STRUCTURE OF HERRIN (NO. 6) COAL BED IN RANDOLPH, WESTERN PERRY, SOUTHWESTERN WASHINGTON, AND SOUTHEASTERN ST. CLAIR COUNTIES, ILLINOIS

By

Gilbert H. Cady

Assisted by

Earle F. Taylor and Adler E. Spotti

WITH NOTES ON THE OIL AND GAS POSSIBILITIES

By

Alfred H. Bell
ENLARGED STRUCTURE MAP OF HERRIN (NO. 6) COAL BED IN SPARTA FIELD
This circular presents a brief discussion of the structural features of the Herrin (No. 6) coal bed in Randolph County and in adjacent parts of Washington, St. Clair, and Perry counties. The first part of the circular discusses the structure of the coal bed with relation to coal mining; in the second part of the circular the structure is discussed by Dr. A. H. Bell with respect to its relation to possible oil and gas accumulation.

The coal production in this area is mainly from the Herrin (No. 6) coal bed. A few mines, serving only local needs, produce coal from the underlying coal bed known in this region as the Blair (No. 5) coal bed. There were 15 railroad shaft mines producing coal in this area in 1938, all located close to railroad lines. An important slope mine was opened near Sparta in 1939 about one mile from the nearest railroad line. This is the only mine in the area where it was necessary to build more than a short spur to give railroad connections to underground mines.

Three stripping operations lie completely or partly within this area, but at the present time stripping is being carried on within the area by only one of them which is located at Percy. Present operations of the other two mines lie outside of this area.

About 400 square miles originally underlain by workable coal is represented in this area. Of this original quantity of coal not more than 20 square miles, located adjacent to the railroad lines, has been removed or rendered unminable by mining. The coal bed is generally 5 1/2 to 6 feet thick, of average quality, and represents a remaining reserve (calculated on the basis of approximately 1,000,000 tons per mile-foot) of 2,000,000,000 tons in the No. 6 coal bed. A considerable tonnage is also probably present in the No. 5 coal bed although probably not more than one-quarter as much as in the No. 6 coal bed.

The area lies within 50 miles of St. Louis and within 20 miles of the Mississippi River at Chester, which provide locational advantages of considerable importance.
The structural features of the Herrin (No. 6) coal bed are in general of a mild character in this area. Faults are infrequent and possibly non-existent; the only fault shown on the map located south of Willisville is based upon drilling data. The regional dip is northeastward, the altitude of the coal bed being lowest in the northeast corner of the area where it is between 100 and 125 feet above sea-level, and highest almost due southwest at Schuline where it is between 525 and 550 feet above sea-level. The extreme difference in the altitude of the coal bed is about 400 feet, representing an average regional dip of 13.8 feet per mile.

This general northeast dip, however, is far from regular, and in a number of places the inclination is about 100 feet per mile for short distances. The steepest dips shown are between McKinley and Oakdale, between the Sparta basin and the outcrop of the coal bed to the west and southwest, and in a region about 5 miles north of Percy along the Randolph-Ferry county line.

Here and there in the area the direction of dip is reversed or the coal bed is horizontal. Thus there are produced local structural basins and troughs, domes, and low anticlines, platforms, and terraces. The position and character of these should be taken into consideration when selecting any portion of the area as a site for mining operations. It is probable, however, that no part of the area has structural conditions that will interfere seriously with mining operations.

The map which has been prepared to accompany this report in blue-print form was constructed by the use of very unevenly distributed datum points. Drilling and mining operations are concentrated in the southwest part of the area, particularly near the outcrop of the coal beds. On the other hand, datum points are widely spaced in the northeast part of the area and the identification of the coal beds is much less certain in some instances. The interpretation of the structure between McKinley and Tildon in this part of the area is not strictly in accordance with the engineering principles that control the position of the contours in the other portions of the map, since there are no datum points to justify extending a trough northward from Coulterville across section 1, T. 4 S., R. 5 W., and sections 25 and 36 of the township north. It is not impossible that the coal bed is raised in a continuous arc extending from Tildon northeastward to the McKinley region thus entirely closing off the Coulterville basin to the south. The actual conditions can probably not be known until some drilling is done in the intermediate position.
FUTURE PUBLICATIONS

A more comprehensive report describing the stratigraphy, structure, chemical character of the coal, and the roof conditions of the Herrin (No. 6) coal bed, with brief consideration of the Blair (No. 5) coal, is in preparation.

