

U. S. GEOLOGICAL SURVEY
TRAVERSE BOOK

9-904

Rocky Mts.

2278

U. S. GEOLOGICAL SURVEY
WASHINGTON, D. C.

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To the Director of the

United States Geological Survey,

Washington, D. C.

U. S. GEOLOGICAL SURVEY
WASHINGTON, D. C.

Edward M. Kindell.

CCCCCCCC

July 6

Arrived at Rawlins Wyo

10 30 A.M.

Cherokee Spur camp

Bar. 4900 P.M.

West of camp about 3/4 mi
a small ravine cuts
out good section. Bedd. Strike
S 86° E. D 30 S.W.

1. Grainy section no 1 125'

1. Light grey sandstone
hard, approaching quartz
in many places
in 8 to 24" beds 130'

2. Red highly porous ~~massive~~
with dark greenish patches
and marked with numerous
small worm like trails.
Dr. here is N. 95. 30

3. Dull grey hard fine
textured ls. 180'

4. Cherty grey ls.
& red shales, first
with Carb. foss. 50'

5. Pink & mottled grey
greenish ls. capped
fossils abt. 70±
6. Covered 200±
7. Light grey fine
grained thin bedded
ls. with some thin
arenaceous ls. layers
with fossils near base 500±
8. Covered - - - 2000±
9. Red beds (seen at
distance) 200±

The general strike
as seen from the hill
top is about S60°E.

No 2 of section is a well
defined band. Color al-
ways reddish but varies
from dark cherry
to pale pink. The
most conspicuous part
resembles the ore some
what and have been
spurred at two points.
There is a finely con-
glomerated band of
very hard reddish
stone upper part.

No. 1 lower layers of
No. 1 are quite coarse
locally, quartz pebbles
size of plum pits are
common, rather open
quartz also of large
pebbles. The formation
is a quartzite rather than

July 7 07 Sunday

No 2
The ridge S. of first valley
bearing east N. of Chea-
the Spring the Redish sh.
and ss. bed (no 2 p 3)
has been prospected
for Fe ore. The red
calcareous rock thrown
out several fanned Linguletes
fish teeth, trilobites

Quarry in quartz-
ite (no 1 p. 3) N. of
Rawhick exposed
rock full of weather
crinoid

Certain bands full
of succid impressions.
Upper layers
here are pale brownish
with greenish bands.

Lower beds
mostly pale with
green color. No fossils.

July 8.

No 3. Red shale a br.
band above quarry
just N. of Rawhick
this is no 2 of sect.
p. 3. Trilobites are
common here

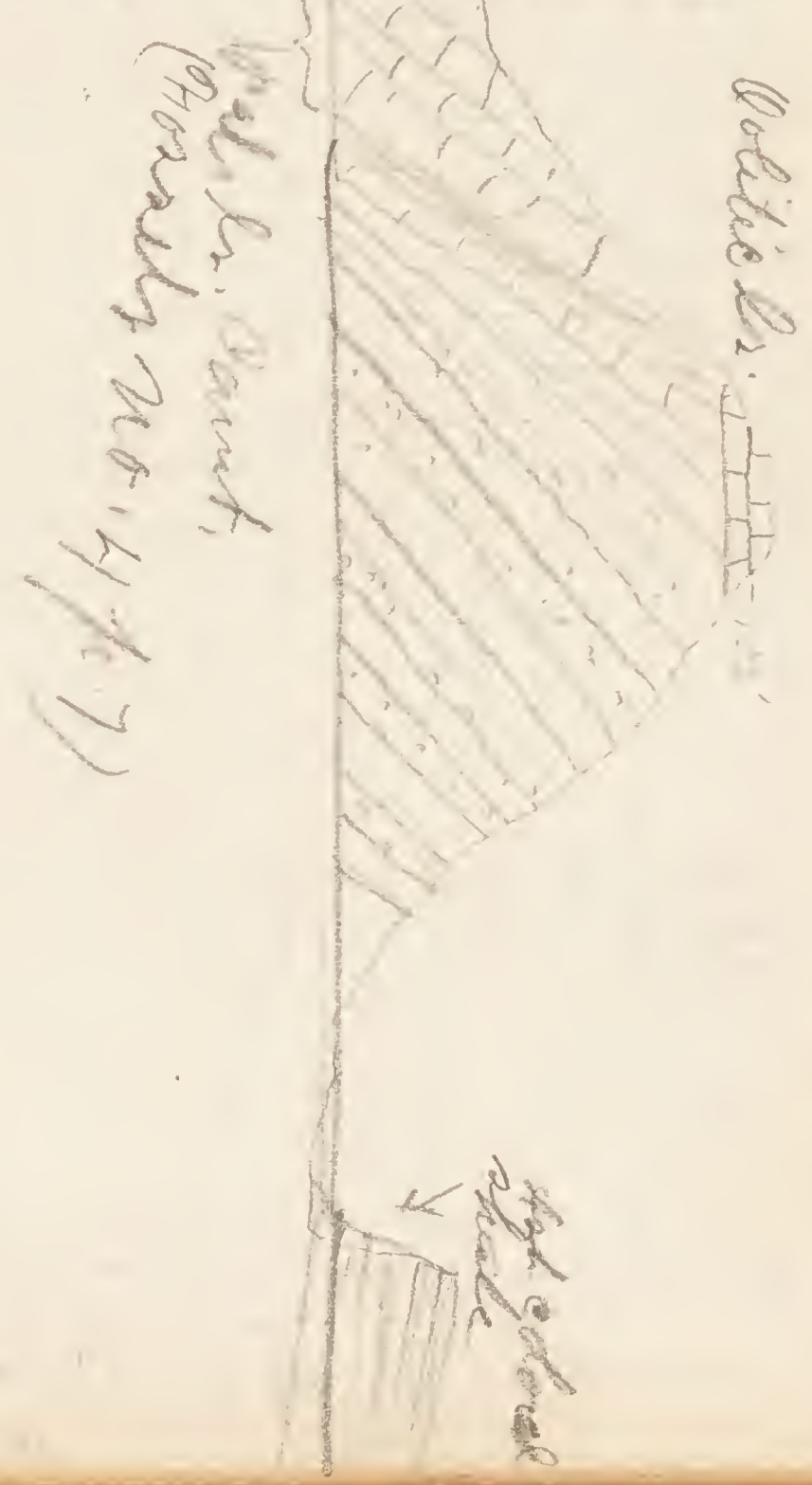
July 9. Went by
stage from Fairview
to Tabangge. No fossils
we stopped at Brown
ranch.

July 10.

No 4. Just N. of Tabangge
in gap in the Paleozoic
ridge thin bedded
ls containing and

about 1/2 way up
 trilobite fragments
 Camb 9 of this L.
 dips N. just 85-90
 up hill as a jagged
 wall some 15' thick

The summit of ridge on
 S. side of sect. 18 N. 24 W. is
 capped by same coarse
 shaly ls. seen on S. side
 of Labarge at E. of road.
 Contains large banded
 oolitic balls of lime the size
 of walnuts to peas. This
 ls. is hard & apt to be
 Relations shown thus.



No. 5 S.W. slope of Labarge Mt.

