



The Discovery of Petroleum in Nebraska

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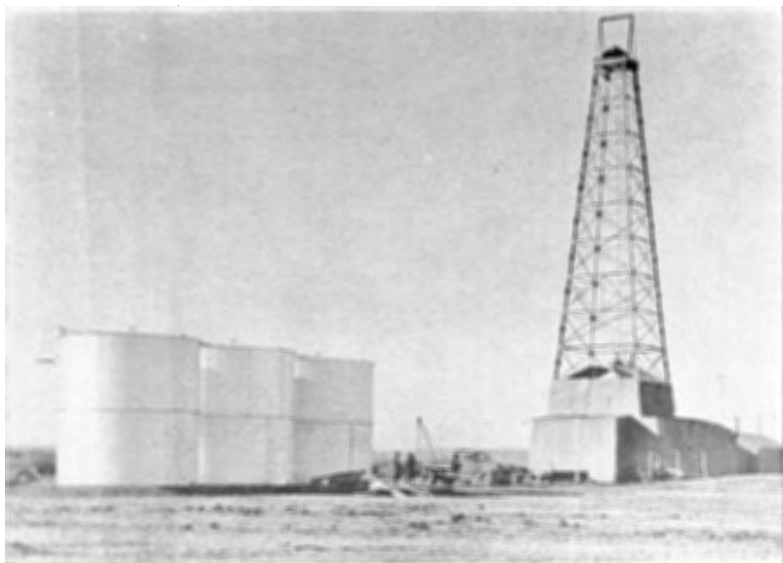
Contents: A J Weaver, “The Discovery of Producing Petroleum Wells in Nebraska”
Edward A Huffman, “Oil in the Forest City Basin”
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Summary: Its first producing wells led to speculation that Nebraska might soon be an important oil-producing state.

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Oil well near Falls City, Richardson County, in 1940. View Showing storage tanks and 84-foot derrick.

The Discovery of Producing Petroleum Wells in Nebraska

President A. J. Weaver undertook to provide competent persons from the Falls City oil area to present this outstanding event in the history of Nebraska. Governor Weaver presented two brief manuscripts with an introduction in the following words.

Fellow Members:

I have had a hard time to get somebody to present this subject of the development of oil in Nebraska. First I tried to get the geologist of the company that brought in the first well, but all these men are busy—they are professionally engaged.

Then they suggested that I get Archibald Hoffman, geologist of the company that has been actively engaged in the development. He said he would come, and I told him to prepare a paper for use in the event he couldn't. Last night he had a telegram saying that officials of the company were coming to Falls City today for a conference! So I shall be glad to read this paper to you.

Then, too, I have a statement from my nephew, Archibald J. Weaver, who as a lawyer represents various oil companies in that field. This was prepared for a meeting of the commissioners of Richardson County and, I think, of twenty-three other counties in southeastern Nebraska some time ago. (Reads papers by Mr. Hoffman and Mr. Weaver.)

Now, Mr. Secretary, in reply to your letter which I haven't answered—I have been busy with about fifty men in packing an apple crop, and that delayed me a little this morning. You suggested that I bring with me a suit of clothes or pair of overalls actually worn in this field, as permanent exhibits for this Society, but we haven't settled the question as to whether you or I shall wear them, and that makes a difference. I have the promise of such clothes and am sure we shall get them. You will remember that it was my privilege to give you for the Society the very first oil that came out of the field.

Oil in the Forest City Basin

EDWARD A. HUFFMAN, Falls City

Geologist, Skelly Oil Company

Please do not consider this a complete dissertation on this subject, in any way. I will merely present a few of the more outstanding facts and perhaps help you understand some of the problems involved.

Petroleum reservoir rock consist of two principal lithologic varieties, namely, sandstones and limestones, or dolomites. The difference between dolomite and limestone is only the presence of magnesium in dolomite. The production in Nebraska has come principally from dolomites, so my discussion will deal entirely with finding that type of reservoir rock.

Also there are a great number of varieties of types for petroleum. Here again I will deal only with the type that has produced oil here in Nebraska, which is structural in character.

In searching for oil the first step of any scientific method is to locate a "structural high" or anticline. An anticlinal structure, in the geological sense, is a locality where the rock strata have been arched so as to form a ridge or inverted bowl. The valleys between the anticlinal structures are called synclines.

