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ILLINOIS PETROLEUM

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OIL POSSIBILITIES OF THE PAYSON ANTICLINE,

ADAMS COUNTY, ILLINOIS

By Ben B. Cox

INTRODUCTION

Although geological conditions in western Illinois are known to be generally favorable for oil accumulation, the geologic structure has not been determined over the entire area in sufficient detail to give any assurance that all of the most promising structures have been adequately tested. Accordingly, it is the policy of the Illinois State Geological Survey to make careful determinations of the geologic structure as part of the regular work of detailed quadrangle studies now in progress in western Illinois. From time to time, preliminary reports will be issued giving the pertinent facts concerning oil possibilities of such interesting areas as are found in the course of the quadrangle studies.

Field work in the Quincy-Liberty quadrangles, which are located principally in Adams County, resulted in the determination of geologic conditions which appear to be favorable for oil accumulation. Although ten deep wells have been drilled in this area, none of them was favorably located for testing the structures which appear most promising. It is the purpose of this report to give a brief summary of the geological conditions and recommendations of locations for testing the anticline.

The index map (fig. 1) shows the location of a part of the Quincy-Liberty quadrangles, the Pittsfield gas field in Pike County, and the Colmar oil field in McDonough County. The beds which produce in these nearby areas are known to underlie the Quincy-Liberty area.

STRUCTURE

The structure map (fig. 2, pp. 6-7) shows the form and location of the Payson anticline by contours drawn on the top of the Keokuk limestone.

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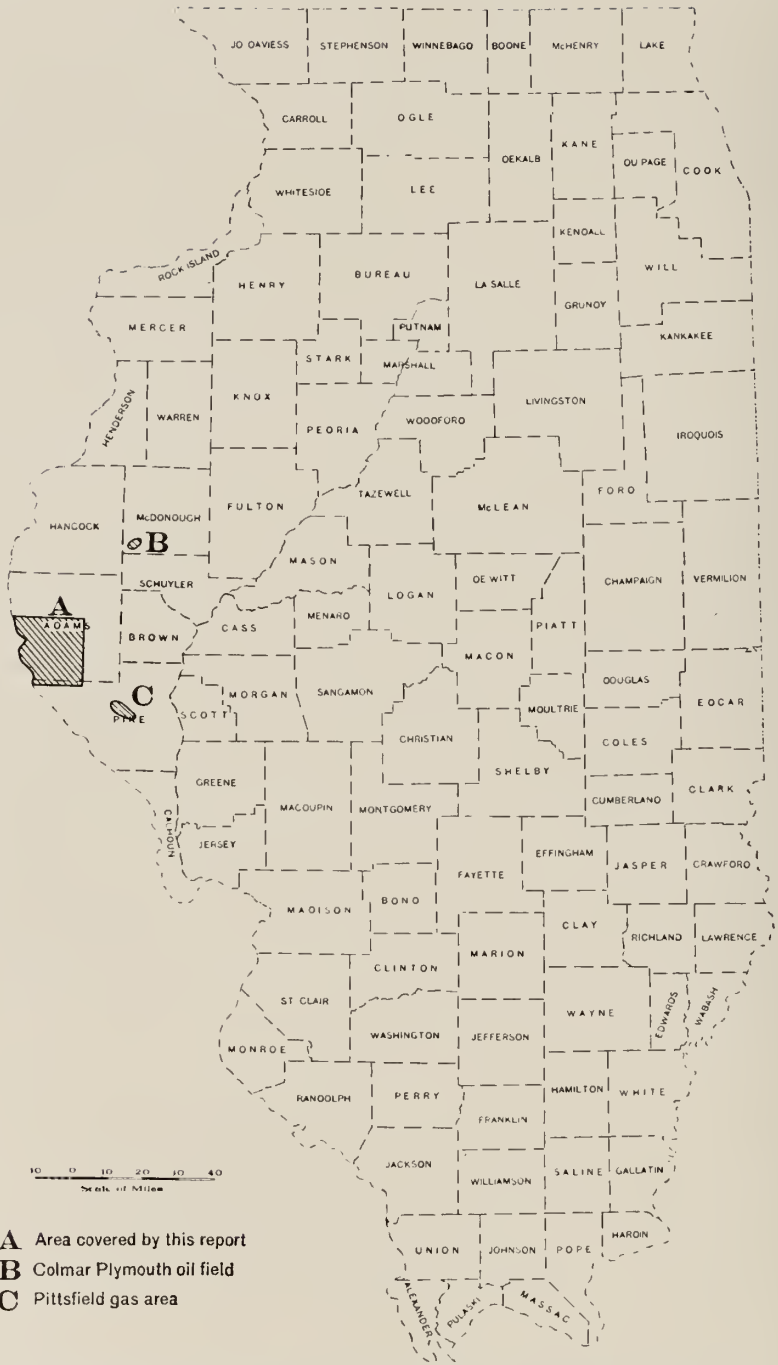


