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Chas. N. Gould, Director

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OIL AND GAS IN OKLAHOMA

**GEOLOGY OF CADDO AND GRADY COUNTIES,
OKLAHOMA.**

By

Clyde M. Becker

NORMAN

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OIL AND GAS IN OKLAHOMA

CADDO COUNTY

GEOGRAPHY

Caddo County, Oklahoma, comprises the following area: Tps. 5 to 10 N., Rs. 9 to 13 W., also Tps. 11 and 12 N., Rs. 11, 12, and 13 W. The total area covers 35 townships or 1,296 square miles.

FOREWORD

In 1917 the Oklahoma Geological Survey issued Bulletin 19 part 2 entitled, "Petroleum and Natural Gas in Oklahoma." This volume was so popular that the supply was soon exhausted, and for several years copies have not been obtainable.

The present director has seen the need of a revision of this bulletin. On account of lack of appropriations he has not been able to employ sufficient help to compile the data, and has called on some twenty representative geologists throughout the state to aid in the preparation of reports on separate counties. These gentlemen, all busy men, have contributed freely of their time and information in the preparation of these reports.

It will be understood that the facts as set forth in the various reports represent the observation and opinion of the different men. The Oklahoma Geological Survey has every confidence in judgment of the various authors, but at the same time the Survey does not stand sponsor for all statements made or for all conclusions drawn. Reports of this kind are, at best, progress reports, representing the best information obtainable as of the date issued and doubtless new data will cause many changes in our present ideas.

Mr. Clyde M. Becker of Chickasha, the author of the reports on Gray and Caddo counties, has worked in these counties for a number of years, and is generally recognized as being the best local authority on the geology of this part of Oklahoma as of this date.

March, 1927

CHAS. N. GOULD
Director

TOPOGRAPHY AND DRAINAGE

The topography of this region has been developed by the erosion of a high sandy plateau. The minor streams of the area are intermittent and descend rapidly toward the major streams. Their banks are steep and canyon-like and the general topography indicates that the drainage is recent in development.

Two major streams drain this area. The South Canadian River bounds the county on the north, and the Washita River crosses near the center of the county from east to west. The valley of this river is from 2 to 4 miles wide and its soil is very fertile. A peculiar feature of the drainage of the region is that nearly all the creeks run south. The Washita River drainage system extends almost to the South Canadian, but creeks which have their source south of the Washita also run south and finally find their way into Red River. Examples of this are Medicine and Cache creeks, both of which have their source within a few miles of the Washita and flow directly away from that stream and cross the Wichita uplift on their way southward. The course of streams has little or no relation to structural conditions.

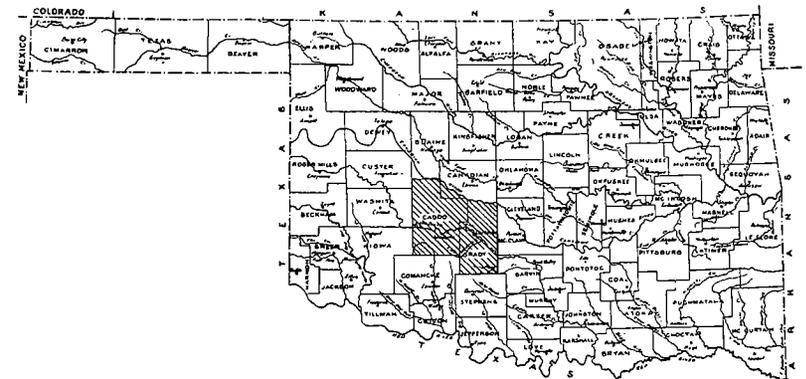


Figure 1—Map of Oklahoma showing area covered by this report.

GEOLOGY

STRATIGRAPHY

The exposed formations in Caddo County range in age from Cambrian to latest Permian. They are, in descending order, as follows: Day Creek dolomite and Cloud Chief gypsum, thought by some to occupy the same stratigraphic horizon, and from 5 to 35 feet thick; Whitehorse sandstone, soft red poorly cemented sand, 200-275 feet thick; Dog Creek-Blaine, red gypsiferous shales and gypsum, 125-150 feet thick; Chickasha sandstone, dark red and lenticular, with frequent clay partings, probably 150 feet thick in southeastern Caddo County, but thinning to not more than 75 feet where it crosses the western boundary of the county south of Carnegie; Duncan sandstone, loose uncemented sand, 30-50 feet thick; Clear Fork formation, 400-600 feet of red banded shales; and approximately 6,000 feet of Arbuckle limestone.

The major portion of Caddo County is covered by the Whitehorse sandstone of the Permian, but along the east side of the county the Dog Creek and Blaine shales are exposed. Along the north flank of the Wichita uplift, the Dog Creek, Blaine, Chickasha, Duncan and pre-Permian formations are exposed in narrow steeply dipping outcrops.

The Duncan sandstone, in southeastern Caddo County is separated from the Chickasha above by 30 to 50 feet of almost uncemented sand. Below this sand is 20 to 30 feet of dark red sandstone similar to the Chickasha. Northwest of Apache the loose upper sand disappears and the lower beds of the Duncan come up into contact with the base of the Chickasha. This lower bed becomes more and more shaly to the northwest until it is difficult to follow the contact beyond the western boundary of the county.