There are a number of methods used in trying to locate the structures. The following are most commonly used: (1) Surface Work, or the detailing of the surface outcroppings of the rocks and locating structures in that manner; (2) Core-Drilling, in which shallow holes are drilled to penetrate the shallow rock strata and determine dips and slopes in that manner; (3) Seismographic surveys, in which method minor earthquakes or seismic disturbances are set up by discharging a quantity of dynamite

in a shallow hole and the vibrations interpreted through a seismograph by an experienced operator; (4) Subsurface, in which a geologist uses the records of all the wells drilled and attempts to forecast where structures might be found in surrounding areas.

All these methods have their own disadvantages, and some will work in areas where the others won't. In other words, we try to get the best information we can of subsurface conditions with the least expenditure. But the cost of the cheapest method is too high if the data obtained is inaccurate.

But the structure is only the first requisite for the accumulation of petroleum. In addition there must be porosity in the reservoir rock to permit storage, and permeability to permit movement. There must also be a cap rock or impervious layer of rock above the reservoir rock to act as a seal and insure against the escape of the petroleum. There are also other factors, but these I have mentioned are the indisputable ones and must be present if oil is to be accumulated in limestone on structure.

Now we will assume that petroleum is in existence in a general area. As the oil is lighter than water it will rise to the top of the water within the reservoir rock. When it has risen as high as it can vertically and has encountered the cap rock or seal it begins to move laterally up the slope or dip of the rock strata. When it reaches a point where the slope has been reversed it has reached the peak of that local structure or anticline, and will remain trapped there as long as the cap rock remains impervious and unbroken and the strata are not further tilted at some later date so as to permit the escape of the petroleum.

That is stating the problem in the very simplest form. Of course there are a great many local complications, far too many to discuss in such a short discourse as this, and each local pool is a problem in itself.

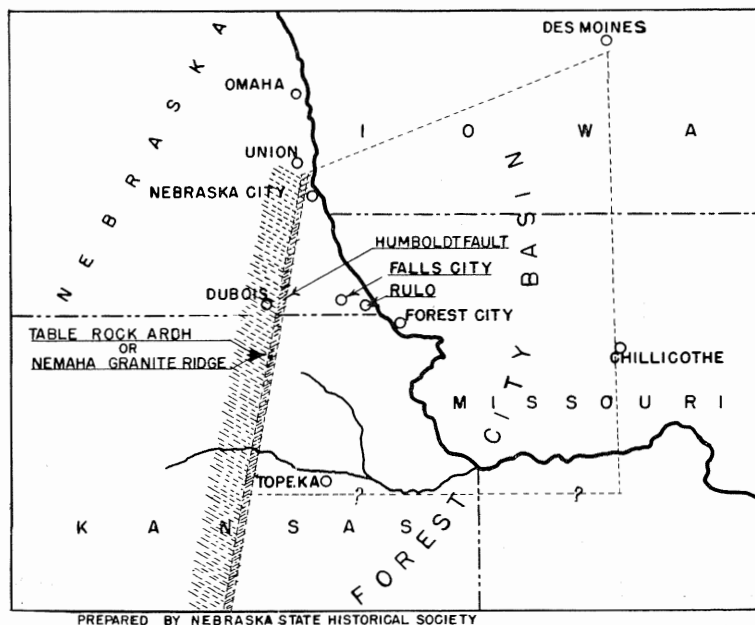
There are several theories as to the origin of petroleum, but I won't even attempt to discuss them at this time. We will just have to be satisfied with the fact that it does exist and simply try to find it. Suffice it to say that each theory has outstanding proponents.

Now, regarding the Forest City Basin, we geologists have recognized the existence of the Basin for a great many years. In fact, the Forest City core-hole was drilled by the state of Missouri in Holt County (Missouri) in 1901 to determine what rock strata were present and what economic possibilities they might have.

The rock strata dip very gently into the basin from three directions, the west side being very steep and abrupt. As a result the limits of the basin are very indefinite with the exception of the west side. The following lines will serve as a very rough outline and give you some idea of the extent of the basin:

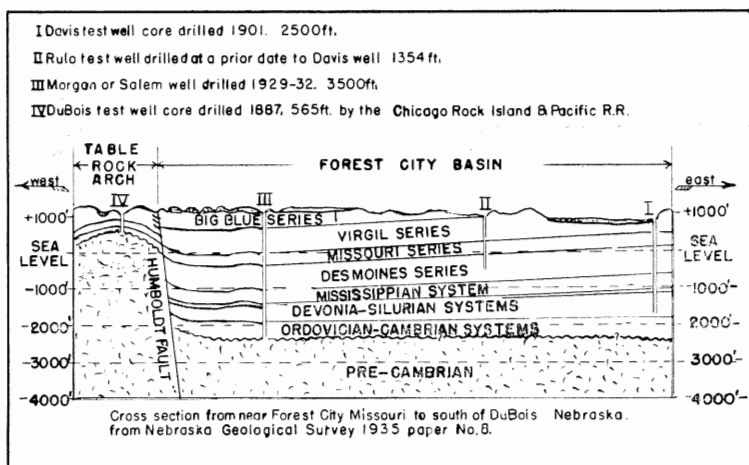
The south boundary is an arbitrary line drawn east and west through a point just south of Topeka, Kansas; the east boundary is an arbitrary line drawn a little east of directly north and running through Chillicothe, Missouri; the north boundary is an arbitrary line drawn east and west through a point just north of Nebraska City, Nebraska;* the west boundary is the only real sharp and definite one and is marked by the Nemaha Granite Ridge. This is a major subsurface feature that begins down in Oklahoma and runs a little east of due north all the way through Kansas, passing through just about directly under Eldorado, Kansas, crossing into Nebraska at about the town of DuBois, Nebraska, and continuing northward into western Nemaha county. It is a buried granite ridge, very steep on the east flank, and about 400 feet below the ground surface at its highest point.

*"The Nebraska Geological Survey considers that the north edge of the Forest City Basin is marked by the Redfield anticline, which trends east-northeast from a point about one mile south of Union, Nebraska, to near Des Moines, Iowa."—Dr. George E. Condra, University of Nebraska.



Showing area of Forest City Oil Basin in Nebraska, Kansas, Missouri and Iowa

One of the main reasons why most geologists have been skeptical of the occurrence of petroleum in the Forest City Basin is because they have believed that all the stresses and strains of the earth's forces were relieved when the rock strata broke and the Nemaha Granite Ridge was formed. That is, they did not believe that enough force was left to arch the rock strata into anticlines, or at least into very large ones. There also was a very wide-spread belief that the possible reservoir rocks were so close to the surface that all the petroleum had been flushed out by circulating ground waters. They pointed to the wide-spread occurrence of relatively fresh water in the possible producing horizons as evidence that this had taken place. In most oil fields very briny waters are found below the oil.



Geological strata in the Forest City Oil Basin in southeast Nebraska

Those were the chief objections to the Forest City Basin when oil was discovered near Falls City, Nebraska, by B. G. Guinn and W. A. Guinn operating as the Pawnee Royalty Company. After Brick Edson had blocked up much acreage for them in Richardson County, the Apache Exploration Company explored the area by means of seismograph work and mapped the structure. Albert Ladner, president of the Apache Exploration Company, was in charge of the work and made the location for the Pawnee Royalty No. 1 Boice. Work was commenced on the well on September 6, 1939, and oil was found in the Hunton limestone on November 2, 1939, at a depth of 2,278 feet. I will not attempt to detail the miseries the Guinn brothers had

with their discovery well or the following development. Suffice it to say that the Pawnee No. 1 Bucholz, their third well, successfully completed the state's Bonus Test on July 28, 1940, after producing at least 50 barrels of oil per day for 60 consecutive days.

The highest well to date on the structure is the Pawnee Royalty No. 2 Sandrock, which encountered the Hunton limestone at a point 1,315 feet below sea-level. To illustrate the magnitude of the structure I will point out that the Pawnee No. 1 Meyers, $2\frac{1}{2}$ miles to the west, found the Hunton 1,545 feet below sea level; and to the east the Rust and Jackson No. 1 Holt, at the north edge of Falls City, found the Hunton at 1,540 feet below sea-level. That is 225 feet of dip to the east and 230 feet of dip to the west, which is a man-sized structure in any country.

Also, pretty fresh water has been found below the oil at Falls City, which to my mind refutes the idea that salt water must be present before you can hope for petroleum.

Now as for the amount of producing section present, water has been encountered in several wells at about 1,395 feet below sea-level. That leaves 80 feet of section that should produce oil at Pawnee No. 2 Sandrock.

There are now sixteen producing wells in the pool and seven drilling wells. Most of the wells have practically stopped flowing and are now pumping various amounts up to to approximately 800 barrels every 24 hours. The oil is being sold as fast as it can be collected by several buyers, and there is pretty good competition among the buyers for the oil that is being produced.

