OKLAHOMA GEOLOGICAL SURVEY
Chas. N. Gould, Director

Bulletin No. 40-W

OIL AND GAS IN OKLAHOMA

GEOLOGY OF McINTOSH COUNTY

By
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NORMAN
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FOREWORD

In 1917 the Oklahoma Geological Survey issued Bulletin 19, Part II, 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 the 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 the 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.

Dr. Robert W. Clark, the author of this report, and also the author of the oil and gas report on Okmulgee County, has been in close touch with conditions in this region for a number of years and is, therefore, well qualified to write on McIntosh County.

CHAS. N. GOULD,
Director

January, 1928

McINTOSH COUNTY

By

Robert W. Clark

ACKNOWLEDGMENTS

In the preparation of this report use has been made of information already published in Bulletin 19, Pt. II, and Bulletin 17, of the Oklahoma Geological Survey. I am deeply indebted to Robert H. Dott of the Mid-Continent Petroleum Corporation, for information relative to the surface formations and general structure of the western part of the county and to the Geological Department of the Sinclair Oil and Gas Company for correlations in a well south of Eufaula proving the synclinal condition of the south part of the county.

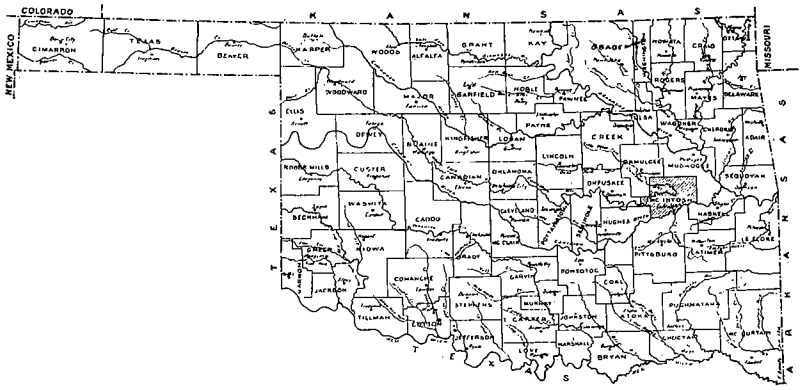


Fig. 1—Map of Oklahoma showing area covered by this report.

LOCATION

McIntosh County is located in the east-central part of Oklahoma. The Canadian River forms its southern boundary line and its northern line is the north line of township twelve north. From east to west it lies in ranges 13 to 18 inclusive. There are fifteen whole townships within its boundaries, the east half of T. 12 N., R. 14 E., and fractional parts of eight townships bordering on the Canadian River. Its total area is approximately 724 square miles.

TOPOGRAPHY

McIntosh County, for the most part, presents a rather rugged topography except for an area about three townships wide extending from Eufaula northward to the county line. This area lies in Rs. 15, 16, and 17 E., and is gently rolling and mostly open country. Its surface rocks are shale and shaly sandstone. Over the rest of the county the surface rocks are largely massive sandstone which cause the rugged topography. The relief may be as much as 350 feet in one-half mile.

The Canadian River borders the county on the south. The North Fork of the Canadian River crosses the county from west to east. It enters the county near the southeast corner of T. 10 N., R. 13 E., and flows northeastward to the middle of T. 11 N., R. 14 E., thence eastward to the southwest quarter of T. 11 N., R. 16 E., and thence southeastward and joins the Canadian River about three miles southeast of Eufaula. The Deep Fork of the Canadian River enters the county in the southeast part of T. 12 N., R. 14 E., and, after flowing east and southeastward, joins the North Fork about six miles north of Eufaula. The extreme northeast part of the county is drained by small tributaries of the Arkansas River.

STRATIGRAPHY

Surface Geology

The surface formations embrace that part of the Pennsylvanian included between the Savanna sandstone and the Senora as described by Taff.[1] The Savanna sandstone outcrops in the northeast part of T. 11 N., R. 18 E., and the southeast corner of T. 12 N., R. 18 E.

BOGGY SHALE

The Boggy shale is next above the Savanna. There are several sandstone beds, some of them quite massive, in this formation. These sandstones give rise to the rugged topography in the southern part of the county, especially along the Canadian River. Toward the north the sandstones become more shaly and even disappear, giving rise to the more open prairie type of country north of Eufaula. From logs of wells drilled in R. 14 E., and starting about the top of the Boggy or in the Thurman sandstone above it, the thickness of the Boggy appears to be about 1,000 feet.

THURMAN SANDSTONE

The Thurman sandstone lies above the Boggy and outcrops in a narrow belt across the county from north to south. It nearly covers the east half of T. 12 N., R. 14 E., the major part of Tps. 9, 10, and 11 N., R. 14 E. The width of the outcrop increases toward the south due in large part to the presence of some large domes in its southern

1. Taff, J. A., U. S. Geol. Survey, Geol. Atlas, Coalgate Folio (No. 74), 1901. Also Gould, Chas. N., Index to the stratigraphy of Oklahoma: Oklahoma Geol. Survey, Bulletin No. 35, 1925.

area. It is about 75 feet thick and forms a very rugged topography. In the extreme northern part of the county it becomes somewhat shaly and a less rugged topography results.

