

State of Illinois
Henry Horner, Governor
Department of Registration and Education
John J. Hallihan, Director

Division of the
S T A T E G E O L O G I C A L S U R V E Y
M. M. Leighton, Chief
Urbana, Illinois

No. 58

C I R C U L A R

March 1940

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

By

Gilbert H. Cady

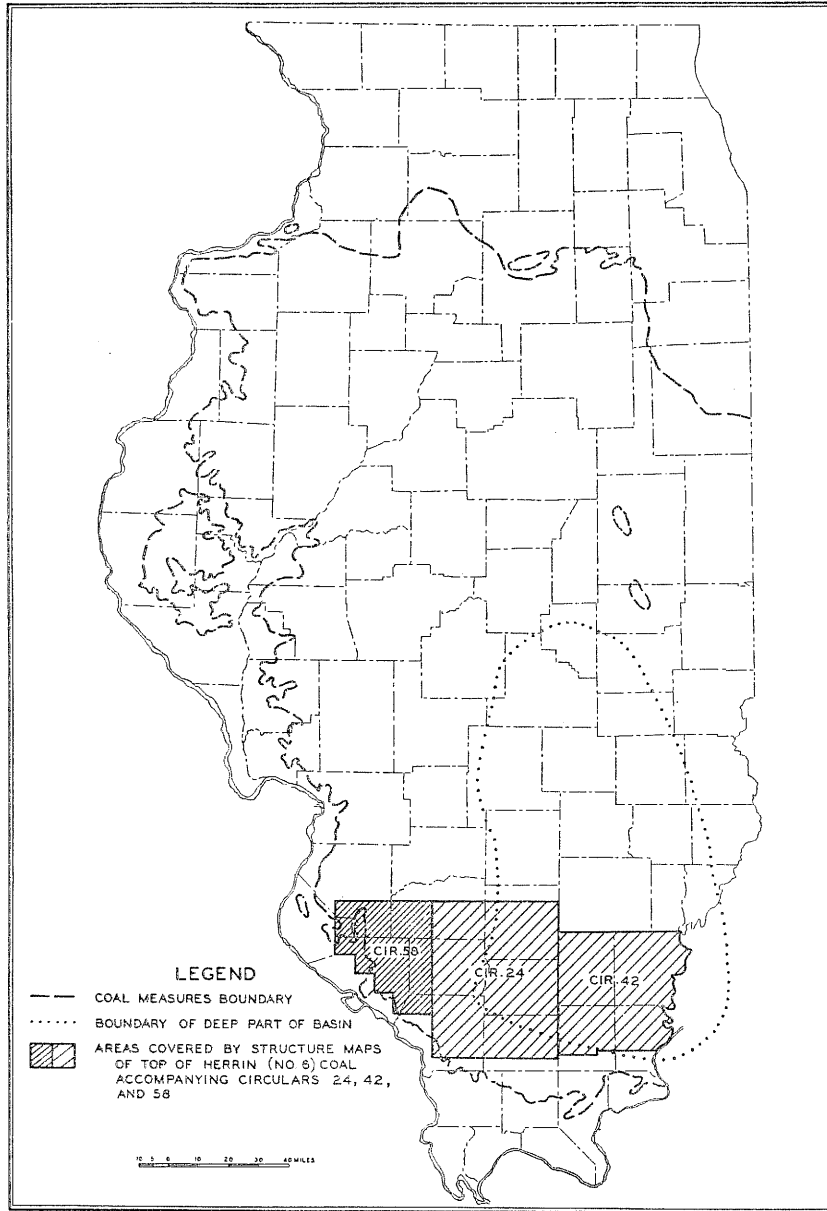
Assisted by

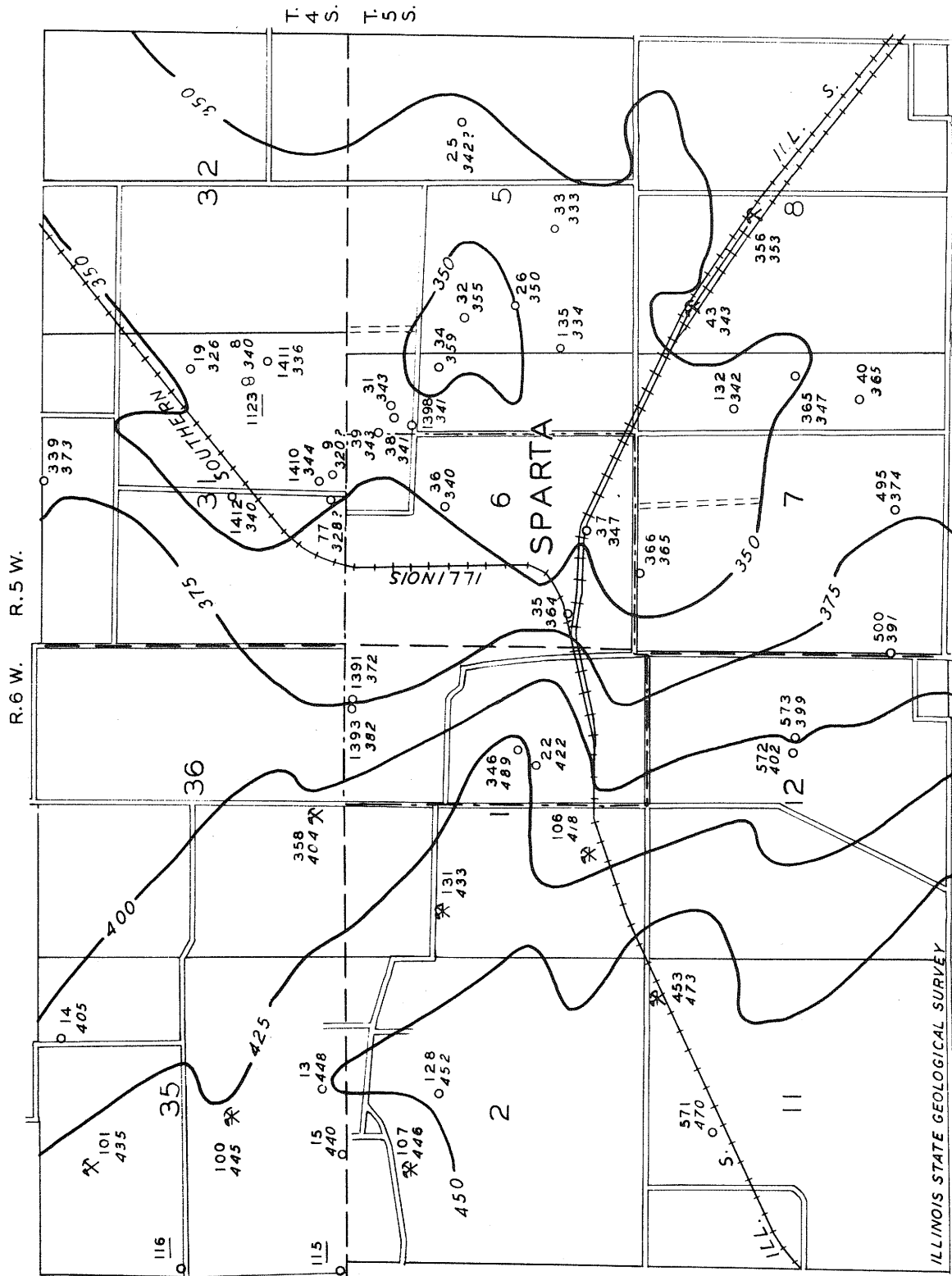
Earle F. Taylor and Adler E. Spotti

WITH NOTES ON THE
OIL AND GAS POSSIBILITIES

By

Alfred H. Bell





LEGEND

O DRILL HOLE

X MINE

X ABANDONED MINE

14 VERTICAL NUMBER -
SEE TABULATED
DATA

405 SLANTING NUMBER -
ALTITUDE OF TOP
OF NO. 6 COAL
BED



ENLARGED STRUCTURE MAP OF HERRIN (NO. 6) COAL BED IN SPARTA FIELD

STRUCTURE OF THE HERRIN (NO. 6) COAL BED
IN THE AREA

By

Gilbert H. Cady

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.

COAL MINING

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.

STRUCTURAL FEATURES OF SPECIAL INTEREST
WITH RESPECT TO COAL OCCURRENCE
AND RECOVERY

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-Perry 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 Tilden 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 arch extending from Tilden 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:

Bell, A. H., The Darmstadt Anticline and Related Structures, St. Clair County: Illinois State Geological Survey Illinois Petroleum No. 18, November 1929.

_____, Ball, C. G., and McCabe, L. C., Geology of Pinckneyville and Jamestown Areas, Perry County, Illinois: Illinois State Geological Survey Illinois Petroleum No. 19, April 1931.

- 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.
- Cady, G. H., Coal Stripping Possibilities in Southern and Southwestern Illinois: Illinois State Geological Survey Min. Inv. Bull. 31, 1927.
- Kay, F. H., Coal Resources of District VII (Southwestern Illinois): Illinois State Geological Survey Illinois Min. Inv. Bull. 11 (Randolph, Perry and Washington counties, pp. 169-204) 1922.
- Moulton, G. F., Oil and Gas Possibilities near Sparta: Illinois State Geological Survey Illinois Petroleum No. 1, pp. 2-7, 1927.
- Nickels, J. M., Report of the Illinois Board World's Fair Commissioners, pp. 183-205, 1893.
- Root, T. B., Oil and Gas Resources of the Ava-Campbell Hill Area: Illinois State Geological Survey Report of Investigations 16, 1928.