Below the Duncan is a series of red banded shales 400 to 600 feet thick as shown in well logs. These shales, like the formations immediately above them, appear to thin to the northwest, and the big white sandstone series which underlies these shales is found not far below the dolomite previously referred to in the northern part of T. 7 N., R. 16 W., north of the town of Gotebo. This white sandstone series is the same sandstone referred to by Wegemann and Howell¹, whose description is as follows:

The most prominent bed or group of beds in the Lawton field structurally and stratigraphically is the sandstone that forms the low rounded hills east and north of the gas wells. Its outcrop may be traced for 12 to 15 miles northwest of the Lawton pool and probably much farther along the north flank of the Wichita Mountains. The individual beds of sandstone are lenticular being interbedded with shales but the group as a whole seems to be continuous over a large area in this part of the State. It occupies

1. Wegemann, C. H., and Howell, R. W. The Lawton oil and gas field, Okla.: U. S. Geol. Survey, Bull 621 G., 1916.

about the same stratigraphic position as the high ridge 6 miles north of Loco in which grahamite was at one time mined in sec. 6, T. 2 S., R. 4 W., and also the prominent wooded ridge extending across T. 1 S., R. 5 W., in the direction of the Duncan gas field. **This sandstone is about 200 feet thick. Some 400 or 500 feet above it lies the sandstone that forms the escarpment about the Duncan gas field, as well as the line of hills 6 miles northeast of the Lawton field. The rocks between these two sandstones are predominately shales.

The sandstone scarp referred to, as well as the area 6 miles north of the Lawton gas field, is the Duncan sandstone. The author has detailed most of the area discussed in the preceding paragraph and is in complete accord with Wegemann's conclusions.

The above described Permian formations are in contact with the Arbuckle limestone in the southeastern corner of the county, and is approximately 6,000 feet thick in this area. The Reagan sandstone is not exposed below the Arbuckle in Caddo County. The Reagan is found below the Arbuckle and above a porphyritic granite south of the county line in T. 4 N., R. 12 W., and is approximately 100 feet thick. This porphyritic granite is similar to the Colbert porphyry of the Arbuckle Mountains and is exposed in contact with the Arbuckle limestone in the southwest portion of Caddo County in T. 5 N., R. 13 W.

STRUCTURAL GEOLOGY

The major structural features of this area are the Wichita uplift and the Anadarko basin. Minor structural features so far as known are the Cement anticline and a structural terrace northeast of the Anadarko basin.

The Wichita uplift is believed by Taff to have occurred in early Pennsylvanian times and was greatly eroded between the time of uplift and the beginning of the Permian. The detrital material consisting of both clastic and non-clastic sediments was dumped as deltaic deposits around the base of the older truncated formations. The area was reduced to the proportions of a peneplane at the close of the Pennsylvanian by the lowering of the uplift by erosion and the filling in of the deep basin by the eroded material. The Permian beds were laid down upon this surface and covered both the eroded uplift and the deltaic material around its base. Later when the entire area was re-elevated the eroded material below the Permian settled much more than the resistant beds of the truncated uplift, resulting in the Anadarko basin. The Permian beds show steep dips at the perimeter of the old uplift, and range from 3 to 7 degrees but the dips are 20 to 40 feet per mile where they actually overlie the uplift.

Because of the character of Pennsylvanian deposits below the Permian in the Anadarko basin it is almost impossible to correlate well logs after they pass through the Permian and it is also impossible in most

instances to tell exactly when the drill passes from the Permian into Pennsylvanian formations. Wells drilled near the buried uplift usually find granite wash just below the Permian while out a little farther a sand and sandy shale series appears, and still farther out in the basin the section shows almost no sand, the entire log consisting of shales and a few thin limestones. Therefore there are two distinct types of Pennsylvanian sediments in the Wichita region. First, those laid down as horizontal strata before the uplift, and deposited as was the Glenn of the Arbuckle Mountains; second, the eroded deltaic material similar in character to the so-called Permon-Pennsylvanian Pontotoc series.

ECONOMIC GEOLOGY

At the present time the Cement anticline is the only oil and gas producing structure in Caddo County. This structure was first mapped by D. W. Ohern and Frank Buttram in 1916. The history of the early development and a description of sub-surface geology and discussion of drilling conditions are fully described in Frank Reeves, U. S. Geol. Survey, Bulletin 726-B, "Geology of the Cement Oil Field, Caddo County, Oklahoma."

At the present time, according to the best data available, there are 175 oil wells and three gas wells producing in the Cement field, 95 of which are owned by independent producers, and produce at the present time approximately 1,000 barrels per day. Much of this oil is handled by the Anderson Pritchard Refining Co. of Cyril. The Magnolia Petroleum Company is operating 80 wells which produce 700 barrels daily. Mr. C. P. Parsons of the Magnolia Petroleum Co., has furnished for use in this report a graph of the production decline curve of a type lease of the Cement field. It will be noted that production holds up exceedingly well, which has been the chief characteristic of all the wells which have been properly cared for.