STUART SHALE

The Stuart shale, lying above the Thurman, consists of a series of red and gray clay and sandy shales with some rather massive sandstone ledges near its base. In T. 10 N., R. 13 E., it underlies the Senora which caps the big outlier through the center of the township. It covers the most of the rest of the township except the southeast corner and a'ong the river. It extends southward across Tps. 8 and 9 N., R. 13 E., and froms a strip of territory of the prairie type contrasting with the rugged topography of the sandstone areas on either side of it.

SENORA FORMATION

Only the basal part of the Senora formation is exposed in this county. It is composed of massive sandstone which caps the big outlier in the central part of T. 10 N., R. 13 E. Its full section is developed in Okfuskee and Okmulgee counties to the west near Henryetta where it is important economically on account of the coal beds.

QUATERNARY AND RECENT

Along the rivers there are deposits of sand and silt of Quaternary age while in the vicinity of Texanna is quite an extensive deposit of dune sand.

SUBSURFACE GEOLOGY

In the western part of the county the subsurface formations are the same as are found in Okmulgee County adjoining it. The productive horizons in descending order are; the Salt sand, the Booch, the Morris, Glenn of Morris, and the Fields sands. The last three are in the Dutcher group of Pennsylvanian age. The Lyons-Quinn sand, near the base of the Pennsylvanian,[2] is a productive horizon in the western part of the county. The Salt sand and the Booch sand are found throughout the county and correspond respectively to the Savanna and the Hartshorne with the intervening McAlester sale. This shale attains a thickness of 600 feet in the eastern part of the county whereas it is only 250 feet thick in the vicinity of Morris in Okmulgee County. The formations below the Booch are not uniform. The Atoka formation varies in thickness from 500 feet in the northwest part of the county to more than 2,000 feet in the southeastern part. In some places several sands are reported in the Dutcher series while in other places only one or even none are reported in this group. The Lyons-Quinn sand is reported in nearly all logs in the county where the wells have been drilled to a sufficient depth but its thickness and position in the lime

2. Dott, Robert H., personal communication.

are not uniform. The Mayes lime, or black lime above the Wilcox, is also reported in all logs that have been drilled deep enough for it. Its thickness, however, is variable and it is often broken. Occasionally a white lime is reported directly beneath the Mayes, which is probably the Boone. With few exceptions 40 to 60 feet of Chattanooga black shale are reported below the Mayes and then 10 to 25 feet of Hunton lime. Below the Hunton are 50 to 60 feet of Sylvan shale and under that the Viola lime, which varies in thickness from 35 to 60 feet and is often sandy according to the logs. The two wells in secs. 3 and 11, T. 11 N., R. 18 E., show 213 and 225 feet of white lime above the Wilcox sand. If this is not due to careless logging, then the Viola lime is thickening up to the east and approaching the thickness shown at the outcrop at Marble City. Below the Viola is the Wilcox sand, which has been penetrated in several tests in different parts of the county.

SURFACE STRUCTURE

In the eastern part of McIntosh County the surface formations dip normally to the southwest but on the western side they have a normal northwest dip conformable with the normal dip of the surface rocks in Okmulgee County. The regular dip varies from 40 to 60 feet to the mile. A large structure known as the Warner anticline extends, according to Snider,[3] from the northeast corner of sec. 36, T. 12 N., R. 18 E., southwestward to the center of the SE.¼ sec. 5, T. 11 N., R. 18 E. On the western side of the county there are surface structures of considerable magnitude. A fault extends nearly north and south in R. 14 E. The downthrow is on the east side but the amount has not been measured accurately because of the nature of the beds involved. It has been found in places across Tps. 11 and 12 N., R. 14 E., and the northern part of T. 10 N., R. 14 E., and probably extends further south. It also shows in the subsurface formations (see Wilcox sand structure map, Plate I). In this range on either side of the fault are large surface structures or closed domes. Other minor structural features are observable throughout the county.

SUBSURFACE STRUCTURE

Small domes and noses occur in the subsurface formations and are the immediate cause of accumulation of oil and gas. Frequently location of these subsurface structures is marked by a surface dome, nose, or terrace but often there is no discernable surface structure overlying one of these small subsurface domes.

The major subsurface features of this county are very interesting and are shown on Plate I. The south part of the county lies in the Porum syncline, the axis of which is south of the Canadian River and outside of the county. The Atoka formation has thickened up greatly in this area. A well near Texanna in sec. 17, T. 10 N., R. 18 E., topped

3. Snider, L. C., Geology of east-central Oklahoma: Oklahoma Geol. Survey, Bull. No. 17, 1924.

the Atoka at 1,493 feet and was abandoned at 3,190 feet, still in it. A well is now drilling across the river south of Eufaula in sec. 32, T. 9 N., R. 16 E., which at 3,400 feet was still in the Atoka formation. In a twin hole to this an equivalent to the Lyons-Quinn sand was found at 4,500 feet. The Wilcox sand should be about 700 feet deeper or about 5,200 feet. A well in sec. 16, T. 10 N., R. 15 E., was drilled to 3,815 feet. The last 500 feet were black shale and slate. It is believed that the Wilcox sand would be at least 4,200 feet deep here.