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 30, 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 no 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:

	<u>Feet</u>
Cypress	925
Bethel	1075
Aux Vases	1160
Ste. Genevieve	1242
Devonian system	2500
Kimmswick	3425
St. Peter	4235

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

	<u>Thickness</u> Feet	<u>Depth</u> Feet
Pleistocene system, glacial drift	20	20
Pennsylvanian system	695	715
Mississippian system		
Chester series		
Menard-Vienna formations	115	830
Tar Springs sandstone	70	900
Glen Dean-Golconda formation	215	1115
Cypress sandstone	52	1167
Paint Creek formation	98	1265
Bethel sandstone	23	1288

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

	<u>Thickness</u> Feet	<u>Depth</u> Feet
(No samples)	200	200
Pennsylvanian system	500	700
Mississippian system		
Chester series		
Menard-Vienna formations	40	740
Tar Springs sandstone	12	752
Glen Dean formation	62	814
Hardinsburg sandstone	16	830
Golconda formation	146	976
Cypress sandstone	64	1040

No. 2. - (Continued)

	<u>Thickness</u> <u>Feet</u>	<u>Depth</u> <u>Feet</u>
Mississippian system (continued)		
Paint Creek formation	82	1122
Bethel sandstone	18	1140
Renault formation	55	1195
Aux Vases sandstone	99	1294
Iowa series		
Ste. Genevieve formation	79	1373

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

	<u>Thickness</u> <u>Feet</u>	<u>Depth</u> <u>Feet</u>
(No samples)	140	140
Pennsylvanian system (Top of No. 6 coal at 210 feet)	480	620
Mississippian system		
Chester series		
Vienna formation	40	660
Tar Springs sandstone	45	705
Glen Dean formation	95	800
Hardinsburg sandstone	13	813
Golconda formation	157	970
Cypress sandstone	80	1050
Paint Creek formation	35	1085
Bethel sandstone	22	1107
Renault formation	13	1120
Aux Vases sandstone	80	1200
Iowa series		
Ste. Genevieve formation		
Levias limestone	10	1210
Rosiclare sandstone	25	1235
Fredonia limestone	110	1345
St. Louis limestone	130	1475
Salem limestone	285	1760
Osage group - limestone, siltstone, and shale	610	2370
Kinderhook group - shale	17	2387
Devonian system - limestone	88	2475

No. 4. - 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

	<u>Thickness Feet</u>	<u>Depth Feet</u>
Pleistocene system	32	32
Pennsylvanian system (Top of No. 6 coal at 56 feet)	148	180
Mississippian system		
Chester series		
Glen Dean, Hardinsburg, and Golconda formations	150	330
Cypress sandstone	44	374
Paint Creek, Bethel, and Renault formations	71	445
Aux Vases sandstone	52	497
Iowa series		
Meramec and Osage groups - limestone	1014	1511
Kinderhook group - shale	6	1517
Devonian-Silurian systems - limestone	273	1790
Ordovician system		
Maquoketa shale	137	1927
Kimmswick ("Trenton") limestone	35	1962

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

	<u>Thickness Feet</u>	<u>Depth Feet</u>
Pleistocene-glacial drift	60	60
Pennsylvanian system (Top of No. 6 coal at 132 feet)	414 ?	474 ?
Mississippian system		
Chester series	516 ?	990
Iowa series		
Meramec group - limestone	540	1530
Osage group - shale and limestone	428	1958
Kinderhook group - shale	10	1968
Devonian-Silurian systems - limestone	472	2440
Ordovician system		
Maquoketa shale	165	2605
Kimmswick ("Trenton") limestone	83	2688

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

	Thickness <u>Feet</u>	Depth <u>Feet</u>
Pleistocene system - glacial drift	45	45
Pennsylvanian system (Top of No. 6 coal at 196 feet)	647	692
Mississippian system		
Chester series		
Menard-Golconda formations	311	1003
Cypress sandstone	13	1016
Paint Creek formation	74	1090
Bethel and Renault formations	68	1158
Aux Vases sandstone	97	1255
Iowa series		
Meramec group		
Ste. Genevieve formation		
Levias limestone	15	1270
Rosiclare sandstone	10	1280
Fredonia limestone	75	1355
St. Louis limestone	110	1465
Salem limestone	265	1730
Osage group		
Limestone and shale	270	2000
Siltstone and shale	333	2333
Kinderhook group - shale and sandstone	15	2348
Devonian system - limestone	334 ?	2682 ?
Silurian system		
Niagaran series - limestone	248 ?	2930
Alexandrian series - limestone and sand- stone	145	3075
Ordovician system		
Maquoketa shale and limestone	65	3140
Kimmswick limestone	95	3235
Decorah limestone and shale	30	3265
Plattin and Joachim limestone and dolomite	375	3640

