24

U. S. GEOLOGICAL SU

LOOSE-LEAF FIELD NOTEBOO

E. O. Ulrich
Notebook 24
Ohio, Tennessee, Virginia.
1914, 1915.

Dover Bay, Sept.6,1915
with H.P.Cushing and A.E.Hyde.

gray sh.

black sh.

as in section in culvert.

dam

interbedded blue and blk. sh.with occasional thin flags or lenses of fine sandy material.

20'-25'

at Nickle Plate road.

about 15'

above (S) trolley line.

Possible break but physical evidence very scant - Ceratiocarid and rugulose plant.

Looks exceedingly like upper 25 ft,of Chagrin

Not over 10 ft.

N.of trolley line

Chance for break - but seemingly of no consequence.

20-25'

Black sh.with striated strep like plants.

Black,blue,green and a few flags - black sh.is dark-gray rather than black and not fissile. Has a black strep like plant. Saw no other fossils - also no Protosalvinia.

20'

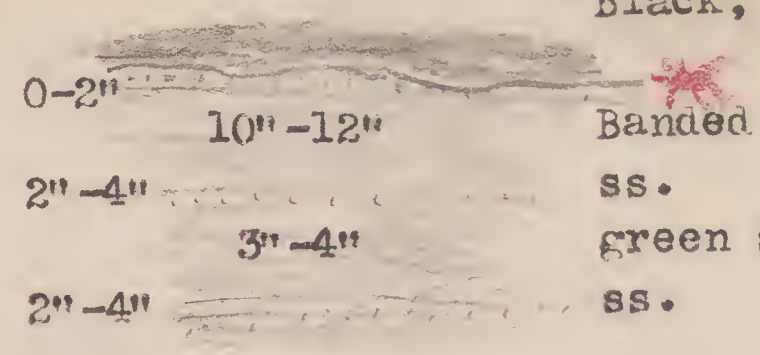
Lake

4 or 5 sand flags - rusty, 1/2 - 3 in.thick - in basal 18 inches.

Sept. 9, 1915, with H. P. Cushing and A. E. Hyde.

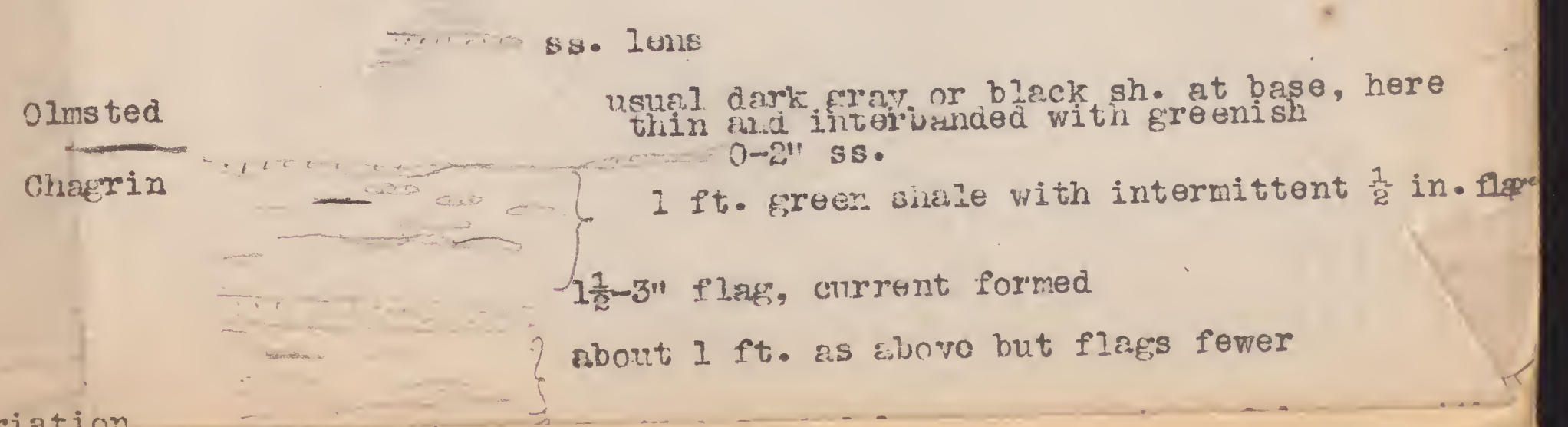
At John Goetz house (Felseneck). Same section (with beds dipping NW.) as at Hinz's. Contact well shown at water's edge at west end of bay and rising east about 5 ft. in 250 ft.

Blocks and slabs of a six-inch ss. lie at water's level but no corresponding ledge is seen in section. May be one of the 2-4 in. beds.



Contact Chagrin-Olmsted-Lake Erie

At Goetz's - lower part of section in detail.
100 yds. east of stairs.



*See variation

Sept. 9, 1915, with H. P. Cushing and A. E. Hyde.

At John Goetz house (Pelseneck). Same section (with beds dipping NW.) as at Hinz's. Contact well shown at water's edge at west end of bay and rising east about 5 ft. in 250 ft.

Black, basal Olmsted ss.

0-2"

10"-12" Banded sh., dark and green

2"-4" ss.

3"-4" green shale

2"-4" ss.

Blocks and slabs of a six-inch ss. lie at water's level but no corresponding ledge is seen in section. May be one of the 2-4 in. beds.

Contact Chagrin-Olmsted-Lake Erie

At Goetz's - lower part of section in detail.
100 yds. east of stairs.

ss. lens

Olmsted — usual dark gray or black sh. at base, here thin and interbanded with greenish
0-2" ss.

Chagrin — 1 ft. green shale with intermittent ½ in. flag

1½-3" flag, current formed

about 1 ft. as above but flags fewer

*See variation on opp. page — 3"-4" 2 sand layers or series of lenses with shale between

9" soft greenish or grayish - laminated shale

2-3" darker and harder shale

Red ss. x — 2 in. flag - reddish (cf. Porter Creek)

irregular nods

2 ft.

Large nods 2 ft. wide 8 in. thick

1 in. reddish layer of confluent nods

4"
} 1 in.
4"

6" green clay shale

4"-6" nodular fine limy ss.

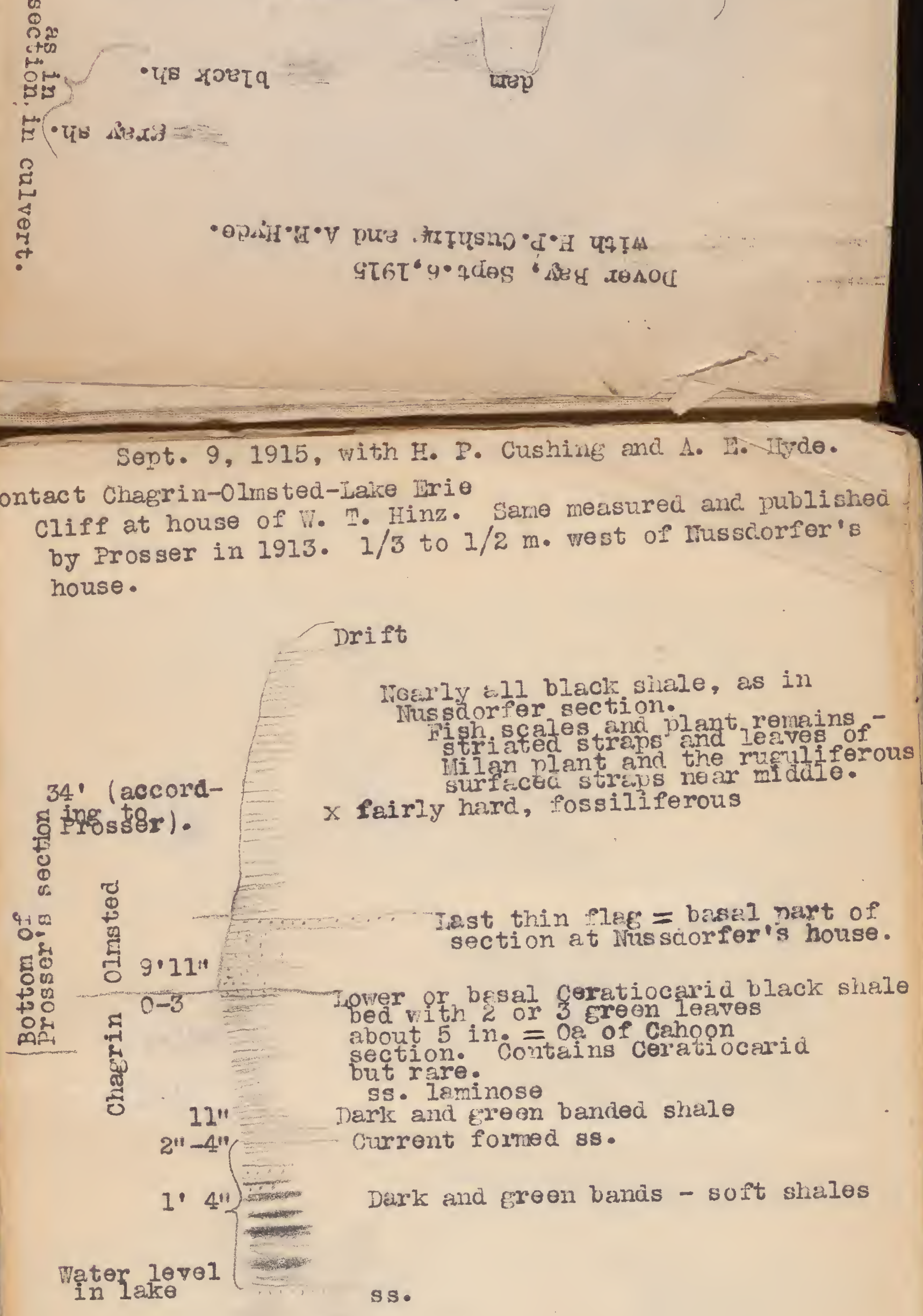
Shale and ? ss. or nods

Lake 1 ft.

*This double layer of sandstone varies as it is followed along cliff. The two layers are thicker and more persistent toward west (beginning 100 yds. east of stairs) and near stairs (50' east of) the two show tendency to merge into one by elimination of clay parting. At the stairs itself the horizon is covered by talus. It is suggested that in the covered space the two layers are fully merged and that the thick blocks or slabs on the shore represent the combined beds.

Sept. 9, 1915, with H. P. Cushing and A. E. Hyde.

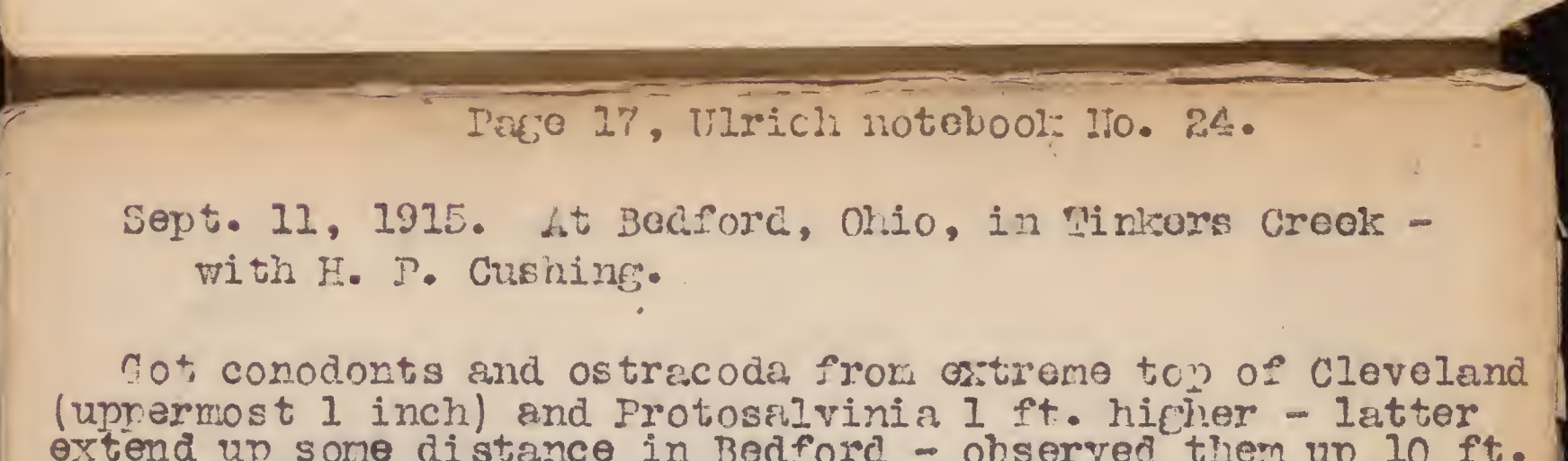
Contact Chagrin-Olmsted-Lake Erie
Cliff at house of W. T. Hinz. Same measured and published by Prosser in 1913. 1/3 to 1/2 m. west of Nussdorfer's house.

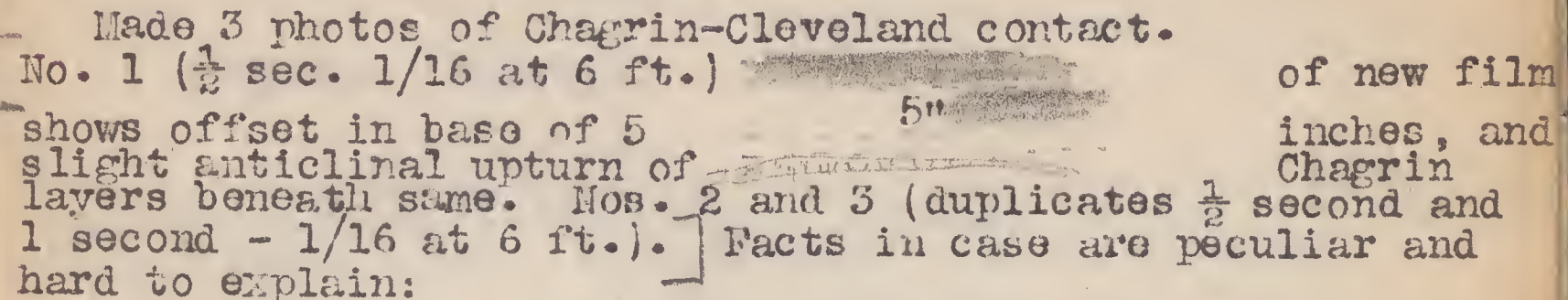


Sept. 11, 1915. At Bedford, Ohio, in Tinkers Creek - with H. P. Cushing.

Got conodonts and ostracoda from extreme top of Cleveland (uppermost 1 inch) and Protosalvinia 1 ft. higher - latter extend up some distance in Bedford - observed them up 10 ft. or more above base. Cushing took all of the Bedford fossils worth while. With lower water many might have been procured.

Made 3 photos of Chagrin-Cleveland contact. [No. 1 ($\frac{1}{2}$ sec. 1/16 at 6 ft.) [illegible] of new film shows offset in base of 5 [illegible] 5" inches, and slight anticlinal upturn of [illegible] Chagrin layers beneath same. Nos. 2 and 3 (duplicates $\frac{1}{2}$ second and 1 second - 1/16 at 6 ft.).] Facts in case are peculiar and hard to explain:

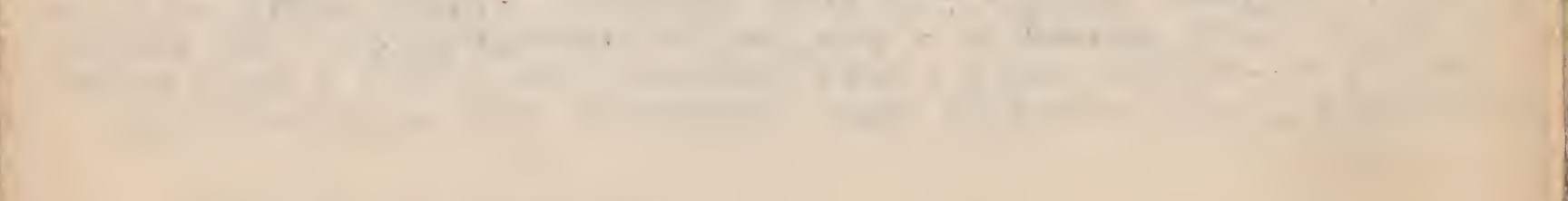




Fossils practically confined to upper 5 ft. of Chagrin at this locality and most of them to the interval lying 2 to 5 ft. beneath the top. Two or three seams in this interval are crowded with their remains, but the number of species seems to be small. Extensive collecting, however, may bring out many rare forms.

At present this Chagrin fossil zone suggests a definite bed laid down in retreat of Chagrin sea rather than local occurrence of fauna or removal of zone by pre-Ohio shale erosion.

Slate Cut, Ohio, Sept , Monday, 13, 1915. With Cushing. Very warm!



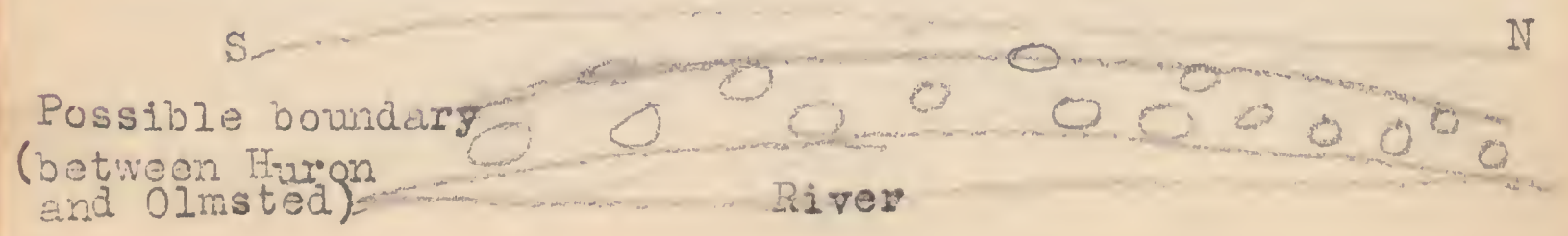
The Huron here is black, hard, and very fissile, making it difficult to procure fresh surfaces showing the conodonts which it contains. Brought about a dozen specimens.

The Prout ls. is a crystalline rock, apparently dolomitic, with corals and crinoidal remains. The corals comprise, so far as observed, Zaphrentis cf. gigantea (3 inches in diameter and 1 ft. long) Z. cf. prolifica, Heliophllum Halli, Favosites with cells 1/32 to 1/16 inch.

Upper part of rock usually in "spalls" as though exposed to weather. In one place across (on south side of) track it is solid to the top. Generally, however, 4 or 5 inches at top appear as "shaly." The extreme top is smooth or but slightly uneven, and replaced by marcasite to a depth of 1/8 to 1 inch. The upper inch contains occasional green spots. Corals sometimes project slightly above general level of surface.

