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Chas. N. Gould, Director

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OIL AND GAS IN OKLAHOMA

POTTAWATOMIE COUNTY

By
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NORMAN
MAY, 1930

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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.

The author of the separate on Pottawatomie County, Mr. E. T. Weirich, chief geologist of the Tidal Oil Company, of Tulsa, has been in active touch with the developments in this county. The facts as set forth represent the best up-to-date information which we have been able to secure.

Norman, Oklahoma — CHAS. N. GOULD,

May, 1930. — Director.

POTTAWATOMIE COUNTY

By

T. E. Weirick[1]

LOCATION

Pottawatomie County is located in the central part of Oklahoma. It is bounded on the south by the Canadian River. Included within its boundaries are Tps. 5 to 11 N., Rs. 2 to 4 E., and a part of Rs. 5 and 6 E. Total area of the county is about 750 square miles.

TOPOGRAPHY

The county is drained by the Canadian River and the North Fork of the Canadian and their various tributaries, the most important of which are Little River and Salt Creek. The flood plains of these streams are, in general, about a mile wide and lie at an elevation of approximately 850 to 950 feet above sea level. Summits of the hills are at an elevation of 1,000 to 1,100 feet above sea level. The county presents an appearance of heavily wooded, low lying, undulated hills.

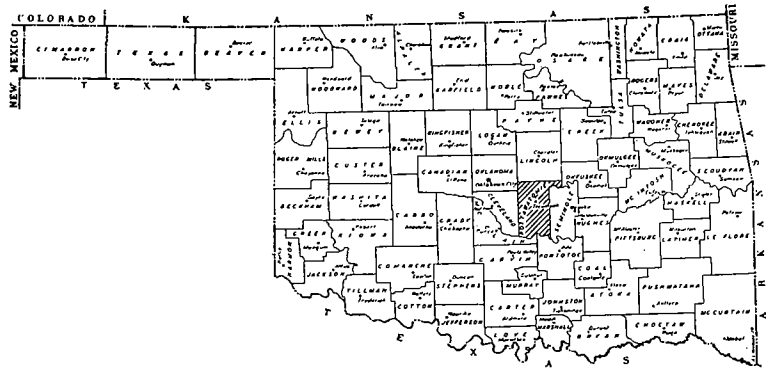

Figure 1. Index map of Oklahoma showing location of Pottawatomie County.

STRATIGRAPHY

SURFACE GEOLOGY

The Pontotoc group of sands, shales, and conglomerates outcrop in the eastern part of the county. The overlying Asher formation out-

1. Geologist, Tidal Oil Co., Tulsa, Oklahoma.

crops in the western part. The normal dip of these surface beds is eighty feet per mile toward the west.

Surface geology has been some aid leading to the discovery of pre-Pennsylvanian oil pools in Pottawatomie County[2] Such surface folds are not of the anticlinal type but are "noses" typical of the general region.

SUBSURFACE GEOLOGY

Continuity of formations below the surface in the county is broken by many unconformities. However, the Pennsylvanian section is generally quite conformable. Subsurface formations occurring in Pottawatomie County are shown in the following table:

Subsurface formations in Pottawatomie County.

AGE	FORMATION
Pennsylvanian	ASHER PONTOTOC ADA BELLE CITY FRANCIS SEMINOLE HOLDENVILLE WEWOKA WETUMKA CALVIN STUART BOGGY
	SAVANNA McALESTER HARTSHORNE ATOKA WAPANUCKA
Mississippian	CANEY WOODFORD
Devonian	HUNTON
Silurian	
Ordovician	SYLVAN VIOLA SIMPSON
Cambrian	ARBUCKLE

2. Levorsen, A. L., Greater Seminole district, Seminole and Pottawatomie counties, Oklahoma: Am. Assoc. Pet. Geol. Structure of typical American Oil fields, vol. 2, p. 348, 1929.

GEOLOGIC HISTORY

Pottawatomie County and its environs has experienced many intense periods of uplift during its geologic history.