FIG. 1. Index map of Illinois showing location of area covered by this report and its relation to the Colmar Plymouth oil field and the Pittsfield gas area.



As shown on the map, this fold is marked by gentle dips to the north, and comparatively steep dips on both the east and west. The Payson anticline is the most favorable structure which has been found in the Quincy-Liberty area.

The greater part of the geologic structure of the Quincy-Liberty quadrangles was determined by level measurements on outcrops of rock beds of Mississippian age. Consequently, the structural features shown in figure 2 can be depended on at the depth of the oil-producing beds much more than can most of the structures in western Illinois which have been described, for generally the structure of Pennsylvanian beds has been the basis of recommendations for prospecting. Since it is reasonably well established that there was no local folding of importance in the region from the time of the deposition of the oldest, probable oil-bearing beds until after the deposition of the lower Mississippian, the structure of all of these beds should be closely parallel. Between the times of deposition of the Mississippian and of the Pennsylvanian, there was important folding followed by erosion, so that the structure of the Pennsylvanian deviates considerably from the structure of the lower, oil-bearing beds. In view of this relationship, the Payson anticline is favorably regarded as a possible oil-bearing structure.

The structure map shows that although the Payson anticline dips gently to the north, the rate of dip is rather irregular. Experience shows that along a fold of this type there is a better chance of finding oil accumulation where the dip of the axis is locally flattened than elsewhere. On this anticline, a flattening of the dip was determined about six miles due east of Quincy, and it is indicated on the map, figure 2, by shading which covers the area considered favorable for production.

#### POSSIBLE OIL-BEARING HORIZONS

A well drilled to 950 feet should be deep enough to test the various possible oil-bearing formations, for the St. Peter sandstone should be reached at about that depth. The first well should be located in the SE.  $\frac{1}{4}$  sec. 30, or the NE.  $\frac{1}{4}$  sec. 31, T. 1 S., R. 7 W. As far as is now known, wells at these locations have an equal chance of being productive.

#### BURLINGTON LIMESTONE

The graphic record of a general section of the beds to be expected in a well drilled on the favorable part of the structure is given in figure 2. The first possible oil- or gas-producing horizon is the sandy, basal Burlington limestone which should be found at about 290 feet. However, the prospects for this horizon do not appear to be very good in the area, for none of the wells drilled found showings of oil or gas at this depth.

## DEVONIAN-SILURIAN FORMATIONS

The lower part of the Devonian (or Silurian) lime is porous and has yielded some showings of gas in the Kelley well in T. 3 S., R. 5 W., and is to be considered as a possible source of oil or gas in the area recommended in this report, for the Pittsfield gas is obtained from it. There is some possibility, also, of finding oil or gas in the sandy beds which occur in the overlying Devonian shale in many parts of the region. The sandy beds should be found at about 375 feet and the porous limestone at about 400 feet. The horizon of the Hoing sand, which produces in the Colmar field, is just below the porous limestone, but is not likely to be sandy enough to give any production on the Payson anticline.

## "TRENTON" LIME

The top of the "Trenton" lime should be found at about 600 feet. This formation deserves testing on the Payson anticline, for showings of oil and gas have been reported from it in the well drilled on the Luther Rice farm in sec. 17, T. 3 S., R. 7 W., but this well was located low on the structure and found a flow of "Blue lick" water 240 feet below the top and was abandoned. The oil showings were reported from beds 140 feet below the top of the lime.

