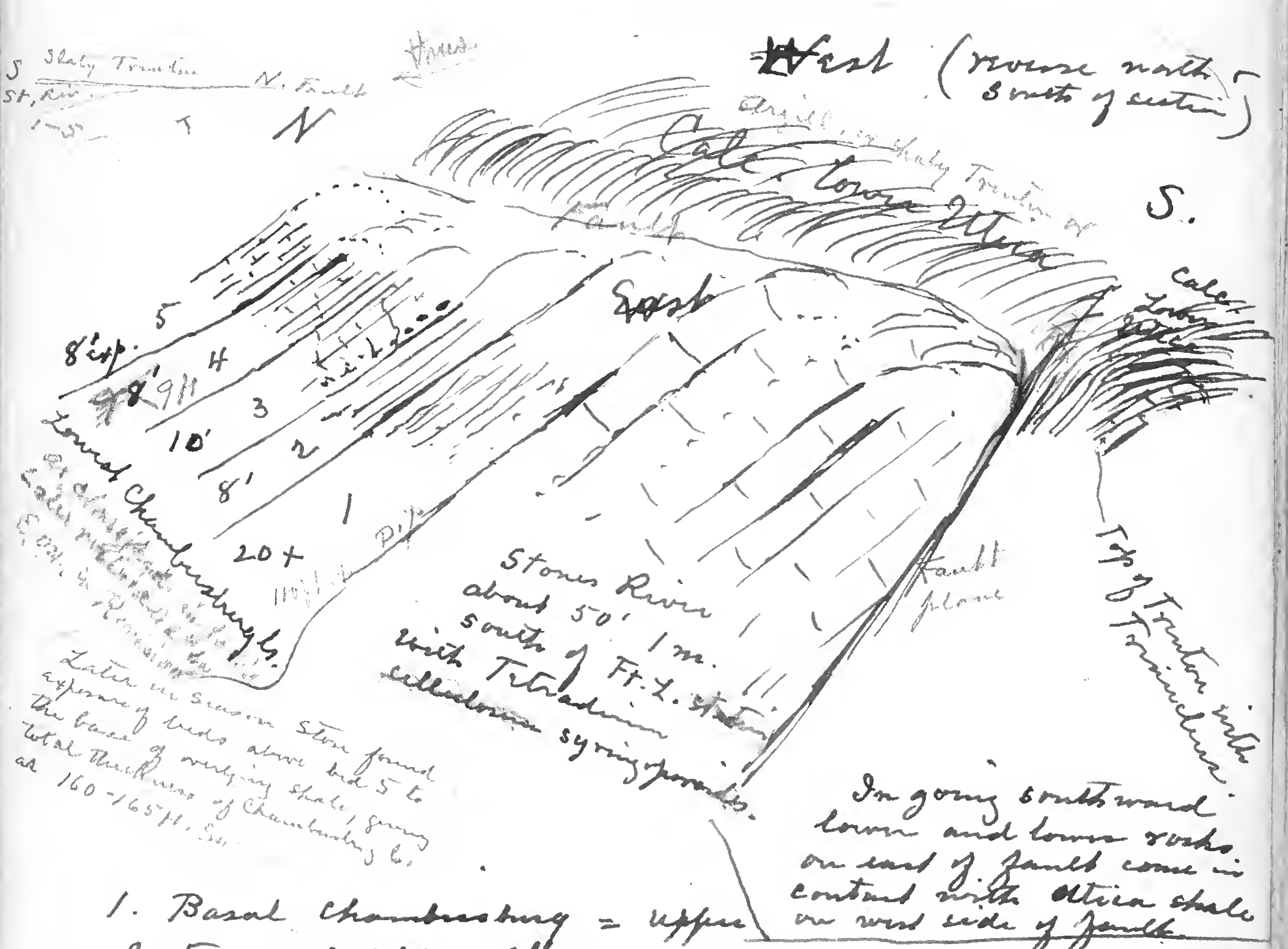
288a 2' (? 15 ft) Bed 7 [illegible] ls with fossils
(Bed 7 & 8 = bed 5 of St. Thomas (294) section.)

Bed 6 12' [illegible] subgranular [illegible]
(= bed 6 of Dickey section and top bed 4 of St. Thomas (294))

3' Bed 5 (288) Pure dove ls with Tetrad. gastropods Lepeditia etc.
(Same beds as at C42)
= top of bed [illegible] in Blue Spring section. And top of bed 5 of Ulrich's Ft. Loudon Chambersburg ls. section

Chambersburg ls.

May 6, 1906.
Ft. Loudon section along R.R. from 1/4 to 1 mile south of station.



1. Basal Chambersburg = upper Carters = ? upper Chazy. Large Clitocrinus and other things mentioned on p. 27. Also Gonioceras. Rocks mainly thin bedded & thinly banded. At base some granular beds with gastropoda & Gonioceras. Thickness not seen but probably more than 20 ft. (To be revised) (Probably faulted)

2. As described p. 27.

3. More or less cryst. crinoidal, grayish ls., full of fossils. A layer near base full of Solenopora. (Clitocrinus bases at top with Beatricea in plaster) Cystid plates, Rhy. plena O. costalis (in body of bed), Tetradium columnare, Columnaria alveolata etc.

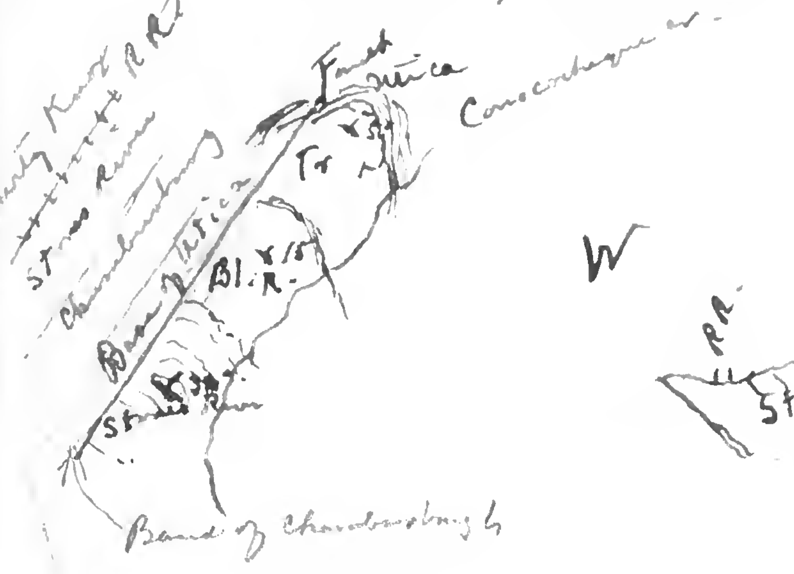
4. Bluish subgranular with Lepeditia and dark gray rather compact and irregularly bedded ls. with Isotelus and Illaenus. (Much less fossiliferous than no. 3 except at base)

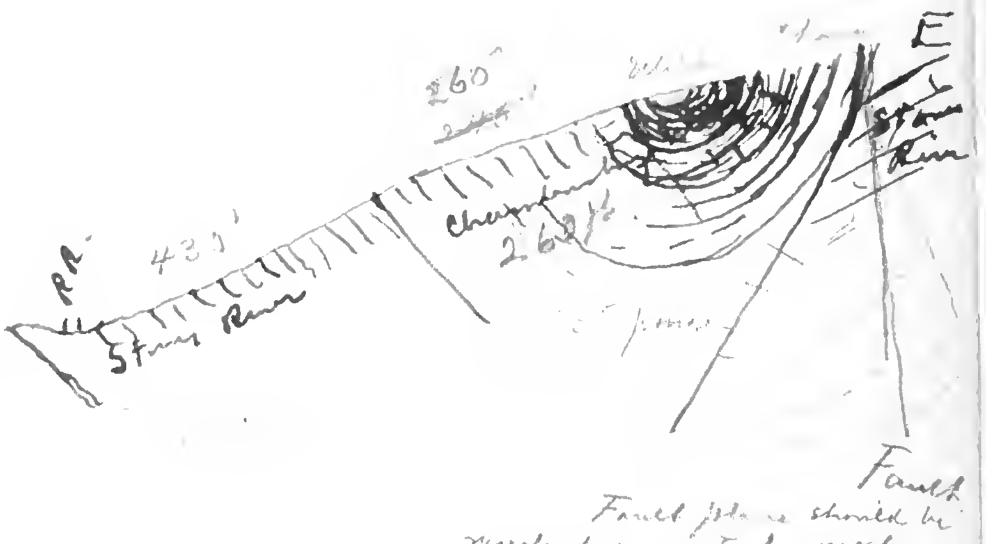
5. Conglomeratic dove ls., pebbles very small and of (resembles oolite) same general character as matrix. Contains Tetradium cellulosum fasciculata, [illegible]

Utica rather limy – probably near base of formation. Same indicated by slabs (out of place) containing Trinucleus.

Stone loc. K9.

1½ m. N.E of Mercersburg, at plunging N-end of anticline, outlined on west side by fault





Fault plane should be revolved so as to be nearly vertical or with the hade on the east

This may be cherty [illegible] Stones River but on account of the [illegible] of upper [illegible] R. in that [illegible] (? 430') [illegible]

Normal fault in west limb of plunging anticline later subjected to lateral pressure from east. The shale in syncline caused it to close more than did the anticline to east of it.

Blue Spring section revised May 8th 1906

75' III Chambersburg

? Hiatus

II

30'+ I

Shale - None of it lumpy. (Either overlap or small fault.)

About 40 ft. (? as much as 50 ft.)

Beatricea bed - in quarry on top of S.R.

About 35' upper part referred to an upper [illegible] [illegible] - large & small [illegible]

Very pure and very smooth [illegible] about 30 ft. [illegible] upper Stones River - straggly.

Upper part of I = bed 2 [illegible] p. 29.

2 B'

Trenton J.

At Blue Spring 3 miles southwest of Mercersburg.

Flat beds on east side of anticline. Sponge and associated fossils, Bed of shells, etc. No 210. Shale contact exposed (Good.)

June 17. This locality proved very interesting and in a considerable degree perplexing. In the first place the exposure is of the top of the Stones River and basal Black River — about 30 ft. (top only exposed) of former and about ~~40~~ 75 ft of the latter. (The Bl. R. part is divisible into ~~The contact in a way may be said to be sharply distinct, with~~ a blackish subgranular ls. (No. III) the base of which is plastered on 6-8' more massive, fine-grained dove ls. (bed II) preceded by nearly 30' (25-30) dark ls.) Considering all beneath the dark ls. as Stones River, then the upper beds of the S.R. are to be described as consisting ~~largely~~ entirely of a very fine? limestone congl., with the matrix highly fossiliferous. With Lep. near fabulites the upper bed 2 contains a multitude of gastropoda, one of these a Helicotoma with sutures on upper side deeply impressed & whorls nearly separate. Unfortunately none of these shells could be secured in satisfactory condition. With them occurred either a Tetradium like cellulosum (on small equidistant single tubes - another form in fascicles of 4 or 5) or a sponge like Dystactospongia ~~minor~~. Also a Beatricea ½ to 1 inch in diameter. Another Beatricea found at quarry ⅛ m. S.W. of spring is less than ½ in. in diameter. Above these clearly Stones River beds and just beneath bed 2 (Beatricea) come the darker subcryst. ls. filled with the same fossils found at Ft. Loudon. ~~Dal. plicata~~ Hebertella borealis? [illegible] occurred abundant - also Raf. (Lep.) charlottae, a Rhynchotrema plena, Zygos. recurvirostris and a number of Ostracoda. Among the latter a Leperditia near or identical with L. fabulites. Also a number of

The upper part of bed III also is fine gr., but is distinguished by having a [illegible] limestone

Bryozoa, also the cystid plates found at Ft. London
(~~It is possible that the whole ls. series here is~~
~~really Lower Black River - if so, the Ft. London section~~
~~which agrees in lithol. & fauna is the Lebanon~~
~~St. Rec.~~).

The most peculiar feature of the structure of both areas is the fact that the ls. are nearly horizontal and the shales to the east are so near that, if there is no fault between them, there is not room for the upper Mohawkian beds. The big spring and fractures in the ls. indicate faulting, - likewise the vertical attitude of the shales just to the east.

The above sketch illustrates the explanation according to a partly reversed normal fault, pushing shales over ls.

On the other hand, if there is no fault then we must assume that the upper Black River and the whole of the Trenton is missing in this band. The band of shale closing over ls. area just south of P and the narrowness of the Mohawkian band on the east side of the shale band are indicative of this second view. Still this condition could have been produced by erosion of the ls. area prior to the thrusting of the shale over the area. The absence of the Trenton may be due to non-deposition but the erosion theory strikes me as the more probable.

Possibly this view applies also to the features observed in McConnellsburg area. This would obviate the necessity of a fault there which otherwise would have to be assumed. Still non-deposition would have to be entertained as partly explanatory of the conditions.

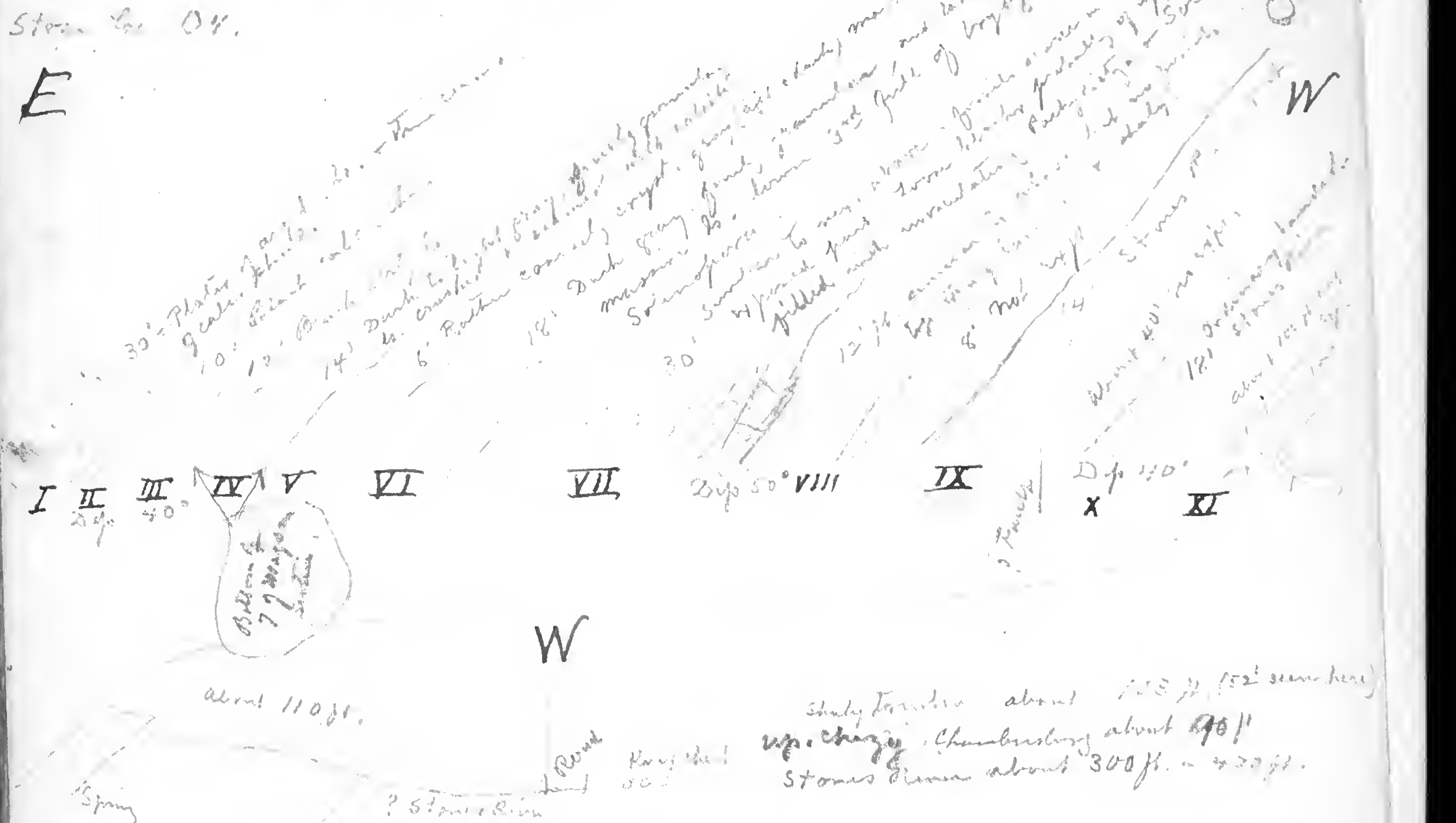
Faulting to E. explanation.