S. of small ravine runs along the west slope of Labarge Mt. in a strike which shows many canyons "red beds".

The lower beds of the latter series include 8 or 10 of coarse sandstone and reddish ss. The upper part of the red clay with occasional bands of ss or lg. The latter appears to grade into the red shale typically the ss bands show the large oolitic structure finely which has been noted on the char. red ss of the lower part of the latter (p. 100)

It seems clear that both belong to same formation

The red series dips mysteriously like the Palaeozoic but at much less angle than and apparently some evidence of unconformity (see below)

sect. no. 2



Red clay ls.

953

The red clay contains numerous small garnets and a few of which have fossils of fossiliferous shells inside

(No. 15a) = sec. I. p. 4

Lead gray ls. with fossils from top of Pal. ser. (b.)

July 11

Bayles coal mine
 bed dip to N. 20 at mine
 mouth.
 bed exposed, -
 White to buff ss 15'
 Drab clayst shale 10'
 Coal 5'
 Clay 1'
 Massive light gray ss 10'
 Drab shales, thin bedded
 ss at intervals (base) 400+

Below the coal about
 75' to shale and ss con-
 tains several very con-
 siderable of peculiar form
 some are cylindrical & the size
 of a small pea; others
 of a more globular shape found
 by short pieces.

The other top are great-
 ly elongated; of length size
 of a hand and found 3 or 4
 planes. A specimen was taken
 from the lower part of the
 ss. The weight of the
 specimen was 2300 lbs.

Relation of coal beds above
 to rocks of west
 side in following

Section up trail from Bayles mine
 No 6.

- a. Drab shales & ss. with coal 700+
- b. Covered 100'
- c. Lead gray limestone check-
 ed by innumerable small joints
 which are generally calcite
 filled 120'
- d. Drab shale, mostly covered 100'
- e. Thin bedded gray ss. with
 carb. trilobites abt. 10'+
- f. Drab shale mostly covered 30'
- g. Green shale mostly covered
 & nowhere well exposed 300'
- h. Green ss with trilobite
 fragments & abundant
 carb. 70'
- i. Drab ss limestone mostly
 covered 700'
- j. Buff to gray calcareous
 shales, 100 yds. weather
 very soft & sandy
 with occasional corals. Upper
 part of section mostly
 dark nearly black & quite
 partly covered but mostly

- exposed
- 1000
4 +
- k. Drab shales and shaly thin bedded grey and blue limestone 80
- l. Light to dark green limestone with oolitic structure in lower 20' fossils (Dev.) in upper 20' which is very tough. 100
(= 5-8 ft. thick)
- m. Limestone same as above (fossils in lower 200' 400' unconformity.)
- n. Red clay with scattered coarse conglomerate near base and occasional thin band of limestone or ss 800.
(see p. 10711 no 5 a)
(Covered & per north of Viola P.O.)
- m' Covered 90'
- m² Bluish grey hard ls. interbedded with grey or brownish quartzite, the latter probably representing about the first stage 100'
- m³ Covered 700'
- m⁴ Grey quartzite with small amount of sh. & carb. + (shale?) 1000'

No. of above section fills an old valley in the Pal. covering the lower part of the Carb. per. probably where we cut a trail of road with N.W. of head of Spring branch of Oak.

m⁴ is exposed on N. of this old valley.

July 11 Latter part of above section marked out

July 12 Finished section
By stage to Kummer

July 13 Stage to Kummer
Packed fossils.

July 14 Lumbered in
Kummer & packed
fossils.

features of an and
stone north and S.
They are very common
through the May paper
of 1880.

The course of the
but some of the
and of the
agony of the

I was after moving by
stage to the

July 22, 1880
at the

B. 7

Took to the
lower slope of
N. S. end

The section represents
all the
the narrow
along the
the
The
is a
of
of
the
below
on
side

- No 8 a (base) Gray to purple
quartzite apparently 154
- b. Covered 50
- c. Dark gray ls with
fine texture and con-
choidal fracture 140+
- d. Covered 450
- e. Light gray limestone
massive to shaly
thinly bedded
fossils abundant
(Fossils marked 80
from base of the series) 120+
- Dredged as an
of the
of the
- of the
of the

July 23

From Grand Teton
Park to Yellowstone
Mount
Grant quarry Tower
Cav. Sect. in after-
noon

July 24 Livingston Mont.

South of Livingston Mont
3 1/2 miles to Yellowstone
River in bridge. Yellowstone
narrow stretch of valley
The lower canyon of about
2 miles long. The river
crosses middle of the section
taper which dips N. at
10 to 20° to an undulating surface
at base of the section, and
in fact above the Tower
Canyon in a bluff end.

On W. side however
valley interrupts the success
rain near base of old
plateaus and has some
hundred feet high
mounts. These are
racks much broken

up the section on river
on W. side of river follows.

No 9 ls. with
a (base) light gray with
numerous white structures
frequently developed and
some ferruginous bands

b. Mostly covered 180'
200'

c. Hard buff 149 ls.
mottled with dark grey
two areas of greenites
to be only with
Sylvania? 75'

d. Hard dark grey limestone
with abundant bryozoan
corals and
trilobites of chevron
and camosium and
sclerites; elsewhere barren
and some bands of red iron
ore rock 180'

e. Light grey to buffish ls. 700'
partly with lenses of

f. Buff quartzite 75'

July 28 ...
... of Bozeman

July 29

Bridge creek canyon
section, N.E. of Bozeman
4 mi

10 a. Red shales, interbedded
with quartzite and
quartzite 30'

b. Buff colored m. & quartz
thinly bedded, except
near top where they
become more massive
and showing a structure
to heavy bedded

c. Thin bedded dark grey
m. & quartzite 50'

d. Thin bedded dark grey
m. & quartzite with
thinly bedded shales
dark grey, abt. 10'

e. Grey limestone weathering
buffish 40'

- a-4 Brownish to grey quartzite with
red fossiliferous upper part 100+
- a-3 Greenish shales, covered 200-
- a-2 Grey m. & quartzite, thin bedded 220+
- a-1 Dark shale and ls. 80'

July 27 Logan Mount,
Section of granite Logan
N. side of Gallatin River.

Roll
a. Black to dark grey limestone
with some chert 40'

b. Dark chocolate colored to nearly
black, m. & quartzite, rough
mottled buffish and blackish
ls. texture of indurated
massive 120'

c. Red and buff shaly shales
& shaly yellow ls. near top 15'

d. Grey limestone buffish
at base 10'

e. Green ~~with~~ argillaceous
shales with ls. 5-6'

e' Grey limestone argillaceous
yellow calcareous ls. 5'

f. Buff to dark shaly limestone
with a shale at lower half 30'

g. Hard grey limestone
1 to 4' (to 40' in some places) 300'+

Beds show a pretty uniform dip of 45° to N.W. & strike of N. 20° E.

Fossils are extremely rare in a 96' except a small branching corals which is extremely abundant in certain strata. A few small brachiopods which are pretty certainly Devonian. A piece of fish bone was also found.

Sp. disjunctus & Martins are common in the gray shale also small parallel branches.

