UNITED STATES DEPARTMENT OF THE INTERIOR
Harold L. Ickes, Secretary

GEOLOGICAL SURVEY
W. C. Mendenhall, Director

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(SHORT PAPERS AND PRELIMINARY REPORTS)

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POSSIBILITY OF NEW OIL POOLS IN THE SILICEOUS LIME AND BARTLESVILLE SAND IN T. 23 N., R. 10 E., OSAGE COUNTY, OKLAHOMA

BY

N. WOOD BASS, W. REESE DILLARD
AND JESS H. HENGST

Contributions to economic geology, 1937

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POSSIBILITY OF NEW OIL POOLS IN THE SILICEOUS LIME AND BARTLESVILLE SAND IN T. 23 N., R. 10 E., OSAGE COUNTY, OKLAHOMA

By N. Wood Bass, W. Reese Dillard, and Jess H. Hengst

Many localities in the Osage Indian Reservation of Oklahoma that are worthy of prospecting for oil are indicated by the results of a recent investigation by a field party of the United States Geological Survey engaged in the study of the subsurface geology of the reservation. Several of these localities, typical of those that appear favorable for prospecting, are described here in advance of the completion and publication of the Geological Survey's report that will cover all of Osage County, which coincides in area with the reservation. These localities are in T. 23 N., R. 10 E., in the east-central part of the reservation (fig. 1). One area that may contain an oil pool of considerable extent in the Bartlesville sand includes the NW¼ sec. 16 and the NE¼ sec. 17 and possibly extends into secs. 9 and 10. Other areas are in the W½ sec. 20 and the S½ sec. 4, where the Siliceous lime remains untested in small domes that are structurally similar to two nearby domes producing from the Siliceous lime—one in sec. 17 and the other in sec. 32.

The well in the northeast corner of sec. 17, which was drilled by Waite Phillips in April 1923, according to its log had an initial yield of 150 barrels of oil a day after being shot in the Bartlesville sand. It struck sand at a depth of 2,080 feet and continued into the sand for 33 feet. The log does not indicate whether the base of the sand was reached. Records on file in the Osage Indian Agency at Pawhuska, Okla., show that this well, which was drilled 13 years ago, had produced 63,000 barrels of oil by the end of July 1936 and is still producing at the rate of approximately 10 barrels of oil a day. The gravity of the oil, as reported by the pipe-line company, is about 28° to 29° Baumé. A little more than

