A RECONNAISSANCE FOR OIL NEAR QUANAH, HARDEMAN COUNTY, TEXAS.

By CARROLL H. WEGEMANN.

INTRODUCTION.

The town of Quanah is situated on the Fort Worth & Denver City Railway, in Hardeman County, Tex., about 90 miles northwest of Wichita Falls and 6 miles south of Red River, which here forms the boundary between Texas and Oklahoma. (See fig. 9.) It is reached

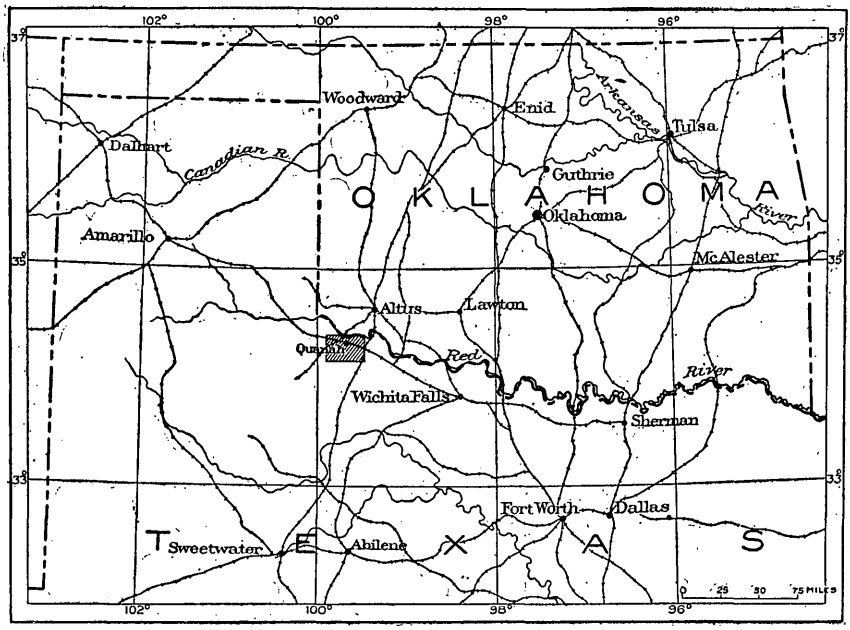


FIGURE 9.—Index map of Oklahoma and northern Texas, showing location of area near Quanah.

also by a branch line of the St. Louis & San Francisco system. The country in the vicinity of Quanah is not a proved oil or gas field, but reports of surface indications of oil and gas in the region have been current for some time. The examination here reported was undertaken in the fall of 1914 to determine if possible the geologic

structure of the area and the presence or absence of anticlines which might be effective in producing accumulations of oil or gas.

The writer has been assisted both in the field and in the office by Mr. Ralph W. Howell, of whose able work he desires to express his appreciation. Thanks are due to many residents of the district for courtesies extended during the prosecution of the field work, and particularly to members of the W. A. Doyle Oil Co. for valuable information in regard to the region.

The most noteworthy occurrences of oil near Quanah are those reported from the wells of the American Cement Plaster Co., 1 mile north of Acme, and of the Acme Cement Plaster Co., near Acme station, about 6 miles northwest of Quanah. According to report, the American Cement Plaster Co. sunk a well for water in the engine room of the plant to a depth of 27 feet. The well had a diameter of 11 feet and produced water, oil, and gas. It is said that from 8 to 12 barrels of oil a day was taken from this well for a considerable period and that the oil appeared to flow into the well intermittently. It is also said that the well seemed to be situated on the line of a fault, the strata on one side being displaced with reference to those on the other. Because of difficulty in regard to fire insurance this well was finally closed. A well sunk by the Acme Cement Plaster Co. to a depth of about 70 feet is reported to have yielded warm water and a showing of oil.

