

The Recent Impetus to Oil Prospecting in Illinois*

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The present "oil boom" in Illinois started with the extensive leasing program in Marion and Clay counties by the Carter Oil Company during the latter part of 1935 and the early part of 1936. In a short time many companies and individuals were taking leases in the Illinois Basin. Land was leased in large blocks for as little as 10 cents a year per acre for a period of ten years.

In many areas leasing proceeded rapidly and without any attempt to secure geologic information. The major companies were more fortunate in that they were able to finance the operation of seismograph parties which could provide geophysical information bearing upon oil possibilities.

These geophysical methods are especially necessary in examination of the Illinois basin as so much of the subsurface formation there is completely hidden by a thick cover of glacial drift. Even where bedrock is exposed by stream erosion, the formations usually consist of sandstones and shales which are very difficult to place in their correct stratigraphic position. And in the deeper part of the basin there has not been enough drilling to yield detailed subsurface information.

Although the seismograph in many areas has given very satisfactory results in geophysical prospecting for structures favorable to accumulation of oil, and much can be said in favor of the results obtained by the torsion balance, magnetometer, and electrical resistivity in particular kinds of exploration, still, geophysical surveys are only preliminary steps in the search for oil: after favorable structures have been located, drilling is necessary to determine whether or not oil is actually present.

Two methods used in seismographing, this indirect but very important means for locating oil, are those of refraction and of reflection.

The refraction method which was used in the Gulf Coast region until 1930 for the detection of salt domes, consists of setting off a charge of dynamite with detectors arranged in a circle around the shot point. The radius of the circle is from 5 to 7 miles. As much as 500 pounds of dynamite is used for one shot. Velocities of the waves through the rock layers from the shot point to the detectors are computed. Extremely high velocities between these points indicate the presence of high velocity beds or salt domes between the shot point and the detector.

The reflection seismograph method is used in Illinois. It consists of setting off a charge of explosives at a certain point and having detectors called geophones placed at an accurately measured distance away from the shot to receive the ground vibrations. This distance is usually in the neighborhood of one quarter of a mile. When the detectors are jarred by the ground vibrations they generate an electric current which is in proportion to the ground vibration. This voltage is stepped up by the vacuum

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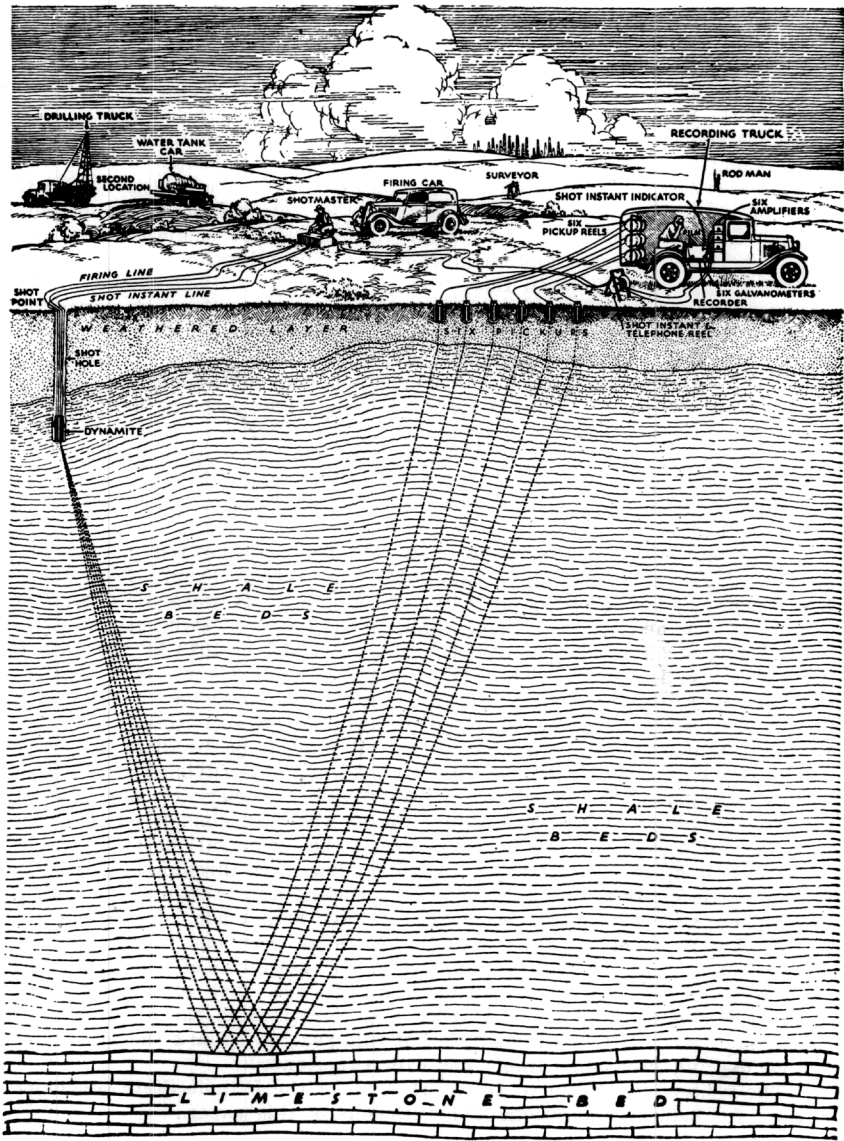