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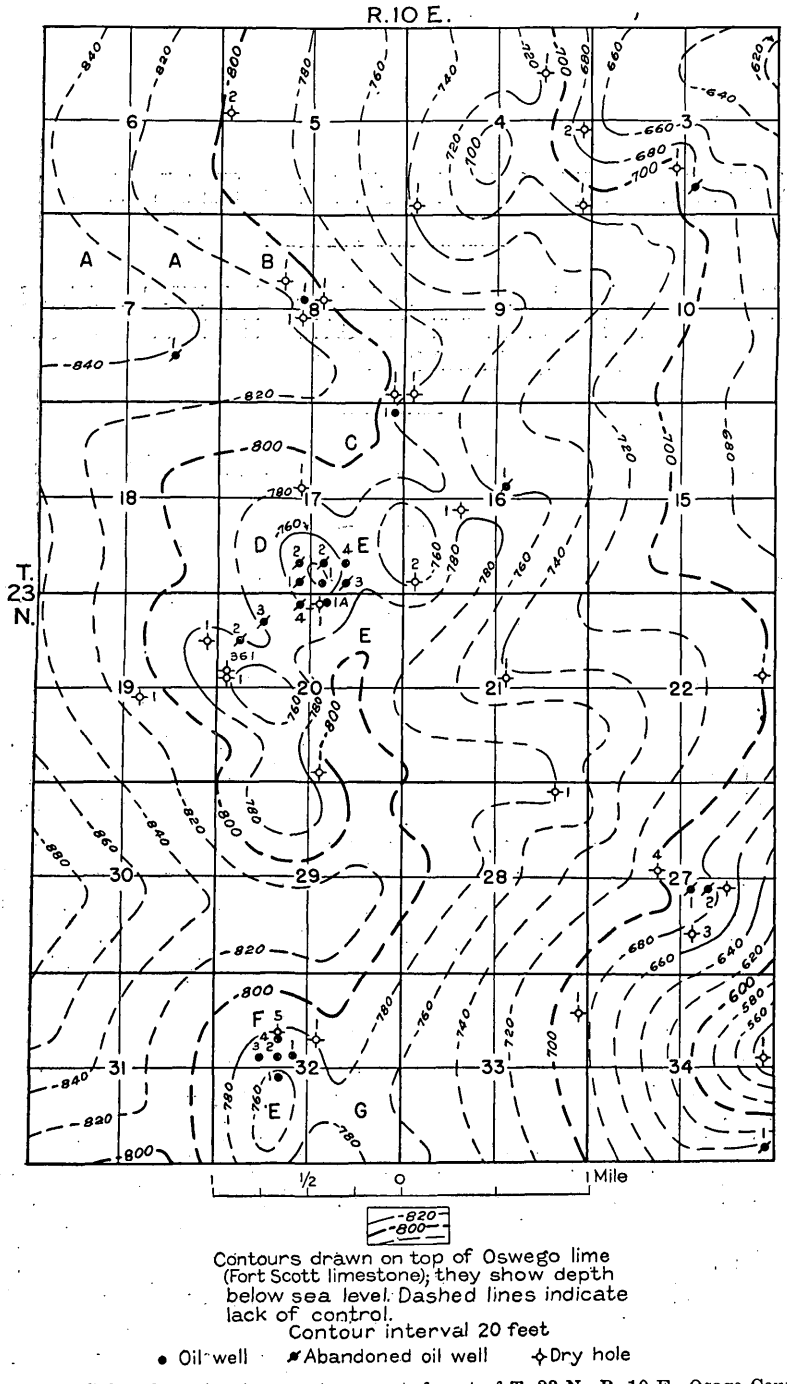

FIGURE 1.—Subsurface structure contour map of part of T. 23 N., R. 10 E., Osage County, Okla. Lessees: *A*, Stephenson & Worten; *B*, J. A. Presbury and others; *C*, Marathon Oil Co.; *D*, Barnsdall Oil Co.; *E*, Indian Territory Illuminating Oil Co.; *F*, Union Oil & Mining Co. and others; *G*, Western American Oil Co.

half a mile southeast of this lone producer from the Bartlesville sand a 30-barrel show of oil in the Bartlesville sand was obtained in September 1922 in a well of the Evidence Oil Co. in the southwest corner of the NE¼ sec. 16. The sand was struck at a depth of 1,902 feet and is recorded in the log as 43 feet thick. Broken sand and shale are reported at the horizon of the Bartlesville sand in the log of the dry hole in the northwest corner of the NE¼SW¼ sec. 16, which was drilled by the Cosden Oil & Gas Co. in 1926. The beds at the horizon of the Bartlesville sand were shot after the well had been drilled into the Siliceous lime and plugged back.

A well producing about 25 barrels of oil from the Bartlesville sand was drilled in May 1921 by John E. McKinley in the SW¼SE¼ sec. 3. This well struck the sand at a depth of 2,052 feet and penetrated it to a depth of 95 feet. The log of the well does not indicate whether the base of the sand was reached. The well was abandoned after producing a total of 600 barrels of oil in 8 months.

The presence of productive oil sand in the three wells just mentioned strongly indicates that oil-bearing Bartlesville sand is present in parts of the NW¼ sec. 16 and the NE¼ sec. 17 and possibly in parts of secs. 9 and 10, inasmuch as throughout a wide region in northeastern Oklahoma the Bartlesville sand occurs characteristically in narrow lens-shaped bodies that yield large quantities of oil. Drilling depths to the Bartlesville sand in these sections range from about 1,900 to 2,100 feet.