Cowan Gap, 6 miles north of Ft. London.

Eden shales exposed below ~~Clinton~~ Medina red sandstone. Fine fossil locality in weathered calcareous layers. No. 823. Fossiliferous fossils from shales up road to west near Gap. (See if any Clinton here)

2 miles NE of McConnellsburg, Pa.
May 7th 1906

Stones Loc. O4.



Bed above spring probably still Stones River, being fairly low in magnesia. It is however different from Stones River in having no banding. May correspond to beds seen west Mercersburg quarry. The 110 ft. next beneath (to beneath spring) are more or less magnesian and may be Knox, but more likely are to be considered as lower Stones River. No chert was observed in these 110 ft. but on other (east) side of road Knox chert was seen.

(Compare Murat ls. with beds IV – VIII. Also Goshen Gap section.)

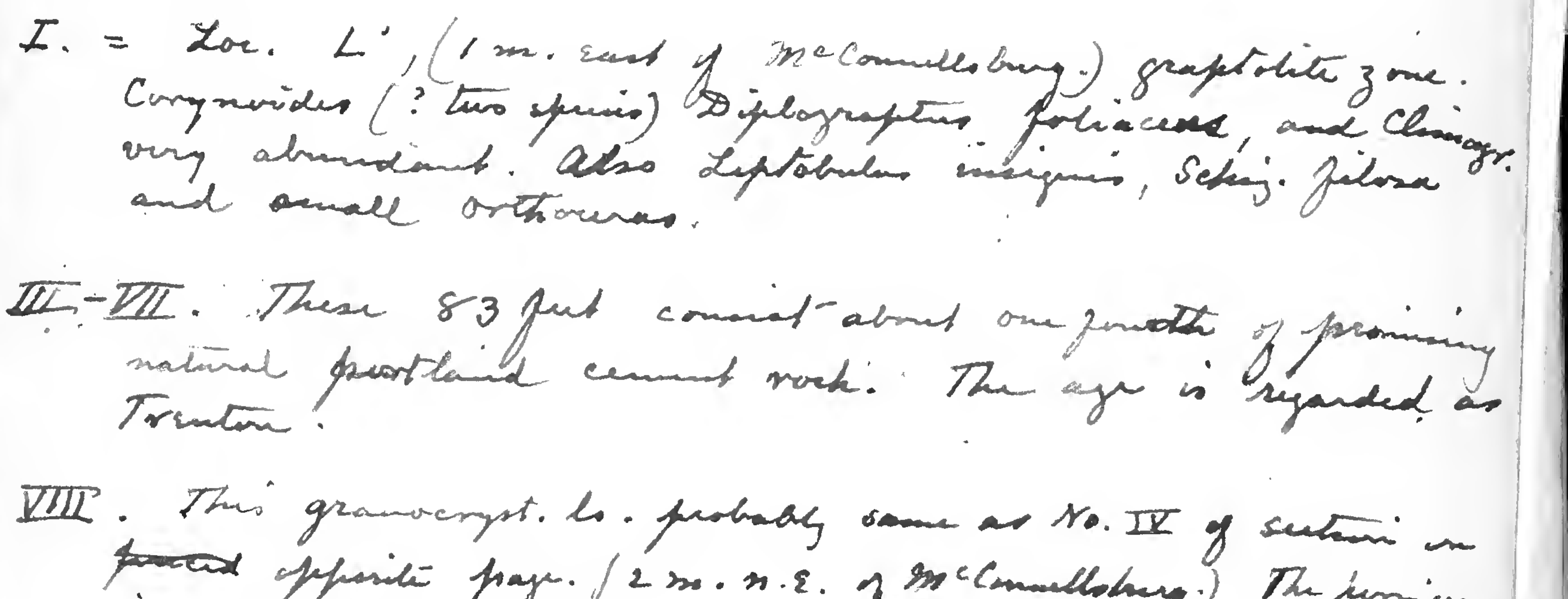
Beds IV – VIII (= 88 ft.) are referred to Black River and should be compared with Murat ls. of Virginia.

Beds I – III are regarded as of Trenton age. (See opposite page for overlying shale).

The lith. character of the beds is very diff. from corresponding beds in Chambersburg trough and the measures thinner. The fauna likewise is diff. Under circumstances cannot yet decide whether this thinner representation corresponds to the Top or to the bottom of the Chambersburg section at Loc. H. The fauna reminds of Clinton trough. Could not see these beds on west side of McConn. valley but did see Stones Riv. there, where lowest outcrop of these was decidedly a ls. conglo. Some of the boulders were themselves finely conglomeratic.

Sink on Magsam's land, near angle of Mercersburg pike

2 miles South of McConnellsburg.

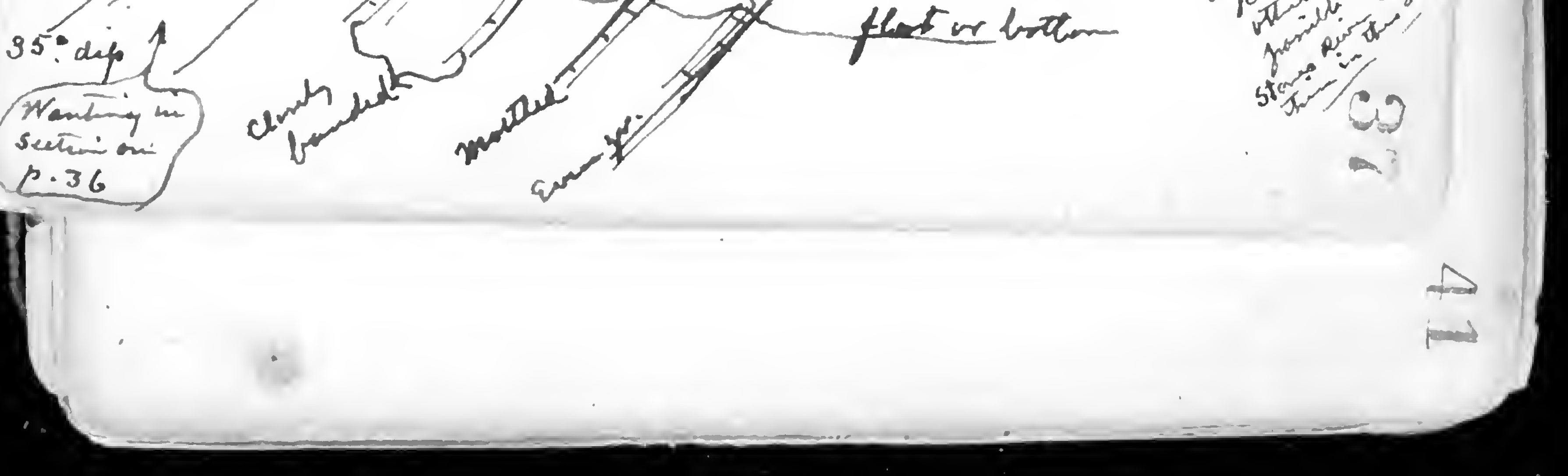


I. = Loc. L' (1 m. east of McConnellsburg.) graptolite zone. Corynoides (? two species) Diplograptus foliaceus, and Climacogr. very abundant. Also Leptobolus insignis, Schiz. filosa and small Orthoceras.

III. – VII. These 83 feet consist about one fourth of promising natural portland cement rock. The age is regarded as Trenton.

VIII. This granocryst. ls. probably same as No. IV of section on ~~faced~~ opposite page. (2 m. N.E. of McConnellsburg.) The horizon is provisionally referred to top of Black River but in absence of a fauna cannot say positively that it is not Trenton.

½ m. S. of this sink, gully and adjacent slopes exposes underlying Stones River beds but none of Bl. Riv. Chambersburg ls.



Eden L.

2 miles east of Mc Connellsburg.

Soft sandstones with shells + crinoid stems

Limestone contact at L', 1 mile east of Mc Connellsburg. Graptolites in shale #182

June 16. Loc. L'.

Crossing the mountain west from Ft. London to McConnellsburg saw this locality first. The exposure of Ellis is very good, especially in a small opening above the house where an attempt was made to procure drying shales. In this opening which may be 15 - 20 ft. above base, graptolites occur very abundantly, 6 - 8 species apparently were found, among them Coryndeis gracilis. Some graptolites occur also just above the contact. Leptobolus magnus is the only other fossil seen.

The actual contact is not satisfactorily exposed but the upper beds of the underlying Trenton are more or less earthy and interbedded with shale. Fossils are rare in these upper beds. The strata dip about 35 - 40° eastward.

Within less than 300 yards west from the Trenton - Ellis contact ^ is, outcrops at several points. These outcrops belonged in every instance to Kittatinny. One of the beds was very siliceous the whole layer weathering into a rotten chert, in which a Raphistomina-like Gastro. was observed. Some sandstone shales (apparently not Trenton rock) were associated with the chert beds.

If the dip of the shales and ss. Trenton is continued in strata of valley, the Trenton, Black River and Stones River should occur further from the base of Ellis than the outcrops of Kit. already mentioned. Either a thrust or a strike fault exists at base of the first hills or the Kittatinny formation, are found, reduced in thickness.

(Loc. L next page)

Loc. L.

This point, like a number of others along the road in the next half mile, exposes fossiliferous Edon. With careful and long continued searching of these outcrops a considerable fauna might be procured. The crinoid column discs are the commonest of the fossils - next in abundance is Plectambonites then Dal. multisecta. Among the rarer fossils are the small Climacograptus of the Cin. Edon, a Strophomma like hallicanna, Calymene callicephala Protowarthia cancellata, Lophospira like one of the Cin. forms. Specimens of a Strophomma very like or identical with S. sinuata were on watched for occurrence. All the other fossils however from this horizon in ~~the~~ southern Pa. are clearly indicative of Edon.

Clinton M, N, O.

In Cove Gap and on pike near tollgate 4 miles northwest of Mercersburg.

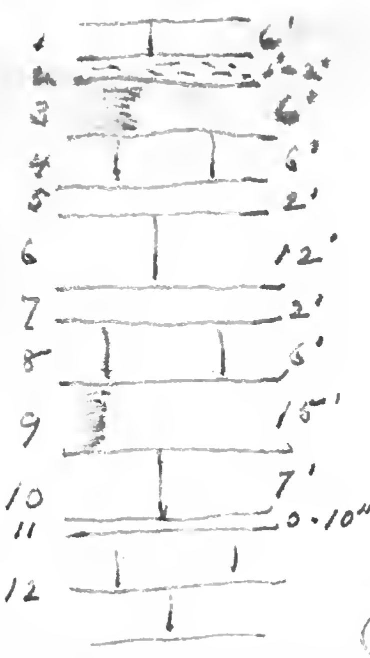
Localities 190, 191, and 195. Beyrichia and shells. Exposures on two sides of a faulted syncline.

Loc. M (= 190). After dinner at McConnellsburg and after passing loc. 2, finally reached 2nd Clinton outcrop just beyond (below) tollgate. In addition to fossils brought in by Stose, procured several Pelecypoda. Several specimens of a large Cyrtodonta, 2 species of Chedospherus and one or two of Rhynchonella. Also a new Trematis related to T. umbonata. The Ostracoda - principally Bollia lata - are extremely abundant in some of the layers. Brachs. are much less common.

As we were through with Loc. M. the third rain of the day set in, and, continuing until we had passed the other Clinton localities, we did not examine them. Probably not much loss.

2A

depot at Martinsburg, W. Va.

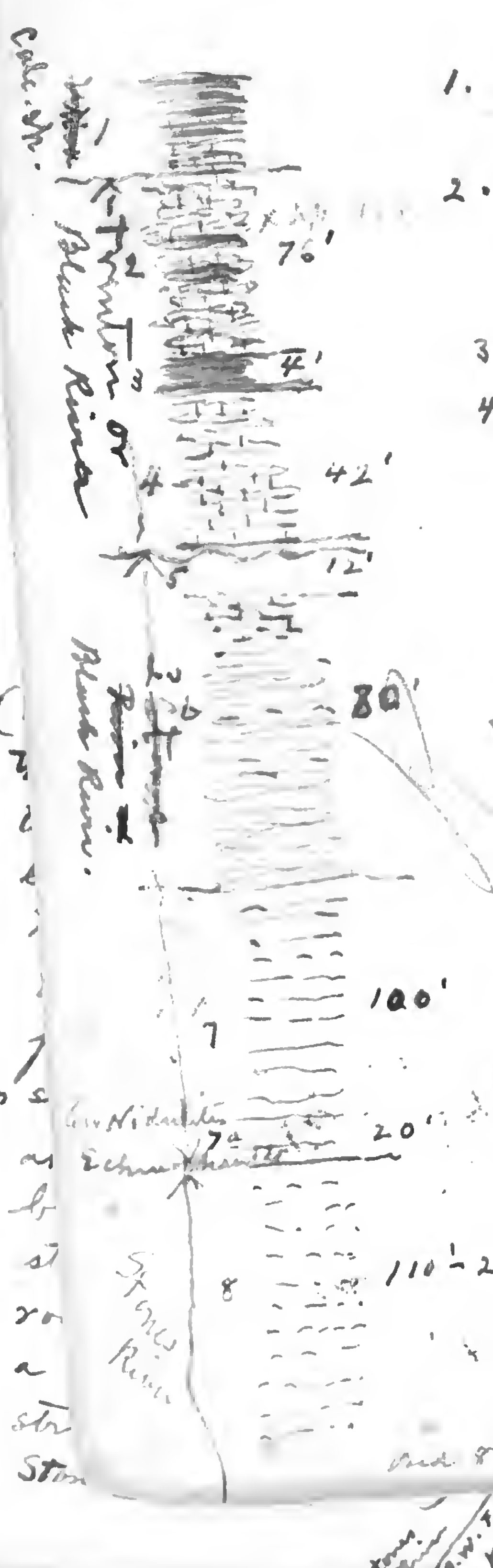


2, 3, 5, 7, 9 and 11 consist of finely laminated, yellowish dolomite.