The thickness of Arbuckle limestone or the Ordovician section as a whole is unknown in this county, as no well has reached this horizon or the underlying pre-Cambrian granite. The exposure of these formations in the Arbuckle Mountains, a few miles to the south, gives some information as to the history during the Cambro-Ordovician ages. Their thickness, as compared to that found in northern Oklahoma, suggests a sinking of the sea floor in the region of what is now the Arbuckle Mountains or a transgression of the sea from the south. This relative sinking continued throughout the deposition of Arbuckle lime, Simpson formation, Viola limestone and Sylvan shale. The presence of regional unconformities between various members of the Ordovician suggests exposure of these sediments at times. Their dip was probably toward the south as each member has been leveled leaving thicker portions on the south; i. e. the Burgen, Tyner and Wilcox are much thicker in the immediate Arbuckle region than in Creek County and vicinity. The "post-Wilcox" member is 100 feet thick in Pottawatomie County as compared to 25 feet in Creek County. The Viola limestone is 500 to 750 feet thick in the Arbuckle Mountains as compared to 30 feet in Lincoln County.

STRUCTURE

In general, beds from the upper Boggy to the Asher formation are competent. This group does not reflect the attitude of lower beds.

Most geologists use the Viola limestone as a key bed. Attitude of this formation is satisfactorily reflected by the overlying Sylvan shale. Due to the erratic thickness of the Hunton formation in parts of the county, its upper surface does not reflect the structure of the Sylvan shale or lower beds. Where the Hunton is missing entirely, the Woodford, Caney and even the Wapanucka may be used as markers for the attitude of lower beds.

The Seminole district produces its oil from a great pre-Pennsylvanian structural plateau. Contours on the Viola lime picture the structure as an arch dipping away from the Arbuckle Mountains. This structural conditition was mapped and named the "Hunton Arch" by Dott.[3] Apparently throughout Tps. 4 to 6 N., Rs. 1 to 10 E., trends of folds are radiating from the Arbuckle Mountains. Dip of the pre-Pennsylvanian rocks in this area will average 350 feet per mile. The region contained within Tps. 7 to 9 N., Rs. 4 to 7 E., is occupied by the structural plateau. Here the pre-Pennsylvanian dips are usually more gentle than to the south, averaging but 125 feet per mile. The Viola lime on the Seminole plateau seldom reaches an elevation below sea level

3. Dott, Robert H., Oil and gas in Oklahoma, Pennsylvanian paleography: Oklahoma Geol. Survey, Bull. 40-J, 1927; ibid. Bull. 40-K, fig. 3, 1927.

higher than -3,000 feet. Accumulation of oil usually occurs within areas enclosed by the -3,200-foot contour line.

The difference in thickness of Hunton lime or Chattanooga shale is not influenced by the attitude of underlying rocks. The highest well structurally may have a greater thickness of these formations than a lower well. This condition has been amply illustrated by Leverson.[4]

Contouring of individual pools does not in general exhibit rational features. The Seminole district must be treated in a broad way in order to obtain a true picture of conditions.

