

SUBSURFACE GEOLOGY OF THE IUKA-CARMI POOL AREA,
PRATT COUNTY, KANSAS IN RELATION TO PETROLEUM ACCUMULATION

by

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INTRODUCTION

Purpose of Investigation

The purpose of this work is the analysis of the stratigraphy, structure, and geologic history of the Iuka-Carmi Field Area, Pratt County, Kansas, and the relationship of these factors to economic petroleum accumulation.

Location and Physiography of the Area

The area is located in the Northeastern one fourth of Pratt County, Kansas (Appendix, Fig. 1) including sections 7 and 18 of Township 26 South, Range 11 West; Sections 11 through 16 and 19 through 34 of Township 26 South, Range 12 West; Sections 22 through 29 and 32 through 36 of Township 26 South, Range 13 West; Sections 4 through 8 and 17 through 20 of Township 27 South, Range 12 West; and Sections 1 through 5, 9 through 15, 23 and 24 of Township 27 South, Range 13 West.

The area comprises 60 square miles and is situated between the City of Pratt to the southwest, the town of Preston to the east, and the community of Strickler to the northwest.

The area lies entirely within the Great Bend Prairie physiographic province. The surface of the area is covered with wind-blown sand which is poorly drained. The only drainage is a small intermittent stream which flows southeast through the southeastern corner of the area and is a tributary to the Minnescah River.

Until the year 1943 the area was primarily an agricultural community with wheat and milo being the principal crops. In 1943 the Carmi Field

was discovered (Ver Wiebe, 1943) and since that time the production of oil and gas has developed into an important industry in the area.

Procedure

Six sub-surface structure maps and three isopachous maps were constructed as part of the research. The structural maps were drawn on the Heebner shale, Lansing-Kansas City group, Mississippi, Viola, Simpson and Arbuckle. Thickness maps were drawn to depict the interval between the Mississippian and Viola, Viola and Simpson, and Simpson and Arbuckle. The thickness of the Arbuckle could not be determined due to lack of wells which had penetrated to the basement.

Two cross sections were also constructed to show relative thicknesses and elevations of the various formations.

This information was plotted on a base map of a scale of 4" = 1 mile. An acetate template was used to determine well locations.

All wells available in the area were used for control points. This information was obtained from radioactive logs and from scout cards of the Kansas State Geological Survey.

Figures 6A, 7A, 8A, 9A, 10A, 11A, 12A, 13A, 14A show the subsurface control points which were used for contouring the various formations.

REVIEW OF LITERATURE

Previous investigations of the area consisted of regional studies, and studies of individual oil and gas pools in Pratt and surrounding counties. Numerous investigations of this type were available to the writer. Barwick (1928), McClellan (1930), Roth (1930), Morgan (1932), and Rich (1933) conducted studies of the stratigraphy of Central Kansas which are of considerable importance in geologic literature. Koester (1935) summarized much of this literature and made contributions to the knowledge of the Central Kansas Uplift. Rutledge and Bryant (1937), described the stratigraphy and oil production of the Cunningham pool. Ver Wiebe (1938), described the stratigraphic units of Pratt County. Imbt (1941), made a study of the Zenith-Peace Creek pool, and Kornfeld (1943), a study of the Peace Creek pool which were applicable to the area of this investigation. Lee (1939), Lee and Merriam (1954), Merriam (1955), and Lee (1956), in their studies of regional structures, through the use of thickness maps, added to the knowledge of the area. Latta (1950) made a detailed study of the surface and subsurface geology of Barton and Stafford counties, and the relationship of geology to ground water, which was of use for this area. The oil and gas production of the area and related information was available from the numerous bulletins and circulars of the State Geological Survey of Kansas. A circular published by the Kansas Geological Society, describing individual oil and gas pools of south central Kansas has contributed greatly to the knowledge of petroleum accumulation. The State Geological Survey of Kansas is, at the present time making a detailed study of the geology of Pratt county which will be available at a later date.

STRATIGRAPHY

Pre-Cambrian Era

The pre-Cambrian rocks do not outcrop anywhere in Kansas. They consist of granite, schist, gneiss, quartzite, slate and marble (Moore, et al 1951). No wells have penetrated the basement complex in the area, however, in Stafford county to the north the pre-Cambrian has been logged as granite.

The pre-Cambrian basement complex has two general trends. The dominant trend is generally north-south. The other trend is northwest-southeast. These two trends have been dominating features throughout Paleozoic deformation (Ruedemann, 1935).

Cambrian System

Waucoban and Albertan Series. Rocks representing these two series are absent or are not recognized in the area (Moore, et al, 1951).

Groixian Series. The Lamotte (Reagan) sandstone is probably absent over the area, as it is reported to be absent just a few miles north of the area in Stafford county (Keroher and Kirby, 1948).

The Bonnetterre dolomite lies unconformably upon the pre-Cambrian basement complex. It is a coarsely crystalline dolomite similar to the overlying Arbuckle group. It has an approximate thickness of 100 feet.

The upper Cambrian Eminence dolomite is absent in the area probably due to post-Bonnetterre erosion.

Ordovician System

Lower Ordovician. The Arbuckle group present in the area consists of

the Roubidoux and Jefferson City-Cotter dolomites, which have been identified in Stafford County (Keroher and Kirby, 1948). The Van Buren- Gasconade dolomites, also of lower Ordovician, are absent in the area. The Roubidoux dolomite lies unconformably upon the Bonneterre dolomite.

The thickness of the Arbuckle group in the area varies due to erosion of its upper surface.

The Arbuckle group consists of coarsely crystalline dolomite with some subangular, fine sand zones, and some chert.

Middle Ordovician. The Simpson group of the area is represented by the St. Peter sandstone with the overlying Plattsville formation being absent due to post-St. Peter erosion. The St. Peter sandstone lies unconformably upon the Arbuckle group of Lower Ordovician age.

The St. Peter sandstone contains frosted well-rounded grains of quartz. The lower Simpson beds consist of green shales and sandy shales (Ver Wiebe, 1938).

The Viola which has an average thickness of 80 feet in the area is also of middle Ordovician age. The Viola limestones, also known as the "Kimmswick" consist of dolomites and limestones, the upper part of which contain chert (Ver Wiebe, 1938). The Viola is very porous, due to pre-Mississippian erosion. This is very evident in the neutron curve of radioactive logs, which give the indication of porosity.

The Viola has been one of the most prolific producers of oil and gas in the area.

Late Ordovician. The Maquoketa (Sylvan) shale has been identified overlying the Viola limestones by Imbt (1941) in the Zenith-Peace Creek field to the northeast, but it has not been recognized in wells of the immediate area.

Silurian System

Rocks of Silurian age have not been recognized in the area. The Hunton limestones of Silurian and Devonian age pinch out to the east of the area covered by this report (Geil, 1957).

Devonian System

Rocks of Devonian age lie unconformably upon the Viola limestone; they consist of the Chattanooga shale and a basal sandstone, the "Misener." The "Misener" sandstone has been recognized only in a few wells on the flanks of the main structure of the area, however it may be very thin over the crest of the structure, due to Pre-Chattanooga erosion.

The Chattanooga shale is a black, silty, pyritiferous shale in the southern part of Kansas, and grades into gray further north (Moore, et al, 1951).

Mississippian System

Kinderhookian Series. Unconformably overlying the Viola formation are thin lenses of sands known as "Misener" sands. The "Misener" occurs irregularly as beach sands and off-shore bars. It is lithologically a fine to medium, quartzose sandstone containing black chert (Kornfeld, 1943).

Above the Misener sands is found a series of silty dolomitic limestones with an average thickness of about 30 feet. The upper part of the Kinderhookian Series is represented by a series of red to olive green shales with some sand and white to gray chert. This series averages about 50 feet in thickness (Kornfeld, 1943).

Osagian Series. Throughout nearly the whole area is found a thin section

of limestone which varies in thickness from 60 to 100 feet. It is a chalky, tan to buff limestone with zones of residual chert (Kornfeld, 1943). The upper surface of the limestones is an erosional surface which developed during late Mississippian and Early Pennsylvanian time (Appendix, Fig. 8).

Meramecian and Chesterian Series. Rocks of Meramecian and Chesterian age are not recognized in the area.

Pennsylvanian System

Morrowan and Atokan Series. The Pennsylvanian basal conglomerate rests unconformably upon rocks of Mississippian age throughout the area. It consists of reworked chert and other erosional debris from the underlying rocks, limestones and red and green shales. The thickness is variable, probably from 0 to 50 feet in the area of investigation. Where the conglomerate zone is clean it is a reservoir for petroleum accumulation.

The Cherokee group has not been recognized in wells in the area, however it is reported to have been encountered in the western part of Pratt County (Muehlhauser, 1958). The group is composed of shales, limestones and sandy shales.

The Marmaton group as recognized in the area consists of thick shales containing thin beds of reddish gray limestones. The shales are gray in the upper part and grade into red and green near the base of the group. The Marmaton group has a thickness of approximately 100 feet. (Rutledge and Bryant 1937).

Missourian Series. The Pleasanton group may be represented by a shale underlying the Kansas City group in the area (Geil, 1957).

The Kansas City group lies unconformably upon the Marmaton group through-

out the area. It is composed of the Bronson sub-group, the Lin sub-group, and Zarah sub-group. These alternating limestones and shales have not been differentiated in the subsurface.

The Lansing Group is predominantly limestones which probably belong to the Plattsburg and Stanton limestones in surface outcrop. The Lansing-Kansas City group is considered to be one lithologic unit as there is no distinct break between the two to facilitate their separation in the subsurface. The overall thickness of the Lansing-Kansas City group in the area is from 300 to 400 feet.

The Pedee group consists of the Weston shale overlain by the Iatan limestone. The Iatan limestone is often called the Brown Lansing by drillers in Central Kansas. The limestone is mainly white and is very dense and fine (Moore, et al, 1951).

Virgilian Series. The Virgilian Series consists of the Douglas group, Shawnee group, and the Wabaunsee group in ascending order.

The Douglas group unconformably overlies the Pedee group indicating an interruption in sedimentation and a minor period of erosion. The Douglas group is composed of shales and sandstones with thin hard limestones in the lower part (Ver Wiebe, 1938).

The Shawnee group consists of massive limestones with thin shale partings. The Heebner shale is important as an excellent marker bed which is easily recognized on radioactivity logs. The Shawnee group has at its top the Topeka limestone and at its base the Oread limestone. The group is about 350 feet thick in the area with the Heebner being about 10 feet thick.

The Wabaunsee group consists of thick shales and siltstones interbedded with micaceous limestones and is about 500 feet thick (Ver Wiebe, 1937).

Permian System

Wolfcampian Series. This Series consists of the Admire, Council Grove, and Chase groups, in ascending order.

The Admire group rests unconformably upon the Wabaunsee group throughout the area. It is approximately 100 feet thick and consists of thin limestones separated by thin shales. The formations of the Admire group are nearly impossible to identify in the subsurface.

The Council Grove group is made up of alternating shales and limestones which are thicker than those of the underlying Chase group. The thickness of the Council Grove group is from 300 to 400 feet.

The Chase group is the youngest of the Wolfcampian Series. The Herington limestone member is widespread in the area and is a good marker bed. Its composition is dolomitic with some anhydrite. The lithology of the group is primarily shales and limestones. The thickness of the Chase group ranges from 250 to 350 feet in the area.

Leonardian Series. The Sumner group overlies the Chase group in the area and is composed of evaporites, shales and a few limestones. The Minnescah shale is mainly red, consisting of calcareous siltstones, some gray shales, and impure limestones. The Minnescah shale is approximately 450 feet thick (Moore, et al, 1951). The Wellington formation, which contains the Hutchinson salt member, is overlain by the Minnescah shale. The lower part of the Wellington formation consists of gray shales and anhydrite. The upper part, above the Hutchinson salt member, consists of blue shale, approximately 200 feet thick. The total thickness of the Sumner group in the area is approximately 1,000 feet.

The Nippewalla group is composed of alternating shales and sandstones

with some gypsum beds. The thickness of the Nippewalla group is approximately 600 feet. The predominant color of the Nippewalla group is red.

Triassic and Jurassic Systems

Rocks of Triassic and Jurassic age have not been identified in the area.

Cretaceous System

There are no Cretaceous rocks present in the area, however they are present to the west of the area of study.

Quaternary System

Pleistocene Series. The Meade formation lies unconformably upon Permian rocks in the area. The Meade formation is exposed at the surface except where it is covered by younger sediments. The Meade formation consists of loosely cemented, poorly sorted sands, gravels, and silts. The Meade deposits are a prime source of groundwater in the area. The thickness of the Meade formation is from 0 to over 200 feet (Latta, 1950).

Pleistocene and Recent Series. Dune sand of Pleistocene and Recent age covers most of the surface of the area. The dune sand is composed of fine to medium-grained quartz sand with minor amounts of silt and clay. The dune topography has a relief of 50 feet locally (Latta, 1950).

STRUCTURE

Pre-Mississippian Regional Structure

North Kansas Basin. The north Kansas Basin was located in northeast

Kansas, east of the Ellis arch and north of the Chautauqua arch (Appendix, Fig. 2). The basin was named by Rich in 1933. It was formed by the subsidence of the Nebraska Arch during Cambrian and Ordovician time (Lee, 1948).

Chautauqua Arch. The Chautauqua Arch is an extension of the Ozark uplift into southeastern Kansas (Appendix, Fig. 2). The dipping pre-Mississippian beds on the north flank of the Chautauqua Arch formed the Ozark Monocline (Jewett, 1951).

Ellis Arch. The Ellis Arch is considered to have been a part of the ancestral Barton Arch. The arch is located in central and northwestern Kansas (Appendix, Fig. 2), and was named by Moore and Jewett in 1942.

The Ellis and Chautauqua Arches were a part of a cross structure of the Transcontinental arch (Eardley 1951). A low saddle separated the two structures and is unnamed. These two pre-Mississippian structures separate the North Kansas Basin from the Southwest Kansas Basin.

The area of investigation lies to the south of the main axis of the Ellis-Chautauqua Arches, with the saddle between the two to the east and the Ellis arch to the north and northwest.

Southwest Kansas Basin. The basin was named by Moore and Jewett in 1942 and was located to the south and west of the Ellis-Chautauqua Arch (Appendix, Fig. 2). This pre-Mississippian trough is sometimes referred to as the Colorado Sag (Eardley, 1951).

Major Post-Mississippian Regional Structure

Central Kansas Uplift. This area is located in northcentral Kansas and southcentral Nebraska (Appendix, Fig. 3). The Central Kansas Uplift trends at a slight angle to the grain of the pre-Mississippian Ellis-Chautauqua

Arches (Appendix, Fig. 2). The name "Central Kansas Uplift" was first published by Morgan (1932). This area was originally called the Russell Arch (Denison, 1926), and later the Barton Arch (Barwick, 1928). The name "Central Kansas Uplift" has been the most accepted term in recent literature.

The uplift has been a positive area throughout most of the Paleozoic. It probably originated as a series of batholiths which intruded the pre-Cambrian. During the Paleozoic and Mesozoic eras, there were six periods of epeirogeny; post-Algonkian, post-Canadian, post-Hunton, early-Pennsylvanian, post-Missourian, and post-Cretaceous. Folding became dominant in early Pennsylvanian and post-Cretaceous time (Koester, 1935).

The Hugoton Embayment. The Hugoton Embayment was the name first used for the embayment extending from the Anadarko basin into southwestern Kansas (Appendix, Fig. 3). This embayment was first called the Dodge City basin by McClellan (1930) and later by Moore and Jewett (1942).

The Hugoton Embayment is bordered structurally on the west by the Sierra Grande Uplift; on the southwest by the Amarillo Uplift; on the northwest by the Las Animas Arch; on the northeast by the Central Kansas Uplift, and on the east by the Pratt Anticline.

Northern Basin Shelf. The Northern Basin Shelf of the Anadarko Basin extends north and west from the Basin proper into Comanche, Clark, Barber, and southern Pratt counties (Appendix, Fig. 3).

The Northern Basin Shelf was named by Wheeler who observed that the Pennsylvanian strata have an abrupt change in rate of thinning which would indicate a shelf area (Jewett, 1951).

Salina Basin. The Salina Basin was first described by Barwick (1928). The Pre-Mississippian North Kansas Basin was divided into two parts by the

Nemaha Anticline, these being the Salina Basin to the West and the Forest City basin to the east (Appendix, Fig. 3).

Sedgwick Basin. The Sedgwick Basin is a south plunging, relatively symmetrical extension of the Anadarko Basin (Merriam and Goebel, 1956). It is west of the Nemaha Anticline, south of the Salina Basin, and east of the Northern Basin Shelf (Appendix, Fig. 3). The Sedgwick Basin was named by Moore and Jewett (1942).

Minor Structures

Ellsworth Anticline. A structure extending from the vicinity of Ellsworth to beyond the southern limits of Rice county was named the Ellsworth Anticline by Koester in 1934. This structure was extended across Stafford county by McClellan (Welch, 1951). The axis of the Ellsworth anticline was shifted to the east in southern Stafford county by Geil (1957). This relocation of the structure was determined on the basis of a structural high apparent in the Arbuckle and Lansing formations.

Pratt Anticline. The largest and most important minor structure is the Pratt Anticline, which trends northeast through Stafford, Pratt, and Barber counties (Appendix, Fig. 3). The Pratt anticline is believed to be an extension of the Ellsworth anticline. This is in agreement with the findings of Geil (1957) and Muehlhauser (1958).

The Pratt Anticline is nearly parallel to and about 100 miles west of the Nemaha Anticline. The writer believes that the east flank of the Pratt Anticline is faulted similarly to the faulting along the Nemaha Anticline, with the east side being downthrown, displacing the Viola limestones and

the Simpson formation approximately 100 feet. This is shown on the Simpson structure map (Appendix, Fig. 10) and on the Viola structure map (Appendix, Fig. 9). The fault is shown on the Arbuckle structure map (Appendix, Fig. 11). Due to lack of control points available on the Arbuckle surface, the fault is not as prominent as in the Viola, Simpson and Mississippian strata (Appendix, Fig. 11A). The time of faulting is post-Mississippian; pre-Pennsylvanian as the Pennsylvanian and younger beds are not displaced (Appendix, Fig. 5).

Kornfeld (1943) describes a fault in the Peace Creek Field of Reno county, extending from Sec. 16 T. 23 S., R. 10 E., to Sec. 19 T. 24 S., R. 10 E. The fault is normal with the east side downthrown with a displacement of approximately 150 feet. The Peace Creek Fault and the fault found in the area of this investigation are located along a line parallel to the Ellsworth-Pratt Anticline trend (Appendix, Fig. 3). This is suggestive that they may be of similar origin, however this cannot be determined without further study.

Minor Post-Mississippian Structures

Cunningham Dome. The Cunningham Dome is located 5 miles southeast of the area of this report, and is parallel to the structure of the area. The Cunningham Dome is an elongate structure plunging to the southwest with a slight northwesterly tilt (Rutledge and Bryant, 1937).

GEOLOGIC HISTORY

Pre-Cambrian Era

Little is known of the pre-Cambrian history of Kansas, however both

igneous and metamorphic rocks have been recognized from well cuttings and cores. In pre-Cambrian time batholithic intrusions cut pre-existing rocks and metamorphosed these rocks to form the quartzites, gneiss, and schists which are better known as the basement complex. Extensive erosion followed which probably lasted into the Cambrian.

Paleozoic Era

Throughout much of Paleozoic time the area of investigation was alternately submerged and elevated. The Waucoban and Albertan epochs of the Cambrian were periods of erosion of the underlying basement rocks. The surface was possibly peneplained with a few resistant rocks projecting above the general surface. Croixan seas spread over the area, reworking the erosional debris and depositing the Reagan sandstone. Deposition continuing through Bonneterre time is indicated by the gradation of the Reagan sandstone into the Bonneterre dolomite. It is possible that the Reagan sandstone was not deposited over the area of investigation as it may have been a topographic high during early Croixan time. At the close of Cambrian time, the Central Kansas Uplift was elevated and erosion of earlier sediments resulted.