The contact, as intimated, is a sharp but even line, with no trace of conglomerate or soil. The black shale begins at once in typical character and, - under cover beyond the oxydation of the marcasite, - adheres firmly to the limestone floor.

Reached Milan about noon. Examined good exposure of lower member Ohio shale along west bank Huron river, beginning about 100 yds. above bridges. Exposure fairly well reported by Prosser except that the beds dip more gently at upper end than suggested by him.



Page 19, Ulrich notebook No. 24.
Sept. 12, 1915.

Facts bearing on Chagrin-Ohio shale problem observed in passing westward from Bedford to Beach Park, Ohio.

(1) There is a definite though often inconspicuous contact between the top of the unquestionable Chagrin and whatever rests on it throughout the distance of its exposure.

(2) At Bedford the interval between the top of the Chagrin and the base of the Bedford is about 20' or 24' and consists practically wholly in its unweathered condition of hard, slaty, though not decidedly fissile black shale, evidently representing the upper half or more of the typical Cleveland. In Doan brook the Cleveland has increased to 40' or more. The upper 20-25 ft. represents the shale found at Bedford. Beneath this come some 8 or 10 ft. with green (and black shale?) interbedded, and including several ss. flags. Under this come 10-12 ft. black fissile shale to top of Chagrin. These two places are on east side of Cuyahoga River.

West of the Cuyahoga the interval between the Chagrin and the Bedford increases continuously.

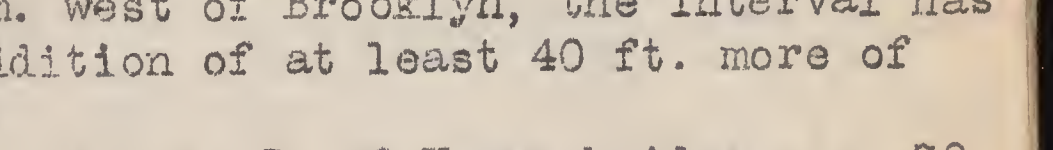
In Big Creek, 1 m. west of Brooklyn, the interval has increased by underlap addition of at least 40 ft. more of intercalated basal beds.

On Rocky River, 1 or 2 m. S. of Kamms bridge over 70 ft. have been added making the total of Cleveland + Olmsted here 110 ft. or so.

Farther west at Dover Bay, Eagle Cliff, Avon Point and Beach Park, though full thickness could not be determined, it is evident that still other beds are added to the base from point to point. The total may have risen to 150 or 200 ft.

(3) On the east side of the Cuyahoga and goind west from Bedford, greenish shale with ss. flage are first added to the Cleveland as developed in the section at Bedford. These greenish sh. and ss. are observed in Doan brook 20-30 ft. beneath top. See §2. Similar beds holding the same or a little lower position are still recognizable in Big Creek but west of this area their place is occupied by rather soft black shale.

Under this upper greenish zone comes black shale which increases rapidly in Big Creek - 5 ft. to 25 ft. in about 1 mile. One or 2 flags are present in this but they are no longer seen on Rocky river. In Doan brook 10 ft. + black shale occurs at base beneath the green or blue. As this brook is east of the Cuyahoga some irregularity or unevenness of top of Chagrin is indicated.

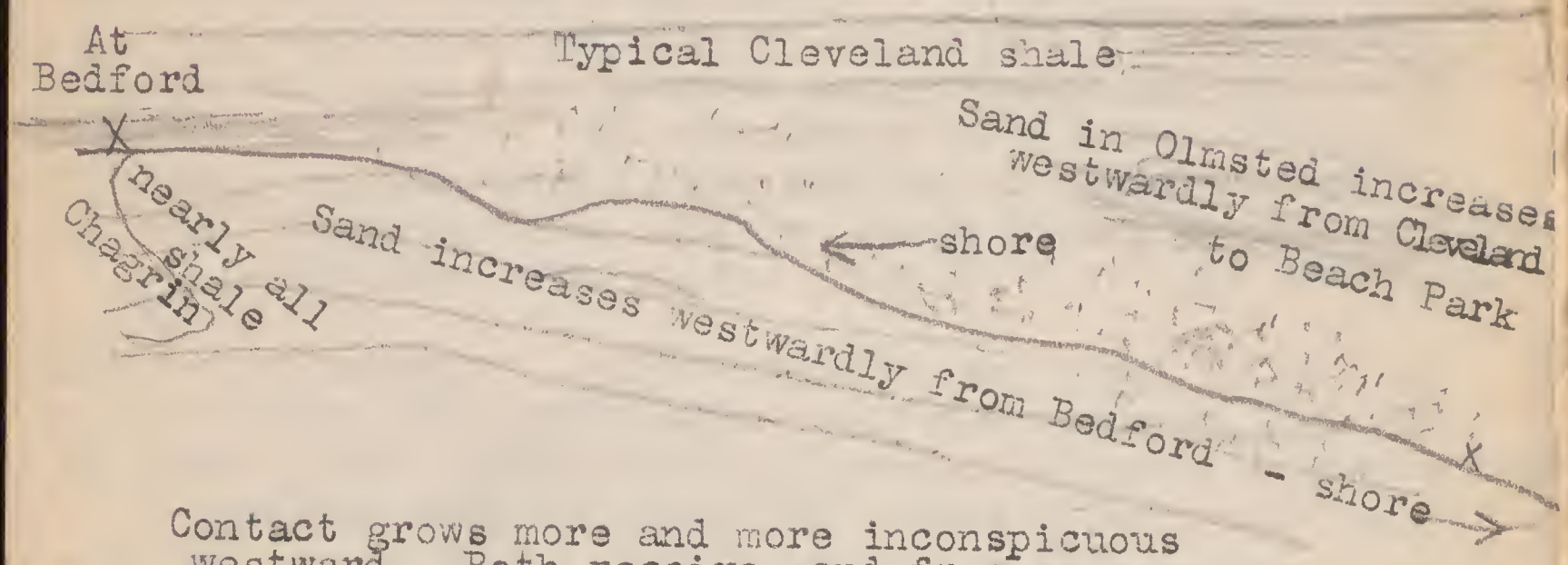


(See sketches on reverse.)

Page 21, Ulrich notebook No. 24.

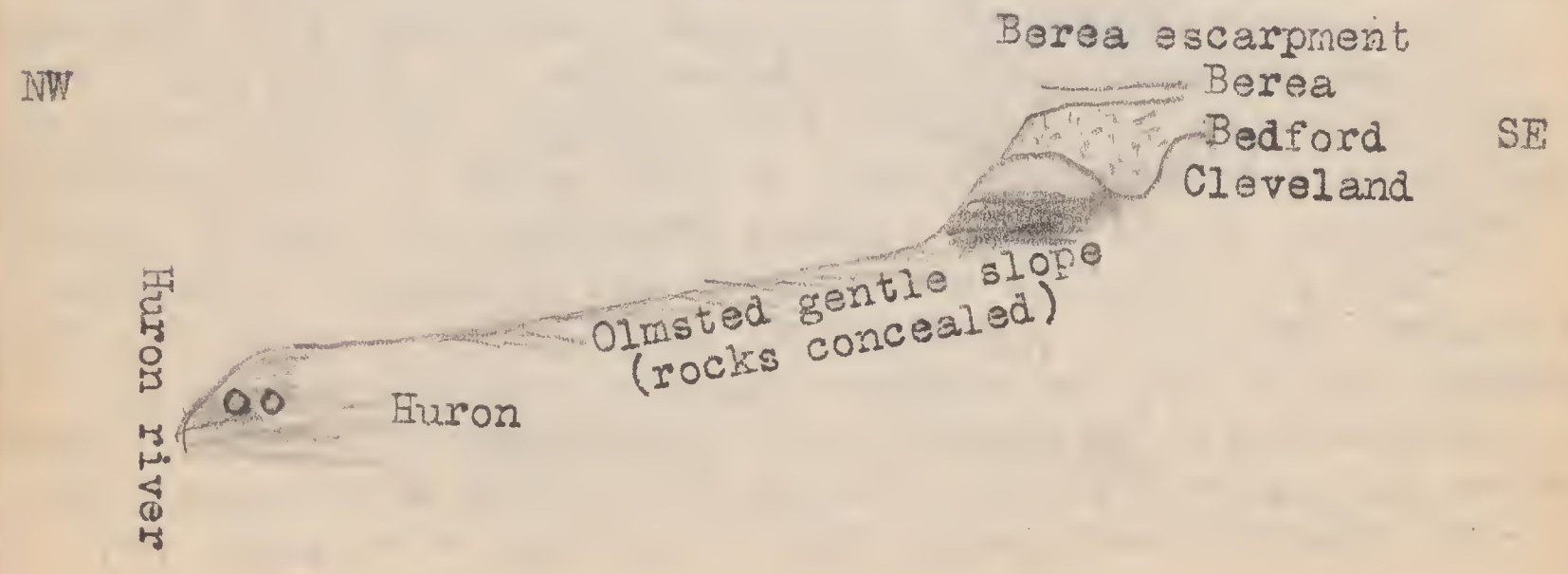
Sketches illustrating deductions on p. 19.
Sept. 12, 1915.

Doan Brook



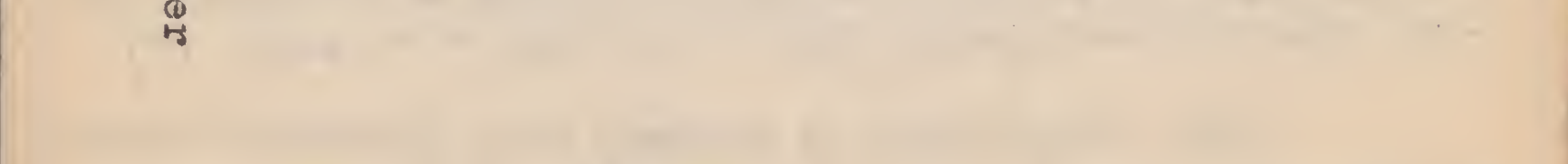
Contact grows more and more inconspicuous westward. Both receive sand from same source, and the Ohio got little of its sand from erosion of Chagrin.

Probable condition in vicinity (to southeast) of Huron river at Milan.



Page 15, Ulrich notebook No. 24.
Sept. 10, 1915.
Beach Park, O. Section made by Hyde.

The chief peculiarity of this outcrop is the obscurity of the Chagrin-Olmsted contact. Still, after being located the contact proved determinable throughout the length of the exposure of its horizon.*



The break lies from 27 to 29 inches beneath the lower of two layers of sandstone, each 2-3 inches thick and less than a foot apart.

Apparently quite as much sandstone here in the Chagrin as at Goetz's.

*Contact marked by a thin but varying thickness of easily decomposing clay shale carrying minute globules of pyrite. Line of contact cuts underlying Chagrin sedimentation planes through thickness of an inch or so in distance of 4 to 6 ft. at both places where this criterion was tested. Sandstone lenses here and there beneath contact may accentuate the unevenness of the contact, but the minor erosion irregularities of the old surface are at best not very conspicuous.

Sept. 8, 1915, with A. P. Cushing and A. E. Hyde.

Cahoon Creek - ¼ mile west of stop 23 on traction line.

1-3" [redacted]
2-4"

Black shale with ceratiocarid and usual rugulose surfaced plant remains.
Greenish initial deposit.
Current marked bed.

Under trolley trussle.

645'

12'

about 20' — Rather harder and more fissile and mainly black shale usually without flags.

15' — Ordinary but rather soft grayish black shale, fissile interbedded with nearly equal thicknesses of blue gray shale. 1 or 2 thin flags at top and locally at two lower horizons. Straplike plants with nearly smooth surface. Rugulosities faint and long lines indistinct.

Oh

Og 1'±

Of 10' — Gray and black shale, rather soft, the gray checking

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2-4" ——— Greenish initial deposit.
Current marked bed.

Black shale with ceratiocarid and usual rugulose surfaced plant remains.

Under trolley trussle. 645'

12'

about 20' Rather harder and more fissile and mainly black shale usually without flags.

15' Ordinary but rather soft grayish black shale, fissile interbedded with nearly equal thicknesses of blue gray shale. 1 or 2 thin flags at top and locally at two lower horizons. Straplike plants with nearly smooth surface. Rugulosities faint and long lines indistinct.

Oh

Og 1'±

Of 10' Gray and black shale, rather soft, the gray checking under weather with 2 ft. at top containing current marked flags. 10-ft. bed overlying is the same lithologically as 9-ft. bed.

Oe

Od 9' Gray and black shale, rather soft, the gray checking under weather with 2 ft. at top containing current marked flags. 10-ft. bed overlying is the same lithologically as 9-ft. bed.

Oc ——— Ceratiocarid.

Ob 10'

Oa Ceratiocarid.

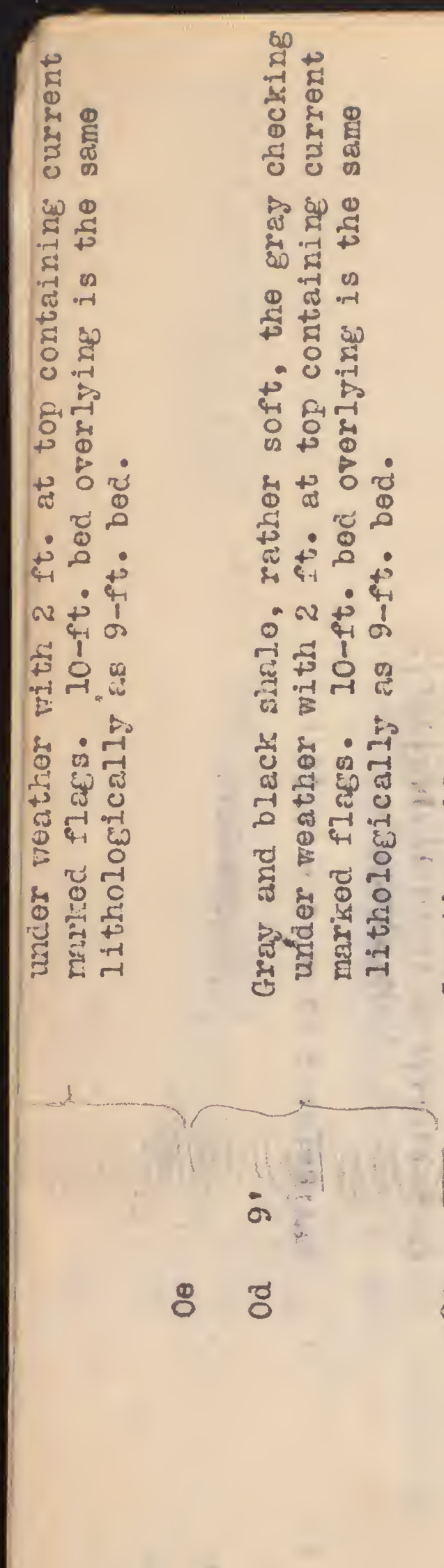
(OVER)

2-4 ft.

Od		7'+	gray blue fissile	
Oc			black shale	wagon road
Ob		9' 5"	blue sh. slightly fissile and more clayey than above but less than below, with 2 or 3 thin flags, 2-in. flag 3 ft. above base.	
Oa	Olmsted 8"	8"	blue sh. base of Olmsted.	
Cc	Chagrin 10'	10'	soft blue and dark shale with 5 or 6 or more 1-3" flags and rusty nods. between the flags.	All the Chagrin dark ("black") shales are more clayey than those of the Olmsted. Exposed in the creek beds, their top surfaces soon check.
			dark sh.	
Cb	8"	8"	dark clayey shale with sharply striated plant straps	
Ca	7'	7'	mainly soft blue clay shale	
Lake Erie	3'		1' black bands alternating with green, each 2-3 in. thick.	These correspond to the best brick shale along Big Creek.
	573		2' dark sh.	

645
573
72

72' = diff. in altitude
87' = estimated and measured thickness of beds passed over in going from lake shore to Nickle Plate R.R. track.
Top of Cleveland to 740 ft. contour
3 miles south of Nickle Plate R.R.



(OVER)

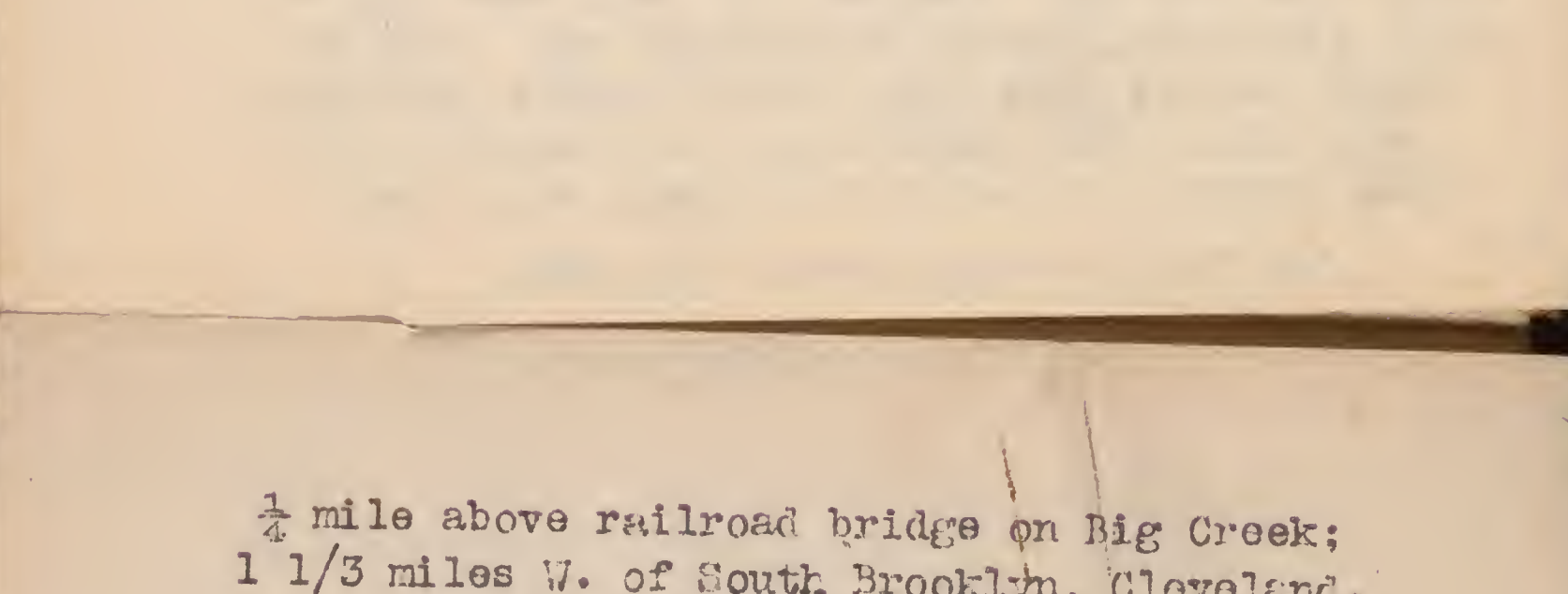
In Porter Creek ½ mile west of Cahoon Creek the lower beds of the Olmsted (Oa to Oh, inclusive) contain less flags than in the Cahoon section. The proportion of dark and black shale to the gray also is greater. The Chagrin, whose top lies about 18-20 ft. above the lake, on the contrary has rather more and thicker flags and particularly of irregularly shaped rusty nods; also a foot or two beneath the top a worm bored fine earthy red ss. 1 in. _ thick, beneath which 1 ft. or so the irregularly shaped, nodose to finger shaped nods are very abundant. The contact between the Olmsted and the Chagrin in places cuts out the top sandstone. The latter seems to be the same layer that is beneath the contact in the nearby Cahoon Creek.