As a subsurface structure the Warner anticline extends all the way across the county from east to west about through the middle of the county. The gas fields south of Checotah lie on this structural ridge. A dry hole to the Wilcox sand in sec. 27, T. 11 N., R. 15 E., and another in sec. 22, T. 11 N., R. 14 E., indicate that this ridge extends westward across the county.

North of the Warner anticline and about parallel to it is a syncline extending all the way across the county in T. 12 N. This is called the Hitchita syncline. The Porum syncline, the Warner anticline and the Hitchita syncline form a series of major folds parallel to the Choctaw fault and the folds north of it. They mark about the northern limit of the influence of the Ouachita thrust, as no such folds occur in Okmulgee and Muskogee counties to the north.

A series of nearly north-south faults cut across the Hitchita syncline and the Warner anticline. Their southward extent cannot be determined because of lack of drill holes to furnish information. One of these faults lies in R. 14 E., another in R. 15 E., and a third in R. 16 E. The fault in R. 14 E., has a downthrow on the east side of nearly 200 feet, while the one in R. 16 E., has a downthrow on the west side of nearly 500 feet. Thus the area between these two faults is a huge graben, the east side of which has dropped more than the west side and which is again faulted through the middle by the fault in R. 15 E. This latter fault is not as extensive as the other two nor does it have anywhere near as much throw. The axis of the Warner anticline is nearly level between these two faults while to the east of the fault in R. 16 E., this axis dips steeply to the west.

There have apparently been two periods of deformation in this area and, because of the difference in the nature of the cause of these disturbances, the results are decidedly different. First there was the folding due to the Ouachita thrust from the south. This caused the Porum syncline, the Warner anticline and the Hitchita syncline. Then the Ozark uplift to the northeast caused the north-south faults cutting across the already existing folds.

DEVELOPMENT

The greater part of McIntosh County has not yet been tested for oil or gas. Pools have been developed in six different townships and a few dry holes are widely scattered over the county.

T. 11 N., R. 17 E.

A small gas pool was opened up in 1915 about half way between Checotah and Eufaula. The gas occurs in sands at depths of about 650 feet, 1,950 to 2,000 feet, and 2,400 feet. The wells had an initial capacity up to 35 million cubic feet. Another little gas pool was found in sections 17 and 18 of this township. The sand occurs at 775 to 800 feet and another sand about 1,800 feet deep. This pool was discovered in 1919. In 1925 some gas was found in section 2 in a sand about 800 feet deep. Only two gas wells were completed here as they were just small wells.

T. 12 N., R. 16 E.

Shows of oil and gas have been found in some wells in section 12, but other tests in this township have not been productive.

T. 11 N., R. 15 E.

In 1920 oil was found in section 27 in a sand 1,080 to 1,096 feet deep. Five oil and gas wells were productive of small amounts in this pool but deeper drilling afforded only dry holes. This is the only production in this township.

T. 12 N., R. 15 E.

Gas has been encountered in several different sands in many widely separated parts of this township. The Beggs Oil and Gas Company has a pool around the section corner of 2, 3, 10, and 11. The Booch sand at 1,290 feet and sand at 1,765 feet are productive of gas. A good oil show was found at about 1,850 feet but the well was drilled to the Wilcox sand without results. Gas was also found and produced at 725 feet in the SE. cor. SW.¼ section 16 and at about 700 feet near the SW. cor. section 26. In the SW. cor. NW.¼ section 29 shows of gas were found in every sand and 15 million feet were encountered at 2,340 feet. A test to the Misener sand offsetting this was dry. Shows of oil and gas have been found in several other tests in the township but none were productive.

T. 12 N., R. 14 E.

Only the east half of this township lies in McIntosh County and there is not very much production in it although the west half has been productive of several good pools. There is a little oil pool in the NW.¼ section 2 and the NE.¼ section 3. Two sands are productive, the Morris, at around 1,700 feet, and the Fields sand at about 1,800 feet. The wells were small. In the SW. cor. section 3, oil is produced from the Fields sand, and gas from the Salt sand, at a depth of about 800 feet. In the west half of section 10, several wells are producing gas from the Salt sand. A well near the center of section 10 was dry in all sands to the Wilcox. In the SW.¼ section 15, the Salt sand produces gas. Near the SW. cor. section 22, there is a small oil well

in the Lyons-Quinn sand at 2,115 feet. The pool lies across the line in Okmulgee County. Other wells drilled in the east half of this township were not productive.