1, 4, 6, 8, 10 and 12 consist of compact dove ls. several layers, especially 1 and 8, containing recognizable Stones River fossils. This horizon should be compared with Oregon dolomite of Ky. River section (Jessamine section). Bed 12 is the first of a large series of dense Stones River ls. terminating in the low ridge west of the crusher quarries.

(A large part of these ls. layers are composed of a fine ls. conglomerate, so fine as to simulate oolite.)

Section along Burke st. Martinsburg, W. Va., between B. & O. R. R. track and cemetery at top of hill east.



1. Martinsburg shale, black, lower 120 ft. more or less highly calcareous. Graptolites 10 ft. above base.

2. Dark gray to black, subgranular, weathering cobbly knotty ls., with 2 or 3 thin layers of shale. Fossils few. Nidulites abundant 20 ft. beneath top.

3. Yellow clay shale.

4. Similar to bed 2 but in lower half most of the layers are thicker and less knotty, and many are nearly as dense in texture as the underlying Stones River. About 20 ft. above base procured specimens of Parky. acuta and Rafinesquina recta. Fossils not common.

5. Not exposed here - probably shaly - contact between Trenton and Stones River - No Black River.

6. Dark ls. similar to nos. 2 and 4 but all of it dense in texture and without luster or crystalline grains. Some of it also considerably lighter in color. Texture normal for Stones River but color unusually dark. Nidulites & other fossils listed on p. 48, occur rather commonly, especially in lower half.

7. Still rather dark but otherwise typical Stones River rock. Base of bed as shown in quarry south of town contains Echinosphaerites. These beds are subgranular for a few feet and sharply distinguished from the underlying light dense glassy rock. In section shown on

8. Not exposed here. 2 blocks north it is seen to be a normal upper Stones River rock. Full of calcite specks and strings, some clearly of Tet. cellulosum. and 8 including in bed II of section page 46-47. ...gravels of

(over)

at east fault Kitt. is very much fractured & crushed. ... bridge in creek fault is marked by thick beds of travertine

Martin...
Stones River
N.W. Fault
Kitt.

Martinsburg, W. Va. June 18th-19th 1905.

Section SEE. through town beginning with last good exposure of limestone just west of rock crusher quarries and ending in shale hills beyond eastern edge of town.

I. 200 ft. or more of ls., most of it dark gray to almost black and all moderately compact in texture. Except in color agrees very well with usual Stones River. Part of the beds however appear to be slightly magnesian, especially in basal 50 ft.

Fossils are not uncommon, in some of the layers very abundant, but good specimens are very rare except in a layer (about 125 ft above exposed base) shown in quarry. This is filled with a small species of Solenopora and fairly good specimens of Stones River gastropoda. The latter however are satisfactory only in the chalky surfaces of the decomposing boulders.

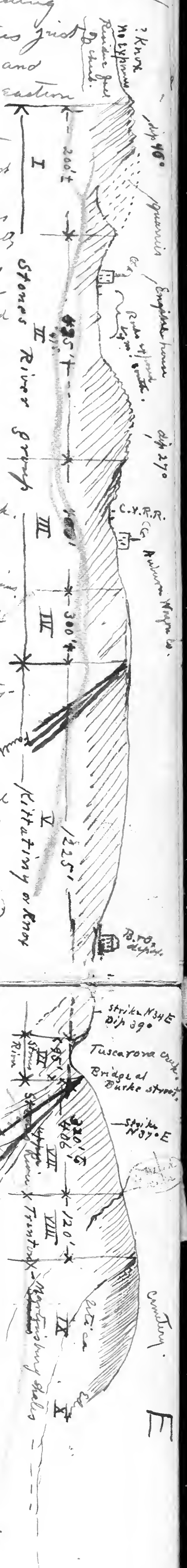
II. 475-500 ft. of lighter colored - usually a light to dark dove - compact textured ls., having all the characteristics of the usual Stones River rock. Hundreds of thin bands or seams are crowded with fossil remains, but unfortunately it is almost impossible to secure satisfactory specimens. They appear only on the weathered surface as more or less imperfect sections, but on fresh surfaces they are scarcely visible. The fossils consist mostly of gastropods like Liospira and Ectomaria with some Bathyurid trilobites, Lep. fab. Cyclonemas, Orthonemas etc., the fauna reminding of Murfreesboro ls.

III about 400 ft. of mostly normal Stones River ls., the lower third of which is excellently exposed in a succession of cuts along Cumberland Valley R.R. north of depot. The interval comprised between 50 and 125 ft. above base consists of gravel dove ls. (more or less highly fossiliferous) interbedded with thinner (6"-6H) yellowish finely laminar dolomite. (??This horizon probably corresponds to the Oregon ls. (Ky. marble, (See detailed section p. 45) of the Kentucky Stones River section)

The fossils of this division agree in general aspect very well with those found in div. II. Additional forms are Helicotoma sp., Maclurea sp., Eccyliomphalus sp. and a syringosphaerid. Single tubed Tetradium.

IV. About 300 ft. intermittently exposed ls. A small outcrop above the middle is of the dark type of rock known to occur in the upper division (see VII) of the Stones River group in this section. It contained Lep. fab. and undet. gastropods and pelecypoda.

V. The next exposure of rock occurred in an excavation for water pipes on Martin st. west of this the excavation showed only red residual clay for 100 ft. or more. The rock is unquestionable Kit: or Knox. Occasional small outcrops indicate the same formation to the fine cuts just n.w. of the B.&O. R.R. depot, where a complete succession of the same formation (160 ft. in thickness) is shown. S.E. beyond this point to the first Stones River outcrops there is room for an additional 165 ft. of Kit. ls., the last outcropping within 30 ft. of the first Stones River. No sign of fossils was observed in any of the outcrops of this formation, the thickness of which, from its first appearance in the excavation on Martin st. to the base of the Stones River, is estimated at 1225 ft. There can be no doubt that this Kit. band is defined on the n.w. margin by a strike-thrust fault. 800 ft. Farther north, opposite the B.&O. round house, the east margin likewise is defined by a similar fault, but at Burke st. the creek crosses the strike of the fault so as to expose a 95 ft. belt of Stones River (no VI)



(over)

at most fault Kitt. is very much fractured + crushed + at bridge in creek fault is marked by thick beds of travertine

Martinsb... W.Va.
cont'd from p. 47.

VI. 95 ft. of basal Stones River shown along Burke street to bottom of Tuscarora creek bed under B.&O. R.R. crossing. This band narrows in going up the creek until it is completely covered opposite the B.&O. R.R. shops 800 ft. northward from Burke st. (There the overthrust upper Stones River has a thickness of about 406 ft. at Burke st. only about 320 ft.) Fossils of Stones River types, especially Lep. Jub., were not uncommon in these lowest Stones River rocks.

VII. 320-406 ft. of upper Stones River rocks. The lower 3rd of this has the characteristic color and texture of the Stones River rock, but above this it grows darker (almost black, though generally only dark gray). ~~and~~ The color is very much like that of the overlying Trenton but may be distinguished by its more compact texture and conchoidal dull surface when fractured. Fossils are not abundant except in a few layers - nor can good specimens be procured under the conditions of weathering & decomposition of the rock. Saw Monotrypa (? magna) Streptelasma profundum, Dalm., subacuta, Thaleops, etc. This is the bed that contains the Nidulites found here and at Chambersburg. The B.&O. bridge over creek & Burke st. is built of this rock; specimens of the Nidulites ~~[illegible]~~ being clearly visible in some of the stones.

Contact with Trenton, despite absence of all the Black River and much of lower Trenton, is ~~[illegible]~~ not sharply marked. In better and larger outcrops no doubt it would be more noticeable.

VIII. The Trenton is thin here and very sparsely fossiliferous. Only 120 ft. of rock intervene bet. top of Stones Riv. & base of Utica. Near base procured Pachydictya acuta and Escharopora recta? The rock is dark, subgranular, and interbedded with several thin beds of shale. (See detailed section p. 45)

IX. Utica shale, lower 20 ft. calcareous. Graptolites present but rare. 500-600 ft. of it apparently before slightly arenaceous layers and yellowish color referred to Eden horizon sets in.

[illegible]

Medina to Oriskany. P. ~~[illegible]~~

North of Great Cacapon Capon and East of same.

Section north of river shows Clinton quartzite at east end with Niagara? limestone above, followed by Salina red sandstone and limestone, Helderberg limestone, and Oriskany sandstone all more or less fossiliferous. Rocks folded. x

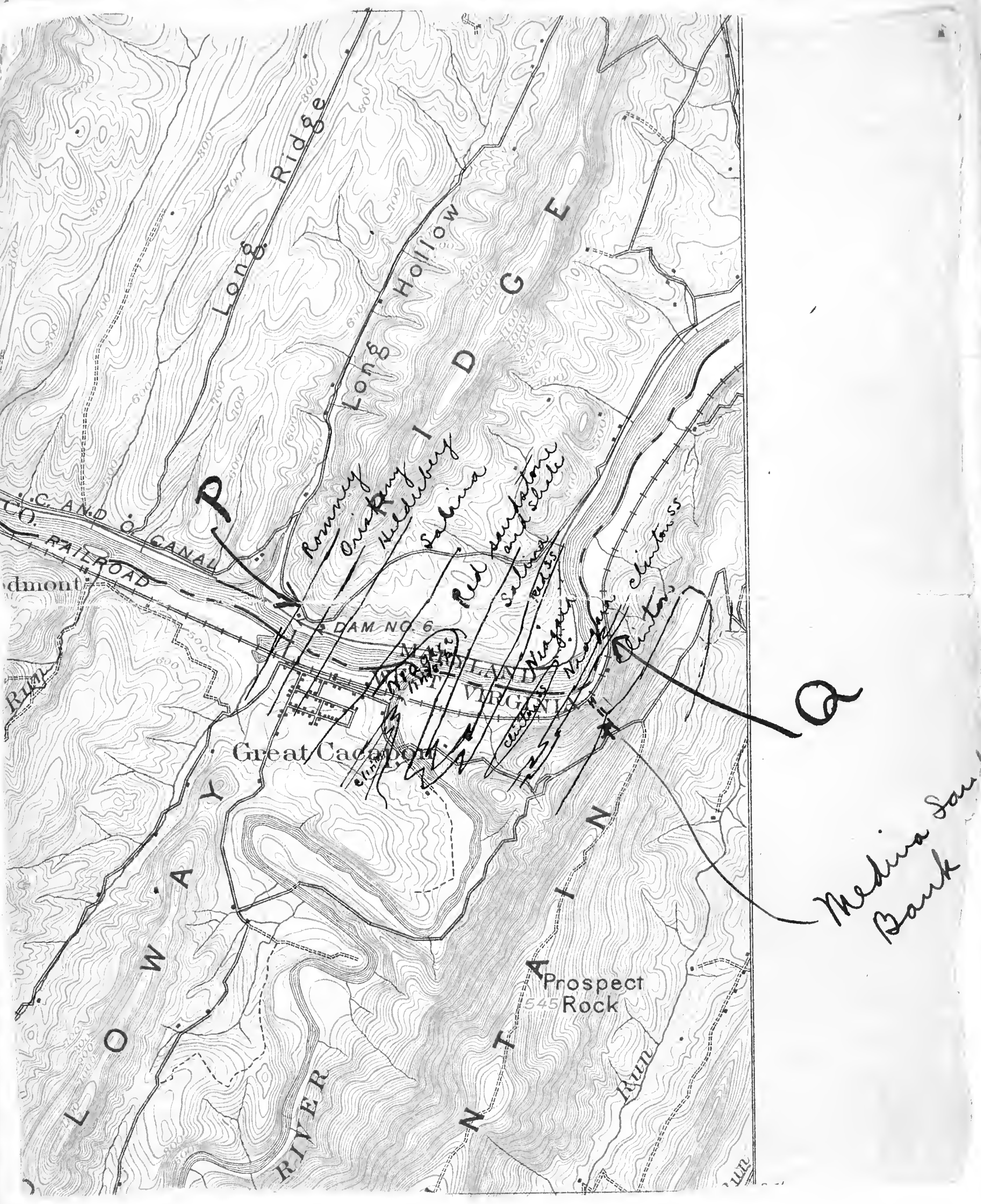
At Q the Clinton quartzite is exposed with Clinton shales below containing fossiliferous limestone at the top. Medina is quarried just above on the mountain.

(New R.R. probably afforded good sects; along canal many [illegible] with [illegible] side of river)

Great Cacapon, W.Va. ~~Md.~~ June 20th 1905.

Spent morning at section of Helderberg to Clinton sandstone exposed in cuts of the new Wabash R.R. on north side of river. Collected only in the ls. bands in the shaly formation (?=Niagara) overlying the Clinton s.s. Procured a great number of excellently preserved Ostracoda. Other classes of fossils rare.

In P.M. visited locality Q. on W.Va. side of river. Here found the fossiliferous ls. layers at top of lower, shale, division of Clinton. The fossils in these layers consisted in all but one case observed chiefly or solely of large crinoid stem buttons - an occurrence that is elsewhere very characteristic of the Clinton. One layer was full of altogether different fossils - namely Platyceras, several brachiopods, a Dalmanites and Beyrichia of large size. So far as I can see this is a nearly normal Clinton fauna, though not of the western type.



Virginia localities

Winchester, Va. June 21, 1905. 2A

Having 2 hours between trains, en route from Martinsburg to Strasburg, at Winchester employed part of time in looking at section. Starting at B.&O. depot walked S. along track to exposures ~~[illegible]~~ in cuts opposite cemetery. ~~[illegible]~~ These rocks certainly look like Knox dolo. but am not entirely certain they ~~do~~ not belong to dolomitic (upper) Stones River horizon. Saw no fossils in them. Neither did I notice any in occasional outcrops along a street running west from the r.r. track. Farther west, however, there are quarries in Stones River rocks, but had not time to decide position of outcrops in formation. Coming back to depot, went eastward ~~[illegible]~~ along pike to Utica outcrop at trial track. All the outcrops seen till ~~[illegible]~~ undoubted ~~Trenton~~ Mohawkian was recognized at corner in road at track, seemed to be quite ~~[illegible]~~ unfossiliferous ± and in all cases highly magnesian. Hence, although the time at command was too short for definite determination it may be provisionally assumed that the structure at Winchester is practically the same as at Martinsburg — i.e. faulted so that a belt of Canadian (Beekmantown) rocks intervenes between two of Mohawkian age.