Contact in places cut out the top sandstone flag of the Chagrin.

Black Olmsted

Chagrin

¼ mile above railroad bridge on Big Creek;
1 1/3 miles W. of South Brooklyn, Cleveland.
With Cushing, Sept.2,1915.



* Collected and mailed in unlabeled material procured here from the basal bed of Olmsted.

In Big Creek

Black sh.

30-40" Alternating green and black sh.

8" black sh.

8-10" greenish sh.

30" black sh.
green sh.

6" black sh.

2" ss.and green sh.

2" ss.as below - shaly flags 8-9"

4" green soft sh.

about 3 ft. black more or less fissle sh.

0-1" fine ss.,dark-gray

about 22" black sh.

soft green sh.

12-15 ft.more or less ss.and sssh.

upper part sandy plates fewer than in middle and basal thirds. At brickworks $\frac{1}{4}$ mi.E. of bridge and in cuts E.of that ss.layers are more prominent than under bridge.

8 or 10 ft. almost wholly of soft blue sh. chiefly in brickworks.

25-35 ft.mostly soft blue sh. in brickworks and bluff along creek. Concretions abundant.

numerous conodonts,ceratiocarids (cf.Plumulites of Whitf.),and many remains of plants. Apparently a shallow lagoon-like depression in which surface regolith and new bl.sh.deposit is mixed and fused.

5' 2" from contact to first ss. (see note above)

Valley of Big Creek.

Under foot bridge 1 mi.W. of main bridge in Brooklyn.

This interval expands in 1 mi.SW. to 5' 2"

$\frac{1}{4}$ mi.up stream these beds are beautifully shown in bluffs. The whole becomes more sandy in this direction and apparently thicker, sand layers(some of them bluish and calc.inside,brown outside) being prominent and in part predominant rock through thickness of 25 feet beneath base of Cleveland.

Contact between Cleveland and Chagrin is abrupt and nearly even line that is difficult to see in clightly weathered cut or bluff. On close inspection the line is sharply traceable with slight $\frac{1}{2}$ to 2 inch undulations. The depressions are filled with granular dark-gray material - some grains appear to be of rounded quartz, others and perhaps majority are of minute golbules of pyrite. Just above top line of shallow depressions the sh.is ? the usual fine-grained black or very dark-gray type commonly spoken of as black shale.

Same contact shows in similar manner in bluffs along creek above bridge to second wagon bridge,thence up creek to $\frac{1}{4}$ mi. above wagon br. which is on E.-W.road $1\frac{1}{4}$ mi.W.of S.Brooklyn where contact is at water level.

At last place contact plane sinks some 6-10inches and is fused in a single layer,which is green beneath and dark above,the contact an uneven plane(see specimen).The 6-10 inch depression is filled with somewhat granular bl.sh. containing many small flakes of mica,

Kamm bridge over Rocky River.
Sept.4, 1915.

Soft weathered black and gray-green sh.;to top of bridge about 53 ft.

Black sh. medium hard
About 38'

Chagrin
about 37'

Rocky River

East bluff Rocky River, just below wagon road bridge
1 mile SW. of Kamms.

Ohio sh. now perhaps 100 ft.thick

All bl.sh.,rather soft but yet more or less decidedly fissile

6' 5' Gray and dark to bl.fissile sh. ss.lens at top.

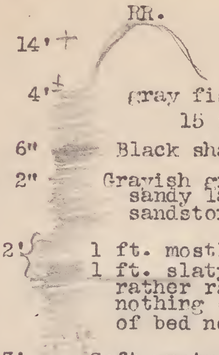
2' Gray fissile sh. - thin ss.lens at top.
2"-3" black sh. Olmsted

4' ss.laminose - fine-grained.
Soft kneady gray-green sh. Chagrin

Rocky River ss.and greenish sh.

Contact represented by a thin(0-1/3 in.) seam of rather rusty clay followed at once by 2"-3" of black fissile sh. or by intervening ½ inch or so of bluish shale. This is the same boundary observed in Big Creek and Doan Brook sections.

Small creek 1 mi. east of Dover Bay, outcrop in west bank just N. of N.Y.C. and St.L.R.R.



gray fissile sh., 1 layer sandy and somewhat fissile and 1' thick, 15 inches above base.

Black shale

Grayish greenish blue sh., more or less fissile with 4 to 6 thin sandy layers in upper 2/3, the latter fissile and scarcely a sandstone, one layer about midheight reaches 3 in. in thickness.

1 ft. mostly platy and partly fissile sandy sh. and ss. Bluish fresh.
1 ft. slaty bl.sh. with conodonts, ceraticarids, and plant remains, all rather rare. Protosalvinia of small size, exceedingly abundant, nothing of kind observed in underlying Chagrin. Lower 2 in. or so of bed not so black as remainder.

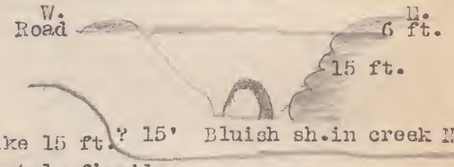
Chagrin

Soft, unctuous, green to dark-gray shale, nearly 1 ft. at top, beneath which sandy layers occur frequently in similar shale.

Contact in exposure shows a rusty, unlaminated seam 1/32 to 1/4 inch thick.

Lake shore 573

Farther up creek to crossing of main (North ridge) road - a mile more from lake - higher beds are seen in bank of creek and in excavation on roadside to east and west of culvert.



Here something like 15 ft.? 15' Bluish sh. in creek N. of ridge road.

abundant Protosalvinia.

of rather soft, moderately fissile very dark or black shale, the base of which can hardly be more than 15 ft. - and may be less - above the top of preceding section of basal Olmsted section. This shale contains ceratiocarid, few conodonts, and plant remains, these were not found in place but seem to have come from the lower part which may have been less fissile than the main part of bed. The ceratiocarid however also occurs in the upper foot of the black shale near the transition into the overlying gray shale.

The black is overlain by about 6 ft. (all exposed) of gray shale rather soft yet fissile sh. The layers and flakes when thrown out in excavation weather white when the fresh surface is exposed and rusty where the older partings are concerned. The material does not melt down like the simulating but really much more clayey Chagrin; and it contains

Stop 55 on Traction line.
Sept. 9, 1915, with H. P. Cushing and A. E. Hyde.
Eagle Cliff, near its eastern extremity. In short ravine beside W. H. Nussdorfer's house.

About 40 ft. cliff.

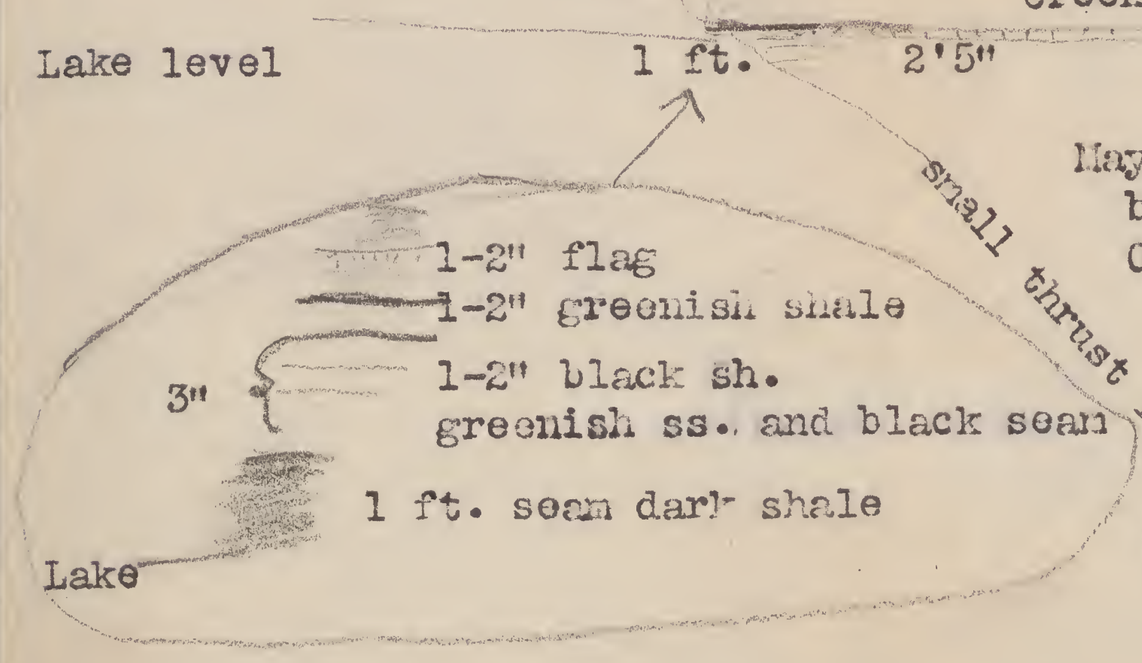
Mostly black medium hard, fissile shale with some beds of a foot or less that are softer and light to dark gray in color. All of this section is Olmsted. Flags of ss. are practically and probably sholly lacking above the one at top of green bands at base of cliff. The latter may correspond to Ob of the Cahoon Creek section, while the remainder to top of cliff is precisely like Ob and higher beds as developed in the Porter Creek section, except that flags are now entirely absent.

Plant fragments of the kind seen in Oh of Cahoon Creek section.

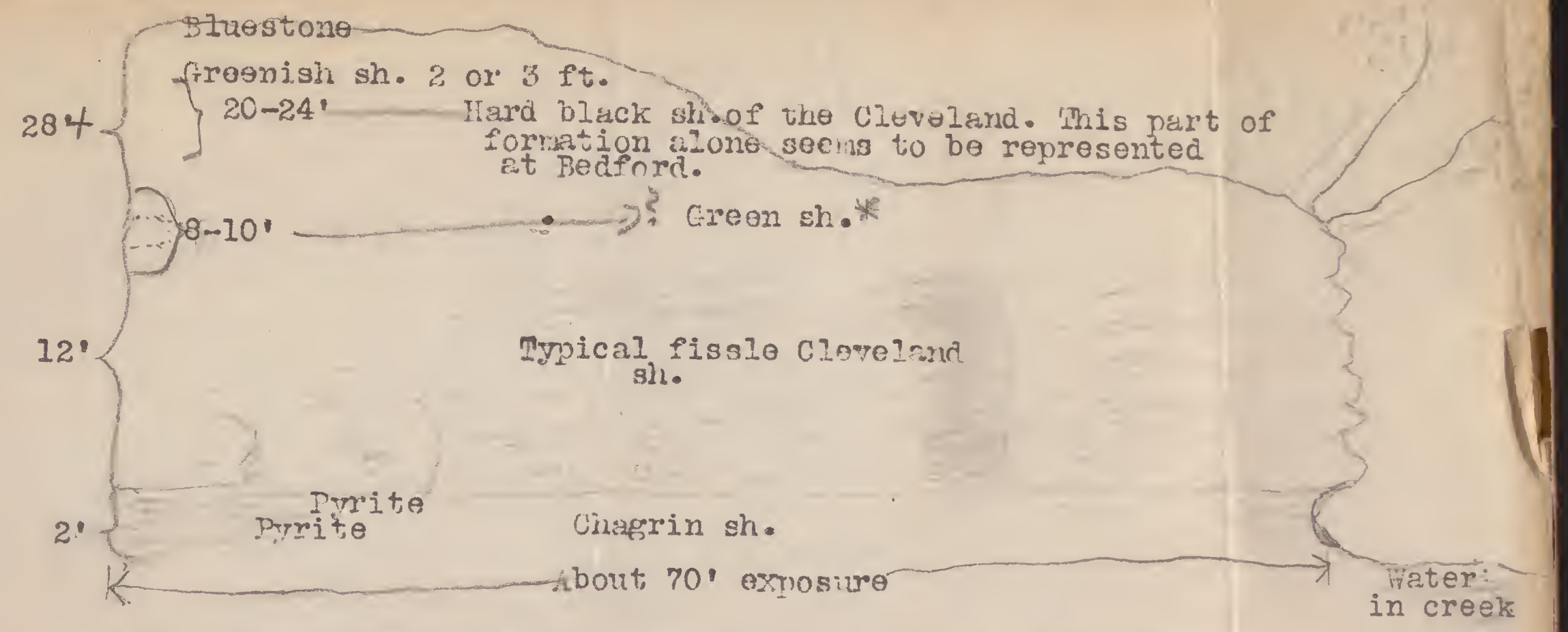
Lake level — 1 ft. — 2'5" — Lake level

May correspond to Og of Cahoon Creek section but it seems more likely to represent Ob or Od.

Composition somewhat variable but essentially as in detailed section (see



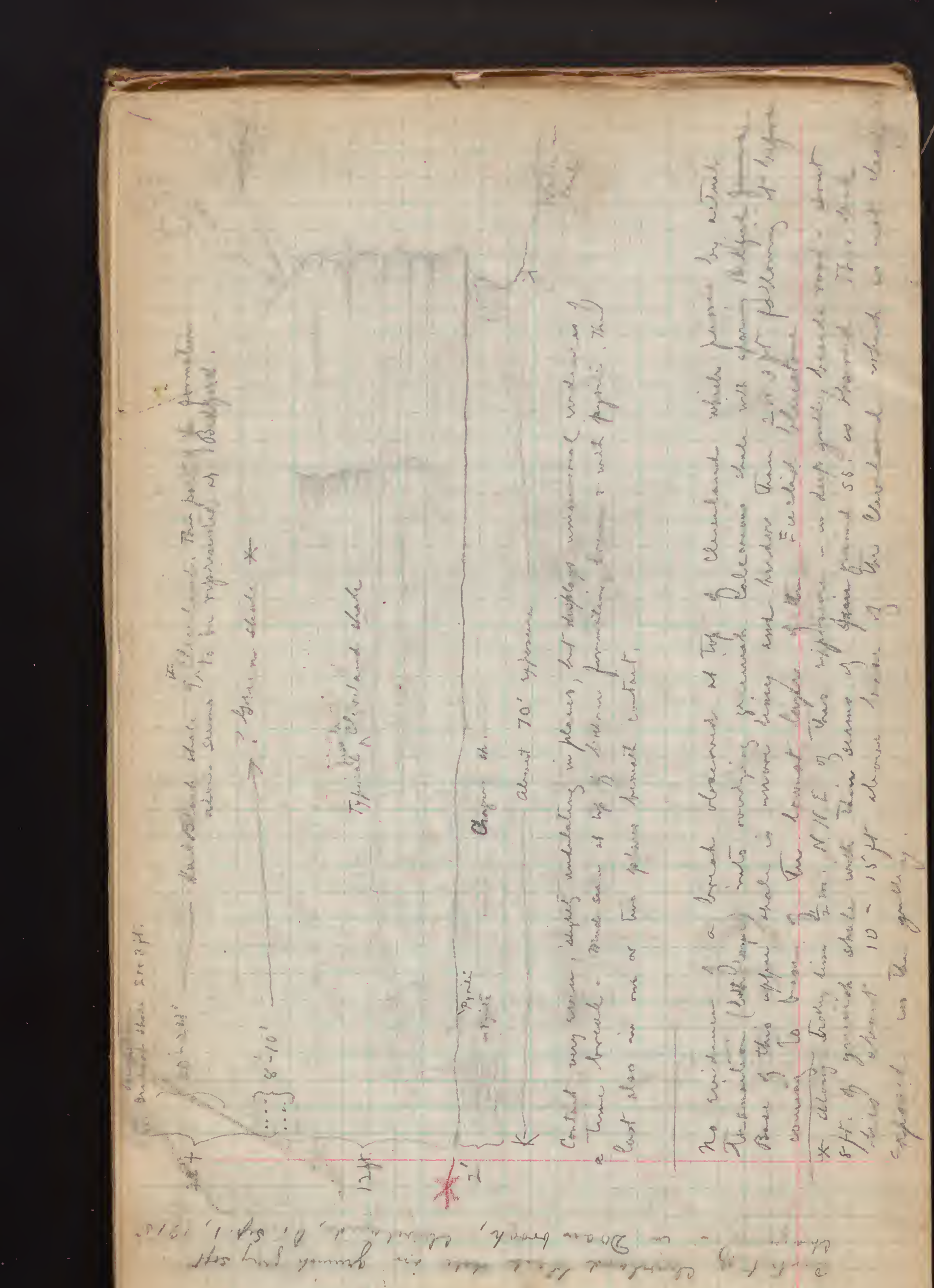
Contact of Cleveland black sh. on greenish-gray soft Chagrin - in Doan Brook, Cleveland, O., Sept. 1, 1915.



Contact very even, slightly undulating in places, but displays unequivocal evidences of a time break. Mud seam at top of bottom formation, brown and with pyrite. The last also is in one or two places beneath contact.

No evidences of a break observed at top of Cleveland which passes by actual transition (lithologic) into overlying greenish calcareous shale with sparing Bedford fauna. Base of this upper shale is more limy and harder than 2 or 3 ft. following it before coming to base of lowest layer of Euclid bluestone.

* Along trolley line ½ m. NNE. of this exposure - in deep gully beside road - about 8 feet of greenish shale with thin seams of fine-grained ss. observed. This bed lies about 10-15 ft. above base of the Cleveland which is not clearly exposed in the gully.



50 ft
under bridge, in ½ w. of main bridge
in Brooklyn.

Cleveland

30-40" — 5" [illegible] — 8" Black sh. — 3" greenish shales
8" — Black shale
8-10" — greenish sh.
30"+ — Black shale
6" — [illegible] green shale — Black shale — 3 ft green shale
4" — 2" — SS. or Sidonia — [illegible] flag 8"-9"
green soft sh.
about 3 ft. — Black more or less graphite shale
0-1' — fine ss. dark gray
about 22" — Black sh.
soft green shale

This interval expands in [illegible] SW. to 5' 2"

12-15 ft. more or less ss & ssd. upper part sandy plates [illegible] than in middle & basal [illegible]. At brick works ¼ m. east of bridge & in cuts east of that, the ss. layers are more prominent than under bridge.