The principal operators of the field are as follows: Magnolia Petroleum Corporation, Homaokla Oil Co., Lone Star Gas Co., Gorton Trust Co., Hall and Briscoe, Louisiana Oil and Refining Co., Flor-okla Oil Co., English Drilling Co., Clyde Kale, Achme Development Co., Prairie Oil and Gas Co., Wampum Oil Co., and W. H. Livermore, Inc.

FUTURE DEVELOPMENT

The development of oil and gas fields in Caddo County in the future will probably be confined to two areas, the terrace-like structures along the north slope of the truncated Wichita uplift and the terrace-like structure northeast of the Anadarko basin in the northern part of the county. In the northern area the productive horizon, if found, will probably be near the base of the Permian. In addition to the possible horizon at the base of the Permian, the Glenn and deeper strata as low as the Simpson may produce oil in the southwestern part of the county.

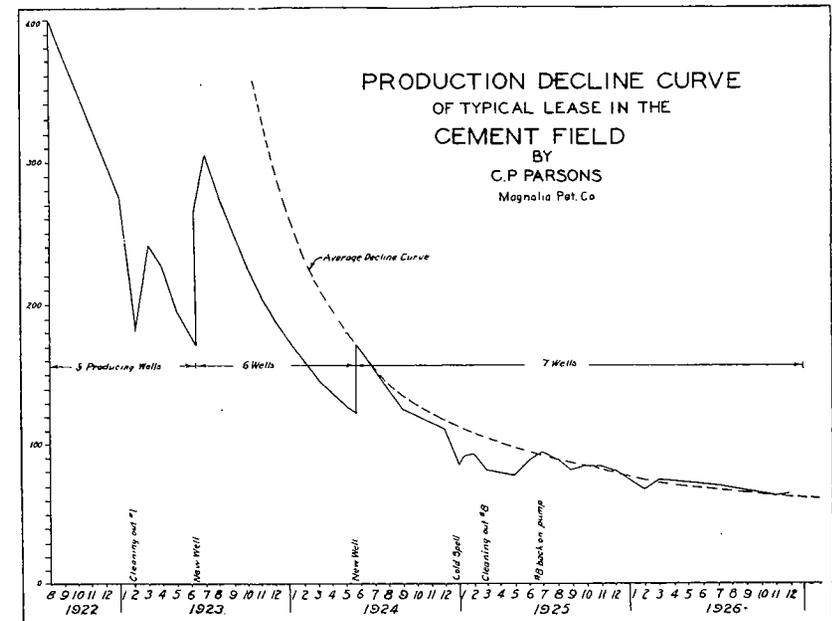


Figure 2—Production-decline curve of the Cement field.

GRADY COUNTY

INTRODUCTION

LOCATION

Grady County, Oklahoma comprises the area south of the Canadian River between Rs. 4 and 9 W., and extends south to the north line of T. 2. N. The county is 24 miles wide, east to west, and the mean of the north and south dimension is approximately 46 miles. The total area is a little over 1,100 square miles.

ACKNOWLEDGMENTS

The following men have been of great assistance with advice and data; Chas. N. Gould¹, J. V. Howell, F. W. Floyd, Joseph B. Umpleby, C. D. Stephenson, Rudolph Brauchli, and in the actual mapping of

1. Gould, Charles N., A new classification of the Permian red beds of southwestern Oklahoma: Bull. Amer. Assoc. Pet. Geol., Vol. 8, pps. 322-341, 1924.

structure, Allan B. Gray, and Waldemar M. Ervin. Reports by Sawyer² and Clifton³ have furnished additional material.

GEOGRAPHY

The South Canadian and Washita rivers drain Grady County. Only two small streams run northward into the South Canadian, all other streams running southward into the Washita River. The valley of the South Canadian is sandy and unproductive, while the valley of the Washita is one of the most fertile in the State.

TOPOGRAPHY

The topography of Grady County consists of high sandy hills, cut by deep drainage channels where erosion has attacked the Whitehorse and Chickasha sandstone formations, and rolling plains where the Dog Creek and Blaine shales are exposed.

Surface elevations range from 975 feet to 1,100 feet along the valley of the Washita, to slightly above 1,400 feet along the high sandstone hills north of Rush Springs in T. 4 N., R. 7 W. It is probable that the sand hills 7 to 10 miles northwest of Pocasset attain nearly the same elevation.

STRATIGRAPHY

CLOUD CHIEF GYPSUM

The Cloud Chief gypsum is a stratum of crystalline gypsum 10 to 20 feet thick where exposed in Grady County.

WHITEHORSE SANDSTONE

A loose almost uncemented red sandstone 225 to 325 feet thick, the lower 100 feet containing much gypsum and is more cemented than the upper portion.