Stones River / Knox / Trenton / Shales

Strasburg, Va., Jesse 2 pt. ... 1905 52

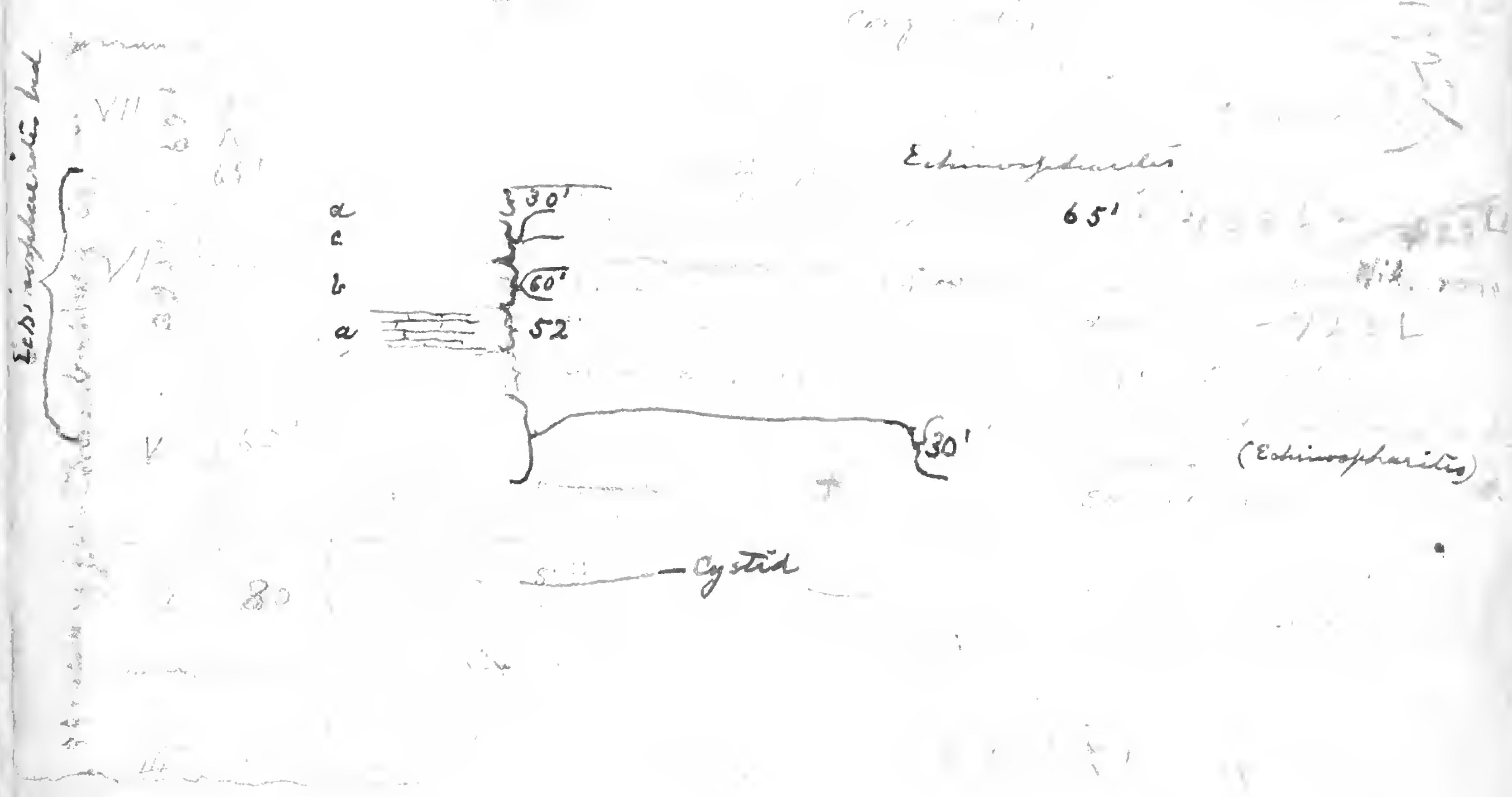
2A

dark shales

Interval? >

Thin bedded argillaceous and calc. rock

VIII 450'
exposed



IIa

II

I

IX

I. Usual Stones River – ~~not~~ as at Martinsburg, W. Va.

II Corresponds to similar bed in Martinsburg section; the lower part of which, however, only was seen there. Here the upper part.

III. Pure ls. of Stones River facies. Gastropods & Tetradium cellulosum.

Bifoliate, narrow branched (? Rhinidictya) abundant in lower & upper parts. Upper ledge also contains ball cystid. (? Echinosphaerites), Girvanella etc.

V. This bed is full of fossils. The lower half contained Solenopora. Among others two species of Phylloporina, one like corticosa, the other a lower type like reticulata, Crepipora perampla? Heloporoid (2) species, Batostoma fertile, B. winchelli, Pinnatopora, Stictoporella, Rhinidictya, Isotelus very abundant but poor, Dalmanella (St. Pauli) & pervata, ? Dinorthis, Plectambonites, Echinosphaerites, Leptaena and others. This assemblage is strongly suggestive of N.W. Black River shales. Bolboporites suggests eastern Tenn.

VI. The main fossil of this bed is Nidulites. It is especially abundant in bed VIc. Other fossils are Phylloporina ? dawsoni, Bolboporites ? Monotrypa, Isotelus and a hydrozoan like the Beatricia of the Mercersburg section.

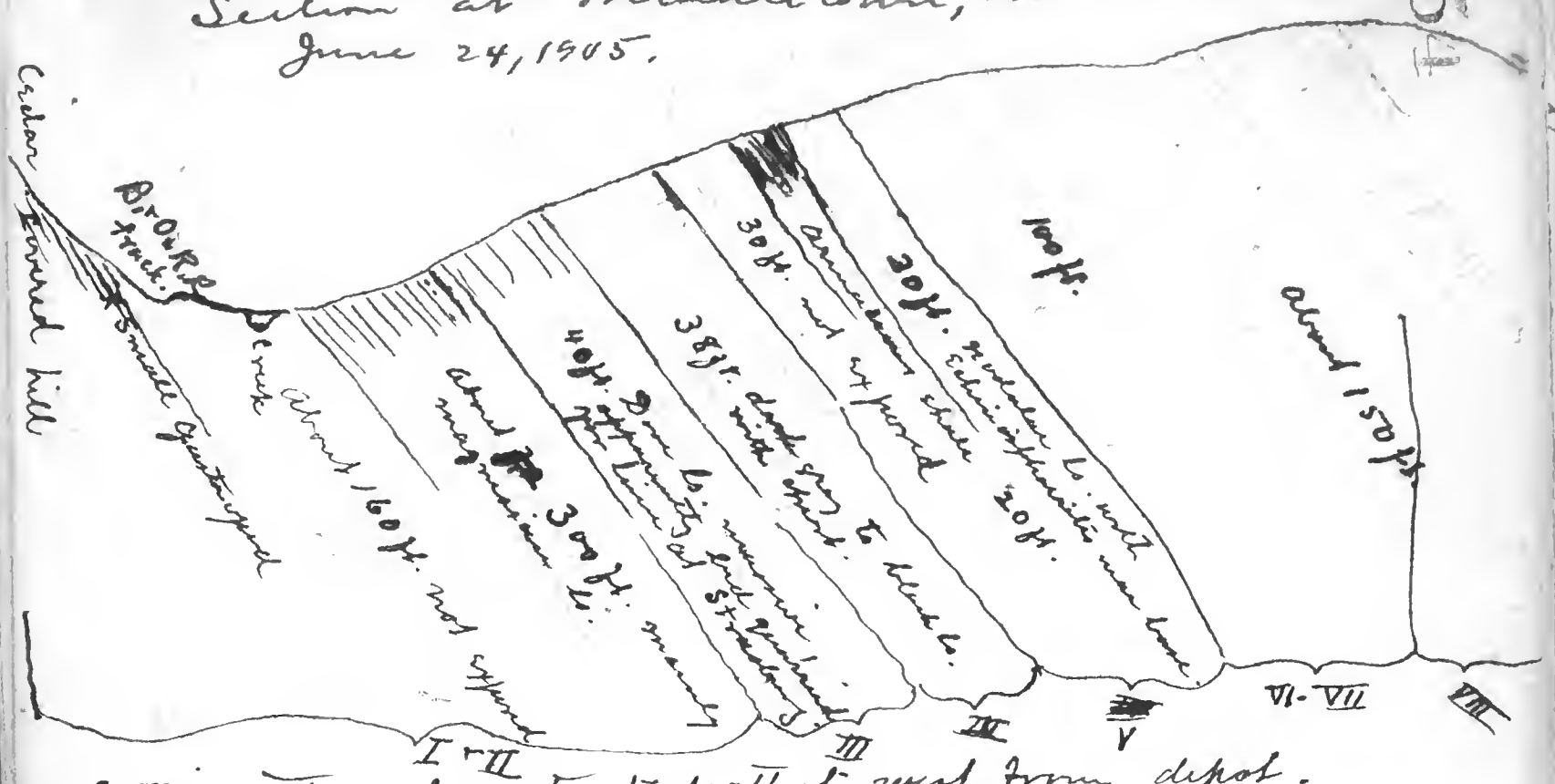
VII. This bed also afforded many fossils. A small Christiania is the most characteristic fossil. With it Plectambonites ... n. sp. = P. ... not ...) several orthids, a Triplecia, Bolboporites, Echinosphaerites, numerous ostracoda, Tetradium and Isotelus ...

VIII Lower 50 ft. of this bed only seems fossiliferous. A few graptolites, ... ; Leptobolus and Corynoides calicularis! ~~? ...~~. Not Utica but may represent Trenton.

IX. No fossils seen. Lithologically probably grades into no VIII

53

Section at Middletown, Va.
June 24, 1905.



Section taken along street farthest west from depot.
Numbers (I - VIII) correspond to Strasburg section.

(For Parnesburg, Md. section see p. 78.)

June 25th 1885

I [illegible] complete.

II [illegible]

III. Mud [illegible] pebble [illegible] Edessonnies, [illegible]

IV. [illegible] middle [illegible] streaked and [illegible] grayish [illegible] apparently without fossils.

V. [illegible]

VI. No exposure – evidently shaly [illegible] found near middle with [illegible]

VII. No exposures but evidently part of [illegible] (float from layer above.)

VIII. Sandstone and shale [illegible]

IX. Alternating s.s. & sh. [illegible] shale. Two of the ss. [illegible] The latter 5–8' [illegible]

X. Shale; at top [illegible]

XI. White Medina Tuscarora ss.

XII. Red [illegible] Juniata.

[illegible]

[illegible] Seen [illegible]

June 1905

[illegible]

[illegible] 152 [illegible]

[illegible] [illegible]

[illegible] in the [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] In the [illegible] section ~~[illegible]~~ at least [illegible] [illegible] rock are exposed [illegible] [illegible] [illegible] thicker, both the top [illegible] [illegible] [illegible] [illegible] and [illegible] rather [illegible] [illegible] unfairly and [illegible] [illegible] that [illegible] the [illegible] [illegible] [illegible] possibly a [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] the [illegible] [illegible] [illegible] [illegible] the [illegible].

The [illegible] [illegible] think [illegible], [illegible] it is [illegible] [illegible] to say anything very definite [illegible] thickness of [illegible] in this [illegible] [illegible] area. It is full of large Solenopora and [illegible], with these [illegible] [illegible] [illegible] apparently the same as species found [illegible] [illegible] [illegible] Simpson, [illegible] [illegible] [illegible] Ravenna valley [illegible] [illegible] [illegible], [illegible] Orthoceras [illegible] like those found with Solenopora at [illegible] Bluff, Tenn. occurs also. Finally the remarkable [illegible] found at Strasburg & [illegible] [illegible] an unusually developed [illegible] septum.

Stones River [illegible] [illegible] [illegible] occur at Staunton, the [illegible] [illegible] [illegible] [illegible], However, [illegible] disturbed condition of [illegible] cannot be [illegible] [illegible] [illegible]. If they do occur here then they are [illegible] [illegible].

Suggestions

S.W. [illegible] N.E.

Staunton to [illegible] [illegible] Sydney

[illegible]

[illegible]

[illegible] ?

W. Staunton to [illegible] [illegible] E

[illegible]

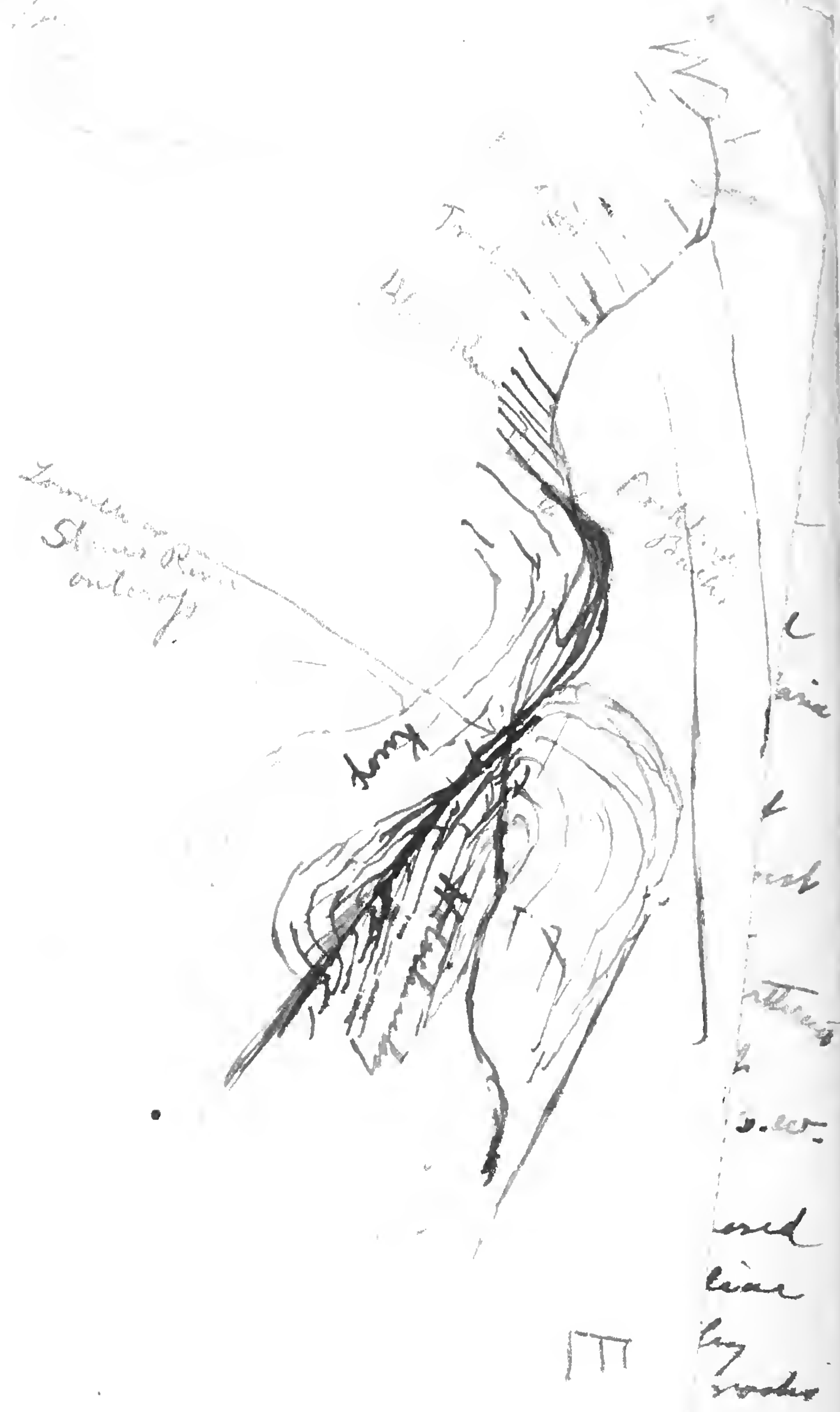
[illegible] rock

[illegible]

[illegible]

[illegible] [illegible]

June 25, 1905



overthrust fault
Just above Ro...
on North River
V. The fossils ...
some doubtless are
are different and
recognizably disti...
a distinct subbas...
of the typical ...
a subbasin ...
fault above me...
that the Murat
(at edge of quad.)
This Kerrs Creek ... ...sed
by the removal of ... ...liar
structure in this ar... ...ly
the nearly horizonta... ... rocks
along the road for ... the
Murat exposure.
The Trenton rocks ... ...eek of
Little North Mt. is more fossil... than
the cement rock at Lexington. ...probably
also was deposited in a partially or entirely
separated basin defined by the same thrust
fault above referred to. Considerable shale
seems to be included in upper part of the
Trenton. In the uppermost ls. numerous Plectambonites
and Zygo. recurvirostris occur.