8 or 10 ft. consisting almost wholly of soft blue shale, chiefly [illegible] in brick works.

25-35 ft. mostly soft blue shale in brick works & bluff along creek. Concretions abundant.

Chagrin

Valley of Big creek

¼ m. up stream these beds are beautifully shown in bluffs. The whole becomes more sandy in this direction and apparently thicker, sand layers (one of them black & calc. inside [illegible] outside) being prominent and in part predominant rock thru the thickness of 25 ft. beneath base of Cleveland.

Contact between Cleveland and Chagrin is abrupt and nearly even line that is difficult to see in slightly weathered cut or bluff. On close inspection the line is sharply traceable with slight ½ to 2 inch undulations. The depressions are filled with a granular dark gray material – some of the grains appear to be of rounded quartz others & perhaps majority are of [illegible] globules of pyrite. Immediately above the top thin of the shallow depressions the shale is the usual fine grained black or very dark gray type commonly spoken of as black shale.

Same contact shows in similar manner in bluffs along creek above bridge to second wagon bridge and thence up creek to ¼ m. above wagon bridge which is on E-W road 1¼ m. W. of South Brooklyn where contact is at water level.

At the last place the contact plane sinks some 6-10 inches, and becomes fused in a single layer, which is green beneath & dark above, the contact an uneven plane (see specimen). The 6-10 inch depression is filled with somewhat granular black shale, containing many small flakes of mica, numerous conodonts, Centrocaride (cf. Plumulites of Whitf.) and and many remains of plants apparently in shallow [illegible]-like depression in which surface [illegible] & now black shale deposit is mixed & fused.

5' 2" from contact to first ss. (see note above)

¼ m. above R.R. bridge on Big Creek, 1⅓ m West of South Brooklyn

Cleveland
Wells [illegible]
Sept 2, 1915.

Drift

about 12' — Hard, blocky, fissil black sh. = typical Cleveland

about 12' — Rather soft black shale –

ss. 1"-3"
2' — greenish to black shale.
ss. 1"-3".
5'-6' — Mostly greenish shales interbedded with dark to black seams [illegible] rather soft.

about 20' — Rather soft black shale

44' 8"

ss flag.
5' 2" — Black shale, not very hard with plants and [illegible] & conodonts ✱

Chagrin

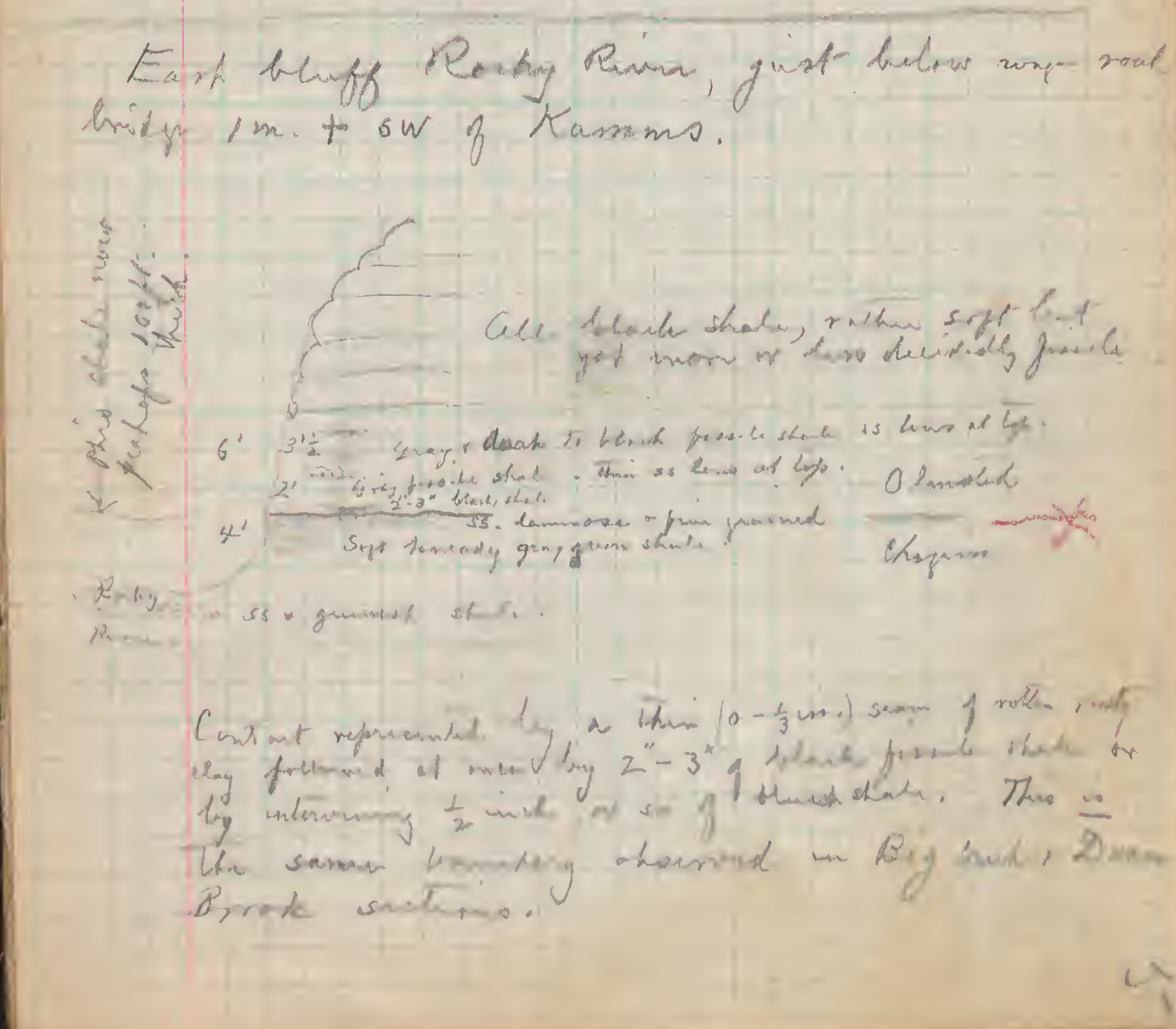
Olmsted member

Big Creek level

✱ Collected and mailed in unlabeled material procured types from the basal bed of Olmsted.

Kamma bridge over Rocky Run.
Sept. 4, 1915

East bluff Rocky River, just below way road bridge 1 m. to SW of Kamms.



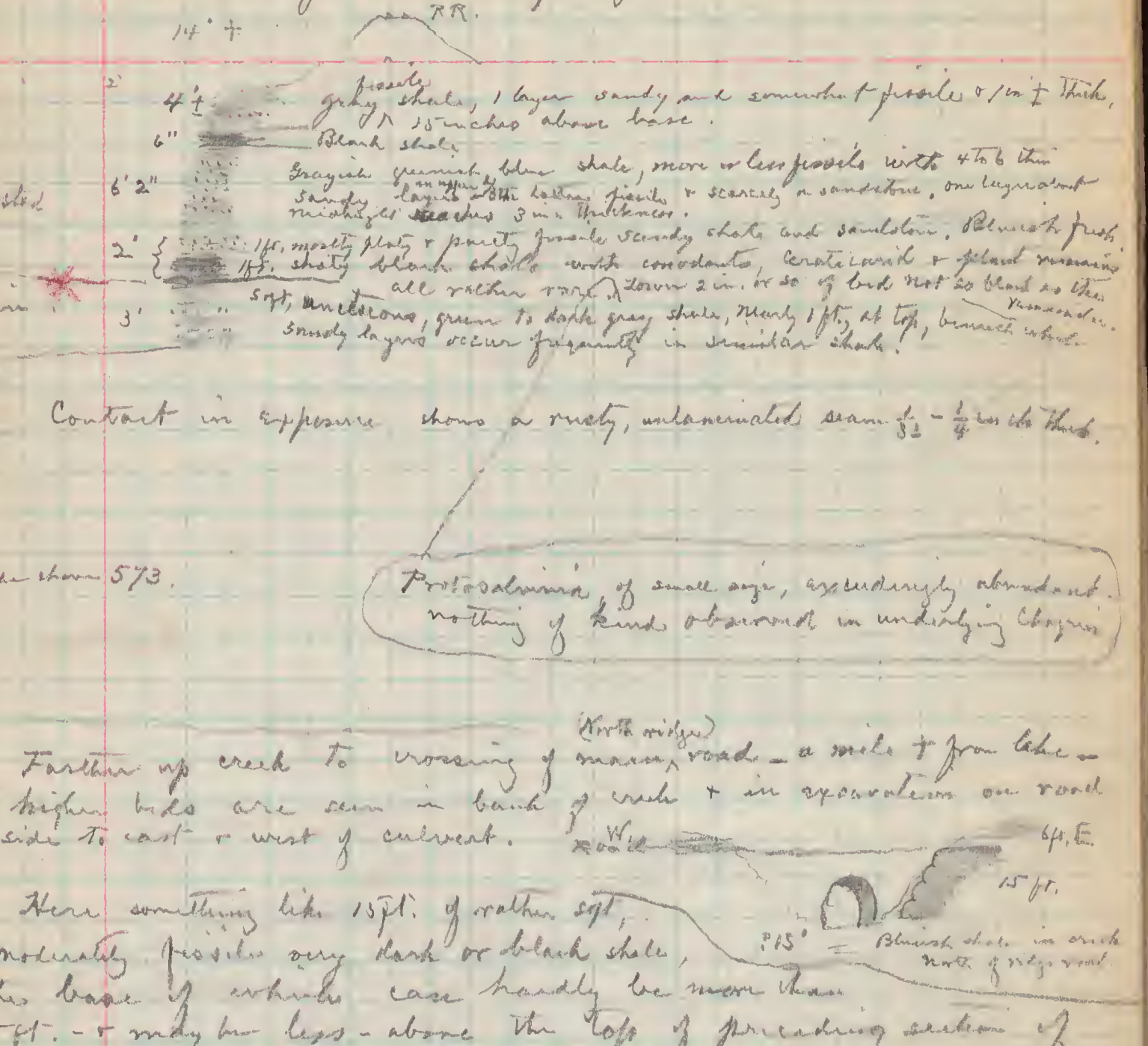
Contact represented by a thin (0 - 1/3 in.) seam of rotten, rusty clay followed at once by 2" - 3" of black fissile shale & by intervening 1/2 inch or so of black shale. This is the same boundary observed in Big Creek, Dunn Brook sections.

8

2-8

Sept. 6th 1913

Small creek 1 m. east of Down Bay, outcrops in west bank, just north of N.Y.C. & St L. R.R.



Contact in exposure shows a rusty, undulating seam ½ - ¼ inch thick.

Lake shore 573.

Protocalamites of small size, exceedingly abundant. Nothing of kind observed in underlying Chapman

Farther up creek to crossing of main road (North ridge) road — a mile ± from lake — higher beds are seen in bank of creek & in excavation on road side to east & west of culvert.

Here something like 15ft. of rather soft, moderately fossile very dark or black shale, the base of which can hardly be more than 15 ft. - & may be less - above the top of preceding section of basal Olmsted section. This shale contains Ceratiocarides, fish remains & plant remains - these were not found in place but seem to have come from the lower part, which may have been less fossile than the main part of bed. The Ceratiocarids however also occurs in the upper part of the black shale near the transition into the overlying gray shale.

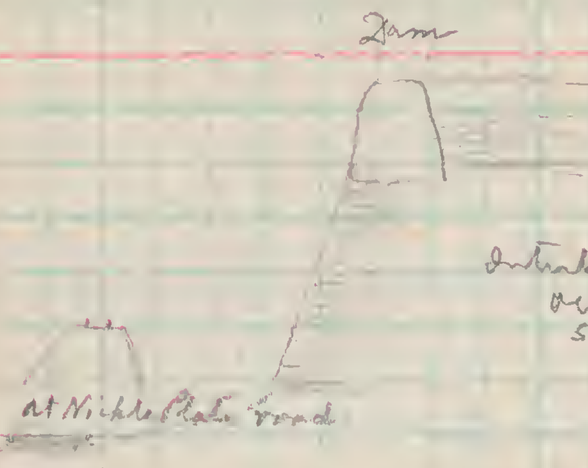
The black is overlain by about 6 ft. (all exposed) of gray shale rather soft yet fossile shale. The layers & plates are white when worn out in excavation weather white when the fresh surfaces is exposed and rusty where the ribbon fossils are concerned. The material does not melt down like the immediately underlying Chapman; & it contains abundant Protocalamites.

Dover Bay

Sept. 6, 1915
with H. P. Cushing & A. E. Hyde

gray shale
Black shale } as in section at culvert.

Dam

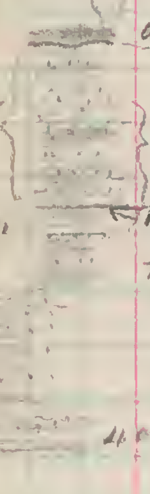


20'–25' ± } Interbedded blue & black shale with occasional thin flags or lenses of fine sandy material.

At Nickle Plate road

about 15'

(S) Above Trolley line — Possible break but physical evidence very scant – Ceratiocaris & rugulose plant.



Not over 10 ft. } N of Trolley line } Looks exceedingly like upper 25 ft. of Chagrin.

Chance for break – but seemingly of no consequence.

20–25' Black shale with striated strap like plants!

Black, blue-green & a [illegible], few flags – The black shale is dark gray rather than black & not fissile. Has a black strap-like plant. Saw no other fossils – also no [illegible].

20'

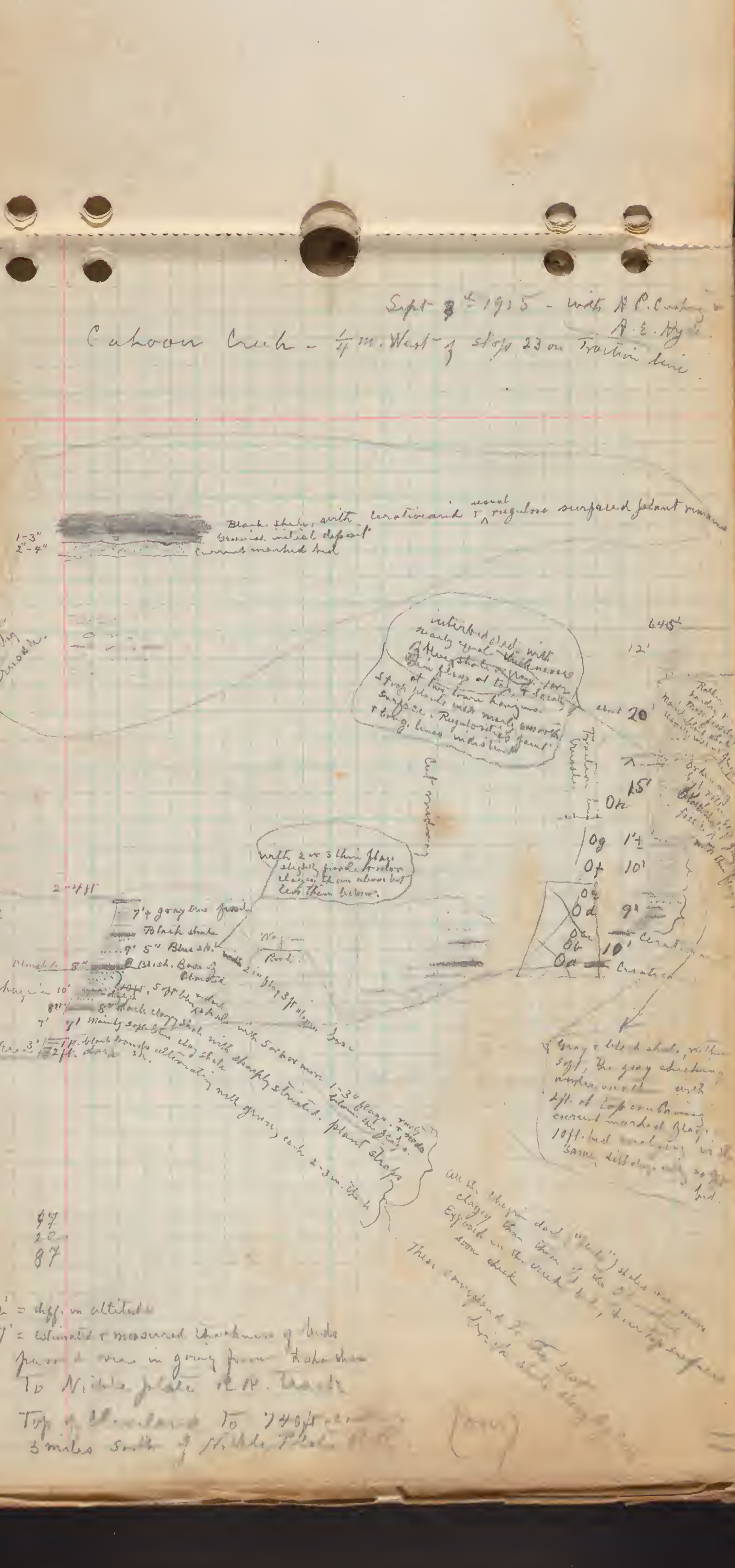
Ladder 4 or 5 sand flags – rusty, ½ – 3 in. thick – in basal 18 inches.

90
85 – 90

635
580
[illegible]
573
57

Sept 8th 1915 - with N.P. Crook & R.E. Hyde.

Cahoon Creek - ¼ m. West of stop 23 on Traction line.



The proportion of dark and black shale to the gray about the greater.

In Porter creek ½ m west of Cahoon creek. the lower beds of the Olmsted (Oa to Oh inclusive) contain less flags than in the Cahoon section.) The Chagrin, whose top lies about 18-20 ft above the lake, on the contrary has rather more & thicker flags and particularly of irregularly shaped nearly (?) rocks. Also a foot or two beneath the top a wavy (?) flat, fine, rotten (?) ss, 1 in 2 thick, beneath which for 1 ft or so the irregularly shaped, nodose to finger shaped rods are very abundant. The contact between the Olmsted & the Chagrin in places cuts out the top sandstone, the latter seems to be the same layer beneath that is the contact. in the nearby Cahoon creek.

Contact in places cut out the top sandstone flag of the Chagrin

Devono - Miss. - contact

13

Basal Olmsted - Lake Erie   Stop 35 on Traction line

Sept. 9th 1915 with H. P. Cushing & R. E. Hyde

Eagle Cliff near its eastern extremity. In short ravine beside W. H. Nussdorfer's house

Olive shale about 40 ft cliff.

Mostly black, medium hard, fossile shale with some beds of a foot or less that are softer and light to dark gray in color. All of this section is Olmsted. Flags of ss are practically & probably wholly lacking above the one at top of green bands at base of cliff. The latter may correspond to Ob of the Cahoon creek section while the remainder to top of cliff is precisely like Ob & higher beds as developed in the Porter creek section, except that flags are now entirely absent

— Plant fragments of the kind seen in Ob of Cahoon creek section

Lake level   7 ft.   2'5"

— Lake level

May correspond to Og of Cahoon creek section but it seems more likely to represent Ob or Od.