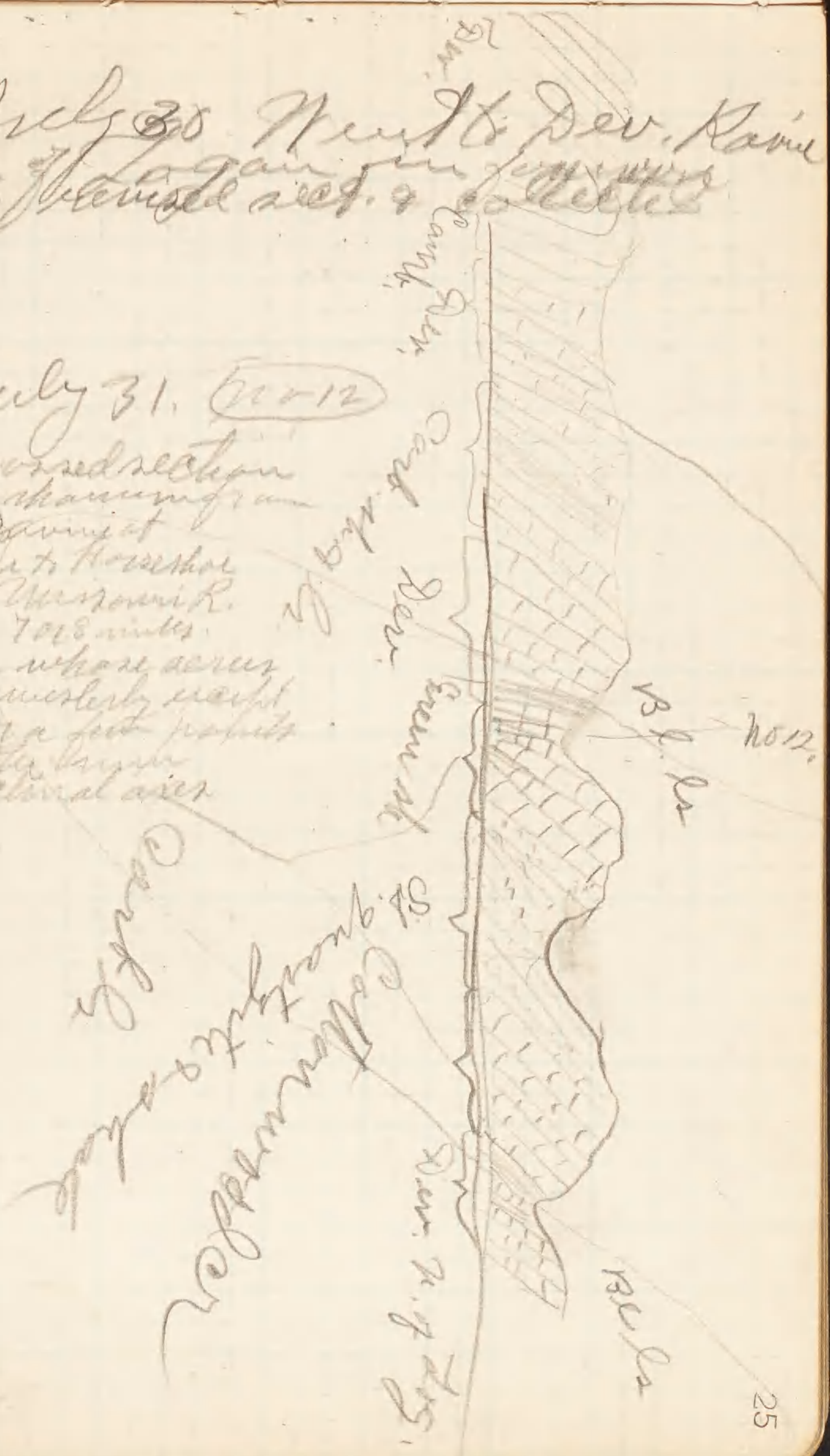
July 28th Sunday.

July 29th went to mouth of the river to Missouri River Canon No. 100 W. side & home within 1/4 mile of river.

July 30th went to Dev. Canon N. of Logan in Missouri & collected.

July 31. 10012

Crossed section here showing a Dev. Canon at Logan to the north of the Missouri R. and 7 or 8 miles. The whole series dips westerly except near a few points are the same anticlinal axis.



Aug. 1. Logan & Dixter in morning

Section from Leany 3 miles below Dixter st. to Dixter

- No 3
- a. Massive light grey limestone (Canada in this) 1000'
- b. Thin bedded buff grey sandstone with small pebbles and in some places small shells. 140'
- c. Thin bedded bluish grey sandstone with argillaceous part and some numerous fossils. 80'
- d. Covered with pebbles large blocks of heavy red shale. 60'
- e. Dark grey colored or bluish black Mg. ls. saccharoidal texture. 20'
- f. Grey limestone with black granular black Mg. ls. near base. 170'
- g. Yellow calcareous ss with nodules. 25'
- h. Green & red shale no fossils. 50'
- i. Very hard light to grey ls. bluish with glauconitic texture. 120'

* collecting. A collection
of fossils was made
by Daniel and Jack. S.W. of

Aug 6
To Philipsburg by rail
Looked over section
near high school in
afternoon

Aug. 6
Went to canyon E. of
Rock creek collected
fossils made in
afternoon

Aug. 7. Frank of
Rock creek section. Notes
(a = base of sect.)
a. White mg. limestone 275±
b. Brownish thin bedded mg.
ls. said to be shale elsewhere (near
creek shale) 90±
c. White limestone 5±
d. Shale and covered 730
e. limestone banded with
thin layers of brown to
grey shale the latter usually
from about 1/2 in bands of equal
thick 273± bands of grey ls. 250±
Trilobites abt.
(Belongs just under a
dip 32° N.

- d. Pink limestone = b.
- e. Heavy bedded mg. black with
interrupted with beds of
different character as below
- f. Light grey ls. 30
- g. Black and greyish
limestone 40±
- h. Buchian limestone
grey to pinkish 30±
total Jefferson → 800±
- i. Drab calcareous
shale 350±
- j. White to light grey
massive limestone 250
(Dilgum)
- k. Blue dark steel grey
ls. white ls. bed at base 400

h. lies near upper limit of
the Jefferson 100' band of
mostly black ls. above it
Contact of the Jefferson
Carboniferous shale
is not exposed

Aug 7 Worked on above section

Aug 9 Went to Princeton

Aug 10 NE 1/4 mouth of Wynans creek the following section begins which is N.W. 1/4 of section 214 map on N. side of Boulder Co. Jefferson ls. dip 90 S. 5. 45 E

- a. Light grey to cream colored hard ss. 300' +
- b. Bluish grey ls with thin argillaceous or shale films at intervals of 1 to 3" these weather brownish & have associated thin flat concretionary shales. Trilobite brachia 275'
- b'. Grey to brownish shales ss. latter predom. 210'
- c. Jefferson ls. Grey to black limestone alternations; the latter predominant and is highly magnesian, generally with saccharoidal texture & very few fossils; the light to very dark grey ls. is mostly non mag. and contains fossils of Corals 1000'

The Jefferson ls. of above section appears to terminate with the Quadrant quartzite which appears to be faulted up against it. A short distance eastward however as well as at Princeton the great thickness of the Madison ls. follows the Jefferson; the relations of the two however are not very clear at Princeton. The Jefferson ls. stands vertical both sides the valley

Aug. 14 Melrose Mount.
of camp creek section E.
of Melrose Mount.