T. 11 N., R. 14 E.

In 1913, gas was discovered in section 6 and since that time drilling has continued in the northwest quarter of this township. A few oil wells have been developed on the north side of sections 5 and 6, in an 1,800 foot sand but gas is the chief product of this township. The principal gas sands are the Salt sand at 700 feet, and the Booch sand at about 1,400 feet deep. A few wells scattered throughout the township failed to find any production below 1,900 feet.

RECOMMENDATIONS

There are several major structural features in this county which are favorable for oil and gas accumulation. With the exception of a few wells in the northwest corner of the county, and in section 27, T. 11 N., R. 15 E., all the production to date has been gas, but shows of oil have been found in several places and there is reason to believe that more oil and gas pools can be developed in this county by careful study and prospecting in the areas of the major domes and anticlines.

Log of well drilled in NW. cor. SE.¼ sec. 22, T. 11 N., R. 14 E.

Formation	Top	Bottom
brown sand	0	47
dark shale	47	145
sandy shale	145	205
shale	205	400
sandy shale	400	410
blue shale	410	550
sandy shale	550	560
blue shale	560	700
lime	700	705
sandy shale	705	790
Top of Salt sand		
white sand	790	805
white shale	805	815
white sand	815	825
white sand	825	940
Base of Salt sand		
blue shale	940	1100
white lime	1100	1105
blue shale	1105	1380
white sand (Booch)	1380	1390
shale	1390	1825
white lime	1825	1830
blue shale	1830	1910
white lime	1910	1920
blue shale	1920	1930
white lime	1930	1940
black shale	1940	1960
white lime	1960	1965
black shale	1965	1985
white lime	1985	2000
black shale	2000	2005
white lime	2005	2015
black shale	2015	2020
white lime	2020	2025
black shale	2025	2035
white lime	2035	2045
black shale	2045	2080
white lime	2080	2085
black shale	2085	2100
gray lime	2100	2110
white shale	2110	2125
black shale	2125	2140
white sand (Dutcher)	2140	2160
white sand	2160	2200
black shale	2200	2270
white lime	2270	2280
black shale	2280	2350
white lime	2350	2360
black shale	2360	2390
white lime	2390	2440
sandy lime	2440	2470
white shale	2470	2520
gray lime	2520	2590
black shale	2590	2593
black lime	2593	2650

(Continued on page 12)

Formation	Top	Bottom
white sandy lime	2650	2680
gray sand (Lyons-Quinn zone)	2680	2715
black shale	2715	2745
black lime	2745	2750
white lime	2750	2755
white sand (HFW.)	2755	2800
black shale	2800	2860
black lime (Mayes)	2860	2940
brown shale	2940	2955
black lime shells	2955	3005
brown shale (Chattanooga)	3005	3055
lime shell (Hunton)	3055	3085
shale (Sylvan)	3085	3123
white lime (Viola)	3123	3153
white sand (Wilcox)	3153	3157

Log of well in cen. of NE.¼ NE.¼ sec. 18, *T.* 11 *N., R.* 17 *E.*

Graham Brothers Oil Company

Formation	Top	Bottom
clay	00	20
shale	20	75
sand (salt sand)	75	250
shale	250	490
lime	490	502
shale	502	658
coal	658	660
sand	660	675
shale	675	778
sand (Booch sand)	778	812
shale	812	895
sand (Booch sand)	895	995
shale	995	1423
limy sand	1423	1460
shelly sand	1460	1475
shale	1472	1485
sand (gas)	1485	1580
caving shale	1580	1815
gas sand	1815	1833
sand (Dutcher group)	1833	1865
shale	1865	1878
sand	1878	1930
shale	1930	1970
lime	1970	2070
shale	2070	2133
sand	2133	2175
shale	2175	2185
sand	2185	2230
shale	2230	2240
lime	2240	2250
shale	2250	2260
lime	2260	2392
brown shale	2392	2397
lime	2397	2400
brown shale	2400	2415
lime	2415	2560
black lime (Mayes)	2560	2715
brown shale (Chattanooga)	2715	2753
lime (Hunton)	2753	2780
break (Sylvan)	2780	2825
lime (Viola)	2825	2873
sand	2873	2878

Log of well drilled in SW. cor NW.¼ SW.¼ sec. 35, *T.* 12 *N., R.* 15 *E.*

Gilcrease Oil Company

Formation	Top	Bottom
sand	0	15
shale	15	50
sand	50	55
shale	55	170
sandy shale	170	200
shale	200	494
sand (Salt sand)	494	680
broken sand	680	706
shale	706	995
sandy shale	995	1187
sand (Booch sand)	1187	1210
black shale	1210	1376
sand	1376	1384
black shale	1384	1555
lime	1555	1563
shale	1563	1599
lime	1599	1610
shale	1610	1741
sandy lime	1741	1745

(Continued on page 13)

