



~~Edney Powell~~

~~Donnelly Chicago~~

~~See want my paleog. map. Blue print, etc.~~
~~Also see folder for further sheets~~

~~James M. Muse,~~
~~McKinney~~

~~Texas.~~
~~Wants Paleogeography~~

~~Blyde M Bennett~~

~~Box 94~~

~~Shurport~~

~~See want my paleog. M. G.~~

~~La~~

~~To Arkansas Nat. Geol.~~

~~Copy of Paleog. Geo.~~



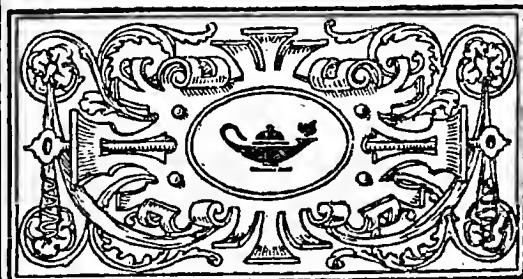
FOURTH
ANNUAL MEETING

+

AMERICAN
ASSOCIATION
of
PETROLEUM
GEOLOGISTS



MARCH 13 to 15, 1919
ADOLPHUS HOTEL
DALLAS, TEXAS



34 salt domes in Tex., Half an oil bearing
1 mile square in size. rocks

^{containing}
Oil 10 to 100 feet in thickness

PROGRAM

All meetings will be held in the Roof Garden of the Junior Adolphus Hotel, unless otherwise announced.

Thursday, March 13th

9 a. m.

Registration of Members and Guests, Lobby of Junior Adolphus Hotel

10:30 a. m.

OPEN MEETING

Addresses of Welcome by MAYOR LAWTHER and GILBERT H. IRISH of Dallas

Five-minute addresses by

DAVID WHITE,

Chief Geologist, U. S. Geological Survey

I. C. WHITE,

State Geologist, West Virginia

RALPH ARNOLD,

Valuation Expert,
Internal Revenue Department,
U. S. Treasury

J. A. UDDEN,

State Geologist of Texas

CHAS. SCHUCHERT,

Professor of Geology,
Yale University, New Haven, Conn.

2-5 p. m.

TECHNICAL SESSION

1. Subsurface Geology of the Oil Producing Districts of North Central Texas
Discussion led by JON A. UDDEN

Description of Cuttings from

- Duffer Well, Ranger Field

- Empire Well near Brownwood

- Goode Well, Young County, and Dye Well, Palo Pinto County

- Bartles & Dumènil Well, Brown County

- Lithologic Characteristics of the Bend Series

CHAS. R. ECKES

D. B. GREGER

F. B. PLUMMER

V. V. WAITE

ALEX W. MCCOY

The main part of it is blue granite
The large part of it is granite



PROGRAM

Thursday 2-5 p. m.—(Continued)

Laboratory Methods for the Examination of Well Cuttings - EARL A. TRAGER
Methods of Examination of Well Cuttings Used by the Bureau of Economic
Geology and Technology, Austin, Texas - V. V. WAITE

2. The Bend Formation and its Correlation - G. H. GIRTY
3. Structural Conditions in the Bend Series Adjacent to the Llano Uplift
Discussion led by J. M. SANDS

4. Notes on Structure of Surface Rocks as Related to Subsurface Structure and
Petroleum Accumulation in North Texas - WALLACE E. PRATT

5. A Preliminary Paper on the Stratigraphy of the Pennsylvanian Formations of
North Central Texas - F. B. PLUMMER

6. Notes on the Structures and Oil Showings in the Red Beds of Coke County,
Texas - J. W. BEEDE

7. Observations on Two Deep Borings on the Balcones Faults - J. A. UDDEN

8. Water Problems of the Bend Series, and Its Effect on Future Production and
Flooding of Oil Sands

Discussion led by M. L. FULLER

9. The Cretaceous Problem as It Relates to the Possibility of Determining Structures
in the Underlying Pennsylvanian and Mississippian Formations

Discussion led by ROBERT T. HILL.

8:15 p. m.

POPULAR MEETING (OPEN TO THE PUBLIC)

Auditorium of Municipal Building

Address by DAVID WHITE, Chief Geologist, U. S. Geological Survey

Oil Bearing Formations in Texas

J. A. UDDEN

Illustrated Lecture on China

M. L. FULLER

Friday, March 14th

9:30 a. m.

TECHNICAL SESSION

Symposium on Valuation Methods

1. Problems of Oil Lease Valuation

RALPH ARNOLD

2. Factors in the Valuation of Oil Lands

CARL H. BEALL

3. Decline Curve Methods

ROSWELL H. JOHNSON

4. Valuation of Gas Properties

EUGENE W. SHAW

2-5 p. m.


TECHNICAL SESSION

1. Principles of Oil Accumulation

ALEX W. MCCOY

2. Development of the Butler County, Kansas, Field

H. R. SHIDELL





PROGRAM

- 3. Extent and Interpretation of the Hogshooter Gas Sand - WALTER R. BERGER
- 4. Review of Developments in Kansas During 1918 - RAYMOND R. BERGER
- 5. A Review of Development in the Central Texas Oil Fields - W. L. MATTESON
- 6. A Statistical Investigation of the Influence of Structure on Oil and Gas Production in the Osage Nation - ROSWELL H. JOHNSON and SHIRLEY L. MASON
- 7. Unconformities in Oklahoma - Ed. BLOESCH

7:00 p. m.

- Banquet complimentary to the Association by the Dallas Chamber of Commerce & Manufacturers' Association, Junior Ball Room, Adolphus Hotel
- The toast list for the banquet will be made up of talks by local and visiting oil producers, including a special address on
- Valuation of Oil Properties - Valuation Expert, U. S. Treasury Department. RALPH ARNOLD

Saturday, March 15th

9:30 a. m.

TECHNICAL SESSION

- 1. The Saratoga, Texas, Oil Field - J. W. BOSTICK
- 2. Relations of Sulphur and Cap-Rock in the Gulf Coast Salt Domes - C. R. ECKES
- 3. History of Geologic Exploration in the Southwest - ROBERT T. HILL
- 4. Notes on the Stratigraphy of Panama and Costa Rica - D. F. MACDONALD
- 5. Structural Conditions in the Oil Fields of Bexar County, Texas - E. H. SELLARDS
- 6. Geologic Work of the American Expeditionary Forces - SIDNEY POWERS
- 7. Gas Conservation and Distribution Under the U. S. Fuel Administration - T. W. GREGORY
- 8. Design for a Log Meter - GEO. E. BURTON
- 9. Oil Field Waters - G. SHERBURNE ROGERS

2-5 p. m.

BUSINESS SESSION

- Annual Report of the President
- Annual Report of the Secretary-Treasurer
- Annual Report of the Editor
- Report of Committees
- Introduction of New Business
- Election of Officers

at 11:17
doc. 117





7. Unconformities in Oklahoma - ED. BLOESCH

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2.5 n. m.

Henry Powell

1010
~~doc. 117~~
doc. 117

Lee
Alton

J

w

ok

Post

Go

~~Send Plemons a ^{as a present} ~~Gift~~ and Ench
of Life. ~~Gift~~~~

~~Send Ryan a questionnaire, part time
for one year, work. Has no bachelor
degre. maybe enterable college, or in
any event for one year, work.~~

Professor Charles Schuchert
Yale University
New Haven
Conn.

Home 19 Hall st.

Texas 1919.

3453 Mar 11-29 Texas,
. Oklahoma

doc. 117

~~Forrest~~ ~~Adams~~ ~~to~~ ~~go~~ ~~to~~ ~~the~~ ~~meeting~~.
H. H. Adams

Ranger Petos,
Has a young paleontologist. Wants
met. Will help him out. Wants especially
to study the Pennsylvanian.
Mr. Arthur J. Adams is the young paleontologist.
Has other College geologists and paleontologists.

Deussen is deeply interested in
the possibilities of stratigraphy in the Foraminifera.

Write thanks to Prof. Shuter of Methodist
College. In lantern work and benches

~~Mr. Chester A. Hammond~~

Box 12

Mineral Wells, Texas
Will come to see for a doctorate.
Has had a great deal of geology
at Chicago Univ. Keep track of him
Is his health good? Looks. Talks casual and
long. Lots of campfire talk. Has the right
ideas, he and his campfire wife.

Emma Schuchert
 1900 Mills Ave
 Norwood, Ohio.

H. E. Mather, Dallas Texas.

A. H. McCoy
 Empire ~~Oil~~ Gas and Fuel Co.
 Bartlesville, Oklahoma,
 See here Walter R. Breger,
 Robert H. Pratt,
 L. C. Snider

O. S. Bartley #411 Colcord Building
 Oklahoma City, Okla.
 Recently got my Pat. of U.S.

Prof. Charles N. Gould
 Oklahoma City, Okla.

L. L. Hutchinson
 Kanola Oil Co
 Tulsa, Okla.

C. L. Baker
 Emil Brese

W. C. Bear

Box 140

Mineral Wells, Tex.

Send him my file of N.A. as a gift.

With Empire Club Ben Chapman March 17

and 18

F. A. Sampson, of Leclavia, ~~Tex.~~

State Historian. Requires send address.

His collection is for sale. Requires the price

The fossils would be had for \$500. All other

things \$500 more. His library is a quantity

out of his Missionary. Sampson's is an actor

A language in it. on his collection.

Write to Mrs. Mabel Miller (daughter of Sampson)

Hotel Bellevue, N. Y. City

Send Wagner a list of my duplicate books

and paraphrase.

Send him Less and Barnes by W. C. Bear

and some of Wagner's list.

He about Becker's list on Evolution.

If I have Trotter's list send it

to him.

~~Send Alex Mac Coy, Origin and Evol. of Life (depression)~~

~~Send Mac Coy references to H. A. book and paper
in own handwriting.~~

~~D. K. Goeger Home Add.
709 Grand Ave., Fulton,
Garrison T., Bartlesville Ok.~~

~~Send books to Fulton, Mo~~

~~L. C. Orledge 3 years ago through Cummings
made an application to join the S. D. A. and
has secured no more admitt.~~

~~Has a number of bulletins.~~

~~Send L. C. Orledge my Pal. of H. A.~~

~~Have made in Mac Coy copies of my photographs
with the following Capt. Cameron (2) Bud, Chas, Stan R.,
Low, McHardy, Mich Ricks, H. W. Niagara, Mrs. Dallas
Orick, L. A. Hamilton, East H. W. (Berens), H. W.
Fatterson, W. D. Hindert and rest of Pal.~~

~~Send Hays a questionnaire, May go into College
As yet he has no Bachelor degree.~~

~~He has a copy of my Pal. of H. A. that I gave him
a few ago.~~

B. Plata (Colombian)

Drawer "S"

Bartholomew, Oklahoma.

Carl A. Drager,

1106 Orange Ave.

Bartholomew, Okla.

Looks after the character of the lithology of the
logs, petrographically, minerals, etc., etc. dominant sands
dominant ls, and picks out the fossils.

Should develop a new stratigraphy around Fusulina,
crinoid stems, hygon, etc., etc., as papers of backlogs.

Write a paper on the subject of Economic Geology.

Write Cushman about study of Fraxinifera

Write Barber " " " Hygon

See about some one on Crinoid stems.

Send some Wood nubs from New Haven. For oil papers
see if I shall in Rep. on Economic Geology, etc. have

Send Drager 2 pounds of ~~Crinoid stems~~ ~~ls~~
for oil companies.

Ask Drager to find where the occurrence of
rolling of mud balls.

Tuesday March 11-1919

Started from New Haven for Dallas at 12:17 and at New York at 4:04. Rain at New Haven but none at N.Y. The great city is flooded with soldiers.

On the fine P. R. R. train The St. Louisian, and it is crowded. Had brown beef & on car 35 and retired at 8:15 P.M.

Wednesday March 12, 1919.

Got up at 7 A.M. and had breakfast in Ohio west of Columbus. It is a fine St. Valentine's day. Some willows are green, spring wheat is two or three inches above the ground, and some farmers are plowing. We passed through Dayton and Xenia in Ohio, and then Richmond, Indianapolis and Terra Haute in Indiana. In all this the wheat is even higher out of the ground, and many of the trees are developing into buds. The season appears to be a full month ahead, and I hope there will be no frost to come along and destroy the wheat.

Out of Columbus we were about 30 minutes late, but are making it up as we go. Read all day on the geology of Texas. On time at St. Louis at



5.04. Started out on M. & T. at 6.30 P.M. Met on the train Sidney Powers, and later another young oil man, Mr. Donnelly, a graduate of the U. of Chicago. Powers is just returned from the area and has the insignia of the General Staff having worked with Brooks.

Powers and I talked for three hours about things in general in geology and more specifically about the oil conditions. He says no two geologists make identical maps of the same area or impossible it is to be certain of minutiae. Starting to start in somewhere and if it happens not to be the ideal place may come out with a bad result. Then too the guide horizon thin or thicken and what a worse the strata change. This divergence he thinks is due to original deformation. He tells me that one li. 20 feet thick pinches out to nothing in 10 miles.

About divergence of formations as a difficulty in locating horizon in unexposed geology see Sidney Powers work in Bull. U.S.G., no 686 and especially in 686 B. Also look under Township, R. 24, R. 12 E.

OIL GEOLOGISTS TO MEET HERE TODAY

Thurs. & Fri. March 13-14

**PUBLIC MEETING WILL BE HELD
TONIGHT AT 8:15 O'CLOCK**

AT CITY HALL.

Prominent geologists from all parts of the United States, with some from foreign nations, are assembling in Dallas for the fourth annual meeting of the American Association of Petroleum Geologists, which begins this morning and will conclude Saturday. Some arrived yesterday and many last night, but the bulk of the delegates is expected this morning. It is understood that the morning will be devoted to registration at headquarters in the junior lobby of the Adolphus Hotel, although some informal addresses may be made. Business sessions will be held in the inclosed roof garden of the hotel.

The first business session will be held from 2 to 5 o'clock this afternoon. This is to be a symposium on the North Texas oil fields. The program calls for a discussion, led by J. A. Udden, on the lithology and characteristics of the Bend series; relation of surface structures to the occurrence of oil in North Texas, by Wallace E. Platt; folds in the Bend formation, discussion led by J. M. Sands; ancient rocks shown in the well borings around the Llano uplift, J. A. Udden; notes on the structures and oil showings in the red beds of Coko County, by J. W. Beede; the Cretaceous problem as it relates to the possibility of determining structures in the underlying Pennsylvanian and Mississippian formations, general discussion; water problem of the Bend series and its effect on future production and flooding of oil sands, general discussion; a review of the developments in the Central Texas oil fields, by W. G. Matteson.

Public Meeting Tonight.

The only meeting for the general public, save the banquet tomorrow night, will be held at 8:15 o'clock tonight at the City Hall Auditorium. Here the addresses will be of such a nature that the laity can understand them. The principal talk will be made by David White, chief geologist, United States Geological Survey. "How Formations Are Defined and Identified" will be the subject of an illustrated address by J. A. Udden, State Geologist of Texas. An illustrated lecture on China by M. L. Fuller also will be given.

Secretary W. E. Wrather said that, while the public will be excluded from no session of the convention, the discussion in the main will be too technical to be appreciated by the laity. He urges all persons interested in any way in oil development to attend the meeting tonight, when "inside information" on oil geology will be set forth in understandable terms.

Prominent Geologists Arrive.

Prominent among the arrivals yesterday were Alexander Duessen of Houston, president of the association, and Dr. I. C. White of Morgantown, W. Va., who has been State Geologist there for twenty-two years. Dr. White is known as the "father of oil geology." Three distinguished Pacific Coast geologists also arrived yesterday. They are A. J. Tart, geologist for the Southern Pacific and the Associated Oil Company of California; Carl H. Beal, petroleum technologist of the Bureau of Mines, San Francisco, and Maurice Lombardi, superintendent of production of the Southern Pacific oil properties.