REVIVION OF PRESENT MAP
AND PREPARATION OF MAPS OF OTHER AREAS

The present map, like those of the areas to the east (Circulars 24 and 42), is a progress map of such form that additions and corrections can be readily made from time to time. Because of the large amount of new drilling that is being done in the State and the vigorous search for records of earlier drilling, it is expected that additional information will constantly be made available for Survey use. It is anticipated that a revision of the present map will not be available for several months. Until revised, except for minor corrections, it will bear its original date. Subsequent revisions will be designated as such, carrying a new date of issue.

The map is one of a series of seven showing the structure of Herrin (No. 6) coal bed in southern Illinois. The next to appear will represent an area extending north from the area represented by the present map to the southern part of Macoupin and Montgomery counties and including Madison County and adjacent parts of St. Clair, Washington, Bond, Clinton, Montgomery and Macoupin counties.

REFERENCES

Previously published data on the structure and occurrence of the Herrin (No. 6) and Blair No. 5) coal beds in this area may be found in the following publications:


Blatchley, R. S., Oil Resources of Illinois with Special Reference to the Area Outside the Southeastern Fields: Illinois State Geological Survey Bull. 16, Randolph County, pp. 146-157, 1910.


NOTES ON OIL AND GAS POSSIBILITIES
(In the Area Contoured on Coal No. 6 in Randolph, Western Perry, Southwestern Washington, and Southeastern St. Clair Counties, Illinois)

By
Alfred H. Bell

In employing the structure map of this area as an aid in the exploration for oil, it should be borne in mind that the structural features in the pre-Pennsylvanian systems, which include most of the possible oil-producing strata, are not all parallel to those of coal No. 6. Experience elsewhere indicates that some structural features of the coal continue downward and are accentuated with depth, whereas others do not.

The following discussion concerns the structural features of coal No. 6 as related to oil and gas possibilities, previous oil and gas development, and the results of deep drilling in the area. It does not include a special study of the pre-Pennsylvanian stratigraphy and structure.

A key map to the location of representative oil and gas test wells is given on the margin of the large structure map. Summary logs of the wells are given at the end of this report.

Sparta gas pool, Randolph County

At the present time one pool, the Sparta gas pool, is located within the area contoured on coal No. 6. Gas was produced for approximately 12 years from 1888 to 1900. The producing formation, locally called the "Sparta gas sand," is correlated as the Cypress formation of the Chester series and its approximate average depth is 850 feet. A small amount of oil was produced in a few wells but there is no record of the total amount produced.

Several attempts have been made at various times to produce oil commercially in the Sparta Field, but so far with little success. Recently the Ralston and Beattie L. C. Foster well No. 1, SW. 1/4 NE. 1/4 SE. 1/4 sec.31, T. 4 S., R. 5 W., Randolph County (Map No. 1123), was drilled to a depth of 937 feet. On February 13 it was reported to be pumping oil, but testing of the well has not been completed.
Cordes pool, Washington County

Just east of the mapped area is the Cordes pool, located mainly in secs. 14, 15, 22 and 23, T. 3 S., R. 3 W., Washington County. This pool was discovered February 7, 1939, and on January 3, 1940, it had 99 producing oil wells in the Benoist sand at an average depth of approximately 1260 feet. The cumulative production at the end of one year is a little more than 500,000 barrels of oil. The location of the structure and discovery of the Cordes pool was by the reflection seismograph method. Prior to discovery of the field, data on coal No. 6 were available for this area.