The shales above this ... soon take on a
sandy character. They are to be correlated
with upper part Martinsburg shale and contain Fauna of Eden
fossils like those found in Chambersburg-
Mercersburg quad. More sandy beds referred
by geologists to Medina contain similar fossils
and also Orthorhy. linnigi(?). A large part of
this "Medina" (at least all beneath Tuscarora ss.)
thus is referable to Cincinnatian. The Tuscarora
~~may be no younger than Lorraine or more
likely represents Richmond.~~ Prof. H. D. Campbell
says he has found Triarthrus in basal part
of shales.
The Lexington cement rock and calcareous shales associated
with and above them in bands S.E. of overthrust
above referred to belong to the Lenoir or some other Atlantic basin
and the beds in this basin are to be correlated
about as follows: The Murat ls. which is in
part a ... marble with ... the Holston marble
or with the marble beds near base of Sevier.
The cement rock = shales with higher beds
of Sevier. (The Sevier is not the same everywhere as mapped. July 18)
A few feet above Murat the cement rock
contains the Ampyx and associated trilobite
fauna. Another species of Ampyx possibly
Rouaulti(?), was found by Prof. Campbell
south of Big House Mt.
At Buchanan, 20-30 miles S.W. of Lexington
the valley is very much contracted, being less
than 2 miles wide.

Lexington

100'± 1. Crypt. gray ... ls.
10'± 2. ... rock
40'± 3. Ampyx ... ls. full of trilobites
+ ...
50'± 4. Cement rock, ...

[illegible] Doubtless an overthrust fault here.

Just above Rockbridge Baths bluff on east bank of North River exposes heavy beds of very fossil. ls. The fossils remind of those in Murat ls. and some doubtless are the same. Others (like a Constellaria) are different and with the lithology which is recognizably distinct probably indicate at least a distinct subbasin or trough to the northwest of the typical Murat trough. That such a subbasin existed is indicated by the overthrust fault above mentioned. Also by the fact that the Murat ls. in the Kerrs Creek area 5 miles S.W. (at edge of quad.) is typical Murat.

This Kerrs Creek Murat area must be exposed by the removal of the overthrust Knox. Peculiar structure in this area is further indicated by the nearly horizontal position of the Trenton rocks along the road for nearly 2 miles north of the Murat exposure.

The Trenton rocks on the southeast flank of Little North Mt. is more fossiliferous than the cement rock at Lexington. It probably also was deposited in a partially or entirely separated basin defined by the same thrust fault above referred to. Considerable shale seems to be included in upper part of the Trenton. In the uppermost ls. numerous Plectambonites and Zygospira recurvirostris occur.

The shales above this [illegible] soon take on a sandy character. They are to be correlated with upper part of Martinsburg shale and contain Frankfort Eden fossils like those found in Chambersburg-Mercersburg quad. More sandy beds referred by geologists to Medina contain similar fossils and also Orthorhynchula linneyi. A large part of this "Medina" (at least all beneath Tuscarora ss.) thus is referable to Cincinnatian. The Tuscarora ~~may be no younger than Lorraine or more likely represents Richmond~~. Prof. H. D. Campbell says he has found Triarthrus in basal part of shales.

The Lexington cement rock and calcareous shales associated with and above them in bands S.E. of overthrust above referred to belong to the Lenoir or some other Atlantic basin and the beds in this basin are to be correlated about as follows: The Murat ls. which is in part a light marble with either the Holston marble or with the marble beds near base of Sevier. The cement rock + shales with higher beds of Sevier. (The Sevier is not the same everywhere as mapped July 1892)

A few feet above Murat the cement rock contains the Ampyx and associated trilobite fauna. Another species of Ampyx, possibly Rouaulti, was found by Prof. Campbell south of Big House Mt.

At Buchanan, 25-30 miles S.W. of Lexington the valley is very much contracted, being less than 2 miles wide.

100' = 1. Congl. gray [illegible] ls.
25' = 2. [illegible] cement rock [illegible] Ampyx sponges [illegible]
40' 3. Ampyx beds — argillaceous [illegible] ls. full of trilobites.
+ [illegible] (Athens shale in [illegible])
500' 4. Cement rock, [illegible]

June 25, 1903

60

62

63

[illegible] June 25, 1905 60

Section from Pearisburg Va., to half way up Pearis Mt. Beds I & II seen below town and railroad station one mile north. 64 62

July 3. '05

[illegible]

2225			1 inch of sandy shale. yellowish ss.
		20 ft	Sandy shales & calcareous ss. (Lazy Oriental) Like Juniata, but with fewer ...
2130 IX		95' to top. Good hill	
2130 VIII		48'	Purple calc. shale & argil. ls. with dove ls. seams at top containing fossils. Rhinidictya, Ostracoda, Rhynchotrema with smooth plications
VII		30'	Fine gr. thin bedded, earthy ls. with interbedded shale, dark to & ch. at first, light gray then reddish; in lower part a Dalmanella-like fossil. In upper part no recognizable fossils although thin seams may be made up of fragments of Trilobites & Ostracoda. x Ostracoda x Buccania & Strophomena. Slight dip westward into Moccasin.
2055 VI	60'	60'	Mostly light gray, medium compact ls., with darker & some (or subcrystalline) mottled beds. Ostracoda abundant in upper part. Also Strophomena. Poor gastrop. in lower part.
V		20'	Dove, fine gr. ls. Probably ~~upper Stones River~~ Lowville
IV		25'	Mostly even bedded, slightly laminar impure magnesian ls. Strophomena at base. (? Carters) Girvanella 3 large sp.
III		65'	Light (gray to dark) ... fine gr. ls. ... knotty & earthy. Contains brachiopoda & large celled bryozoa and toward top Dystactospongia. Girvanella very abundant in top layer.
II		30'	Dark bluish gray, subcryst. & earthy ls. Especially in upper part containing brachiopoda and gastropoda. one like Maclurea & also very numerous Girvanella less than ½ in dia.
		20?	... 30 ft (& perhaps ...) of massive slight cherty ls. Belongs to bed II.
I		160'+ 200'	More or less cherty, especially lower 50 ft, dark gray, mottled massive ls. Large celled bryozoa & occasional brach. Fossils more numerous in lower 50 ft. D. pulchella? Pachydictya etc. and ... Small Stromatocerium. *
50 ft Moccasin			rather massive, dark blue, cherty ls. with Dystactospongia, Stromatocerium, large celled bryozoa, numerous gastropods, one like Liospira ...

Lower Stones River Beekmantown

Pearisburg [illegible]

readily distinguished though that of the Knox is more abundant and deeper, the soil being very rocky with no bedded dolomite outcrops. The ls. chert is of a deeper red smoother on the surface, in larger pieces and usually associated with ls. outcrops. Besides it is more or less fossiliferous as at Pearisburg. no fossils observed in Knox chert and comparatively little soil covers the angular fragments of whitish chert. The chert of the ls. is black inside and usually laminar horizontally not concentrically.

In the quarry the ls., except along fissures, is practically free of chert, but it shows abundantly enough on long weathered surfaces.

Apparently no lower Stones River in Pearisburg section - However, lower & middle St. River time is represented. The dolomite beneath bed I was not carefully searched for fossils, illness & rain preventing in time at our disposal. (See pp. 80-85 for sections between Eggleston and Dry Branch, and below Narrows, Va., respecting south and north of Pearisburg.) - made in 1907).

Moccasin Stones River resting ... [illegible]

69

[illegible] June 25, 1908

Section from Pearisburg Va, to [illegible] of Pearis [illegible], [illegible] I & II seen [illegible] one mile north,

July 2, [illegible]

[illegible]

2 inch of sandy shale
28 ft sandy shale & calcareous ss (Clays Ordovic?)

VIII.

48' Purple calc. shale & argil. ls. with dove ls. seams at top containing fossils, Rhinidictya, Ostracoda, Rhynchotrema & smooth plications

VII 30' [illegible] thin bedded, earthy ls. with interbedded shale [illegible]

2055 — ... [illegible] Dalmanella like fossils. In upper part no recognizable fossils ... Slight dip westward into Mountain ... fragments of Trilobites & Ostracoda

VI 60' ✱60'

mostly light gray, medium compact ls. with darker & some mottled beds. Ostracoda abundant in upper part. Also Strophomena [illegible]

Pearisburg or Sterling formation

Spears Ferry formation with the Mason Valley near Hickory [illegible] ... shale mentioned above to [illegible]

✱ at Ripplemead - 3 m. east of Pearisburg - [illegible] quarry works ^lower part Bed I. which here occurs in a neat syncline. Beds beneath the quarry rock (of which analyses were obtained from owner — Mr. Mason) afforded Tetradium ~~[illegible]~~ ^syringoporoides -single tubed form - and a few other things. Among the latter chert plates with widely separated pits that represent openings of a loose Tetradium or Syringopora-like form.

Contact between Knox and purer ls. not well shown. Between Pearisburg and Ripplemead road passes from lower cherts of limestone to chert hills of Knox and again to cherts of ls. The cherts of the two horizons are not readily distinguished though that of the Knox is more abundant and deeper, the soil being very rocky with no bedded dolomite outcrops. The ls. chert is of a deeper red smoother on the surface, in larger pieces and usually associated with ls. outcrops. Besides it is more or less fossiliferous as at Pearisburg. No fossils observed in Knox chert and comparatively little soil covers the angular fragments of whitish chert. The chert of the ls. is black inside and usually laminar horizontally not concentrically.

In the quarry the ls., except along fissures, is practically free of chert, but it shows abundantly enough on long weathered surfaces.

Apparently no lower Stones River in Pearisburg section - However, lower & middle St. River time is represented. The dolomite beneath bed I was not carefully searched for fossils, illness & rain preventing the time at our disposal. (See pp. 80-85 for sections between Eggleston and Dry Branch, and below Narrows, Va., respectively south and north of Pearisburg. - made in 1907).

[illegible]

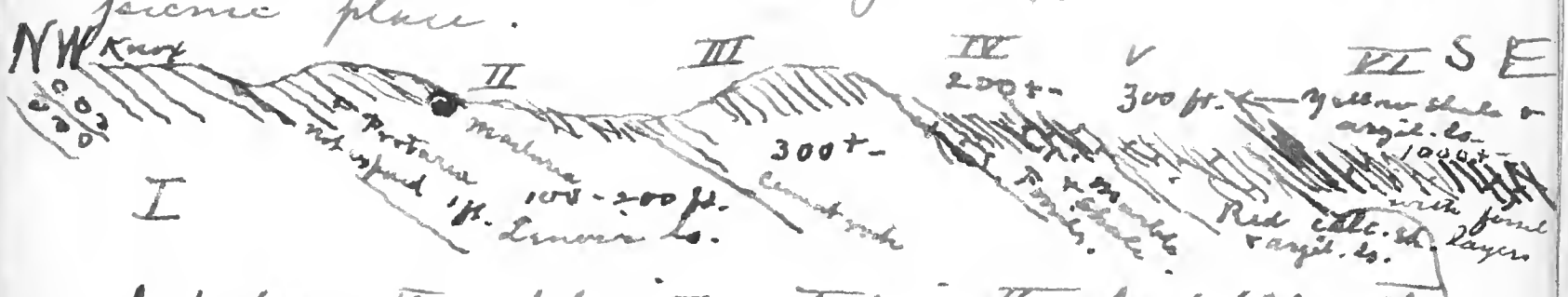
June 25, 1905

C.
C.

Ordovician section (between July 4th 1905. along railroad) C.
Glade Spring and Saltville, Va. C.

Saltville lies on the north side of a great thrust-mass with lower (edgewise) Knox thrust on Mississippian gypsiferous shales. At locality 1 (R.R. cut about 2 m. SW. of Saltville depot) found ~~some~~ layer with up. Cambrian trilobites. Associated beds were shaly and the lo. seams non dolomitic, the general aspect, with small lo. conf. seams, recalling supposed equivalent Elvins form. of Mo. 400 - 500 ft. approximately, of similar and thicker bedded more dolomitic rocks followed in ascending order. Above these for perhaps a thousand feet dolomites continue very sparingly cherty. Then the chert becomes abundant. The upper 500 ft. or more of the Knox is again very sparingly cherty. (Can any of this be Stones River?)

At loc. 2, about 4 miles from Saltville first Lenoir ls. is met with. What appears to be contact between same and underlying non-cherty Knox is shown - though not very satisfactorily in a small R.R. cut just opposite a small picnic place.



Just above the dolomite - that is the first 6 ft. - the the rock contains some pebble-like plates and fragments of dolomite in a pure ls. matrix. About 3 - 6 ft. above contact a massive ls. bed is largely made up of such pebbles and fossils - the latter in poor condition. However, in face of rock recognized a cross-section of a large specimen of the laminar coral - presumably of the kind Stylina ~~found~~ in same bed near Knoxville. About 20 ft. higher in section have good sections of a Maclurea knoxvillensis.

I. Knox dolomite ? Beekmantown ?

II. Over 100 ft. of largely magnesian Lenoir ls.

III Cement rock, representing higher division of Lenoir farther south and the Nittany shale of the eastern trough; (also possibly ~~perhaps~~ corresponds in part to cement rock of Lexington; and Red calc. sh. & argill. ls. of Pearisburg. The last possibly should be correlated with bed V, of which it greatly resembles (compare).