"This is our most important and should be our largest convention," Mr. Duessen said. "It is impossible to tell just what attendance will be, as scores of geologists whom we are not expecting may come in Thursday or Friday. The movements of oil geologists are uncertain, owing to rush instructions they may receive at any time."

Dr. White said this was his first trip to Dallas. He has visited the South Texas oil fields, but has never seen the North Texas district. He said he hoped to visit Ranger and other sections immediately after the convention.

Europe Bare of Oil.

"Europe is bare of oil and the Texas discoveries came at a most providential time, just as various American fields were weakening," Dr. White said. "Throughout the United States Texas is the chief subject whenever oil men get together. It so happens that the Texas development comes at a time when pipe and other facilities for handling oil are difficult to secure and skilled labor is at a premium. This, rather than any talk that the world is not greatly in need of oil, may tend to retard Texas development."

Mr. Wrather pointed out that the geologists are assembling in Dallas just at a time when some of the biggest and most sensational wells in the State have just been brought in. He said that many of the geologists have not seen the new Texas field and that an excursion for them to Ranger may be arranged just after the convention, provided a sufficient number wish to go. The coming of some of the world's leading geologists to Texas, some of them representing the really big developing companies in other States, may be the means of interesting other outside capital in the State, he said.

Lege to Be Toastmaster.

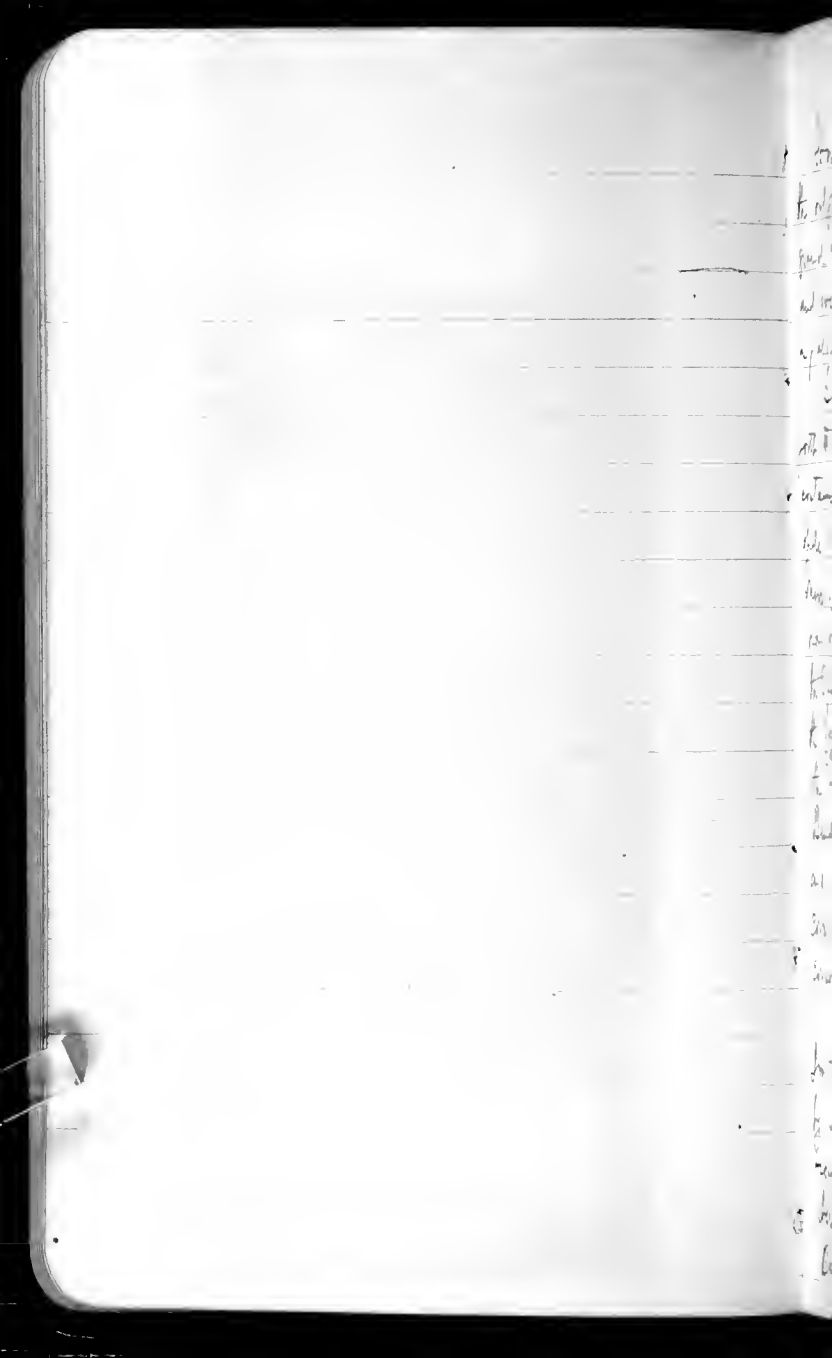
F. M. Lege Jr. will be toastmaster at the banquet beginning at 7 o'clock, tomorrow night at the junior ballroom of the Adolphus, which is given by the Chamber of Commerce complimentary to the visitors. Tickets are on sale at the Chamber of Commerce and the Adolphus Pharmacy at \$2 a plate. Music and entertainment features, such as an address by J. J. Taylor (State Press of The News), illustrated by John Knott, have been arranged. The principal address will be made by Ralph Arnold, chief of the valuation department of the internal revenue office for oil and gas properties. He will discuss methods of estimating depletion and depreciation of oil and gas properties. Gilbert Irish, chairman of the oil development committee of the Chamber of Commerce, is anxious to have a large attendance of Dallas citizens at the banquet.

Dallas, Texas.

Thursday March 13, 1919

Got up at 7 A.M. in central Oklahoma. At breakfast at 8 we crossed the Canadian river that coincides one of the Platte, a wide shallow expanse with little water and much drifted sand. The strata are all dipping gently, and the depressed hills have a thin soil with the ground covered with loose flat rocks. South of McAlester the strata are more strongly folded. The settlements are few and very small, and all is cheap and squalid. Evidently it is not the best farming country. Although somewhat warmer here the vegetation is not further along than in Illinois. The valleys the railway goes through has at times wide expanses of flat lands once forested, with very low mountains to the east. Brick houses are rare in the towns, usually one or two stories high, and those 3 high are rare. It is the beginning of civilizing the wilderness.

Got to Dallas in time at 2.05 P.M. Could not get a room at the Adolphus, had quarters on the A. A. P. S. The only Sidney Powers took a room at the Oriental Hotel. At 2.45 we were at the meeting and soon got into the discussion on the Bend. See the appended discussion



It is just as plain as anything can be that the oil geologists know next to nothing about underground emulations. It is all on the basis of lithology and even that is very poor. As I told them they need a paleontologist, and they need one in a hurry.

Sixty in a paper read by D. White clearly sets forth that the Bend is a deep series, and that it contains Miss. and Penn. The lowest Bend a black shale has 35 to 40 species and these are of the higher Miss. i.e., the Tennesseean. He does not make it clear how high, but apparently it is well up and probably in the Chester though of a different sea-way. He correlates the lower Bend with the lower 500 feet of the Canyon, ^{and White does not seem to agree with any of the correlations!} the other 500 feet being apparently Penn. The lowest Bend has Smiatula striatula and S. and it was one of these fossils that led J. P. Smith to correlate the fossil with the higher Miss. In this he is correct according to Sixty.

The Marble Falls has 100 species and the Smithwick 35, both go to sections. The latter is marked by Hadrophyllum explanatum. In the former occur Paralepoceras and Hyatt's large nautilus. Here also the species identified by Smith in Paris Burret - Van Datta Folio. Also Taxalifera

Did all of Lutz's mineral come from the Marble Falls area, or was he also in the Bend area?

**GEOLOGIST TO ADDRESS
BUSINESS WOMEN TONIGHT.**



DR. J. A. UDDEN.

Popular information comprehensible to the lay mind will be presented this evening in a lecture on oil fields, oil wells and oil investments by Dr. J. A. Udden at the Business Women's Club of Dallas. Nothing technical will be discussed, but interesting knowledge for the average young woman on a popular topic will be set forth by Dr. Udden. This is the second address on current topics which has been given at the club. Dr. Udden will speak at 8 o'clock.

His lecture will be preceded by a meeting of the physical training class at 7 o'clock. Dr. Graham Frank will make a brief talk. The soloist of the evening is Miss Mattie Bell Winfrey. These evenings have been arranged especially for the club members and their invited guests.

Dr. Udden is attending the annual session of geologists, which is being held in Dallas this week.

Mullerella, Chaetetes, milliponaceus, Pseudomontis
and primitive Fusulina. Certainly here also a
Miss. bed on - Palaeocin.

In the woods but has at least 170 species.

Mr. R. C. Ancker ^{of Kansas University} is also studying the Bend faunas
and he tells me he has 100 species. He is of the
Univ. of Kansas, and State geologist. I think he
is to publish on the matter.

H. J. Addins of Baylor Medical College,
Dallas is at work on the Lower Cretaceous faunas
and is disposed to make entirely new formations on
the basis of the faunas. The distribution of these do
not agree with Hill's classification. I told him
I would read his paper. He wants to publish
soon.

^{See for Arant and other upper li that}
disappears. ^{in Bridger paper of U.S.G.S.}
^{connected with the Stogolster}
li., a very persistent li. known formerly above
the Arant. He also has striated surfaces, as if made
by ice in an interval of at least 1000 feet between
the Arant and Elgin li. They do not look to me
like ice grooving but they are too regular to
suggest anything other than slickensiding. Powers
I know says they are not so made. I would
explain them as a last result due to ice.

part of the series is the new and the upper Mississippian is the most popular theory. And it was pointed out by Dr. W. E. Cummings of Houston, termed the patriarch of the profession, that he put the bend in Texas geology many years ago and that he was not considering the upper members of the series as they are now considered to be a part of the bend. He defended the theory that the whole series is Pennsylvanian and attempted to show this by paleontological researches.

It was pointed out by Professor Charles Schuchert of Yale University that the underlying Ellenberger limestone is the only good place upon which to correlate, and then he raised a question as to whether the so-called Ellenberger is Ellenberger all the way north.

It was a lively and wit-sharpening discussion that the petroleum geologists had over the bend, the producing formation in the new Texas fields.

Meeting Opens With Welcome.

Alexander Deussen of Houston, president of the association, called the association to order at 11 o'clock and introduced Gilbert H. Irish of Dallas, who welcomed the association on behalf of the Chamber of Commerce.

David White of the United States Geological Survey spoke briefly, expressing surprise at the large attendance. It



in individual box; regular price
.....
2.95
nd see our great display of all the
inner frocks.

Friday March 14-

OIL GEOLOGISTS DISCUSS BEND SERIES

FOURTH ANNUAL CONVENTION OF
AMERICAN ASSOCIATION
MEETS IN DALLAS.

PROMINENT MEN HERE

Dr. David White of U. S. Geological
Survey and Prof. Schuchert of
Yale Are Among Speakers.

The bend series that produces the oil in the North Central Texas field held the attention of the two hundred or more petroleum geologists who met yesterday in this city for the fourth annual session of the American Association of Petroleum Geologists. The meeting took on the aspect of the local situation. But inasmuch as the North and North Central Texas oil fields are the most interesting feature of the petroleum business just now, this was natural and proper.

It developed that geologists are not of one accord as to the great plunging anticline that is known as the bend series and that the so-called black limestone that is the bend formation is really mostly calcareous shale; and one geologist advanced the theory that great thickness of the so-called bend limestone is due to the fact that drillers get better pay for drilling in limestone that is found at great depths than they get for drilling in other formations—so the logs of the wells show lots of limestone.

The theory was advanced that logs of wells, according to drillers' reports, are not good data for correlation purposes.

Paleontologists Appear.

Then it was that the paleontologists had an inning and told the geologists that fossils alone are the true index and the only sure way of correlating structures.

Dr. David White of the United States Geological Survey, and Professor Charles Schuchert of Yale University, led the onslaught that was made by the paleontologists, and made it very clear that certain fossils that can be identified even when drilled into infinitely small fragments, alone can determine the age and character of a structure that is being drilled into. "Are your correlations based upon mythology?" asked Professor Schuchert. "You are trying to correlate things on their color. Let me make a plea for fossils. You need the aid of paleontologists."

Surface Reflections.

The subject of surface structure as related to subsurface structure was also interestingly discussed, a paper by Wallace E. Pratt, of the Humble Oil and Refining Company, on this subject leading to considerable discussion and some emphasis of opinions. It seemed to be the opinion of Mr. Pratt that surface indications in the North and North Central Texas fields are not very good signs to point the way to pools of oil deep underneath the surface. Mr. Pratt did not warm up to the whole theory of the bend being a great plunging anticline. His paper indicated that the arch is probably very distinct in the southern part of its progress, but that as it dips to the northward it also flattens out to a considerable extent. He described the minor folds and formations on the bend from which oil is produced, and went into detail as to the results of tests and correlation of strata that has been attempted by him and his associates. He also discussed the relation of productivity to surface structure. He concluded that so far as development has proceeded, the best production has come from the wells located on the highest points on the bend structure. He concluded that the problems of the geologist in North Texas are research problems and that more accurate data is required in order to get the best results.

Dr. Robert T. Hill of Dallas discussed the theory of the plunging anticline of the bend and defended it, despite the fact that the arch may flatten out in Stephens County and to the north. He also took issue with the theory that surface indications are not a good index to the hidden structure. He pointed to the drillings in Brown County as showing that surface indications have pointed to the subsurface formations with accuracy.

Age of the Bend.

The question as to what period the bend belongs to has evidently not been settled. That the bend is made up in part of the lower Pennsylvanian and the upper Mississippian is the most popular theory. And it was pointed out by Dr. W. F. Cummings of Houston, termed the patriarch of the profession, that he put the bend in Texas geology many years ago and that he was not considering the upper members of the series as they are now considered to be a part of the bend. He defended the theory that the whole series is Pennsylvanian and attempted to show this by paleontological researches.

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Alexander ... of Houston, presi-

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It was a lively and wit-sharpening discussion that the petroleum geologists had over the bend, the producing formation in the new Texas fields.

Meeting Opens With Welcome.

Alexander Deussen of Houston, president of the association, called the association to order at 11 o'clock and introduced Gilbert H. Irish of Dallas, who welcomed the association on behalf of the Chamber of Commerce.

David White of the United States Geological Survey spoke briefly, expressing surprise at the large attendance. It is the biggest meeting ever held by the association. He was followed by I. C. White, geologist of the State of West Virginia, who reviewed the early history of petroleum geology and told of the deepest well in the United States, drilled in that State last year, which was lost at 7,386 feet. Professor J. A. Udden of the University of Texas told of the vicissitudes of Texas geological work and expressed the hope that some day Texas will be classed as a great State intellectually, as it is now in other ways. Dr. W. F. Cummings of Houston told of his early work in the Permian of Texas and of his work with Dr. Dumble in Texas geological surveys years ago. He related an anecdote of 1862, when the Confederate States needed copper for percussion caps, and of his accompanying other geologists to Archer County, where a quantity of copper was taken from the earth and made up into munitions in Austin. He said he is holding some aces to play in the speculations that are now being made about the bend. J. A. Taft, geologist for the Southern Pacific and the associated oil companies of California, spoke briefly in response to an invitation, as did T. B. Gregory of the National War Service Petroleum Committee, and Lee Hagar of Houston.

