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OIL AND GAS IN LOUISIANA

WITH

A BRIEF SUMMARY OF THEIR OCCURRENCE IN ADJACENT STATES

BY

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OIL AND GAS IN LOUISIANA, WITH A BRIEF SUMMARY OF THEIR OCCURRENCE IN ADJACENT STATES.

By G. D. Harris.

INTRODUCTION.

During the last eleven years the Louisiana Geological Survey, in the course of its geologic work, has been gathering facts concerning the occurrence of oil and gas in Louisiana, and has published an elaborate report regarding the occurrence of salt within the State, which necessarily brought out many facts relating to oil and gas, the common if not universal accompaniments of saline deposits. During this interval the United States Geological Survey has published two reports relating in part to the oil of the State.[a]

It seemed therefore eminently proper, when field work was resumed by the State Survey in the fall of 1908, to devote the funds made available by the last legislature to the completion of an up-to-date report on the oil and gas resources of Louisiana. The United States Geological Survey added $1,500 to the State appropriation. The late fall and early winter of 1908 were spent in field work by G. D. Harris, I. Perrine, and W. E. Hopper. The laboratory or office work connected with this report has been done for the most part gratuitously.

OUTLINE OF OCCURRENCE, EXPLOITATION, AND RESULTS.

THE TWO MODES OF OCCURRENCE.

The expensive, avoidable mistakes thus far made in oil and gas development in Louisiana and adjacent States have been due mainly to a lack of proper understanding of the two very distinct ways in which these substances occur in this region. One way is well exemplified at Spindletop, a saline dome, where oil and gas have been highly concentrated in enormous quantities, all the surrounding territory being barren. The other way is equally well exemplified at Caddo or Corsicana, where oil and gas are coextensive with certain widespread, well-known geologic strata, though occurring in commercial quantities only in areas where the structure is favorable.

The importance of a clear understanding of the distinction here implied can scarcely be overestimated. A well sunk but a mile from

[a] Hayes, C. W., and Kennedy, William, Oil fields of the Texas-Louisiana Gulf Coastal Plain: Bull. U. S. Geol. Survey No. 212, 1903. Fenneman, N. M., Oil fields of the Texas-Louisiana Gulf Coastal Plain: Bull. U. S. Geol. Survey No. 282, 1906.

the center of operations on a saline dome is sure to be a failure; a well 2, 4, or even 10 miles away from producers in fields where oil and gas occur at certain geologic horizons may be entirely successful. In the saline domes, where impervious layers overlie the oil-bearing beds, enormous yields from single wells have been obtained, reaching 10,000 barrels or more a day for months; in the fields of broadly expanded oil strata a 1,000-barrel well is a rarity.

In the present report the brief terms "saline dome" and "stratum" will be used to indicate these two modes of occurrence.

Since 1859 geologists and well operators have been accumulating knowledge regarding the geologic occurrence of stratum oil and gas; formation after formation has been added to the "productive" list till now it includes beds that range in age from Ordovician to Recent. Certain classes of oil and gas are expected from certain beds or horizons in Pennsylvania, West Virginia, and so on. In the Appalachian region the driller has learned to be on the lookout for the Big Injun, Squaw, or Cow Run sands and for the Clinton, Trenton, and other characteristic formations.

Saline-dome oil has been known in commercial quantities along the Gulf border only since 1901. Its composition may or may not vary, but has no relation to the particular stratum in which it is found. It occurs now where it stopped in its last migration, in beds ranging from Cretaceous to Quaternary, inclusive. The porous limestone and the overlying sands beneath Spindletop, all of which are oil bearing, are of Quaternary age. At Sour Lake oil has long been known at the surface and in Quaternary beds, and fossils prove that some oil comes from Oligocene and some from Eocene (Jackson) sands. In the Jennings field two sands at the same depth and apparently yielding oil from the same source are of Quaternary and Miocene age, though laterally but a few yards apart. Stratum oil or gas may have originated in the stratum where it is now found; saline-dome oil and gas are certainly migrants.