- 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

	<u>Thickness</u> Feet	<u>Depth</u> Feet
Pleistocene system - glacial drift	50	50
Pennsylvanian system (Top of No. 6 coal at 161 feet)	315	365
Mississippian system		
Chester series		
Clore formation	93	458
Palestine sandstone	18	476
Menard-Vienna formations	166	642
Glen Dean-Golconda formations	230	872
Cypress sandstone with middle shale ("Sparta gas sand")	56	928
Paint Creek formation	21	949

- 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

	<u>Thickness</u> Feet	<u>Depth</u> Feet
(No samples)	220	220
Mississippian system		
Chester series		
Paint Creek formation	17	237
Bethel sandstone	48	285
Renault formation	60	345
Aux Vases sandstone	85	430
Iowa series		
Meramec group		
Ste. Genevieve formation		
Levias limestone	10	440
Rosiclare sandstone	10	450
Fredonia limestone	97	547
St. Louis limestone	84	631
Salem limestone	256	887

No. 8. - (Continued)

	<u>Thickness Feet</u>	<u>Depth Feet</u>
Mississippian system (continued)		
Osage group		
Warsaw, Keokuk and Burlington formations	331	1218
Fern Glen limestone and shale	135	1353
Kinderhook group - sandstone	5	1358
Silurian system		
Niagaran series - limestone	197	1555
Alexandrian series - limestone	60	1615
Ordovician system		
Maquoketa shale	140	1755
Kimmswick limestone	45	1800

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

	<u>Thickness Feet</u>	<u>Depth Feet</u>
Mississippian system		
Chester series		
Golconda, Cypress, Paint Creek, Bethel, and Renault formations	230	230
Aux Vases sandstone	80	310
Iowa series		
Meramec group		
Ste. Genevieve formation		
Levias limestone	10	320
Rosiclare sandstone	12	332
Fredonia limestone	33	365
St. Louis limestone	90	445
Salem limestone	265	710
Osage group		
Warsaw and Keokuk limestone and shale	190	900
Burlington limestone	82	982
Fern Glen limestone and shale	98	1080
Devonian system - limestone	5	1085
Silurian system		
Alexandrian series - limestone	30	1115
Ordovician system		
Maquoketa shale and siltstone	125	1240
Kimmswick limestone	95	1335
Decorah limestone and shale	30	1365
Plattin and Joachim limestone and dolomite	460	1825
St. Peter sandstone	80	1905

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

	<u>Thickness</u> Feet	<u>Depth</u> Feet
Pleistocene system - glacial drift	70	70
Pennsylvanian system	270	340
Mississippian system		
Chester series		
Menard-Vienna formations	110	450
Tar Springs sandstone	25	475
Glen Dean-Golconda formations	240	715
Cypress sandstone	15	730
Paint Creek formation	70	800
Bethel, Renault, and Aux Vases formations	175	975
Iowa series		
Ste. Genevieve formation	115	1090
St. Louis limestone	20	1110*

* 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

	<u>Thickness</u> Feet	<u>Depth</u> Feet
Pleistocene system	20	20
Mississippian system		
Chester series		
Clore formation	21	41
Palestine sandstone	39	80
Menard formation	65	145
Waltersburg sandstone	30	175
Vienna formation	20	195
Tar Springs sandstone	35	230
Glen Dean formation	75	305
Hardinsburg sandstone	5	310
Golconda formation	130	440

No. 11. - (Continued)

	<u>Thickness Feet</u>	<u>Depth Feet</u>
Mississippian system (continued)		
Cypress sandstone	15	455
Paint Creek formation	90	545
Bethel sandstone	20	565
Renault formation	60	625
Aux Vases sandstone	80	705
Iowa series		
Meramec group		
Ste. Genevieve formation		
Levias limestone	5	710
Rosiclare sandstone	8	718
Fredonia limestone	82	800
St. Louis limestone	165	965
Salem limestone	260	1225
Osage group		
Warsaw and Keokuk limestones	180	1405
Burlington limestone	175	1580
Fern Glen limestone and shale	100	1680
Devonian system - limestone	180 ?	1860 ?
Silurian system		
Niagara series - limestone and shale	230 ?	2090
Alexandrian series - limestone	45	2135
Ordovician system		
Maquoketa formation	145	2280
Kimmswick limestone	28	2308 T.D.

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

	<u>Thickness Feet</u>	<u>Depth Feet</u>
Pleistocene system	40	40
Pennsylvanian system	780	820
Mississippian system		
Chester series		
Menard formation	60	880
Waltersburg, Vienna and Tar Springs formations	110	990
Glen Dean-Golconda formations	240	1230
Cypress sandstone	70	1300