About 7 miles northwest of Quanah and 4½ miles north of Acme, in sec. 199, a test well known as the W. A. Doyle No. 1 is now being drilled. In this well a showing of oil is reported. A well sunk for water on the Gardenhauer ranch, in sec. 290, 13 miles west and a little south of Quanah, is said to have given a trace of oil. Other reports of oil and gas seeps are current in the region, but the details of the occurrences were not learned.

TOPOGRAPHY.

Quanah lies in the open plains region of northern Texas. The surface of the country is gently undulating, and rock exposures over much of the area are comparatively few. The area studied lies between Red River on the north and Pease River, a branch of Red River, on the south.

STRATIGRAPHY.

The rocks exposed at the surface in the vicinity of Quanah belong to the Clear Fork formation of the Permian series. The Clear Fork overlies the Wichita formation and, according to Cummins,[1] who

[1] Cummins, W. F., Geology of northwest Texas: Texas Geol. Survey Second Ann. Rept., pp. 400 et seq., 1890.

originally defined the terms, differs from the Wichita in having a greater number of limestone beds and in containing beds of gypsum.

About 11 miles southwest of Quanah and 7 miles south and a little west of Goodlet, in the "breaks" of Pease River, all the strata which reach the surface in the Quanah area are well exposed, the detailed rock section being as follows:

Section at wooded bluff half a mile west of the west line of sec. 287.

[See graphic section on Plate XIV.]

	Ft.	in.
(A) Limestone, coarse grained, soft	5	0
Shale, red and blue	26	0
Gypsum, soft, granular	3	0
Shale, red and blue	25	0
(B) Gypsum, base soft, upper part hard, white	10	0
Limestone, fossiliferous		8
Shale, red at base, gray above	11	0
Gypsum	9	0
Shale, calcareous, gray, containing some thin limestone layers that weather white	6	0
(D) Limestone, hard, light gray, weathering white; prominent over much of field	3	0
Shale, gray and green	5	6
Gypsum, white and blue, hard	9	0
Shale, gray and red	8	0
Limestone, white, fine grained, perforated with innumerable small holes about one-sixteenth of an inch in diameter	4	0
Shale, blue and greenish gray	3	6
(G) Gypsum; soft and granular in lower part; hard, blue, tinted with red, in upper part	21	0
Shale, red	5+	
Base not exposed.		
	154	8+

In the section given above the bed of gypsum 21 feet thick (bed G) appears to be the same as that which is mined at Acme. The 3-foot bed of hard light-gray limestone weathering white (bed D), which lies about 35 feet above the top of the thick gypsum bed, forms the surface rock over much of the area and may be used as a convenient horizon marker in the determination of structure. The 8-inch bed of limestone recorded 30 feet above the white limestone appears in some places to be represented by a bed several feet thick, as if part of the overlying gypsum bed (bed B) were replaced by limestone. The highest limestone bed noted in the section (bed A) is the same as that which caps the line of wooded hills several miles west and southwest of Goodlet.

METHODS OF WORK.

In the prosecution of the field work locations were made and altitudes determined by means of a plane table and telescopic alidade on the 3-foot bed of limestone (D in section on p. 111 and Pl. XIV), which lies about 35 feet above the thick gypsum bed (G) mined at Acme. Where this bed is not exposed or has been removed by erosion, altitudes were determined on other beds which lie either above or below it and whose relations to the limestone bed are known. By comparison of these numerous observations of altitude throughout the field it has been possible to determine the localities in which the limestone bed has been thrown into gentle folds by earth movements and those in which it is undisturbed and comparatively horizontal. In other words, it has been possible to distinguish the location of the upfolds or anticlines where such exist which may have influenced the accumulation of oil and gas.

On the map which accompanies this report (Pl. XIV) outcrops are indicated by crosses, the altitude of each outcrop is given and a letter referring to the rock section at the side of the map shows the stratigraphic position of the bed on which the altitude was determined. The estimated altitude of the limestone key rock (D) is given in parentheses at outcrops in which it is not exposed.