Formation	Top	Bottom
shale	1745	1755
black lime	1755	1805
shale	1805	1867
sand (Top of Dutcher group)	1867	1900
shale	1900	1910
sand	1910	1920
black lime	1920	1995
shale	1995	2015
sandy lime	2015	2025
sand	2025	2060
shale	2060	2120
lime	2120	2123
shale	2123	2400
lime	2400	2404
sandy shale	2404	2428
lime	2428	2434
slate	2434	2437
lime	2437	2470
shale	2470	2525
white lime	2525	2586
sandy shale	2586	2626
gray lime	2626	2638
gray sand (Lyons-Quinn zone)	2638	2642
white lime	2642	2646
gray sand	2646	2651
gray lime	2651	2692
black shale	2692	2697
gray sandy lime	2697	2730
black shale	2730	2738
black lime	2738	2754
black shale	2754	2777
white lime	2777	2786
black shale	2786	2796
hard black lime	2796	2800
black shale	2800	2814
black lime	2814	2848
black shale	2848	2857
black lime	2857	2866
black shale	2866	2870
black lime	2870	2905
black shale	2905	2925
black lime	2925	2955
black shale	2955	2990
brown shale	2990	3035
brown sandy shale	3035	3095
brown lime (Mayes lime)	3095	3210
hard brown lime	3210	3259
brown shale (Chattanooga)	3259	3287
white sandy lime (Hunton)	3287	3305
white shale (Sylvan)	3305	3353
white lime (Viola)	3353	3405
white sand (Wilcox)	3405	3465
white sand and green shale	3465	3505

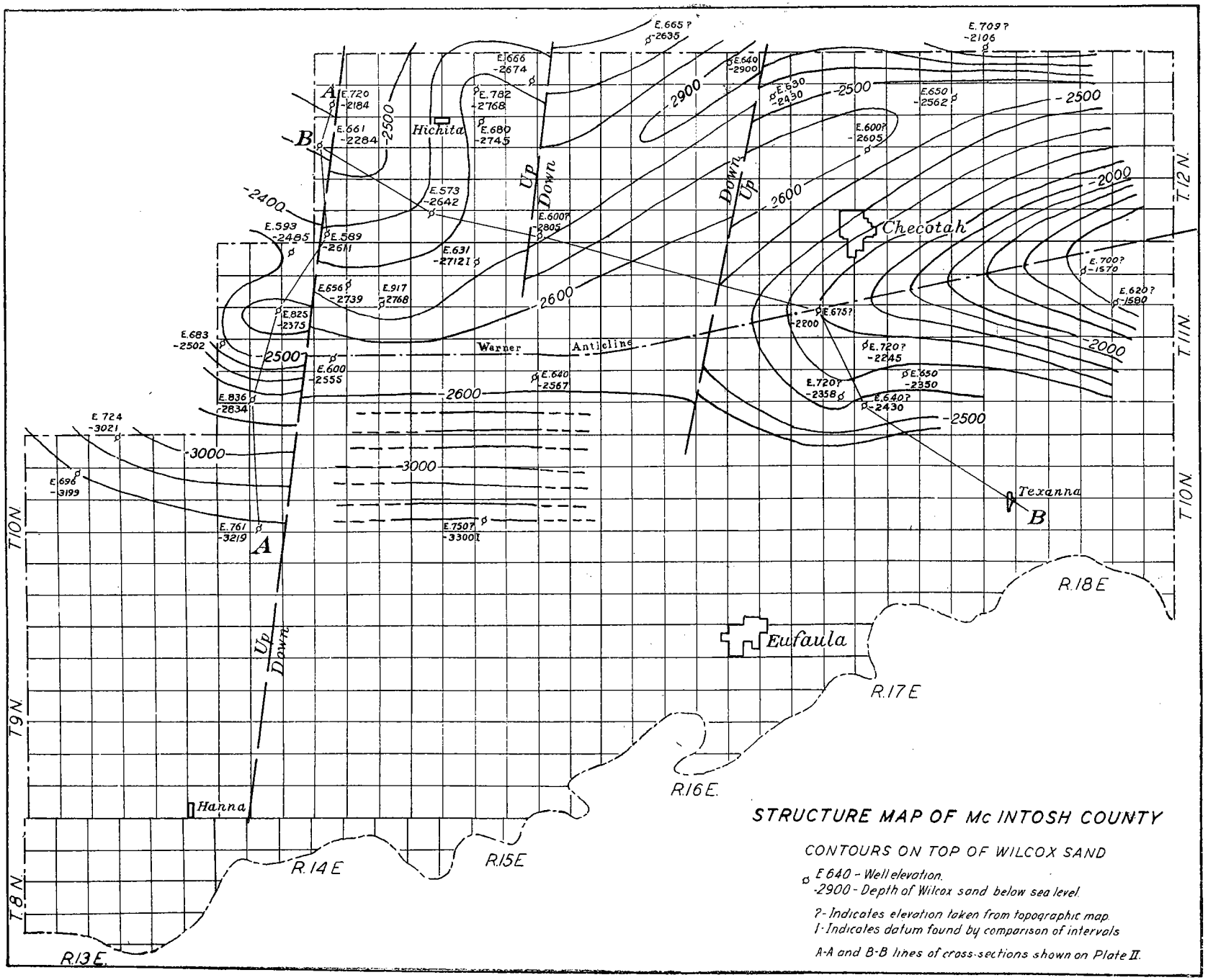
Log of well in SE. cor. NW.¼ SW.¼, sec 16, *T.* 10 *N., R.* 15 *E.*