Surface Geology in Texas.

In the afternoon John D. Udden of the Sinclair Gulf Company led a discussion with a paper on the subsurface geology of the North Central Texas region. He presented cuttings from the Ledbetter well, Stephens County, and described the formations. It was his paper that brought on the discussion as to the value of fossils and of the work of the paleontologist.

Charles R. Eckes of the Texas Company discussed cuttings from the Duffer well of that company a mile west of Ranger.

Others who joined in the discussion of Mr. Udden's subject included Richard Hughes of the Cosden Company, F. E. Plummer of the Roxana Company, W. G. Matteson of Fort Worth, Dr. David White of Washington, Professor Charles Schuchert of Yale and others.

Dr. David White read a paper by Dr. G. H. Girty of the United States Geological Survey, in which he advanced arguments to prove that the bend is Mississippian in its lower and Pennsylvanian in its upper phases.

Dr. White expressed regret that there is woeful lack of ability among drillers to make proper and responsive logs of their wells, and blamed it to lack of intelligent co-operation between the geologists and drillers. He said the geolo-

March 14-1929

OIL GEOLOGISTS DISCUSS BEND SERIES

FOURTH ANNUAL CONVENTION OF
AMERICAN ASSOCIATION
MEETS IN DALLAS.

PROMINENT MEN HERE

Dr. David White of U. S. Geological
Survey and Prof. Schuchert of
Yale Are Among Speakers.

The bend series that produces the oil in the North Central Texas field held the attention of the two hundred or more petroleum geologists who met yesterday in this city for the fourth annual session of the American Association of Petroleum Geologists. The meeting took on the aspect of the local situation. But inasmuch as the North and North Central Texas oil fields are the most interesting feature of the petroleum business just now, this was natural and proper.

It developed that geologists are not of one accord as to the great plunging anticline that is known as the bend series and that the so-called black limestone that is the bend formation is really mostly calcareous shale; and one geologist advanced the theory that great thickness of the so-called bend limestone is due to the fact that drillers get better pay for drilling in limestone that is found at great depths than they get for drilling in other formations—so the logs of the wells show lots of limestone.

The theory was advanced that logs of wells, according to drillers' reports, are not good data for correlation purposes.

Paleontologists Appear.

Then it was that the paleontologists had an inning and told the geologists that fossils alone are the true index and the only sure way of correlating structures.

Dr. David White of the United States Geological Survey, and Professor Charles Schuchert of Yale University, led the onslaught that was made by the paleontologists, and made it very clear that certain fossils that can be identified even when drilled into infinitely small fragments, alone can determine the age and character of a structure that is being drilled into. "Are your correlations based upon mythology?" asked Professor Schuchert. "You are trying to correlate things on their color. Let me make a plea for fossils. You need the aid of paleontologists."

Surface Reflections.

The subject of surface structure as related to subsurface structure was also interestingly discussed, a paper by Wallace E. Pratt, of the Humble Oil and Refining Company, on this subject leading to considerable discussion and some emphasis of opinions. It seemed to be the opinion of Mr. Pratt that surface indications in the North and North Central Texas fields are not very good signs to point the way to pools of oil deep underneath the surface. Mr. Pratt did not warm up to the whole theory of the bend being a great plunging anticline. His paper indicated that the arch is probably very distinct in the southern part of its progress, but that as it dips to the northward it also flattens out to a considerable extent. He described the minor folds and formations on the bend from which oil is produced, and went into detail as to the results of tests and correlation of strata that has been attempted by him and his associates. He also discussed the relation of productivity to surface structure. He concluded that so far as development has proceeded, the best production has come from the wells located on the highest points on the bend structure. He concluded that the problems of the geologist in North Texas are research problems and that more accurate data is required in order to get the best results.

Dr. Robert T. Hill of Dallas discussed the theory of the plunging anticline of the

geologists should get elbow to elbow with the drillers, and put aside their highbrow language and their good clothes, while getting in touch and laying a predicate for co-operation. Dr. I. C. White illustrated the need for this co-operation by a story.

Night Session for Everybody.

A meeting to which the general public had been invited was held last night at the Municipal Building. The program consisted of three interesting addresses. David White of the United States Geological Survey told of the need for conservation of oil and for exploration in foreign lands and urged that United States companies secure holdings of reserves in other countries against the approaching time when the supply of American petroleum shall become exhausted.

I. C. White, State Geologist of West Virginia, who was presiding over the meeting, suggested that the fate of American oil investments in Mexico is not calculated to encourage American oil men to explore abroad and suggested that a stronger foreign policy will be a great help toward the end sought.

Dr. J. A. Udden of the Bureau of Economic Geology and Technology of the University of Texas, read a paper on the oil-bearing formations in Texas. He discussed his subject in nontechnical language and went into considerable detail as to the formations that make up Texas and the outlook for oil production in this State. Among the suggestions made was one that the Edwards plateau seems to him to be likely territory for great oil pools. Dr. Udden made plain just what sort of structure are likely to produce oil and described the oil fields of Texas with reference to structure and formation.

M. L. Fuller of the Sun Company of Dallas, who spent a number of years in China as geologist for the Standard Oil Company, gave a most interesting illustrated lecture on China.

The meeting was attended by practically all of the geologists attendant on the association sessions and by a large number of others who accepted the invitation to hear plain talks about geology. The auditorium of the Municipal Building was almost filled.

Arrangements are being made by Secretary W. B. Wrather for an excursion of geologists to Ranger through the oil field there if as many as twenty desire to go. The plan is to leave Dallas Sunday evening and spend Monday in the field, returning to Dallas Monday night.

Friday, March 14-1919.

Spent the day at the A. A. P. S. meetings. Mr. Moore of Univ. of Kansas and of Mr. Clemmer's staff is studying the Bend faunas. He has 185 species of which 25% are undet. sp. Has good crinoids, 27 sp. of Hyozoa, 58 brachi, 27 trilobes, 22 gast., 20 cephalopods, 4 tent., etc. Does not agree with Sippy since he calls one Pennsylvanian, and no part Mississippian*. The lower Bend has a small fauna and these species are much like those of the Marble Falls. Has no Fusulina in Marble Falls. He says the whole fauna is much like Mississippian but clearly the fauna is nearer the Morrow.

Went to see his fossils on Sunday at Mineral Springs.

The banquet was a big affair and many of the citizens of Dallas attended. Fearfully crowded and the music was not music at all simply noise. It wore me out, and I left before the speaking was over.

* It appears that all of Moore's material came from the Bend country.

conclusion as to structure at large into vicinity is that it will work out into one great anticline with two or more distinct domes and many great cross-foldings creating noses that will extend in many directions like the arms of an octopus. Mr. Matteson finds eight producing horizons in the fields of North Central Texas, six of them being in the Bend series. He reviewed a number of wells and pointed to their horizon of production with reference to the Marble Falls limestone member of the Bend series.

What Formation Is Bend?

Raymond T. Berger, State Geologist of Kansas, presented a paper in which he told of extensive recent work in the outcroppings of the Bend series and differed from the conclusions of Dr. Girty as to the formation to which the lower member of the Bend series belongs, placing it in the Pennsylvanian and doing it by fossils and the very methods that meet approval of the paleontologists. His paper started the discussion as to the formation to which the Bend series belongs.

A paper by Walter R. Berger of the Empire Company went into the geology of the Hogshooter gas fields of Oklahoma and related also to the fossils and the paleontological theories of formations. It was commented upon by Professor Schuchert, who is a very close student of the entire proceedings.

Origin of Sulphur.

C. R. Eckes was on the program for a paper on the relations of sulphur and caprock in the Gulf Coast field, but said he wants to get more data before presenting such a paper. The discussion went on, however, as to the origin of sulphur in the saline domes and there was interesting chemical and geological discussion, with a great deal of diversity of opinion and few firm convictions. F. B. Plummer of the Roxana Company advanced a very profound theory as to the origin of sulphur there and gave a learned discussion of the chemical formation of the sulphur due to laboratories that are created by natural causes in the underground regions.

Sidney Powers, who was with the American Expeditionary Forces in France as a geologist officer, told of the work of geologists in the several armies, allies and enemies, and gave the German geologists credit for the successful negotiation by Hindenburg of some swamps that baffled the Russians. He showed maps that were made by the American Expeditionary geologists and told of their surveys as to water and materials.

Coke County Red Beds.

J. W. Beede presented a paper on the oil showings in the red beds of Coke County and explained a very thorough exploration of that region. He told of copious oil showings and advanced several theories as to the origin of the oil, but approved none of them fully. He pointed to the general belief, however, that all known oil in the red beds is in the region of faults, as at Healdton, or else overlying sharply inclined Pennsylvanian formations. He admitted that it seems improbable that oil is indigenous to the red beds, but won some applause when he wound up with the statement that the question "can only be settled by the drill so far as he is concerned."

Examination of deep borings near Georgetown and at Leon Springs by Dr. J. A. Udden was explained by him and he discussed the Balcones escarpment in connection with these cuttings, which, he said, showed the existence of a very old formation there and indicated that a great uplift had been in the region of the fault under discussion. He said this seems to indicate a syncline to the westward of the Balcones escarpment. This paper brought forth considerable discussion.

E. E. Gregory of the Fuel Administration reviewed the work of that body and told of its efforts and success in conserving natural gas, the conservation of which, he said, is of paramount importance. He incidentally repeated the heretofore published statement that a great deal of waste is due to unnecessarily high pressure in gas lines.

Roxana Helps Materially.

A paper on the stratigraphy of the Pennsylvanian in Texas by F. B. Plummer, assisted by C. H. Hammill, both of the Roxana Company, was accompanied by a map made by them showing the correlation of limestone in that area. The map and its explanation were exceedingly interesting to the geologists and drew a great deal of attention and much discussion. The Roxana Company and its geologists were complimented by many present for their public spirit in making this material available to the profession in this way and the example was pointed out as one worthy to be followed by other large companies that have capable corps of geologists in this field. Professor Schuchert, David White and Wallace E. Pratt all paid the map and the paper very high compliments. The map shows much work on the ground and adds measurably to the known areal geology of the Texas oil fields.

Water in the Bend.

Water problems in the Bend series were discussed in a paper by M. L. Fuller of the Sun Company, who advanced a number of theories and outlined sections where the water is known to be along certain horizons. His paper was generally discussed, as it presented a subject of great immediate and practical interest to the oil men developing that region. He pointed out that an official of the Texas Pacific Coal and Oil Company says that no well drilled by that company shows water in the Black lime, and he referred to diverse expressions by other drillers showing that the subject is still undecided. Mr. Fuller concluded that it is hard to say whether the water comes with the oil or from above. The discussion was participated in by a number of the men who have been working in the field and the information that was collected for the record is voluminous.

NOTES OF GEOLOGISTS.

Maurice Lombardi, assistant manager of the oil production department of the Southern Pacific Railroad, who is attending the convention from San Francisco, is one of the prominent young men of the profession. He has been with the

big California fields for a long time and knows them well.

It is the belief of Mr. Lombardi that California production will increase when it shall become possible to expand development that is at this time restricted by litigation and otherwise.

He is also of the opinion that the Treasury Department will be disappointed in the revenues that are to be derived from the internal revenue tax on oil producers under the new law, which provides a very comprehensive method of ascertaining depletion and depreciation figures on producing properties. But it is nevertheless his belief that the new law and the curves and tables prepared by the Treasury Department for ascertaining these factors are both improvements over the old law and methods and more just to the petroleum industry.

Value of Fossils.

Charles Schuchert, professor of geology at Yale University, enlivened the sessions of the Association of Geologists by interposing a suggestion that one fossil named by John A. Udden as having been found in the borings of one of the Sinclair wells in Stephens County would definitely and beyond doubt determine whether the formation in which it was found was Pennsylvanian. This fossil is the Fusulina.

It never did any good for itself in any other than the Pennsylvanian period. It is easily identified under the microscope and can hardly be mistaken for any other of the low forms of animal life that are found in ancient fossils. This bug is about the size of a grain of wheat and has cell and circular characteristics that makes him individual to an extent that a chunk of him the size of a grain of sand tells his identity. A similar form of Fusulina was active in the Permian period, but his earmarks and brands are different to the eye of the paleontologist.

This creature had as a latter section of his name the word "secalica." When Professor Schuchert had made his suggestion as to the Fusulina, some one asked the identity of the speaker—the meeting was young and the scientists had not all become acquainted.

Oil Geology of Texas.

Dr. J. A. Udden of the bureau of economic geology and technology of the University of Texas has presented very comprehensive papers in plain language for the benefit of the people who are interested in oil lands or oil investments. He has told of the formations in Texas and pointed out that about 97 per cent of the area of Texas is of possible oil-producing character.

He told the production of oil in the Thrall field from igneous rocks, one of the few instances of such rocks yielding petroleum. He described the salt dome production in the Gulf Coast fields and on the Rio Grande, and went into details as to the anticlines and terraces that are producing oil in North and North Central Texas.

His theory that a great oil field may be developed on the Edwards Plateau of Texas seems to be new to some of his scientific hearers, but there is a lot of testing now under way in that region.

Dr. David White of the United States Geological Survey told the geologists of the estimates that have been made by his survey of the possible future production of petroleum in the United States. It is not much, compared with the increase of consumption.

He pointed out that the geologists should work for conservation of petroleum and save money by discouraging drilling in areas where there is no probable chance to get production. He pointed to the increase of consumption of petroleum products and to the probability that the United States will soon have to secure oil from other lands across the seas.

He advised the acquisition of oil reserve areas overseas by American oil companies against the day when there will be necessity to import petroleum products into this country. He said Texas, Oklahoma and Wyoming are looked to for new fields and pointed out that the estimates made by the Government geologists as to future production in that country give to North Texas 400,000,000 barrels, to Louisiana 100,000,000 barrels and to the midcontinent field 1,700,000,000 barrels.

GEOLOGISTS CONTINUE TALKS ON BEND SERIES

W. L. MATTESON DECLARES SUB-SURFACE STRUCTURE MORE PRO-
NOUNCED THAN SURFACE.

SULPHUR AND CAPROCK

C. R. Eckes and F. B. Plummer Discuss Origin and Chemical Formations.

The Bend series in Texas continued to be a subject of interesting debate in the meeting of the American Association of Petroleum Geologists yesterday. There was renewed discussion of the paper of Dr. G. H. Girty in which the conclusion was reached that the Bend is of Mississippian formation in its lower member. Dr. J. A. Udden talked about the fossils in the Bend and noted that they are found all the way through the several members of the series. A debate that was illuminating ensued between Dr. Udden, David White of the United States Geological Survey and Professor Charles Schuchert of Yale.

A paper by W. L. Matteson reviewed and illustrated development of the North Central Texas field. He pointed to the Parks well in Stephens County as a real discovery well and said that the Texas Pacific Coal and Oil Company took heart to pursue their Ranger explorations when it became known that the Parks well was a producer. Mr. Matteson said that development in the Eastland-Stephens County pools shows that subsurface structure is more pronounced than surface structure and that surface structure is not a true index to the lower strata. He pointed to the development that is being made and said the drilling wells will continue to afford sound basis for correlation of formations and that the data should be carefully kept. His

dallas March 15 - 1919

Saturday, March 15, 1919.

A high wind is on, so strong as to make it almost impossible to hear the speakers at the meetings of the A. A. P. S. Arnold and others had a hard time of it.

At 2 P. M. I finally read my paper and later on showed the 20 slides to bring out the many disconformities.

I never attended a meeting where I was more desired and more looked up to than here. I never spoke better than here, for I felt I had a mission to perform and I performed it well. This is what President Deussen told me at dinner this evening, whose guest to dinner I was. Many other men talked to me about coming to Yale to work with me, and some are men of 35 to 40 years. H. H. Adams, and Mr. Chester A. Hammill are one of this latter type. Even one of Deussen's ^{wealthy} associates in the Chamber Oil area and of his company told him he was going to Yale to work with me in geology.