Ava-Campbell Hill gas pool, Jackson County

The Ava-Campbell Hill gas field is located just outside and to the south of the area contoured on coal No. 6. It produced gas and a little oil from 1917 to 1934. Estimated total oil production is from 20,000 to 25,000 barrels. Production was from the Cypress sandstone in the Chester series at an approximate average depth of 780 feet. The structure has been tested by one dry hole (the Mid-Egypt Oil & Gas Co. - Lange No. 4, NW SE NE, sec. 15, T. 7 S., R. 4 W., Jackson County, drilled about 1921), into the Devonian limestone and one in April 1938 into the St. Peter sandstone (Log No. 13).

Structural features of Coal No. 6 as related to Oil and Gas prospects

The McKinley anticline. - The McKinley anticline is located in southwestern Washington County and is the most prominent structural feature shown by the contours on No. 6 coal in the northeastern part of the area mapped. It has an area of about 20 square miles and the closure on the coal is probably between 25 and 50 feet. The strata dip steeply on the northeast flank of the structure but, because of the lack of datum points to the west the amount of westward dip is in doubt. A test well into the Devonian drilled in May 1939 (Log No. 3) was located nearly on the crest of this structure but failed to find production. The Trenton, at an estimated depth of 3200 feet, has not yet been tested.

The Darmstadt anticline. - The Darmstadt anticline in southeastern St. Clair County was tested in May 1930 by a well into the Kimmswick ("Trenton") limestone which was a dry hole (Log No. 5). Prospects do not appear sufficiently favorable to warrant further testing.
The Coulterville dome. - A small closed structure about two miles northwest of Coulterville is here called the Coulterville dome. This is not to be confused with the closed syncline centering about Coulterville. The Coulterville dome was tested by a well drilled into the Kimmswick-Plattin ("Trenton") limestone (Log No. 6) which was a dry hole.

Conant dome. - A small structure having a closure of 25 feet or more is located near Conant in western Perry County, here called the Conant dome. Because of its small size and the possibility that it does not extend into the pre-Pennsylvanian formations, oil prospects are only fair. Following are estimated depths to the tops of formations:

<table>
<thead>
<tr>
<th>Formation</th>
<th>Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cypress</td>
<td>925</td>
</tr>
<tr>
<td>Bethel</td>
<td>1075</td>
</tr>
<tr>
<td>Aux Vases</td>
<td>1160</td>
</tr>
<tr>
<td>Ste. Genevieve</td>
<td>1242</td>
</tr>
<tr>
<td>Devonian system</td>
<td>2500</td>
</tr>
<tr>
<td>Kimmswick</td>
<td>3425</td>
</tr>
<tr>
<td>St. Peter</td>
<td>4235</td>
</tr>
</tbody>
</table>

General Comments

Regional strike of the strata in the area is approximately northwest-southeast and regional dip approximately northeast. For this reason the chances for commercial accumulations of oil increase from southwest to northeast because the number and thickness of possible producing formations are greater. In a broad area northeast of the McKinley anticline and northwest of the Cordes pool, coal No. 6 is shown on the map as nearly flat, but it will be noted that few data on the coal are available. As local highs may be present, further exploration appears desirable by structure test drilling or by geophysical methods, or both.

Many minor flexures of the strata are indicated by contours showing the structure of the coal, particularly in the areas southwest and southeast of Sparta. An anticlinal nose exists in secs. 9, 10, 16, and adjacent part of sec. 15, T. 5 S., R. 5 W., Randolph County, and another extends from a point north of Jamestown in a direction east of north to the vicinity of Winkle. These and other minor features are not necessarily favorable to the occurrence of oil.
Summary logs of representative oil and gas test wells in the area are given below. For locations see index map on left margin of structure map.

No. 1 - Representative log of producing well in Cordes pool.
Manitou Oil Co. - Oak Grove Cemetery well No. 1
SE. corner SW. 1/4 sec. 15, T. 3 S.,
R. 3 W., Washington County. Drilled
April 1939. Elevation 534 feet.