In view of the fact that the "Trenton" has given showings of oil and gas within a short distance of the locality recommended in this report it is particularly deserving of a test. The chances of finding oil or gas seem to be better for the "Trenton" than for any of the overlying horizons, for it is reasonable to expect that the upper part of the lime which showed oil in the Rice well, located very low on the dip, would be more porous on the higher part of the structure where there is more probability of fracturing.

There also is some probability that the water-bearing zone found 245 feet below the top of the "Trenton" in a well in sec. 34, T. 2 N., R. 7 W., on the Dougherty farm will be found to contain oil or gas on the favorable parts of the Payson anticline.

On the basis of the considerations mentioned, it is believed that the Payson anticline deserves a test to a depth of 950 feet which should be deep enough to test the "Trenton".

## PETROLEUM IN ILLINOIS DURING 1926

By Gail F. Moulton

## INTRODUCTION

New drilling in Illinois during 1926 was only moderately successful on the whole, for although the average initial production of the oil wells drilled was fairly high, a large number of dry holes was drilled and no new producing area of considerable importance was discovered. Consequently, at the beginning of 1927 the oil operators are confronted with the necessity of a program of wildcatting to discover new producing areas, or to prove the existence of deeper producing sands in the older shallow pools, if the present annual production is to be maintained for another year.

## PRODUCTION

The Illinois field produced about 7,760,000 barrels<sup>1</sup> of oil during 1926. As the curve of production (fig. 3) shows, this is only a very slight decline from the production of the two previous years. The production has been maintained at a nearly constant mark during this time because of the flush production obtained from the new producing areas in the Allendale pools in Wabash County, and the Martinsville pool in Clark County. Because no new producing areas are outlined for development for the coming year, it is believed that unless the average price of crude oil for 1927 is \$2.50 or more per barrel, the production for the year will show a much greater decline than in the few years previous, and will be only about 7,500,000 barrels. If the price of oil is materially higher, it is very probable that the operators will clean out old wells and apply improved recovery methods to such an extent that within a year or two the production will reach 10,000,000 barrels per year. Very likely interest in this type of work will grow rapidly in the Illinois fields during the next few years.

## NEW DRILLING

## GENERAL STATEMENT

The new drilling undertaken in Illinois during 1926 was not as successful as that of 1925 for the average size of the oil wells completed was smaller, and the percentage of dry holes was greater. This condition was the result of the drilling up of the new territory in Wabash and Clark counties where in general smaller wells were found in the later stages of the development, and of the failure of wildcatting during the year to discover any new producing areas as important as those brought in during 1925.

## PROSPECTS FOR 1927

New drilling for 1927 will be much less than for either 1926 or 1925 unless a new producing area is discovered during the early part of the year.

<sup>1</sup> Preliminary figures from the U. S. Dept. of Commerce.