Deussen is thinking that the salt domes are due to Permian salt squeezed (plastically) into their present position. He is also thinking of old

GEOLOGISTS HAVE A BUSY FINAL DAY

Roller March 16-1919
PAPER BY PROF. SCHUCHERT ON
PALEONTOLOGY URGES PROPER
LOGS BE KEPT.

FACTORS OF VALUATION

Treasury Department Official Tells
How to Arrive at Deductions on
Property.

An illustrated lecture on the relations between paleontology and petroleum geology by Professor Charles Schuchert of Yale University was a feature of yesterday's session of the American Association of Petroleum Geologists. Professor Schuchert throughout the proceedings has been stressing the importance of paleontology and of fossils in the work of the petroleum geologist. He urged in his paper that no greater service to science nor more profitable departure on the part of their scientific staffs can be accomplished by the great oil companies than to preserve logs of selected wells under scientific direction with a view to disclosing the stratigraphy of the fields through micropaleontology and thus collecting the material for a paleontological geography such as would be of inestimable value to the profession. He pointed to possibilities that have been overlooked in a million wells that have been drilled for oil and said that if a small portion of these wells had been scientifically logged with reference to their fossil production the book of which he is the author on paleogeography of North America would be of comparatively small value.

The slides shown by Professor Schuchert were from photographs of strata in various parts of the country and were designed to show conditions that make it imperative in studying stratigraphy of wells that the fossils be examined. Many slides showed limestone of varying geologic periods that in the absence of micropaleontology was sure to be confused as one limestone, thus laying a false predicate for further drilling.

"It is encouraging to note," said Professor Schuchert, "that most of the great oil companies are now recognizing the value of geology and that some of their geological staffs are devoting study to paleontology as a necessary part of their work. Every large oil company should have paleogeographic maps showing the formations that have followed each other during the several geologic periods disclosed by their drill records."

Oil Property Valuation.

Ralph Arnold of the United States Treasury Department gave a talk on the valuation of oil and gas properties for income tax purposes and his talk was supplemented by papers by Carl H. Beall, Roswell H. Johnson and Eugene W. Shaw on various concrete phases of this subject.

At the outset Mr. Arnold said the Treasury Department has need of the services of several geologists in connection with this law and the work of depletion and depreciation of oil and gas properties and he hopes to secure such men. He said the Government can not compete with the big oil companies in bidding for such services, but would offer opportunity for wide fields and offer prestige in that the offer of the Government is in effect to pay their worth in about one-fourth cash and three-fourths opportunity to become known and to gain prestige employment. Mr. Arnold indicated that he is a

believer in applied psychology in the taxing business, much as the several governmental agencies have been working applied psychology in winning the recent war. He said the use of common sense in arriving at depletions and deductions is the best rule and that in the end business is nothing but applied psychology. He referred to the dilemma of the producer, who, in order to make the best showing possible in his own interest, swelled his capital investments for the excess profits tax and minimized them for the purpose of the income tax.

Factors affecting value of oil properties, Mr. Arnold said, are the market for oil, the theoretical value of oil lands, the speculative value of leasing and drilling territories and the price of oil and amount of production from the property. He talked of so-called settled production and declared that it is an indefinite term governed by the field and the condition of the lease. One way to reach the value of an oil property, he asserted, is to get the relation between the gross profit and the production—how long will it take the property to pay out. In established fields factors to be considered are porosity of the sand, gas pressure, water troubles, depth of drilling, character of formation, cost of labor and supplies, method of recovery, efficiency of operation, distance from market, condition of roads, available transportation and oil reserves in the land. He concluded that the safest method of figuring is the production method.

Value of Wildcat Stuff.

In estimating the value of wildcat properties it was the opinion of Mr. Arnold that some potent factors are nearness to production, has it been tested before, dry holes, successful wells, geologic conditions, number of wells drilling. In the wildcat territory the psychological feature was again found by Mr. Arnold, who went to some length to explain that a well being drilled by a known and successful company adds more to neighboring holdings in the way of value than a well being drilled by irresponsible or unknown parties.

Indirect factors in finding the value of oil properties are the cost of the property, sales of similar properties and the speculative value of leasing and drilling fields. He pointed out that affidavits as to the value of oil properties are of little worth toward establishing the value of such properties. In the case of incorporated companies or joint stock companies the value of a property is to an extent measureable by quotations on the company's stock on the stock exchange or in the curb market. But this test is not conclusive. The amount of royalties and rentals is a good criterion of value, he said.

Apportioning Between Interests.

As to royalties Mr. Arnold said that in apportioning the value of the property as between the lessor and the lessee a rule of thumb method would lead to the conclusion that the value of the interest of the lessor is double the value of the same interest held by the lessee. In other words, the taxable value of one-eighth royalty interest in a property are as great as one-fourth of the working interest. This is on the theory that the lessee pays all the cost and takes all the risks.

Analogous to this Mr. Arnold explained that in interpreting the laws for deductions it is the intention of the department to construe the reports so as to protect the wildcatter and the man who takes the risks of pioneering and discovering oil lands. The man who does actually discover oil properties will get exemptions allowed by law for such discovery, but the law will not be construed favorably to the man who sits by and gets into the field after it has been discovered by the wildcatter.

Responsibility of Geologists.

In his suggestions to geologists as to their reports on properties Mr. Arnold said he would advise them always to be conservative, to make the same kind of a report for the man who seeks to buy as for the man who is on the selling side of the market.

"I used to think that my responsibility ended," he said, "when I signed my name to a report. But I found out in a few months that the report frequently got into the hands of unscrupulous promoters and men who capitalized their holdings too highly. The result was tearful visits from widows and orphans whose money had been lost in the investment, which was, in part, at least induced by the geological report."

volcanoes emitting hot water that is bringing the salt, sulphur and limestone along with the carriers to the surface. It is these salt domes that is furnishing the 100,000,000 barrels per year of oil in the coastal plain. He tells me there are about 50 of these domes in a belt along the coast, and then another string ^{in Louisiana} farther inland. I believe he said that it is all the water belt that is decidedly oil bearing.

Deussen and Hildebrand apparently do not believe in any old land of Louisiana, but Deussen cannot overcome it. He says the Tertiary of the coastal plain is at least 7000 feet thick, and beneath this of course are the Cretaceous and below the Comanchian. Under this must be my old land. All of this matter should be thoroughly geological. Mr. McCoy is a firm believer in my old eastern Texas land.

It may be that Moses has the best part of the collection at Lawrence. Ask him when he is to publish and to what extent.

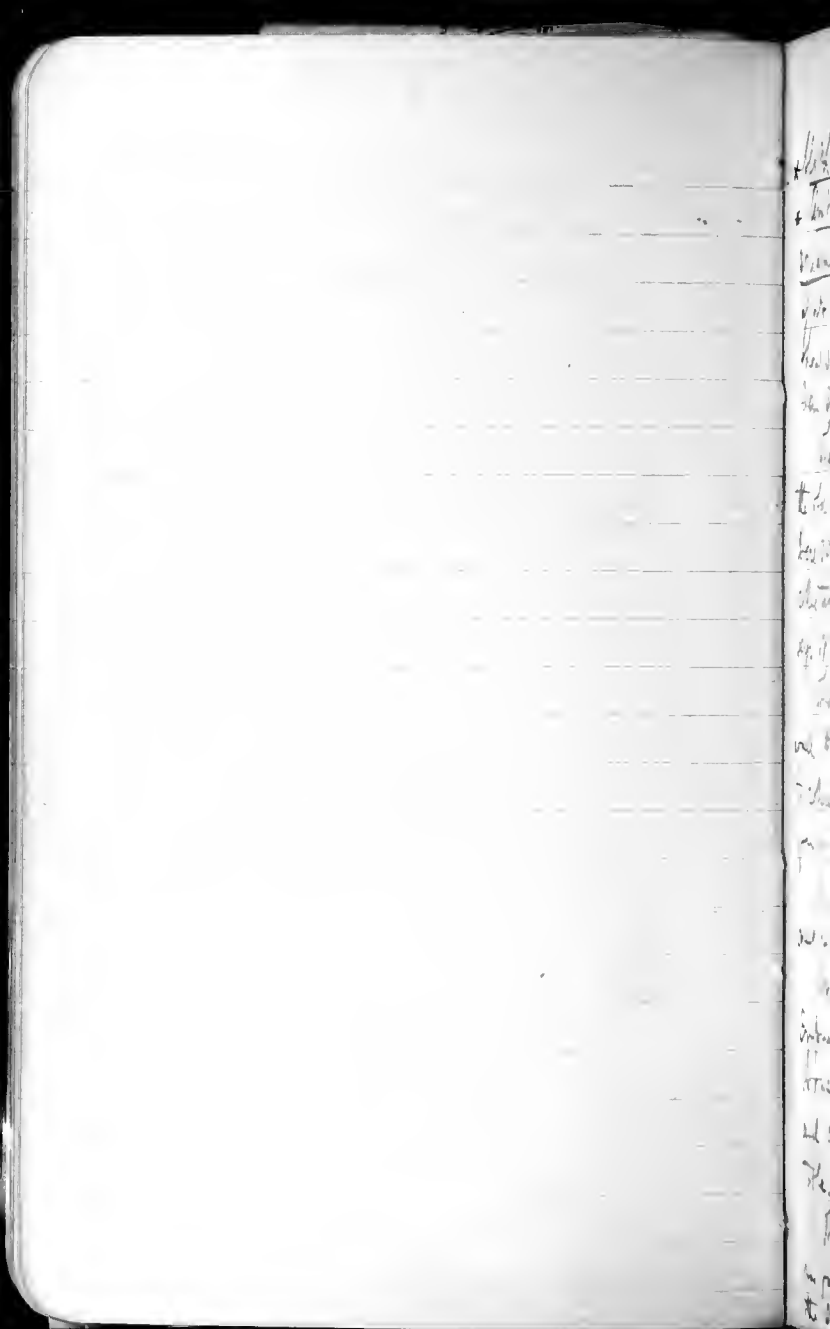
Sunday, March 16, 1919, Mineral Wells.

Got up at 6.15 and had breakfast with Alex. Mc Coy and old Dr. Szege. At 7.30 we boarded a trolley for Fort Worth and then by train for Mineral Wells where we arrived at 11.30 A.M., stopping at Hotel Damon at Mineral Wells. The day is bright and sunny and spring like.

Had an interesting ride down over the Cretaceous and now we are in the Strawn. The country here in the west is not so good farm land, rather it is a sand country and of cattle raising.

Had dinner at Dr. Plummers home. Then to his office to see the Marble Falls collection and of the Smithson collection by Dr. Moore. ^{It is all from the Bend series of the San Jacinto area.} It is a large collection out of dark li., and in general the specimens are not good. Some of the species are clearly Pennsylvanian but in general it is a strange lot of fossils that in no way remind of the Upper Mississippian. One sees no characteristic *Chonetes* species, no *Platystrophia*, and none of the characteristic *Favosites*. All in all it is rather of Pennsylvanian time.

From the Lower Bend shale Moore had but few fossils and more of these are clearly indicative of age. He has *Leiorhynchus carmichaeli*, *Leda bellistriata*



* Sphyroceras tendense n. sp. * Lingula altapinensis,
* Ambretella planiconvexa, and Orticuloides
squamula, n. sp. All of these but the last species go
up into the Marble Falls. On this basis the fauna
should be Pennsylvanian, but as to the conclusion
I am still skeptical.

(at Mineral Wells)
Then we went east from the hotel a few blocks to
the old brick yards where mud strata is exposed.
Here 300 feet beneath the top of the strata we all
collected strata fossils out of a blue shale. Reyer
says it is the same as the Beekmantown of Oklahoma.

Then 2 or 3 blocks nearer the hotel along a rising
road that is about 20 feet higher than the brick yards
to collect the same kinds of fossils. Here crinoids are
far more common.

In the evening was at Mr. Hammill's home to
meet his wife and to talk his evening to fall.

As left we visited the Roxana Oil Co, and the
Empire Oil Co gave me a dinner at the "Crazy
House". This is the water resort (sulphur water)
and cure place of this part of Texas. About 18 to
table. The original owner was a crazy woman.

The wind was strong today and the atmosphere
was full of wind blown sand. I don't appear as well
the sun is not looked like the moon.

Our party consists of Alex Mac Coy, ^{L.C.} John-
den, Anjer, H.C. Beale, and myself.

Monday March 17 - 1919. Mineral Wells.

Finally got started at 8:15 although I got up at 6 to start at 7 A.M. Mr. H. C. Bean is our geol. chauffeur.

About 10 miles out to the west from Mineral Wells are one of the base of the Canyon series in the Palo Pinto limestone. ^{It is a yellowish color and is in a quarry in the north.} There is a good outcrop quarry one sees about 25 feet. We saw about 10 identifiable species also Spirifer cuneatus, see the little Libyops. Bellerophon crassa occurs commonly near the top.

The upper 300 feet of the Strawn consists essentially of blue shales with thin and thick series of sandstone. Near the top is a thick series of sandstone decidedly cross bedded indicating the shallowest sort of a sea. Coal is minimal in thickness at about 800 feet ^{at} ^{with the top of} ^{bed about 3 feet thick} ^{at} ^{13 mi. S. of} ^{of the Canyon series} ^{is an impure}

Just beyond Palo Pinto ^{at} ^{13 mi. S. of} ^{of the Canyon series} ^{is an impure} Mineral Wells is the Graford limestone. It is an impure li. one with heavy fine grained, hard to get. The zone is 26 feet thick with an interbedded shale zone 12 feet thick heavy 14 feet of li.

In this region the Strawn is 3500 feet, the Canyon 700, and the Cisero 1000 feet. The Strawn and Cisero thicken to the N.E. The Marble Falls does the same, but the li. appear to give way ^{in the north} to shales. The Strawn is largely shale with sandstone and

The geologist would not have located the area from the surface indications. What ever the structure is that gathered the oil, is all surface geology.

For McClellan's ideas about oil accumulation see his paper in the Bull. G. O. P. S. of last year. His ideas are now somewhat modified, but he does not believe in long oil migration at all at all on the basis of water transportation.

Hammel told me he had seen further entire schinids but we saw no evidence of them. Had seen plates a species.

These coal beds seem not to be over 2 feet thick.
The ~~coal beds~~ ^{transition} in the Canyon is shale with thin zones
of li, and thin zones of sandstone. There are also other
thin and low quality li.