Summary of driller's log

<table>
<thead>
<tr>
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<th>Depth</th>
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</thead>
<tbody>
<tr>
<td>Feet</td>
<td>Feet</td>
</tr>
<tr>
<td>Pleistocene system, glacial drift</td>
<td>20</td>
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<tr>
<td>Pennsylvanian system</td>
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<td>Mississippian system</td>
<td>Chester series</td>
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<tr>
<td>Menard-Vienna formations</td>
<td>70</td>
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<tr>
<td>Tar Springs sandstone</td>
<td>215</td>
</tr>
<tr>
<td>Glen Dean-Golconda formation</td>
<td>52</td>
</tr>
<tr>
<td>Cypress sandstone</td>
<td>98</td>
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<tr>
<td>Paint Creek formation</td>
<td>23</td>
</tr>
<tr>
<td>Bethel sandstone</td>
<td>146</td>
</tr>
<tr>
<td>Cypress sandstone</td>
<td>16</td>
</tr>
<tr>
<td>Golconda formation</td>
<td>64</td>
</tr>
</tbody>
</table>

No. 2 - J. B. Oberholtzer et al - Freeman well No. 1
SW. 1/4 SW. 1/4 SW. 1/4 sec. 10,
T. 3 S., R. 4 W., Washington County.
(County No. 179). Drilled January
1939. Elevation 501 feet.

Summary of sample study log

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<td>Feet</td>
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<td>Mississippian system</td>
<td>Chester series</td>
</tr>
<tr>
<td>Menard-Vienna formations</td>
<td>12</td>
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<tr>
<td>Tar Springs sandstone</td>
<td>62</td>
</tr>
<tr>
<td>Glen Dean formation</td>
<td>16</td>
</tr>
<tr>
<td>Hardinsburg sandstone</td>
<td>146</td>
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<td>64</td>
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No. 2. - (Continued)

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<td>Paint Creek formation</td>
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<tr>
<td>Renault formation</td>
<td>55</td>
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<tr>
<td>Aux Vases sandstone</td>
<td>99</td>
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<tr>
<td>Iowa series</td>
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</tr>
<tr>
<td>Ste. Genevieve formation</td>
<td>79</td>
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</table>

No. 3. - Phillips Petroleum Co. - Hunleth well No. 1
NE. 1/4 NW. 1/4 NE. 1/4 sec. 32,
T. 3 S., R. 4 W., Washington County,
(County No. 180). Drilled May 1939.
Elevation 522 feet.

Summary of sample study log

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<td>Feet</td>
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<td>(No samples)</td>
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<td>Chester series</td>
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<td>40</td>
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<td>Glen Dean formation</td>
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<tr>
<td>Iowa series</td>
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<tr>
<td>Ste. Genevieve formation</td>
<td></td>
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<td>Levis limestone</td>
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<td>Rosiclare sandstone</td>
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<td>Fredonia limestone</td>
<td>110</td>
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<tr>
<td>St. Louis limestone</td>
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<tr>
<td>Salem limestone</td>
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<tr>
<td>Osage group - limestone, siltstone, and shale</td>
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<td>Kinderhook group - shale</td>
<td>17</td>
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<tr>
<td>Devonian system - limestone</td>
<td>82</td>
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</table>
No. 1. - Paul Mossbach - J. C. Miller well No. 1
SE. 1/4 SE. 1/4 NW. 1/4, sec. 31,
T. 1 S., R. 7 W., St. Clair County.
Drilled March 1939. Elevation 485 feet.

Summary of driller's log

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<tbody>
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<tr>
<td>Chester series</td>
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</tr>
<tr>
<td>Glen Dean, Hardinsburg, and</td>
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</tr>
<tr>
<td>Golconda formations</td>
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<td>330</td>
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<tr>
<td>Cypress sandstone</td>
<td>44</td>
<td>374</td>
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<td>Paint Creek, Bethel, and Renault formations</td>
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<td>445</td>
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<td>Aux Vases sandstone</td>
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<td>497</td>
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<td></td>
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<td>Meramec and Osage groups - limestone</td>
<td>1014</td>
<td>1511</td>
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<td>Kinderhook group - shale</td>
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<td>Ordovician system</td>
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<tr>
<td>Maquoketa shale</td>
<td>137</td>
<td>1927</td>
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<td>Kimmswick (&quot;Trenton&quot;) limestone</td>
<td>35</td>
<td>1962</td>
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No. 5. - Ohio Oil Co. - M. Koch well No. 1
SW. 1/4 SE. 1/4 SW. 1/4 sec. 35,
T. 2 S., R. 6 W., St. Clair County.
(County No. 436), Drilled May 1930.
Elevation 424 feet.