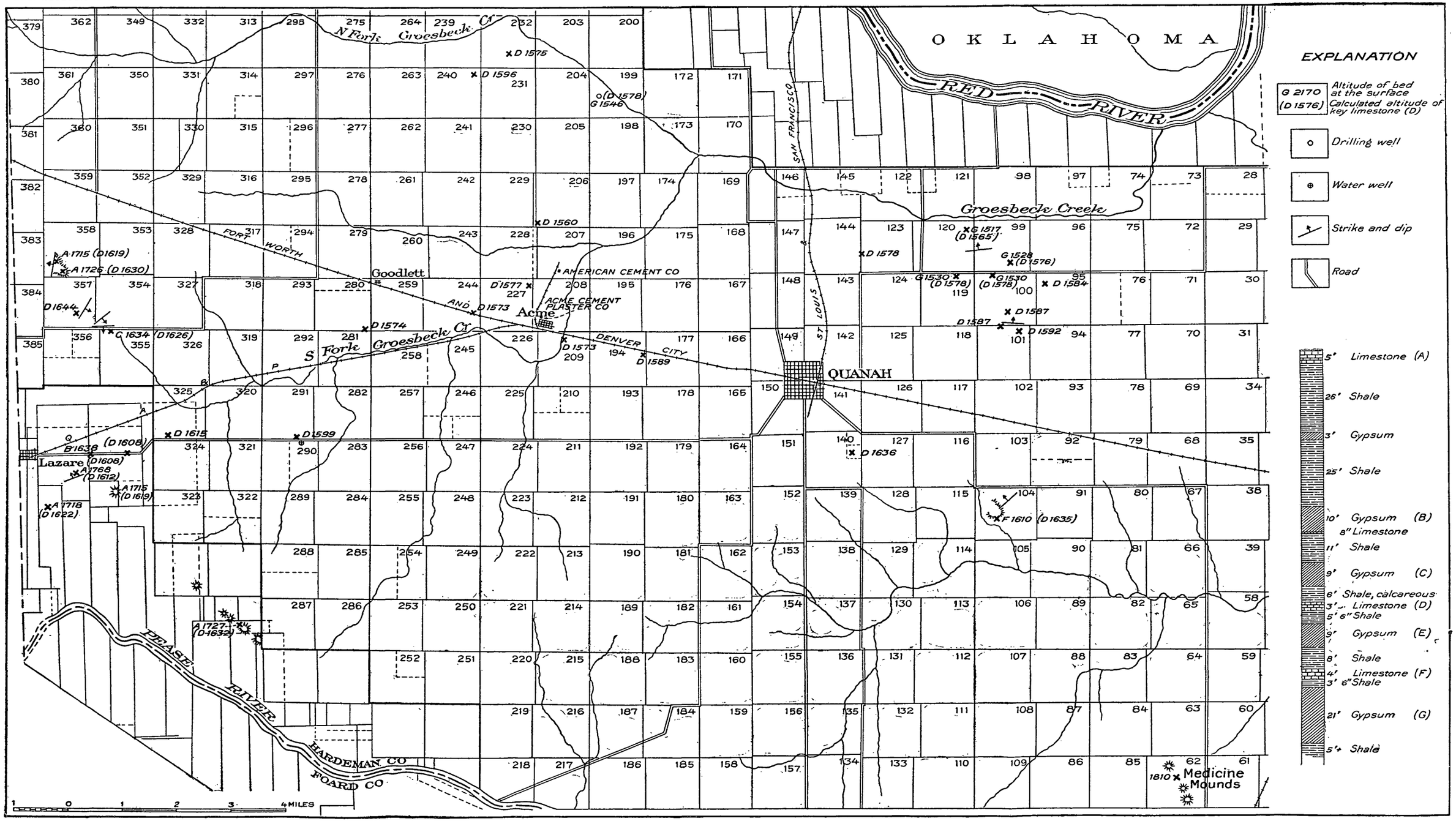
Altitudes in the field were calculated by means of vertical-angle readings and are correct with reference to one another within 5 feet. The elevation above sea level as represented by them is not precise, being estimated approximately from railroad profiles.