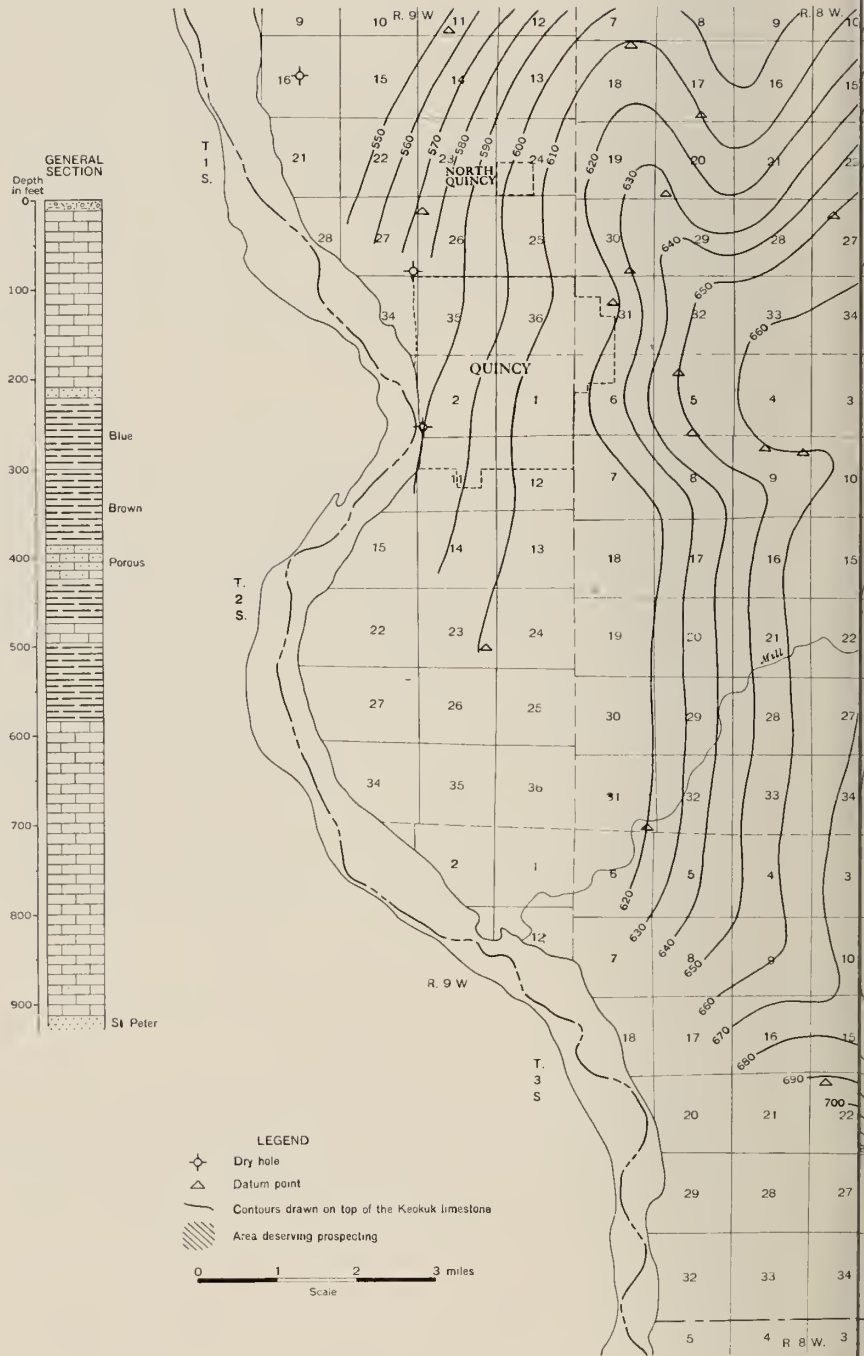
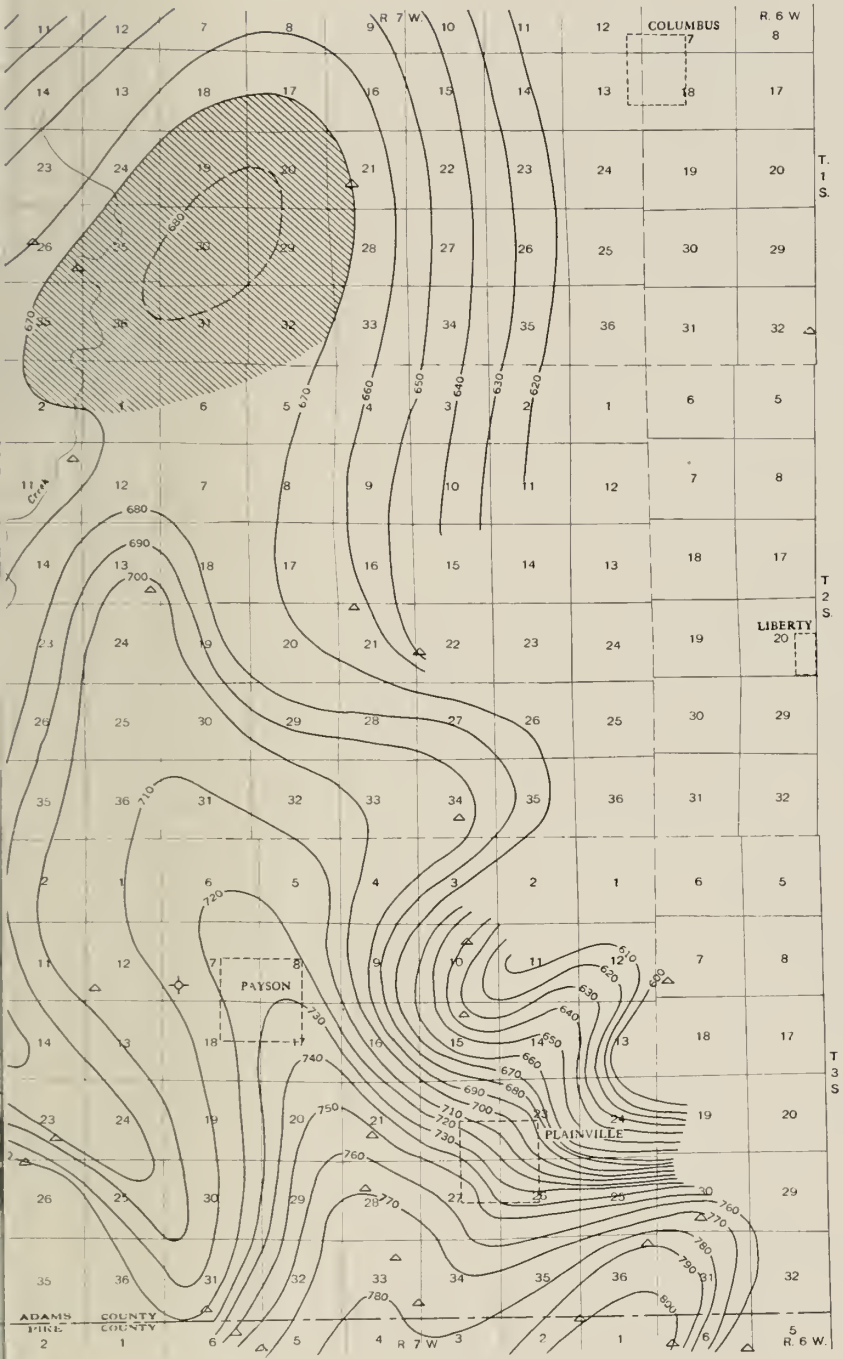