The Eminence dolomite sequence may have been deposited and then removed by post-Bonneterre erosion, or it may never have been deposited over the area.

The seas advanced again in lower Ordovician times, depositing the Roubidoux, Jefferson City, and Cotter dolomite sequence. The seas again retreated and the Cotter sequence was subjected to erosion. When the seas again encroached upon the area the St. Peter sandstone was deposited,

followed by the deposition of the Plattsville formation, however the Plattsville is absent from the area due to post-St. Peter, pre-Viola erosion (lee, 1956). The Viola limestones were deposited over the area, followed by extensive erosion which resulted in considerable dissection of the Viola limestones. This period of erosion increased the porosity to form the petroleum reservoir of the present (Appendix, Fig. 9). Following this period of erosion the Maquoketa shale was deposited over the area followed by the Hunton limestones of Silurian age. Following the deposition of the Hunton limestones there was a period of extensive erosion which removed the entire sequence of Silurian rocks and the major portion of the Maquoketa shale, however the Maquoketa may be found in topographic lows of the Viola. Again the Viola limestones were exposed to weathering where not overlain by the remnants of the Maquoketa shale. The Chattanooga shale was then deposited unconformably upon the Viola and scattered remnants of the Maquoketa. The writer concurs with Geil (1957) that the post-Chattanooga erosion which followed divided the Devonian and Mississippian rocks in the area.

After the extensive post-Chattanooga erosion the seas again covered the area, depositing the Misener sands. During the period of non-deposition the area was uplifted thus causing the Misener sands to be deposited as beach sands and off-shore bars. Above the Misener sands were deposited the Kinderhookian limestones, followed by another period of erosion which removed a portion of the section. This period of erosion was followed by the deposition of the Osagian limestones.

At the close of the Mississippian period extensive erosion predominated. The Central Kansas Uplift was re-elevated, the North Kansas Basin was divided

into the Salina Basin and the Forest City basin by the uplift of the Nemaha Anticline. Faulting along the southeast flank of the Central Kansas Uplift gave rise to the Ellsworth-Pratt Anticline. This period of tectonic activity encompassed all of Meramecian and Chesterian time. The Mississippian strata of the area were deeply eroded giving rise once again to good porosity.

The period of erosion between the Mississippian and Pennsylvanian produced one of the major unconformities of the area, lasting through the Morrowan and Atokan epochs of the Pennsylvanian.

Folding which occurred from Late Mississippian into Early Pennsylvanian followed a general northeast-southwest trend which may have been controlled by faulting. These structures had their beginnings in pre-Mississippian time, but the predominant deformation occurred in the Morrowan epoch of the Pennsylvanian.

The Cherokee seas began to cover Kansas from the southwest in Des Moines time, but did not cover the Pratt Anticline (Merriam, 1955). As the seas transgressed up the Pratt Anticline and Central Kansas Uplift the Pennsylvanian basal conglomerate was deposited. As the seas continued, the Marmaton group was deposited upon the erosion surface. Following the deposition of the Marmaton group the seas retreated and the Marmaton group was subjected to post-Marmaton erosion. Pleasanton sediments were probably deposited over the extreme southwestern portion of the area as a shale which cannot be distinguished from the Kansas City group. The seas continued to overlap the area as the Kansas City group was being deposited. Fluctuations of the sea during Kansas City time caused cyclic deposition, which was more controlled than in the area of outcrop in eastern Kansas, as the limestones are thicker and the shales thinner than in surface outcrop.

The Pedee group was deposited over the entire area, with the entire section being present, indicating that the area was not affected by post-Iatan erosion.

As the seas returned the Virgilian series was deposited over the entire area, including the Central Kansas Uplift. The Wabaunsee group was also deposited over the entire area before the interval of erosion which ended the Pennsylvanian Era.

The thickness maps of Merriam (1955) and Lee (1956) indicate no deformation of the Ellsworth-Pratt Anticline trend after the deposition of the Lansing group, however, the Heebner shale shows that slight deformation has taken place since deposition of the Shawnee group (Appendix, Fig. 6). This, however may be due to differential compaction of the upper Pennsylvanian and younger sediments over the Pratt Anticline. It cannot be determined if similar deformation is present over the Ellsworth Anticline due to lack of a subsurface structure map of the area.

During the Wolfcamp epoch the seas returned to the area depositing alternating limestones and shales similar to those of the Upper Pennsylvanian. In Leonard times the climate became progressively more arid and the sediments deposited became predominately shales and evaporites. At the close of Permian time the entire area was tilted to the southwest toward the Hugoton Embayment.

Mesozoic Era

The entire central Kansas area was above sea level throughout Triassic and Jurassic time. During this time the Hugoton Embayment was tilted to the northwest (Merriam, 1955). Permian sediments were exposed to erosion until

Early Cretaceous at which time Commanchean seas transgressed the area depositing the Cheyenne sandstone as a continental and littorial deposit. The Kiowa shale, which is marine in origin was deposited before the seas retreated from the area. The last time the seas covered the area was in Gulfian time. This resulted in the deposition of the Dakota sandstone, the Colorado group and an unknown amount of Montana group rocks. At the end of the Cretaceous period the entire area was tilted to the northwest, and severe erosion followed, laying bare once again the rocks of Permian age.

Cenozoic Era

During Tertiary times the Permian rocks were eroded and the Ogallala formation of Pliocene age may have been deposited and subsequently removed by erosion. The Meade formation was deposited over the eroded Permian rocks during Pleistocene time, as a heavy flow of sediments from the Rocky Mountains and Western Kansas was carried into the area. During Late Pleistocene time a dune topography began to develop as wind-blown sands were carried over the area. The wind-blown sands continued to be deposited throughout Recent time.

HISTORY OF DRILLING IN THE IUKA-CARMI POOL AREA

Drilling in 1937

In the year 1937 a second oil pool was discovered in Pratt county. The discovery well was drilled on the Runyon farm in Sec. 11, T. 27 S., R. 13 W., by the Atlantic Refining Company and was completed in December of that year. The well had good showings of oil in a dolomitic layer at the top of the

Simpson but was drilled on to the Arbuckle limestone. A hole full of water was encountered at this lower zone and the well was plugged back to the Simpson. The Simpson was acidized with 2,000 gallons of hydrochloric acid giving the well a potential of 397 barrels of oil with 2 million cubic feet of gas. Before the end of the year 2,921 barrels of oil had been produced from the well (Ver Wiebe, 1938).

Drilling in 1938

In 1938 two other wells were completed in the dolomitic layer of the Simpson.

Drilling in 1939

Atlantic Refining Company drilled a test well on the Hacker farm in Sec. 11, T. 27 S., R. 13 W., 0.5 mile south of the newly opened Iuka pool. This well, finding the dolomitic layer of the Simpson with little or no porosity, was drilled 9 feet deeper and abandoned (Ver Wiebe, 1940).

Drilling in 1940

1940 was a year of continued drilling activity in the area, with the completion of Skelly's No. 1 Helmke in Sec. 1, T. 27 S., R. 13 W., which was completed in the upper 13 feet of the Arbuckle limestone. The potential of this well was 1,572 barrels per day. At the close of 1940 the well also had 15 million cubic feet of gas in the Simpson. Two other wells were completed in the area with production from the Simpson. Two dry holes were drilled in 1940, one in the NW $\frac{1}{4}$, Sec. 1, T. 27 S., R. 13 W. by Marlyn Oil

Company, and the other 1 mile southeast in Sec. 13 (Ver Wiebe, 1941).

Drilling in 1941

Iuka Pool. Four additional wells were drilled in the Iuka pool in 1941, all producing from the Simpson. One dry hole in Sec. 1, T. 27 S., R. 13 W., which seemed to limit the pool in this direction was drilled by Tuesday Oil Company.

Stark Pool. A test well drilled in 1941 by George Reeves on the Stark farm in Sec. 18, T. 26 S., R. 11 W., found good shows of oil in the top of the Lansing lime and in the Simpson formation. These shows were not promising however, and the well was plugged back to a Viola gas show and was completed with a capacity of 12 million cubic feet per day. This well is noted as the discovery well of the Stark Pool.

Ward Gas Pool. A second new gas pool was discovered with the completion of Central Petroleum Company's test well on the Ward farm in Sec. 11, T. 26 S., R. 12 W. Good saturation was found in the Viola but drilling continued on to the Arbuckle. The well was plugged back to the Viola and acidized with 3,000 gallons of hydrochloric acid. The well produced by flowing 2.5 million cubic feet of gas per day.

Rank-Wildcats. The first rank wildcat drilling in the area began in 1941 with one in T. 26 S., R. 11 W., two in T. 26 S., R. 12 W., and one in T. 26 S., R. 14 W. (Ver Wiebe, 1942).

Drilling in 1942

Iuka Pool. Twelve producing wells were completed in the Iuka pool during the year, along with 6 dry holes.

Carmi Pool. The Carmi pool was opened with the completion of Hollow Drilling Company's well on the Hattie Brown farm, Sec. 29, T. 26 S., R. 12 W. with a potential of 3,000 barrels of oil per day. There were no exploratory wells drilled in the area during 1942 (Ver Wiebe, 1943).

Drilling in 1943

The year 1943 was a very important year for the area as far as drilling and discoveries were concerned. Activity was greater than in previous years, and has never been equalled.

Carmi Pool. More than half of the wells drilled in the entire county were in the newly discovered Carmi Pool. As one maximum well after another was completed drilling activity increased. The Carmi Pool was discovered in December 1942 when Hollow Drilling Company completed the first well, the No. 1 "B" Brown in Sec. 29, T. 26 S., R. 12 W. This initial well produced from the Arbuckle dolomite at the rate of 6,400 barrels per day. During 1943 the Carmi pool was extended to the west into T. 26 S., R. 13 W., and to the east into sections 28, 32, and 33 of T. 26 S., R. 12 W., it thus covered nearly 3,000 acres and had practically joined with the Iuka pool to the southwest. The total number of producing wells at the close of 1943 was 69, of which one produced from the Simpson and 68 produced from the Arbuckle. Only two dry holes seemed to limit the field to the northeast and northwest, one in section 17 and the other in section 19.

Iuka Pool. The Iuka Pool had been developed slowly but drilling in the nearby Carmi Pool caused considerable interest in the vicinity of the Iuka Pool. Three producing wells were added to the east side of the pool with only two dry holes, one in section 6 and one in section 7. These two dry

holes seemed to separate the Iuka Pool from the Carmi Pool but it was suspected they might join across section 5 in the future. On the north side of the Iuka Pool only two dry holes seemed to separate the Iuka Pool from the western part of the Carmi Pool. One of these wells was in section 2 and the other in section 3 of T. 27 S., R. 13 W.

Stark and Ward Pools. Five new wells were added to the Stark Pool with one dry hole being drilled on the edge of the pool. In the Ward Pool (which was combined with the Stark Pool) ten tests were drilled of which five were good oil producers and five were dry holes. An offset well drilled by Lion Oil Refining Company on the Ford farm in section 12, T. 26 S., R. 12 W. was thought to have opened a new pool of production but was later included in the Stark Pool.

Considering the excitement caused by the large wells in the extension of the Carmi Pool it is surprising to find only four dry holes in the area, one in section 24, T. 27 S., R. 13 W., on the McGuire farm and three southeast of the Carmi and Iuka Pools in T. 27 S., R. 12 W. (Ver Wiebe, 1944).

Drilling in 1944

Iuka Pool. One additional oil well was completed in the Iuka pool with a potential of 102 barrels of oil and a small amount of gas.

Carmi Pool. In the Carmi pool 20 producing wells were completed. Some were only marginal producers with the major portion of the new completions being large producers. Four dry holes were drilled in the Carmi pool in 1944.

Stark Pool. Drilling in the Stark pool amounted to only four wells. Two were dry holes, one produced oil, and one was completed as a gas producer.

Both the gas and oil were produced from the Viola dolomite zone. (Ver Wiebe, 1945).

Drilling in 1945

Carmi Pool. The Carmi Pool was slightly enlarged by the completion of only two oil wells, however two deep salt-water disposal wells were drilled by Shell Petroleum Company and one dry hole was drilled in section 21, T. 26 S., R. 12 W., by Bishop Oil Company.

Stark Pool. Drilling activity in the area was on a greatly reduced scale in 1945 with two wells being added to the Stark Pool, one in section 7, T. 26 S., R. 11 W., and one in section 12, T. 26 S., R. 12 W.

Only two exploratory wells were drilled during 1945 in the area, one by Kingswood Oil Company in section 3, T. 26 S., R. 12 W. and one in section 3, T. 27 S., R. 12 W., by Amerada Petroleum Company and both were dry (Ver Wiebe, 1946).

Drilling in 1946

Chance Pool. There was strong revival of interest in the area in 1946 with the discovery of the Chance Pool in section 4, T. 27 S., R. 13 W. The discovery well was drilled by Lion Oil Refining Company and produced at the rate of 200 barrels per day from the Arbuckle with a trace of water. The well was treated with 3,000 gallons of acid before the final potential was determined. By the end of the year three other wells were completed on the Chance farm and three on the Jo farm in section 33, T. 26 S., R. 13 W.

Stark Pool. The Stark Pool was enlarged by the completion of two new oil producers.

Two dry holes were drilled in the area during the year, one located in section 6, T. 26 S., R. 11 W., and the other in section 15, T. 26 S., R. 12 W. (Ver Wiebe, 1947).

Drilling in 1947

The only new oil producers in the area in 1947 were four wells in the Chance Pool, three of which produced from the Arbuckle dolomite and one producing from the Simpson sand.

Only one dry hole was drilled in the area during this year. This was the No. 1 Mardis in section 35, T. 26 S., R. 12 W., drilled by Harbar and Lion. (Ver Wiebe, et al, 1948).

Drilling in 1948

Twelve wells were drilled in the Carmi pool in 1948, all producers. Three extension wells drilled in the Iuka pool also resulted in producers. Only one extension well was drilled in the Stark pool and it was dry. This well was located in section 17, T. 26 S., R. 11 W. (Ver Wiebe, 1949).

Drilling in 1949

Carmi Pool. Nine new wells were drilled in the Carmi Pool in 1949. A new oil producing zone, the Viola, was found in one well. One well produced gas from the Lansing-Kansas City, three produced oil from the Arbuckle dolomite, and four produced oil from Simpson rocks.

Chance Pool. The Chance pool had nine new wells drilled, all producing from the Arbuckle (Ver Wiebe, et al, 1950).

Stark Pool. A new zone of production was completed in the Stark pool, the Lansing-Kansas City.

Drilling in 1950

Activity in the area in 1950 resulted in seven new producing wells in the Iuka pool, five in the Chance pool, one oil producer, and one gas well in the Carmi pool. Four old wells were reworked in the Carmi pool which resulted in producers. There were no dry holes drilled in the area during 1950 (Ver Wiebe, et al, 1951).

Drilling in 1951

Iuka-Carmi Pool. During the year of 1951 the Iuka and Carmi Pools were combined and given the designation Iuka-Carmi Pool. The pool was actively extended by the addition of 26 new oil wells.

Chance Pool. The Chance pool was also extended considerably during 1951 with the addition of 30 extension wells. The No. 1 Luke Mowbray well in section 29, T. 26 S., R. 13 W., drilled by the Texas Company gave the Chance pool a new pay zone, the Mississippian. The No. 1 Jo well in section 33, T. 26 S., R. 13 W., which was completed in 1946, was reworked and given a potential of 17 barrels of oil and 10 barrels of water per day from the Viola (Ver Wiebe, et al, 1952).

Drilling in 1952

Iuka-Carmi Pool. The Iuka-Carmi pool was enlarged by the addition of 33 oil wells, 11 dry holes were drilled.

Chance Pool. Seventeen new oil wells were added to the Chance pool along with one dry hole. The Viola Limestone was officially recognized as a producing zone.

Chance East Pool. The Chance East pool, located between the Chance and Iuka-Carmi pools was opened by the completion of a well on the Briggeman farm in section 34, T. 26 S., R. 14 W. This well was rated at 220 barrels per day from the Viola limestone. The Mississippian was also recognized as a producing zone in the Chance East pool during 1952.

Two dry holes were drilled in the area in 1951, one in section 16, T. 26 S., R. 12 W., on the Long farm, and the other, the No. 1 Burkner in section 25, T. 26 S., R. 12 W. (Ver Wiebe, et al, 1953).

Drilling in 1953

Iuka-Carmi Pool. The activity in the Iuka-Carmi pool consisted of the completion of 55 wells, of which 46 were oil producers and nine were dry holes. There were five old holes reworked and made into oil producers and one reworked into a gas producer, with only one attempt being unsuccessful.

Iuka-Carmi Northwest Pool. Two wells were completed in the newly discovered Iuka-Carmi Northwest pool, with one producing from the Viola and one from the Arbuckle.

Iuka-Carmi South Pool. This pool was opened in 1953 with production from the Lansing-Kansas City. The pool was combined with the Iuka-Carmi pool.

Only one wildcat well was drilled in the area in 1953 that being the No. 1 McKibbin in section 17, T. 26 S., R. 12 W., drilled by Helmerich and Payne. (Ver Wiebe, et al, 1954).

Drilling in 1954

Two new pools were discovered in the area in 1954. The Chance North pool was opened with the completion of two wells producing from the Simpson sand. The Chance Northwest pool was opened as the result of finding production in four wells all producing from the Simpson. One dry hole was drilled in the newly opened Chance Northwest pool.

The Iuka-Carmi pool was expanded by the addition of 15 extension wells, seven dry holes and seven reworked wells resulted in production (Ver Wiebe, et al, 1955).

Drilling in 1955

Iuka-Carmi Pool. Development during 1955 in the Iuka-Carmi pool included 17 oil wells and five dry holes. Nine old wells were reworked in the pool with seven being recompleted and two were converted to salt-water disposal wells.

Chance East Pool. New zones of production were designated in the pool during the year. The new zones were the Arbuckle dolomite and Simpson. Field development resulted in the completion of four oil wells and one dry hole.

Chance Pool. Marmaton rocks were found to be a new zone of production in the Chance pool in 1955.

There was no wildcat activity in the area during 1955 (Goebel, et al, 1956).

Drilling in 1956

Activity in 1956 resulted in six new oil wells in the Iuka-Carmi pool,

three reworked wells and two dry holes. The two dry holes were located in T. 26 S., R. 12 W., one in section 22 and the other in section 26 (Goebel, et al, 1957).

Drilling in 1957

The Chance North pool was abandoned during 1957, while the Chance East pool was combined with the Iuka-Carmi pool. A new zone of production was found in the Iuka-Carmi pool, that being the Marmaton. There were no wells drilled in the area during 1957 (Goebel, et al, 1958).

RELATIONSHIP OF STRUCTURE AND STRATIGRAPHY TO PETROLEUM ACCUMULATION

Arbuckle Production

Arbuckle production in the area of investigation is concentrated in the area above the -2480 contour line on the Arbuckle structure map (Appendix, Fig. 11), with the exception of the high in the northeast corner of the area. Good permeabilities and porosities are apparently associated with the solution of the dolomites and limestones in the area where production is concentrated. The permeability and porosity was developed during pre-Simpson weathering and erosion. Structure may also be a factor in Arbuckle accumulation, however a small high located in sections 11 and 14 of T. 27 S., R. 13 W. appears to be barren of Arbuckle accumulation.