- a. mica schists 500+
- b. Shale and siltst weathering brownish buff
- c. Quartzite weathering brownish buff 65-
- d. Gray shale 40
- e. Shale & thin bedded brownish (weathered) ls. 40
- f. Shale 100
- g. Light gray mg. ls. with some dark bands in lower half 500±
- h. Dark red sandy shales 20
- i. Buffish gray non mg. ls. with 3" laminae, separated by thin wavy bands of shale similar to that of Phillipsburg. No fossils seen 35
- j. Buff gray hard mg. ls. shaly shaly bands. No fossils seen. This band is quite clearly between this and the following Jefferson ls. This band is not seen in lower

part of the Black ls above

- k. (Jefferson ls) Black magnesian limestone 500±
A few bands of gray ls occur through the gray but they are of small importance with reference to the entire mass. No fossils seen except the *Gymnophora* like corals so common at Logan. Also here
- l. Bluish gray argillaceous shale & buffish shaly ls. in lower half with some magnesian in middle 200±
- m. Gray non mg. ls. 300±
(Madison)

The section terminates at camp creek with the Madison. The broadest quartzite however is well exposed near the N. of Melrose a well out

The beds of above section dip SE. at about 30° to 35° and camp creek cuts the strike at about right angles

Aug 7. Dall Point

Blue creek enters into
the main stream for
the first time. It is a
very narrow but in
places dipping 200
feet. The left bank
is composed of shales and they
are probably of the same age.

The dirt of five miles
is in a very fine stone
of the Tule River region
and is very soft. The
appearance of the dirt in
contact with the
shales.

The left bank limestone
does not appear in the
section.

Aug 9. Dall Point Logans Bluff

Barren hills 4849 at the
base of the bluff. The
bluff is about 1000 feet
high. The considerable peak
is 1000 feet high. The
height from the
base is 300 to 400 feet
each side.



Profile of the three bluffs from
O.C. R.R.

Aug 10. Dall Point Logans Bluff

Height of the bluff is 1000 feet
measured at base
on account of badly used
knives.

Aug. 19 Hyrum, Utah.

D. W. Cannon, 1/2 mi S. of Hyrum
and just E. of Providence

Lower limestone appear and
of canyon up here, bedded
nearly black ls.

Dip 10° E. Str. N. 30 S.

Light colored ls. appear about
these

18a Near mouth of canyon
two or three species of *Spirifer*
and *Zaphrentis* occur
abundantly in the limestone.
They seem to be Carboniferous
crustaceans.

Aug 20

Hyrum 1875

Aug 21

D. W. Cannon Str. N 30 W.

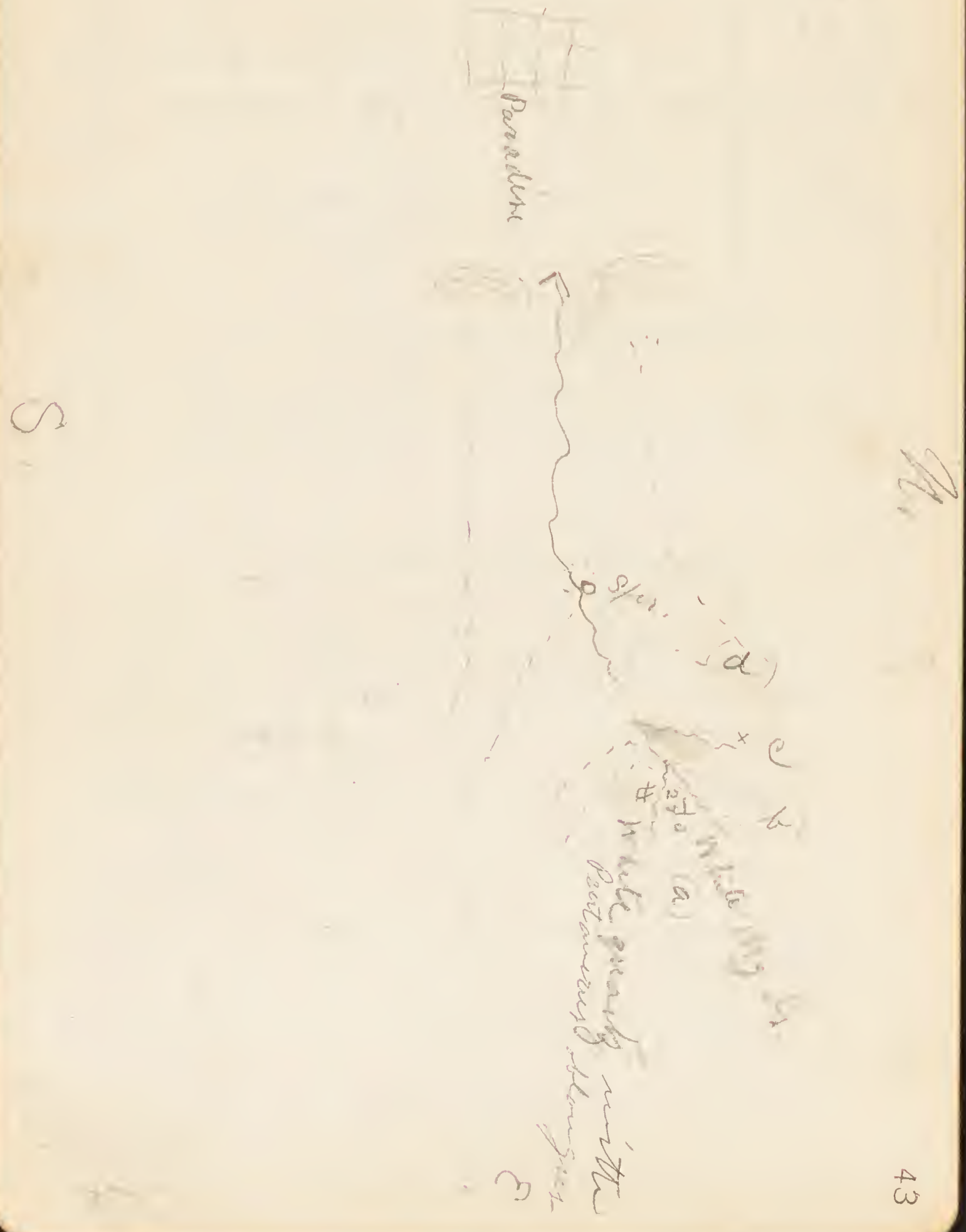
Section of fork of Blacksmith
Rock Canyon, 1/2 mi E. of
No Hyrum Utah

- 19 a. Bluish grey flaggy
hardly fossiliferous shale
weathering buff 50+
- b. Dark blue grey shale, fine
ly crystalline, pebbly
fossiliferous 100+
- c. White crystalline ls. (mostly
northwest from section
out 200+ 280+
- d. Partly covered ls. 150+
- e. Black mg. ls. with light
beds ripple, 1200+ 1200+
- f. Gray limestone 1000+

Aug 22
 E. Paradise Canyon
 Sect No 20 beginning at base
 5' - 10' above mouth of canyon
 20a Blue ss. with numerous
 green sandstones and
 sheets of argillaceous
 material distributed
 throughout.
 Resembles No 10
 of Illinois. good.
 Traces of fossils. 50'
 b. Covered 80'
 c Black to dark gray arg.
 limestone 1100'
 d Shales with ss. bands 400'
 e Light and dark gray (dark)
 1200'
 Some traces of fossils were
 found in a.