Summary of driller's log

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<thead>
<tr>
<th>System</th>
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<tbody>
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<td>Pleistocene-glacial drift</td>
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<td>Iowa series</td>
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<tr>
<td>Meramec group - limestone</td>
<td>540</td>
<td>1530</td>
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<td>Osage group - shale and limestone</td>
<td>428</td>
<td>1958</td>
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<td>Kinderhook group - shale</td>
<td>10</td>
<td>1968</td>
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<td>Devonian-Silurian systems - limestone</td>
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<td>Ordovician system</td>
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<td></td>
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<td>Maquoketa shale</td>
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<td>2605</td>
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<tr>
<td>Kimmswick (&quot;Trenton&quot;) limestone</td>
<td>83</td>
<td>2688</td>
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No. 6. - Mabee Drilling Co. - Wilson well No. 1
SE. 1/4 SE. 1/4 NE. 1/4 sec. 3,  
T. 4 S., R. 5 W., Randolph County.  
(County No. 1410). Drilled March 1938. Elevation 545 feet.

Summary of sample study log

<table>
<thead>
<tr>
<th>Thickness Feet</th>
<th>Depth Feet</th>
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<tbody>
<tr>
<td>Pleistocene system - glacial drift</td>
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<td>Pennsylvanian system (Top of No. 6 coal at 196 feet)</td>
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<td>Mississippian system</td>
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</tr>
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<td>Chester series</td>
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</tr>
<tr>
<td>Menard-Golconda formations</td>
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<tr>
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</tr>
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<td>Paint Creek formation</td>
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<td>68</td>
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<td>Aux Vases sandstone</td>
<td>97</td>
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<tr>
<td>Iowa series</td>
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<tr>
<td>Meramec group</td>
<td></td>
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<tr>
<td>Ste. Genevieve formation</td>
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<td>Levias limestone</td>
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<td>Limestone and shale</td>
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<td>Kinderhook group - shale and sandstone</td>
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<td>Devonian system - limestone</td>
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<td>Silurian system</td>
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<td>Niagara series - limestone</td>
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<tr>
<td>Alexandrian series - limestone and sandstone</td>
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<tr>
<td>Ordovician system</td>
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<td>Maquoketa shale and limestone</td>
<td>65</td>
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<tr>
<td>Kimmswick limestone</td>
<td>95</td>
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<tr>
<td>Plattin and Joachim limestone and dolomite</td>
<td>375</td>
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### No. 7. - Representative log for Sparta field
Cain and Pollack - McElroy Heirs well No. 9
SW. cor. NE. 1/4 NE. 1/4 sec. 6,
T. 5 S., R. 5 W., Randolph County.
(County No. 1398). Drilled July 1934. Elevation 501.7 feet.

Summary of sample study log

<table>
<thead>
<tr>
<th>Thickness (Feet)</th>
<th>Depth (Feet)</th>
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<tbody>
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<td>Pleistocene system - glacial drift</td>
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<td>Pennsylvanian system (Top of No. 6 coal at 161 feet)</td>
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<td>Chester series</td>
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<td>Clore formation</td>
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<td>Menard-Vienna formations</td>
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<td>Glen Dean-Colconda formations</td>
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<td>Cypress sandstone with middle shale (&quot;Sparta gas sand&quot;)</td>
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<td>Paint Creek formation</td>
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### No. 8. - Dr. Seward - Rehmer well No. 1
SE. cor. SE. 1/4 NE. 1/4 sec. 19,
T. 4 S., R. 7 W., Randolph County.
Drilled March 1939. Elevation 413 feet.