Simpson Production

Production from the Simpson group is obtained exclusively from the

Simpson (St. Peter) sandstone. It appears to be a clean sand throughout the area, with accumulation of petroleum being controlled by structure. Production from the Simpson in the area is found to be above the -2400 contour line (Appendix, Fig. 10), with the exception of the high in section 18, T. 26 S., R. 11 W. which is barren. The presence of a fault along the southeast flank of the main structure in the area may have produced a porosity barrier which tends to limit the Iuka-Carmi pool in this direction. The thickness of the producing zone is from six to 15 feet.

Viola Production

The Viola limestones produce from porous zones which are parallel to the bedding planes. This widespread porosity is evident from radioactivity logs.

Pre-Mississippian weathering also influenced the porosity of the Viola limestones. Although porosity is the prime factor in Viola accumulation, structure seems to be important also. The only possible exception is in the Stark pool vicinity, which is thought to be a porosity trap. The producing zone on the Viola varies from two to 18 feet in the area.

Mississippian Production

Production from the Mississippian is rather limited in the area of this investigation. The oil occurs in cavities of the limestones or in the weathered chert. Production from the Mississippian is characterized by high initial production followed by a sharp decline. The producing zone varies from 12 to 25 feet in thickness and production is usually stimulated by acidizing.

Marmaton Production

Very few wells in the area have produced from the Marmaton. The production is thought to be from small localized stratigraphic traps which are associated with sand lenses. Production from the Marmaton is generally very short lived and was developed as the result of reworking old wells.

Lansing-Kansas City Production

The producing zone of the Lansing-Kansas City averages about 30 feet in the area. Production from the Lansing-Kansas City is limited to small areas of closure of not more than 20 feet. Wells producing from the Lansing-Kansas City are the result of reworking older wells which were drilled to the deeper more prolific zones of production.

CONCLUSIONS

The location of the area of investigation along the Pratt Anticline has resulted in favorable accumulation of petroleum. This was probably due to the updip migration from the basin to the south and west. Thinning of the formations over the major structure of the area also may have been instrumental in localized accumulation. Erosion of underlying rocks during geologic time was responsible for porosity development in the Arbuckle, Viola, Simpson and Mississippian rocks. Subsequent folding and faulting provided traps for accumulation.

Petroleum production has been from a total of 12,350 acres in the area. From this area of production 23,728,210 barrels of oil have been

produced along with 3,221,362 MCF of gas, has been produced in a period of 20 years from 1937 to 1957.

Future possibilities for new oil discoveries in the area are extremely scarce, however a few new wells may be discovered along the margins of the already proven areas. Possibilities of finding oil still exist in the small area of sections 14 and 23 of T. 26 S., R. 12 W.

It is the opinion of the writer that this area has very good possibilities of producing greater amounts of petroleum through secondary recovery methods. Detailed studies of porosity and permeability would be required before an undertaking of this type.

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BIBLIOGRAPHY

- Barwick, J. S.
The Salina basin of north-central Kansas. Amer. Assoc. Petr. Geol. Bull., Vol. 12, 1928, pp. 177-199.
- Cole, V. B., and E. A. Koester
Developments in north mid-continent in 1944. Amer. Assoc. Petr. Geol. Bull., Vol. 29, 1945, pp. 706.
- Dellweg, L. F.
The Barber County earthquake of January 6, 1956. State Geol. Survey of Kansas, Bull. 119, Pt. 5, 1956, pp. 175-185.
- Denison, A. R.
Discussion of early Pennsylvanian sediments west of the Nemaha granite ridge, Kansas. Amer. Assoc. Petr. Geol. Bull., Vol. 10, 1926, p. 636.
- Eardley, A. J.
Structural Geology of North America. New York; Harper Brothers, 1951, 620 pp.
- Emmons, W. H.
Geology of Petroleum. New York; McGraw-Hill, 1931, pp. 239-420.
- Farquhar, O. C.
The pre-Cambrian rocks of Kansas. State Geol. Survey of Kansas, Bull. 127, 1957, 122 pp.
- Frye, J. C. and B. A. Leonard
Pleistocene geology of Kansas. State Geol. Survey of Kansas, Bull. 99, 1952, 230 pp.
- Geil, D. D.
Structure and stratigraphy of Stafford County, Kansas related to petroleum accumulation, Unpublished Master's Thesis, Kansas State College, 1957, 64 pp.
- Goebel, E. D., et al.
Oil and Gas Developments in Kansas during 1955. State Geol. Survey of Kansas, Bull. 122, 249 pp.
- Goebel, E. D., et al.
Oil and Gas Developments in Kansas during 1956. State Geol. Survey of Kansas, Bull. 128, 1957, 250 pp.
- Goebel, E. D., et al.
Oil and Gas Developments in Kansas during 1957. State Geol. Survey of Kansas, Bull. 133, 1958, 264 pp.

- Imbt, W. C.
Zenith pool, Stafford County, Kansas, Stratigraphic type oil fields,
Amer. Assoc. Petr. Geol., 1941, pp. 139-165.
- Jewett, J. M.
Geologic structures in Kansas. State Geol. Survey of Kansas, Bull. 122,
1951, 172 pp.
- Kansas Geological Society
Kansas Oil and Gas Pool. Vol. 1 - Southcentral Kansas Wichita, 1956,
96 pp.
- Keroher, R. R. and J. J. Kirby
Upper Cambrian and Lower Ordovician rocks in Kansas. State Geol. Survey
of Kansas, Bull. 72, 1948, 140 pp.
- Koester, E. A.
Geology of Central Kansas Uplift. Amer. Assoc. Petr. Geol. Bull.,
Vol. 19, 1935, pp. 1405-1426.
- Kornfeld, J. A.
Peace Creek Field - a stratigraphic trap. World Petroleum, Vol. 14,
1943, pp. 38-41, 44-47.
- Latta, B. F.
Geology and Ground-water Resources of Barton and Stafford Counties,
Kansas. State Geol. Survey of Kansas, Bull. 88, 1950, 228 pp.
- Lee, Wallace
Relation of thickness of Mississippian limestones in central and eastern
Kansas to oil and gas deposits. State Geol. Survey of Kansas, Bull. 26,
1939, 42 pp.
- Lee, Wallace
Thickness maps as criteria of regional structural movement. State Geol.
Survey of Kansas, Bull. 109, Part 5, 1945, 80 pp.
- Lee, Wallace
Stratigraphy and structural development of the Salina basin area. State
Geol. Survey of Kansas, Bull. 121, 1956, 167 pp.
- Lee, Wallace and D. F. Merriam
Preliminary study of the structure of western Kansas. State Geol. Survey
of Kansas, Oil and Gas Investigation 11, 1954, 23 pp.
- Maher, J. C., and J. B. Collins
Hugoton embayment of Anadarko basin in southwestern Kansas, southeastern
Colorado, and Oklahoma panhandle. Amer. Assoc. Petr. Geol. Bull.,
Vol. 32, 1948, pp. 813-819.
- McClellan, Hugh W.
Subsurface distribution of pre-Mississippian rocks of Kansas. Amer.
Assoc. Petr. Geol. Bull., Vol. 14, 1930, pp. 1535-1556.

- McGaha S. W., and J. M. Terry
Lane-Wells correlation study; central Kansas area. Lane Wells Company, 1952, 3 pp.
- Merriam, D. F.
Structural development of the Hugoton embayment. Proc. 4th subsurface symposium. Univ. of Okla., Norman, 1955, pp. 81-97.
- Moore, R. C., and J. M. Jewett
Oil and Gas fields of Kansas. Mines Magazine, Vol. 32, 1952, pp. 491-498, 515-520, 526, 538, 560.
- Moore, R. C., et al.
The Kansas rock column. State Geol. Survey of Kansas, Bull. 89, 1951, 128 pp.
- Morgan, J. U. Jr.
Correlation of radioactivity logs of the Lansing and Kansas City groups in Central Kansas. Lane Wells Company, 1951, 10 pp.
- Morgan, L. C.
Central Kansas Uplift. Amer. Assoc. Petr. Geol. Bull., Vol. 16, 1932, pp. 483-484.
- Moss, R. G.
Developments in Kansas 1938. Amer. Assoc. Petr. Geol., Vol. 23, 1939, pp. 805.
- Muehlhauser, H. C.
Subsurface geology of Pratt County, Kansas. Unpublished Master's Thesis, Kansas State College, 1958, 66 pp.
- Ricci, A. T. Jr.
Subsurface geology related to petroleum accumulation in Reno County, Kansas. Unpublished Master's Thesis, Kansas State College, 1955, 49 pp.
- Rich, J. L.
Distribution of oil pools in Kansas in relation to pre-Mississippian structure and areal geology. Amer. Assoc. Petr. Geol. Bull., Vol. 17, 1933, pp. 793-815.
- Roth, R.
Regional extent of Marmaton and Cherokee mid-continent Pennsylvanian formations. Amer. Assoc. Petr. Geol. Bull., Vol. 14, 1930, pp. 1249-1278.
- Ruedemann, Paul
Geology of Southern Central Lowlands and Ouachita Provinces. Geology of North America, Vol. 1, 1935, p. 482.
- Rutledge, R. B., and H. S. Bryant
Cunningham field, Kingman and Pratt Counties, Kansas. Amer. Assoc. Petr. Geol. Bull., Vol. 21, 1937, pp. 500-524.

Taylor, M. H. Jr.

Siluro-Devonian strata in central Kansas. Amer. Assoc. Petr. Geol. Bull., Vol. 30, 1956, pp. 1221-1254.

Ver Wiebe, W. A.

Oil and gas resources of western Kansas, Mineral resources circular 10, State Geol. Survey of Kansas, 1938, pp. 90-94.

Ver Wiebe, W. A.

Western Kansas oil and gas developments during 1938. Mineral Resources Circular 13. State Geol. Survey of Kansas, 1939, 106 pp.

Ver Wiebe, W. A.

Exploration for oil and gas in western Kansas during 1939. State Geol. Survey of Kansas, Bull. 28, 1940, 106 pp.

Ver Wiebe, W. A.

Exploration for oil and gas in western Kansas during 1940. State Geol. Survey of Kansas, Bull. 36, 1941, 109 pp.

Ver Wiebe, W. A.

Exploration for oil and gas in western Kansas during 1941. State Geol. Survey of Kansas, Bull. 42, 1942, 123 pp.

Ver Wiebe, W. A.

Exploration for oil and gas in western Kansas during 1942. State Geol. Survey of Kansas, Bull. 48, 1943, 86 pp.

Ver Wiebe, W. A.

Exploration for oil and gas in western Kansas during 1943. State Geol. Survey of Kansas, Bull. 54, 1944, 104 pp.

Ver Wiebe, W. A.

Exploration for oil and gas in western Kansas during 1944. State Geol. Survey of Kansas, Bull. 56, 1945, 112 pp.

Ver Wiebe, W. A.

Exploration for oil and gas in western Kansas during 1945. State Geol. Survey of Kansas, Bull. 62, 1946, 112 pp.

Ver Wiebe, W. A.

Exploration for oil and gas in western Kansas during 1946. State Geol. Survey of Kansas, Bull. 68, 1947, 111 pp.

Ver Wiebe, W. A.

Oil and gas developments in Kansas during 1947. State Geol. Survey of Kansas, Bull. 75, 1948, 230 pp.

Ver Wiebe, W. A.

Oil and gas developments in Kansas during 1948. State Geol. Survey of Kansas, Bull. 78, 1949, 186 pp.

- Ver Wiebe, W. A.
Oil and gas developments in Kansas during 1949. State Geol. Survey of Kansas, Bull. 87, 1950, 176 pp.
- Ver Wiebe, W. A.
Oil and gas developments in Kansas during 1950. State Geol. Survey of Kansas, Bull. 92, 1951, 187 pp.
- Ver Wiebe, W. A.
Oil and gas developments in Kansas during 1951. State Geol. Survey of Kansas, Bull. 97, 1952, 188 pp.
- Ver Wiebe, W. A.
Oil and gas developments in Kansas during 1952. State Geol. Survey of Kansas, Bull. 103, 1953, 201 pp.
- Ver Wiebe, W. A.
Oil and gas developments in Kansas during 1953. State Geol. Survey of Kansas, Bull. 107, 1954, 204 pp.
- Ver Wiebe, W. A.
Oil and gas developments in Kansas during 1954. State Geol. Survey of Kansas, Bull. 122, 1955, 215 pp.
- Welch, V. J.
Structural and sedimentation study of the Shawnee group in central Kansas and the possible relationship to oil producing areas. Unpublished Master's Thesis, Kansas State College, 1951, 38 pp.

APPENDIX

Table 1. Oil pools and production of the Iuka-Carmi Pool area, Pratt County, Kansas

| Pool | Area in Acres | Year | Annual Production in bbl. | No. of Producing Wells | No. of Wells Reworked | No. of Wells Abandoned |
|---------------------|---------------|-------|---------------------------|------------------------|-----------------------|------------------------|
| Iuka | 160 | 1938* | 2,921 | 1 | | |
| | 160 | 1939 | 43,468 | 3 | | |
| | 200 | 1940 | 78,300 | 3 | | |
| | 640 | 1941 | 134,568 | 7 | | |
| | 1,200 | 1942 | 221,785 | 19 | | |
| | 2,000 | 1943 | 627,700 | 52 | | |
| | 2,000 | 1944 | 217,995 | 21 | | |
| | 2,000 | 1945 | 188,965 | 22 | | |
| | 2,000 | 1946 | 162,820 | 22 | | |
| | 2,000 | 1947 | 145,799 | 20 | | |
| | 2,000 | 1948 | 161,294 | 21 | | |
| | 2,000 | 1949 | 161,109 | 18 | | |
| | 2,200 | 1950 | 182,582 | 23 | | |
| Combined with Carmi | | 1951 | | | | |
| | | Total | 2,329,306 | | | |
| Carmi | 40 | 1942* | No production | 1 | | |
| | 3,000 | 1943 | 537,900 | 69 | | |
| | 3,000 | 1944 | 2,491,050 | 89 | | |
| | 3,000 | 1945 | 1,158,940 | 90 | | |
| | 3,000 | 1946 | 96,890 | 91 | | |
| | 3,000 | 1947 | 938,596 | 89 | | |
| | 4,400 | 1948 | 953,849 | 95 | | |
| | 4,400 | 1949 | 721,030 | 103 | | |
| | 4,400 | 1950 | 660,709 | 106 | | |
| Combined with Iuka | | 1951 | | | | |
| | | Total | 7,558,964 | | | |
| Iuka-Carmi | 7,200 | 1951 | 1,086,190 | 156 | | |
| | 7,600 | 1952 | 1,250,142 | 183 | | |
| | 8,500 | 1953' | 1,316,301 | 224 | 5 | |
| | 8,780 | 1954 | 1,434,766 | 234 | | |
| | 8,780 | 1955 | 1,450,121 | 241 | 9 | 2 |
| | 8,780 | 1956 | 1,472,971 | 238 | | 6 |
| | 8,980 | 1957# | 1,219,204 | 233 | | 11 |
| | | Total | 9,229,695 | | | |
| Iuka-Carmi NW | 80 | 1953* | 4,700 | 2 | | |
| | 400 | 1954 | 34,807 | 6 | | |
| | 400 | 1955 | 36,880 | 6 | | |

Table 1. (Cont.)

| Pool | Area in Acres | Year | Annual Production in bbl. | No. of Producing Wells | No. of Wells Reworked | No. of Wells Abandoned |
|-----------------------|---------------|-------|---------------------------|------------------------|-----------------------|------------------------|
| Iuka-Carmi NW (Cont.) | | | | | | |
| | 400 | 1956 | 19,537 | 6 | | |
| | 400 | 1957 | 34,797 | 6 | | |
| | | Total | 130,721 | | | |
| Chance | | | | | | |
| | 200 | 1946* | 5,955 | 5 | | |
| | 400 | 1947 | 87,220 | 10 | | |
| | 440 | 1948 | 47,639 | 11 | | |
| | 550 | 1949 | 123,052 | 19 | | |
| | 600 | 1950 | 196,925 | 22 | | |
| | 1,400 | 1951 | 402,952 | 57 | | |
| | 1,500 | 1952 | 647,841 | 72 | | |
| | 1,580 | 1953 | 506,699 | 74 | | |
| | 1,600 | 1954 | 492,604 | 75 | | |
| | 1,600 | 1955 | 353,668 | 74 | | 2 |
| | 1,600 | 1956 | 255,027 | 72 | | 1 |
| | 1,600 | 1957 | 179,280 | 72 | | |
| | | Total | 3,198,862 | | | |
| Chance East | | | | | | |
| | 160 | 1952* | 14,779 | 4 | | |
| | 160 | 1953 | 30,205 | 4 | | |
| | 300 | 1954 | 47,837 | 7 | | |
| | 300 | 1955 | 77,845 | 11 | | |
| | 320 | 1956 | 90,691 | 12 | | |
| | | 1957# | | | | |
| | | Total | 261,357 | | | |
| Chance NW | | | | | | |
| | 120 | 1955 | 29,537 | 3 | | |
| | 120 | 1956 | 13,026 | 3 | | |
| | 120 | 1957 | 5,341 | 3 | | |
| | | Total | 47,904 | | | |
| Chance North | | | | | | |
| | 80 | 1954* | 6,378 | 2 | | |
| | 80 | 1955 | 3,490 | 2 | | |
| | 80 | 1956 | 1,962 | 2 | | |
| | 80 | 1957 | 292 | 2 | | 2 |
| | | Total | 12,122 | | | |

Table 1. (Concl.)

| Pool | Area in Acres | Year | Annual Production in bbl. | No. of Producing Wells | No. of Wells Reworked | No. of Wells Abandoned |
|-------------|---------------|-------|---------------------------|------------------------|-----------------------|------------------------|
| Stark | 160 | 1941* | No oil production | | | |
| | 160 | 1942 | No oil production | | | |
| | 500 | 1943" | 81,000 | 12 | | |
| | 500 | 1944 | 228,430 | 13 | | |
| | 600 | 1945 | 161,670 | 16 | | |
| | 800 | 1946 | 154,865 | 16 | | |
| | 800 | 1947 | 81,458 | 16 | | |
| | 850 | 1948 | 42,341 | 13 | | |
| | 850 | 1949 | 34,868 | 13 | | |
| | 850 | 1950 | 28,938 | 13 | | |
| | 700 | 1951 | 17,904 | 10 | | |
| | 600 | 1952 | 10,303 | 6 | | 4 |
| | 300 | 1953 | 7,145 | 6 | | |
| | 300 | 1954 | 5,541 | 6 | | |
| | 300 | 1955 | 4,576 | 6 | | |
| | 40 | 1956 | 240 | 1 | | 5 |
| | 40 | 1957 | No runs | 1 | | |
| | | Total | 859,279 | | | |
| Ward | 160 | 1941* | No oil production | | | |
| | 160 | 1942 | No oil production | | | |
| | | 1943" | | | | |
| Iuka- | | | | | | |
| Carmi South | | 1953* | Combined with Iuka-Carmi | | | |

* Year in which pool was discovered.

' Iuka-Carmi South combined with Iuka-Carmi.

Chance East combined with Iuka-Carmi.

" Ward combined with Stark.

Table 2. Gas pools and gas production of the Iuka-Carmi pool area, Pratt County, Kansas.

| Pool | : Area in : : Acres : | : Year : | : Annual : : Production : : M cu. ft. : | : No. of : Producing : Wells : |
|--------------------|--------------------------|----------|---|--------------------------------------|
| Carmi | | 1942-45 | No report | |
| | | 1946 | 28,258 | 1 |
| | | 1947 | 38,185 | 1 |
| | | 1948 | No report | |
| | | 1949 | No report | |
| | | 1950 | No report | |
| | | 1951 | No report | |
| Combined with Iuka | | 1952 | | |
| Iuka-Carmi* | | 1952 | 1,088,352 | 9 |
| | 400 | 1953 | 938,012 | 6 |
| | | 1954 | No report | |
| | 300 | 1955 | 424,106 | 3 |
| | 600 | 1956 | 429,051 | 5 |
| | 680 | 1957 | 209,105 | 6 |
| Chance | 40 | 1956 | 3,000 | 1 |
| | 240 | 1957 | 63,293 | 3 |
| | | Total | 3,221,362 | |

* Ward and Stark pools included.