Empire Gas and Fuel Company

Formation	Top	Bottom
surface	0	29
shale	29	59
lime	59	75
slate	75	90
lime	90	95
shale and slate	95	415
white lime	415	420
black shale	420	495
hard lime	495	510
black shale	510	525
hard lime	525	555
black slate	555	761
hard white lime	761	786
black slate	786	830
gray lime (top of Savanna or Salt sand	830	860
sand	860	870
lime	870	881
black slate	881	905
gray lime	905	960
gray sand (base of Savanna)	960	1070
black slate	1070	1095
hard lime	1095	1110
black slate	1110	1135
gray lime	1135	1160
black shale (McAlester shale)	1160	1570
hard white sand (Hartshorne or Booch sand)	1570	1620
black shale	1620	2025
gray shale	2025	2070
light sand	2070	2100
black shale	2100	2255
dark sandy lime	2255	2296
dark shale	2296	2357
hard sand	2357	2370
light shale	2370	2395
dark sand	2395	2425

(Continued on page 14)

Formation	Top	Bottom
light slate	2425	2460
hard sand	2460	2470
black shale	2470	2495
hard sand (base of Dutcher sands)	2495	2520
dark slate	2520	2590
pencil slate	2590	2970
sandy lime	2970	3010
light shale	3010	3025
gray lime	3025	3188
black shale	3188	3213
black lime	3213	3225
light sand	3225	3238
sandy lime (Lyons-Quinn zone)	3238	3260
brown lime	3260	3268
black shale	3268	3269
black lime	3269	3275
sandy lime	3275	3286
water sand	3286	3307
hard lime	3307	3325
black slate	3325	3328
pyrites of iron	3328	3340
black shale	3340	3798
brown shale T. D.	3798	3815