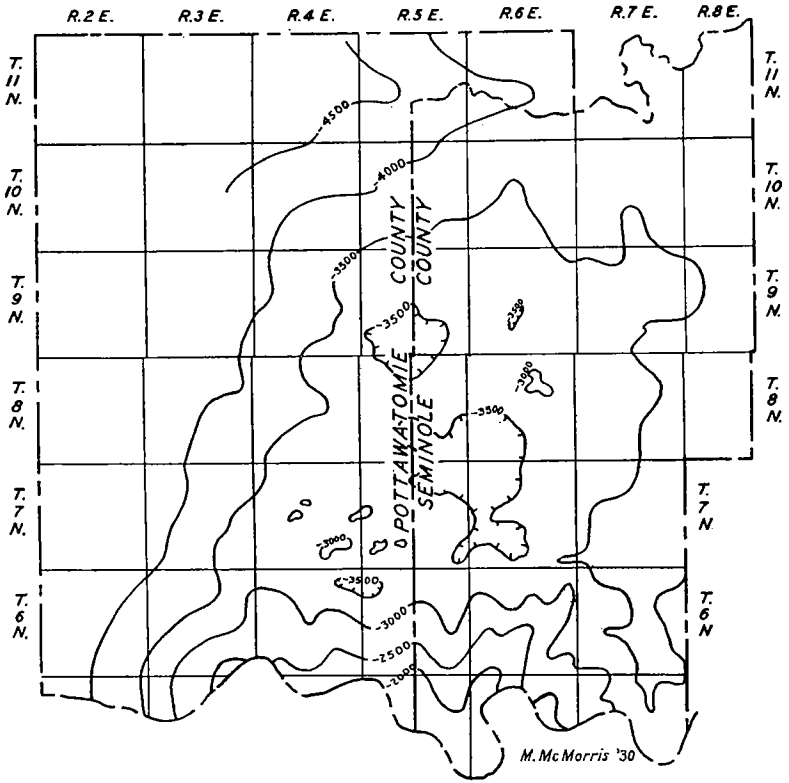

Figure 2. Structure map of greater Seminole district.

DEVELOPMENT

The oil pools of Pottawatomie County in order of their discovery are: South Maud, Earlsboro, Pierson, St. Louis and North Maud. (See figure 3.)

4. Op. cit., fig. 5.

The first producing oil well in Pottawatomie County was drilled by the Maud Oil and Gas Company in the NW.¼ NW.¼ NE.¼ sec. 18, T. 7 N., R. 5 E., in 1920. The producing horizon is the Hunton lime, topped at a depth of 3,730 feet. The initial production of this well was 14 barrels per day. This discovery led to the drilling of three additional Hunton lime wells, their total production being relatively small. This small production is being completely absorbed by the later St. Louis field development.

The original wells in sec. 18, T. 7 N., R. 5 E., have been highly important in the history of Pottawatomie County development. The elevation of the Hunton limestone here is structurally high as compared to that of the Wewoka field, the latter being one of the earlier discoveries of the region.

Information on the attitude of the subsurface formations on the north flanks of the Arbuckle Mountains, together with the knowledge that the Hunton lime was abnormally high structurally, in sec. 18, T. 7 N., R. 5 E., gave geologists the first intimation of an arch extending northward from the Arbuckle Mountains into Pottawatomie and Seminole counties.

EARLSBORO FIELD

The Earlsboro field was discovered by the completion of a well drilled by Morgan and Flynn on March 1, 1926, which had an initial production of 200 barrels per day. The producing formation, found at a depth of 3,557-82 feet is commonly referred to as the Earlsboro sand. The horizon is correlated with the Boggy formation, about one hundred feet above the base.

Subsequent development was restricted to the Earlsboro sand. The prolific nature of the nearby Seminole field prompted an intensive exploitation of the Wilcox sand in the vicinity of Earlsboro. Two wells were drilled to this horizon with unsatisfactory results, but they proved the presence of Wilcox at a satisfactory datum elevation. The Wilcox discovery well was drilled by the Gypsy Oil Company in the NE. cor. sec. 16, T. 9 N., R. 5 E. The well was completed for an initial production of 8,050 barrels per day. Intensive development of the Wilcox sand throughout the area was immediately started.

The field, as now defined, lies in an east-west direction. (See figure 4.) It is well defined by dry holes to the north and south, but is being extended to the east. It is partially outlined on the west. Considered in a broad manner, the field occurs on an anticline. It is well known among geologists that the speed with which the wells were drilled caused crooked holes, whose vertical measurements resulted in untrue datum elevations.