Composition somewhat variable but essentially as in detailed section (see

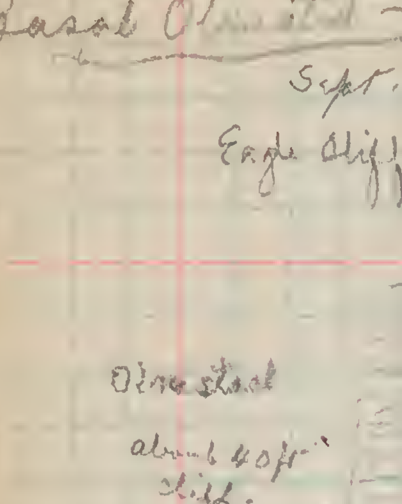
Contact Chagrin - Olmsted ~~in Lake Cliff~~

Cliff at house of W. T. Henz - Same measured & published by Prosser in 1913
⅓ to ½ m. west of Nussdorfer's house.

— Drift

Nearly all black shale, as in Nussdorfer section.
Fish scales, & plant remains - striated straps & leaves of Milan plant & the rugulifeous surfaced straps near middle

34' (according to Prosser)   X. Fairly hard, fossils.

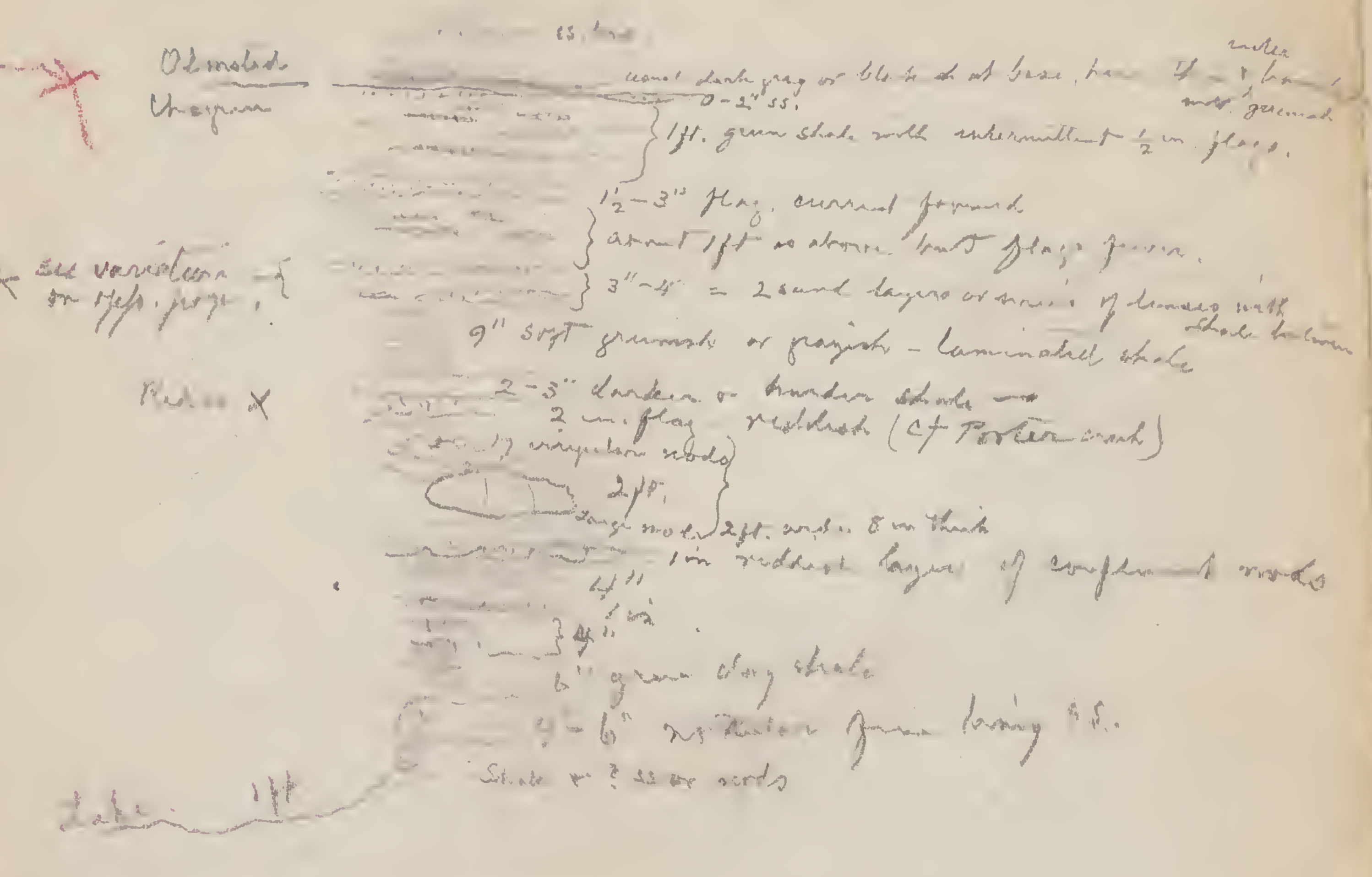


— Last thin flag = basal part of section at Nussdorfer's house
lower or basal Cerolose and black shale bed with 2nd green band about 5 in. = Oa of Cahoon section. Contains Cerat. more(?) but rare.
ss, laminose
Dark & green banded shale
Current formed ss.
Dark & green bands - soft shales.
ss

At John Boetz (?) house (Felsenpik) Same section (with beds dipping NW. ha at Henz's. Contact well shown at water's edge at west end of bay and near east about 5 ft. in 250 ft   0-2"   10"-12"
Black shale, 2 thin 4 (?) ... at water level   2" 4"   3"-4"
... corresponding ... (see over)
Banded shale ...

Contact Chagrin & Olmsted – Lake View Park

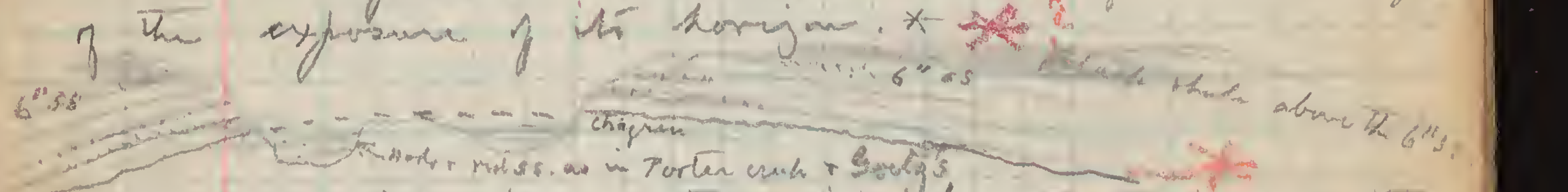
– lower part of section in detail
100 yds± east of stairs.



* This double layer of sandstone varies as followed along cliff. The two layers are thicker and more persistent toward west (beginning 100 yds east of stairs) and near stairs (50'± east of) the two show tendency to merge into one by elimination of clay parting. At the stairs itself the horizon is covered by talus. It is suggested that in the covered space the two layers are fully merged and that the thick blocks or slabs on the shore represent the combined beds.

Sept. 10th 1915
Beach Park, O. Section made by Hyde.

The chief peculiarity of this outcrop is the obscurity of the Chagrin-Olmsted contact. Still, after being located this contact proved determinable throughout the length of the exposure of its horizon. * ?



The break lies from 27 to 29 inches beneath the lower of two layers of sandstone, each 2–3 inches thick and less than a foot apart.

Apparently quite as much sandstone here in the Chagrin as at Goetz's.

* Contact marked by a thin but varying thickness of easily decomposing clay shale carrying minute globules of pyrite. Line of contact cuts underlying Chagrin sedimentation planes through thickness of an inch or so in distance of 4 to 6 ft at both places where this criterion was tested. Sandstone lenses here and there beneath contact may accentuate the unevenness of the contact, but the ~~undulations~~ minor erosion irregularities of the old surface are at best not very conspicuous.

16

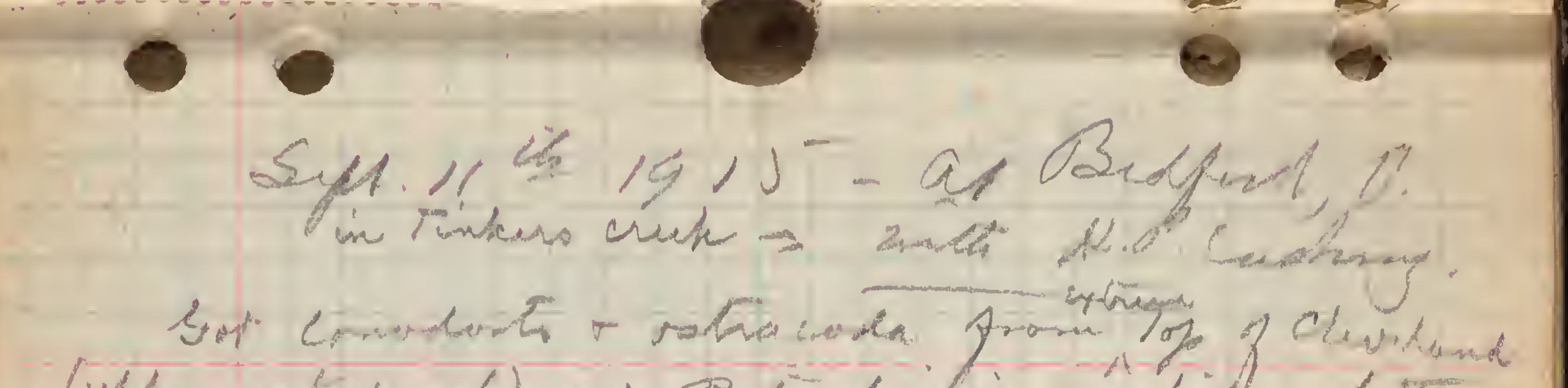
Sept. 11th 1915 – At Bedford, O.
in Tinkers creek – with H. P. Cushing.

Got conodonts + ostracoda from extreme top of Cleveland (uppermost 1 inch) and Protosalvinia 1 ft. higher – latter extends up some distance in Bedford – observed them up 10 ft. or more above base. Cushing took all of the Bedford fossils worth while. With lower water many might have been procured.

(Made slight [illegible] upturn (?) Chagrin ledges beneath the sand.)

Made 3 photos of Chagrin – Cleveland contact.
[No 1 (½ sec. 1/16 at 6 ft) of new film shows offset in base of 5 inches. ~~1 second 1/16 at 6 ft.~~
Nos 2 + 3 duplicates ½ second + 1 second – 1/16 at 6 ft] Facts are locally peculiar and hard to explain:

Or all three parts of this Chagrin material may have been deposited after beginning of Cleveland deposition.



Fossils practically confined to upper 5 ft. of Chagrin at this locality and most of them to the interval lying 2 to 5 ft. beneath the top. Two or three seams in this interval are crowded with their remains, but the number of species seems to be small. Extensive collecting, however, may bring out many rare forms.

At present this Chagrin fossil zone suggests a definite bed laid down in retreat of Chagrin sea rather than local occurrence of fauna.
Cleveland sh.
Chagrin sh. W
E * Fossils

17 [illegible]

Sept 12, 1915

Facts bearing on Chagrin - Ohio shale problem observed in passing westward from Bedford To Brook Park, Ohio.

(1) There is a definite thought of the unconformity between the top of the unquestionable Chagrin ~~beds~~ and whatever rests on it throughout the distance of its exposure.

(2) At Bedford the interval between the top of the Chagrin and the base of the Bedford is about 20' or 24' (in its unmetamorphosed condition) and consists practically wholly of hard, slaty, though not decidedly fissile black shale, evidently representing the upper half or more of the typical Cleveland. In Doan Brook the Cleveland has increased to 40' or +. The upper 20 - 25 ft. represents the shale found at Bedford. Beneath this comes 8 or 10 ft. with gum (+ black shale?) interbedded, and including several ss. flags. Under this come 10 - 12 ft. black fissile shale to top of Chagrin. These two places are on east side of Cuyahoga River.

West of the Cuyahoga the interval between the Chagrin + the Bedford increases continuously.

In Big Creek, 1 m. west of Brooklyn, the interval has increased by underlap addition of at least 40 ft. more of intercalated basal beds.

On Rocky River, 1 or 2 m. S. of Kamms bridge over 70 ft. have been added making the total of Cleveland + Olmsted there 110 ft. or so.

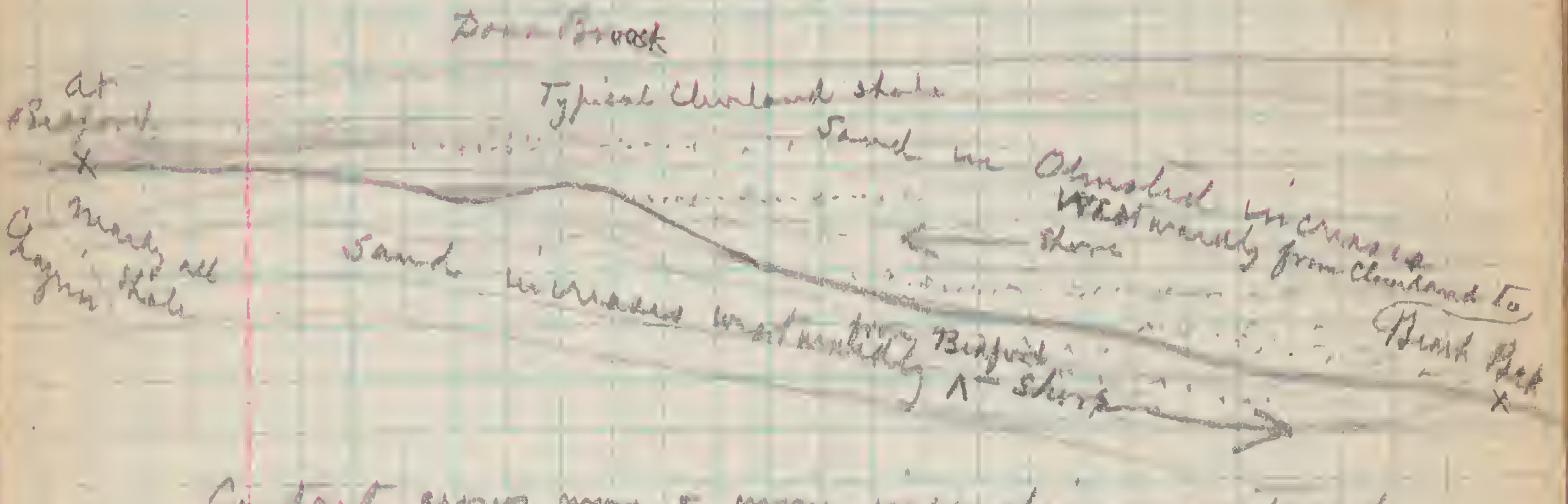
Farther west at Dover Bay, Eagle Cliff, Avon Point + Brook Park, though full thickness could not be determined, it is evident that still other beds were added to the base from point to point. The total may have reached To 150 or 200 ft.

(3) On the East side of the Cuyahoga, and going west from Bedford, (3) a ~~grayish~~ greenish shale with SS. flags are found added to the Cleveland as discovered in the section at Bedford. Similar beds holding the same or a little lower position has also been recognized in Big Creek but west of this area there place is occupied by rather dark black shale.

Under this upper greenish zone comes black shale which increases rapidly on Big Creek - 5 ft. to 25 ft. in about 1 mile. One or 2 flags are present in this shale but they are no longer seen on Rocky River. In Doan brook 10 ft ± black shale occurs at base beneath the green + blue. As this brook is east of the Cuyahoga some irregularity or unevenness of Cleveland top of Chagrin is indicated.

These greenish sh. + SS. are observed in Doan brook 20-30 ft. beneath top of No 2

Sketches illustrating deductions on p. 19.
Sep. 12, 1915

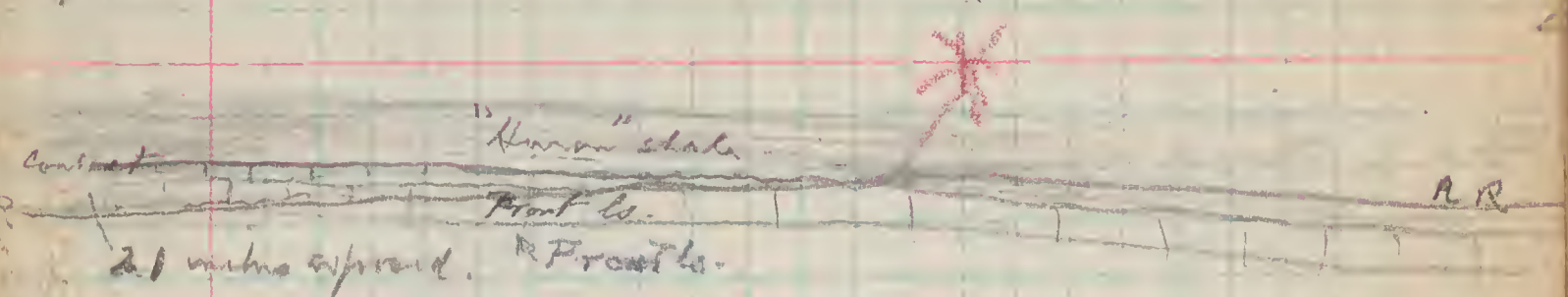


Contact grows more & more inconspicuous westward.
Both receive sand from same source, and both thus got little of its sand from erosion of Chagrin.

Probable condition in vicinity (to southeast) of Huron river at Milan.

Shale Cut, Ohio, Sept. Monday 13th 1915.
Wet Looking.

Very warm!



2-1 inches upward.

The Huron here is black, hard, fissile, making it difficult to procure fresh surfaces showing the concretes which it contains. Brought about a dozen specimens.