BLAINE AND DOG CREEK FORMATIONS

Red soft banded gypsiferous shales, 120-130 feet thick. Included in these formations are two sandstone members, the upper 30 to 40 feet below the base of the Whitehorse, is 20 to 25 feet thick, brownish red in color and contains considerable gypsum. It is frequently confused with the base of the Whitehorse. This bed is exposed in a long ledge in the hills south of Verden, and extends eastward to a point three miles west of Chickasha. The other sandstone member is approximately 40 feet below the formation just described, and 30 feet above the base of the Blaine formation. It is a dark red coarse grained somewhat conglomeratic sandstone averaging 10 feet in thickness, and is frequently mistaken for the upper portion of the Chickasha formation. This bed is well exposed in a scarp south of the Little Washita River near the center of Sec. 4, T. 5 N., R. 7 W. It is also ex-

2. Sawyer, R. W., Areal geology of a part of southwestern Oklahoma: Bull. Amer. Assoc. Pet. Geol., Vol. 8, pp. 317-321, 1924.
3. Clifton, R. L., The Whitehorse sandstone: Unpublished thesis, University of Oklahoma.

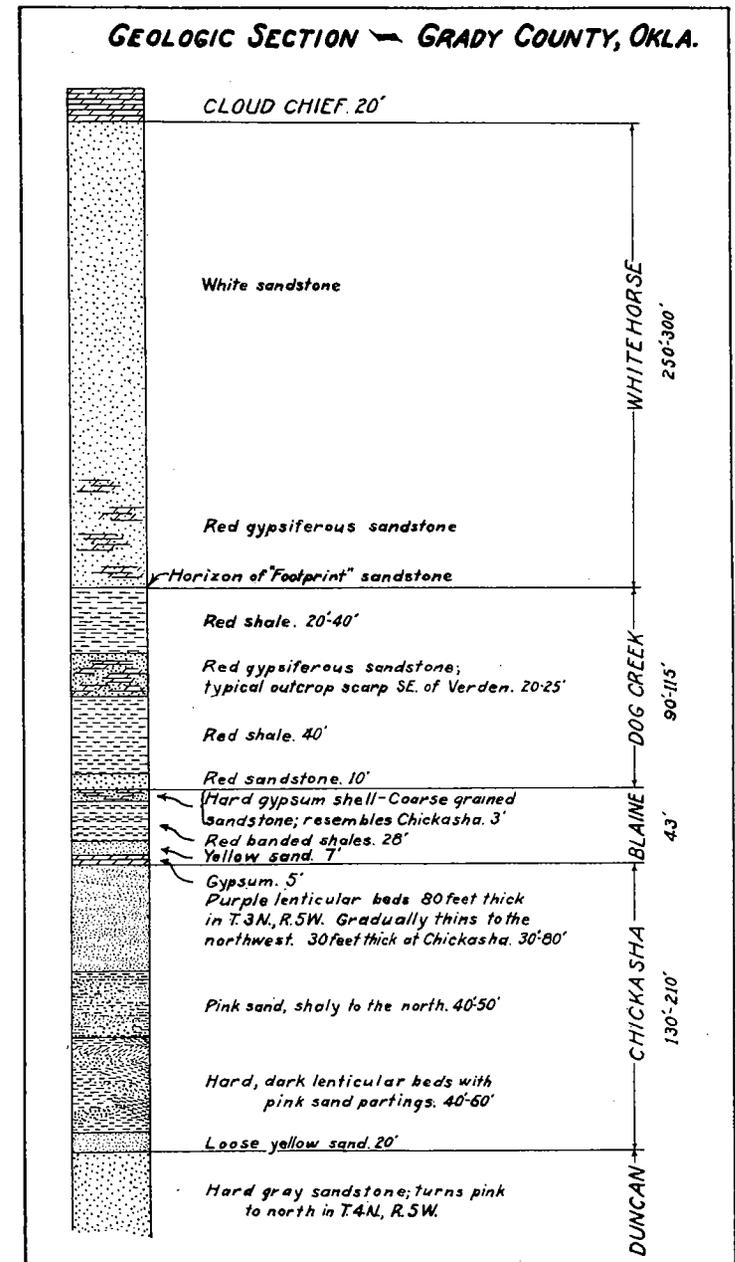


Figure 3—Geologic section of Grady County.

posed west of Chickasha in secs. 25 and 36, T. 7 N., R. 8 W., and in sec. 31, T. 7 N., R. 7 W.

VERDEN CHANNEL SANDSTONE

The so-called Verden sandstone occurs between the base of the Whitehorse and the top of the Dog Creek formation. It is a long channel-like deposition which has been described by Stephenson⁴, and Reed and Meland⁵. The latter suggested the name of the Verden sandstone.

The lower sandstone member of the Dog Creek formation extends over a very wide area, and has been found mappable as far southwest as sec. 21, T. 4 N., R. 10 W., southwest of the town of Fletcher, Comanche County.