On May 1, 1930, the field had 4,170 producing acres. At that time it had produced 92,755,218 barrels of oil, an average per acre yield

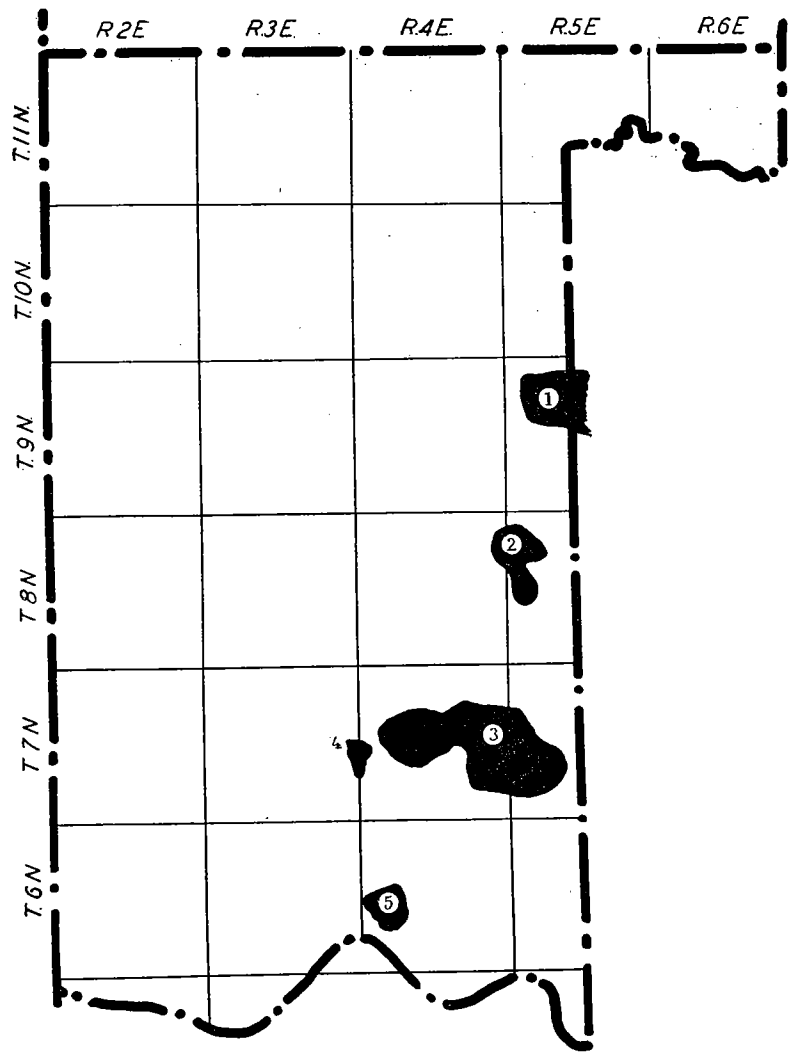

Figure 3. Map showing location of Pottawatomie County fields.