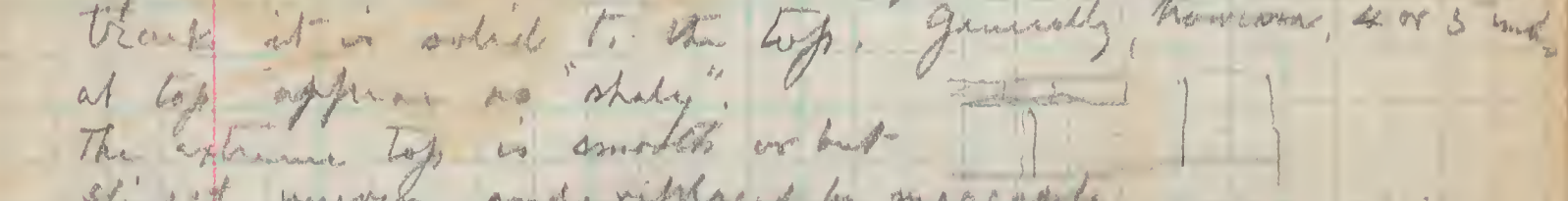
The Prout ls. is a crystalline rock, apparently dolomitic, with corals and crinoidal remains. The corals comprise so far as observed, Zaphrentis cf. gigantea (3 inches in diameter and 1ft. long) Z. cf. prolifica, Heliophyllum Halli, Favosites with cells 1/32 to 1/16 inch.

Upper part of rock usually in "talls" as though exposed to weather. In one place across (on south side?) creek it is solid to the top. Generally, however, 4 or 5 inches at top appear as "shaly".

The extreme top is smooth or but slightly uneven, and is replaced by marcasite to a depth of 1/2 to 1 inch. The upper rock contains occasional glass spots. Corals sometimes project slightly above general level of surfaces.

The contact, as intimated, is a sharp but even line, with no trace of conglomerate or soil. The black shale begins at once in typical character and, under cover beyond the oxidation of the marcasite, adheres firmly to the limestone floor.

Reached Milan about noon. Examined good exposure of lower member "Huron" shale along west bank Huron river, beginning about 100 yds above bridge. Exposure fairly well reported by Orton except that the beds dip more gently at higher and than originally by him.



Big Stone Gap, Va
May 25, 1915
East side of Powell River

East side of Powell River bottom.

Finds Black shale interbedded with soft gray shale, the former apparently predominating, or at least showing more in outcrops. The gray shale being softer may happen to be more largely concealed.

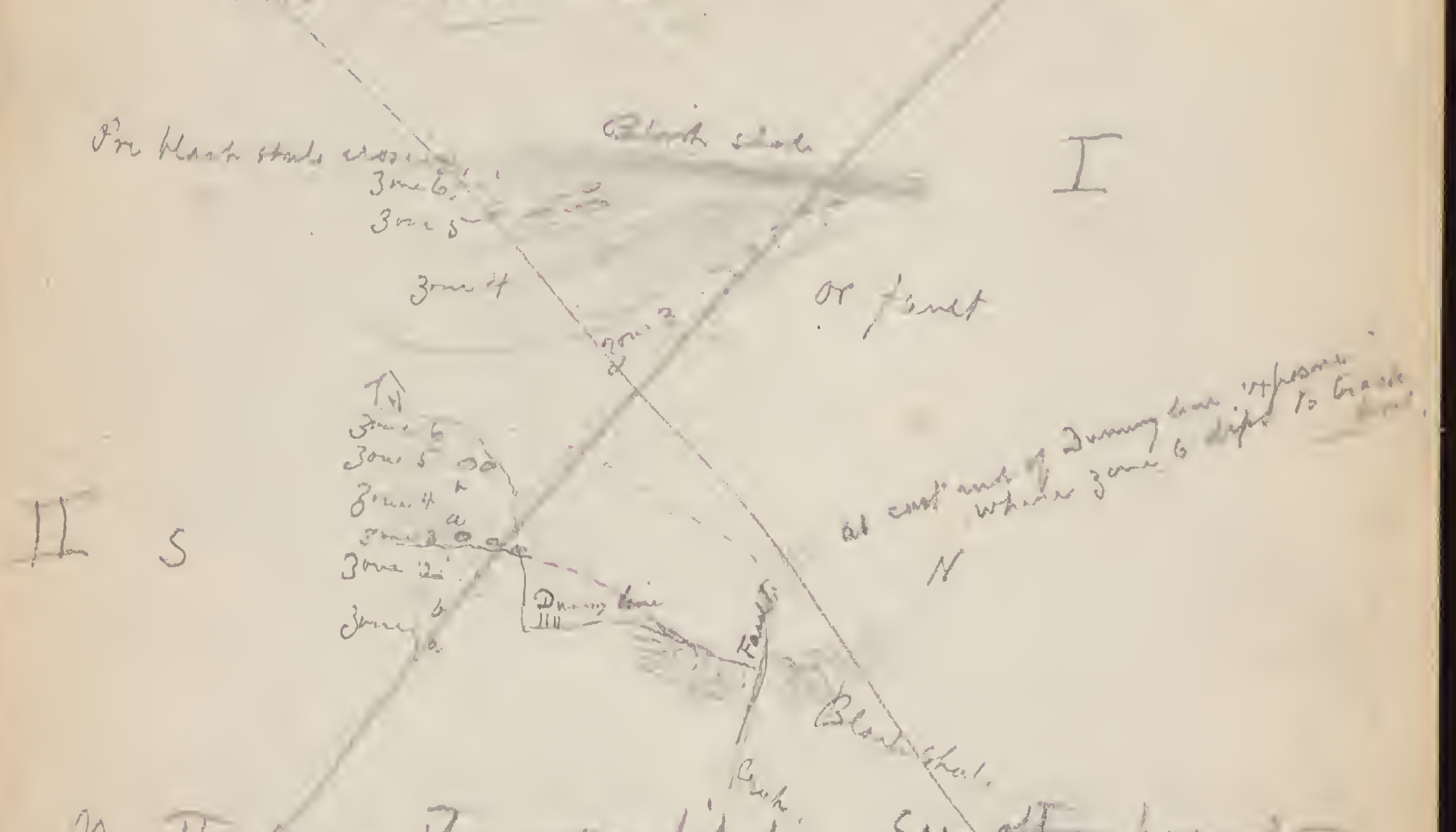
	438	438
D	200 or	150
C	284 "	250
A & B	330 or	330
	1252 or	1168

The exposures [illegible] from coral zone to coll. 63 about equally divided between this covered space and the black shale beneath (i.e. A & B nearly equal)

A + B = [illegible]

Black shale interval.
Big Stone Gap
Va.

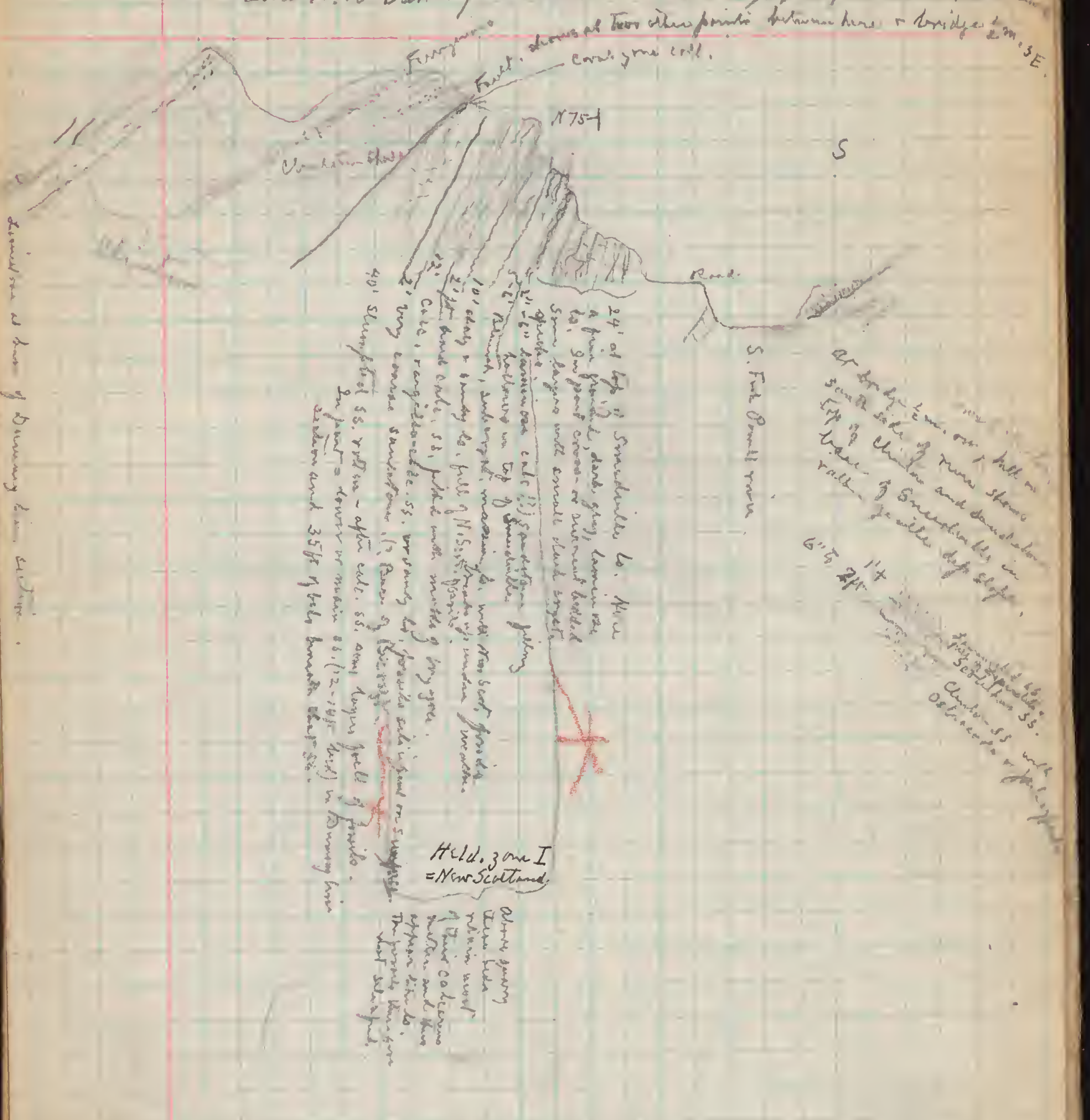
Interpretations of the Dummy line as to content of Helderberg under the black shale.



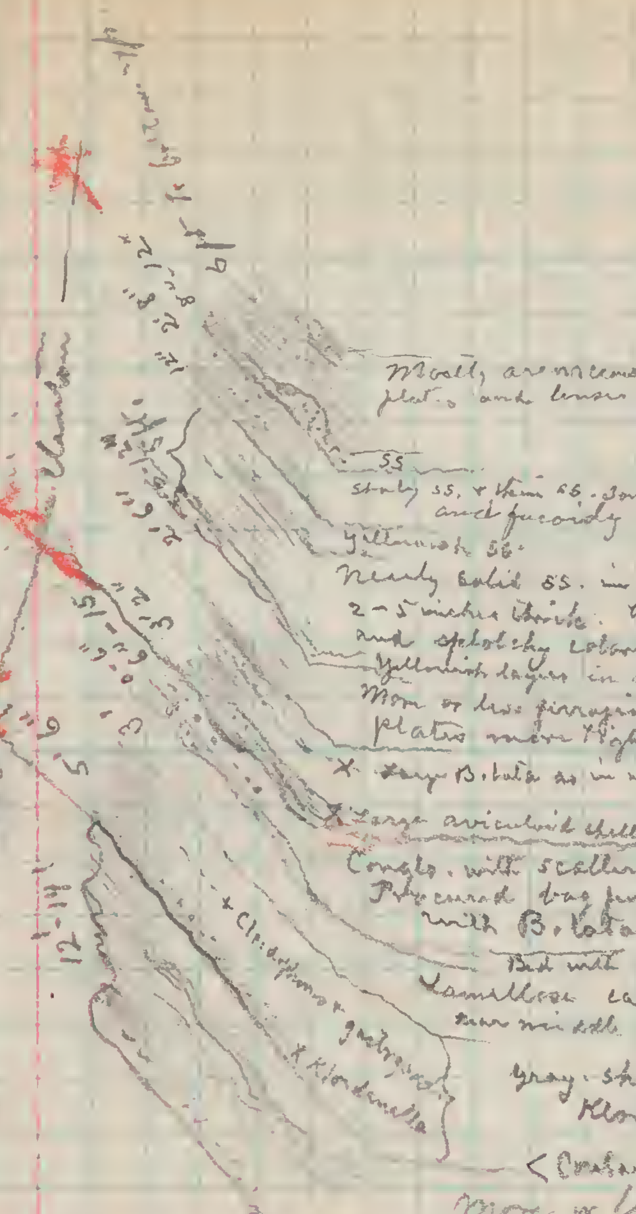
No II seems the more likely. See ~~other~~ page 35.

Photos at Big Stone Gap –
Exp. 7, 8 & 9 – of Held. zones 1, 2, 3 – on Dummy line – 10 a feature
" 1 & 2 (panoramic) " " 2, 3 & 4 to show beds above lower coral zone.

East edge of Big Stone Gap, Va., in bluff at elbow of wagon road to Elvarton and N. to Dummy line section. Oct. 13, 1913, W.H. T.E.W.



Contact Clinton & Sneedville on bank of S. Fork Powell River, just above bridge at Big Stone Gap, Va. with T. E. Willard. Oct 15, 1915.



Mostly arenaceous shale with thin plates and lenses of SS. Typical Clinton

SS

Shaly SS. & thin SS. Some of the latter rippled and fucoidy

Yellowish SS.

Nearly solid SS. in contiguous or close plates. 2–5 inches thick. Upper 1/3 ferruginous, fine grained and splotchy colored. Most surfaces of nodal. } Fossils Above

Yellowish layer in wedge – full of large ostracoda B. lata

More or less ferruginous like below but fewer fossils and plates more tightly cemented & thinner. Top rippled.

× Large B. lata as in wedge below } Blocky SS. and shaly SS. The SS varying from 1–9 in. thick. } Clinton foss. coll.

Large aviculoid shell

Conglo. with scattered quartz pebbles up to 1/4 inch. most of them less than 1/8. Procured bag full of fossils – among them ostracoda that should be compared with B. lata.

Bed with globules of pyrite or gummy pairs.

Lamellose calc. SS. or sandy ls., weathers to a SS. Very hard, bluish on crush where fresh. near middle a blocky, 6 in. fine gr. calc. SS. or rather arenac. ls. Top 6 inches with two or 3 layers gashed with white sand-filled suncracks (Sun cracks)

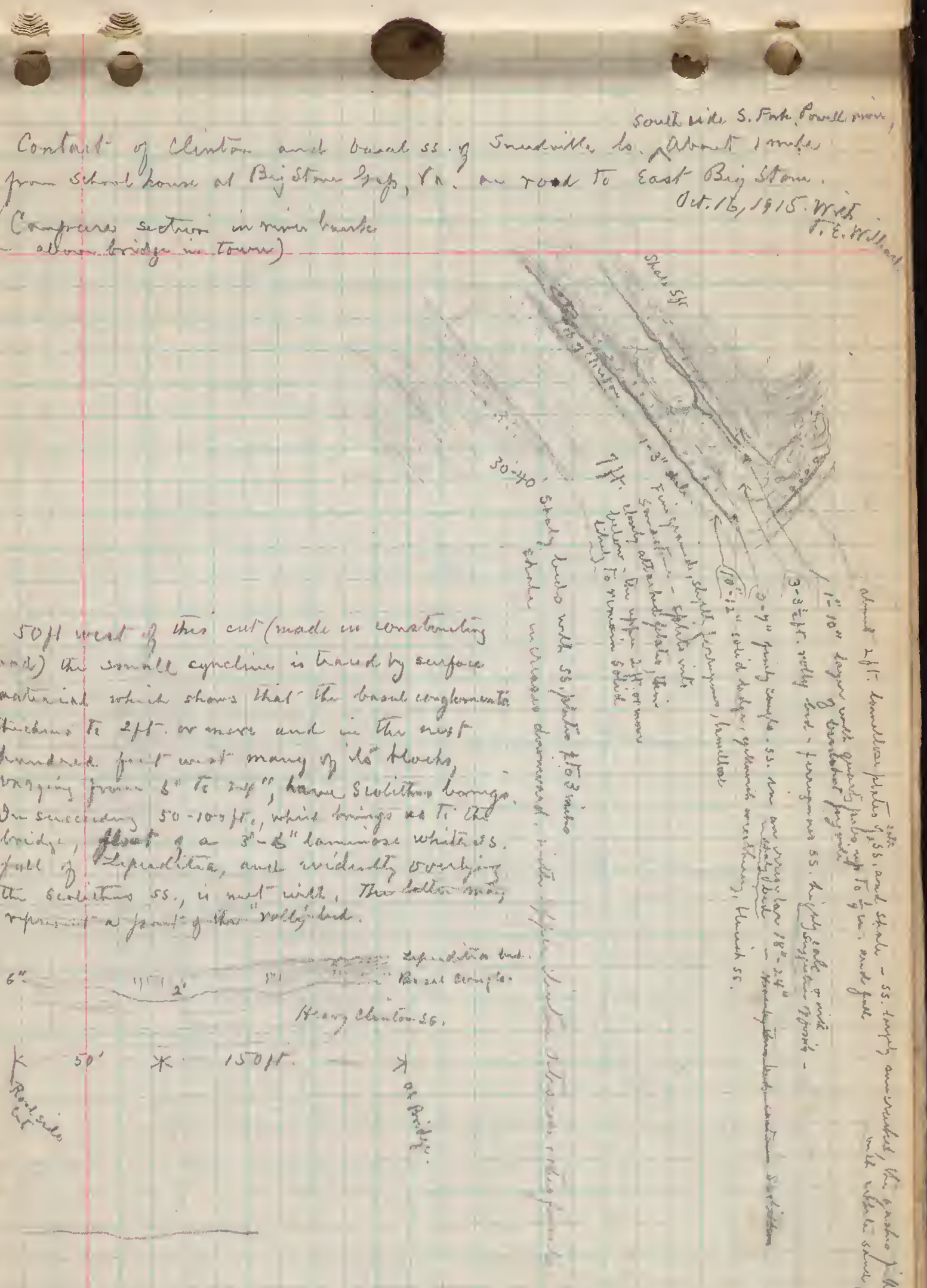
Gray shale, with occasional thin seams of more sandy material. In top foot such [illegible] layers contain Klondenella. Other fossils found near middle. Shale weathers to rusty flakes.

< Contact only slightly irregular.