Fig. 1. This diagram shows field procedure in reflection mapping. The surveying crew determines the position and surface elevation of points where holes are to be drilled by the drilling crew. Soon after the shot holes are drilled, the dynamite charges of from 1 to 6 pounds each are set off and the recordings are made. The diagram shows the path of the vibrations from the shot to the reflecting limestone layer and to the geophones. (Published in "Seismic Prospecting in Exploration for Oil" (1) by courtesy of the Askania Corporation.)

tube amplifiers. After sufficient amplification, the electric current goes to the oscillograph. In one type of oscillograph the vibrating element is a loop of fine metal ribbon in a magnetic field. The loop tries to rotate when the current is introduced in the magnet. At the center of the loop a tiny mirror is fastened upon which a strong beam of light is focused. This beam is then reflected upon a moving sheet of photographic paper and records all movements of the mirror as a fine black line when the paper is developed.

When the explosive is set off vibrations travel outward in all directions. Upon reaching thick rock layers, such as the lower Mississippian limestone, vibrations of less intensity are reflected to the surface. The distance between the shot point and the detectors is known, the velocity of the vibrations through the layers of rock down to the reflecting layer is known, the time elapsed between the shot and the reception of the vibration is recorded on the photographic film. With these values the depth to the reflecting layer can be calculated. The depths to certain key horizons in the area covered by the seismograph survey are plotted on a map and the subsurface contours are drawn. When the map is completed favorable structures for the accumulation of oil such as domes, anticlines, monoclines, and fault zones are outlined if present in the area. Figure 1 shows the operation of the seismograph.

At the present time, April, 1937, there are 13 parties in the State. Two parties are operating in southwestern Indiana. The estimated cost of operating a party for one month is from 6 to 8 thousand dollars. The party includes surveying, drilling, shooting, and recording crews and totals twelve to fourteen men.

To date there have been four new oil fields discovered in Illinois: Bartelso, May 1936; Patoka, January 1937; Clay City, February 1937; Cisne, March 1937. The Patoka, Clay City, and Cisne fields were discovered on structures outlined by the seismograph. The Bartelso structure was described and recommended in Bulletin 20A published in 1912 by the Illinois State Geological Survey. The Patoka structure was shown as a high on coal No. 6 in State Geological Survey Bulletin 16, published in 1910. The recent discoveries have caused extensive exploration activities in southern Illinois. A map showing the area of best oil and gas possibilities in Illinois was drawn by Dr. A. H. Bell, Head of the Oil and Gas Division of the State Geological Survey, and exhibited by the Western Society of Engineers in Chicago, September 1930. The Illinois basin was then considered to be the most favorable area and is now the center of the recent oil "boom."

The new fields indicate that on similar structures throughout the basin, production is likely to be obtained. Much leasing and exchange of royalties have taken place where the recent "finds" have been made. It has been reported that as much as five hundred dollars an acre has been paid landowners for one-half of their royalty which is one-eighth of the production. Oil companies and individuals who formerly were not attracted by the "play" are now taking leases and becoming interested in the possibilities of the Illinois basin. It is anticipated that this year will mark the most widespread drilling program Illinois has ever experienced.

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