FIG. 2. Structure map of Quincy-Liberty area. (E)

OIL POSSIBILITIES OF THE PAYSON ANTICLINE



for the greater part of the new producing territory has been drilled up, and few proven locations are in sight outside of the area of the old pools where the expectation is that wells will be small.

The present outlook is that several wildcat locations will be drilled in Wabash County, and some test wells will be drilled on the structures recommended by the State Geological Survey in Bond, Madison, Macoupin, and Montgomery counties in western Illinois. At least two structures which appear to have excellent prospects have been mapped and recommended and information given the Survey indicates that several wells are planned for the near future.

In the latter part of 1926 a deep well was completed in Indiana a few miles from the Illinois line about due east of the town of Darwin in southeastern Clark County. The production in this well was found in the upper

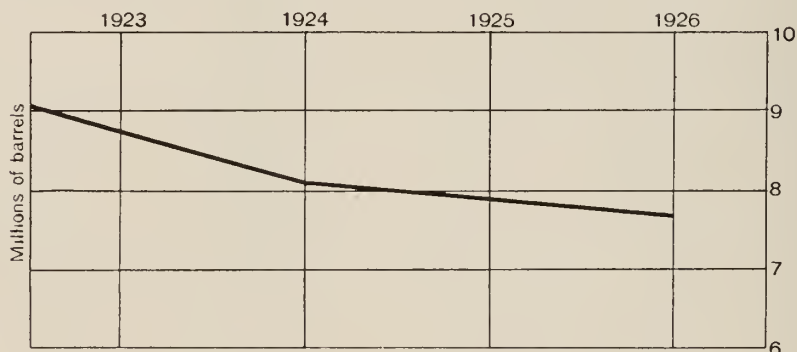


FIG. 3. Graph showing Illinois oil production 1923-1926.

part of the Devonian-Silurian limestone, which is the productive horizon in the Martinsville pool in Clark County. Wildcatting will probably be undertaken in Illinois in an attempt to find other pools in this same horizon.