1. Earlsboro field; 2. Maud pool; 3. St. Louis pool; 4. Pearson Switch pool; and 5. Asher pool.

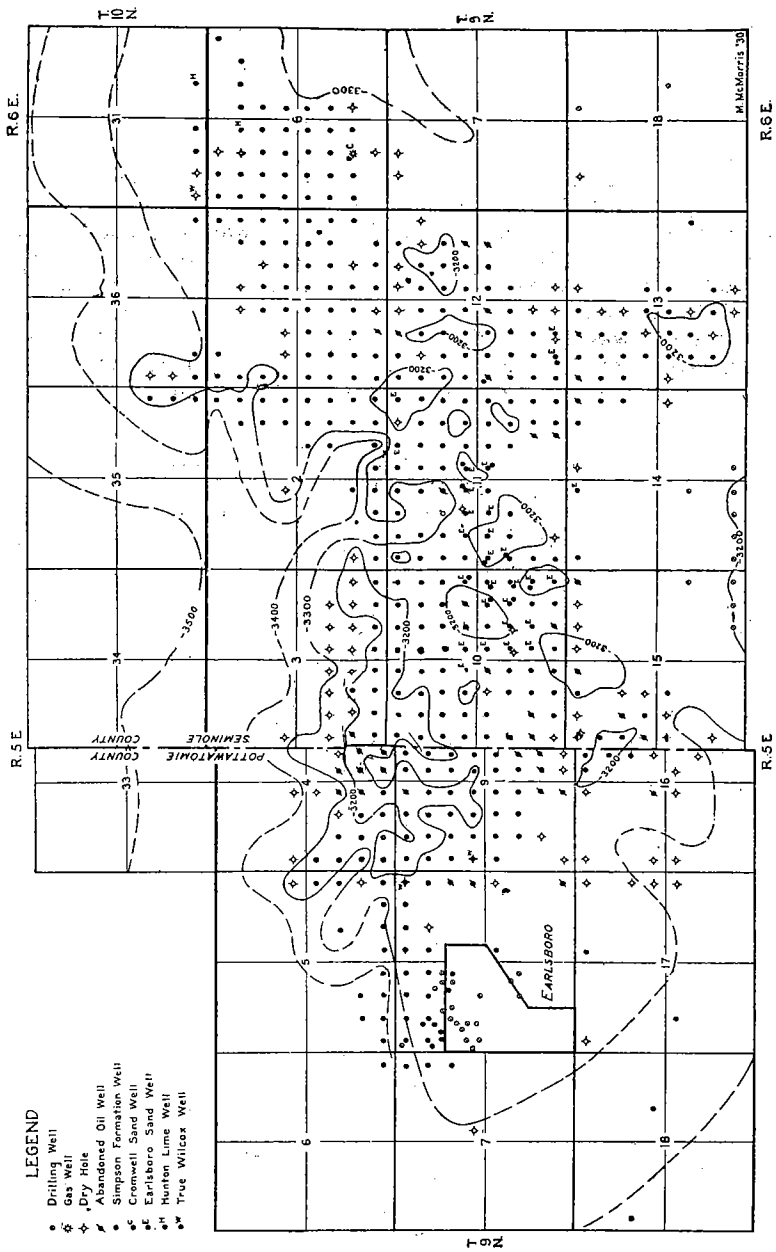

Figure 4. Structure map of Earlsboro field. Contours on top Viola limestone. Contour interval, 100 feet.

of 22,234 barrels. The advent of air and gas lift has been a big factor in the prolific production of wells in the field.

ST. LOUIS POOL

The Darby and Independent companies completed the first well in the St. Louis pool on July 20, 1926 for an initial production of 125 barrels in the SE.¼ NE.¼ sec. 15, T. 7 N., R. 4 E. This well may be referred to as the second discovery well since the original discovery was made in sec. 18, T. 7 N., R. 5 E. The producing formation is the Hunton lime, topped at 3,652 feet. The hole was later carried down to the Wilcox sand which proved to be dry. The outstanding characteristic of this well was the abnormal thickness (348 feet) of the Hunton. Development of the Hunton lime horizon was continued throughout the St. Louis district with occasional tests to the Wilcox sand with unsatisfactory results.

Mid-Continent and McCollough are the discoverers of the Simpson production in the St. Louis pool. Their Smith No. 1, NW.¼ NW.¼ SE.¼ sec. 25, T. 7 N., R. 4 E., was completed on March 20, 1928, for an initial production of 2,007 barrels. This discovery gave a new impetus to the district as the new Simpson sand well gave the area possibilities similar to the other fields in Seminole and Pottawatomie counties.

On July 26, 1928, the Magnolia completed a well for an initial production of 6,169 barrels in the NW.¼ SE.¼ sec. 19, T. 7 N., R. 5 E., in the true Wilcox sand. A number of Simpson wells in the immediate vicinity were deepened to this new producing horizon. Total per acre yield from the true Wilcox in the St. Louis will undoubtedly exceed that of any horizon in either Seminole or Pottawatomie counties. Its average per acre yield from the more prolific leases will probably exceed 100,000 barrels per acre.

The St. Louis pool is now producing from the Hunton, Simpson, and true Wilcox horizons. This field is only partially outlined. (See figure 5.) Its productive area is spreading over the most of T. 7 N., R. 4 E.