No 21 In the canyon just N.
 of E. Paradise Canyon
 Fairly dark blue ss. (carb?)
 are exposed below
 banks of the canyon.
 Corals are extremely
 abundant in these
 limestone. The layers are
 lower part of E. of above
 section

Aug. 23, 2 mi. E. of Paradise
 Inver Cynon, sketch map



- No 22 Green Canyon
 a. White & light grey ls. heavily altered to white quartz & some under, with chert bands 150+
 b. Thin bedded limestone buff & brownish near top with peculiar concretionary development resembling being highly fossiliferous. Below this are thin bedded blue grey ls. several as thick as paper held in mass, blue & grey ls. with shells, thin & greenish covered 100
 c. Dark blue ls. at base (15') followed by black and dark grey ls. especially in the thickness of the part covered Corals common in lower part 1100+
 d. Grey limestone (Oolite) 900+

Aug. 28 Logan Utah

Logan Canyon
 The lower beds exposed at present in the canyon below the upper ones are the black shales & ls. dip steeply to E.

Crossing the axis of the syncline the following section is seen some 8 miles above Logan

- No 23
 a. (base) Dark bluish grey hard mg. ls.
 b. Light grey to white mic. crystalline or sub-crystalline ls. more or less massive all of which is full of circular stems containing also barytes, & other sil. parts, difficult to extract 275+
 c. Dark grey to black mic. limestones with barytes, common also containing other sil. parts 400+
 d. Light grey to greenish thin bedded ls. with barytes & some bryozoanish shells ls. with *Arturia* 285+

8 Dark grey & black shaly sandstone
with thin layers of ls. } 200' +
of Grey north from my ls. 150' +
(Cant.)

Upper Logan Canyon
section, better than
that of Yellow Canyon
in the alkali flats
representing lower
part of ls. & c.

The boundary between
E. & W. is not sharply marked
and is rather difficult to fix

Aug. 27. Went to Salt
Lake City

Aug. 25. Went up Parley's
Canyon about 3 miles
Canyon is about an hour
of strike (E. & W. & West
of Yellow Canyon near
red shale at entrance of
mouth of the canyon,
further up the
sandstone series on
each side of these
no fossils seen.

Aug. 26.

No. 24 On lower mountain
slope 400 yds. N. of
Douglas and north of the
canyon is exposed
a considerable thickness
of dark ss. In these strata
of grey sandstone is
fractured at intervals
containing an abundant
quantity of fossils.
These beds strike parallel
to the canyon & dip S. about
45° to 60°.

In canyon just south
a series of red beds
appear (shale & ss)
peppered with small
fragments of ss. in the
Canyon trail canyon
is peppered with
black ls. fragments
in grey.

No. 25 About 1 mi above
Brewery in the
canyon a small
collection of fossils
was made.

No 26 West canyon S of
Purple canyon S.E. of Salt
Lake City, Utah

And the other canyon the
shale is (S.E.) sand with
the presence of canyons
which are fairly part is
cut in a very good way
limestone resembling a fine
grained quartzite.

Beds inclined to N. 65° S 85°
of dark blue limestone (now
very thin to top of canyon)
at base where top of canyon
is a thin layer of
Cret. fossils, some seen in
the top.

Aug 27 By road to Glenwood
Springs, Colorado

Aug. 28 Glenwood Sprs, Colorado

Above Glenwood. 2 1/2 miles to
channel of the Grand River
on the S. side of canyon
river 1/4 mile. On N. side
over 100 feet of
out of canyon down
bed and on S. side of
granite and above it the
Cambrian are seen

Sect an along Denver
River and S. 1/2 mile
from above upper end
of channel.

- a. Granite 75±
- b. Pale grayish to light
quartzite with some greenish
beds containing numerous
conoid type impressions.
Some also surface seen 800±
- c. Thin bedded to massive
dark gray mg. ls. 75±
- d. Gray shales, thin bedded
unfractured ls. & ss. 50±
- e. Very dark non mg. ls.
with con. and other
fossils in lower 25± ft; the
rest mostly con. 40±
- f. Light to bluish gray
fine grained ls. & ss. with
crystaline or somewhat
white. 160±

9. Buff sand, drab shells
 table off. 50
 40+

Just below town
 1000 or more of the
 red shells of the
 genus *Strophomena*

Fossils are common
 in the lower 50' of C. Above
 that practically none are
 found. The appearance of
 stumps and an occasional
 coral. The appearance of
 to fossils is associated with
 a complete disappearance
 of the rock. The lower 50'
 is a hard, calcareous
 material. The fossils
 in the lower 50' is
 quite massive and covered
 by a thin and quite a few
 ft.

paper, Aug 31

The beds exposed on
 side of Mt. on S.W. side of
 town are about as follows

- a Blue non fossiliferous
 weathering light gray 30'
- b Black or very dark
 gray fossiliferous 450'
- c. Light drab colored
 arg. ls. 100+
- d. Dark bluish, or pink
 arg. ls. apparently quartz
 rich 120+
- e Quartzite light colored 200+
- f Gneiss & mica 300'

Sept. 1

Fourtlotte Park.

no 28

S.W. of Ashpen 4 miles at
 an elevation of 10200
 a mass of bluish gray
 limestone is exposed
 near the highway road
 Carboniferous fossils were
 collected.

relations of this ls to sub-
 jacent beds not exposed.
 No trace of Cambrian
 fossils in the Ashpen area

Sept. 2

Took photographs of
canyon of the Grand K
&c.

Sept. 3. I probed a canyon
of Grand K. on horse
nearly to junction of Eagle
& Grand

In a vicinity of Sho-
shone station the walls
of canyon are in many
places vertical and
were 1000 to 1500' above
the river.

Below Shoshone in
vicinity of the Power
plant the lower
two thirds of the walls
are for some distance
of granite.

Near Shoshone
this granite is

seen to be intrusive
in Prepalaeozoic
gneisses & schists
which it cuts across.
These are vertical or
highly inclined while
the Camb. (?) quartzite
overlying them here
are but slightly inclin-
ed, - the unconform-
ity being pronounced.

As indicated above
is pretty clear that
while the granite
is intrusive it is
of Prepalaeozoic age.

Above Shoshone
3/4 miles the contact
dip brings the Dev. of
Clark fl. down
nearly to river level
elsewhere in the

At the base of c is a
purple colored bed of
shale and ss. in
most of the section 8' or
thick

The ls. of this section
has a texture and appearance
somewhat like that of the
Camarophana with little
fossils were found
in it.

The Spirifer found
appears to be of Carb. type
Fossils are not scarce in
this ls. but its texture &
fracture make extraction
extremely difficult.

Sept. 8 Sunday. Faid in-
sick.

Sept 9 Went to Curay
over Marshall Pass.

Sept. 10 Curay Colo.