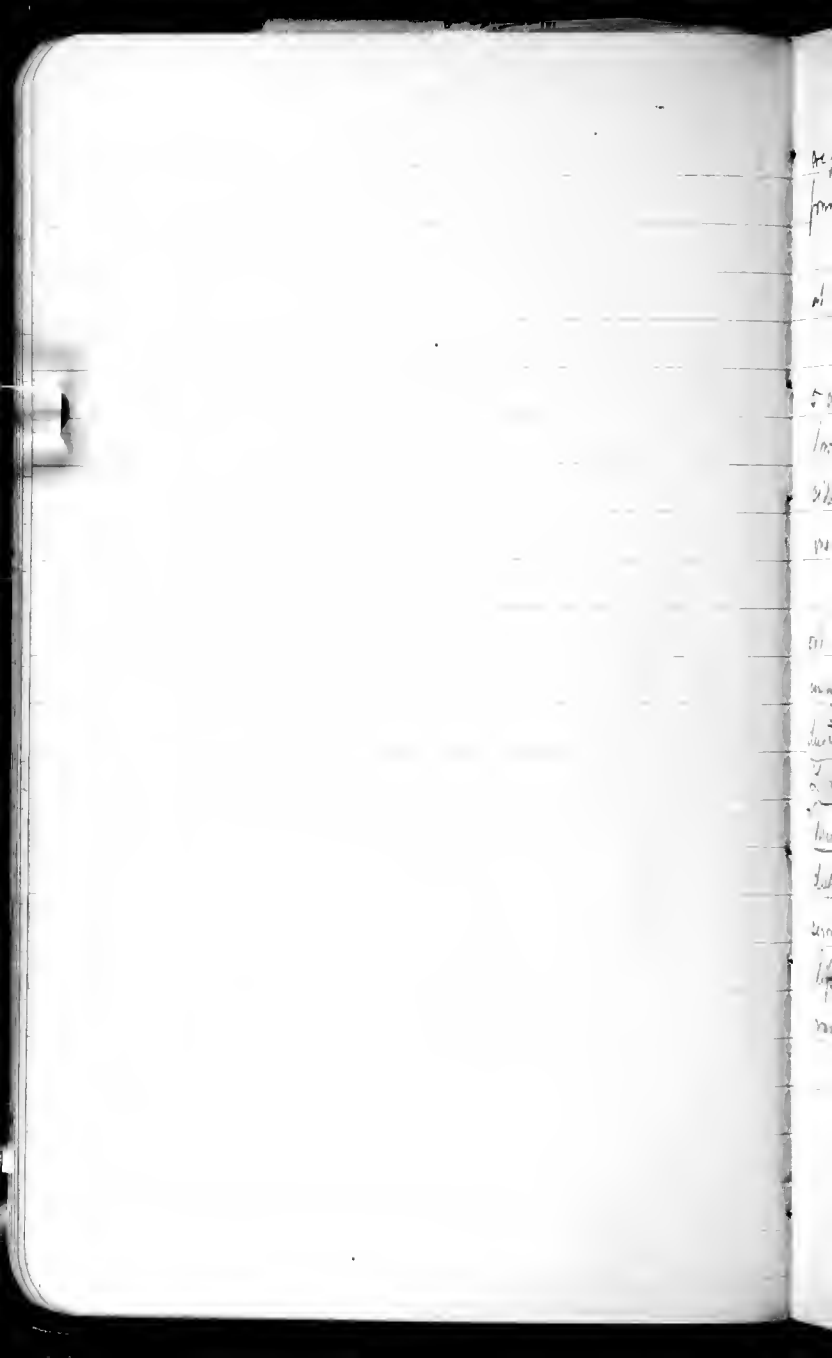
At 12 o'clock we are at Starnon and have lunch
here. It is a very small place.

Three miles west of Starnon in the river canyon we are
again in the Palo Pinto limestone. Here the exposures
are extensive and there are far more fossils to be had.
Fusulina is common here. But a fairly large lot of
fossils. This is a fine place to get a large lot of fossils.

Then we went on to Rainier the booming oil town.
Last October we fear ~~all~~ ^{this place was hardly on the}
~~map~~ ^{a large town and} and now it is all excitement about oil. Over 200
wells are down, and of 150 are dry. ^{Many more are drilling} The oil area is
about 8 miles ^{N-S.} long by 2 or 3 miles wide. The largest wells yield
5000 barrels per day. The first oil well was put down
as a wild cat by the Texas Pacific railway, and now the
field is controlled by the Standard Oil Co. The oil appears
to be in the Bend li., and the structure is seemingly a
series of faults. This is Alex McCoys ideas.

At Rainier is the third li. in the Canyon, but it has
but few fossils. This is the Rainier li.

^{same distance} Then drove on to 5-mile ^{over} west of Earlland and the
east of Cisco. Here about 100 feet above the base of the Cisco



we get a lot of *Cisco* or *Agalatum* Pennsylvania fossils.

Then on to *Cisco* where we get at 7 P.M. Stopping at the Daniels house.

The *Cisco* has in the region just to the north of here 5 different quartz pebble conglomerates. We saw only the lower one today and it is nearly 100 feet thick, decidedly even bedded, with the pebbles averaging nearly one-half inch.

The *Cisco* shales are soft blue clays that weather out an abundance of brownish iron concretions and it is among these in the washes that we find the fossils. *Piscoductus nebrascensis* and *P. inflator* Murch, along with *Lophophyllum proliferum* are the commonest fossils. Also a *Murchisonia*? Here occurs also a characteristic *Chonetes* *dupuyi* (Lind.). *Saxitrochus* are fine with the shell preserved. *Nautiloids* and *goniatites* are ^{very} rare. In general the life must have been rare, but gathered together in the washes it appears to have been abundant.

It is in this area that Salpin collected five upper
Canyon fossils, all of which he gave me. Among them the
Cordate seed were preserved. Salpin promised to
make a collection for me at this locality.

Cisco, Tuesday, March 18-1919.

A fine bright cool morning. Got started for the south at 8.30 A.M.

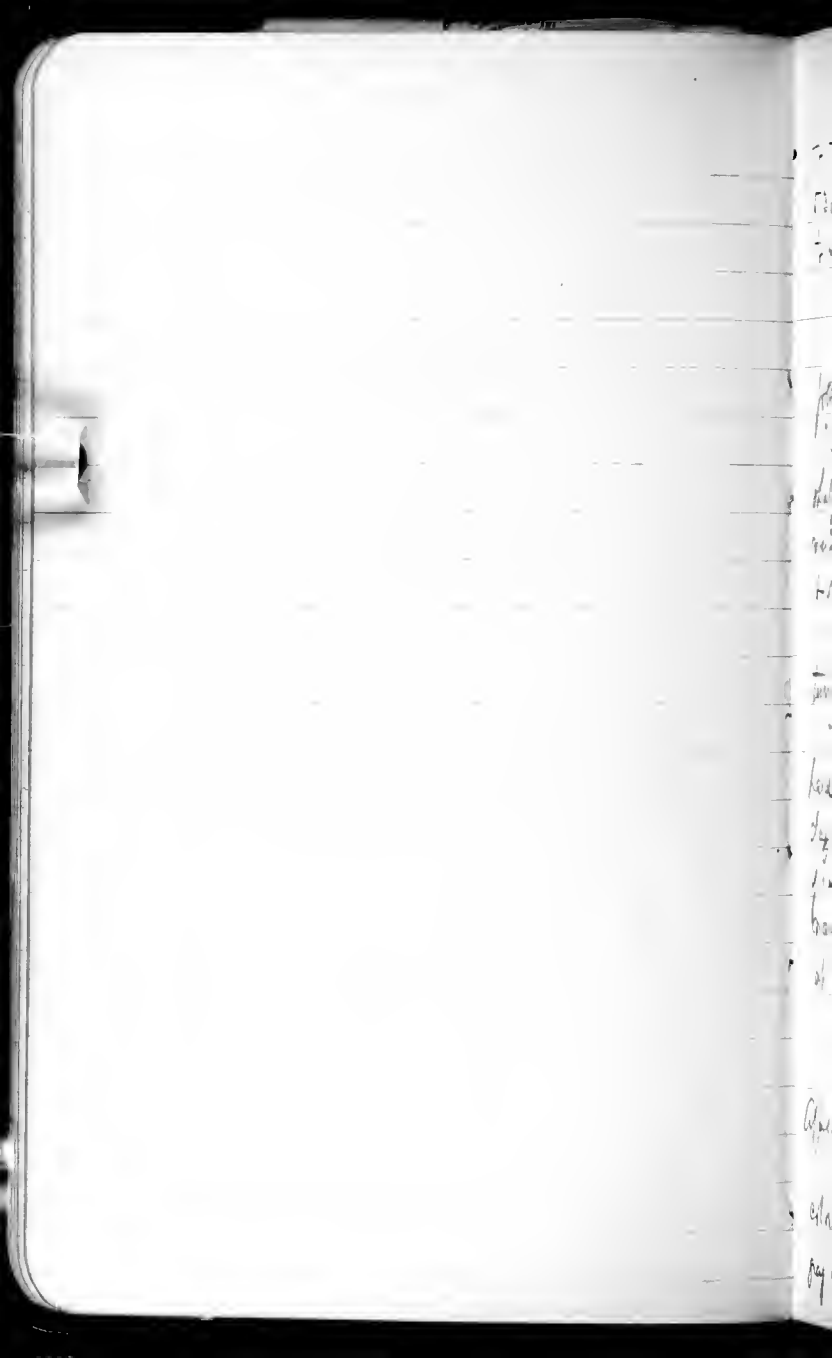
About 5 miles south of Cisco I collected a piece of the so-called Comanchian conglomerate. I don't think it being Comanchian. It looks more like Lofayette material.

Then in the northeastern corner of Grant Co. we come upon rocks of Comanchian. Below are layers of washed white sandstones and these grade up into cherty li. rhyolite with *Syphaca* and other fossils. I have found scabrids from here, a *Cidaris* collected by Beaman, one small aster rock by Schneider and Bryan. The other species about *Syph.* This is my first experience in Comanchian rocks.

Had lunch at noon at May.

We collected in the *Pamphophyllum* li. = *Caddo* li. at the top of the Cannon series above a small stream that is 5 miles south of May and then 5 miles to the west. Above this li. there is a shale series followed by the basal sandstone of the Cisco series. See the fossils. The *Sinclair* corall is near here. There is also some local anticlinal structure along with syndinal structure in the middle of which is faulting.

We then went to another well more drilling about 2 miles



to the south of the Dickinson well, we left here at 5:30, and it is 12 miles to Brownwood where we stay to night.

Drake defined the characters of the Penn. as follows: [In the Colorado Coal Field]

"Cicer: Composed of beds of blue clay, which are shaly at some localities; of sandstone, usually conglomeratic; and often a few conglomerate. Of li. thin, bedded, and some coal.

"Canyon: Alternating beds of rather rough, evenly textured bluish li., blue clay, some sandstone, and congl.

"Thorn: Consists of beds of sharp grained, moderately hard, evenly textured sandstone, alternating with beds of blue clay. Congl. and shales are not abundant, and li. are of rare occurrence". [About 4000 feet] Has 19 named beds. Has but few fossils and these occur at about 300 feet above base. *Very fossiliferous.*

The Canyon has 12 beds. Thickness about 500 feet.

Cicer has 19 beds. Thickness about 500 feet.

Appears to be less fossiliferous than the Canyon.

"Altay: Massive beds of blue, gray and yellowish colored li., alternating with beds of blue clay, black or gray shale. Sandstone and congl. are almost entirely lacking."

Here one party was engaged by another machine
with Messrs Mc Kenzie (very tall), Galpin (very tall)
^{and}
two Clarks (not related)

These fine white sandstones gave me the impression
of the sea sands of Florida about Jacksonville and
Miami.

The Altay has 15 beds, and is 1200 feet thick.
Has many marine fossils and in general appears to
be like those before.

Coal is present in all formations. In the Canyon
and Altay for than 70 miles.

Brownwood, Wednesday, March 19-1919.

Got up at 6.30 and at 8.00 are on our way
to San Jata. The day is again fine and cool.

As we go south we are for a while going over the
Canyon and at about 17 miles ^{south} we are again upon Comman-
chean. Here the basal beds are brick red coarse and
muddy very irregularly bedded sandstones. There are many
sorts of lying concretions and thin sheets of caliche on bedding
planes and thin dikes of impure loam deposits. Rain pitting
are seen. It is the invading water ^{of the overlapping sea} and on the land
side rather than on the marine side. This probably
25 feet ^{thick and thin} changes into more regularly bedded and finer
grained sandstone. Then still higher are white lying
very fine grained sandstones that form much like a
weathered ^{the whole seen may be 100 feet thick} micaceous. Mr. J. H. Meade tells me that
very poor lyellian are sometimes seen in it. In one



place we saw the brick red sandstone roofing the Canyon series.

After we set over ^{the} Comanchian high land we pass down into the valley of the Coal creek, and then all the way to San Jata we are in the strawn. What we see on the road side are thin and thick bedded light greenish sandstones, and by an said like interbedded with bluish shales. These sandstones throughout show current structures, small flows, striated and ground structures, ^{shallow interbedded and pitted ripple marks,} and rain pittings. Of plants there is not as much as we expect but we saw clearly comminuted pieces of fibrous woods and Calamites. There is a fine grained clay washed light greenish sandstone, and was the impression as being overlain of long rivers delinial on long sea flats. Drake reports that the horizon with marine fossils.

Got to San Jata at noon.

After lunch we went south east to Barnett Springs which is 4 miles S.E. of San Jata. Here in the stream we see the top of the Ellenburgian very fine grained dolomite that at the top also has a little of milky white li. At the top saw sections of several species of gastropods.

The top of the Ellenburgian is slightly irregular and

On the ... the dolomite marks the top
... limestone. This in
these ... the granite, that I have.
... we could not
... between the
...
... had fallen down and
... passed over.

There is some chert at the top; rather chert due to weathering.

Then comes in the Lower Bend. First a sandy dolomite (see piece) about 3 feet thick. The basal 3 to 8 inches is muddy and without chert, and the rest is about 75% made up of chert pebbles of all sizes derived from the Ellenburg. It is a conglomerate with the pebbles of chert. No fossils of any kind.

Then a blue-grey nodular dirty li, about 18 inches thick. I thought they had also to be seen. ^{on the top road side on the higher land}

Then a blue clay or soft shale with dark nodules and thin pieces of impure dark ^{earth} li, in upper part. All smells of petroleum. Thickness here about 40 feet.

Fossils are exceedingly scarce in the nodules and hardly any in the clay. The common ones are Leiorhynchus, Strophomena or 3 species, Articuloides, Ambocoelia flavescens (1 specimen), and Otarion. In the thin earthy limestone pieces of rather large Strophomena are frequent and finally I succeeded in getting two specimens that can be identified.

Over this shale follows the Marble Falls li. But later I saw that these blue dense earth li in the beds above belong to the ^{higher} ~~lower~~ Ellenburg.

Then continued S.E. to about 7 miles from Seneca where on the road side may be seen good exposure of the top of the Marble Falls li dipping steeply about 10 degrees.

The next day we stopped here to take the exact dip and strike. The top of the eroded Marble Falls has a dip of about 8 degrees N. 55 W. The underlying Strawn was measured on a sandstone in place and the dip found to be the same or at least 7 degrees N. 55 W. The other dip is about 4 degrees due north.

to the N.-W. Resting disconformably upon the Marble Falls li. are about 10 feet of dark blue ^{massive clay} shales and then about 5 feet of greenish very thin bedded fine grained sandstone with interbedded shales. These sandstones have an abundance of casts of wood and among them may be seen small casts of Calamites. This seemingly is the Staunton. Therefore there is here no Smithwick shales at all.

The disconformity is therefore really an unconformity. The Staunton has the same dip and strike as the Marble Falls and both were deformed at the same time. There is here not the slightest evidence for a bond of roving between the Bend and the Staunton.

We then went S.E. to about 11 miles out of Dan Jaha to Rough Creek and collected in the stream where the road crosses it. The stream runs over a very thick bedded and hard limestone the top of which is hummocky to the extent of nearly 18 inches. For a long time we saw no fossils, but as one mass of flint at the top of this li. attracted my attention I broke it and to my surprise found Textularia and possibly other Foraminifera. I thought it must therefore be the top of the Ellenburger, but later on we saw Productus like erostatus in it. The Coq also at first thought it was the Ellenburger.

The next day it turned out that this zone is the
Lower Band shale and has the same fossils as the
I.G. of Bond. The *Spiralites* turned out to be large
Bellerophon-like gastropods. The mistake by the
men is due to the badly weathered condition of this
area.