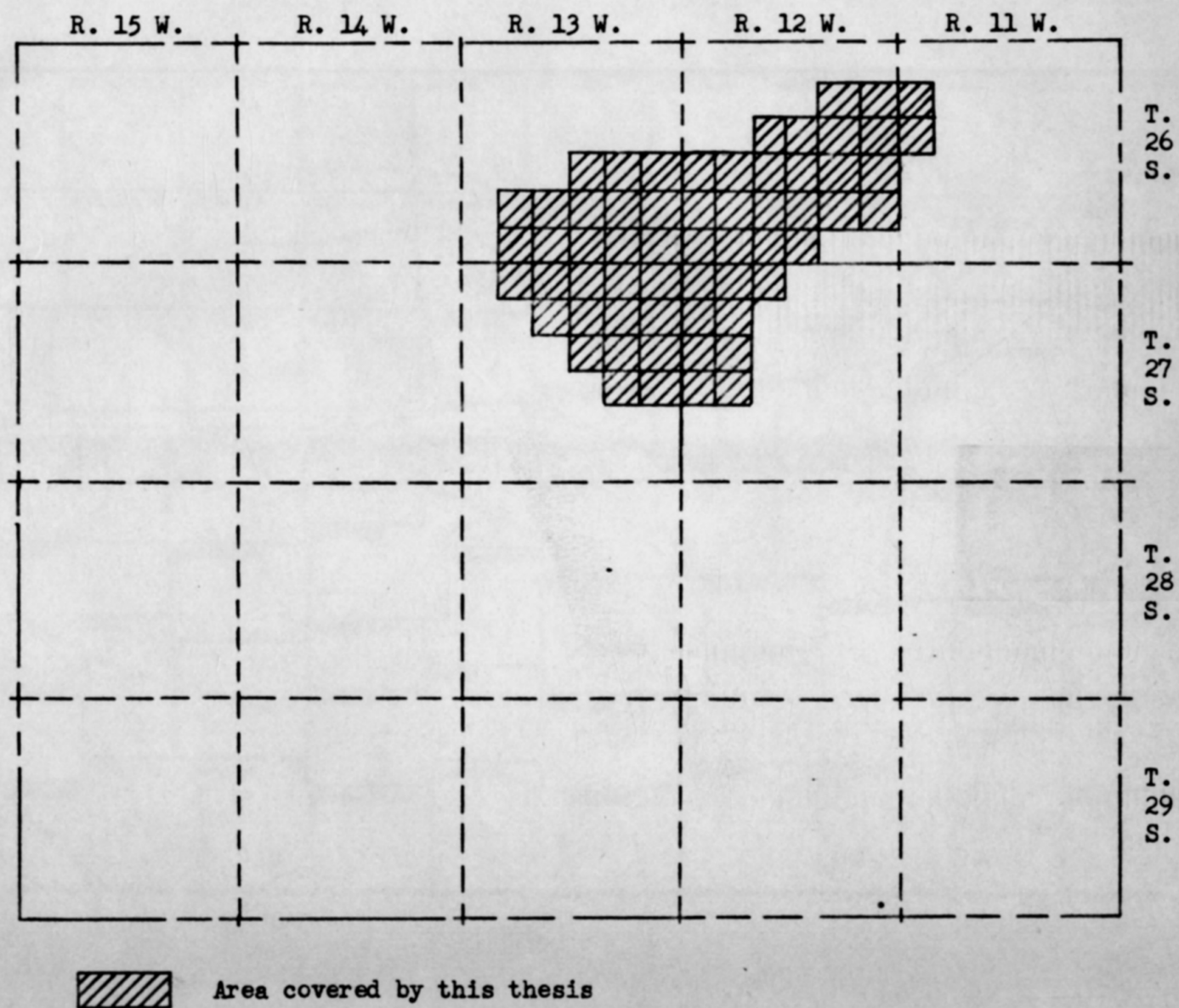


Fig. 1. Map showing location of the Iuka-Carmi pool area, Pratt County, Kansas

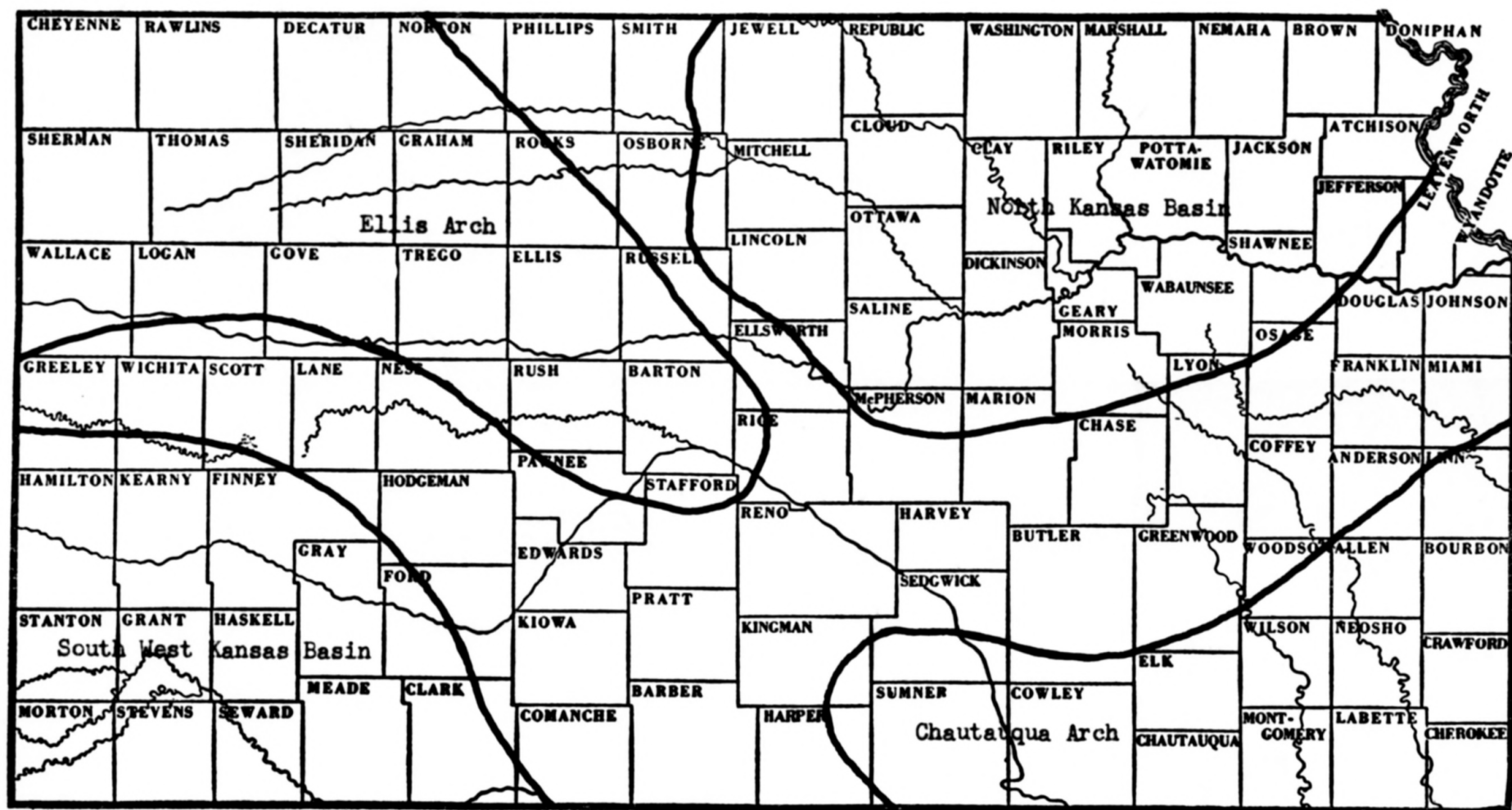
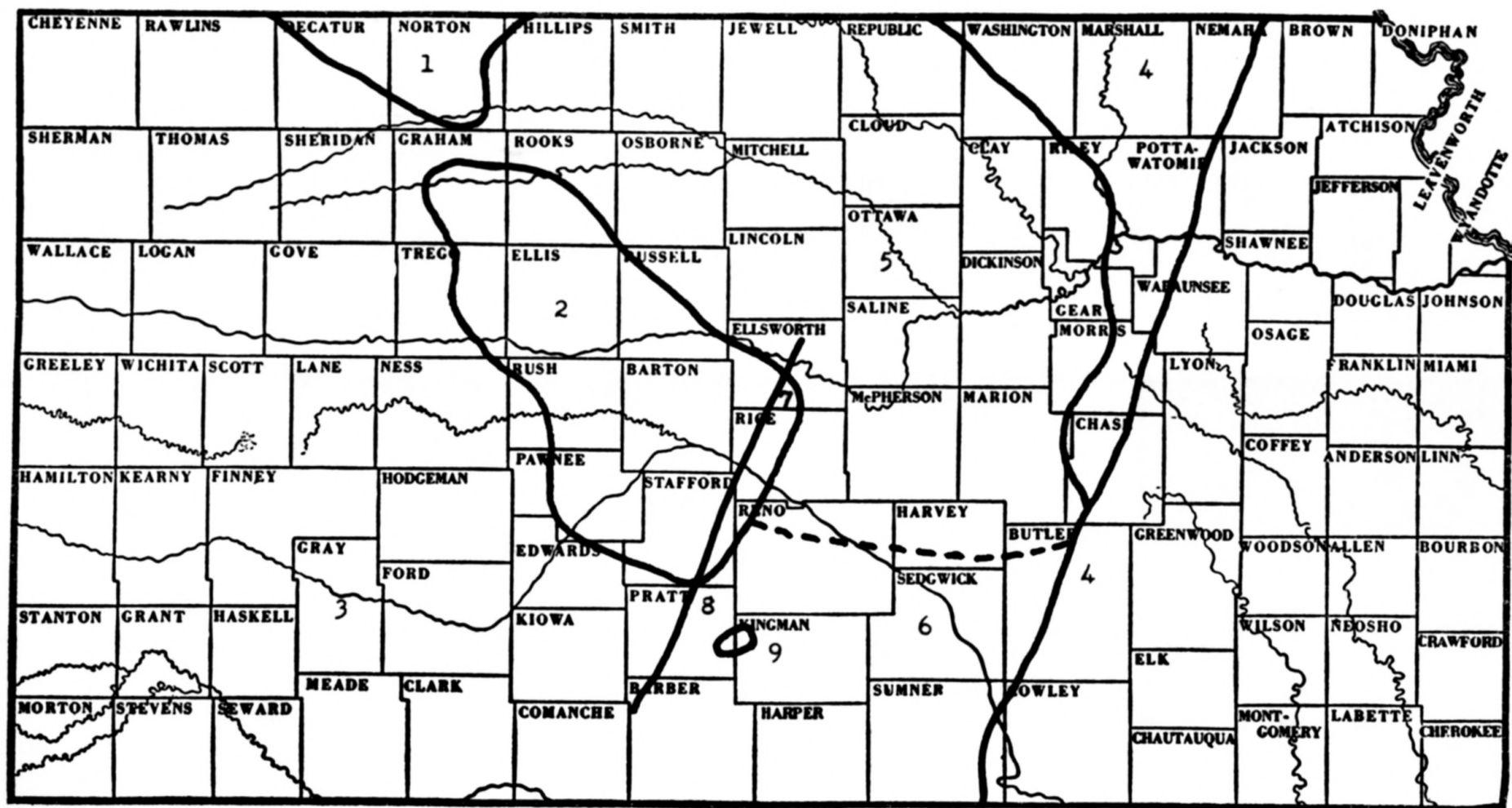
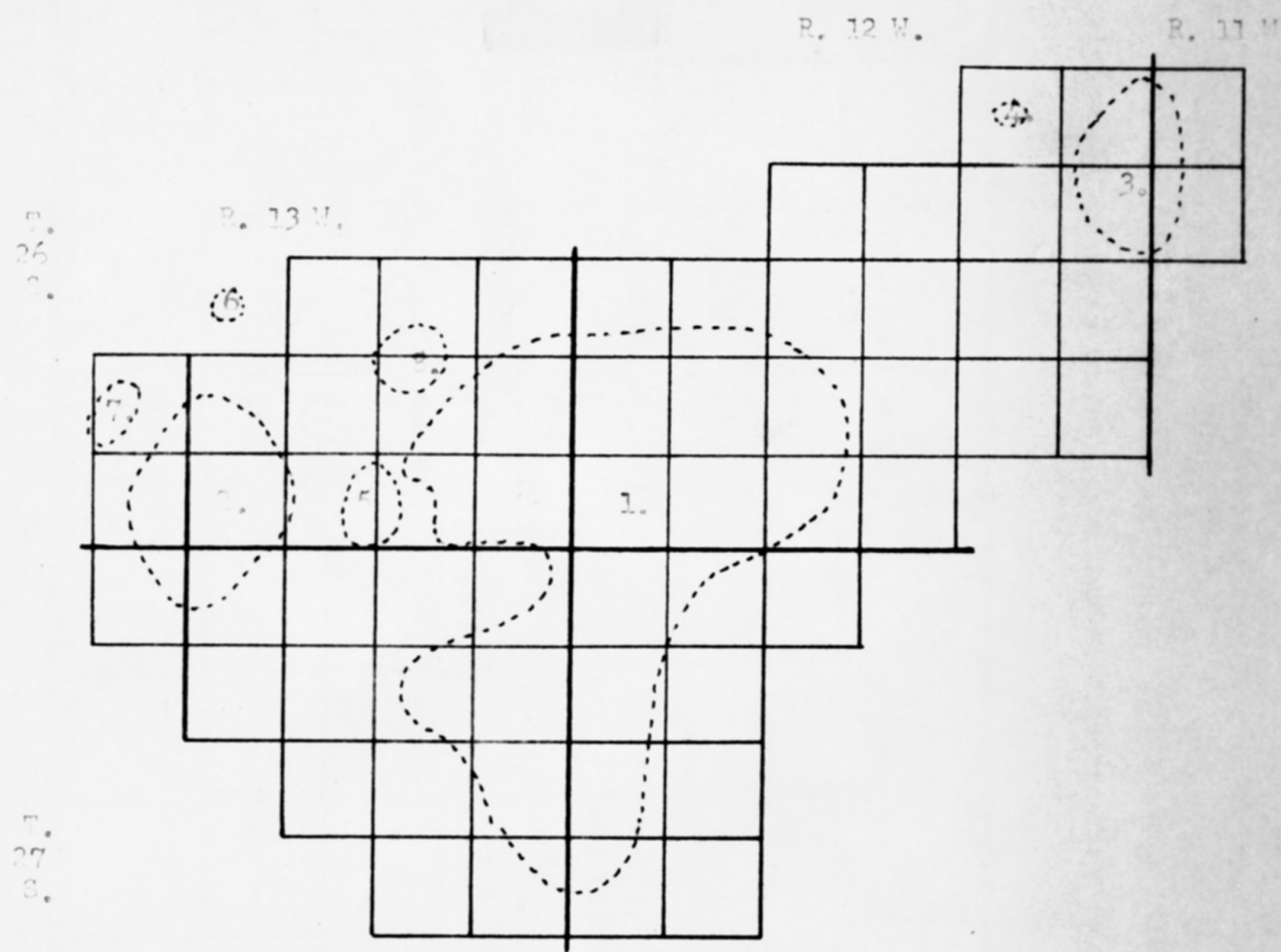


Fig. 2 Geographical distribution of major pre-Mississippian structures in Kansas.



Explanation: 1. Cambridge Arch 2. Central Kansas Uplift 3. Hugoton Embayment
 4. Nemaha Anticline 5. Salina Basin 6. Sedgwick Basin 7. Ellsworth
 Anticline 8. Pratt Anticline 9. Cunningham Dome.

Fig. 3 Geographical distribution of major and minor structures in Kansas.



Explanation: 1. Iuka-Savard pool 2. Clarence pool 3. Turk pool
 4. Ward Gas pool 5. Clarence East pool 6. Clarence North
 pool 7. Clarence Northwest pool 8. Iuka-Savard Northwest
 pool

Fig. 4. Map of Iuka-Savard pool area showing the location of oil and gas pools.

Fig. 5 Cross sections of the Iuka-Carmi pool area, Pratt County, Kansas
(In accompanying plate box)

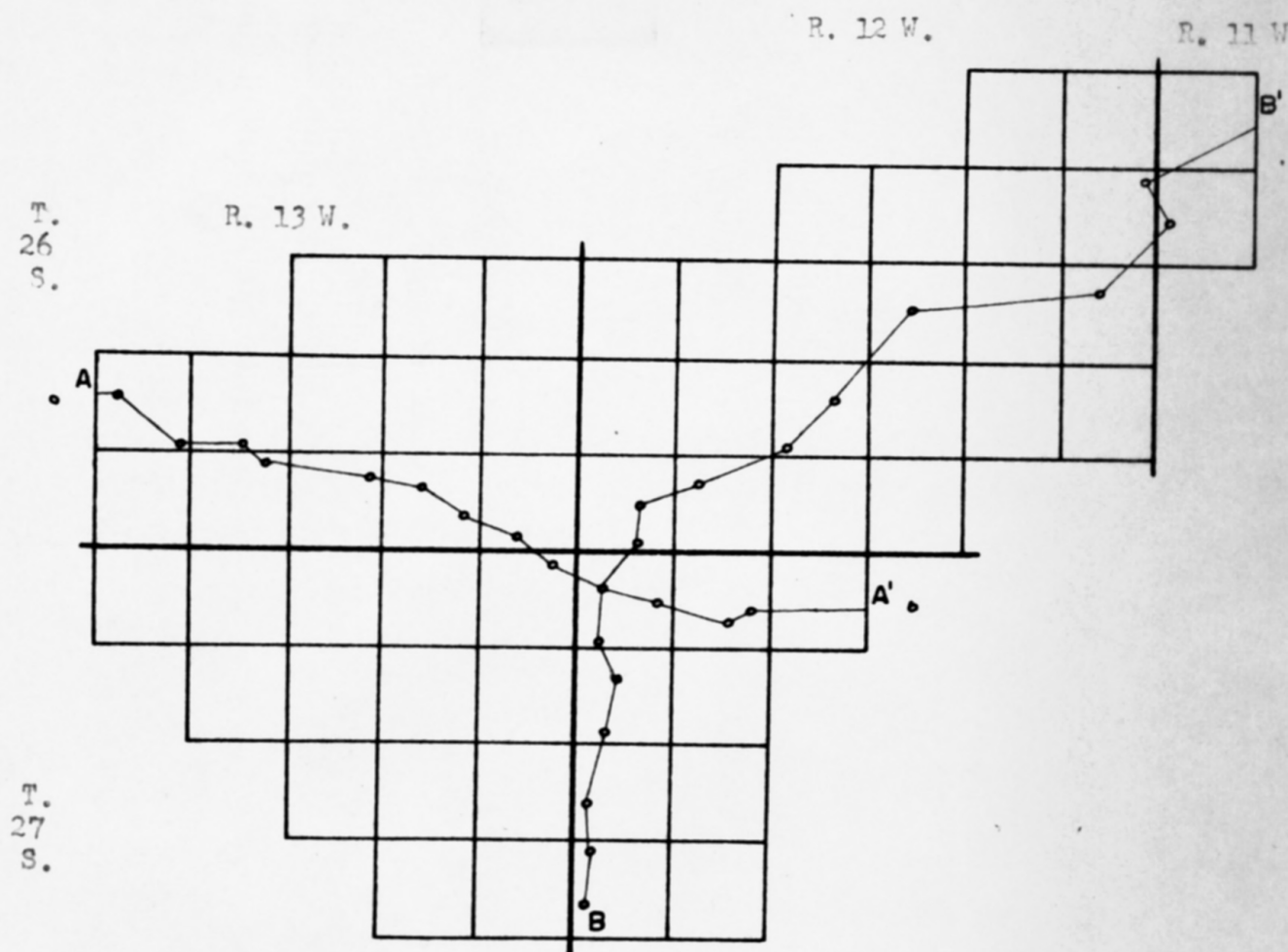


Fig. 5A. Map of Luke-Garai pool area, showing points used for construction of cross sections

