

THE RELATION OF GEOLOGIC STRUCTURES IN INDIANA TO THE ISOMAGNETIC LINES OF VERTICAL INTENSITY AND TO THE ANOMALIES OF MAGNETIC INTENSITY

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The relation of the structural features of Indiana which have resulted in the accumulation of petroleum and natural gas to the areas of normal vertical magnetic intensity and to the anomalous areas presents a problem of interest to the geologist.

The main structural features of Indiana include an anticlinal area separating two synclinal areas. The Northwestern arm of the Cincinnati Arch crosses Indiana from Dearborn County to Lake County. The Arch is divisible into three portions. The first is an elevated region which extends from the Cincinnati area to the southeastern part of Cass County. This elevated region forms a plunging anticlinal area extending northwesterly. This elevated region is succeeded on the northwest by a depressed area in the vicinity of Logansport. The latter has a width of about twenty miles. Within the depression the surface of the Trenton limestone lies three hundred or more feet below sea level.

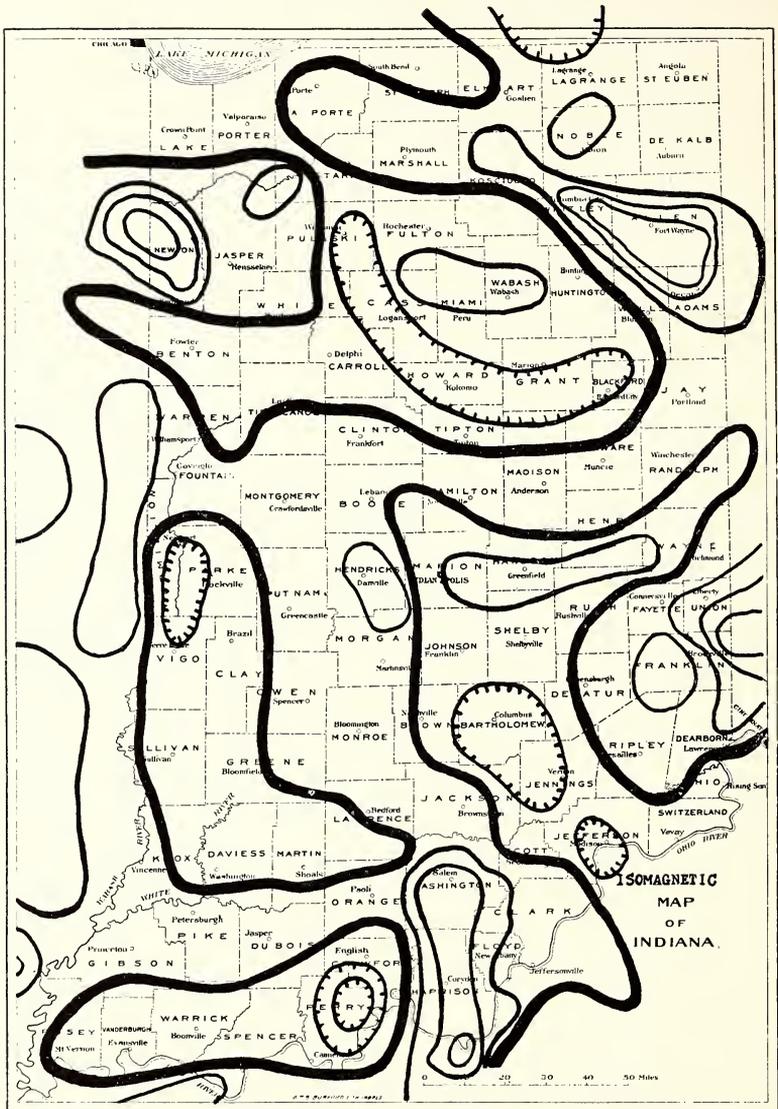
Beyond the depressed area the surface of the Trenton rises until it reaches a height of less than two hundred feet below sea level. Accumulations of petroleum and natural gas in Indiana are definitely connected with the principal anticlinal area and with structural irregularities in the synclinal areas.