For the present this top of the heavy bedded li. appears to me to be a disconformity. The fossils ^{do not} appear to bear

On the hemmooly surface and filling its depression comes in about 12 feet of evenly bedded and wavy thin and thick bedded dark limestone that weather intensely yellow. ^{They are somewhat earthy but are clean good li.} On the surfaces and in the way thin interbedded shales occur many Trepostomata, hardly any Favositellidae, erinoidal ossicles and stems, and many brachiopoda. I saw nothing else that could not be regarded Pennsylvanian.

Several species of large Productus, a coarse striated ^{large} Stuzya, Hustedia mormoni, Pumax utch, Spinifer conerata, Orthotichia resubiride, etc.

This part of the Marble Falls has continuous above other li. not well exposed with much erinoidal material and the thick bedded ^{is a} massive li. The shale of the li. series is ^{but at} ^{see the thin detailed section below} 100 feet thick here.

The more than west of the stream one-half mile above the Marble Falls at the top interbedded black shale with interbedded thin limestone. It is the transition zone here to the Smithtonian black shale. One of the thin li. is literally made up of marked goniatites beautifully sculptured with several very lines. See the several slots.

These shales are clear the mounds of a foul and dead bottom with almost no life. Above are the swimming and sea-weed attached animals whose shells drop into the dead bottom for preservation.

The basal *Smithwickia* partly li. after show Taconurus. A large bivalve, with the valves spread out was common. I have but one specimen.

San Jata, Thursday, March 20, 1919.

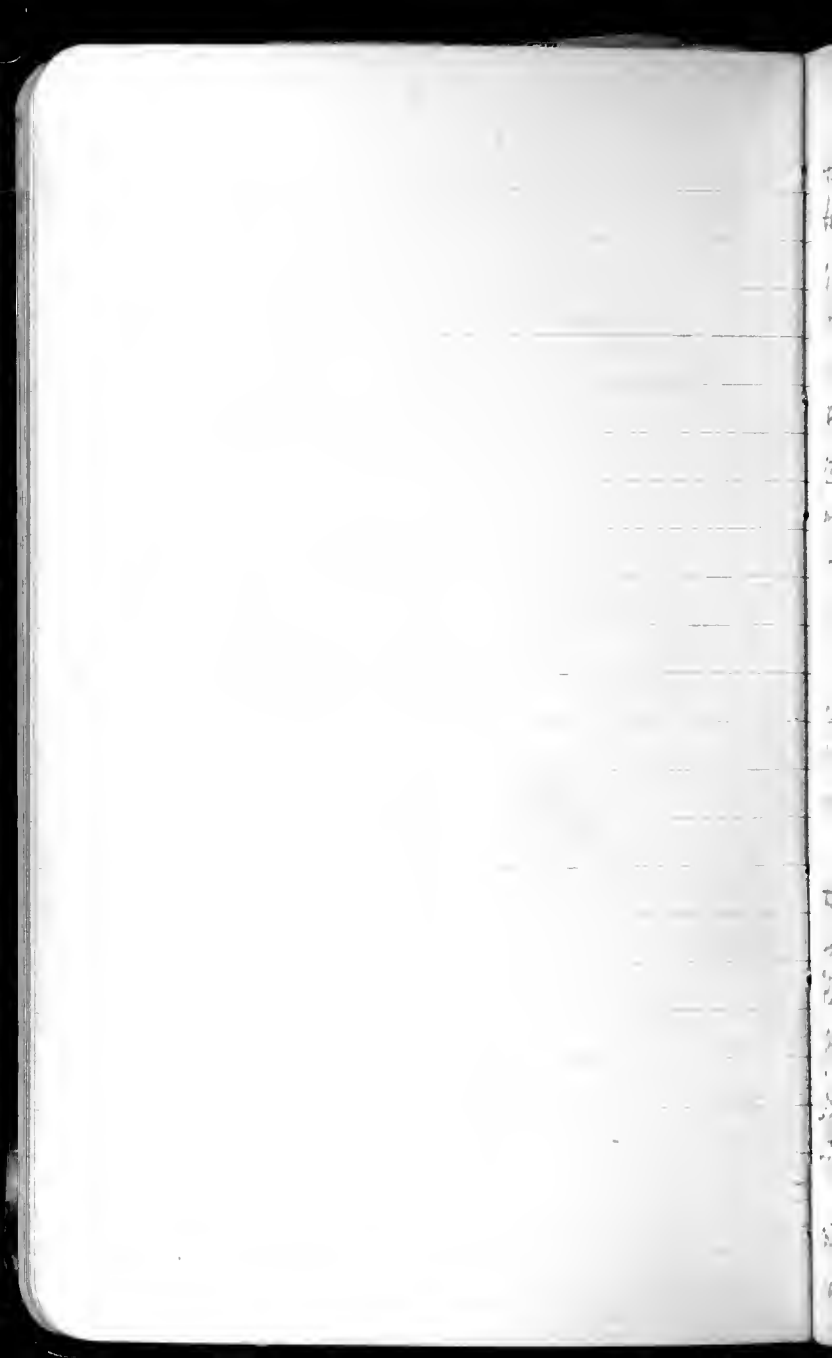
Started out at 8 A.M. to see the rest of the Bend to the south east of San Jata. Dark morning, clear in afternoon.

We first stopped at a place in the valley of the irrigated Colorado River about $2\frac{1}{2}$ miles N.W. of Bend. Here and all the way to Bend the Smithwick shale is well exposed. Mr. Bean tells me the thickness is 250 feet, and that the lower 110 is very black. He saw almost no fossils, small Euomphalites and wood like things. Also one seed. These shales are decidedly carbonaceous and on fresh exposure smell of petroleum.

The upper 110 feet of Smithwick is of an olive color and rather a clay than a shale. He saw no fossils. Inside the shale is said to be mottled.

The Smithwick is here conformably overlain by the Shinarump, here thin bedded greenish sandstones with shale partings. Contact was not exposed. The Shinarump here has wood impressions, saws a small Calamites, and worm burrows. One style of worm burrow was new to me and I have two slabs of it.

Then we went on to within one mile of Bend. Here along the south side of the Colorado river are well exposed the lowest beds of the Smithwick. Black car-



Tonaceous shales, smelling of petroleum, predominates and then appears a blue-black impure or earthy limestone of 18 mts thickness that has scattered fossils of great interest. Did not have enough time to collect and it is exceedingly hard to get good fossils out of the shaly weathered surfaces. Trilobites are common, graptolites are rare, Bellerophon like excisus common, an elongate form is rare, and also some brachiopods. We got two good Phillipsia. One curious feature of this limestone are several hummocks that rise above the general level of the li. ^{from one ft to 4 ft.} They are made up of comminuted fossils (see sample) and around the edges are many Bellerophon like excisus. Also got one large shark's tooth.

Below this li. there are ^{6 to} 8 feet of black shale, and then 3 feet of shaly black li, followed below by 4-5 feet of black shale, and then at the river side another ^{2 to 3 feet of} blue-black limestone. ^{See the grey li. in the Marble Falls.} Had no time to see if there were fossil fossils. The Marble Falls li. was not seen here unless the limestone at the water's edge was it.

[Bear says it appears a little with down stream and in the grey li. above which fossils.]

We then went on to a place between 2 1/2 to 3 miles S.E. of Bend beside the old narrow gauge railway that brings out cedar posts and posts to Lampasas.

... the ... the ... with
 ... in ... but an actual
 ... all shales and then
 the ... Marble Falls li.

Cell of Bond series.

Smithonia

225

? Top of Marble Falls

20	
50	
25	
15	
110	Erwin unconformity
10	
5	
10	
1	
12	
6	
54	
164	

164+

Base not seen. Partially
 Lower Bond

20

Roughly

73

482 feet

Here the top of the Ellenburger is exposed, followed
by about 30 feet of the Lower Bend shale, capped
by the ^{base of} Marble Falls li. Here an oolite like that
of Bedford, Indiana ^(see sample). I saw no fossils in it.

In this shale occurs an abundance of small
fossils most of which were got yesterday. They come
in at about 20 feet above the base. See the fossils.

On our way back to San Joto we stopped at
Pump Creek. I made the following rough section.

Limestones at top of cliffs about half a mile to the
north of the road ford. About 20 feet or more.

Heavy bedded dark blue li. The highest cliff makes.
Thickness estimated at about 50 feet, but may be thicker.

Concreted zone but the softer li., maybe like those
next below. About 20 feet.

Earthier thin bedded li. much more than shale partings.
Weather a very yellow ochre color. At least 10 feet.
It is the poorest fossiliferous zone.

An erosion of uneven formity. Irregular hummocks
of 10 inches high and just south of the road ford there
is a normal dip of about 5 feet. The ditching
on either side is marked, but there appears to be no
such significance in time or form.



Heavy bedded dark blue li with much chert.
In one of these chert lumps, I got yesterday foraminifera.
Thickness about 10 feet.

Dark blue thin bedded knotty li. About 5 feet.

① Thin bedded li without shale partings, regular bedded. Appears as one bed. About 10 feet.

Thin bedded gray li. with thin shale partings. There are 2 or 3 beds that together make 12 inches.

Li. same as ① but weathers somewhat shaly.
Thickness about 12 feet.

Distinctly bedded li. About 6 feet.

Li. same as ①. At least 10 feet can be seen to water edge.

This makes at least 164 feet of li. Bean says the total thickness here of the Marble Falls is 175 feet, but because of the faulting he could not get at the actual thickness.

Saw here also a cast of the outside of a goniatite,
the larger one ^{like the one} broken out of a nodule this morning, and
coming from near Islands.

Near the Culacochyehus loc. the Smithsonite is 135
feet thick. Of this the upper 100 feet is ^{side} there and the rest
float of it. Just whether the top is eroded is not known. Why
it is here less than 20 feet thick is not known.

The Ellenburger here near the top is quite hemi-
mitic and clear. Here one or two Smithsonite ^{present} con- in some
surfaces Chilida sections are common. Also saw
one Naclura.

San Jata, Friday March 21 1919

Got up at 6:30 and after breakfast packed my
two large boxes. They will go by Express from
San Jata. Dark morning and cool.

Got started at 9:15 A.M. for Bridgman 38 miles
to the west to see more of these ^{to look because we can't find any of the San Jata beds} ~~beds~~. The distance will

We then drove to a place 7 miles S. 70° W. ^{in the San Jata valley} of San
Jata and collected at the very top of the Marble Falls,
in fact in the first chazy to the Smithwick although no
black shales are yet present. The limestone here are earthy
and blue in color with the slightest shale partings. The horizon
is not over 8 feet ^{thick} Productus is common and is one bed
not over 1 foot thick Aulacosphondylia the first I have ever
collected of this curious brachiopod.

Coming out of San Jata about 1 mile we saw
beds a little higher ^{at the base of the Smithwick} than the bedded blue-black waterlain
interbedded with black shale. We did not stop to examine them.

We then drove along the south side of the San Jata
river ^{to a place} about 9 miles south of Pickland Springs. Near
here ^{about the falls} in a favorable area we saw the strata to great advantage
that is, from the ^{base of Marble Falls} limestones on up. The shales ^{below} could not be seen
here to so good advantage ^{because of the faulting} but at the former locality there
was one deep side ^{exposing strata and undisturbed} for the Ellenburger below to the
limestones above. From the Ellenburger to the sandy zone ^{within the limestones}

45	
30	
10	
2	
12	99 = Marble Falls, lower
48	
2	
30	
1	73: Limestone

Towns pin here

Label marked Base of Lower Marble Falls Limestone

The Coy measured the height as 89 feet and on section
is a little more, or 97 feet. The section descending is as
follows: - [All of this section is below the main portion of Rough
Top at road side not seen.

Thin and thick bedded hard blue li. interbedded with zones
of fine grained sandstone ^{towards the bottom}. The limestones become more and more
cherty upward. About 40 feet.

Heavy bedded slight shaley and ^{thin bedded} coarse bedded
fine grained sandstone ^{that is} pinkish in stained. About 30 feet.

Coarse zone probably of dark to black hard shales. 10 feet.

Limestone conglomerate apparently of interformational character.
See small sample. The pebbles are fairly well rounded and ce-
mented by limestone, up to 4 inches long but usually from 1 1/2
inches. ^{and very coarse} Some fossils are seen, like large crinoid stems,
bryozoa, and Productus. Zone 2 feet thick.

Dark blue earthy or water lime like limestone in some
beds from 4 to 8 inches thick. Has many scattering fossils
and all I have are from this zone. Thickness about 12 feet.

Shale zone. Not seen in first exposure. Possibly an
olive shale. Thickness about 40 feet.

Blue crinoidal limestone replete with crinoidal columns
and other part, 8 to 10 inches thick. Above it 2 or 3 lime-
stones in thickness that together make 12 to 24 inches.

Lower shale zone. Coarse and could not see its character
about 30 feet thick. Probably olive of all.

The Strawn is said to be 4000 feet thick and here it has thinned down to less than 200 feet. Mc Coy tells me that it thins both to the N. and S. What does this mean in ^{the} light of ^{the} ^{fact} ^{that} ^{the} ^{W. Arkansas} ^{with} ^{the} ^{thick} ^{deposits} ^{to} ^{the} ^{N. and} ^{S.?} ^{at} ^{the} ^{same} ^{locality?} ^{He} ^{reports} ^{before} ^{however} ^{with} ^{marine} ^{fossils,} ^{which} ^{is} ^{what} ^I ^{saw} ^{of} ^{the} ^{Strawn} ^{gives} ^{me} ^{the} ^{impression} ^{of} ^{delta} ^{deposits} ^{rather} ^{on} ^{the} ^{marine} ^{side} ^{than} ^{on} ^{the} ^{fresh} ^{water}. The several coral beds and the great sand accumulations may indicate rather the landward side of the delta. If a delta deposit where was the land, in the E. or in the W.? Probably in N.W. Arkansas.

On what basis did Drake call this sandstone and conglomerate Canyon? The chert conglomerate are interbedded with a fine grained decidedly cross bedded sandstone. Can these deposits be of desert formation interbedded with river wash cherts? Has Drake any marine fossils out of these sandstones? Sayer thinks they may be river channel material. For the present I cannot say.

Blue sandy crinoidal limestone. Here they are not so abundant. In places the crinoidal matter is scarce, thinness not to 1/8 inch.

Unconformity

Ellenburger li. with Officella and Cryptozoum.

We then drove out of the Iowa State valley to ^{the higher land of} a
Richland Springs. Our road soon left the bend
and we went over the stream to fall where we saw
the last of the stream. ^{Said the base of the stream is 200 feet thick.} Then the road descended into
the Smith rock shale ^(then in some depth of the above stratum) and then we rose to higher
land we were in the ^{decided cross-bedded base} sandstone and chert conglomeration
of the so-called Canyon. All the pebbles are of chert,
limestone, sandstone, white, greenish and brown. Where did
these cherts come from? Some ^{are undoubtedly} from the Ellenburger, and others
from the Bend, but some are from other formations.

The road ascended a little more and then we
were in the Comanchian, a good land of many farms,
but of a dry climate however. This is a rolling country
with a relief of at most of 100 feet. It has had to erode
very since Cretaceous time. The streams ^{ridges and plain fertile valleys} have cut down
through the Pennsylvanian Bend ^{and canyon} into the Ellenburger.
We left Baird at 3:40 P.M. on the rough Frisco

Since Monday we have traveled by auto thus

Mineola Wells to Cisco	about	70 miles
Cisco to Brownwood	"	75 "
Brownwood to San Saba	"	65 "
San Saba to Bend	"	40 "
San Saba to Brady	"	65 "
		<hr/>
		315 "

It probably is nearer 300 miles.

in a Pullman and will get to Fort Worth at 6.30
A.M. tomorrow.