IV Crypt. ls. (marble) in thin beds, with more or less calc. shale. Contains numerous bryozoa and Ostracoda of types apparently like those found in basal Lenoir shales of Knoxville. a small Pleurodictyum is characteristic

V. Red calca. sh. & argill. ls. (saw no fossils)

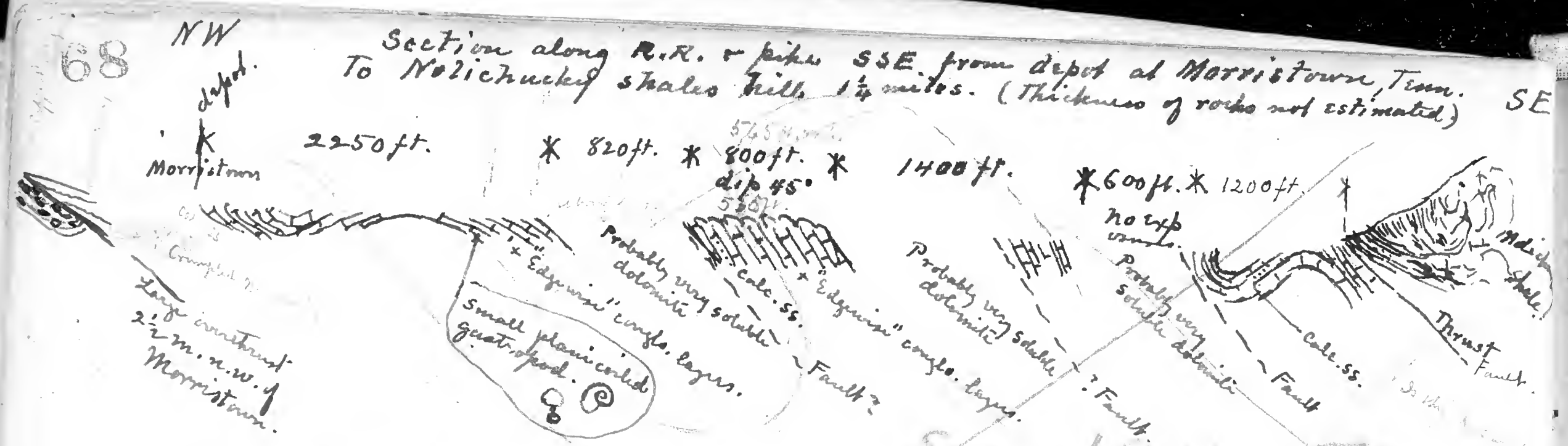
VI Ordinary Lenoir shale except that it contains more numerous plates of fenestellinoid ls. than I have seen. The fossils consist chiefly of Pleurambonites (not sericeus, ~~strias~~ being coarser) and a Dalmanella near testudinaria. a small but relatively long Rafinesquina is characteristic.

VII Red calc. shale very much like parts of bed V. Possibly it is that bed & not top of Lenoir or equivalent to Baya. If the fault just SE. of it is an ~~normal~~ overturn thrust then it may be bed V, but as none of the other beds are repeated I think not. In the latter event the fault would appear to be, like those in the Scotland (Va.) area, normal in origin and subsequently modified to thrust.

VIII Begins with shaly ~~shale~~ magnesian ls. like those near Saltville where fossils prove them to be basal Knox and middle Cambrian. no true Knox outcrops to Glade Spring, all the beds doubtless being older.

68

Section along R.R. & pike SSE. from depot at Morristown, Tenn. To Nolichucky shales hills 1¼ miles. (Thickness of rocks not estimated)



July 5, 1905.

Keith maps a band of Chickamauga (Lenoir) ls. just about one mile s. of Morristown. Cannot understand which of the exposures in that vicinity he mistook for that ls. but am confident there is no Lenoir there. All the rock between Morristown depot and the Nolichucky shale hills is older than Lenoir and all the outcrops according to present knowledge are older than the cherty Knox. Many of the outcrops contain nearly pure fine-grained ls. layers reminding in their weathering & texture rather strongly of typical Stones River rocks. It is certain however that they are much older, the fossiliferous bands showing that the organic remains consist chiefly of trilobite fragments, very much broken up. The Saw not a trace of the high spired gastropods so common in nearly all parts of the Stones River. Still, the rocks contain gastropoda, one layer being observed that was filled with a small, planispired (perhaps involute) shell. The rocks in the various outcrops remind strongly of those seen in the vicinity of Scottland, Pa. It is significant that here as there some of the layers are ls. conglomerates (edgemine beds) others are finely oolitic, while a few, especially in the part regarded as basal, are arenaceous.

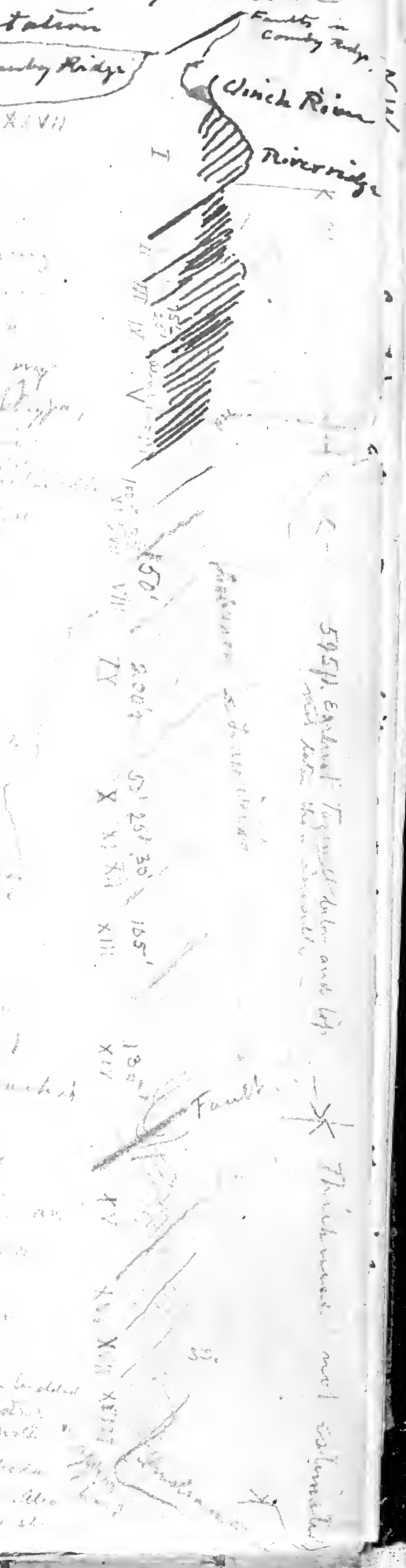
The structure of the Morristown area also recalls that pre
in the Greenvillage - Scottland (Pa) region. If the structure is
aright it is marked in both areas by originally, normal st
subsequently modified to thrusts. Comparing the 4 outcrops
depot and Nolichucky shale it appears that they are
of the same general horizon, distinguished from overlying
rocks in being much less highly magnesian. Many of the lay
especially the fossiliferous ones, being apparently nearly pure
contain streaks that must be quite low in magnesia. If
concerning the relative solubility of such fine-grained pure ls. an
is founded on fact then the intervening subequal spaces
are probably occupied by dolomitic ls. If the 4 outcrops
grained ls. represent practically one and the same horizon and
spaces are occupied by repetitions of a more soluble overlying be
prevailing SE dip can be explained only by assuming a series of th

another striking fact observed in this a
far-east bands of Knox and Shenandoah l
rocks in these are not only purer ls. - especially less magnesian - but als
cherty than in the typical Knox bands further west. Either the ra
is older and the younger cherty beds are not present (perhaps were not
or equivalent beds are strikingly different lithologically. That the for
is probably the case is indicated by observations N.W. of Lexington, also
in Va. where the true cherty Knox is underlain by at least 2000 ft.
in every respect with these. Everywhere they contain ls. compo. & pure streaks
trilobite fragments.

(Notes on Knox cont'd on p. 75.)

June 25, 1903

Morristown (Tenn.) sheet.
Section from Clinch River near Evans Ferry (near corner of Claiborne, Hancock and Grainger cos.) S.E. to Beans Station
(Main barrier in County Ridge)



I. Middle [illegible] and [illegible] XXVII

II Sh[illegible] beds [illegible]

III Shales with thin layers [illegible]

IV Dark gray [illegible] 75 [illegible] thickness [illegible] upper 10 ft. thin bedded and [illegible] Very fossiliferous [illegible]

Base of [illegible]

V Interbedded thin layers of [illegible] shale and plates of [illegible] Bryozoa [illegible]

VI. About 100 (-125) marble, gray above, red below. (thin bedded, heavy)

VII. [illegible] full of [illegible] fossils [illegible]
35

VIII [illegible]
150 [illegible] to [illegible]

Base of Lebanon.

IX Thin bedded [illegible] shale [illegible] same fauna as in [illegible]
200 marked by [illegible]

X [illegible]
50 [illegible]

XI [illegible]
25 [illegible]

XII [illegible]
30

XIII [illegible] Medium thin bedded, [illegible] fossils [illegible] Gastropoda [illegible]
105

XIV [illegible]
135 135 ft. [illegible] Conradella near base.

Fault.

XV Overthrust [illegible]

XVI Sandy [illegible] shale

XVII [illegible]

XVIII [illegible] shale [illegible] 420 ft. [illegible]

Overturned & close folded or separated by fault from bed XIX.

XIX Nodular (Stones River type) [illegible] 80 ft. exposed

XX [illegible] black shale 130', to. 20', shale 20'.

XXI [illegible] 360 ft.

XXII [illegible] 130 ft.

XXIII [illegible] 520 ft.

Nolichucky

XXIV [illegible] 345

XXV [illegible]
On top of ridge lower 150 very [illegible]

XXVI [illegible] (Typical Knox)

Knox dol.

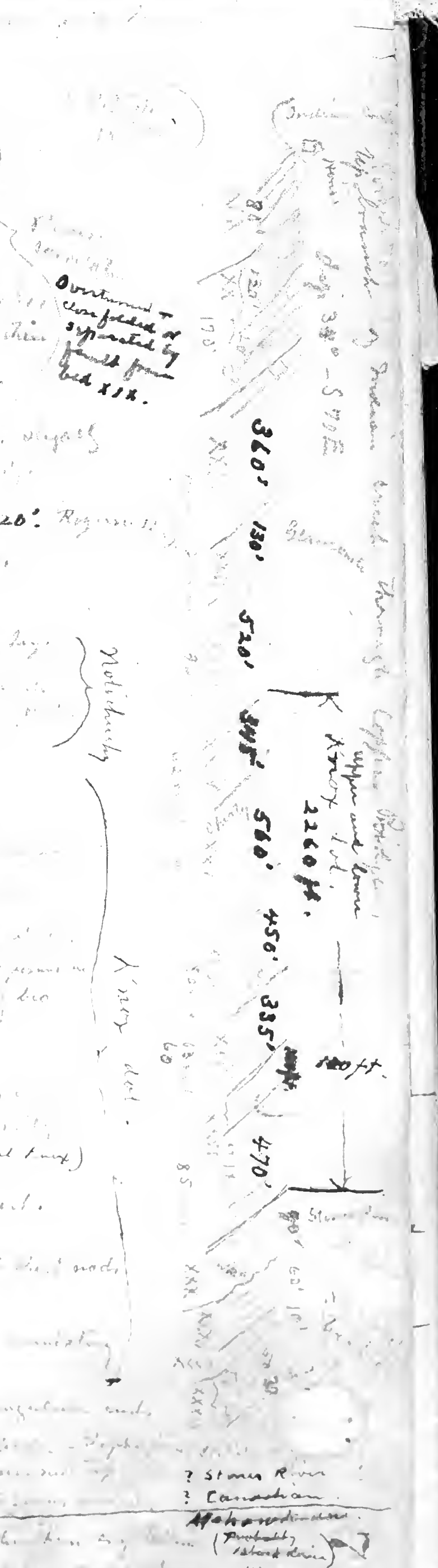
XXVII [illegible]

XXVIII [illegible] 100 ft.

XXIX [illegible]

Athens

XXX [illegible]



595 ft. [illegible]

Notes on Knox dol. giving observations on
from Morristown to Evans Ferry (Clinch River) and
return.

As expected the Knox in going north from Morristown
continued of the non cherty type to overthrust fault along
Crockett Ridge. Considerable platey ss. & shale in these beds
(corresponding to similar beds noted in northern slope
of the Nolichucky ridge south of Morristown - see section p. 68)
however was observed, especially in the 2nd mile north
of town. The beds lie nearly horizontal. Almost
immediately after passing the fork - the left road going
to Turley ferry, the right to Long ferry - chert in greater
or less abundance is felt and seen in the roadway; and
limy outcrops are practically absent between the fork
and the Nolichucky shale in River Ridge. This is in strong
contrast with the conditions south of the fault where limestone
outcrops are abundant and chert almost or quite absent.

The fact that Knox chert extends from the fault to,
or at least very near, the Nolichucky shale outcrop in River Ridge
is interesting & important, since it indicates one of two
conditions: either there is a fault near the Nolichucky
border, causing the lower Knox to be faulted out, or, as
seems much more probable, this band represents an old
barrier on which only the upper or cherty Knox was
deposited by overlap from the northwest. If this is
the proper explanation, I would still maintain that the
subsidence was not sufficiently general to submerge the
lower Knox areas lying to the SE of the Crockett Ridge
fault. These probably were not submerged, before the advent
of the Sevier shales sea, - but evidence on this point - is lacking.
Observations on the Knox area between Long Ferry and D.
the Richland Knobs were not very careful and the results
are now hazy in my mind. As I recollect the facts this area
also contained only, or little else, than the cherty upper Knox.
As shown in the section on p. 71 the Knox band immediately
north of Thorn Hill contains both the upper cherty division and
a comparatively non cherty series beneath it. — Observations
were not extended to the Clinch River Knox band, only the tops
of this being touched.
The faults between Morristown and Poor Valley Ridge
seem to be successively developed and broken folds

Probably Oct. Exc. - Jan. 1921

June 25, 1905

p. 74

345 lower Knox
560 ss layers ... chert ... a few layers ...
450 ...
335 little chert.
1345

Notes on Knox dol. giving observations I did from Morristown to Evans Ferry (Clinch River) and return.

As expected the Knox in going north from Morristown continued of the non cherty type to overthrust fault along Crockett Ridge. Considerable platy ss. & shale in thin beds (corresponding to similar beds noted in northern slope of the Nolichucky ridge south of Morristown – see section p. 68) however was observed, especially in the 2nd mile north of town. The beds lie nearly horizontal. Almost immediately after passing the fork – the left road going to Turley ferry, the right to Long ferry – chert in greater or less abundance is felt and seen in the roadway; and lime outcrops are practically absent between the fork and the Nolichucky shale in River Ridge. This is in strong contrast with the conditions south of the fault where limestone outcrops are abundant and chert almost or quite absent.

The fact that Knox chert extends from the fault to, or at least very near, the Nolichucky shale outcrop in River Ridge is interesting & important, since it indicates one of two conditions: either there is a fault near the Nolichucky border, causing the lower Knox to be faulted out, or, as seems much more probable, this band represents an old barrier on which only the upper or cherty Knox was deposited by overlap from the northwest. If this is the proper explanation, I would still maintain that the subsidence was not sufficiently general to submerge the lower Knox areas lying to the SE of the Crockett Ridge fault. These probably were not submerged again before the advent of the Sevier shales era, – but evidence on this point is lacking.