CHICKASHA FORMATION

Sometimes locally called the "Purple sandstone." There are three distinct divisions of the Chickasha formation, which will be referred to as the upper Chickasha, middle Chickasha, and lower Chickasha. The upper Chickasha is from 45 to 80 feet thick and consists of a series of deep red to purple mudstone conglomerate lenses, separated from each other by very fine grained pink, uncemented sand. The type section is located in the southwestern part of T. 4 N., R. 5 W., and the southeastern part of T. 4 N., R. 6 W. The lenses in this formation become less massive and more shaly to the northwest until it is little more than a banded gypsiferous shale in the northern part of the county. The middle Chickasha, 40 to 50 feet thick, is a stratum of pink unconsolidated fine grained sand in which no massive lenses of any kind occur. The type section is found in the central and southwestern portion of T. 4 N., R. 5 W. Like the upper Chickasha this formation becomes more shaly and gypsiferous to the northwest. The lower Chickasha, 50 to 100 feet thick, consists of a series of massive dark red mudstone lenses separated by red shales and an occasional sandy shale. This lower horizon is the most persistent part of the Chickasha formation.

DUNCAN SANDSTONE

The upper portion of this formation is a well cemented sandstone from 10 to 50 feet thick. Like the Chickasha the thickest, most massive portion is in the southeastern part of the county. In this area its color is almost white, but going northward it changes to a buff, and from buff to a pink or light red color.

Below this upper sandstone are alternate beds of very soft green and red shales, and thin sandstones. The total thickness of the Duncan formation, where exposed in southeastern Grady County, and northern Stephens County, is approximately 150 feet. Inasmuch as the Duncan and Chickasha formations both grade from coarse to fine ma-

4. Stephenson, D. D., Observations on the Verden sandstone of southwestern Oklahoma: Bull. Amer. Assoc. Pet. Geol., Vol. 9, No. 3, pp. 626-631, 1925.
5. Reed, R. D. and Meland, N., The Whitehorse sandstone: Jour. of Geol., Vol. 32, pp. 150-157, 1924.

terial from southeast to northwest, it appears certain that the material for these formations was eroded from the Arbuckle uplift.

GEOLOGIC HISTORY

All the formations described above belong to the late Permian. The entire area was probably submerged, but at very shallow depths, until the close of the Permian period. During the period of emergence, or subsequent to it, important crustal deformations occurred. The result is at least two known major structures; first the Grady County anticline a map of which accompanies this report, and the Chickasha gas structure. Both of these structures are mappable in Permian beds. A number of other structures in southern Oklahoma prove that major folding occurred at least very late in the Permian period. The best known of these folds is the Cruce structure in northern Stephens County. Both limbs of this great anticline show dips as high as 200 feet to the mile on the Duncan sandstone.

The Cement anticline in Caddo County, just west of the Chickasha gas field was mapped by Buttram and Ohern on the Day Creek dolomite above the Whitehorse and near the top of the Permian. Not only do the surface beds give evidence of post-Permian foldings, but several faults have been found and mapped in southeastern Grady County, which are shown on accompanying Grady County structural map.

ECONOMIC GEOLOGY

The economic possibilities of Grady County from the standpoint of development of oil and gas lie in the development of structures previously referred to, and to the remote possibilities of the discovery of structures unknown. The production of oil and gas in Grady County is confined to two well-defined major structures, previously referred to as the Grady County anticline and the Chickasha gas structure. The Grady County anticline enters the southeast corner of the county, the axis being in the western portion of sec. 34, T. 3 N., R. 5 W., and has been mapped for a distance of 25 miles northwest to the Washita River. This anticline is possibly the northwest extension of the Arbuckle uplift. The other producing structure is the elongated dome in Tps. 4 and 5 N., R. 8 W., upon which the Chickasha gas field was developed. This structure together with the history of development, producing sand horizons and drilling conditions is fully described in a paper of the U. S. Bureau of Mines, May 1, 1923, revised March, 1926.

A new development which may be of importance is the well of Gant and Garvin, sec. 19, T. 5 N., R. 7 W., which found oil sand at 1,955 feet and drilled in sand to 1,968 feet. A recent report of this well gives the daily production as 35 barrels of 36° gravity oil. No surface structure is evident, and more drilling is necessary before sub-surface conditions can be determined.

A structure indicating a regional high has been mapped by the Becker-Reed Oil and Gas Company along the east line of Grady County, as shown on the accompanying map, but this company's well drilled in sec. 19, T. 6 N., R. 4 W., near the Grady-McClain County line was dry. No showings of any kind were encountered to a depth of 3,011 feet. This well was drilled with cable tools.

PRODUCING HORIZONS

There is probably some difference of opinion as to the geologic age during which the producing sands of Grady County were deposited, but after several years of study it is believed that the chief horizon of production lies at or near the base of the Permian, probably in a slight unconformity between the Permian and Pennsylvanian formations. Whether the sands are Permian or Pennsylvanian in age can only be determined by paleontologic study, but up to the present time this method has not been attempted. It is certain that the producing horizons of the Cement field from 2,000 to 2,400 feet, the Ramsey gas horizon of the Chickasha Gas field, 2,050-2,500 feet, the Harness field gas production, and the oil and gas production of the important Carter-Knox area between 1,600 and 2,000 feet, and the north end field over 1,200-1,650, correlate very closely. The tremendous importance of the base of the Permian and upper Pennsylvanian as a producer of oil is now recognized in the Texas Panhandle, West Texas, and New Mexico, but it is not believed that it has been fully recognized that this same horizon is the zone of major production in the fields of Grady and Caddo counties. This fact gives importance to the great undeveloped area between the fields of this area around the north flank of the Wichita Mountains and to the fields of the Texas Panhandle. The only commercial production that has been found above this contact zone is in the Nichlos gas sand of the Chickasha gas field, and in the Carter-Knox area in which two wells are producing below this horizon. The Hawkins No. 1 SE. $\frac{1}{4}$ SW. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 5, T. 3 N., R. 5 W., is producing 20 barrels of 41° gravity oil from sand found at 2,785-2,800 feet. The Horton No. 1, SW. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 8, T. 3 N., R. 5 W., is producing 60 barrels from sand at 2,600-2,623 feet. The oil is the same gravity as the Hawkins No. 1. These wells indicate that there is possibility of deeper production for the area. This sand is about 800 feet below the top of the upper producing horizon.