STRUCTURE.

The prevailing dip of the beds throughout this region is to the northwest, and the angle of dip is comparatively low, in many localities not more than 10 or 20 feet to the mile. The monoclinal structure, however, is by no means regular and is interrupted by minor folds or domes which appear to be superimposed upon it.

Southeast of Quanah the dip to the north or northwest is apparent in the difference of 150 feet in the altitudes of the Medicine Mounds and the prominent limestone hill in sec. 104, 5 miles northwest of them. The Medicine Mounds were not visited, but there is little doubt that the bed which caps them is very near the horizon of that which is exposed on the hill in sec. 104 and which caps the line of hills extending northeast from it, if it is not, in fact, the same bed.

On the south side of Groesbeck Creek, about 4 miles northeast of Quanah, excellent exposures of the limestone and gypsum beds occur in secs. 95, 99, 100, 101, and 120. In this locality the beds dip to the north at the rate of about 16 feet to the mile and strike approxi-



EXPLANATION

- G 2170 / (D 1576) — Altitude of bed at the surface / Calculated altitude of key limestone (D)
- Drilling well
- Water well
- Strike and dip
- Road

5′	Limestone (A)
26′	Shale
3′	Gypsum
25′	Shale
10′	Gypsum (B)
	8″ Limestone
11′	Shale
9′	Gypsum (C)
6′	Shale, calcareous
3′	Limestone (D)
5′ 6″	Shale
9′	Gypsum (E)
8′	Shale
4′	Limestone (F)
3′ 6″	Shale
21′	Gypsum (G)
5′+	Shale

MAP OF PART OF HARDEMAN COUNTY, TEX.

Base from local land maps.

mately east. The limestone bed (D) is here 60 or 70 feet lower in altitude than on the hill in sec. 104. It is also exposed about 1 mile north of Quanah at the same altitude as in sec. 101. In sec. 140, 1½ miles southeast of Quanah, is a poorly exposed limestone which may represent the same bed (D). If this identification is correct, the strata at this locality occur at about the same altitude as corresponding beds in sec. 104, and the dip to the northwest in that section persists only for a short distance in the direction of sec. 140 or is reversed, forming a very shallow syncline between sec. 140 and sec. 104. Between the exposure in sec. 140 and that mentioned 1 mile north of Quanah there appears to be a dip of 44 feet. In secs. 169, 167, and 194 the limestone (D) is at about the same altitude as in sec. 143, showing that the bed in these and intervening sections is practically horizontal. There is, however, some uncertainty as to the identification of the limestone in sec. 194. The bed there exposed may be a somewhat higher limestone; but if not, there is a slight dip to the northwest, toward Acme. A mile north of Acme, in the NE. ¼ sec. 227, the limestone (D) is at an altitude of 1,577 feet. In the SW. ¼ sec. 206 it is 17 feet lower, and therefore there is little doubt that it dips either to the north or northwest in the vicinity of Acme. At the Doyle well, in sec. 199, a bed of gypsum supposed to be the same as that (G) underlying the limestone is at an altitude of 1,546 feet, and as the limestone (D) is 32 feet higher, were it exposed at this well it would be at an altitude of 1,578 feet, or at about the same altitude as the bed in sec. 227, just north of Acme.

Unfortunately exposures in this locality are so poor and so far separated from one another that exact correlation is very difficult. If the beds at these several localities have been correctly identified, there exists between Acme and the Doyle well (sec. 199) a very shallow syncline, the strata in the vicinity of the well being at least 18 feet higher than those in the axis of the syncline. Beyond the well the beds appear to rise toward the west, for in the NW. ¼ sec. 240 the limestone (D) lies at an altitude of 1,596 feet, or 18 feet higher than it is at the Doyle well. From this outcrop there appears to be a rather pronounced dip to the northeast, and in sec. 232 the limestone is at an altitude of 1,575 feet, or 21 feet lower than the same bed a mile to the southwest. It would appear, therefore, that a small roll or anticline exists in this locality, the axis of which crosses the NE. ¼ sec. 240 and trends in an east or southeast direction toward the Doyle well but pitches in this direction so that the Doyle well is not on the highest part of the fold.