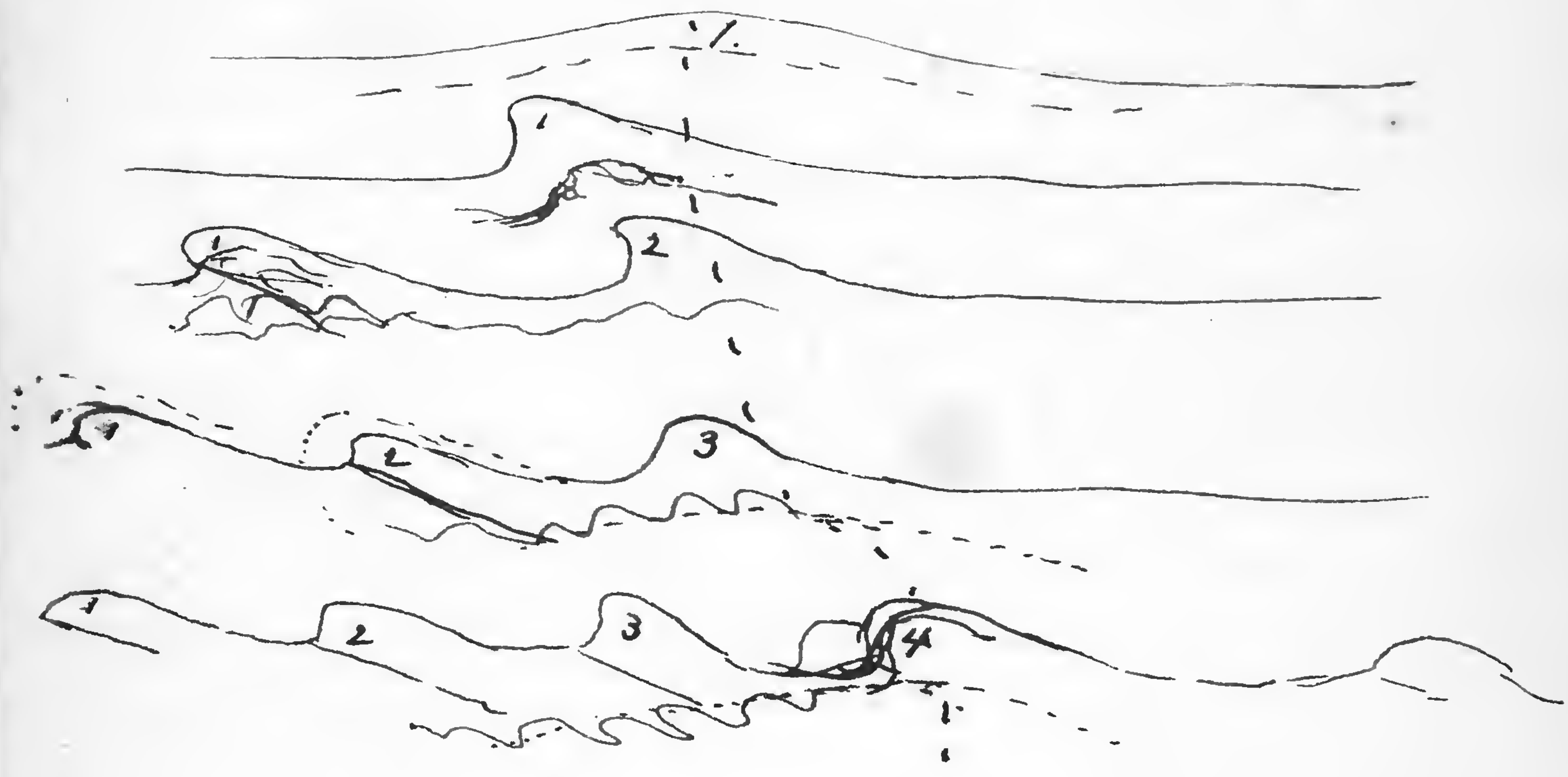
Observations on the Knox area between Long Ferry and the Richland Knobs were not very careful and the results are now hazy in my mind. As I recollect the facts this area also contained only, or little else, than the cherty upper Knox.

As shown in the section on p. 71 the Knox band immediately north of Thorn Hill contains both the upper cherty division and a comparatively non cherty series beneath it. — Observations were not extended to the Clinch River Knox band, only the top of this ~~being~~ but touched.

The faults between Morristown and Poor Valley Ridge seem to be successively developed and broken folds

Probably obsolete – E.O.U. Jan. 1921

as the rocks were pushed over the original anticline located near the present Crockett Ridge fault or even nearer Morristown.

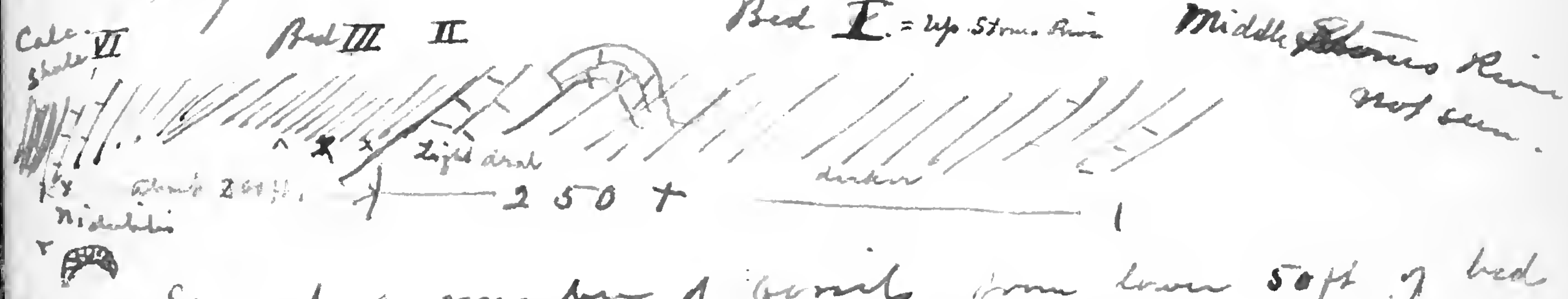


Respecting the Maryville Lo.: in this district it has many of the lithologic characteristics of the Stones River rocks; also outcropping freely and simulating the Lebanon especially in supporting ~~a strong~~ an abundant growth of cedars.

Pinesburg, Md. May 3rd 1906

Came to this burg at noon from Martinsburg via. Cherry Run. Nothing here but several lime and dimension stone quarries.

Bed I/8 of east Martinsburg section furnishes stone. Part immediately beneath Echinosphaerites bed (=II) of bed 7 not being worked but is present in same character and force as at Martinsburg. Beds chiefly worked are from 60 to 200 ft. beneath top of bed I, which is folded at old quarry. The lowest seen begin to include thin seams or strings of more or less magnesian ls. A new plant is being installed for crushing rock. This is to work the lower layers.

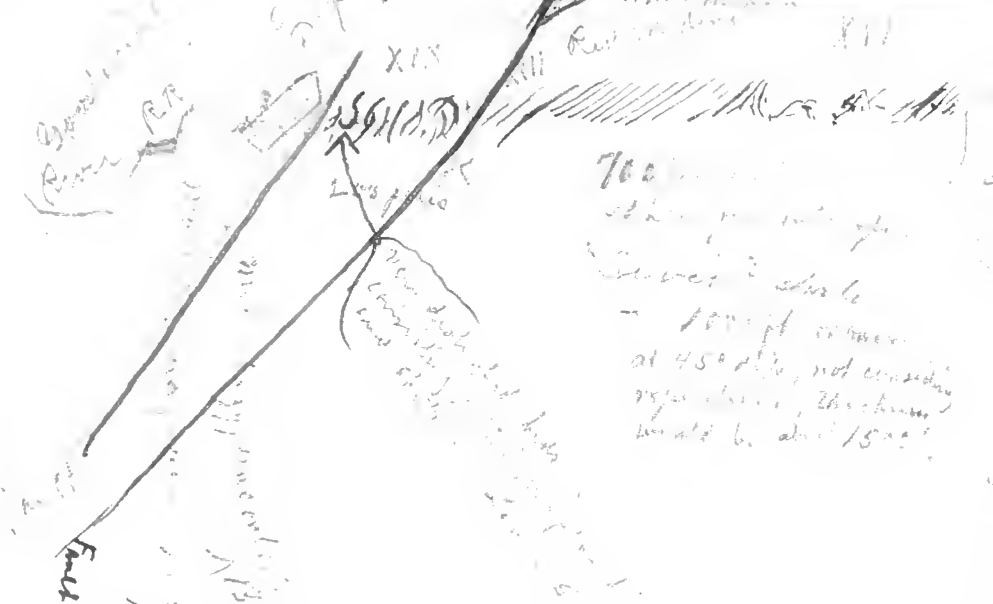


Secured a number of fossils from lower 50 ft of bed II-III/7 among them Echinosphaerites, Nidulites, Receptaculites, Triplecia and Brachiopods & Bryozoa. Near top Nidulites & small hemispheric bryozoan indicate exactly same stage as at Chambersburg loc. F (p. 19). The dense ls. of bed I are not favorable for fossils. An occasional layer contains large Ostracoda (both Lep. & Isochilina) and one layer was noticed in which a part was filled with Girvanella. Another was filled with Lophospira and high spired? Trochonema. Near middle of bed, associated with Girvanella, some of the layers have suncracked surfaces while one at least was observed to be a fine ls. conglomerate. In same quarry some of the seams or cracks contained a very coaly black mineral, which as it would not ignite is supposed to be graphite.

Season of 1907.

Section from Goodwin Ferry, north along New River to Eggleston — 2 miles below.

XV XIV XIII XII XI X IX



170 ft

25 ft at 45°

(On opposite side of river Topography indicates two faults as on south side. Apparently a thrust dividing into two fault planes.)

For continuation of section from Goodwin Ferry southward (upstream) to Dry Branch see pp. 83-82.

NE

SW

Goodwin Ferry-Eggleston

240'

 N

Eggleston

VIII VIIIa III I

30° dip

= 452 ft

= 73 ft

= 90 ft

= 135 ft

= 90 ft

645 ft

82

83

NW

Range

Sect.

SE

Section begins 1 1/2 m. below Narrows Station ... N.W. ... about 1/2 miles toward Zurich ...

Ordovician | Cambrian

70 ft.

52 paces 20 deg. = 68'

30 ft.

56'

165'

June 28 1903

Aug. 8th 1903

Aug. 25 1905

Cryosoda

3351 I

Dominantly clays below

See later (1921) section & notes N.B. 32, p. 50

Apparently no true Ottawa in this section

Thompsonville

Vidalia

[illegible]

3351

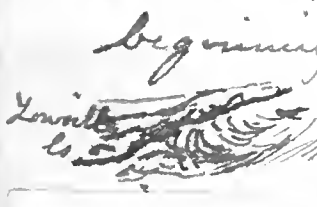
Trenton

[illegible]

See later (1921) sections & notes in (F.B. 32) p. 50

Apparently no Trenton Stone in this section

Many fossils – Phyllodictya grandaeva, R. nitidula, Lepidodendron, Sigillaria &c.



Two sections along L. & N. R.R. track, No 1 beginning with Louisville (near base of) less than ½ m. west of station, No. 2 beginning with Devonian shales overthrust by Louisville immediately opposite station and extending less than a

Pennington Gap, Va.
See revised structure and section pp. 92–93.

Lowville — Bentonite bed

Lebanon — 50′ — Bryozoan bed — 35′ 30′–40

Ridley — 40′ — Granular bed

Pierce — 15′ — Red shaly ls.

Murfreesboro — 50′ — Massive dove ls., Mosheim — 200 + — Murfreesboro

All the Lowville and greater part of upper half of Pennington Gap Stones River strongly suggests tidal flat deposits. Sun cracks occur and have brought to photo. good example belonging to Glade Lebanon Stones River.

Subject to revision according to 1905 studies. E.H.

In these two sections the dolomitic ~~magnesian~~ (Knox-Beekmantown) series offers the following features worthy of notice:

(1) Except the lower 500 ft, aside from the magnesian character of rock there is no agreement between them. 570 ft above lithologically the Chickies section has 100 ft of [illegible] shale, chert & oolite, not seen in Spring Ferry section. The upper 1200 ft look like the cherty Knox but the chert itself is rather sparingly developed (? due to rapid erosion of cherty exposures). In the Spring Ferry section the whole 2300 ft or so is practically chertless [illegible] but [illegible] less tall [illegible] in the [illegible] portion of the

(2) While the upper 1200 ft in the Chickies section is a [illegible] dolomite, the corresponding upper part of the Spring Ferry section [illegible] is [illegible] [illegible] and more [illegible], magnesian &c. In fact while the former will pass very well for true cherty Knox, the latter agrees very closely with the Beekmantown of Pa. (1) ... the B. [illegible] ... than the cherty Knox, and (2) magnesian [illegible] of the

(3) Admitting that the upper 1200 to 1500 ft of the Spring Ferry section are Beekmantown and the ~~remaining~~ lower beds non cherty Lower Knox it follows that the cherty or typical Knox is not represented in the Spring Ferry section.

(The ~~[illegible]~~ [illegible] portion of the cherty Knox beneath the and Beekmantown beds shown by the Chepultepec (Ala.) Chambersburg to McConnellsburg, Pa., and the New York sections in which the whole of either the one or the other occurs in the same section with a part of the other. Pennsburg Va. seems also to have both South of New York at least both occur only in the same trough, Pennsylvania. To the East the Beek. rests on the Lower non cherty Knox, and South of Pa. to the west we have first a good development of cherty Knox and no Beek., then farther west, a cherty Beek. over the typical Knox (in the Chepultepec) general remarks are [illegible] difficult to [illegible] within the [illegible]. The [illegible] of the [illegible], especially in a N.S. direction [illegible] being very complicated.

Notes on Knox + Beekmantown in Chickies - Spring Ferry sections:

Two

The 2 sections along L. & N. R.R. track, No 1 beginning with Lowville (near base of) less than ½ m. west of station, No. 2 beginning with Devonian shales overthrust by Lowville immediately opposite Station and extending less than a mile toward Pennington Gap are interesting for several reasons;

(1) The whole of Ordovician shown in sections is undoubtedly interior in faunal and lithological aspects. The Lowville is closely like High Bridge Lowville, the Hermitage like Jacksboro, Tenn., the Bigby and Cathey closely like north central Tenn. and Lexington, Ky. sections, and the Eden and Maysville very much like middle Ky. and Cin'ti representations.

(2) The Bigby includes a very interesting folded bed the folding of which seems to have taken place before deposition of the Cathey.

(3) An hiatus separates the Cathey and Eden, what I take to be upper, or at least late middle Eden resting on Cathey.

(4) The unusual similarity of the "hill quarry" and the Bellevue beds in section 2 to the north central Ky. representations of these beds.