In the Chickasha gas field, the Magnolia Petroleum Company found gas production 875 feet below the top of the Ramsey horizon at a depth of 3,178 feet in its No. 1 Irwin in sec. 15, T. 5 N., R. 8 W.

Drilling in the area is chiefly with rotary tools. The physical conditions of the Permian red beds make the operation with cable tools too expensive to be practical.

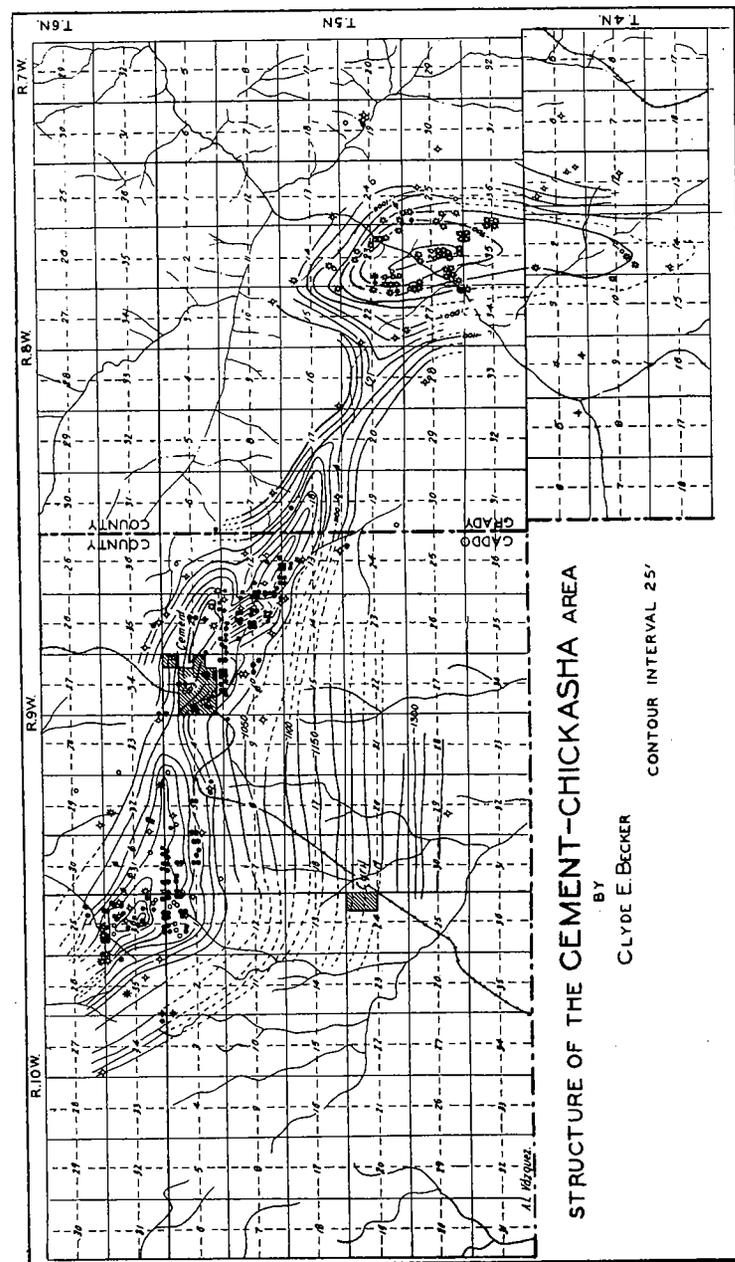


Figure 4—Structure of the Cement-Chickasha area. Contours on top of the Ramsey sand horizon.

HISTORY

CARTER-KNOX OIL FIELD

About 1916 Clyde T. Griswold, under the direction of Frederick G. Clapp, mapped the south end of the Grady County anticline for the A. T. & S. F. Ry. Company. This company drilled several wells along the Grady-Stephens County line, getting showings in at least three of their tests. The distance from pipe lines prevented development, as the wells were not of the gusher type, although the showings were very promising.