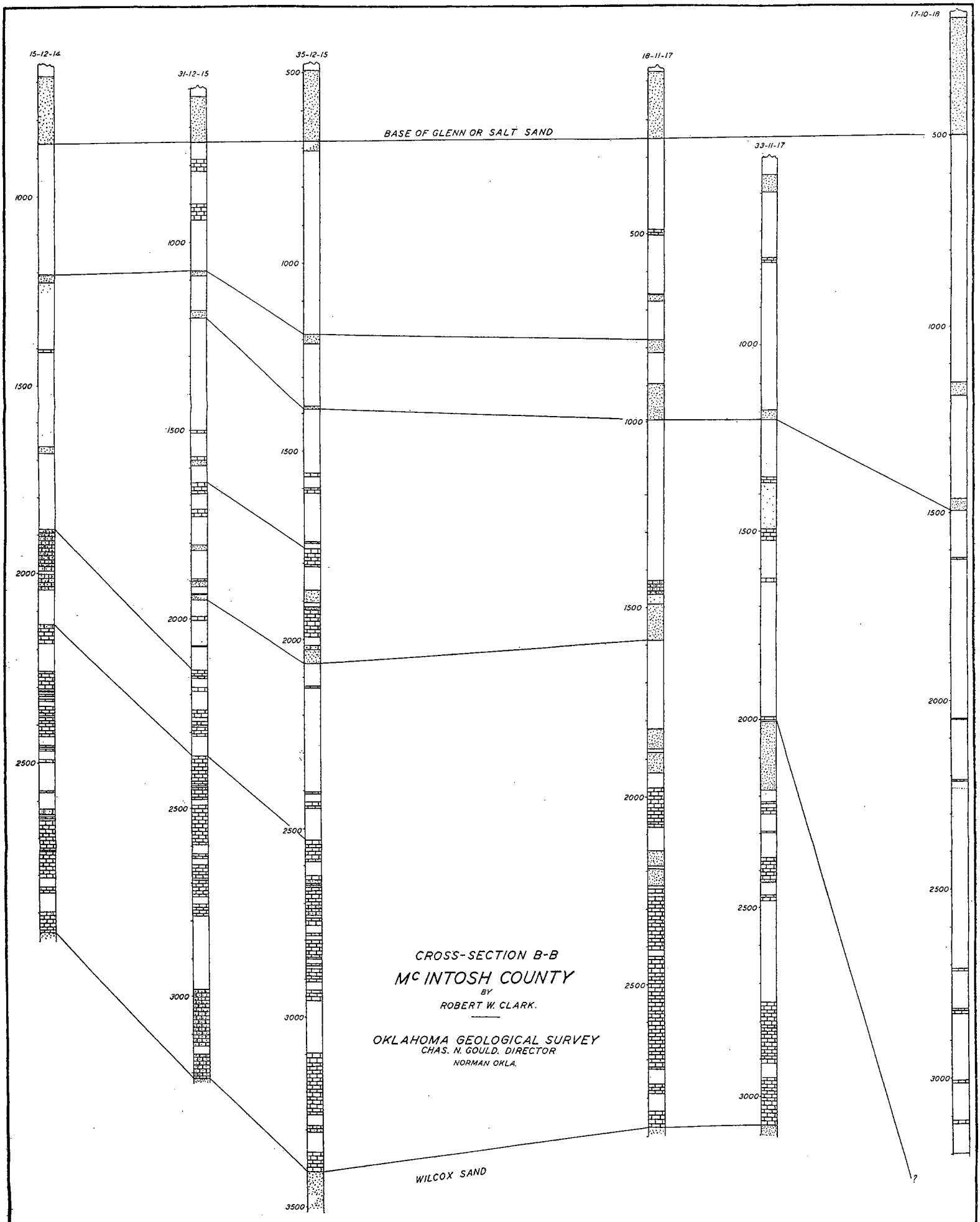
STRUCTURE MAP OF Mc INTOSH COUNTY

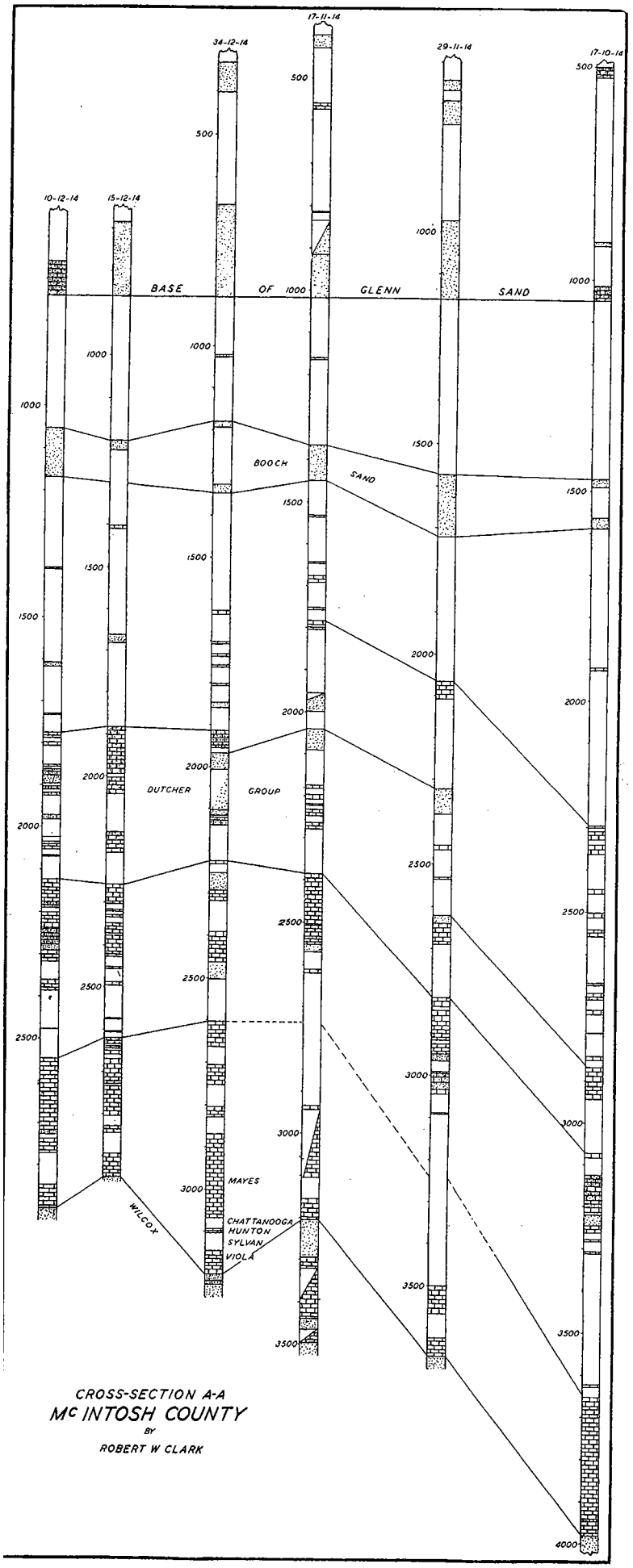
CONTOURS ON TOP OF WILCOX SAND

E 640 - Well elevation.
-2900 - Depth of Wilcox sand below sea level.

?- Indicates elevation taken from topographic map.
I- Indicates datum found by comparison of intervals

A-A and B-B lines of cross-sections shown on Plate II.


15-12-14
31-12-15
35-12-15
18-11-17
33-11-17
17-10-18
BASE OF GLENN OR SALT SAND
WILCOX SAND
?
CROSS-SECTION B-B
Mc INTOSH COUNTY
BY
ROBERT W. CLARK.
OKLAHOMA GEOLOGICAL SURVEY
CHAS. N. GOULD. DIRECTOR
NORMAN OKLA.