More or less laminose calc SS. growing more calcareous toward top. Middle part lamellae inclined to be broadly wavy. Apparently basal Sneedville

Contact of Clinton and basal ss. of Sneedville ls. about 1 mile south with S. Fork Powell river, from school house at Big Stone Gap, Va. on road to East Big Stone.
Oct. 16, 1915. Wilmarth
T. C. Willard

(Compares section in river bank above bridge in town)



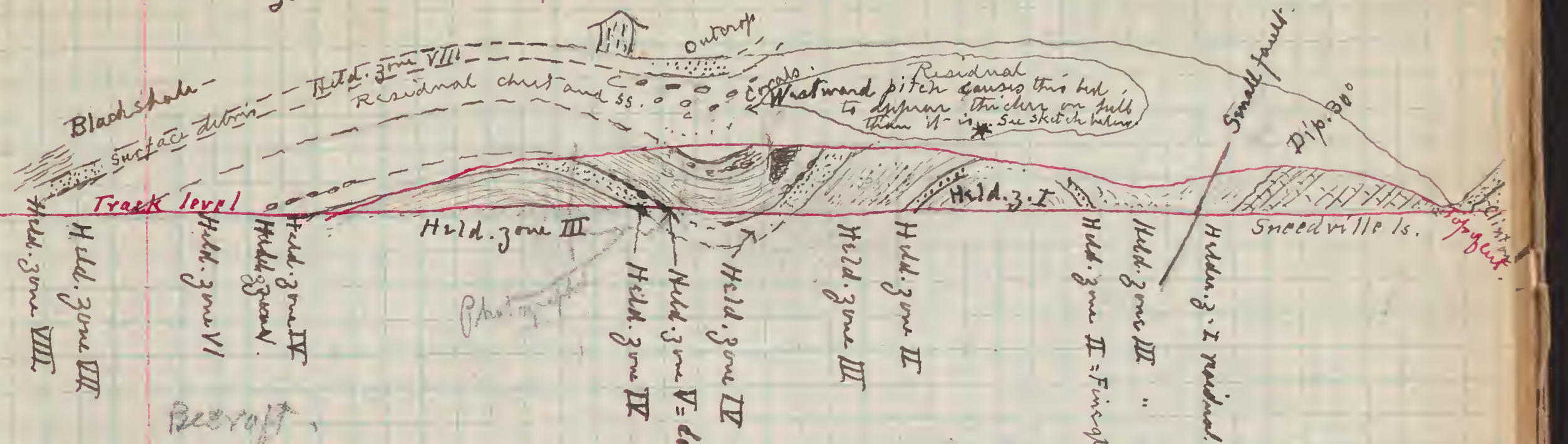
50 ft west of this cut (made in constructing road) the small syncline is traced by surface material which shows that the basal conglomeratic thickens to 2 ft. or more and in the next hundred feet west many of the blocks, ranging from 6" to 2 ft", have Stockton bearings. On succeeding 50-100 ft., white bringes as to the bridge, float of a 3"-6" laminose white ss. full of Lepraditina, and evidently overlying the Sevier ss., is met with. The latter may represent a part of the "valley bed".

For contact of Clinton and Cayugan (Sneedville ls) see 1920 note book p. 19.
For lower (Ordovician) part of section in vicinity of Big Stone Gap see p. 17 of 1920-1 notebook.

along Dunning line at Big Stone Gap, Va. where it passes around west end of hill beginning about ¼ m. SE of schoolhouse. Oct. 13 and 16, 1915.

Folded anticline, pitching strongly down the N.W. end of hill so that Zones 4 and 5 outcrop in brook beneath the track close to black shale.*

N



The interpretation of the stratigraphy and structure of the beds in this cut and areas immediately adjacent is complicated (1) by leaching and decomposition of the shaly limestones which comprise nearly the whole of the Helderberg portion; (2) by gentle folding and repetition of beds, and (3) by small faulting both sides of the Helderberg; an inlier. The sequence of the Hold. zones (I-VIII) however is unquestionably determinable here, but the originally limy character of all the beds had to be shown by other outcrops (over)

in the vicinity. The decidedly limestone character of zone I especially, and its relations to the Sneedville ls., are well shown in small quarry and fall from bluff above quarry ~~etc~~ on East Big Stone road ½ m. SE from Big Stone Gap school house.

Sequence of Helderbergian deposits at Big Stone Gap, Va.

Genesee Black shale.

Zone VIII = About 5 ft. rather coarse, originally calcareous white or light colored ss. carrying a considerable fauna; bed observed only in the Dummy line section. The fauna contains no corals. Brachiopods comprise it's bulk with fewer and rarer pelecypods & gastro. Meristella —— is even more abundant than in lower zones. (This bed usually absent, the Genesee in these cases resting on Zone VII) 5 ft.

Zone VII = Readily decomposing fine grained sandy limestone of a sky blue or shore grenish color when fresh. Upper 3rd or so on weathering liberates more or less sandy chert often filled with corals, the latter usually in one (zone) thin zones. Brachiopods & other fossils are most abundant with the corals but are not confined to these layers — about 20 ft.

Zone VI Apparently similar lithologically and faunally to the underlying (VII) but the upper part is less prominent and the fossils fewer while the lower ⅔ seems even more sandy; both parts fossiliferous 7.+18=25'

Zone V = Cherty layer, marked by an abundance of corals — 1 ft.

Zone IV = sandstone, brownish, fine to course grained, thin & thick bedded, (serpentes) some beds filled with fossil shells etc, among the latter corals as in Z. V, VI & VII. — — — — — 12 - 14 ft.

Zone III = Shale-like residual after laminated sandy ls. fossils silicified; in its present condition resembles Zones VI and VII. Fossils silicified, not very abundant, mostly of species found in overlying zones. — — — — about 35 ft.

Zone II = A coarse, unequal grained sandstone or fine grit conglo. with few or no fossils, in a single ledge — — — 2' - 3'

Zone I = Lower 6 ft. Encrust. bluish massive ls, above which are 10 ft. of shaly ls. full of New Scotland fossils, then 2 ft. hard calc. ss. with molds of bryozoan and finally 12 ft. soft calcareo-argillaceous sandstone or sandy ls, with fossils weathering out in silicified forms. At base 2'-6" slightly calc. hard sandstone filling shallow, follows in underlying Sneedville ls. — — — — — 32 ft.

Sneedville ls. (see description in section ½ m. SE of schoolhouse).

Vicinity of East Big Stone (Elverton) Oct. 15, 1915 with T. E. Williard.

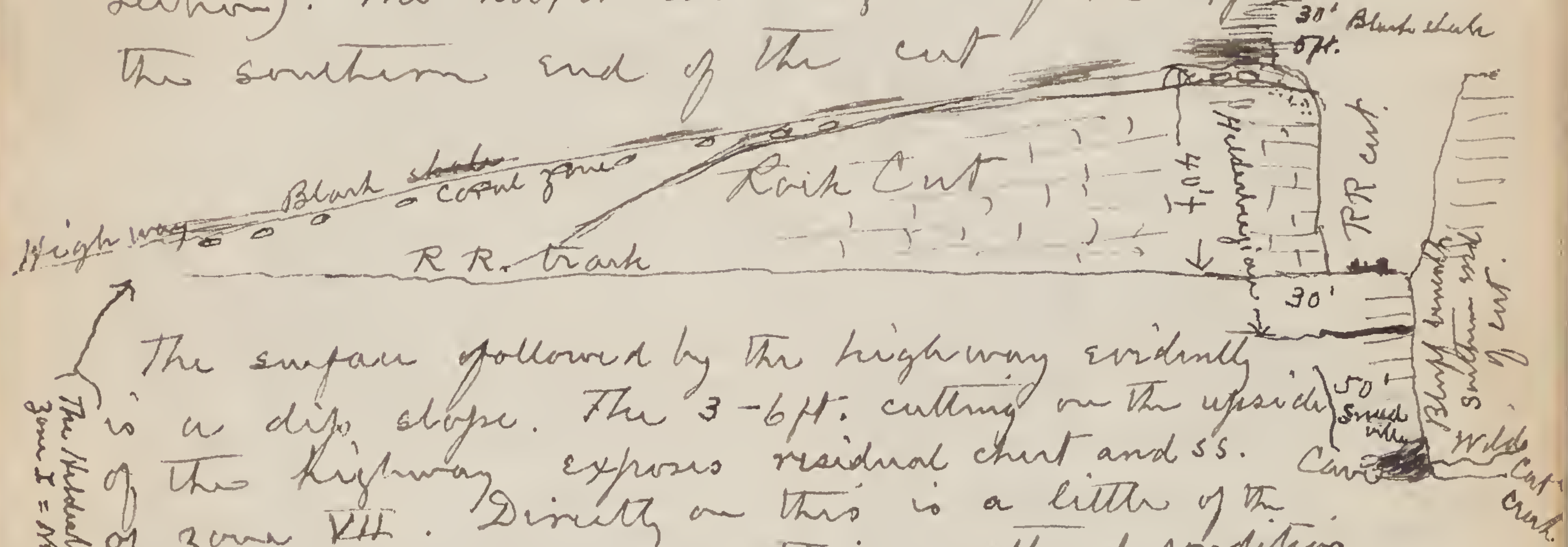
Between East Big Stone and the sink or cave of Wild Cat creek which lies between the R.R. track and the highway running on top of bluff ~~of~~ and just south of the "rock cut" - 1 mile south of station - good sections of the Sneedville and Helderbergian ls (mapped a Hancock ls.) are shown. The best place to get thickness and character of the Sneedville is in hill just SW of the village. The base of the section is seen in new cuttings along the highway almost directly after passing under the R.R. The first beds seen here are of the top sandstone of the Clinton. Climbing the hill, in which the beds lie almost horizontally, the section passes upward through approximately 100 ft. of Sneedville above which follows the Helderbergian. No detailed section nor fossil collections were made at this point. However it was observed that the lower beds of the Sneedville are very sandy, weathering, in part, into a porous sandstone. The base consists of a 6" to 24" massive coarse Scolithus bored sandstone. Above this for 6 to 10 ft. are more or less laminated sandstone parts of which are filled with fossils. Altogether this appears to be the most promising place at which the basal fauna of the Sneedville may be procured. Heavier hammers and chisels are required. Without these facilities no effort was made to collect the fauna. Observed Lingula, Spirifer varicosus Sp. of size of S. var. but more numerous plications, cephalopods, and two species of gastropods - one high the other low spired. All of these were common and preserved as molds in sand. Above these sandy beds come more or less magnesian ls., some of the mottled as though by algal growths, others approaching waterlime and dolomite. The mottled beds seem low in magnesian content. but rather high in argillaceous matter. One of the latter beds contained a peculiar small-tubed moss-like spring sponge organism. Two specimens of this were procured.

Small, rotted outcrops of the basal sandstone of the Sneedville were observed also to the North and NW of East Big Stone along the main road. One of these at the elbow of the road near the town was collected on a former visit by Williard. This outcrop like the others of the same horizon were then supposed to belong in the Clinton

(over)

Hill at "Rock cut" and above sink of Wild Cat Creek.

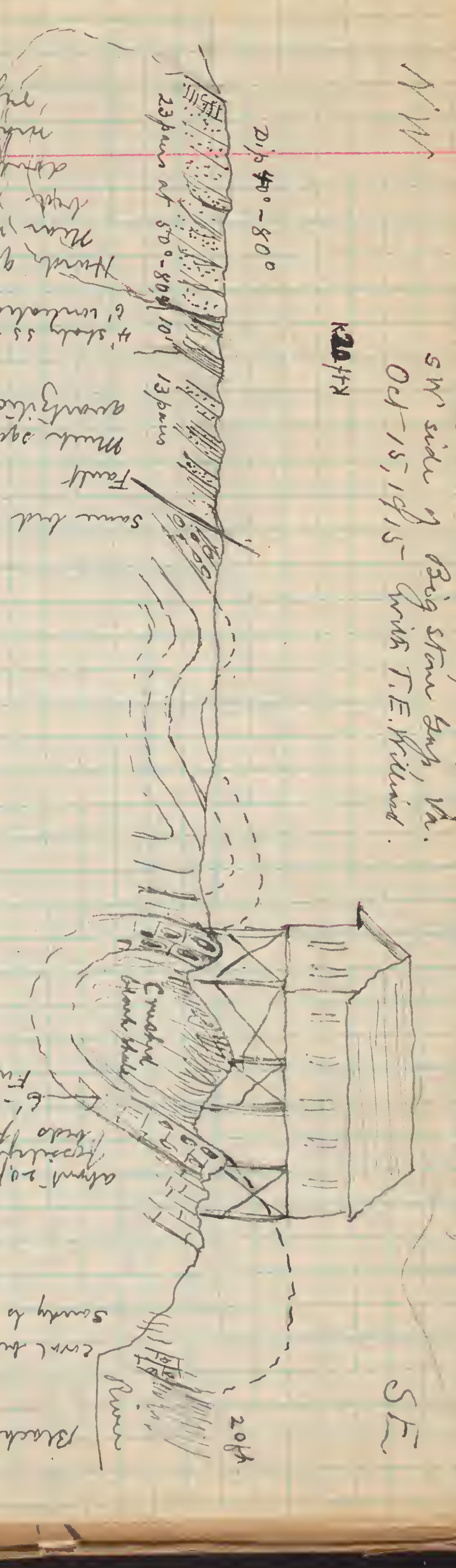
The wagon road passes to the SE of the R.R. over the gap through which the R.R. cut has been made. The latter cuts middle to upper beds of the Helderbergian, apparently all of the beds therein exposed being above the sandstone (zone IV of generalized section). The maximum height of the exposure is at the southern end of the cut



The surface followed by the highway evidently is a dip slope. The 3-6ft. cutting on the upside of the highway exposes residual chert and ss. of zone VII. Directly on this is a little of the Genesee black shale mostly in weathered condition but fresh and 6-10ft. Exposure at top of hill directly above the cave possibly 100ft beneath the highway level. The black shale contains Schizobolus and Leiorhynchus. The more or less rotten & sandy chert under it is full of corals, of many species, all of them surprisingly like typical Onondaga species. However, these corals are intimately associated with typical New Scotland and Becraft fossils like Aspidocrinus scutelliformis, Spirifer perlamellosus, Sp. macropleurus, and Sp. concinnus. On the other hand a single ventral valve, imperfect it is true, but so far as it goes very much like the Onondaga Sp. divaricatus, was found in the same bed. The fauna collected here in zone VII may run to 30 species or more. Disregarding the corals fully nine tenths of the remainder are of supposedly characteristic Helderbergian species. With few exceptions, all of these species – the corals included – are found also in the underlying zones V to I. And as there is neither a well marked faunal break nor a physical break between zones II and VIII, except a possible one at the top of zone IV, it seems unquestionably established that the beds are of Helderbergian age and the corals merely precursors of Onondaga species.

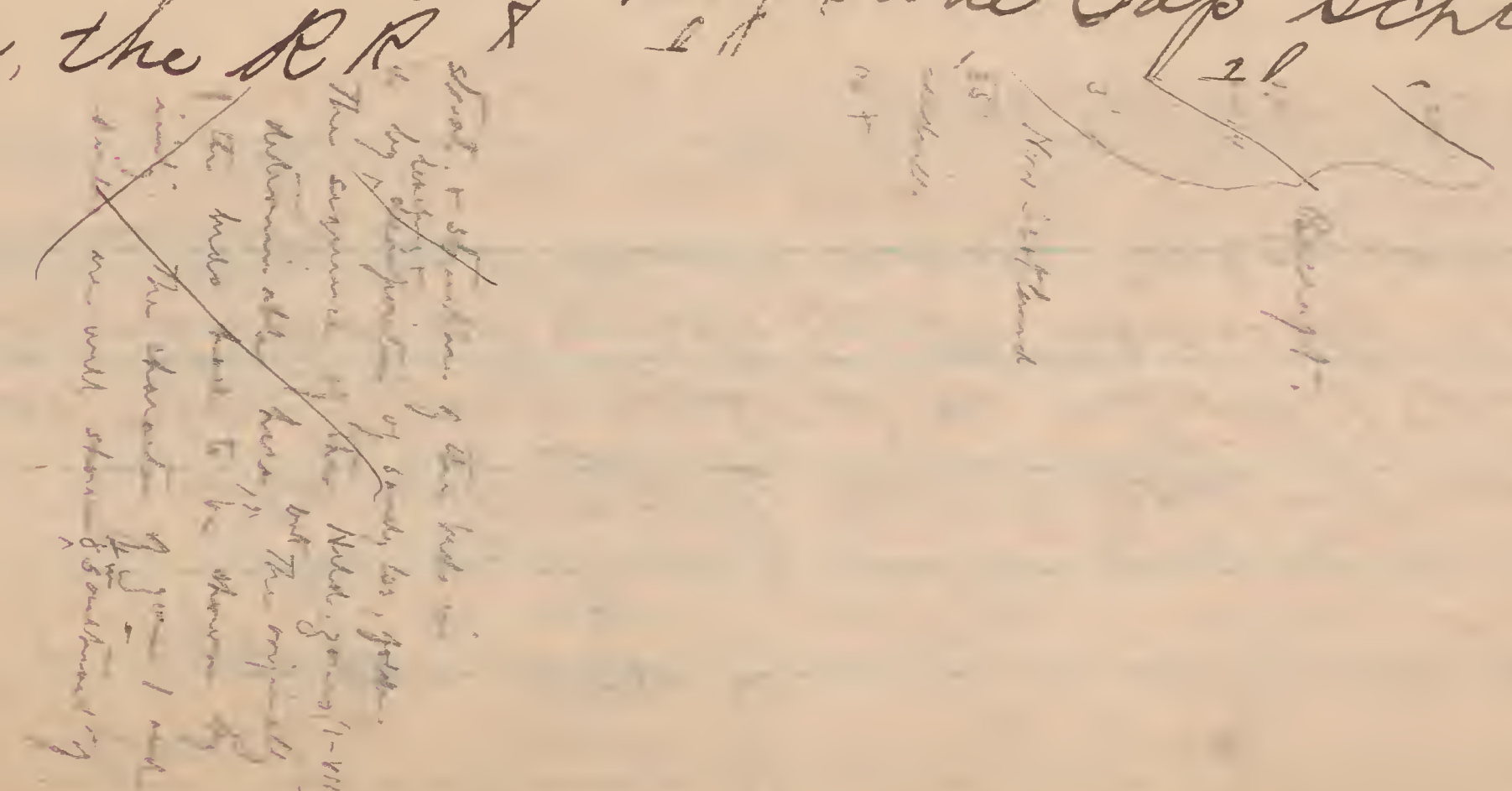
The Helderbergian here seems not to include zone I = New Scotland. - apparently all Becraft.

At Old wooden mills, bank of South Fork Powell River, SW side of Big Stone Gap, Va.
Oct-15, 1915 – with T.E. Williard.



E. M. Kneidler 1910 N.B. p. 39

At the curve of the Powell valley R.R.
350 yards N.E. of Big Stone Gap school
house, the R.R.



E. W. Kindle 1910 N.B. fr 39

At the curve of the Powell valley R.R. 350 yards N.E. of Big Stone Gap school house, the R.R. cut exposed the sandy sh and crumbling ss. at base of Bl. shale. sec. about as follows

(a) Trace of Bl. sh. 0-1'
(b) Crumbling fine grained ss. & sandy sh 30'
(c) Hard ss. mostly fine gr. but 8 to 10 inch band in upper part very coarse pebbles 2" long but mostly small pebbles 9'
(d) soft sandy buff shale with some thin ss. bands 65-1'
(e) gray thinly laminated ls. Water lime type of no fossils seen 30'
(f) Covered. 50'
g. Light gray mg. ls. 25-1'

" The beds a to d can be seen in much more nearly their natural or unleached condition a few hundred yards East near the cemetery where they are much more calcareous

June 24, 1914
With Bassler.

at & n. of Bakers Station, Tenn.
to Ridgetop.