In 1921 Sm. Abshire for the Goldelline Oil Corporation and Dr. Cox for the Josey Oil Company mapped the northern part of T. 3 N., R. 5 W., the southwestern portion of T. 4 N., R. 5 W., and the southeastern part of T. 4 N., R. 6 W. While they both mapped a pronounced high, their work was not followed immediately by drilling. The same year the author mapped the southern portion of T. 3 N., R. 5 W., and made a location for Sorrells and Ellis in the NW. $\frac{1}{4}$ SW. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 27, T. 3 N., R. 5 W., near what is believed to be the top of the structure. Because of financial difficulties this company was unable to complete the well. In 1924 Walter Critchlow of Ardmore completed a 42 million foot gas well on this location. In 1922 the Marland Oil Company, directed by Dr. J. V. Howell and assisted by C. L. Stephenson, mapped T. 4 N., R. 6 W., and re-checked the work of other geologists in Tps. 3 and 4 N., R. 5 W. Their location in the NE. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 17, T. 4 N., R. 6 W., was completed in June 1923 as an 11 million foot gas well in a sand found at 1,990 and drilled to 1,998 feet. In November 1922, the Becker-Reed Oil and Gas Company started a well near the top of the structure as mapped by Abshire and Cox. This well was completed in July 1923, as an 18 barrel oil well in a sand from 1,798 to 1,820 feet. In 1923 the author, assisted by Allan B. Gray, made a connected map of this great structure, from the southern portion of T. 2 N., R. 5 W., Stephens County, to the north line of T. 4 N., R. 6 W., and in 1924, assisted by Waldamer M. Ervin, completed this work to the Washita River in T. 7 N., R. 8 W., as shown on the structural map. The production farthest north on this structure is the Harness gas field in secs. 15 and 22, T. 5 N., R. 7 W. The first well in this field was drilled by the English Drilling Company in 1920 on the Harness farm and was completed as a small oil well at a depth of about 2,100 feet. This was the first producing oil well in Grady County. Later completions in this field have all been gas wells. No actual gauge can be had on the volume as there is no line to the field.

Late in 1923 the Joe Ray Oil Company had completed a small oil well at a depth of 955 feet and a gas well gauging 15 million cubic feet at a depth of approximately 1,350 feet in the NE. $\frac{1}{4}$ sec. 28, T. 3 N., R. 5 W. The purchase of this property by the Magnolia Petroleum Company was the first evidence of interest shown by any major com-

pany since the leasing campaign of the Marland Oil Company the previous year. In 1924, Walter H. Gant and associates began the development in sec. 2, T. 2 N., R. 5 W., just across the Stephens County line which resulted in the finding of a 7 million foot gas well from a sand drilled from 1,210 to 1,213 feet. This well soon began showing oil. This favorable showing resulted in the Carter Oil Company, who already had acquired holdings in the field, buying a half interest in this property and the result was the Carter-Knox Petroleum Company's development which finally brought the field into prominence. The Knox Petroleum Company is Mr. Gant's company, so named for his partner, Knox L. Garvin. Associated with Gant and Garvin in this company are Judge Dolman of Ardmore, Earl C. Frates of Tulsa and the Becker-Reed Oil & Gas Co.

In addition to the names mentioned there are several whose courage and foresight were largely instrumental in the pioneering of a field which now promises to attain major proportions. The firm of Shipp, Nash and Josey were among the first to recognize the possibilities of the field. Although their wells did not produce, they were well located. John Bryan, land man and F. W. Floyd, geologist for the Carter Oil Company, through their faith and effort brought the Carter Oil Company into the field. Joe Ray, a farmer until his first oil venture in 1923, has been a most potent factor in the development of the field. The Walker Drilling Company, which drilled the first wells for Mr. Ray, took stock in this company for a large part of its pay for the drilling of the wells.

Major operating companies in the Carter-Knox field are as follows: Carter Oil Company, Magnolia Petroleum Company, Marland Oil and Refining Company, Sinclair Oil and Gas Company, Amerada Petroleum Corporation and the Gypsy Oil Company. There are 75 producing oil and gas wells in the field; the daily production is approximately 5,000 barrels and there are 63 locations and drilling wells.

The Chickasha gas field, Tps. 4 and 5 N., R. 8 W., was discovered in July, 1922 by John B. Nichlos, who drilled the discovery well in the NE. $\frac{1}{4}$ sec. 26, T. 5 N., R. 8 W. This well gauged approximately 48 million cubic feet of gas coming from a shallow Permian sand found at a depth of approximately 1,350 feet. This sand is known as the Nichlos sand. By the end of the first year ten wells had been drilled to this sand and were delivering over six million cubic feet of gas per day to the Oklahoma Natural Gas Company. By the end of the second year 55 wells had been completed and were delivering from 4 to 19 million feet per day. In March 1923, W. R. Ramsey passed the shallow sand and drilled to a deeper pay horizon, in the SW. $\frac{1}{4}$ sec. 23, T. 5 N., R. 8 W. A series of sands was found at a depth of from 2,029 feet to a total depth of 2,500 feet. The result was a 52 million cubic foot gas well, and the development of the true pay horizon in the Grady-Caddo County area.

HARNES GAS FIELD

Development in this field is being carried on by Robert Sultan of Walters, Oklahoma and his associates, Badgett Bros., and Hughes. There are now six producing wells in the field.