The true Wilcox sand follows structure definitely according to the law of anticlinal accumulation. The -3,050 foot contour line on the Viola lime outlines its productivity.

PEARSON POOL

The Pearson pool is located in the southwest part of T. 7 N., R. 4 E., and the southeast part of T. 7 N., R. 3 E. It was opened by Croxton and Bueklin whose well located in the SW.¼ NE.¼ sec. 19 T. 7 N., R. 4 E., came in for an initial production of two hundred seven barrels from the Hunton. Continued exploitation of the Hunton

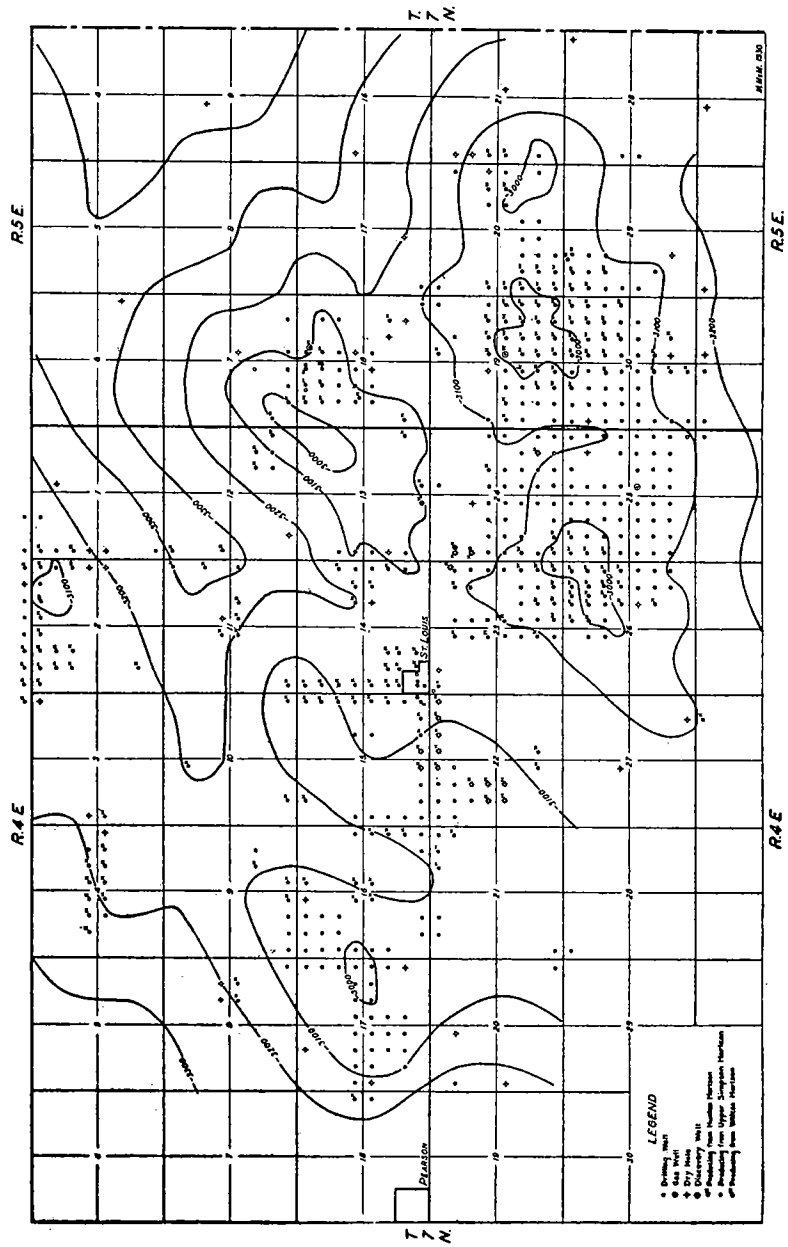

Figure 5. Structure map of St. Louis pool. Contours on top of Viola limestone. Contour interval, 100 feet.

lime at Pierson has expanded its production until there are approximately 600 producing acres. The average per acre yield was 5,420 barrels on May 1, 1930. A few wells in T. 7 N., R. 3 E., are producing oil from the Viola limestone.