Fort Worth, Saturday March 22 - 1919

Got here on time this morning at 6.30, and transferred
to the Santa Fe station where we had breakfast. The Frisco
has a very poor road bed, and so the train goes very slowly
over the very rough and rocky railway.

It is a fine sunny and cool morning.

Now that I have seen the Bend I am agreed with the
author of the series, Cummings, that all is one formation and
that it is much better placed at the base of the Pennsylvanian
system than to place any part of it into the Mississippian. The
question that now arises is, is any part of the series at Marble
Falls of the age of the Mississippian. The lithology of the Lower
Bend is tied and is unbroken with the Marble Falls li. While
the lower shale formation is very meager there is nothing in it of
Miss. age. Not only this, they seem to have specific linkages
with the Marble Falls.

The Marble Falls li. is unmistakably Pennsylvanian
and it does not now seem to me to be so old as even the
Monroe. There are many Penn. species in it.

The *Smithonia* (true) fauna is a very peculiar one due



to the peculiar environmental conditions. ^{these} It is again one of
those whole fauna with a peculiar bottom life and here
with the introduction of ^{in this it reminds of the Pelagia and so-called Pelagial} nautiloids and goniatites. The Smith-
sonian must have to be judged by itself, though the cephalopods
must keep much to a final eye determination.

We left Fort Smith at 8.30 on the Santa Fe for
Oklahoma City where we arrived at 3.30. Looked
about the city and called on Professor Gould. Had
supper at the Lee Hotel and
the movies, and at 9.30 retired to a
Pullman.

Sunday Bartlesville, March 33-1919.

Arrived here this morning at 5.30. Stopping
at Hotel St Clair, a house of rooms only. Spent
the morning at McCoy's office, and he showed me the
Empire Fuel and Gas Co. elaborate system of recording
all that is known about oil wells, their drilling and
production. McCoy has a better hold of the general
geology of Kansas and Oklahoma than any other man.
He is a hard worker and a deep thinker along all
lines of geology and engineering, but does not claim to know

The horizon in the Seneca formation

anything about fossils and correlations based on fossils. He presented me with a map on which he sketched the surface outcrop of various Pennsylvanian formations.

In the afternoon Mr. Carpenter the lead geologist of the Empire Co (a classmate of Chester A. Reed) took me in his car along with Schneider, Beyer and Grege to a ^{near the Blue Mts. has some good beds as well.} famous fossil locality in the Tola. ^{It is near the Kansas line} Gastropods are very fine here. The place is 10 miles north and 3 to 4 miles east of Bartlesville, Okla. ^{his is 2 miles east of Owen} School House N. W. corner of Nowata quadrangle Co. The fossils in the main are gastropods and bivalves with the shell on and Puzosia radiosa montana here very large and common. Almost no other fossils are seen. The fauna remains of the Trias of Graham Texas, but are ^{also} not about the same things as the top of the Canyon.

Grege said he would send me the material he collected at a previous time from this locality.

in log and margin sheet.
These logs for li. sh. and ss. are obtained in on curves and on the
margins x are made for the main li. or ss. horizons. In this way also
quick lithologic correlation can be made. The block holes are analyzed
for oil percentage to aid in spotting the probable sources for the oil.
The percentages of a mixed ss. sh. or ss. or sh. in a li. is gotten by
centrifuging. On this basis a log well record can be logged in about
one week's time.

(McCoy) Photo. system of subsurface recording is elaborate
and on a high scientific basis.

Oil of these lies the upper part from Tazewell eastward, but
thickens rapidly for some distance westward. The Big Lignite runs to
nearly 100 feet. But 70-80 miles to the W. all are gone over into
other things. In general the li. runs out to the W. and to the N.E.
and I think this near the Hopkinton but I never found his channel
river deposits.

Bartlesville, Okl. March 24-1919.

Had breakfast here and then visited the Empire Co's building to see Mr. Supers work in relation to the well record samples. Of nearly all the wells a record is kept, but this is mainly out of value in geology, rather for other purposes. Mr. Traeger does the work in determining the lithology ^{some minor of mica, pyrite, etc. fossils,} and chemistry of the logs. Has a laboratory of his own. In another lab. all the water are analyzed and there is a great variety, and at the same time a constant list of values to the sedimentary geology. The recording system in the Co's department is elaborate and of thousands of wells.

At 2.30 P.M. started out in a large car to the I.E. to geologic about Muskogee. In the party are McCoy, Supers, Ryan and Traeger, a paper young lot of geologists. From Bartlesville we went via Ramona to Vera, Collinsville to Claremore where we put up for the night at the Mason Hotel.

We started down in the Devonian section beginning with the Dewey li. ^(less than 10') and then the ^(less than 10') Higdon. The former is a thick ^(25 to 35') persistent horizon. ^(less than 10') followed by the ^(about 10') Big ^{a widely persistent zone.} mine of the shales or the beds, which the latter made a great cliff down which we descended to the Fort Scott li. the last one seen this afternoon. In the Coleport we saw small exposita, martini, zicker Campophyllum or Lophophyllum and crinoidal etc.

I am told that all of these lie change into shales or sandstone either in Kansas or in southern Oklahoma. The Grant ^{which lies above the Osage} is probably the least persistent as it is about 40 miles long from N. to S.

The whole of this Permian sedimentation is that of a very shallow sea. Shales predominate, and the sandstones which are found are more or less muddy and often ripple (cross-rippled) and even bedded. The li. appears always to be non-crystalline and muddy. Bergen says that he has seen some bedding in some of the sandstones.

The material came from the southwest (Arkansas) but much must have come in from the old land of western Kansas and Colorado. *Gyrodia* could have furnished but little.

The Coleophanes appeared to have no material species, rather all of the species ^{apparently} to be ^{small} or young specimens. Then too the limestone appeared to me to be of an intraformational character, i.e., rolled of sea bottom destroying all life.

All of the limestones seen today are impure and they are often associated with ^{fine-grained} sandstones while the interbedded shales are usually sandy. All of the limestone give way to ^{shales or} sandstone to the south and west.

The rest of the Penn. section to the west of Bartlesville is as follows:-

Permian	{	Maple li
		Cottonwood li
		Deer li
		Franklin li.

Pennsylvanian

Red sands, then bedded 500 to 750 feet

Parksville - Topeka, Deer Creek, ^{and} ^{li} Grand ^{li} 1000 feet.

To the west these pass into a thick series of cross-bedded sandstones.

Grant li. at least 40 miles long.

Then the section seen today, and described above.

This coal zone occurs in little bags between here
and Claremore, where I saw the first little coal mine.
The coal appears to be fair, though it is not of the best. We
collected a few fossils here, among them Chara and Mus.

Claremont, Tuesday, March 25 - 1919.

We left at 7:15 ^{am.} at Broken Arrow we see the "Terminal Bluff" of the Big Limestone, and in the town the last of the Fort Scott. We are now in the Carboniferous Valley. East and south of this place there are ^{no} more of the Pennsylvanian limestones. All have gone over into shales or sandstones. We are at Broken Arrow at 9:15.

A few miles N.E. of Broken Arrow there is a little coal mine (coal 3 feet) between two members of Fort Scott li. Over the coal there is a blue clay followed by the upper li. of the Fort Scott.

At a place 8 miles east of Broken Arrow we come upon a li. with four fossils. See the list. ^{This horizon is 100 feet beneath the Fort Scott li.} ~~They~~ ^{Cooper} said he saw Concordia and Concordia. There are also small Archaeocerasid fossils. ^{above the li there is a sandstone zone, then blue shales, and at the top beneath the Fort Scott li. ^{there is} another sandstone.} McCoy tells me that the Cherokee here is about 500 feet thick. ^{between the upper and lower Cherokee} S.E. the formation of shales and 4000 feet of sandstone, some of which extend further southeast beneath the Cherokee there is still another 4000 feet of sandstone.

^{by the section top} end of section 23, 187. 16 E. ^{here.} There is a fault ridge. To the west the strata dip ^{and the plateau to the west} ^{immediately} to the W, but to the S.E. the strata dip 12 degrees ^{to the west} ^{then an} ^{oil} ^{well} and by the strike ^{there are} ^{more} ^{faults.} ⁱⁿ ^{faulting} was done

The following system was given me by Mr. Coe:
Beginning at the base of the Pennsylvanian and going upward.
Marion formation.

Atoka. Mostly ss. with lens of shale. 1500 to 4000 feet.

Usually said to be 4000 feet thick.

Hartshorne ss. 500 to 1000 feet.

Has some shale members, and some coal.

Cherokee shales and some ss. 5000 feet.

Made up of

McClester 500-4000' Has coals.

Savannah ss. 300-500'

Boggy ss. and sh. 1500 to 2000'

Each 50 to
200 feet
thick.

Amoria sh.

Therman ss. = highest ss. lowest Fort Scott.

A shale member

Calvin ss. = Fort Scott.

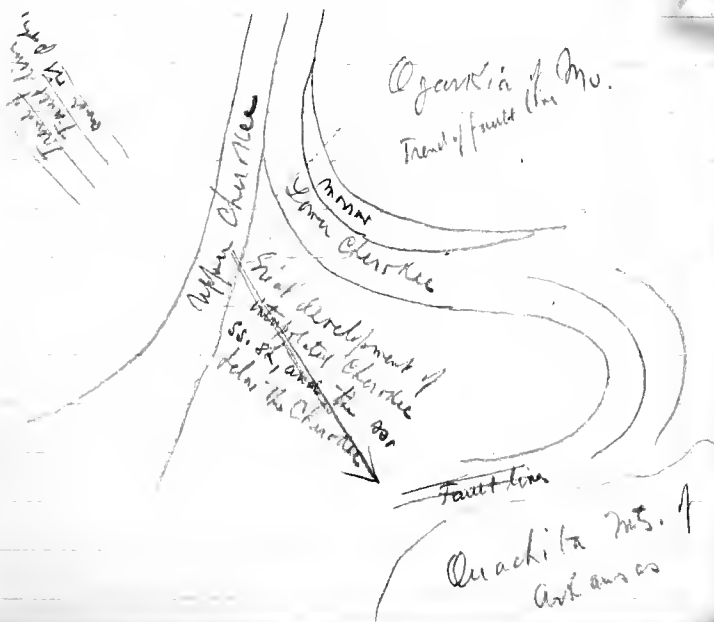
These thicknesses do not occur in any one place.

Probably at no place is there more than 5000 to 6000 feet.

For more detail see U.S. Geol. Survey Atlas, Edgemoor and
Muskegon.

in middle Cherokee time, a just previous to Bogy time. The
 later Cherokee lies horizontally or near all over ^{the faulted Cherokee.} in the Coy
 think there must be many of these faults beneath the surface
 in Oklahoma and that many of the oil pools are lined up on these subsurface
 fault lines.

An machine broke down about 3 miles out of Coستا at
 12.30, and we then walked into the town. Our car finally
 arrived, pulled - by another machine. We then concluded to
 go to Muskogee by rail at 4.30 P.M. Arrived at 5.30 P.M.,
 stopping at a rather fine hotel - Levers.



Section of Quarry at Klong.

(Boyer has a detailed section, marked on a photo).

? Disconformity light greenish sandstone, weathering first yellowish and then reddish. By its color they identify it as being a supposed to be the ^{the} outlying base of the Permian ¹⁰⁰ beneath the Cherokee. Lies over all members down to Brown.

Money, according to Schneider and Mc Coy

Thin and thick bedded greenish grey muddy sandstone, with some shale partings. At the base there is from 2 to 4 feet of li. thickness about 15 feet.

Greenish being shale locally that elsewhere changes into thin and thick bedded li., interbedded with greenish shale.

about 15 feet.

Heavy bedded yellowish grey li. without shale partings.

Partly 12 feet thick.

Black shale with some thin impure li. This is an irregular zone, and the amount of li. is very variable. There is a fossiliferous zone (D). Thickness 10 to 15 feet.

Heavy bedded yellowish grey li. with irregular zones of green shale. Near at the top that the shales and a thin fossiliferous zone. Thickness 12 feet.

Light yellowish earthy li. thickness variable 10 to 15 feet.

Nodular zone, 2 to 5 feet.

Light earthy li., about 8 feet. At base a conical layer. (See two pages over for details).

Not good fossils seen here, but
elsewhere in the Permian zone.

This is an unconformity zone.

Muskogee, Wednesday, March 26 - 1919

Got up at 6 A.M. and we are off at 7.15 for Fort
Sibson via a trolley line 8 miles N.E. of Muskogee. Then
we had a Ford takes us by Fort Sibson (an old abandoned
army post) to a place about 2 miles north of the trolley
station, on the banks of the Grand River also known as
the Nerbera Here on the H. L. and J. F. R. R. at the
open pit Rough there is a large quarry where we
collected all the morning in the ^{original} Monks formation, above
the Archimedes or Grays formation. The great majority
of my fossils come from the upper part of the Monks. After
seeing all the fossils ^{collected} here, I can see nothing of Pennsylvanian
age, and all is to me rather suggestive of Chester. This
Monks fauna has nothing in common with the Permian
of Texas, and seemingly with the Monks described by Mr.
Mather. On the surfaces of the limestone beneath the thick
black shale occur the two species of Pentamerites, Elphipteron, Mickelosis
and the greatest profusion of Bygonia. The Pentamerites go up into the
black shale.

In Schneider report on this area he calls the rough
quarry the Pittkin formation.

Rough quarry continued.

Black very thin bedded li and shale 2 feet

Fossil sandy li. as before 10 feet. Productus ^{flat shell} ~~gone~~ ^{near}
the middle. Zone ③. Thickness 10 feet.

Cluster or Pitkin of Schneider, 20 to 60 feet thick.

Archimedes ^{original} li. with pocket of black shale at top. Thick
non 4 feet. McCoy says this is a Mass formation.

Fossil zone ④
Fossil vills below. Not seen, 60 to 100 feet.

~~Mass~~ li and shale 15-30 feet.

Worm at river level. Not seen. About 200' (Johnston)

This gives a thickness for the Mass of about
114 feet. In actual thickness see exposure measured
section. Schneider gives it as 120 feet

Bridge over Grand River, at Rex, about
8 to 10 miles north of Onondaga.

Pennsylvanian. Top.

Black shale to oxid at top of river bluff 3 feet.

Thin bedded sandy li. with black shales. Was almost no
mass. Thickness 2 feet.

Black shale 12 to 15 feet.

Thin bedded crinoidal li. three thin li. separated by

Black shale ^{thin li.} ^{specific zone} } Thickness
li. on top. Estimate red sandstone below } one foot.

Rex section continued.

Black shale 7-8 feet.

Light blue dense fine grained sandstone, 4 feet.

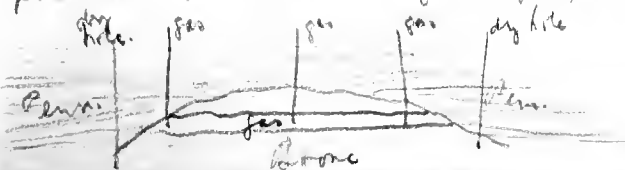
Canda-galli or Taonurus blue black sandy shales completely tanned by the worms, 4 feet.