The Bartlesville sand, as indicated by well logs, is 20 feet thick in the southeast corner of sec. 8, 45 feet thick in the southwest corner of sec. 9, 31 feet thick in the southeast corner of sec. 4, and 130 feet thick in the center of the east line of the SW¼ sec. 3. Perhaps much or all of the sand recorded by the drillers in the well logs is sandy shale instead of sand. This possibility is suggested by the fact that microscopic studies of well cuttings of the Bartlesville sand in Osage County have proved that in many localities sandy shale beds at the horizon of the Bartlesville sand have been recorded by the drillers as sand. Also it appears improbable that Bartlesville sand capable of serving as a reservoir for oil and gas was found in the two dry holes in secs. 8 and 9 near the well in the northeast corner of sec. 17 that produces oil from the Bartlesville sand.

The small dome in the S½ sec. 17 and the N½N½ sec. 20, on which eight wells have yielded oil from the Siliceous lime, and the small dome in the W½ sec. 32, on which five wells have yielded oil from the Siliceous lime, are fairly typical of the oil fields, mostly of small extent but large yields, that produce oil from the uppermost beds of the Siliceous lime on sharply folded domes in the southeastern part of Osage County. The wells on the northern dome in

T. 23 N., R. 10 E., produced a total of 356,587 barrels of oil between October 1926, the date of discovery, and July 31, 1936, the last date on which information was collected for this paper. If each well drains 6.4 acres the yield per acre up to July 31, 1936, had been 6,964 barrels of oil. The first oil on the dome in the W½ sec. 32 was produced in September 1929. By the end of July 1936 this pool had produced 201,716 barrels of oil, which is a yield per acre of 6,300 barrels of oil for this 7-year period. The rate of yields of the wells in secs. 17 and 32 has been greatly increased by treating the oil-bearing beds in the uppermost part of the Siliceous lime with hydrochloric acid. The four wells in the SE¼ sec. 17, which were given acid treatment in 1934, yielded an average total of 266 barrels a month in the year prior to treatment and an average of 3,864 barrels of oil per month during the 2½ years following treatment. The wells produced more oil in the 1½ years following the first acid treatment than they had produced in the 6 years prior to treatment. The wells in sec. 32 responded to acid treatment almost as well as those in sec. 17.

The crest of one of the untested domes in T. 23 N., R. 10 E., that appears favorable for prospecting for oil in the Siliceous lime is in the W½ sec. 20, and the crest of the other most promising dome is in the SW¼ sec. 4, as shown by the structure contour map drawn on the top of the Oswego lime (fig. 1). The contours shown in figure 1 are projected from few subsurface data, because so few wells have been drilled here, but the few available datum points on the Oswego lime were supplemented by structure contour maps of the surface rocks. Each of the domes in the Oswego lime is overlain by either an anticlinal nose or a dome in the surface beds, according to available surface-structure contour maps. The crests of the folds in the Siliceous lime are probably offset short distances to the northwest from the crests of the folds in the surface beds. Test wells in the center of the north line of the SW¼ sec. 20 and in the center of the E½NE¼SW¼ sec. 4 should encounter the Siliceous lime at depths of about 2,500 feet. Experience in the oil fields in secs. 17 and 32 indicates that, if oil is found, acid treatment of the reservoir beds will greatly increase the yield of the wells.

If oil is found in the Siliceous lime on the domes in secs. 20 and 4 the anticlinal nose extending southward into the NW¼ sec. 29 and the structural terrace in the NW¼ sec. 3 may warrant testing; also the dome shown in parts of the SE¼ sec. 17 and the SW¼ sec. 16 may deserve an additional test. Well 2 in the southwest corner of sec. 16, on the south flank of the dome, penetrated the upper beds of the Siliceous lime but found them barren of oil and gas.

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