In the gorge just S. of
at crossing of divert on road
Quartzites, grey and brownish
color striped vertically. They are
finely conglomerate in places
& have marked
base of rest of red
series at this height which
is partly covered
by talus

Section westward about
No 31

- a. Pure quartzites with some
black shales dip 40'
- b. Reddish calcareous shale
and interbedded greenish
blue limestone 8-15'
- c. Dark grey nearly black
limestone heavily bedded
somewhat arenaceous
in lower part fine
grained very hard and
of sub-lithographic texture 60'
for fossils
- d. Light green to more white
limestone with fossils 70'
- e. Interbedded impure green
ls. green and red sh. 7-10'

Thickness estimated
The boundary between

The two layers of the
and the sharp
character of the
side of the top of the
stratification, the
left of the top of the
the sandstone is
to be an angular deposit
or.

No trace of fossils was
found in any of the
They are common
in it.

An E. N. fault brings the
red sandstone up to
dawn and level of the
quartzites of the Cambrian
The same amounting to
700 or more
of the sandstone to be an
Cambrian quartzite
bed in fact, an
intact and of size
in lower part of it.

Sept. 11 Curay Colo.

The east of the high base
of the and about 1000 feet
the quartzite reaches
to the depth of some 2000' above
the creek and rising slightly
by one side the quartzite
is covered by a layer of
sandstone and the rest of the
both being about 10 feet
above the level of the
near the top of the quartzite
is a thin layer of something like
2000' of the quartzite pebbles
to the bottom of the level of the sand.

The sandstone of the L. bank
the lowest part of the
rest of the quartzite
and quartzite bed. They
contain a few fossils. I have
found a few fossils in the
sandstone and quartzite
is a light pink
greenish sandstone
of quartzite.

The bed of sandstone of the
L. bank is covered with
quartzite pebbles
of quartzite.

Sept 12 Went to Silverton
 Made trip S. town in
 afternoon to exposure of
 the Canyon ls.

Sept 13 Silverton Colo.

Section at road crossing
 Agardwood gulch & near
 S. of Silverton.

- a. Grey quartzite (Quartz) 25'
- b. Covered 10'
- c. Green thin bedded siliceous
 limestone somewhat altered 20'
- d. Light colored limestone
 altered to coarsely granular
 texture 25'

A short distance above n. of
 the altered light colored
 ls. is quarried for granite
 No fossils - but the fossils
 having doubtless destroyed them

a rests on the schists
 a quartzite of the junction

No 32 Cataract Gulch set
 2 1/2 mi S. of Silverton
 Colo.

- a. Schists and quartzites
 of gray. series highly
 inclined
 more or less
- b. Grey to purple at base
 quartzite conglom
 weathered at base 10'
- c. Hard speckled and calcareous
 beds thin bedded
 and banded with layers
 of red shale
 bands (E. belt zone)
 bluish gray
 fresh surface weather
 very buff (conglomerate) 18'
- d. Dark grey rather
 massive hard textured
 ranging from saccharoidal
 to splintery graphic ls. 55'
- e. Light grey limestone 30'±
 fossils common

f. Red calcareous and
 conglomeratic shale 15'

Mostly micaceous spines
 of quartz
 of thin spines and often red
 of shale small and a few
 rods to 32.

Sept 14 Rockwood Colo 64

Section at & near
quarry 3/4 mile below Rockwood

No 33

- a. Coarse grained pink quartzite 50+
- b. Coarse brown conglom-
erate composed of
purple quartzite pebbles
to boulders averaging 4" in
diameter & gravel 2-8'
- c. Coarse grained quartzite
of purple color ~~at base~~
base finer than and generally
gray 75'
- d. Quartzite and interbedded pink
or drab ls. weathering buff. 12'
Garnet abt. in some shaly
ls.
- e. Red shale and calcareous ss. 10'
- f. Drab and colored mg. ls.
with some thin red shale layers in
lower part 14'
- g. Red and drab colored shales ^{& some green & sp.} 20±
One specimen showing
salt crystal forms, common
- h. Gray sometimes pinkish
near mg. ls. with
occasional thin shale

partings
Campbelli is common 50

- i. Drab to brownish shale
& ls. 5-10'
- j. Gray near mg. ls. with
numerous irregular
bands of dark red
shale 40'
- k. Covered 150±
- l. Drab shaly & limestone
interbedded with some
chocolate colored ls. &
in upper part 1000±

Sept 15

N. of Orchard, in the
section along road at depth
34 feet that at time of blow down
the lower and upper ls. will
be designated respectively as
a and

b. The impressions are about
same as those noted on the
preceding page of the
thin g. section
The shale + ls. band be-
tween the upper and lower
divisions of the ls. how-
ever is not well marked
as at the true g. section
As usual the shale in
Garnier is weathered but thin
The fossils however
do not represent the
Cam. which is sp. disj
are abt. in upper
part of lower division
but trace of either is
seen in upper part

The limestones in
the two divisions are
much more alike

than they are with the
nearby ones. The ac-
tual part. the lower
ls. approaching the
upper in purity and
texture shows close
similarity to the north
however the upper
fossiliferous beds
have a more coarse
and crystalline
texture than the lower
while the latter has a
thin, fine-grained
granular texture

Sept 16 Rock House to Durango

Sept 17 Durango to Durango

Sept 18 Durango to Durango

Sept 19 Durango to Salida

Sept 20 Salida to Canon City

Pared through the Black Canon of the Cañon on the 19th & the Royal Cañon on the 20th. The rocks on each are granites and schists and phyllites of Algonkian age - the latter being ^{both} highly inclined. The granites cut the old sedimentaries in nearly every favorable manner - across the bedding in irregularities between beds, sometimes on thin dikes again or whole mountain masses.

Black color of the Bl. canon of the Cañon seems to be due to black lichen common on the rocks of the S. side of the Cañon

No 35-

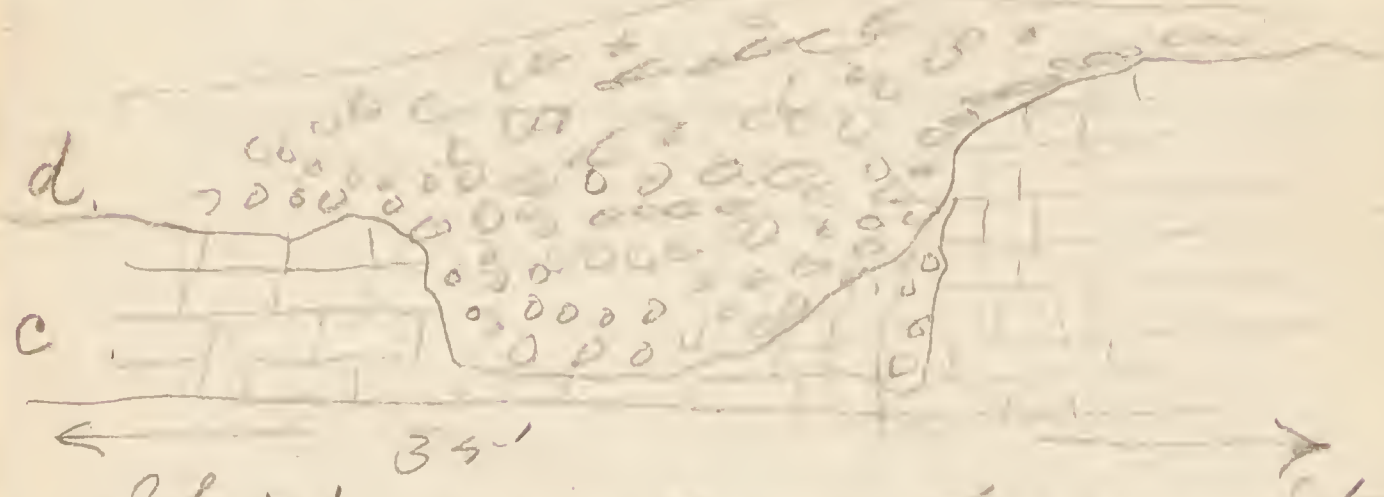
Section 1/2 mi NW. of Canon City Colo. near road up SW. fork of Sand creek.