In the old producing areas of Crawford and Lawrence counties, it is expected that drilling will proceed about as it has proceeded during the past year, but that the developments will not have any marked effect on the total production for the State, unless some of the wildcat wells result in the discovery of new producing areas of importance.

#### DEVELOPMENTS BY COUNTIES

##### SOUTHEASTERN FIELD

*Wabash County* was the leading area of new work for the third consecutive year, with a total of 160 completions, or more than one-third the total for the State. As shown in Table 1, the average initial production was high, but the per cent of dry holes was also large. The development was successful, as a whole.



Perhaps the most important development in Illinois took place north of Allendale on the Kogan and Leek tracts. Most of the completed wells were large producers, and these two leases combined with the surrounding ones had a production of nearly 1,000 barrels a day several months after the last large well was completed.

Additions to the producing area were made in the pool north of Allendale, in the Holsen-Dorney pool east of Allendale, in the Armstrong pool southeast of Allendale, and in the old pool due west of Allendale. A new pool of small size was discovered near Friendsville in an area recommended in a report of the State Geological Survey<sup>2</sup>.

TABLE 1.—*Summary of oil and gas developments in Illinois during 1926, by counties*

County	No. of wells	Total initial production Barrels	No. of gas wells	Dry holes		Average initial production of oil wells Barrels
				No.	Per cent	
Clark	42	843	—	4	8.7	20.1
Crawford	60	501	3	9	12.5	8.3
Lawrence	21	508	—	4	16	24.1
Wabash	90	5,955	2	68	42.5	66.1
Others	14	108	—	32	69.5	7.7
Total State	227	7,915	5	117	33.5	34.8

TABLE 2.—*Summary of oil and gas field developments in Illinois 1924-1926*

Year	Comple- tions	Total initial production Barrels	No. of gas wells	Dry holes		Average initial production of oil wells Barrels
				No.	Per cent	
1924	174	5,568	2	51	29.3	45.1
1925	231	10,028	6	70	30.3	64.7
1926	349	7,915	5	117	33.5	34.8

Wildcat dry holes were drilled in the structural high north of Allendale near the Lawrence County line, in the vicinity of Patton, in the vicinity of Grayville, near Belmont, and west of Friendsville. Structural conditions undoubtedly warranted the locations north of Allendale, as well as those in the vicinity of Patton, but the others were not located in areas

<sup>2</sup> Moulton, Gail F., Further contributions to the geology of the Allendale oil field, with a revised structure map: Illinois State Geol. Survey Rept. Investigations 7, pp. 15-17, 1925.

whose structure was so clearly favorable. Had it not been for the dry holes caused by the very irregular character of the Biehl sand, the results of drilling in Wabash County would have been much more profitable than they were.

The extensive drilling which has taken place during the past year and the small amount of current drilling make questionable the finding of new producing areas of importance in Wabash County during the coming year.

*Clark County* was second in importance of drilling activity during 1926 as it was during 1925 and 1924. There was a total of 46 completions of which 42 were producers with an average initial production of 20 barrels. Most of these wells were drilled in the Martinsville pool and produced from both the Carper sand at about 1400 feet, and the "Niagaran" lime at about 1550 feet.

Operating conditions in Clark County are very different from those in Wabash County, for although the production is less profitable than the best of the Wabash County production, successful operation was practically universal because the extensive character of the sand insures production from all wells drilled on the high part of the structure.

Plans for wildcatting to discover other cross folds similar to the Martinsville producing structure are reported for other areas in Clark County. Unless some such discoveries are made, there will be a considerable reduction in the amount of drilling in Clark County during 1927, for all of the proven acreage is practically drilled up at the present time.