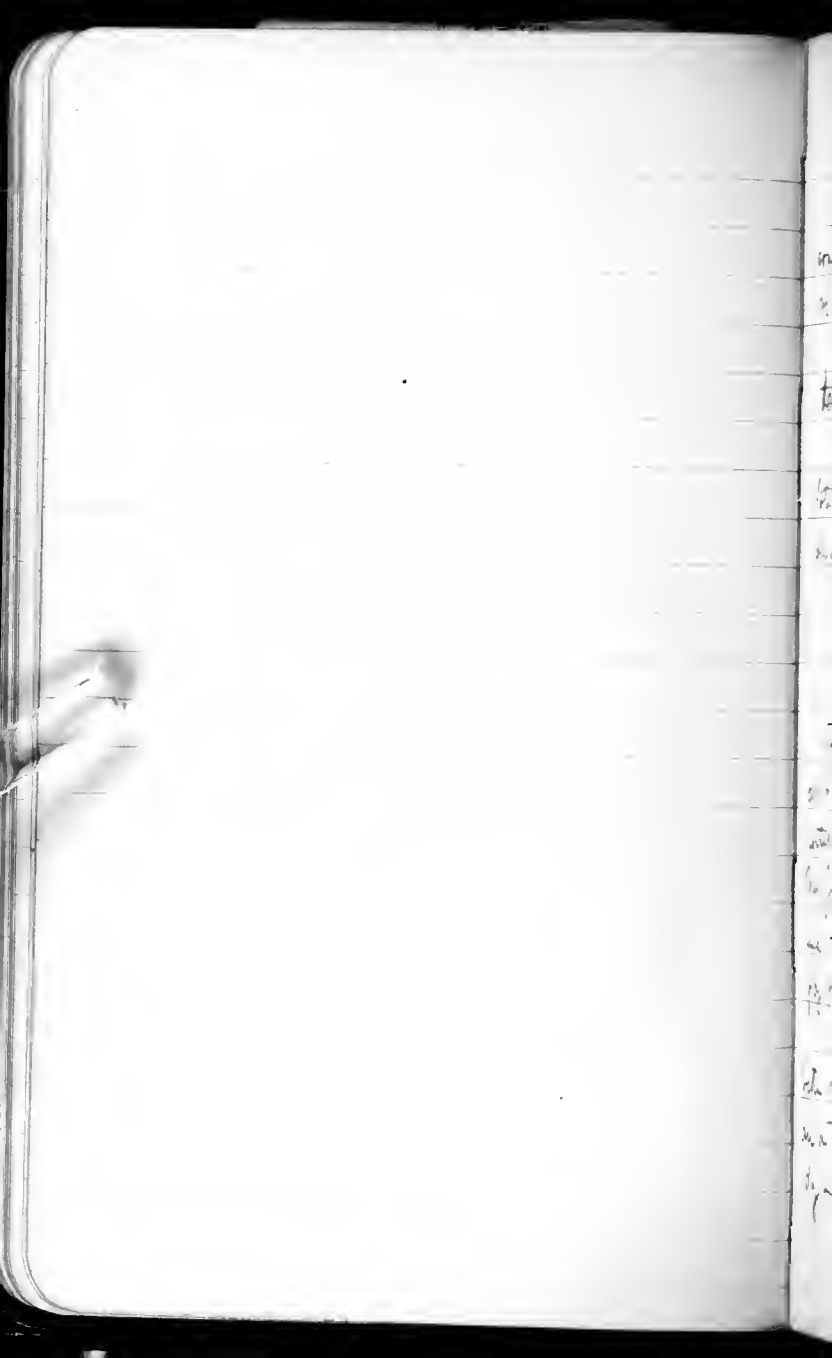
Black shale to river, 8 feet. = 43 feet seen.

These black shales lie in undulations and ^{they show} the effect of oxygen elsewhere. McCoy thinks the horizon may be 70 feet thick, what we saw here at Rex Bridge is about 43 feet thick.

The same black shales also show in the Arkans-
^{near the} sas bridge seen this afternoon and ^{at another bridge} this morning.
 Here also they lie in undulations, where the
 interbedded zones are said to be cherts, probably sandstones.

To the westward of Muskogee at Vinita (a small oil field) an old wooden dome of the Boone protrudes through the older Pennsylvanian. McCoy says many similar domes are encountered in the logs of oil wells. In many of the Boone domes there is a gas horizon, there is





Mustyge, Thursday, March 27-1919.

Got up at 6 A.M. and at 7.30 we found we could not get an auto for a half day under \$10. we concluded to abandon the trip.

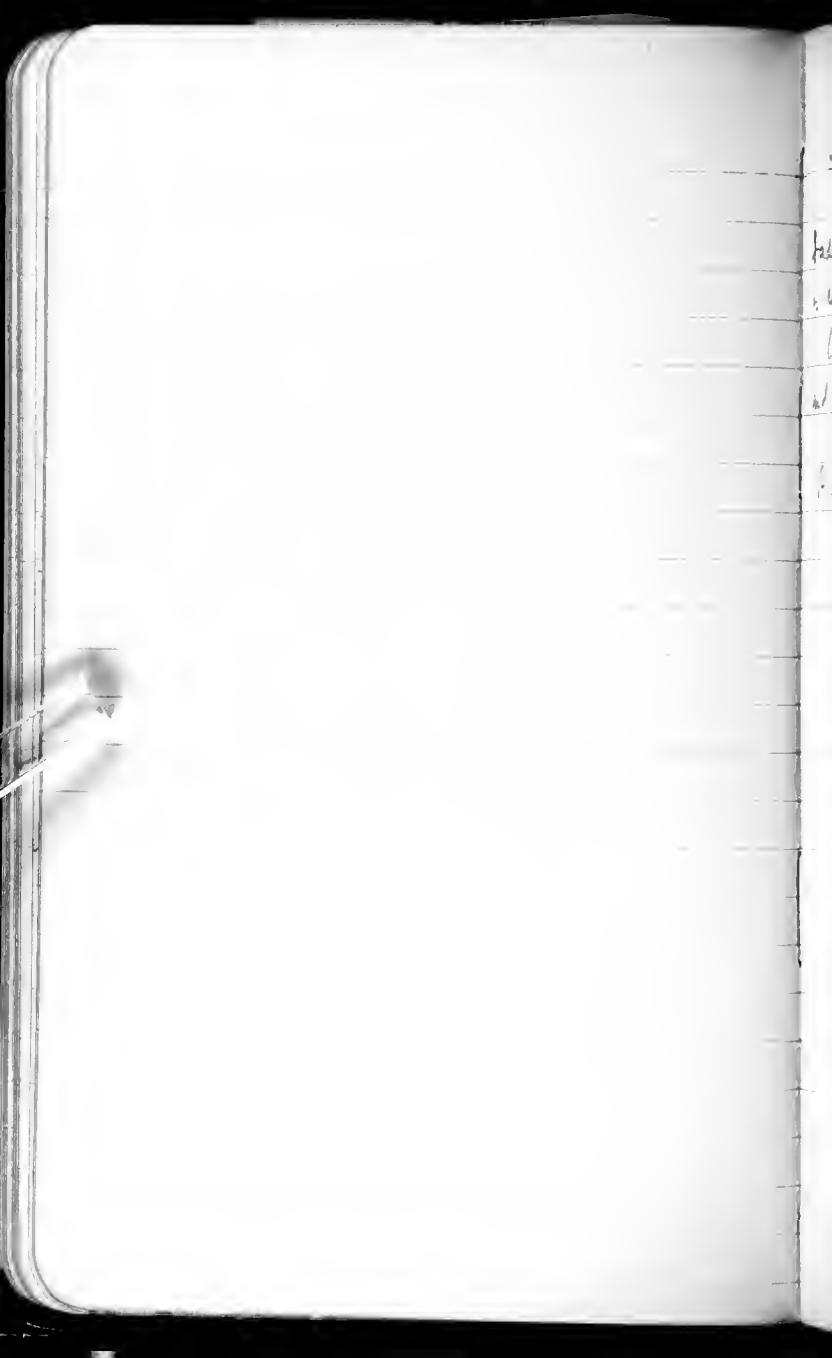
Then packed the boxes of fruit and shipped them via express; charges \$6.92

Left on the "Katy Flier" at 5.15 P.M. 40 minutes late. At Vinita we were held up by a small crowd ahead.

Katy Flier, Friday March 28-1919

The "Katy Flier" is not flying today. Instead of arriving at St. Louis at 8 A.M. we are not to arrive until noon. I was wonder if we will catch the New Yorker at 12.02 P.M. We arrived at 11.15 A.M. and I found my lower berth waiting for me. Had to pay for berth, extra fare and down taxes \$8.76.

The "New Yorker" is flying right along and we far better road way than anything to the east or south. We are on time right along. Had dysentery most of the day and I go to my berth at 8 P.M.



Saturday March 29, 1919 En Route east.

Got up at 6.30 and had the work room to myself. Had breakfast immediately west of the Horseshoe Bend. It is cold, with sun-shine and snow-flurries.

All day long we speed on or time through Penn. and get to N.Y. at 3.10 in a day of sunshine.

Left at 4 P.M. for New Haven. At 6.15 P.M. I am at home once more.





Account of Alex McCoy #60. ^{Hotel besides #210.} March 15-1919.

Expense Account

March	10-1919. R.R. New Haven to Dallas	56.05
	10- Sleeper to St. Louis	6.60
	11 Lunch at New Haven	.60
	11 Sleeper St. Louis to Dallas	4.95
	11 Cat at N.Y.	.80
	11 Extra fare N.Y. to St. Louis	1.08
	11 Dinner on cars	1.35
"	12 Breakfast " "	.70
"	12 Dinner " "	1.25
"	12 Supper at St. Louis	.60
"	13 Breakfast on cars	.70
"	13 Dinner " "	1.00
"	13 Porter " "	.50
"	14 Breakfast in Dallas	.60
"	14 Dinner " "	1.00
"	15 Breakfast " "	.60
"	16 3 nights hotel Oriental, Dallas	9.00
"	26 R.R. New York to N.Y.	49.02
"	26 Sleeper " to St. Louis	3.30
"	26 Telegram for sleeper on St. Louis	.15
"	27 Prepaid Express charges on boxes	6.92
"	27 Dinner in N.Y. Meyer, Trojer and J.	6.00
"	28 Breakfast	.20
		153.37

Fare West to Dallas	— 68.68
Fare East from Murkyn	— 63.53

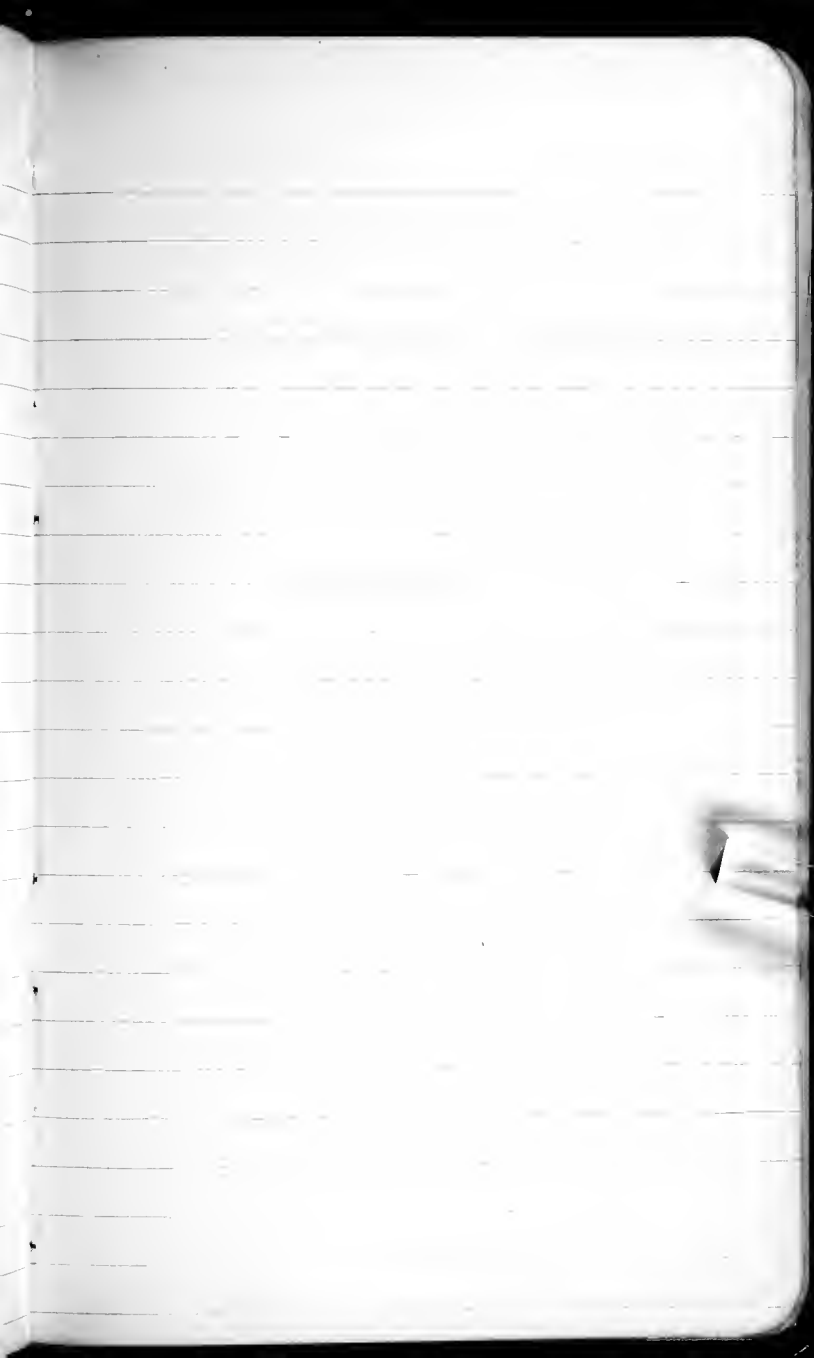
153.37

March 28	Extra fare St. Louis to N.Y. and tax	8.76
" 28	Lunch at St. Louis	.70
" 28	Dinner in cars	1.50
" 29	Breakfast in cars, at House of the Bend	.60
" 29	Lunch " "	1.50
" 29	Cat transfer in N.Y.	.90
" 29	N.Y. to N. Haven	2.24

169.57

The trip cost me about \$150.
 Received of Mr. ... 60
 Actual cost to me of trip. \$120

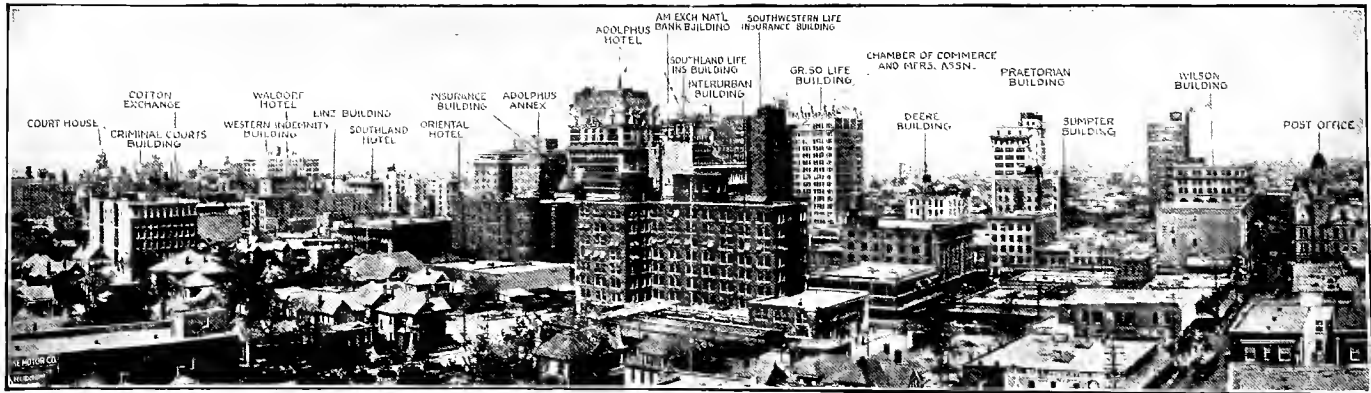












1919 DALLAS—WHERE MEN ARE LOOKING FORWARD 1919