- a. Light colored Mg. ls. 4'
- b. Purple calcareous and sandy shale 9'
- c. Light ash grey Mg. ls.
 containing fossils
 in lower part 40'
- d. Coarse calc. glauconite
 of ls. pebbles & boulders
 in red clayey
 sandy matrix
 composed
 exclusively of ls. of c. 20'
- Thinly distributed
 mica and some
 ls. one side and one
 fine grained
 packed with
 filled with it
- e. Coarse red sh. &
 shale 75'

The Carb. ls. is clearly absent from the section of this point

In the region just E. of the Harding station many thin ^{beds}
 between top of Walcott's section and

Red beds is not exposed (See Stanton
 Bull. Geol. Soc. Am. vol. 17, 1900 p. 540)



Sketch of unconformity
 between Red bed & the
 Ordovician in W. of
 Cannon City

No 35
 a. At the Harding S.S. quarry
 7 mi N.W. of Cannon City
 fossils are common at
 base of the uppermost division
 of Waconda formation limestone
 See Bull. Geol. Soc. Am. vol.
 17, 1900 p. 541.

- Williams Canyon
 Cassatare Col. (N. side
 town)
- a. Reddish siltst & granite
 firm inclined at 30° N 25'
 - b. Red ss. with congl. bands near base
 somewhat calcareous in upper 20' 5-5'
 - c. Light gray generally thin
 bedded mg. ls. with
 Ordov. fossils to top 110'
 - d. Buff mg. ls. entirely
 ungl. preceding 20'
 - e. Light gray non mg. ls. in
 bedded with occasional
 bands of mg. ls. and a
 band in upper part of calcareous ls. 80'
 (about in lower 1/3 but
 a base from upper part same)
 - f. Red S.S. & shale with some
 gray ss beds at wide inter-
 vals.

Unconformity of Esq. in
 present field of the red
 beds at one point coming
 down almost if not quite to
 c (this is on Wall St. from
 Williams Canyon)

Beds of this section
 have a gentle dip to S. It
 is from 2° to 10° in Cannon
 in the border of the State

14
- directly E. of this canyon ⁷²
The beds dip southerly and
Scarp line of Mushroom
Park at only a few degrees
5 to 50 but 1/2 mi further
east the dip has been rais-
ed to vertical, the groups
called Cathedral spires and
others, mostly ~~horizontal~~
standing vertical strata.
Large pebbles of the
size of infants heads occur
in the sand of the red
soil seen in the garden
of the hotel

Photographs.

Roll 1
 Exposure, Cobitic ls. top of
 ridge N. of Tabary @ park
 near Wild Wyoming

No. 2

No. 3. A very tall
 tree yellow timber
 near top of Geyser at first
 basin

Roll 2 Exposure
 summit of mountain
 trail to Old Faithful
 Inn. Deer picture, the
 Grotto.

Roll 3. Geyser
 in upper basin
 near top of the old
 mountain trail

Roll 3 & 4 Grotto, mi above
Yellowstone Falls
No. 19 Upper Yellowstone
River Falls
No. 19 Lower Yellowstone
River Falls

Roll no 17

Madison ls. in & upper creek
Canyon 15 mi N. of Dell, Mont.
Film exp. 4 Jefferson ls. in N. York
of Blackfoot fork Hyman, Mont.
Finished exposure at
Glenwood Colo Sept 2

Roll 27

No 1 Dev & Carb. ls. N. side
Grand River at Glenwood Spgs.
No. 2 Entrance of Grand River
gorge above Glenwood Spgs
Colo.
Rocks seen below Ser.
No. 3 Same as above with
upstream train

No 41 Suffs of dev. & carb. ls.
3 1/2 mi above Cherokee
Colo

Roll 37
No. 197 Looking S. & SE at
Canyon Colo. near station
No. 394 In Garrison
garden just west of first
bridge over canyon

Small 3 in a the

- Shipments of fossils
- By freight
- * Remberer Wyo July 1 Box [1]
- Livingston Mont " 237" [2]
- * Phillipsburg Mont Aug 1 box [3]
- " " gummy rock with corals
- Arucanda
- Box shipped by Calhoun
- Logan, Utah, 1 box Aug 24 [4]
- * Glenwood Spr. Colo. 1 box [5]

- By mail from
- Logan Mont. 4 pkgs fossils
- Bozeman " 1 " "
- Princeton " 2 " "
- Utah
- Merax Mont. 1 pkg
- Jefferson, Idaho fossils
- Salt Lake City 3 pkgs fossils from
- Salt Lake Logan
- Glenwood Colo. Sept 1
- 1 pkg fossils from Popper
- 1 " maps stationery R
- Salt Lake
- 2 pkgs fossils from
- Shoshone

..... " " " " " "

1112



Field Season 1907

E. M. Kindle

July 24

Livingston, Mont.

No. 9. Three and one-half miles south of Livingston, Mont., the Yellowstone River merges from a narrow stretch of valley - the Lower Canyon - about 2 miles long. The river here cuts at right angles across strike of the sedimentaries which dip to N. at 18 to 20. The granite and gneiss at base of the section come in just above the Lower Canyon or at upper end.

On west side, however, a fault interrupts the succession near base of the section and for some hundreds of yards in vicinity of this the exposures are imperfect and rocks much broken up. The section as seen on W. side of river follows.-

	Feet
a. (base) Light-gray limestone with minute colitic structure frequently developed, and some arenaceous bands	120
b. Mostly covered	200
c. Hard, buff, magnesian limestone mottled with dark-gray. Two corals of Zaphrentis type only fossils seen. Silurian?	75±
d. Hard dark-gray limestone and some bands of drab arenaceous rock with obscure bryozoan corals and <u>Orthothes</u> cf. <u>chemungensis</u> common in one stratum; elsewhere barren	180
e. Light-gray to buffish limestone, fossils from lower 60 feet	1100±
f. Light-buff quartzite	70±

Field Season 1907

E. M. Kindle

July 26

Bozeman, Mont.

No.10. Bridger Creek Canyon section, 4 miles NE. of Bozeman.

	Feet
a. Red shale and interbedded conglomerate and quartzite	30
b. Buff-colored sandstone and quartzite. No fossils except near top where they abound but rock does not permit of extraction. (Carb.?)	
c. Massive to heavy-bedded light-gray limestone . . .	50
d. Thin-bedded, dark-gray limestone in 2-4 inch strata separated by thin films of sandy shale. Carb.? Foss. abt.	160
e. Gray limestone and sandy shale weathering buffish .	50 +
a-4. Brownish to gray quartzite with red jasper pebbles in upper part	100 +
a-3. Greenish shales and covered	200 ±
a-2. Gray, non-magnesian limestone, thin-bedded	220 ±
a-1. Drab shale and limestone	80

Field Season 1907

E. M. Kindle

July 27

Logan, Mont.