*Crawford County* was third in amount of new drilling during 1926 with a total of 69 completions which averaged 8.3 barrels initial production for each well. A small, new producing area was developed a short distance south of Robinson, but no new wells of important size were found. At the present time a deep test is being drilled northeast of Flat Rock which will probably test the "Niagaran" horizon and may possibly be carried to the "Trenton". This test is of particular interest because it is located on one of the long, narrow, northeast extensions from the main producing area of Crawford County, and will do much to determine whether there is any relation between these extensions in the shallow sand and the cross folding found in Clark County with a parallel trend. If a slight cross fold caused the oil accumulation, there is a good prospect for finding a more pronounced fold in the underlying beds which should result in oil accumulation there.

*Lawrence County* had the least activity of any of the important oil-producing counties in the eastern part of the State. A total of 25 completions was reported of which 21 were producers with an average initial production of 24 barrels. The most important test of the year for Lawrence County is still drilling near Bridgeport. This well is being put down by the Ohio Oil Company to test the possible oil sands below those which

have been developed in the County, and the intention of drilling this well into or through the "Trenton" has been reported in the press. If this project is carried out, the well will be drilled below 5,000 feet and will be the deepest oil test in the State. The well is particularly important because if new producing horizons are developed, there will be a very large area in the southeastern fields which will deserve drilling to the greater depth.

*Other counties.* Outside drilling in the southeastern fields was most important in Jasper County which had a total of 7 completions, 3 of which had a total initial production of 8 barrels.

There was also some drilling in Coles and Cumberland counties, but no new production resulted from these ventures.

#### CENTRALIA DISTRICT

Most of the operations in the Centralia district for 1926 were in Marion County. As a whole, the results of the drilling were not very satisfactory, for only 7 of the 16 wells drilled were producers, and these averaged only 11 barrels per day.

Wildcat wells were drilled to test the Hoffman structure<sup>3</sup> northwest of Centralia, and the Duquoin anticline near Irvington. Most of the wells were drilled in the Wamac pool south of Centralia, and gave only a small initial yield.

#### SOUTHWESTERN ILLINOIS

*Randolph County.* Four dry holes were drilled in Randolph County, three of which were located in structurally favorable areas described in a report of the Illinois State Geological Survey<sup>4</sup>, but the area which was recommended as most favorable in the report is not yet tested and does not appear to have been condemned by the drilling already done, although the new information has served to emphasize the difficulties to be encountered because of the extreme irregularity of the producing sand.

*Jackson County.* In the Ava field in Jackson County three wells were drilled two of which were dry; ten barrels were reported for the producer. New operations in this area seem to have been abandoned for the present at least.

#### OTHER PARTS OF THE STATE

*McDonough County.* The principal activity in western Illinois was in McDonough County. Five wells drilled during the year tested the Tennessee fold, the southern part of the Sciota dome, and the Gin Ridge area west of Industry. None of these wells found more than a small showing of oil, and at the end of the year the operators had nearly lost interest in the area.

<sup>3</sup> Bell, A. H., Oil investigations in the Centralia area: Illinois State Geol. Survey, Illinois Petroleum No. 5, pp. 8-10, October 16, 1926.

<sup>4</sup> Moulton, G. F., Oil and gas possibilities in the Sparta area: Illinois State Geol. Survey, Illinois Petroleum No. 1, April 17, 1925.

*Morgan County.* East of Jacksonville several wells were completed in the shallow gas sand at 300 feet. One well drilled during the latter part of the year had an oil production of about 4 barrels per day at about the same depth. As a result of these developments, interest has been aroused in the area, and several wells are expected for the coming year.

It is probable that tests will be drilled during the coming year on structures recommended by the State Geological Survey in Bond County, and in Bond, Madison, and Montgomery counties. Both of these structures<sup>5</sup>, which were determined on the No. 6 coal, seem to have good possibilities, and, if they are adequately tested, one of them is likely to be productive.

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<sup>5</sup>Bell, A. H., Oil possibilities of the Ayers anticline: Illinois State Geol. Survey, Illinois Petroleum No. 5, pp. 15-18, October 16, 1926.

Bell, A. H., The Sorento Dome: Illinois State Geol. Survey, Illinois Petroleum No. 6, December 4, 1926.