Fig. 6 Structure contours drawn on the Heebner shale, Iuka-Carmi pool area, Pratt County, Kansas

(In accompanying plate box)

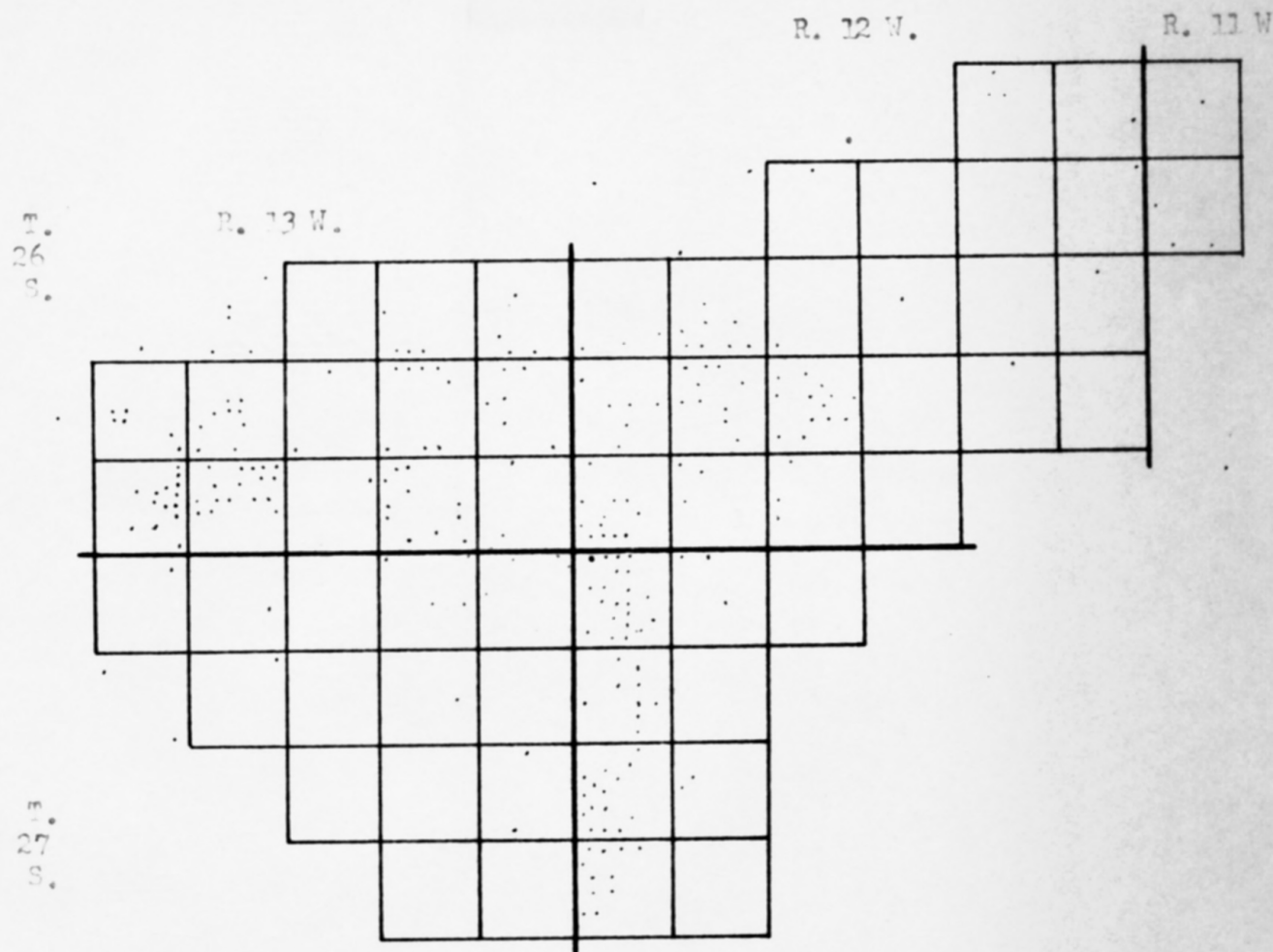


Fig. 6A. Map of Lake-Sardis pool area, showing the locations of control points used for drawing the structural contours on the Hechman shale.

Fig. 7 Structure contours drawn on the Lansing group, Iuka-Carmi pool area, Pratt County, Kansas

(In accompanying plate box)

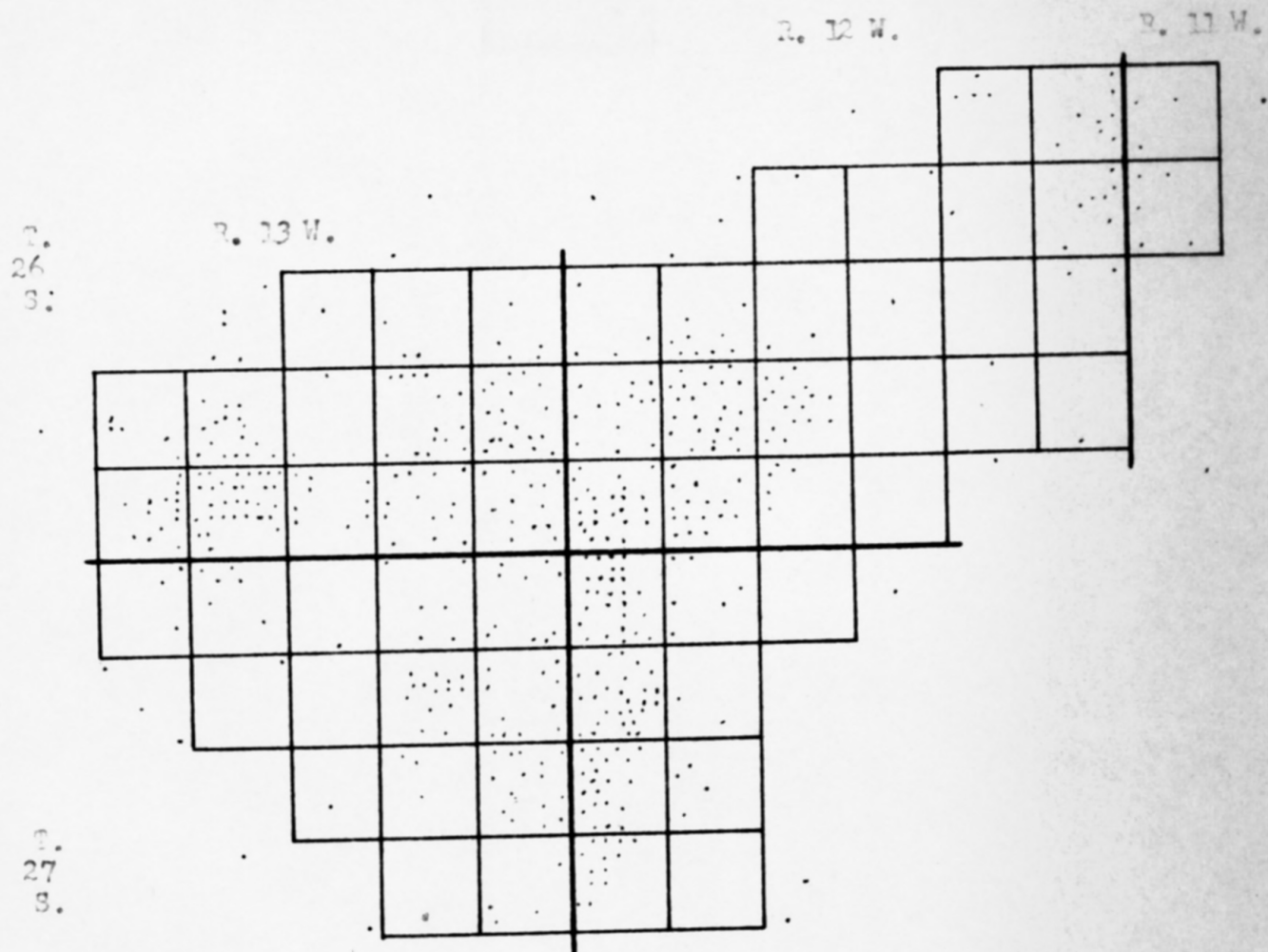


Fig. 7A. Map of Lake-Carrie pool area, showing the locations of control points used for drawing the structural contours on the Lansing group.

Fig. 8 Structure contours drawn on the Mississippian limestones, Iuka-Carmi pool area, Pratt County, Kansas

(In accompanying plate box)

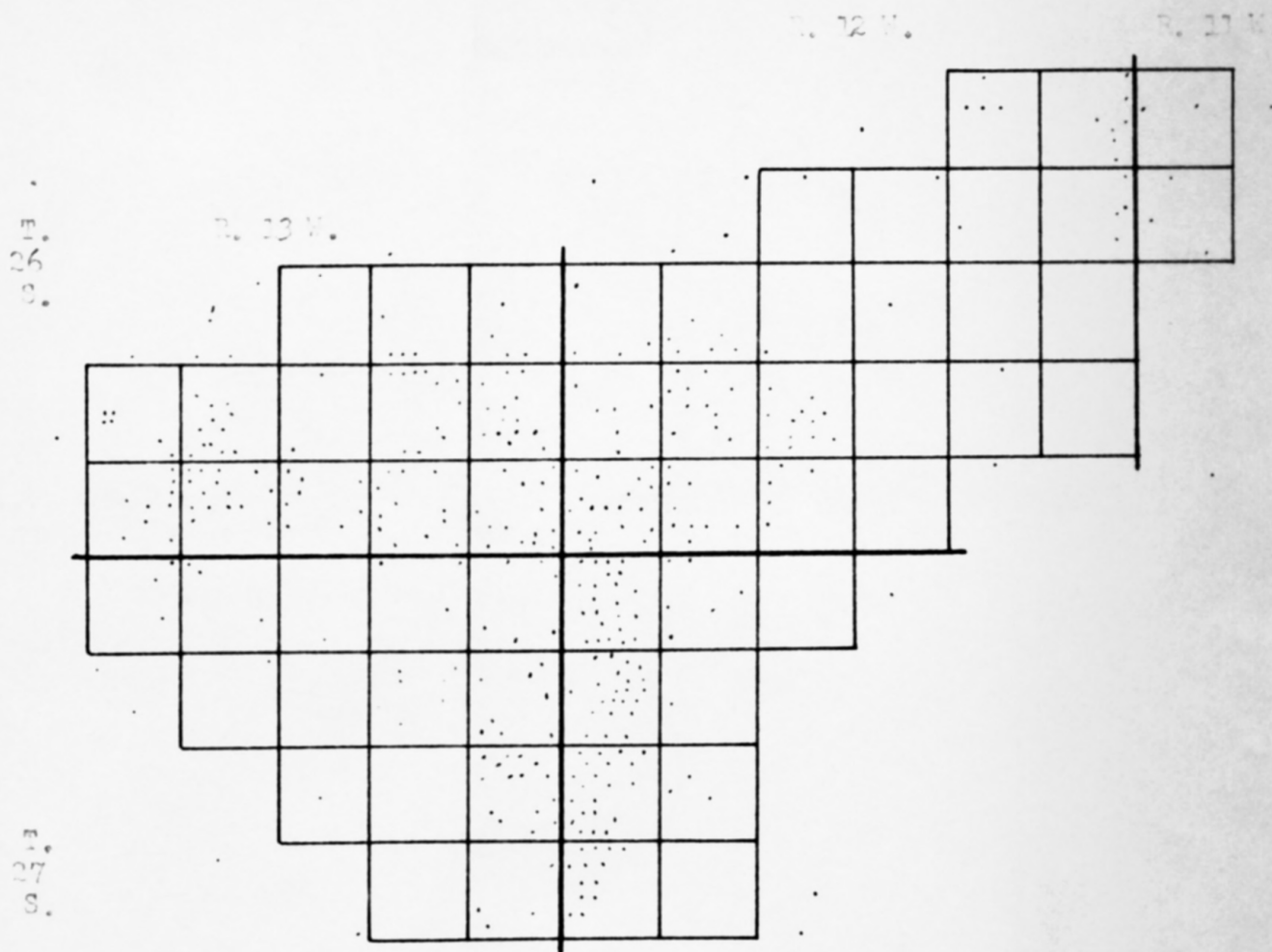


Fig. 8A. Map of the Gulf of Mexico, showing the locations of coastal cities and towns. The grid is drawn on the basis of the International Date Line.

Fig. 9 Structure contours drawn on the Viola limestones, Iuka-Carmi pool area, Pratt County, Kansas

(In accompanying plate box)

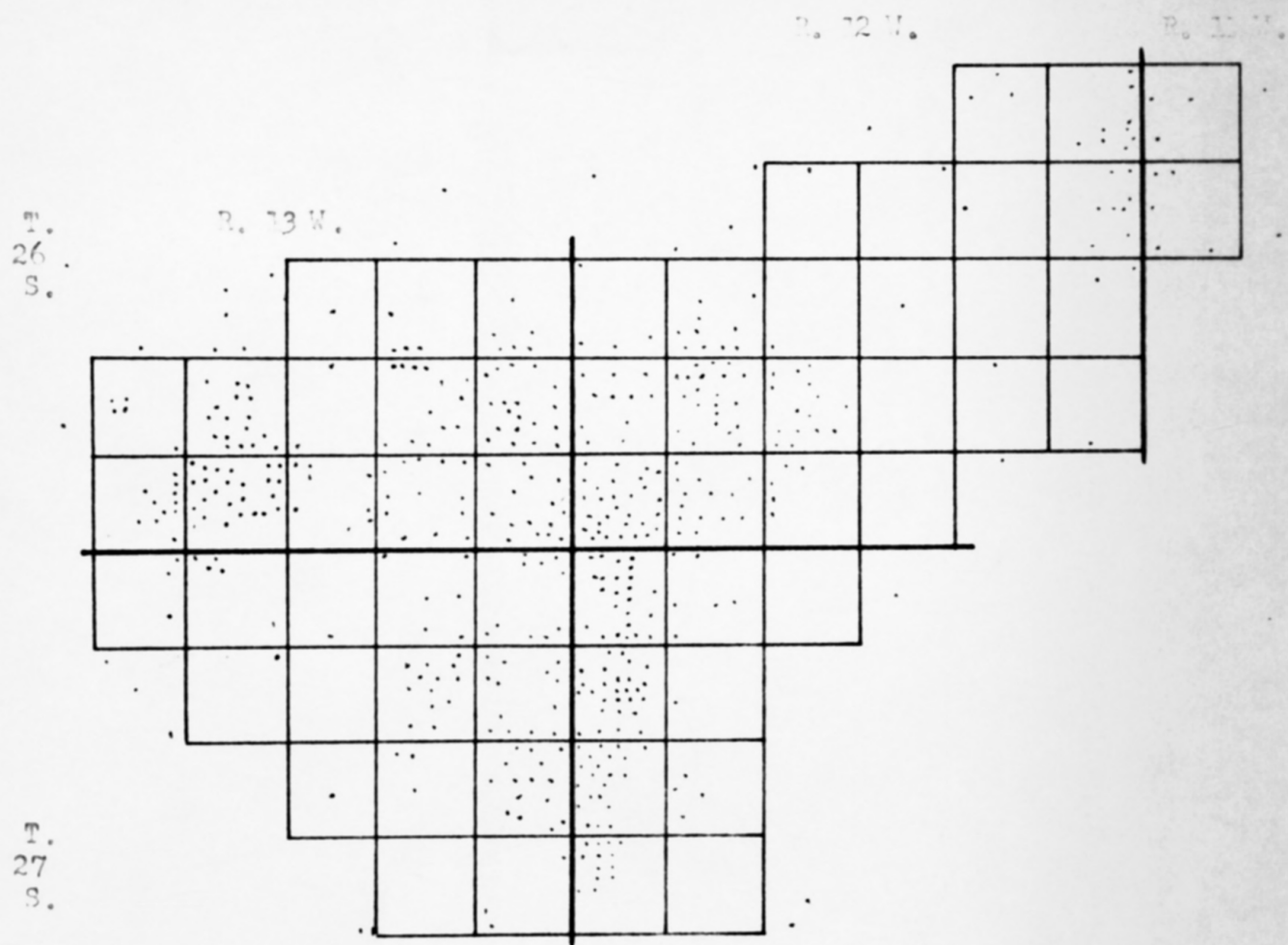


Fig. 91. Map of Triangle Island area, showing the locations of control points and the location of physical contours on the 1:50,000 scale.

Fig. 10 Structure contours drawn on the Simpson group, Iuka-Carmi pool area, Pratt County, Kansas

(In accompanying plate box)

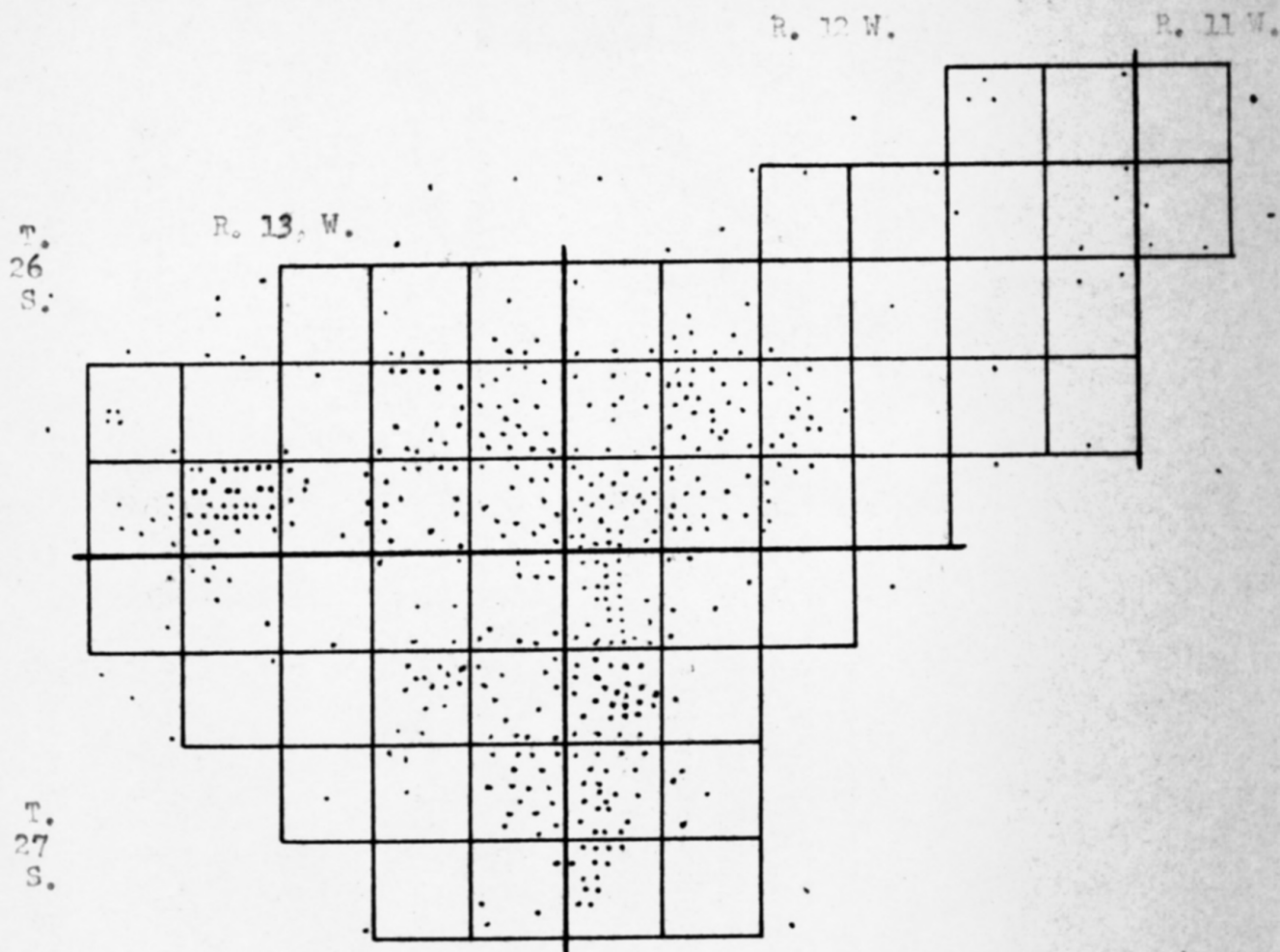


Fig. 104. Map of Iuka-Carmi pool area, showing the locations of control points used for drawing the structural contours on the Simpson group.