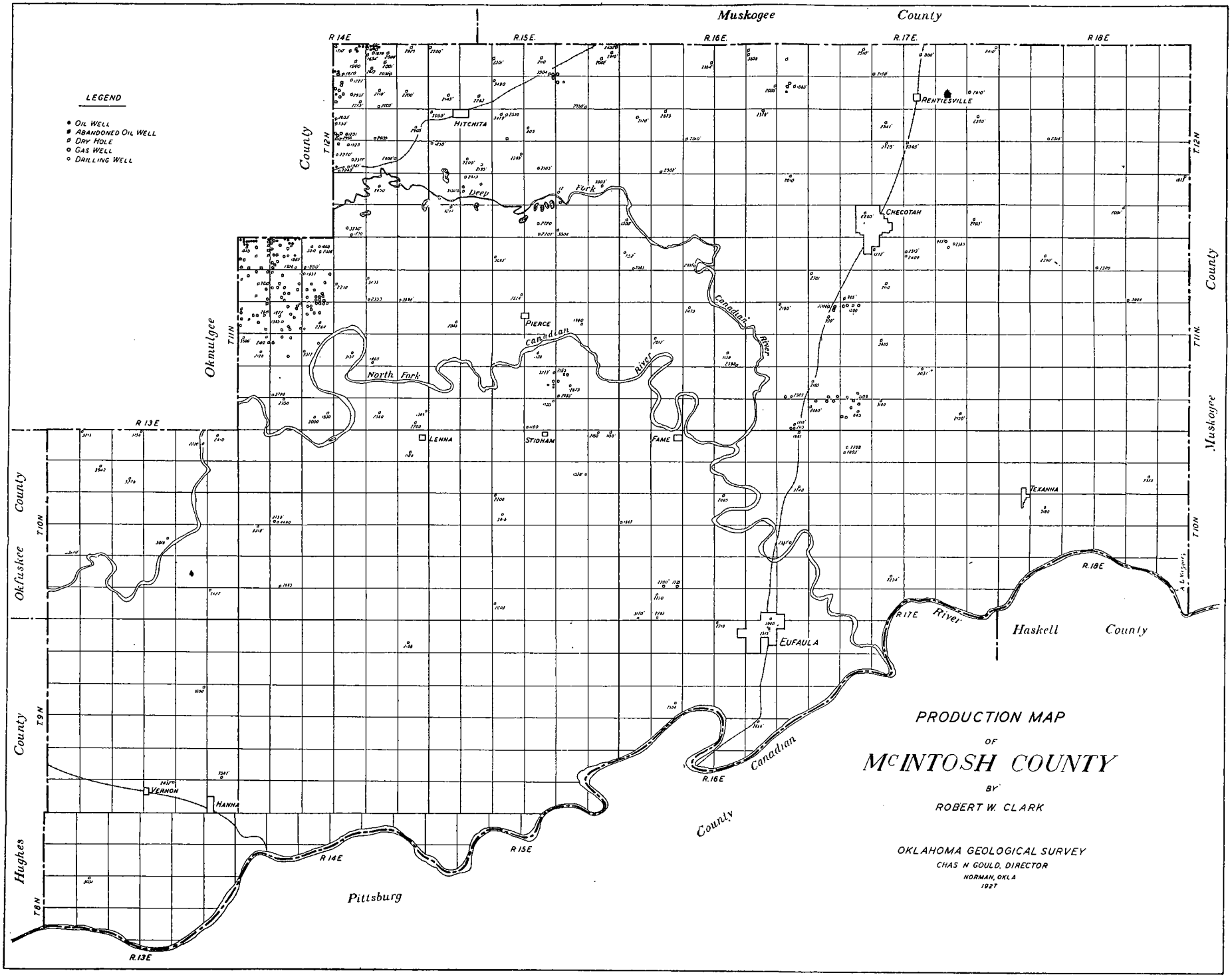


CROSS-SECTION A-A

Mc INTOSH COUNTY

BY

ROBERT W CLARK


Muskogee County
R.14E.
R.15E.
R.16E.
R.17E.
R.18E
LEGEND
Oil Well
Abandoned Oil Well
Dry Hole
Gas Well
Drilling Well
HITCHITA
RENTIESVILLE
CHECOTAH
PIERCE
LENNA
STIDHAM
FAME
TEXANNA
EUFAULA
VERNON
HANNA
Pittsburg
Okmulgee County
Muskogee County
Okfuskee County
Hughes County
Haskell County
T.12N.
T.11N.
T.10N.
T.9N.
T.8N.
R.13E.
North Fork River
Deep Fork
Canadian River
Canadian River
Canadian River
PRODUCTION MAP
OF
McINTOSH COUNTY
BY
ROBERT W. CLARK
OKLAHOMA GEOLOGICAL SURVEY
CHAS N GOULD, DIRECTOR
NORMAN, OKLA
1927