In a causal survey of the structural features of Indiana and of areas of normal and anomalous intensity one may get the impression that there is little relation between structure and vertical magnetic intensity. The more prominent structural areas are crossed by areas of normal intensity and by anomalous areas.

Eastern Indiana (Trenton) Oil Field. This oil producing area lies in the northeastern part of Indiana. Oil production was obtained from parts of Grant, Wells, Adams, Huntington, Jay, Blackford, Randolph, Delaware and Madison counties. Natural gas was obtained from Grant, Blackford, Jay, Delaware, Henry and Hancock counties.

Structural conditions. This entire field lies in an area in which the upper surface of the Trenton limestone lies between sea level and less than one hundred feet below sea level. The main area lies also in an area of normal vertical magnetic intensity. A small oil producing region in northeastern Grant and in northern Blackford counties lies within an anomalous area. A portion of the natural gas territory in southwestern Blackford, in southeastern Grant, in northwestern Delaware, and in northeastern Madison counties lies within an anomalous area.

Other areas connected with the Cincinnati Arch. A small gas bearing area in the northwestern part of Hamilton County in which the surface of the Trenton is approximately one hundred feet below sea level is in a region of normal vertical magnetic intensity. This area is southwest of the axis of the Cincinnati Arch. A gas producing area in the southern part of Howard and the northern part of Tipton counties lies near the axis of the arch. It is within an area of normal vertical magnetic intensity.



In Miami County a small oil field near Peru lies within an anomalic area. Structurally this area lies about two hundred feet below sea level for the upper surface of the Trenton limestone. A small oil producing area lies in the north-western part of Cass County. The surface of the Trenton lies about three hundred feet below sea level. This region is included in an anomalic area.

A small oil field in the southern part of Laporte County lies within an anomalic area. Using the Trenton limestone as a key horizon it lies about 200 feet below sea level and is northwest of the axis of the arch.

A small oil producing area in the eastern part of Jasper County lies within an area in which the upper surface of the Trenton limestone is less than two hundred feet below sea level and where the area is approximately on the axis of the arch. This area lies within an area of normal vertical intensity but near an anomalic area. In the northwestern part of Jasper County there is a small oil producing area where the surface of the Trenton limestone lies at an elevation of less than two hundred feet below sea level.

At Plymouth in Marshall County some natural gas has been obtained. The upper surface of the Trenton limestone in that region lies between five hundred and six hundred feet below sea level. The area lies within a region of normal vertical magnetic intensity.

In the northern part of Adams County in which the upper surface of the Trenton limestone lies between three hundred and six hundred feet below sea level and an oil producing area lies within an anomalic region. This area lies northeast of the axis of the arch.

Two gas producing areas in Decatur County lie southwest of the axis of the arch. The upper surface of the Trenton limestone in the region lies near sea level. These areas are both in regions of normal vertical magnetic intensities.