Fig. 11 Structure contours drawn on the Arbuckle group, Iuka-Carmi pool area, Pratt County, Kansas

(In accompanying plate box)

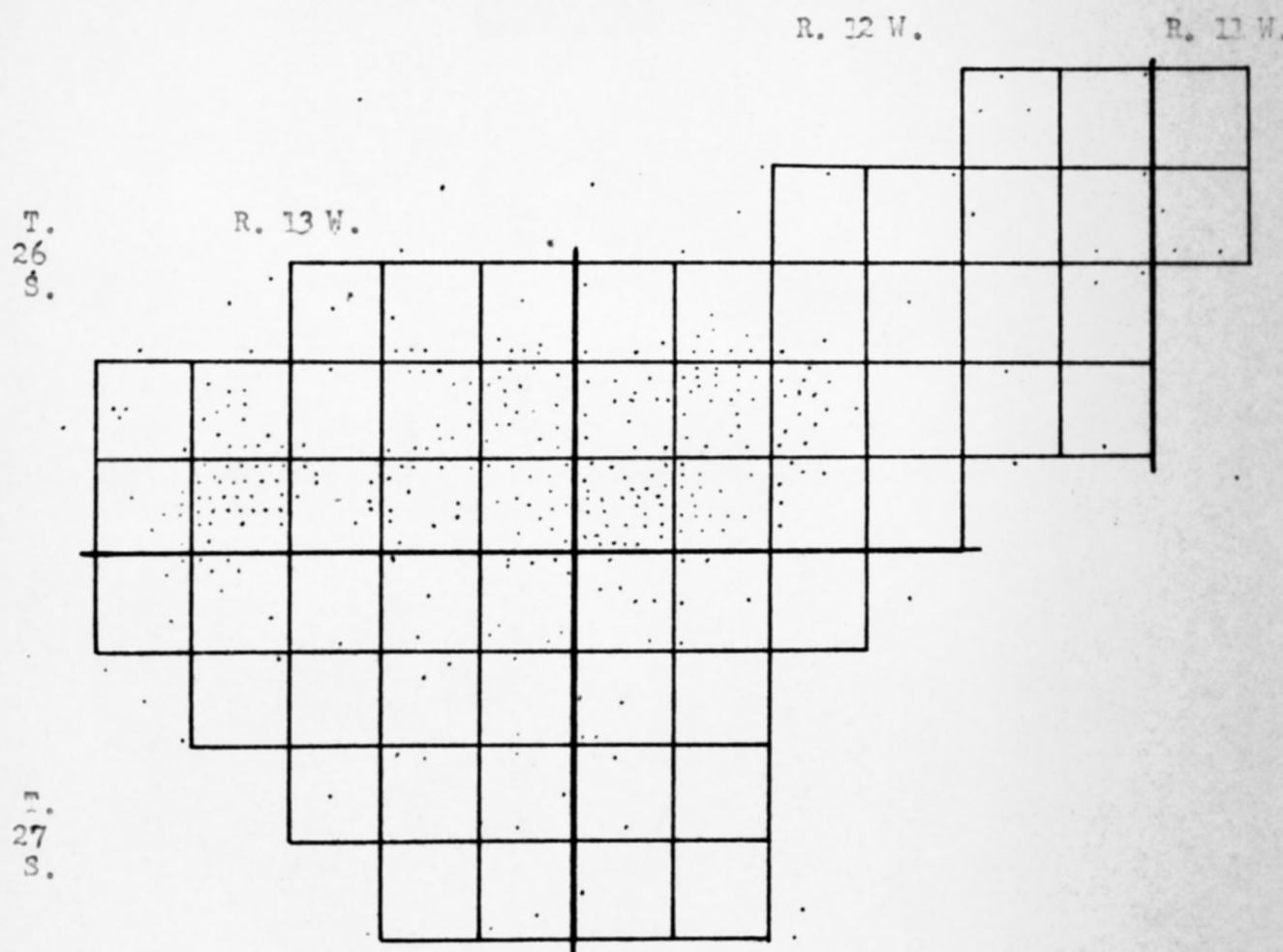


Fig. 11A. Map of Ruba-Garmi pool area, showing the locations of control points used for drawing the structural contours on the Arbuckle group.

Fig. 12 Isopachous lines drawn, representing the interval between the top of the Mississippian limestones and the top of the Viola limestones, Iuka-Carmi pool area, Pratt County, Kansas

(In accompanying plate box)

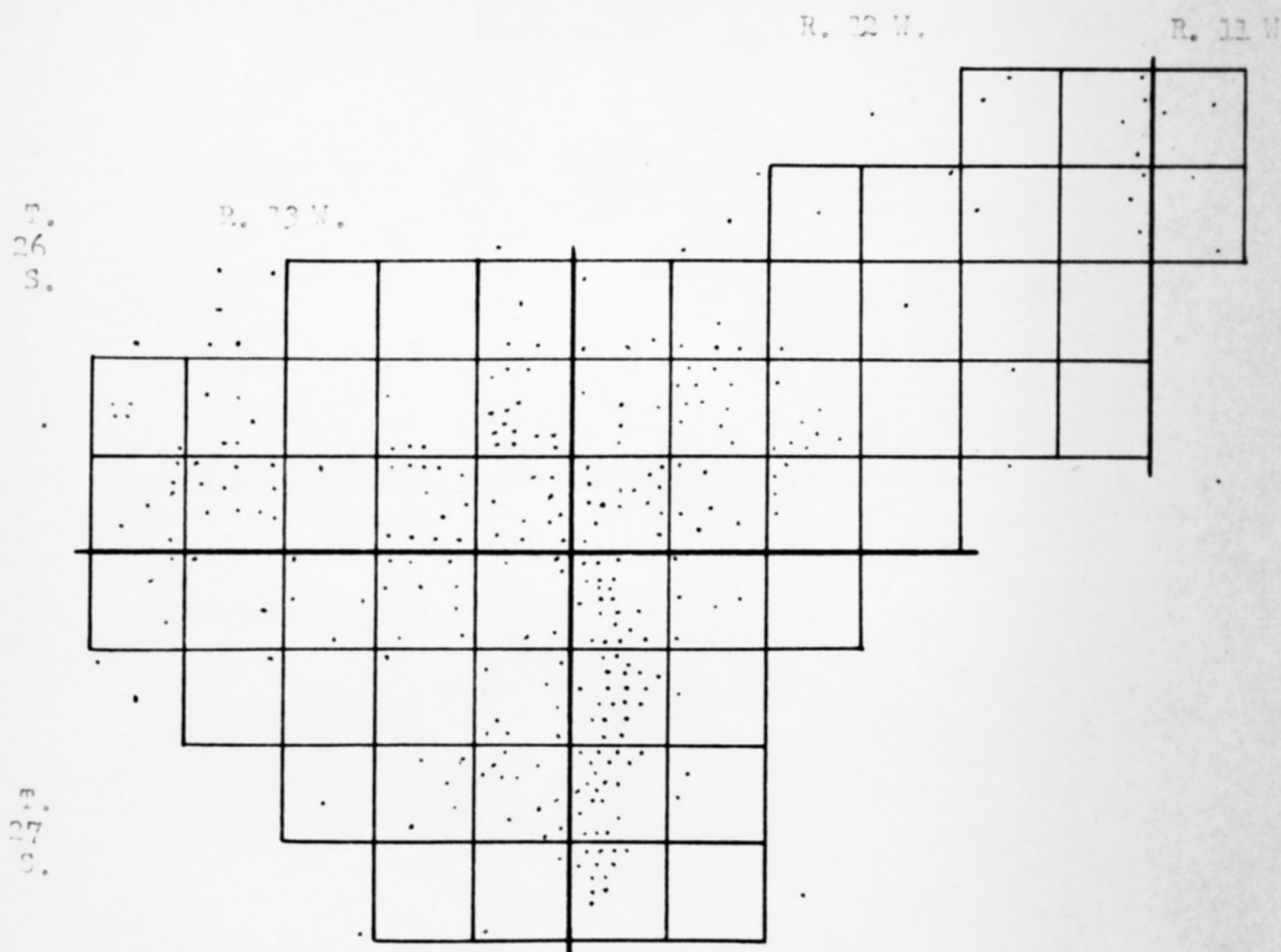


Fig. 12A. Map of Tule Lake flood area, showing locations of control points used for leveling the irregular line between the line of 45° inclination line and the line of the Hole line.

Fig. 13 Isopachous lines drawn, representing the interval between the top of the Viola limestones and the top of the Simpson group, Iuka-Carmi pool area, Pratt County, Kansas

(In accompanying plate box)

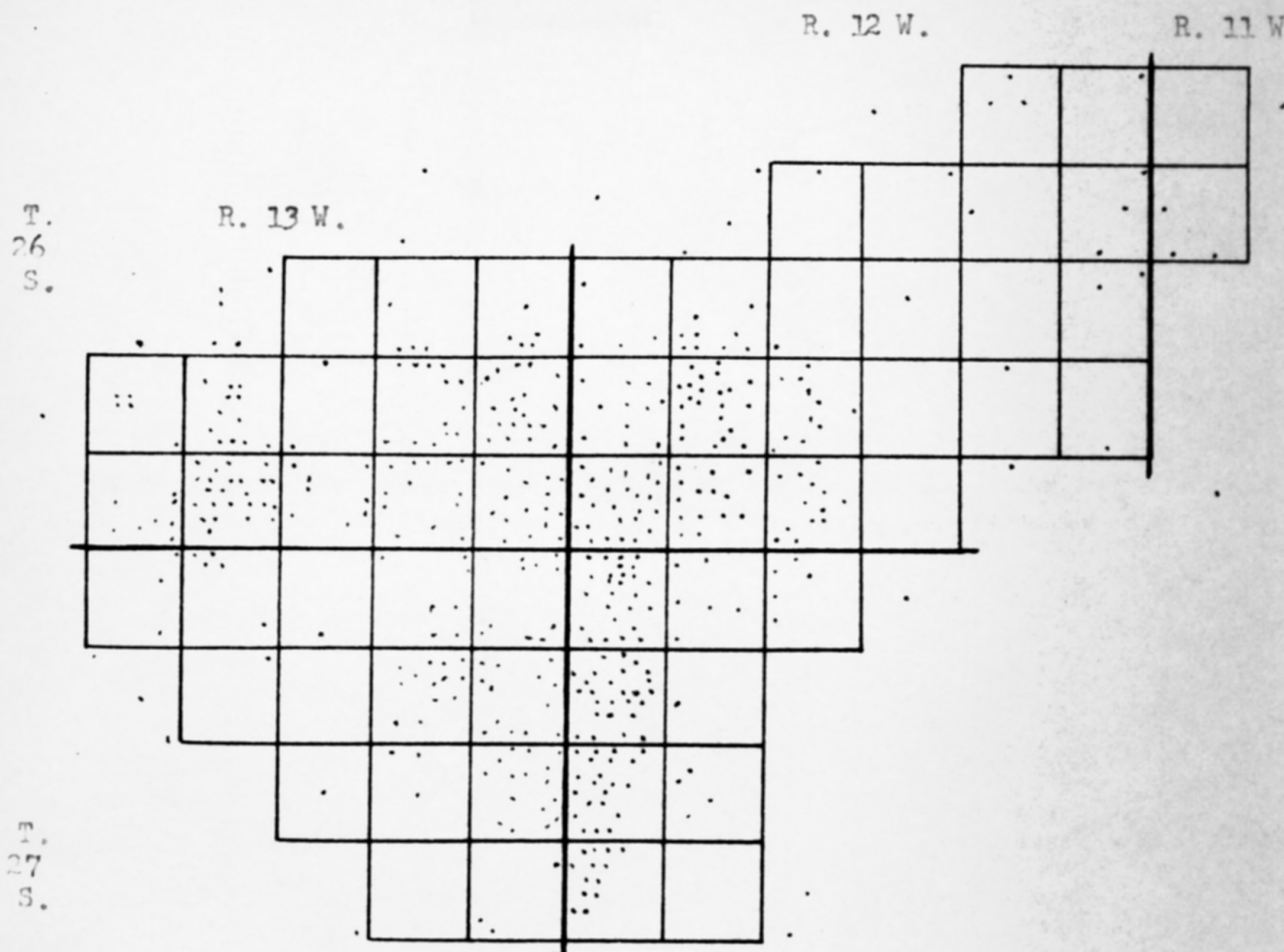


Fig. 13A. Map of Inka-Carral pool area, showing locations of control points used for drawing the isopachous lines between the top of the Viola limestones and the top of the Simpson group.

Fig. 14 Isopachous lines drawn, representing the interval between the top of Simpson group and the top of the Arbuckle group, Iuka-Carmi pool area, Pratt County, Kansas

(In accompanying plate box)

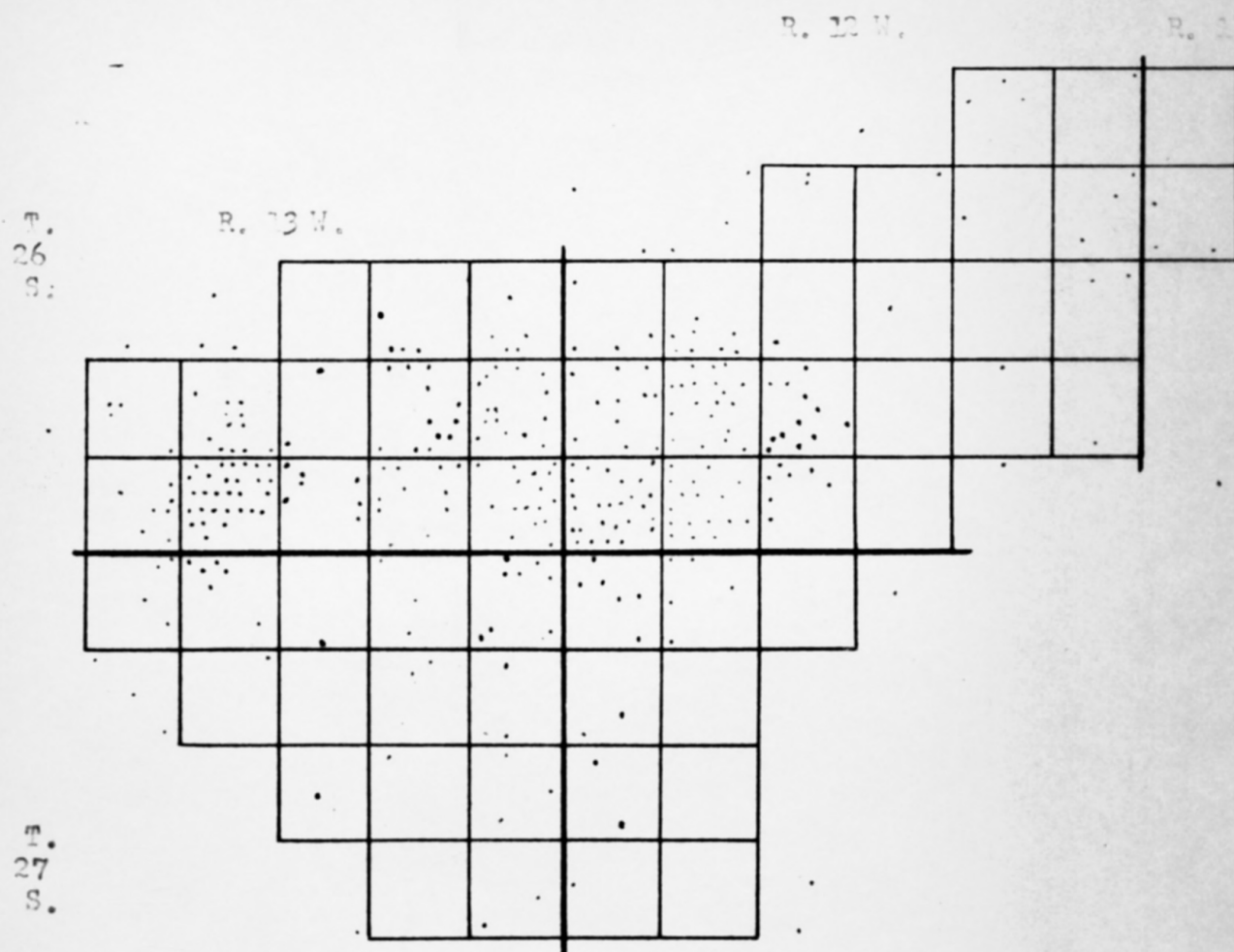


Fig. 14A. Map of Iuka-Carni pool area, showing locations of control points used for drawing the isochronous lines between the top of the Simpson group and the top of the Arbuckle group.

SUBSURFACE GEOLOGY OF THE IUKA-CARMI POOL AREA,
PRATT COUNTY, KANSAS IN RELATION TO PETROLEUM ACCUMULATION

by

Homer Warner Briggeman

B. S., Kansas State College
of Agriculture and Applied Science, 1958

AN ABSTRACT OF A THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Geology

KANSAS STATE COLLEGE
OF AGRICULTURE AND APPLIED SCIENCE

1959

The purpose of this investigation was to determine the sub-surface structure, stratigraphy, and geologic history of the Iuka-Carmi pool area, Pratt County, Kansas and the relationship of these factors to economic petroleum accumulation.

The area is located in northeastern Pratt county, and comprises 60 square miles. The area lies entirely within the Great Bend Prairie physiographic province.

Six structural contour maps, three isopachous maps and two cross sections were constructed using all available subsurface data. These maps were used to determine the relationship of the geology of the area to petroleum accumulation.

The most important structure of the area is the Pratt Anticline, which has a northeast-southwest trend across the area and is believed to be an extension of the Ellsworth Anticline to the north.

Several periods of erosion affected the area; however post-Arbuckle, post-Viola, and post-Mississippian were the most important in relation to petroleum accumulation. These periods of erosion and the associated weathering were responsible for the porosity and permeability developed in the Arbuckle, Viola, and Mississippian reservoir rocks. The porosity and permeability found in the Simpson sand, Lansing-Kansas City, and Marmaton groups were the result of favorable sedimentation conditions during deposition.

Drilling in the area was very limited until 1943 when the Carmi pool was opened. Development activity continued at a high rate until 1951 at which time the Iuka and Carmi pools were combined. Since 1953 drilling activity has been on steady decline in the area.

The major producing zones of the Iuka-Carmi pool area are the Arbuckle, Viola, and the Simpson sand, with minor amounts being produced from the

Mississippian, Lansing-Kansas City, and the Marmaton.

The area has produced a total of 23,728,210 barrels of oil and 3,221,362 MCF of gas. The area has produced for a period of 20 years from 1937 to 1957. Future possibilities for new discoveries are scarce, however the area has very good possibilities of production from secondary recovery methods.