Summary of sample study log

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<td>Chester series</td>
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<tr>
<td>Renault formation</td>
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<tr>
<td>Levias limestone</td>
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<td>Rosiclare sandstone</td>
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No. 8. - (Continued)

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<table>
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<th>Thickness</th>
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<tr>
<td>Warsaw, Keokuk and Burlington</td>
<td>331</td>
<td>1218</td>
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<tr>
<td>formations</td>
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<td>Fern Glen limestone and shale</td>
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<td>Kinderhook group - sandstone</td>
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<td>Niagaran series - limestone</td>
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<td>1555</td>
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<tr>
<td>Alexandrian series - limestone</td>
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<tr>
<td>Ordovician system</td>
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<td>Maquoketa shale</td>
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<td>1800</td>
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No. 9. - Ames Oil Co. - Nicholson well No. 1

SW. 1/4 NW. 1/4 NW. 1/4 sec. 12,
T. 5 S., R. 9 W., Randolph County.
Drilled January 1939. Elevation 615 feet.

Summary of sample study log

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<table>
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<th>Thickness</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chester series</td>
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<td></td>
</tr>
<tr>
<td>Golconda, Cypress, Paint Creek, Bethel, and Renault formations</td>
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<tr>
<td>Aux Vases sandstone</td>
<td>80</td>
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<tr>
<td>Iowa series</td>
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<td></td>
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<tr>
<td>Meramec group</td>
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<td></td>
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<tr>
<td>Ste. Genevieve formation</td>
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<td></td>
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<tr>
<td>Levias limestone</td>
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<td>Salem limestone</td>
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<td>Warsaw and Keokuk limestone and shale</td>
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<td>Maquoketa shale and siltstone</td>
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<td>1905</td>
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No. 10. - Ohio Oil Co. - Aug. Schulte well No. 1
C. SW. 1/4 NE. 1/4 sec. 26,
T. 5 S., R. 6 W., Randolph
County. (County No. 129)
Drilled 1929. Elevation 480 feet.

Summary of sample study log

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<tr>
<td>Mississippian system</td>
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<tr>
<td>Chester series</td>
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</tr>
<tr>
<td>Menard-Vienna formations</td>
<td>110</td>
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<tr>
<td>Tar Springs sandstone</td>
<td>25</td>
</tr>
<tr>
<td>Glen Dean-Golconda formations</td>
<td>240</td>
</tr>
<tr>
<td>Cypress sandstone</td>
<td>15</td>
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<tr>
<td>Paint Creek formation</td>
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<tr>
<td>Bethel, Renault, and Aux Vases formations</td>
<td>175</td>
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<tr>
<td>Iowa series</td>
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<tr>
<td>Ste. Genevieve formation</td>
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<tr>
<td>St. Louis limestone</td>
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* Total depth 1325, no samples below 1110; driller's log reports limestone 1110-1325.

No. 11. - Badger Oil & Gas - Schroeder well No. 1
SW. 1/4 SW. 1/4 NW. 1/4 NW. 1/4
sec. 27, T. 6 S., R. 6 W., Randolph
County. (County No. 635). Drilled
February 1939. Elevation 477 feet.

Summary of sample study log

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<td>Vienna formation</td>
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<td>Glen Dean formation</td>
<td>75</td>
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<td>Hardinsburg sandstone</td>
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No. 11. - (Continued)

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<td>Renault formation</td>
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<td>Meramec group</td>
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<td>Ste. Genevieve formation</td>
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No. 12. - Gilliam et al - Brostmeyer well No. 1
SW. 1/4 SE. 1/4 NE. 1/4 sec. 5,
T. 5 S., R. 3 W., Perry County.
(County No. 2007). Drilled
October 1939. Elevation 555 feet.

Summary of driller's log

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<td>Menard formation</td>
<td>60</td>
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<td>Waltersburg, Vienna and Tar Springs formations</td>
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<td>Glen Dean-Golconda formations</td>
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Mississippian system (continued)

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<td>Iowa series</td>
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<td>1610</td>
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No. 13. - Stanolind Oil & Gas Co. - Leiner well No. 1
NE. 1/4 NW. 1/4 SW. 1/4 sec. 20, T. 7 S., R. 4 W., Jackson County.
Drilled April 1938. Elevation 628 feet.

Summary of sample study log

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<tr>
<td>Chester series</td>
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<td>Kinkaid, Degonia and Clore formations</td>
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<td>Depth Feet</td>
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