No. 11. Section opposite Logan, N. side of Gallatin River.

	Feet
a. Black or very dark limestone with some shale at base	480
a ¹ . Red shale	40
b. Dark-colored to nearly black magnesian limestone. Sometimes mottled buffish and blackish limestone. Texture finely saccharoidal.	120
c. Buff, sometimes reddish, sandy shale and shaly yellow limestone near top	45
d. Gray limestone, buffish at base	10
e. Green argillaceous shale with limestone concretions. Fossils abt. <u>Sp. disj.</u> etc.	50
e ¹ . Gray limestone and shale	5
f. Buff or yellow calcareous sandstone becoming a shale in lower half	30
f ¹ . Gray shaly crumbling limestone	4
g. Hard, gray limestone in 1-4 inch strata (Carb.)	300 +

Beds show a pretty uniform dip of 45 to NW. and strike of N. 28 E.

Fossils are extremely rare in a and b except a small branching coral which is extremely abundant in certain strata. A Favosites was found and a few brachiopods which are pretty certainly Devonian. A piece of fishbone was also found.

Sp. disjunctus and Martinia are common in the green shale; also small lamellibranchs.

Field Season 1907

E. M. Kindle

Aug 1

Sixteen, Mont.

No. 13. Section from Canyon 3 miles below Sixteen st. to Sixteen.

	Feet
a. Massive light-gray limestone (Canyon in this) . . .	1000
b. Thin-bedded, buff, gray, and red arenaceous limestone. Fossils abt. in buff arenaceous beds . . .	140
c. Thin-bedded, bluish-gray somewhat argillaceous limestone with numerous fossils	80
d. Covered with talus	60
e. Dirty mud-colored or buffish-black magnesian limestone; saccharoidal texture	20
f. Gray limestone with 10-foot band of dark, nearly black magnesian limestone near base	120
g. Yellow calcareous sandstone with <u>Productus</u>	25
h. Green and red shale. No fossils	50
i. Very hard black to gray limestone breaking with glassy fracture	120
j. Reddish shales and covered	60
k. Thin-bedded dark-gray limestone. Camb.	100
l. Greenish shales	40+

The shales h seem rather local and appear to be represented by the limestone series i 1/4 mile above Bolanger.

Field Season 1907

E. M. Kindle

Aug. 14. Melrose, Mont.

No. 17. Camp Creek section E. of Melrose, Mont.

	Feet
a. Mica schists	500 +
b. Shale and schists weathering brownish-buff	
c. Quartzite weathering brownish-buff	65
d. Gray shale	40
e. Shale and thin-bedded brownish sandstone (weathered)	50
f. Shale	100
g. Light-gray magnesian limestone with some dark bands in lower half	500 ±
h. Dark-red sandy shales	20
i. Buffish-gray, non-magnesian limestone in 1-3 inch laminae separated by thin wavy bands of shale sim- ilar to Yego limestone of Phillipsburg quadrangle. No fossils seen	35
j. Buff-gray hard magnesian limestone, some shaly bands. (There is quite clearly no break in sedimentation between this and the following Jefferson limestone. Thin bands of j recur in lower 40 feet of the black limestone above.)	30
k. (Jefferson limestone) Black magnesian limestone (A few bands of gray limestone occur through the series but they are of small importance with ref- erence to the entire mass. No fossils seen ex- cept the <u>Syringopora</u> -like coral so common at Logan. also here).	500 ±
l. Bluish gray argillaceous shale and buffish shale, latter in lower half with some limestone bands near middle	200 ±
m. Gray, non-magnesian limestone (Madison)	300 +

The section terminates on Camp Creek with the Madison. The Quadrant quartzite however is well exposed near the railroad N. of Melrose a mile or two.

The beds of above section dip at about 30 to 35 E. and Camp Creek cuts the strike at about right angles.

Field Season 1907

E. M. Kindle

Aug. 19 Hyrum, Utah.

No. 18. Dry Canyon, 4 miles S. of Hyrum and just E. of Providence.
Lower limestones near end of canyon are thin-bedded,
nearly black. Dip 10° E., Strike N. and S.
Light-colored limestone appears above these.

a. Near mouth of canyon two or three species of Spirifer and
Zaphrentis? occur abundantly in the limestone. They
seem to be Carboniferous forms.

Aug. 21. Dip NE. 15 ; Strike N. 50 W.

Field Season 1907

E. M. Kindle

Aug. 21. Hyrum, Utah.

No. 19. Section in N. fork of Blacksmith Fork Canyon, 10 miles E. of Hyrum, Utah.

Bottom

Feet

- a. Bluish-gray, flaggy, hard, calcareous shale weathering buff 50 +
- b. Dark-blue limestone, finely crystalline to lithographic in texture 400 ±
- c. White crystalline limestone (marble generally) in 1'-3' ~~inch~~ beds and worthless from numerous joints 280 ±
- d. Partly covered and limestone 150 ±
- e. Black magnesian limestone, with lighter beds rare (Jefferson limestone) 1200 ±
- f. Gray limestone 1000 +

Carb.

Top.

Field Season 1907

E. M. Kindle

No. 21.

In the canyon just north of East Paradise Canyon only dark-blue limestones (Carb.?) are exposed below forks of the canyon.

Corals are extremely abundant in these limestones (the same as lower part of e of Avon, E. Paradise section).

Field Season 1907

E. M. Kindle

Aug. 22

No. 22. Green Canyon (Paradise of Weeks), 7 miles E. of Paradise P.O., Utah.

Feet

- a. White to light-gray magnesian limestone, locally altered to white quartz and sometimes with chert bands. Sil. fossils 150
- b. Thin-bedded limestone, buff and brownish near top with peculiar concretionary development resembling finely brecciated limestone. Below this are thin-banded blue-gray limestones. General aspect of upper beds is suggestive of Yogo limestone of Phillipsburg quadrangle. This series mostly covered 100
- c. Dark-blue limestone at base (15 feet) followed by black and dark-gray magnesian limestone generally with saccharoidal texture partly covered. Corals common in lower part. 1100
- d. Gray limestone partly covered (Carb.) 900

gt.

Dur.



Field Season 1907

E. M. Kindle

Aug. 23. Logan, Utah.

No. 23. Logan Canyon. The lower beds exposed at west end of Canyon below the power-house are the black Jefferson limestone and dip strongly to E. Crossing the N. & S. axis of the syncline the following section is seen some 8 miles above Logan.

	Feet
a. (base) Dark bluish-gray hard magnesian limestone	
b. Light-gray or white magnesian crystalline or sub-crystalline limestone more or less massive. Crinoid stems common, also <u>Halysites</u> and other Sil. fossils, but difficult to extract	275
c. Dark-gray to black magnesian limestones with <u>Halysites</u> common, also one sp. <u>Pentamerus oblongus</u>	400
d. Light to dark-gray, largely non-magnesian, frequently thin-bedded limestone, and interbedded gray and some brownish shales. Limestone with <u>Martinia</u>	280
e. Dark-gray to black heavy-bedded magnesian limestone	260
f. Gray, mostly non-magnesian limestone (Carb.)	1000

This Logan Canyon section differs from that of Green Canyon in the absence of any separating formation between b and c.

The boundary between e and f is not sharply marked and is rather difficult to fix.