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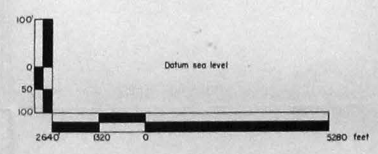
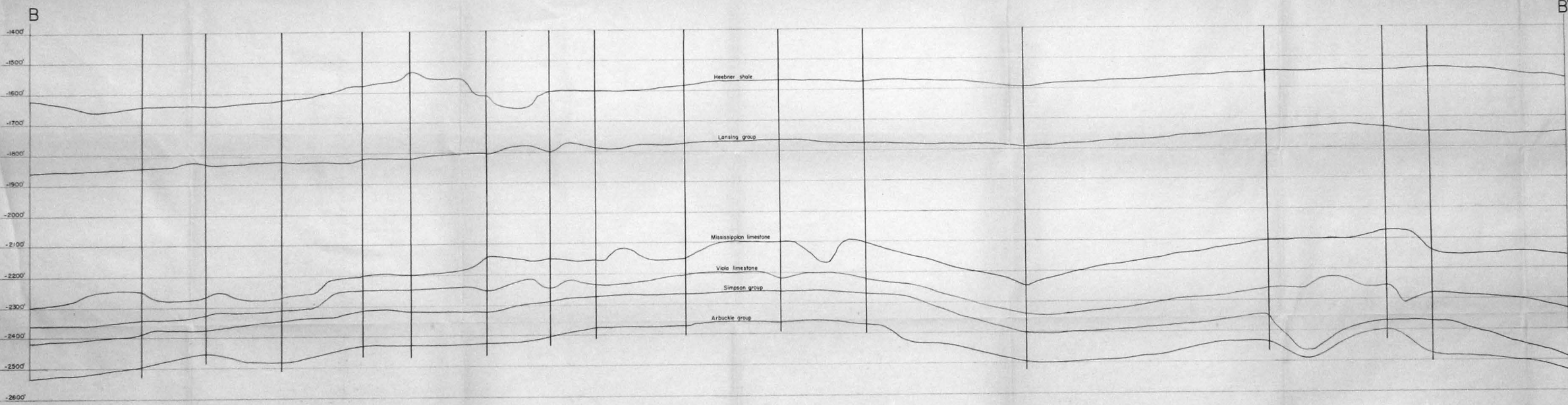
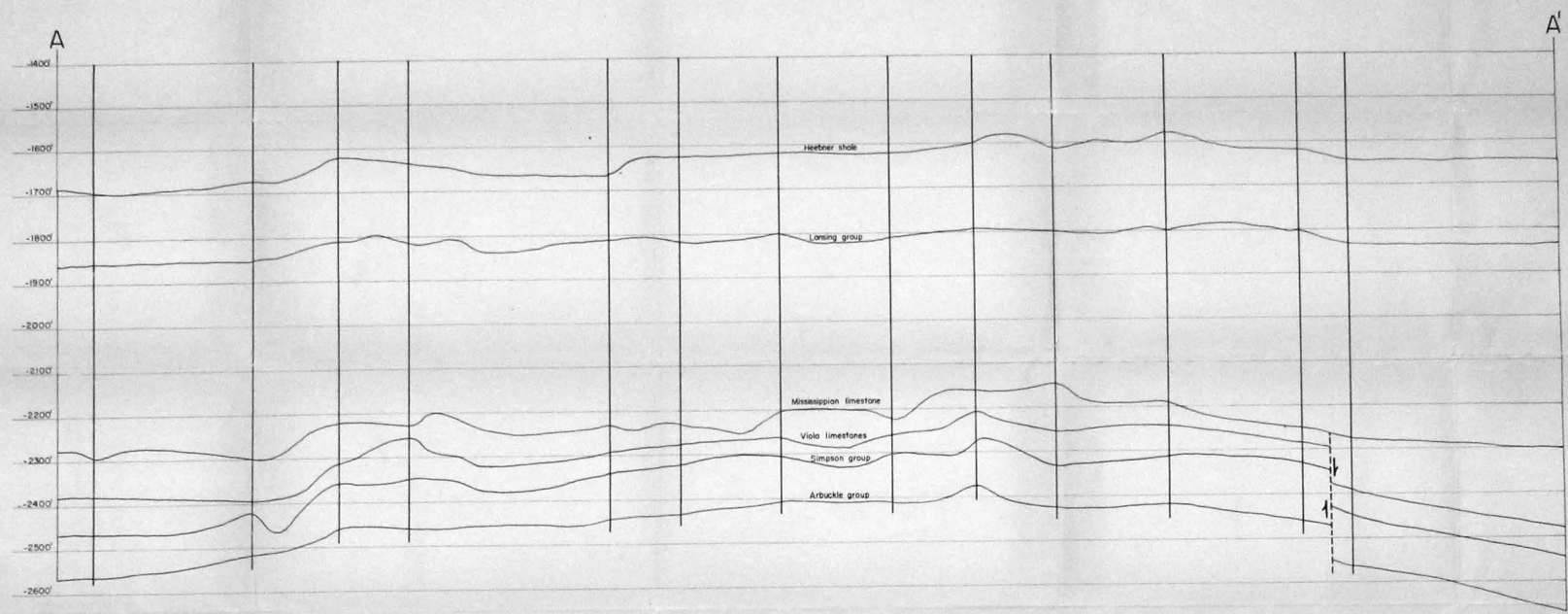
Briggeman, Homer W.

Subsurface Geology of the Iuka-Carmi Pool area,
Pratt County, Kansas, in relation to Petroleum
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Fig. 5 Cross sections of the Iuka-Carmi Pool area,
Pratt County, Kansas

Cross sections of the luka-Carmi pool area,
Pratt County, Kansas

Fig. 5



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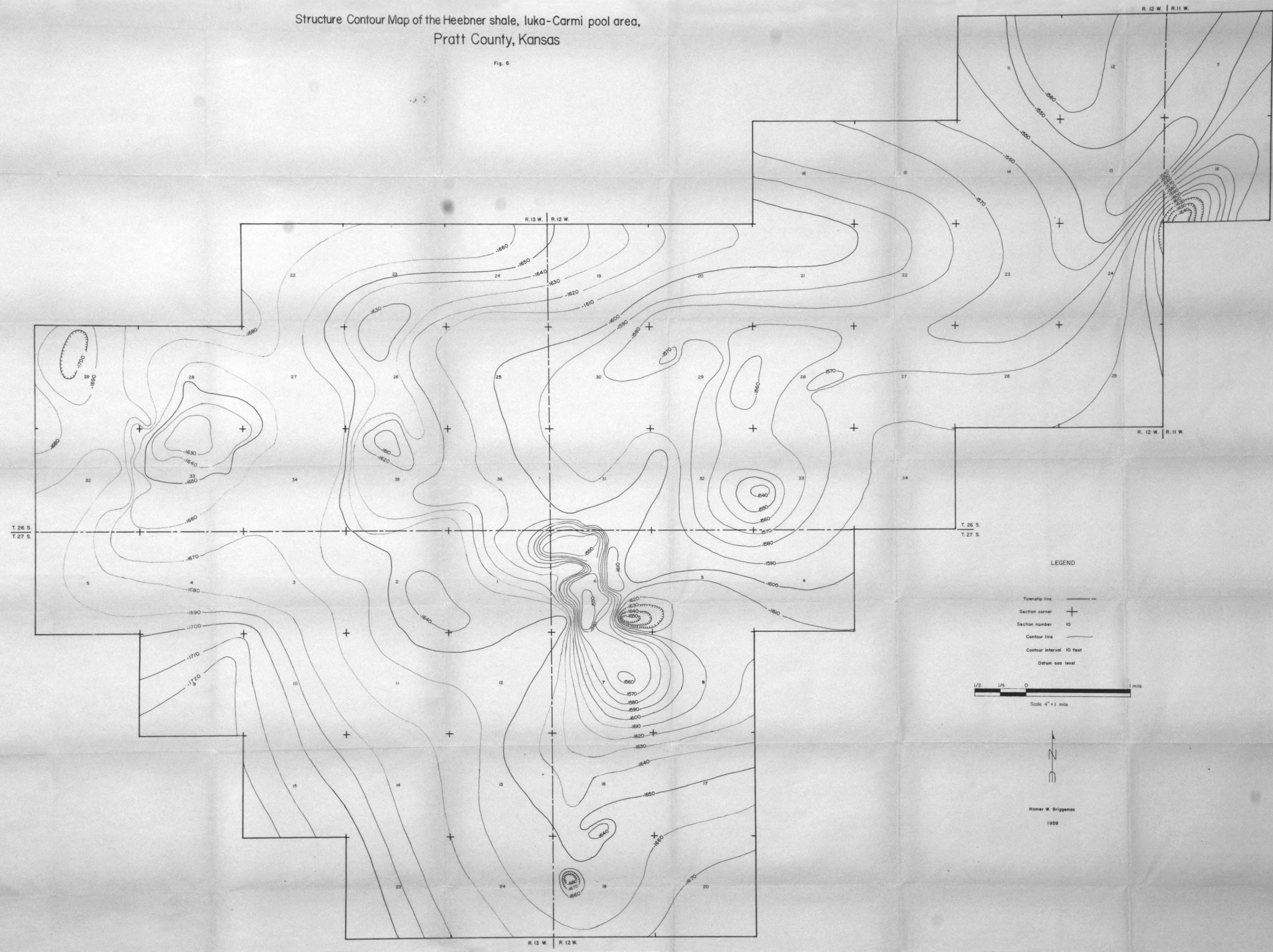
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Subsurface Geology of the Iuka-Carmi Pool area,
Pratt County, Kansas in relation to petroleum
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Fig. 6 Structure contours drawn on the Heebner shale,
Iuka-Carmi Pool area, Pratt County Kansas

Structure Contour Map of the Heebner shale, Iuka-Carmi pool area,
Pratt County, Kansas

Fig. 6



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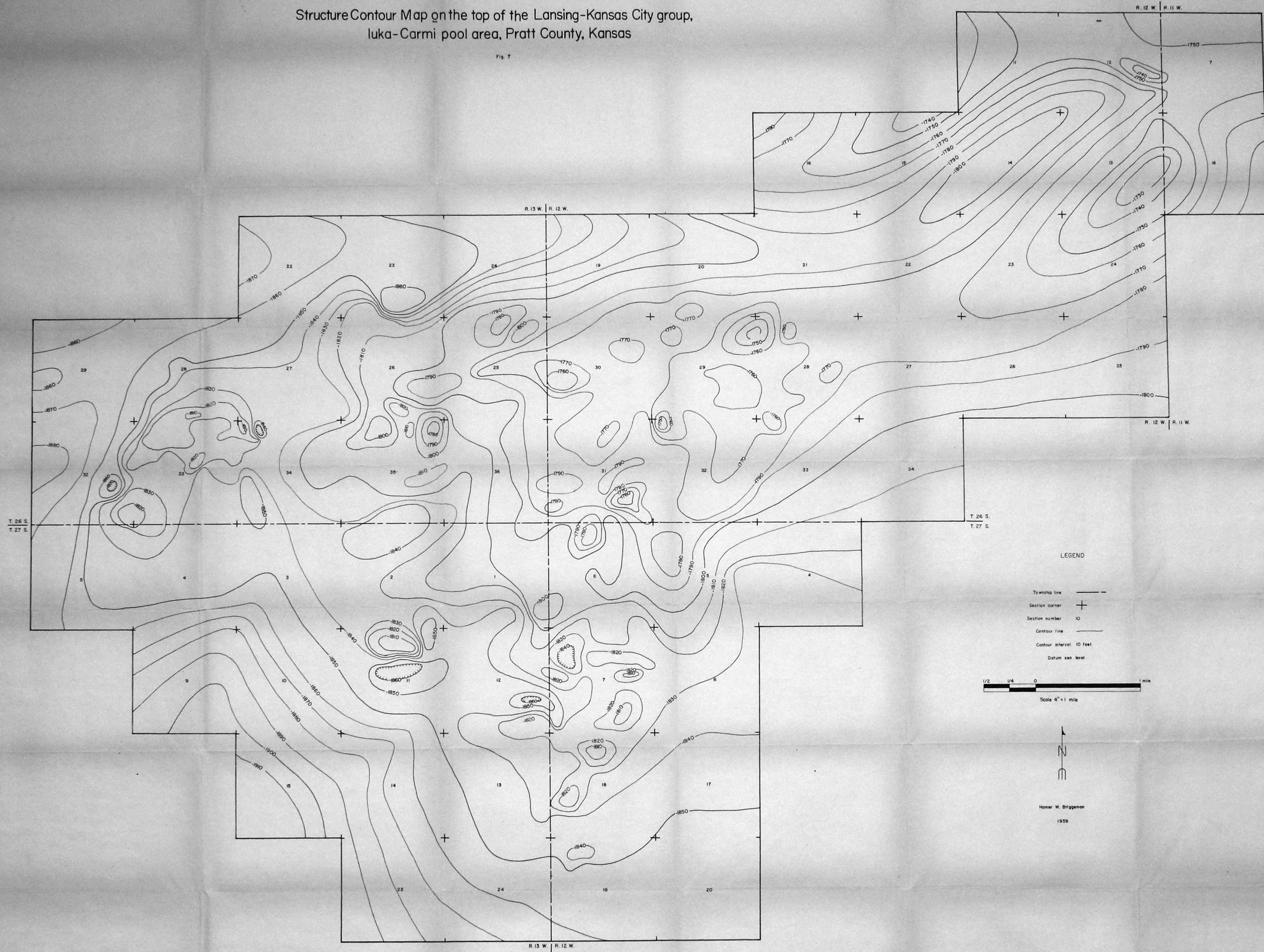
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Pratt County, Kansas, in relation to petroleum
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Fig. 7 Structure contours drawn on the Lansing group,
Iuka-Carmi Pool area, Pratt County, Kansas

Structure Contour Map on the top of the Lansing-Kansas City group, Iuka-Carmi pool area, Pratt County, Kansas

Fig. 7



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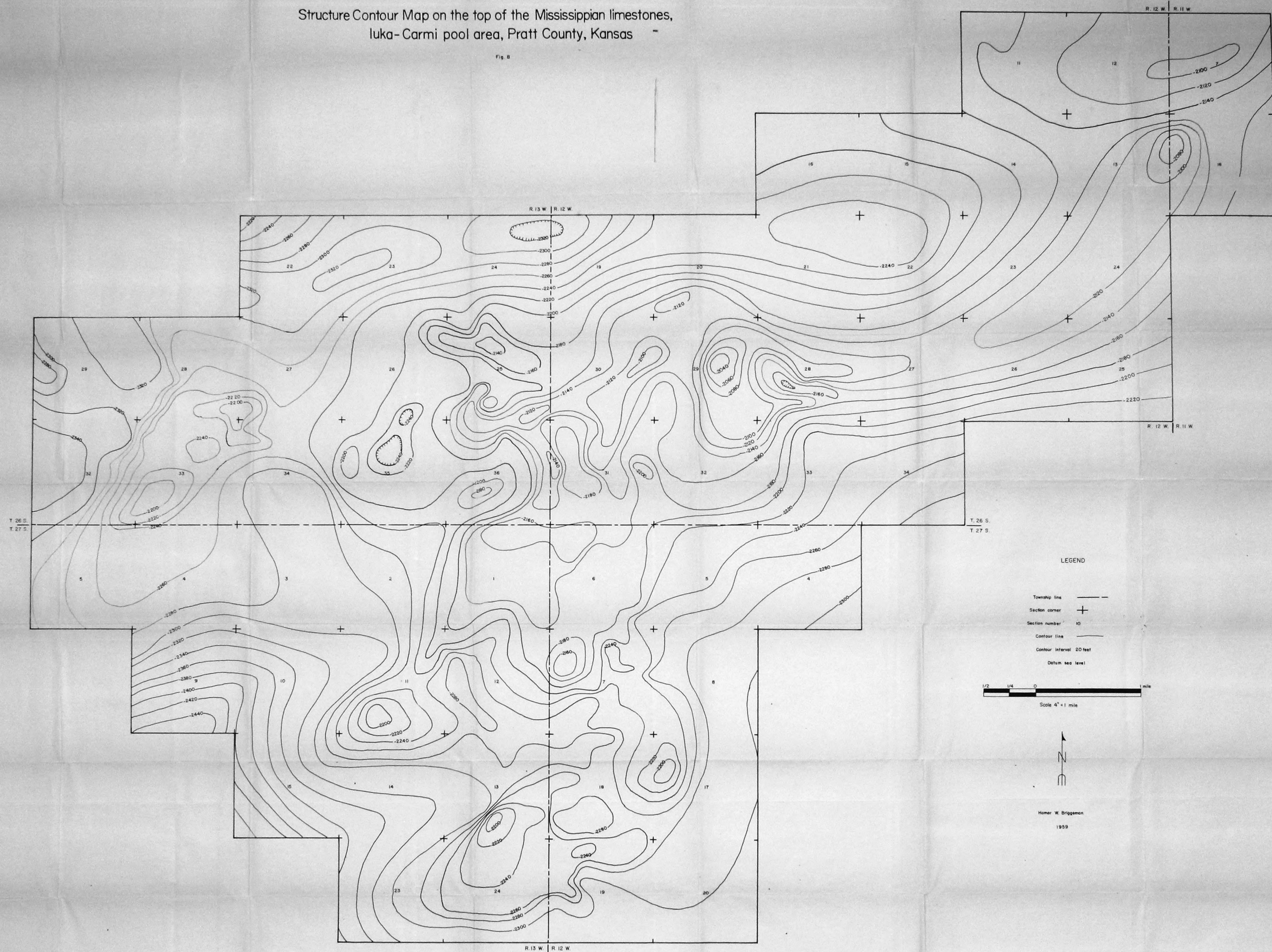
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Pratt County, Kansas, in relation to petroleum
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Fig. 8 Structure contours drawn on the Mississippian
limestones, Iuka-Carmi Pool area, Pratt County
Kansas

Structure Contour Map on the top of the Mississippian limestones, Iuka-Carmi pool area, Pratt County, Kansas