One mile south of Goodlet and 3 miles due west of Acme the limestone (D) is exposed at about the same altitude as in the vicinity of Acme. Six miles due west of Goodlet the highest limestone (A)

in the section caps a prominent hill in the SW. ¼ sec. 358, where the strata dip at a low angle to the west. The key limestone (D) is exposed a mile southeast of this locality, in the SE. ¼ sec. 357, where it dips to the east or southeast, or in the opposite direction from the dip in sec. 358. There is, therefore, in the northern part of sec. 357 a small dome or anticline, probably of very slight extent, the axis of which appears to cross the north line of sec. 357 at about its middle point. About 3 miles south of this dome a dip to the north or northwest is apparent between outcrops of the highest limestone bed (A) southeast of Lazare, the strata rising toward the south or southeast in the direction of the prominent hills which cross the southwest corner of sec. 287 and which are capped by this bed. As the dip 3 miles northeast of Lazare is to the southeast or south and the dip southeast of Lazare is to the north or northwest, it is apparent that there is a syncline about 1 mile northeast of Lazare.

POSSIBILITIES OF OIL AND GAS IN THE VICINITY OF QUANAH.

The possibility of finding oil or gas in commercial quantities in the vicinity of Quanah is a subject on which no very definite conclusions can be reached from an examination of the geology of the surface. The rocks of the lower part of the Wichita formation or the upper part of the Cisco formation, from which the oil of the Electra field, 50 miles southeast of Quanah, is derived, doubtless underlie the Quanah area, and there seems no good reason why the sands which are oil bearing at Electra should not contain more or less oil in the vicinity of Quanah. Pronounced domal or anticlinal structure, however, which appears to be, in the oil fields of this general region, one of the controlling factors in the accumulation of oil, is not well developed in the Quanah area. The gentle northwestward dip of the rocks in this region is interrupted by small domes or anticlines, but the efficiency of folds in which the dips are so low in controlling accumulations of oil may be doubted. The question whether oil is present here can be answered only by the drill. The Doyle well, now being drilled 7 miles northwest of Quanah, appears to be near the axis of one of the small folds but rather low on the axis.

A small fold which may be easily recognized from an examination of the surface is situated in sec. 357, 5 miles due west of Goodlet. This may be tested by a well just southeast of the southeast end of the prominent wooded hill in the SW. ¼ sec. 358.

There is a pronounced rise of the beds from the vicinity of Quanah toward the great buttes known as the Medicine Mounds, which are in sec. 62, about 10 miles to the southeast. The area in the vicinity of the mounds was not studied, but if, on detailed examination, a flat-

tening or reversal of dip is found southeast of the mounds, this area may be considered as worthy of a test.

From the lack of surface exposures or of detailed well records in the area between Quanah and the Electra field, it is impossible at the present time to make accurate estimates of the depth at which the oil-bearing rocks in the Electra field may be reached in the Quanah area. The most productive sand in the Electra field is struck at a depth of about 1,000 feet. A rough estimate, which is all that can be made with the information at hand, would place the Electra sands about 1,000 feet deeper at Quanah than at Electra. In other words, the principal producing sand should be encountered at or a little more than 2,000 feet below the surface at Quanah.

"Wildcatting" in an area in which the rock structure is no more pronounced than in the region of Quanah is attended with considerable risk and should be undertaken only by companies that can well afford to take the chance of failure. It is believed that the locations for test wells above outlined are the best in the area examined. If tests in these localities should prove unsuccessful the chances of finding oil in the area would appear to be doubtful.