Near photos

- 0" — chert layer — 1"-16" with fossils
- 6"-12" Green shale without phosph. [illegible]
- 6" 12" Green " with " "
- 3"-4" " " passing by gradation downward into top of Chatt. black shale
- about 12" Black shale with nodes as above.

No break between Chattan. & Ridgetop shales.

18' (est.) Chattan. sh.

0-2" basal conglo. with Ord. & Rich. fossils
3ft. yellowish gray dol.
3ft green sandy shale. ? Waldron

Laurel ls. dolomitic

Town of Ridgetop.

Warsaw 30-48'

168ft + Ft. Payne — rather decidedly shaly in middle third — same as at head of Whites Creek.

chert with fossils

about 60' gray green calc. sh. & argill. ls. (displaced in [illegible] by faulting)
Maybe New Providence

Ridgetop shale

- e. Not 5' 12 ft. the usual gray green shale, becomes limy toward top — almost [illegible] & contains thin layers [illegible] Fauna.
- 6' 6" [illegible] green soft shale 6"-12" glauconitic light or dark green
- 2'6" gray green shale [illegible] 1'6" to 2'6"
- d. 6 in. blue green soft shale — glauconitic
- about 1½ ft shale as below — gray green
- c. 1-2 ft argillaceous ls. chocolate interiorly — yellow under weather — Ostracods — very slightly fossils — rather conchoidal fracturing — slightly
- b. about 30' calc. green, finely sandy shale. a few geodes in upper half. gray green. Ostracods in several layers
- a.

Chatt. Black shale

Ridgetop sh. about 46ft. Overlying 60ft. probably Lower New Providence.

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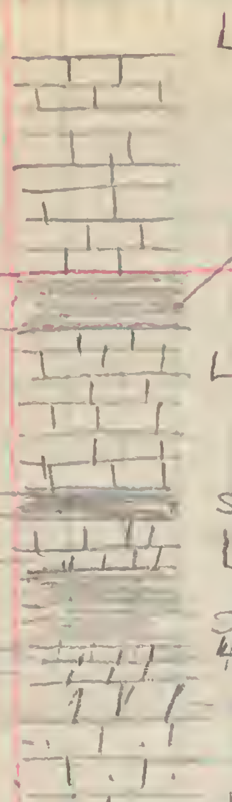


	Ls, LV, 42-100 feet
42-100	
10-12	Sh Waldron 10-12
35-40	Ls. Laurel 35-40 feet
2 1/2	sh Osgood up/pa 2 1/2
5	Ls Osgood 5
15	sh Osgood Lower
2	Ls Brassfied 2 1/2
5	Ls. Ostracod bed 5
30	Ls Siliceous Saluda 30
	Columnaria + Tetradium
10± (16')	Mud rock 10±
	& Rhaphistoma etc collected by Ellen Oct. 4 th 1914.
25-40	Sh + thin ls Eastwood 25-40 - Rhy. + Dunoltina Beds
	Columnaria Calapoecia + Beatricea
50	Ls + sh Greenbeds 50 (Cyphotrypa beds)
	abt. large Cyphotrypa. Columnaria
60-100	Ls + sh Arnheim bottom
	? Dystactospongia + coarsely plicated Opisthoptera. Rhy. dentata, long hinged Platystrophia + Crinoid stems projecting. To base of section.

Silurian section in Jefferson Co. Ky
According to Charles Butts work in
1914 and as verified by Ulrich in Oct. 1914

55

56

(Warsaw/Harrodsburg)

Spergen

with Spergen ... lower part

also oolitic locally

No break here

lenses.

Kenwood ss. (

New Providence shale.

Ohio shale.

Black sh.

or Chattanooga

Brooks + then observed at Brooks a 1/4 in. brownish weathered streak at contact

Generalized section of Louisville district by Charles Butts - 1914

Verified by EOU Oct. 4, 1914

Contact Chattanooga and New Providence shales at Brooks, Ky.

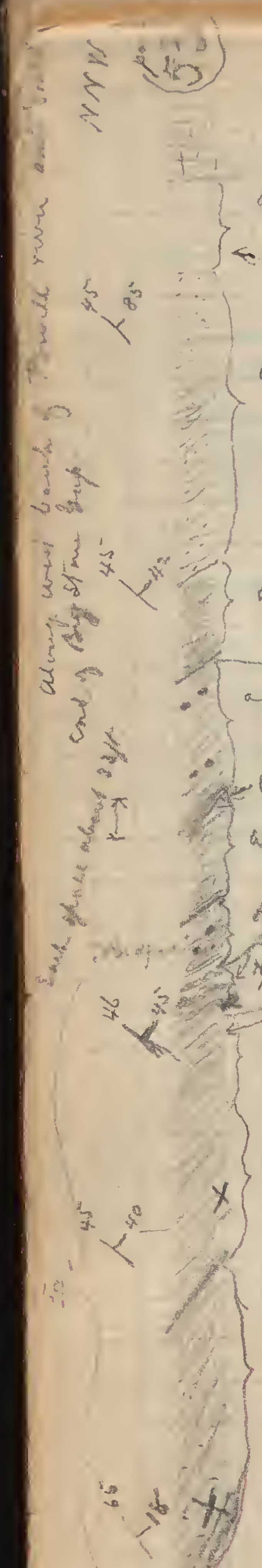
Gray soft clay shale

Contact — 1/4 in. brown weathered streak with 1/2 in.

3/4 in. gray shale dark shale beneath

Top of black shale.

Big Stone Gap, Va. May 24th 1915.
With Butts & Mesler.
Butts did the pacing. (see p. 25 for Devonian part of section)



Newman ls.

about 60' not exposed but probably ½ ls. as indicated by strike from opposite side of river.

Red ferruginous ss. under the limestone. (See later 1921 section)

about 200-220 ft medium hard, fine grained, light gray, reddish weathering ss. thick bedded (1'-2') in lower and upper 3rds, thinner bedded in middle, and there especially with thin partings of bluish shale. (New Providence = Cuyahoga ss) = Grainger ss.

about 60 ft soft greenish fissile shale (? Cuyahoga) May be Ridgetop shale

about 70 ft. soft to medium hard, fissile dark to black shale with a few carb. of iron nods. Sunbury.

Coll. 59 of Mesler's numbers

about 50 ft. Black very fissile shale - at base makes riffle in river

about 30' Russet (rusty weath.) shale with nodular fine sandy masses of whitish color, with black spots - at base a few feet of soft, irregularly fissile greenish shale at top - just over it a hard sand layer forms base of latter. Hard sandy nodular layers, interbedded with hard black shale & greenish shale. One layer with [illegible]
10'+ Coll. 58 Lingula & (? Barroisella) and fish scale.

Upper part makes riffle, being harder than remainder of bed.

Black shale (see Butts for thickness)
(Chattanooga ?)

Mostly dark shale & gray [illegible] thin seams of sandstone as below with about 1/3 soft bluish clay shale
(See Butts for thickness)
X Coll. 56 & 56a Plants & Spine of fish

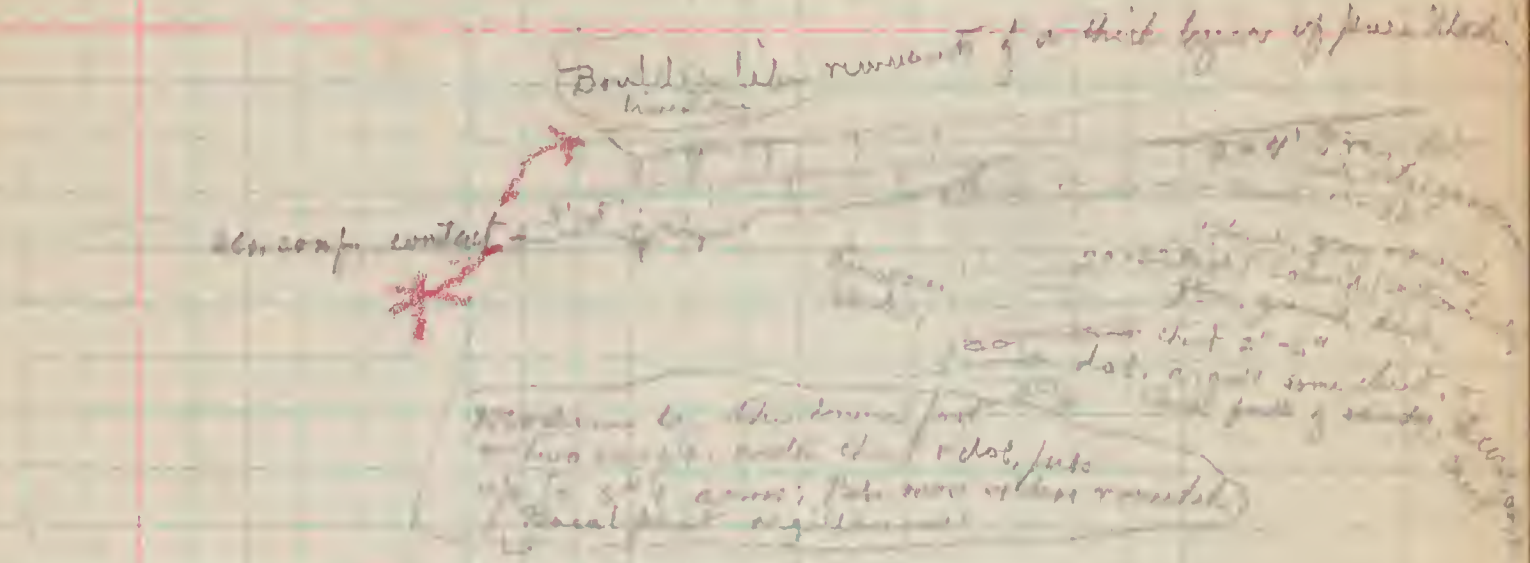
Mainly black or dark in part fissile shale but much of it composed of laminae up to ½ inch of fine grayish sand. The latter splits irregularly. - Plants mainly but also a few Conodonts. Plant seems of the Milan, Ohio, species with grass-like leaves.
(See Butts for thickness)
("Huron" or "Ohio" Chattanooga?)

Coll. 57, 57a, 57b
Mesler's numbers.

Total thickness of shale exposed here about 438 ft. (Actual thickness accord. to Butts)
Evidently all of Huron to Sunbury = Chattanooga, i.e. above Chemung.

July 15th 1919 - With Mather

Catawba, Va.
Small quarry along road beneath Sanatorium



The Martinsburg most probably does not exceed 10 or 15 ft. in thickness here. It is succeeded by Lincoln - for details of Lincoln and higher beds see earlier notes by Mather and myself. Cpm.

For overlying beds see Mather's Notebook for 1915 pp. 5 & 6.

The contact of Moshier & Canadian
seems less uneven than in the older N.E. quarry
where it was photographed by Mosher.

Hagans, Va. July 17, 1919 – W.K. R.D. M.

about 50 paces (60 deg) from ss.
6 deg ss. shale some purple. No good.
6 ft. shale
11 paces SS. r shale former
large with small Anoplotheca
3 ft. shale with occasional ss.
50–75 ft. purplish gray green shale many large Anoplotheca
fossils
10 ft. 8"–30" ss.
8–16" blocky ss. with Anoplotheca
10± covered probably shale
12–15 ft. ss. with Calymene, Palaeopora
Shale + pebbly thin ss.
Dip 50°
Large coll. B
C
D
On bed 3
Small collection
75±
Dip 60°
Shown at North S.G. Dip.
8 ft. ... some clay pebbles
... dip NW.
Strike N ...
35°
Shown in ... of ... valley ...

... shale ...
... 2nd ... of station
The lower contact ...
... specimens ... and ...
... collected ... and ... evaluated.
Bulk in ... got some plant remains

Base of ... Upper Clinton of Big Stone & Cumberland Gap sections.

Now covered p. 1 of N.B. 33.

Hagans, Va.
July 17, 1919.

125' to top of exposure.
6'
29'
40'
60' } Anoplotheca zone.
Ore bed 3'
263
90
Inferred ore 1
10 to bottom of Clinton exposure
364' Total Clinton exposed.
270'± concealed to ... sandy ls.
supposed to belong to the ...

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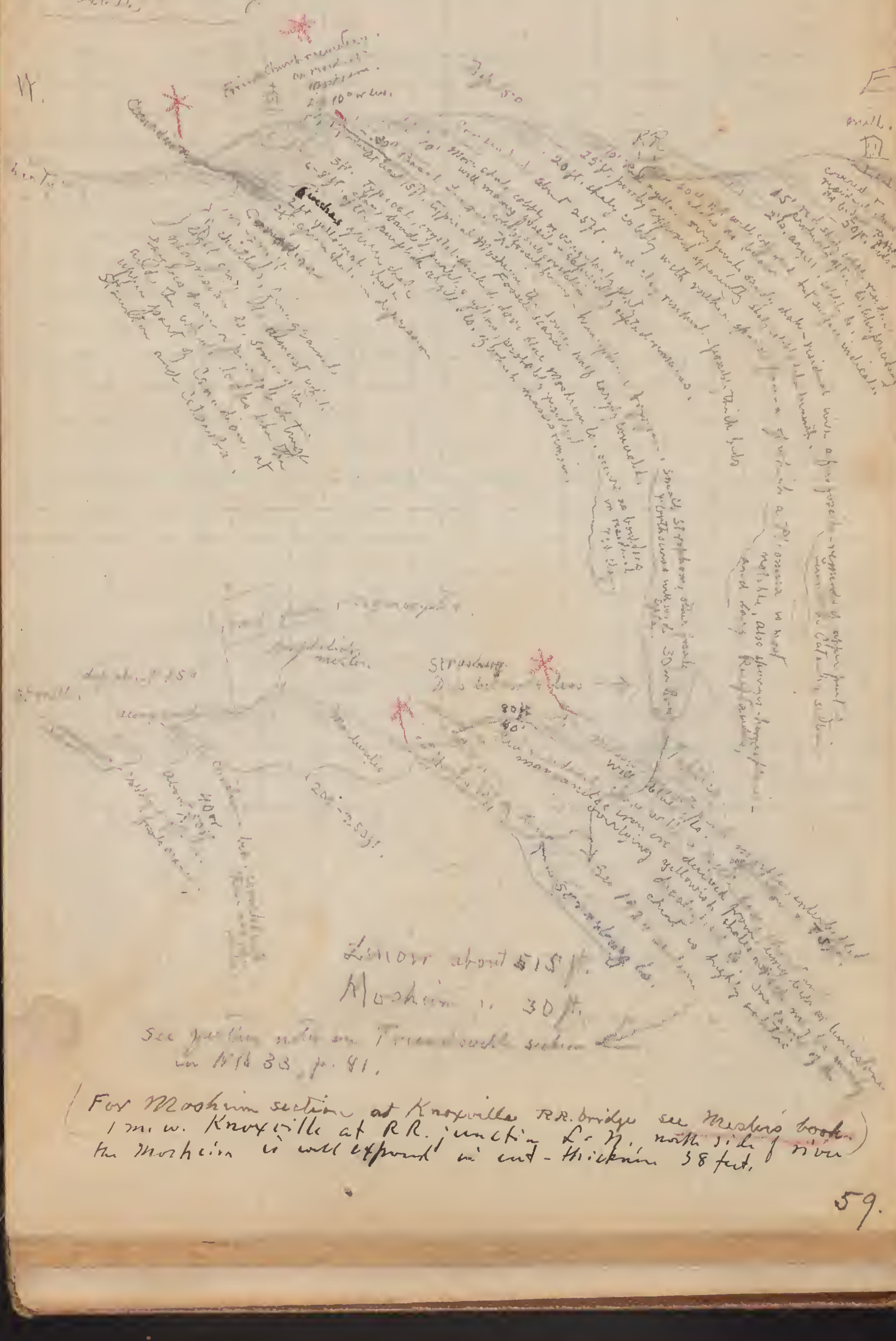
Friendsville, Tenn. July 19, 1919.
with R.D. Wade



Louisville about 815 ft.
Mochein " 30 ft.

See further note on Friendsville section in Bk 38, p. 81.

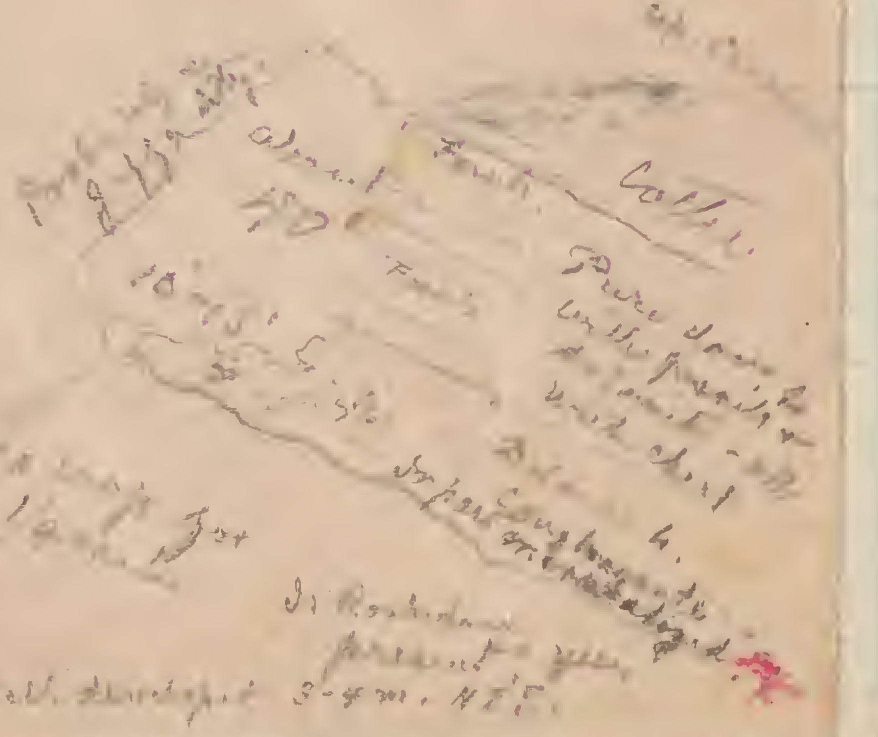
(For Mochein section at Knoxville R.R. bridge see Masters book. 1 m. w. Knoxville at R.R. junction L. & N. north side river Mochein is well exposed in cut - thickness 38 feet.

59.

Collier fossils — 460C

Cotteroceras and Orospira.

Chert above quarry at NE edge of Jefferson City, Tenn.



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