Fig. 8



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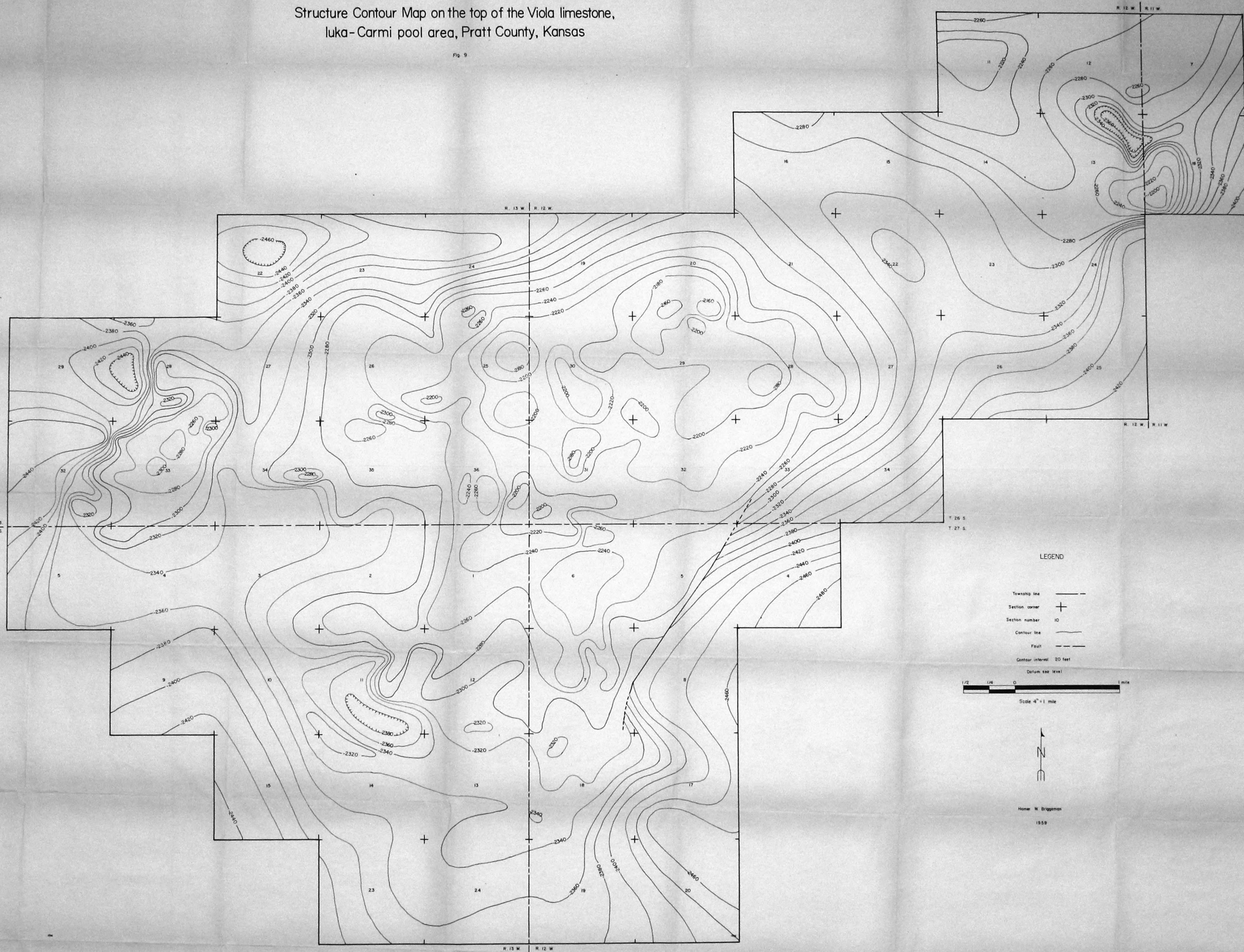
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Pratt County, Kansas, in relation to petroleum
accumulation (Masters Thesis:1959) Copy 2

Fig. 9 Structure contours drawn on the Viola limestones,
Tuka-Carmi Pool area, Pratt County, Kansas

Structure Contour Map on the top of the Viola limestone, Iuka-Carmi pool area, Pratt County, Kansas

Fig. 9



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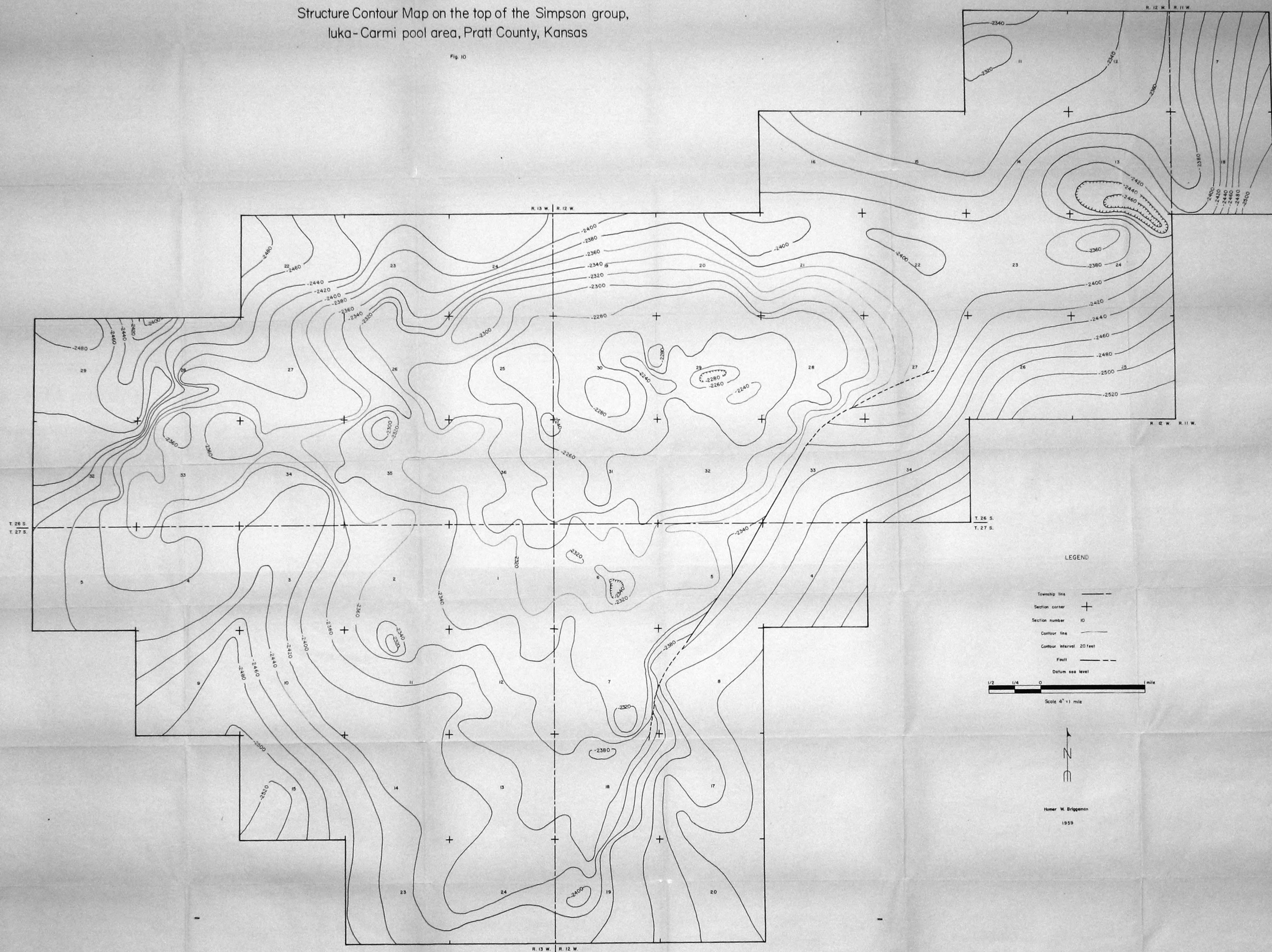
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Subsurface Geology of the Iuka-Carmi Pool area,
Pratt County, Kansas, in relation to petroleum
accumulation (Masters Thesis: 1959) Copy 2

Fig. 10 Structure contours drawn on the Simpson group,
Iuka-Carmi Pool area, Pratt County, Kansas

Structure Contour Map on the top of the Simpson group,
Iuka-Carmi pool area, Pratt County, Kansas

Fig. 10



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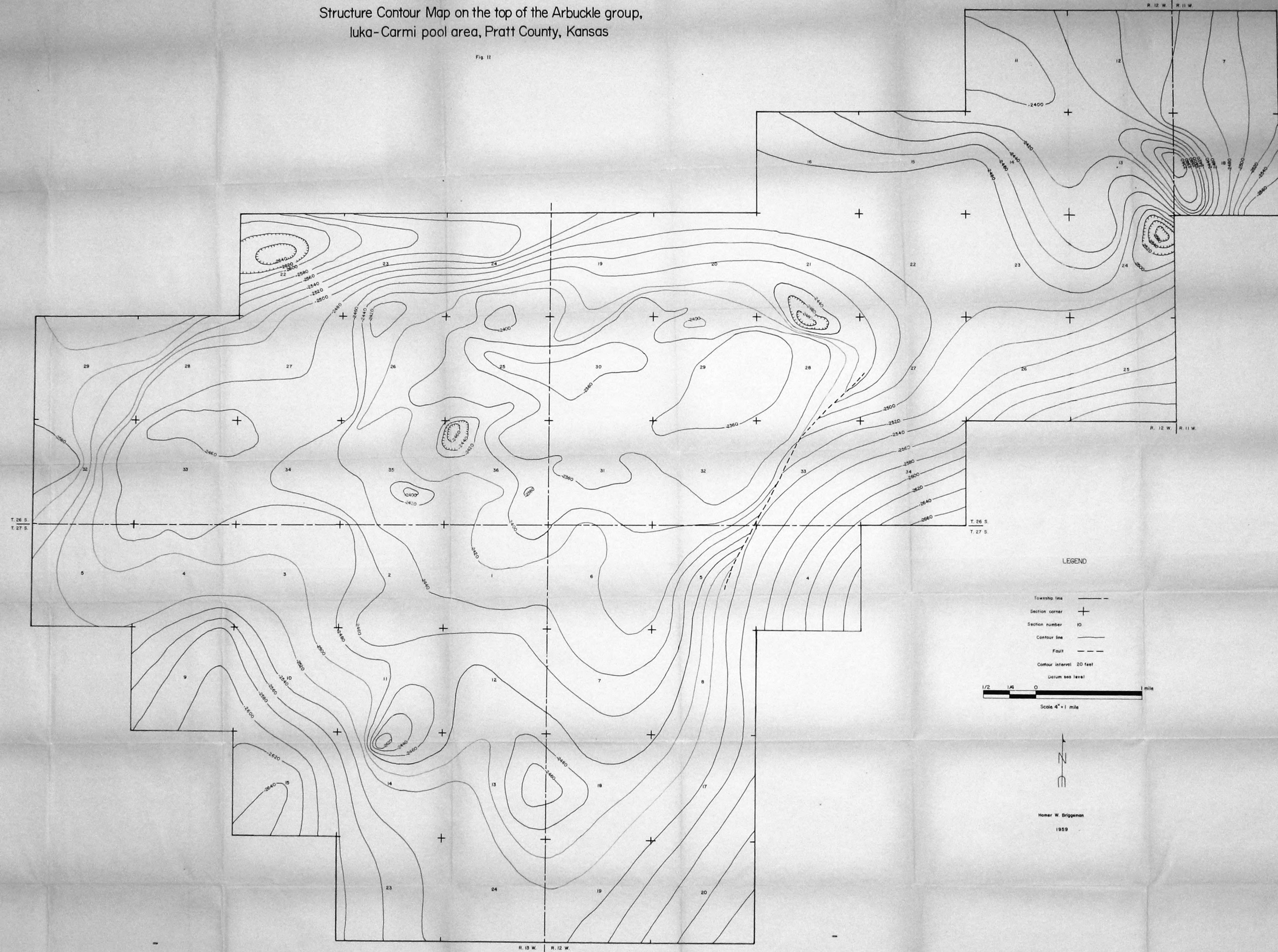
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Pratt County, Kansas, in relation to petroleum
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Fig. 11 Structure contours drawn on the Arbuckle group,
Iuka-Carmi Pool, Area, Pratt County, Kansas

Structure Contour Map on the top of the Arbuckle group,
Iuka-Carmi pool area, Pratt County, Kansas

Fig. 11



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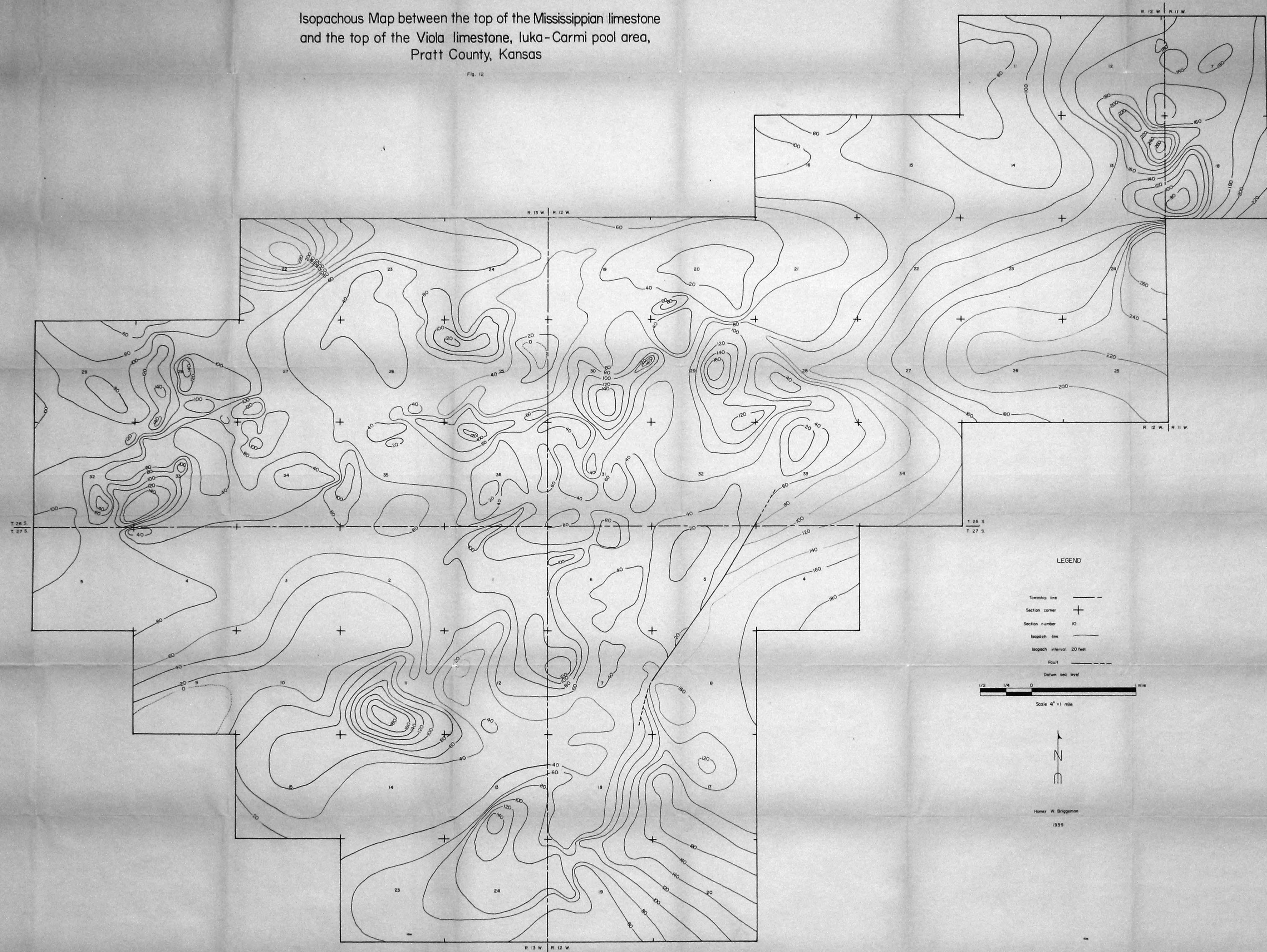
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Subsurface Geology of the Iuka-Carmi Pool area,
Pratt County, Kansas, in relation to petroleum
accumulation (Masters Thesis: 1959) Copy 2

Fig. 12 Isopachous lines drawn, representing the interval
between the top of the Mississippian limestones
and the top of the Viola limestones, Iuka-Carmi
Pool area, Pratt County, Kansas

Isopachous Map between the top of the Mississippian limestone
and the top of the Viola limestone, Iuka-Carmi pool area,
Pratt County, Kansas

Fig. 12



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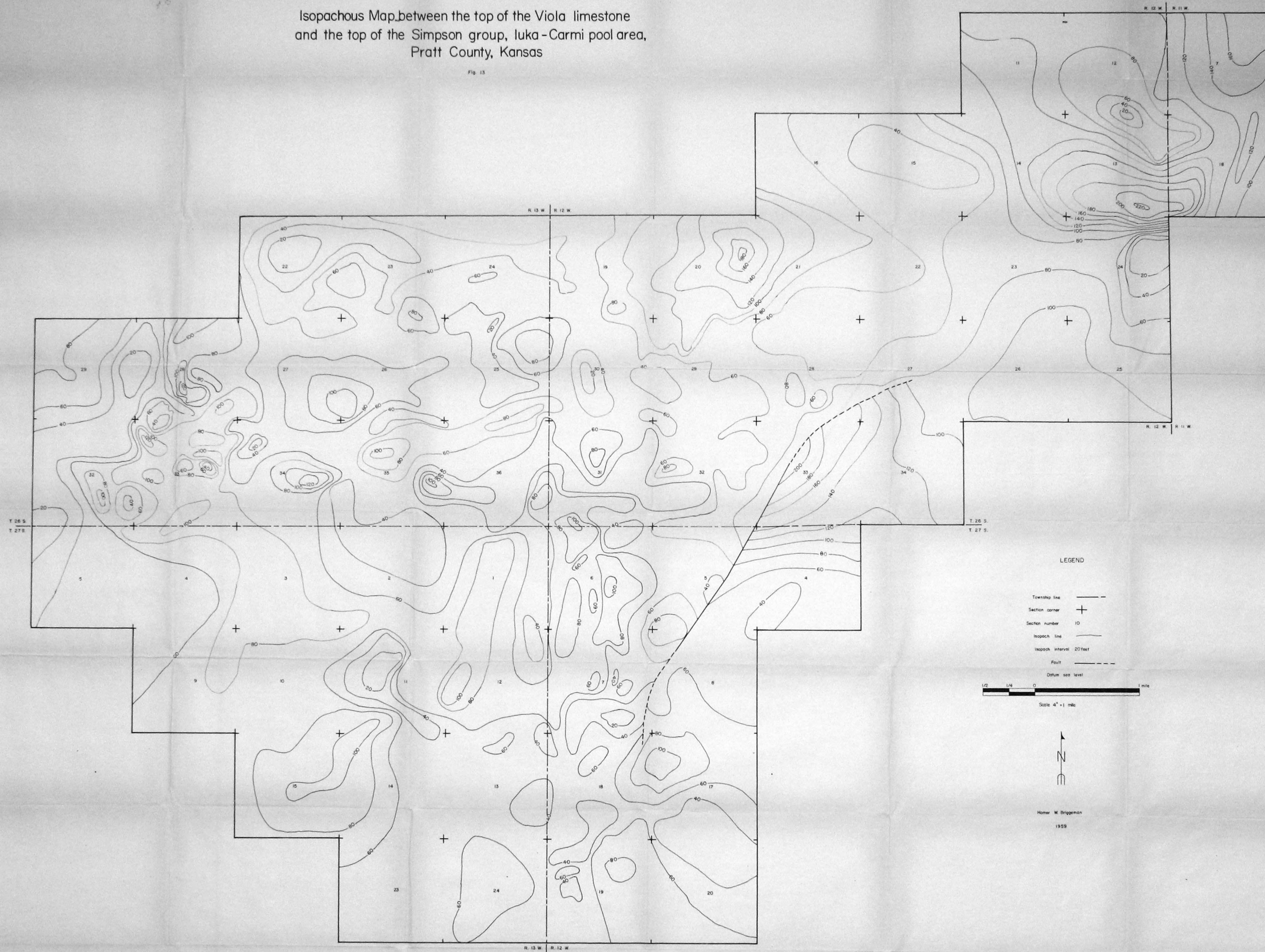
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Subsurface Geology of the Iuka-Carmi Pool area,
Pratt County, Kansas, in relation to petroleum
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Fig. 13 Isopachous lines drawn, representing the interval
between the top of the Viola limestones and the
top of the Simpson group, Iuka-Carmi Pool area,
Pratt County, Kansas

Isopachous Map between the top of the Viola limestone
and the top of the Simpson group, Iuka-Carmi pool area,
Pratt County, Kansas

Fig. 13



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Subsurface Geology of the Iuka-Carmi Pool area,
Pratt County, Kansas, in relation to petroleum
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Fig. 14 Isopachous lines drawn, representing the interval
between the top of the Simpson group and the top
of the Arbuckle group, Iuka-Carmi Pool area, Pratt
County, Kansas

Isopachous Map between the top of the Simpson group
and the top of the Arbuckle group, Iuka-Carmi pool area,
Pratt County, Kansas

Fig. 14