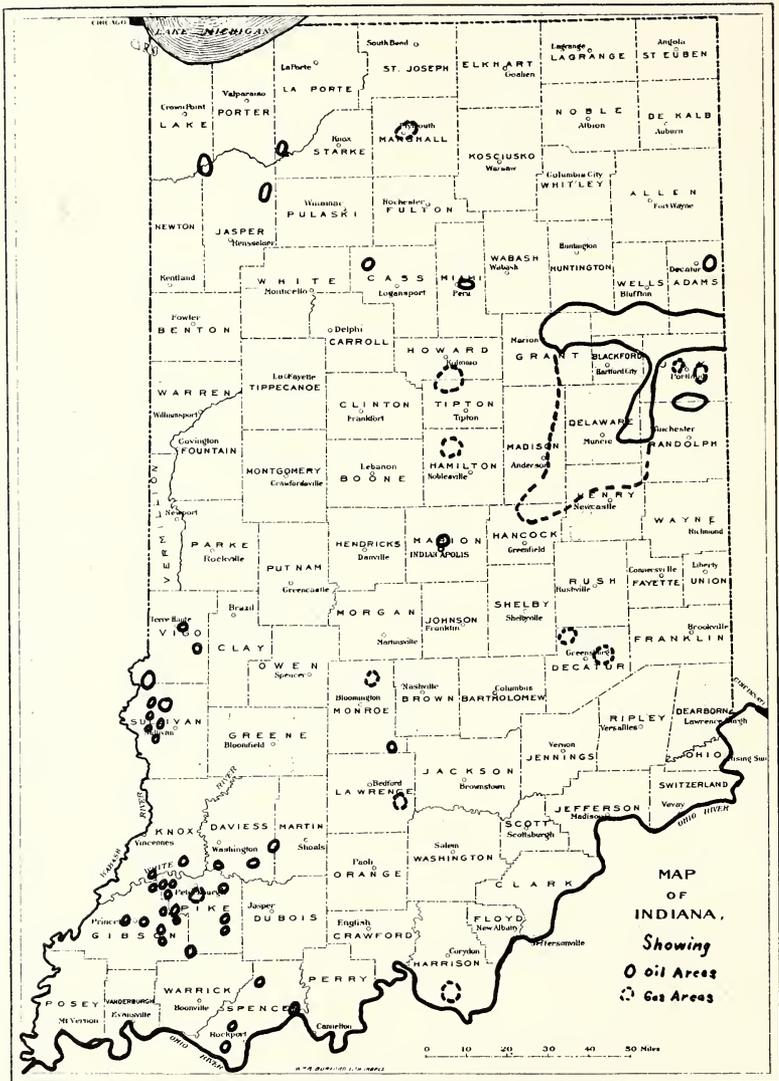
A small gas producing area in the northern part of Jennings County lies within an anomalic area. The upper surface of the Trenton limestone in the region lies at an elevation of about 200 feet below sea level. A small oil producing area in the northern part of Marion County lies within an anomalic area in which the surface of the Trenton limestone lies about two hundred feet below sea level.

The Southwestern Indiana Oil Fields. The oil fields of this region lie southwest of the Cincinnati Arch in a general synclinal area. Production of oil or gas has been obtained in the following counties: Lawrence, Monroe, Martin, Daviess, Knox, Gibson, Pike, Vigo, Sullivan, Spencer and Warrick.

In Monroe County small amounts of oil and gas have been produced in vicinity of the Mt. Carmel Fault in the eastern part of the county. In this area the upper surface of the Trenton limestone lies at an elevation of 900 to 1,000 feet below sea level. The productive areas lie between lines of normal vertical magnetic intensities. In Lawrence County small quantities of gas and showings of oil have been obtained in the eastern part of the county in a similar relation to the fault line. The elevation of the upper surface of the Trenton limestone lies at an elevation of about 1,100 feet below sea level. This area also lies between lines of normal vertical magnetic intensities.

In Harrison County there is a natural gas field which has been producing for many years. A small quantity of oil has been found in the area. In this field the surface of the Trenton limestone lies at an elevation of 1,000 to 1,200 feet below sea level. The entire producing area lies within an anomalic region.

Spencer County contains some small producing areas distributed in several parts of the county. The Gentryville pool is in the northwestern part, a small pool in the southeastern part and two small pools in the southern part of the county. All of these producing areas lie within lines of normal vertical magnetic intensities. Well records which extend to the Trenton are not abundant in this portion of the state. Estimates based on higher key horizons indicated that the upper surface of the Trenton in the eastern part of the county may be 2,700 feet below sea level and that in the western portion it may be as low as 3,400 feet below sea level.



The Tri-County oil pool lies in parts of three counties, Warrick, Pike, and Gibson. A line of normal vertical magnetic intensity passes through this area. Its probable elevation on the upper surface of the Trenton is 3,800 feet below sea level.

Martin County contains a small oil and gas producing area at Loogootee. This field lies within an area enclosed by lines of normal vertical magnetic intensities. In Daviess County there are two oil producing areas, the Cannelsburg, and the Jacobs. These two pools lie within an area enclosed by lines of normal vertical magnetic intensity.