I have tried to keep this little discourse as simple as possible by omitting land descriptions and most geological terms and names. As I stated at the beginning, I have just scraped the surface and there is much to be said for all phases of this and related subjects.

The Richardson County Oil Development

Archibald J. Weaver, Falls City*

The possibility of commercial production of oil in the State of Nebraska (and more particularly in Richardson County), has been the subject of discussion for many, many years. There have been a few hearty souls who have maintained faith in the possibilities of the county in spite of the great number of scoffers who ridiculed the idea.

The first deep test well in Richardson County was drilled many years ago southwest of the town of Rulo. The primary purpose of this test was a search for a possible vein of coal, and the well reached a depth of some 1,200 feet before being abandoned.

*Address at Annual Meeting, State Historical Society, October 19, 1940.

About twenty-five years ago a group of Richardson County citizens, among them former Governors Weaver and Morehead, J. H. Miles, E. H. Towle and John Hutchings of Falls City, and Otto Kotouc and Claude Linn of Humboldt, assembled a block of oil and gas leases in the west part of the county southeast of Humboldt with the idea of drilling an oil-and-gas test well. This was during the period of the Great War, and as it was impossible for the backers of the project to obtain equipment with which to drill, the project was abandoned never to be revived.

The scene now shifts to the year 1928 when Ed L. Morgan, with local financing, assembled a block of leases some six or seven miles south of Dawson and commenced the drilling of a test well. This well had a somewhat checkered career, but finally reached a depth of some 3,300 or 3,400 feet in the fall of 1932. Some show of oil was found in the hole, but operations halted very suddenly when, in February of 1933, the rig mysteriously caught fire and was burned to the ground.

It was largely upon the basis of information obtained from the Morgan well that Ed Uhri of Humboldt, in 1937, was able to interest the Arab Petroleum Corporation of Oklahoma City in the possibility of the area, and in that year a test well was drilled by Arab Petroleum Corporation on the southeast quarter in Section 9, Township 1 North, Range 14 East of the Sixth Principal Meridian. This well was drilled to granite at a total depth of 3,324 feet. Altho showings were found, the operator was unsuccessful in making a commercial producer out of the well and it was abandoned as a dry hole.

During the fall and winter of 1938-1939 Ed Uhri of Humboldt and a group of citizens drilled a well in Section 32, Township 1 North, Range 13 East of the Sixth Principal Meridian, which ran into granite at a depth of about 800 feet. This well was drilled on top of a buried range of mountains known as the Nemaha Uplift.

The current development had its start about November 1, 1938, when Brick P. Eidson came to Falls City and quietly started taking leases for Pawnee Royalty Company. In the space of about six weeks he was able to obtain a large block of acreage in Richardson County, and in May, 1939, Pawnee Royalty Company sent a geophysical crew into the county and conducted a seismographic survey. This survey culminated in the staking of a wild-cat test well at the center of the northeast quarter of the northeast quarter of Section 18, Township 1 North, Range 16 East of the Sixth Principal Meridian on the R. H. Boice farm, approximately two miles west of Falls City. Drilling operations commenced on Wednesday, September 6, and eight weeks later (on Wednesday, November 1, 1939), word leaked out that oil had been discovered in this well. This was publicly verified the next morning. Since that time numerous wells have been drilled in the area southwest of Falls City. The Falls City Pool, as it is now known, extends southeastward from the Boice well some two miles, and at the present time there are sixteen producing wells in the field.

However, the rest of the county must not be ignored. The discovery of oil near Falls City has stimulated the search for oil in other parts of the county, and Mr. Uhri was able to finance the drilling of a test well near the old Arab test of 1937. Oil has been discovered in this latest well drilled by Mr. Uhri. The Indian Territory Illuminating Oil Company has found commercial production in Schaible-Kutler No. 1, located on the northeast quarter of the southwest quarter of Section 29, Township 3 North, Range 16 East of the Sixth Principal Meridian, some two miles southeast of Shubert. At the present time this company is drilling another wild-cat test well approximately a mile north of Verdon. It is too soon to know what the outcome of this test will be.

The discovery of oil in Richardson County will no doubt stimulate the search for oil in other parts of the state, and it is my belief that Nebraska will become one of the important oil-producing states of the country.



Oil derrick on the Morris farm near Shelton, Buffalo County, in 1910.