MAUD POOL

The Maud Pool is located in the northeast part of T. 8 N., R. 4 E., and the northwest part of T. 8 N., 5 E. The Tidal Oil Company's well in sec. 3, T. 8 N., R. 4 E., had small production in the Misener sand which was later abandoned. In sec. 24, T. 8 N., R. 4 E., the Amerada followed with a 53-barrel Hunton well. In sec. 18, T. 8 N., R. 5 E., the Pure Oil Company had the first large Misener producer which had an initial production of 3,000 barrels per day. This well started an intensive development of this sand. To date the Maud field has been strictly a Hunton lime and Misener sand pool. Production is controlled somewhat by the thickness of the Misener sand. Exploitation of the Wilcox sand has been disappointing due to the lack of proper structural conditions.

ASHER POOL

Simms Petroleum Company completed the first well in the Asher Pool on May 28, 1929 for an initial production of 3,630 barrels per day from the Viola lime at a depth of 3640-3699 feet. Subsequent development has proven the presence of a steeply dipping dome. (See figure 6.) On May 1, 1930, there were 26 completed wells. The total production on this date from the field was 2,127,018 barrels, an average per acre yield of approximately 8,000 barrels per acre.

The Asher Pool is especially important since it has added the Viola lime as a prolific producing horizon in southern Pottawatomie County.

FUTURE POSSIBILITIES

The differentiation of pools in Pottawatomie County is a difficult matter. Extensions of the present pools are quite probable. Although any statements predicting the future possibilities of Pottawatomie County extensions are conjectured, it is safe to predict a great amount of new production for the county. The complete picture will possibly show a band of Hunton and Misener sand production throughout portions of T. 7 N., R. 4 E.; T. 8 N., R. 4 E., and T. 9 N., R. 5 E., regardless of the location of anticlines. The eastern part of the county should also have its share of Ordovician pools. The western part of the county is evidently low structurally, insofar as the pre-Pennsylvanian horizons are concerned, but is not completely condemned in these horizons. The Pennsylvanian sands of this portion of the county will bear exploitation.

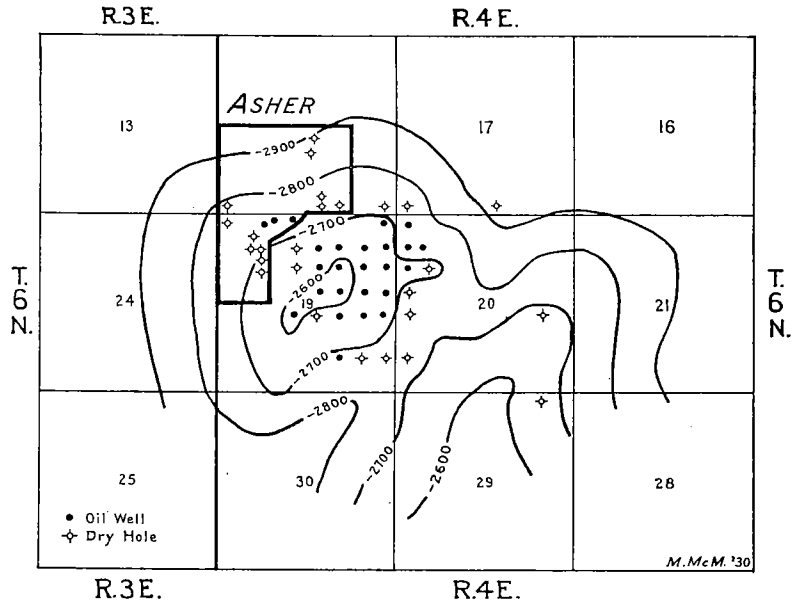

Figure 6. Structure map of Asher pool. Contours on Viola limestone. Contour interval, 100 feet.