SUMMARY

Development of oil and gas in Grady County to date is confined to two structures; the Chickasha gas field structure, and the Grady County anticline. A third structure may be developed through the development of Gant and Garvin, sec. 19, T. 5 N., R. 7 W.

The Chickasha gas field appears to be fully developed unless deeper sands are found.

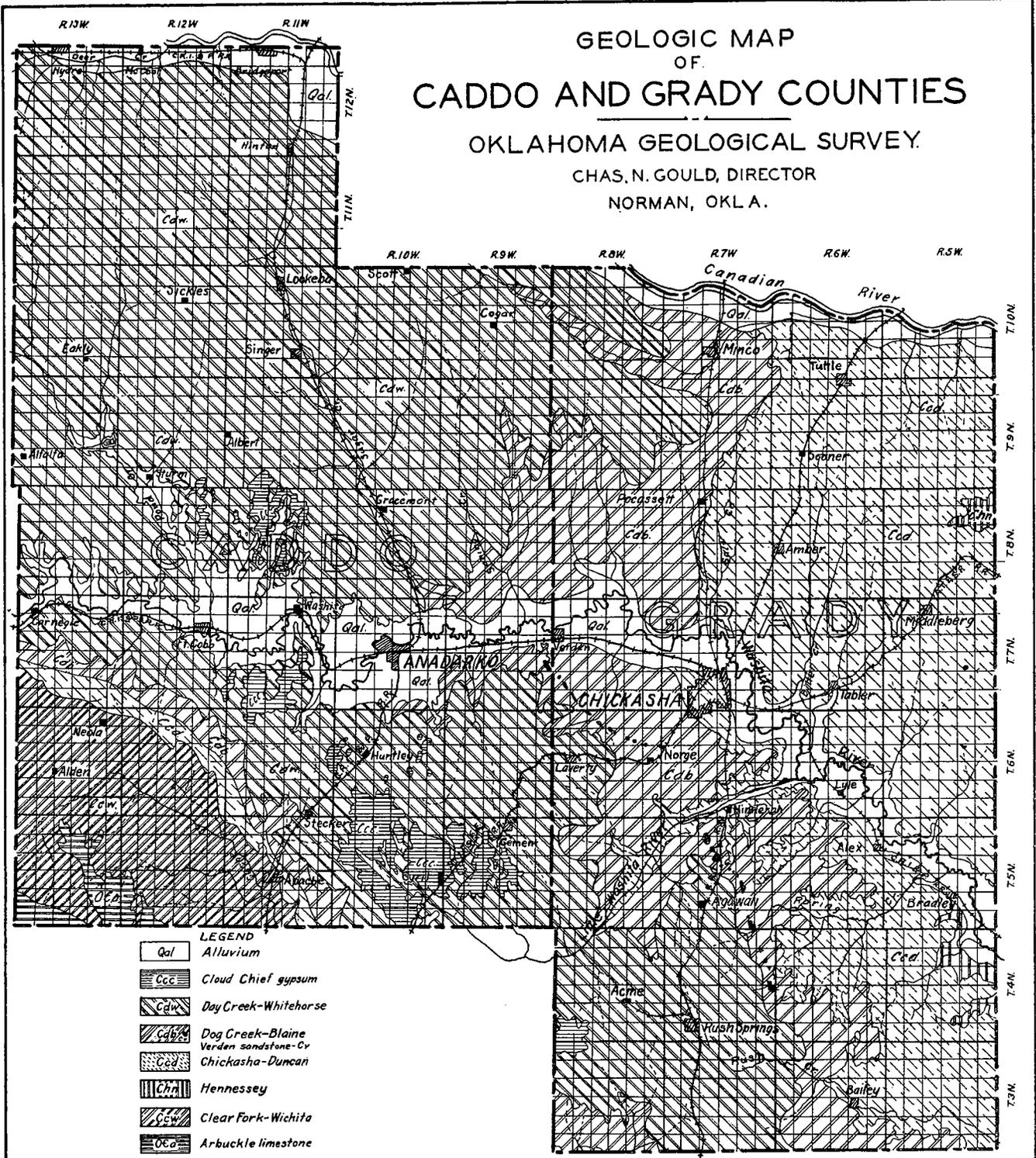
The most important development on the Grady County anticline is the Carter-Knox oil field which, although in the early stage of development, is known to extend from sec. 2, T. 2 N., R. 5 W., northwest for a distance of nearly nine miles.

Experience thus far shows that the major zone of production is the same where oil or gas has been found, but the surface beds do not indicate that any structures of major proportions are yet to be found. The thickness of the principal producing horizon indicates that the total oil recovery per acre will be large.

GEOLOGIC MAP OF CADDO AND GRADY COUNTIES

OKLAHOMA GEOLOGICAL SURVEY.

CHAS. N. GOULD, DIRECTOR
NORMAN, OKL. A.



- LEGEND**
- Qal Alluvium
 - Ccc Cloud Chief gypsum
 - Cdw Day Creek-Whitehorse
 - Cdb Dog Creek-Blaine
 - Ccd Chickasha-Duncan
 - Cpn Hennessey
 - Ccw Clear Fork-Wichita
 - Oca Arbuckle limestone