(5) The extraordinary difference in tops beds of Maysville in the two sections: Thus, while the total Maysville in sect. 1 aggregates but 265-272 ft. (the latter amount is total of estimates), the corresponding beds in section 2 measuring 265 ft.) the total Maysville in section 2 amounts to 427 — a difference of something like 160 ft. As the top of the Maysville bed in sect. 1 is accurately recognizable in section 2 it appears that this difference is ascribable to erosion of the Maysville in the area of section 1. No other cause is apparent, the respective sections up to the bed in question (bottom 4-5 ft of bed VII) correlating exactly.

(6) The thrust fault at Ben Hur station is of the usual Appalachian type in character and direction. The outcrops curve and local disturbances are such that the thrust seems to come from the NW.

The Stones River, though well exposed in vicinity of Pennington Gap, is here so much broken up that it is difficult to make out the succession. Fossils help very little, the rocks having few and those, because of the commonly vertical attitude of rocks, very difficult to see, not to say provoke.

So far as done, investigation inclines to determining the matter the succession appears to be as follows:

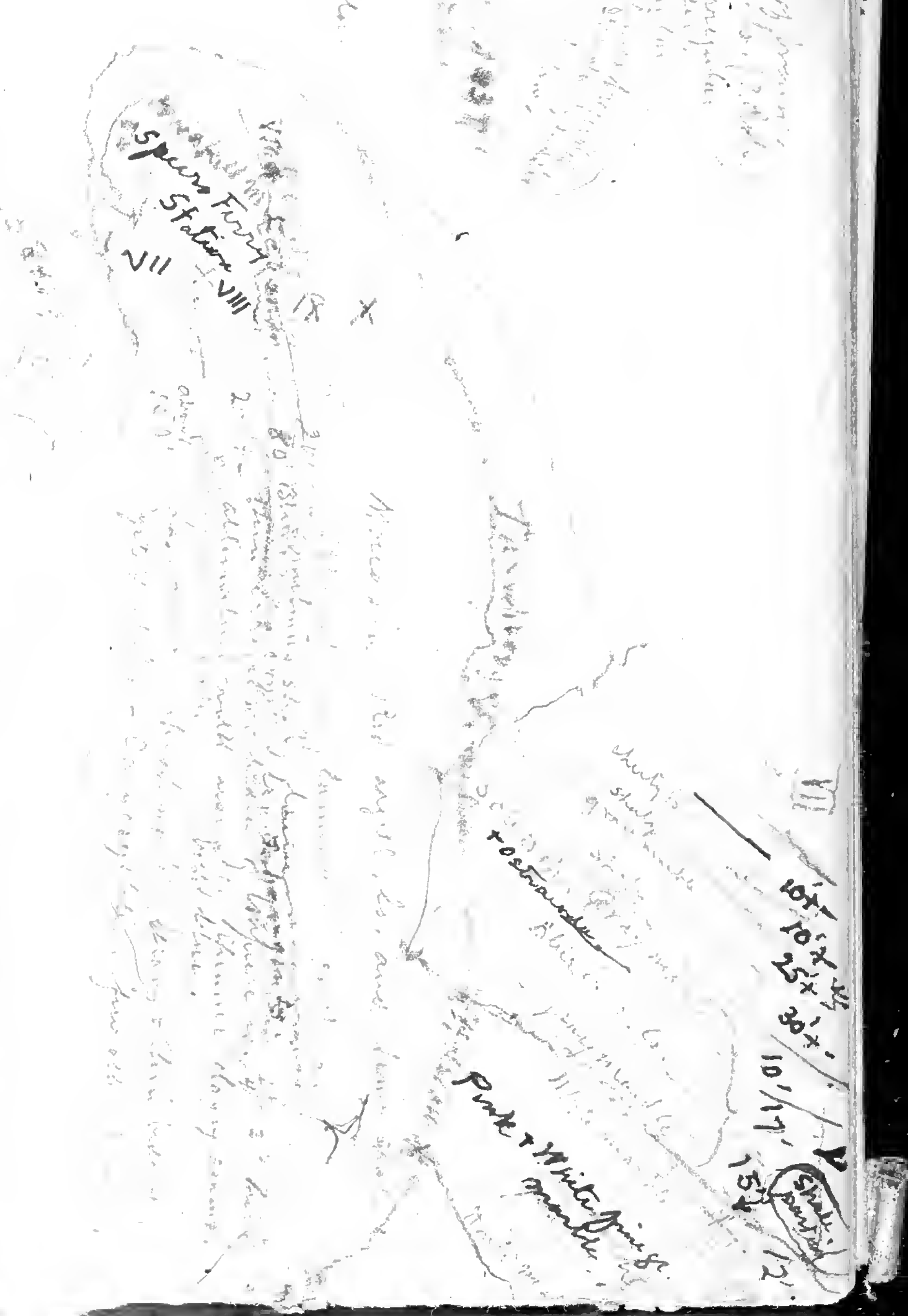
Lowville — — T. cellul. + Beatricea bed / no bed corresponding to Carter ls. seen.

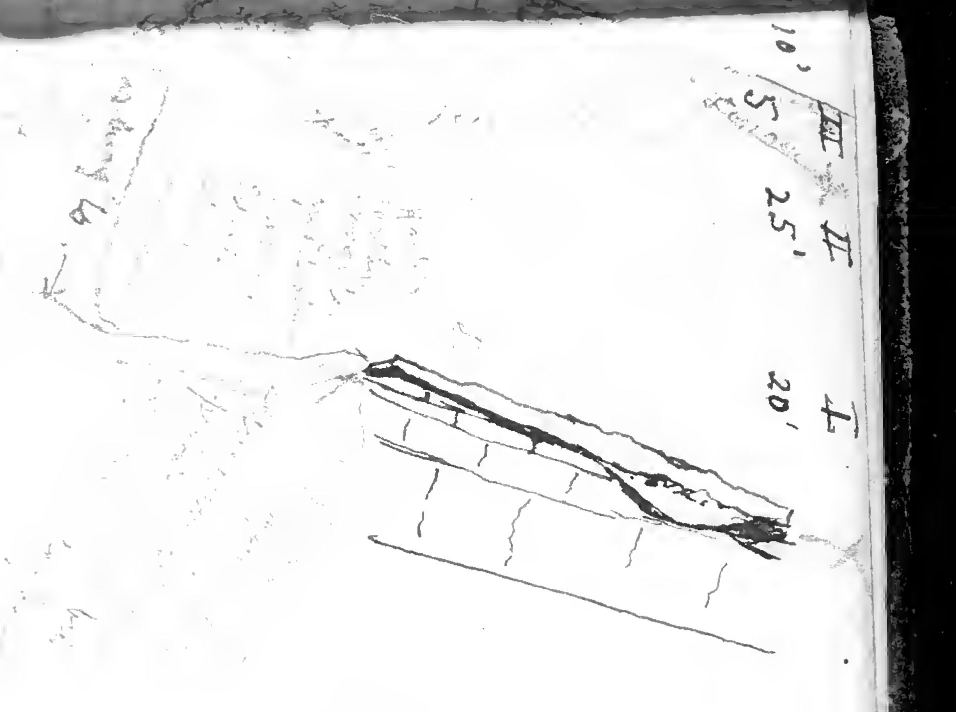
? Lebanon	85'	Mostly thin-bed. dove ls. weathering in part shaly. Lebanon bryozoa in middle part.
? Ridley	40'	Finely granular, bluish dove or gray in color.
? Pierce	15'	Red, shaly ls.
Murfreesboro	200+	compact dove ls. (50ft.) at top with less compact yet fine grained light-gray ls beneath to top of Knox chert. A cherty bed in lower half, 50ft or more above base. No fossils seen.
Totue	340'+	Knox.

Cherty bed in lower part of section reminds in color of ls. and chert - the latter black - of cherty bed in Tazewell section. But it has none of the fossils characterizing that bed and the ls. besides is a trifle finer grained than average of that bed. At present it is regarded as representing cherts of the Murfreesboro ls. horizon.

Another cherty bed seems locally present over a bed that resembles the Beatricea - Tetr. cell. bed (regarded as basal Lowville) lithologically and in holding gastropoda and "worm-tubes". It was noted at two points along R.R. within 2nd mile west of Penn. Gap station, but as the two "list" fossils of the Beatricea bed (Beatricea & T. cell.) were not seen at these points (a number of Gastro. were collected) it is possible that the outcrops in question are of a lower bed. In that case the Stones River - Lowville section here would contain two gastropoda beds closely resembling each other in character of rock and fossil contents - especially gastro. and "worm tubes". The latter occur also in bed X Tazewell Va. section (p. 86) (= basal bed of Lowville). In all cases surface of decomposing # masses of these beds are coated with a chalky layer.

all the Lowville and greater part of upper half of Stones River in this vicinity strongly suggest tidal flat deposits. Sun cracks once I have tried to photo. Good example belonging to Lebanon Stones River shown in quarry 1/2 m. W. of Penn. Gap station.





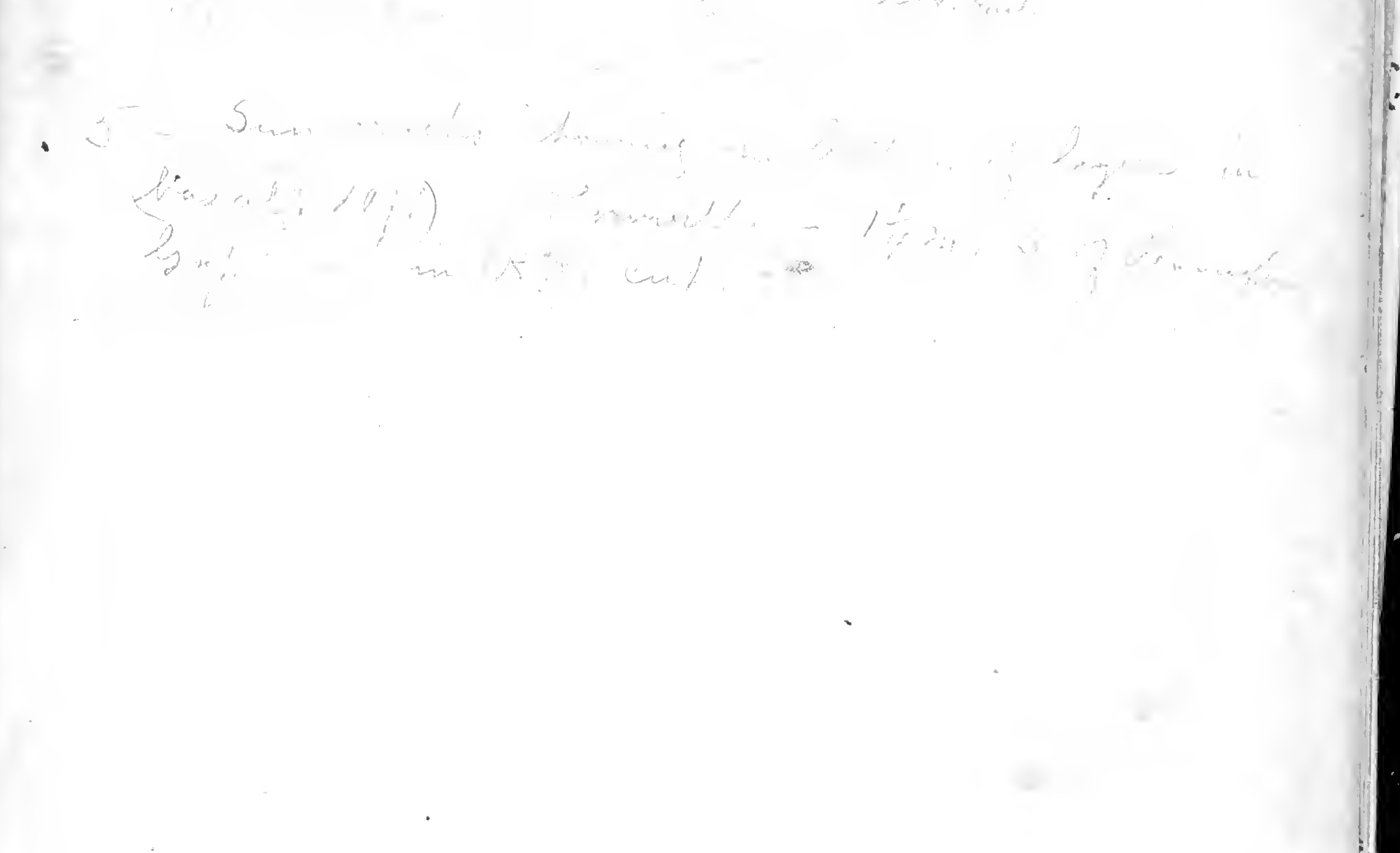
I & II & III is Strasburg Ls — 30 ft ± — about,
(Athens & Whitesburg shales) Tellico? 32 ft.

IV = Holston

V – VIII = Upper (= Hershade shale minus 250?) ... limestone ... (270?) ... 520 ft

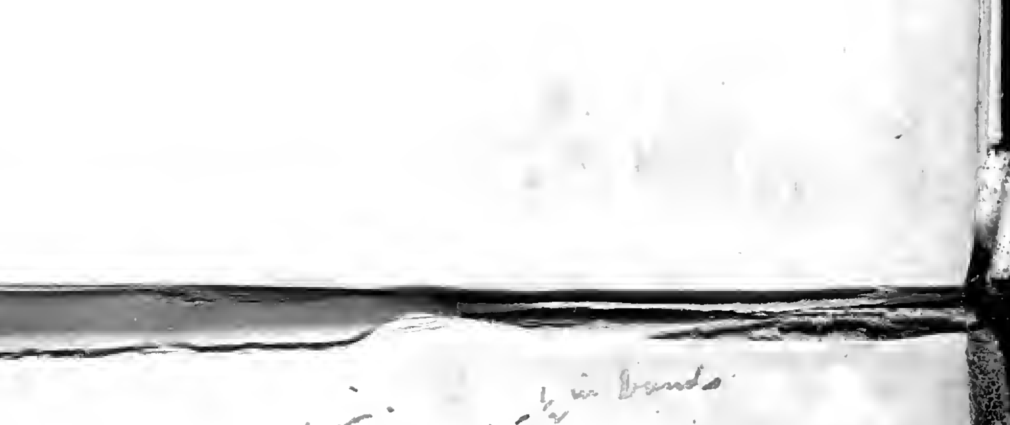
VIIIa = Lebanon

IX = Lowville — X = Moccasin.



Section from Martinsburg to North Mountain along Dry Run

At A a road running SW with strike of rocks connects 1½ m. southward with Tuscarora creek pike, and over this distance passes almost continuous over decidedly cherty beds. Surface thickly strewn with chert, much of it in ball-like masses 4 – 10 inches in diameter.



The stratigraphic position of this cherty bed is doubtful. The ls. shown at A and on west limb of syncline certainly ~~did~~ were not cherty and did not look like it could afford ~~chert~~ much chert under any conditions. However, and this seems a very plausible explanation, it might have come from the oolite and limy beds beneath it.

N.B. 8