Pike County contains many producing areas, Oakland City, Tri-county, Alford, Barker, Bowman, Davidson, Oatsville, and Rogers Station. These all occur between lines bounding areas of normal vertical magnetic intensities.

Gibson County contains the following producing areas: West Princeton, East Princeton, Francisco, Barrett or South Francisco, McDonald, Hoover, Mt. Olympus, Wheeling and Hightower. These pools are all located between lines of normal vertical magnetic intensities which surround areas of that type.

Two small oil producing areas have been found in Knox County, one at Monroe City and the other at Decker. These are both within areas of normal vertical magnetic intensities.

Sullivan County contains many small oil or gas producing areas, as follows: Shelburn, Heims, Dodds Bridge, Denny, Harmon, Bragdon, Edwards, Scott, and Siosi. These all lie within an area bounded by a line representing normal vertical magnetic intensity.

In Vigo County there are three oil or gas producing areas, one at Terre Haute, one near Riley, and one in the southwestern part, the Siosi. The last two are within areas of normal vertical intensity. The last name is within or near an anomalous area.

Oil and Gas Pools in Areas of Normal Vertical Magnetic Intensities.

The following oil and gas producing areas lie within areas of normal vertical magnetic intensity:

1. Laport County, the Wilder oil pool in the southern part of the county.
2. Adams County, an oil producing area in the southern part of the county.
3. Wells County, an oil producing area in the southern part of the county.
4. Grant County, an oil producing area in the northeastern part of the county.
5. Jay County, a gas producing area near Portland.
6. Jay County, an oil producing area in the western part of the county.
7. Randolph County, the Hotmire oil pool in the northern part of the county.
8. Decatur County, gas producing area near Greensburg.
9. Decatur County, gas producing area near St. Paul.
10. Lawrence County, a gas producing area near the Dennison School.
11. Monroe County, a gas bearing area in Benton Township.
12. Monroe County, an oil bearing area in Polk Township.
13. Martin County, a Loogootee gas and oil bearing area.
14. Daviess County, an oil producing area near Cannelsburg.
15. Daviess County, an oil producing area near Jacobs.
16. Knox County, an oil producing area near Monroe City.
17. Knox County, an oil bearing area near Decker.
18. Gibson County, the West Princeton oil producing area.
19. Gibson County, the East Princeton oil producing area.
20. Gibson County, the Mt. Olympus oil and gas producing area.
21. Gibson County, the Francisco oil producing area.
22. Gibson County, the South Francisco oil producing area.
23. Gibson County, the McDonald oil producing area.
24. Gibson County, the Hoover gas and oil bearing area.
25. Gibson County, the Wheeling oil bearing area.
26. Gibson County, the Hightower oil bearing area.
27. Pike County, the Oakland City oil producing area.

28. Pike County, the Tri-county oil producing area.
29. Pike County, the Barker oil producing area.
30. Pike County, the Bowman oil producing area.
31. Pike County, the Davidson oil producing area.
32. Pike County, the Oatsville oil producing area.
33. Pike County, the Rogers Station oil bearing area.
34. Pike County, the Petersburg gas area.
35. Sullivan County, the Shelburn oil and gas area.
36. Sullivan County, the Heims oil bearing area.
37. Sullivan County, the Dodds Bridge oil producing area.
38. Sullivan County, the Denny oil producing area.
39. Sullivan County, the Harmon oil producing area.
40. Sullivan County, the Bragdon oil producing area.
41. Sullivan County, the Scott oil bearing area.
42. Vigo County, the Siosi oil producing area.
43. Vigo County, the Riley oil producing area.
44. Spencer County, the Gentryville oil producing area.
45. Spencer County, the Maxville oil producing area.
46. Spencer County, the Patronville oil producing area.
47. Spencer County, the Stoessel oil producing area.
48. Spencer County, the Stuteville oil producing area.

The grouping of small pools which lie near each other and which might be considered as parts of a general structure would not greatly reduce the number of oil or gas bearing areas within areas of normal vertical magnetic intensities.

The isomagnetic map accompanying this report was enlarged from a small tracing supplied by Mr. G. B. Somers.