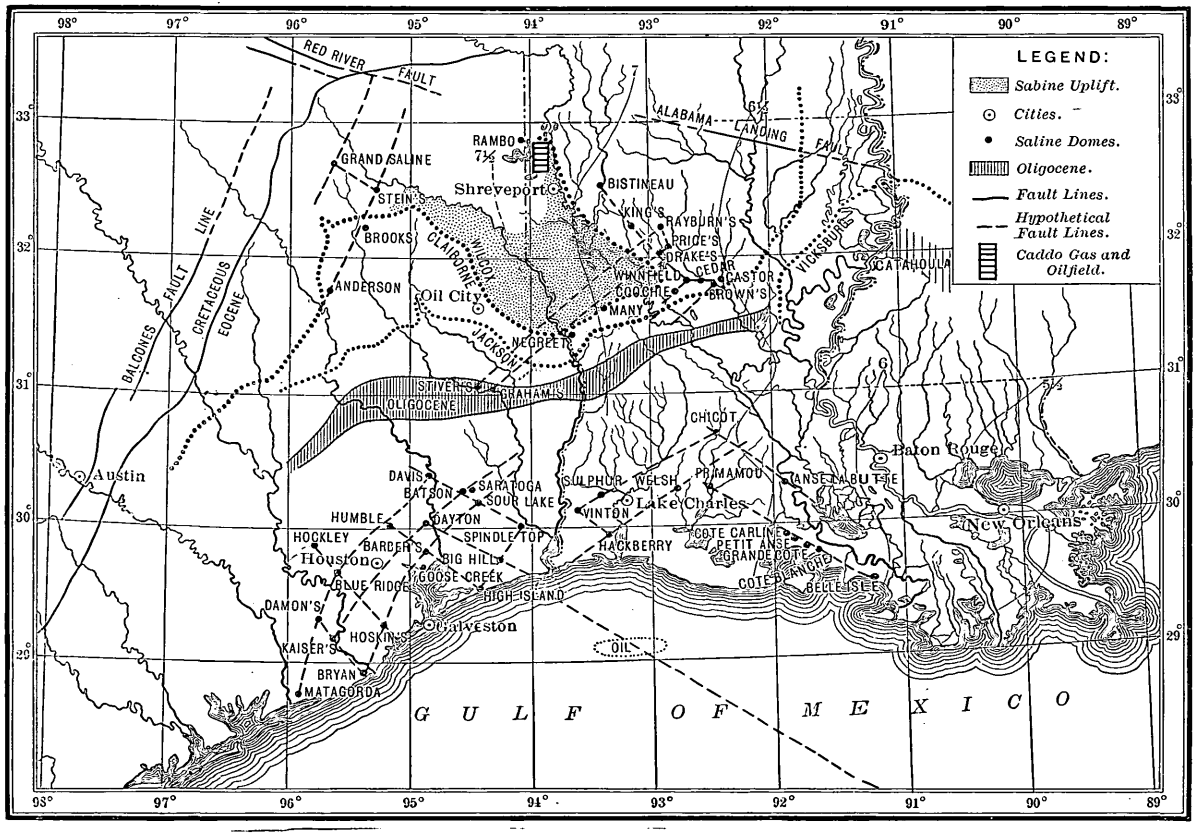
SALINE-DOME OIL AND GAS.

SALINE DOMES.[a]

GEOLOGY OF THEIR SURROUNDINGS.

In a broad way the geology of the lower Mississippi region is very simple. The early Eocene Mississippi embayment extended from the region of the present Gulf border, where it was 200 miles or more wide, to an apex at Cairo, Ill. To the northeast and the northwest Cretaceous rocks formed the border lands. From that time till this the great delta region has, on the whole, been filling in Gulfward. The result is that as the traveler passes from the Cretaceous rocks

[a] For a discussion of the origin, history, and structure of saline domes, see Bull. Louisiana Geol. Survey No. 7, 1908, pp. 75 et seq.; Econ. Geology, vol. 4, 1909, pp. 12-34.



SKETCH MAP OF LOUISIANA AND EASTERN TEXAS, SHOWING MAIN STRUCTURAL FEATURES, ESPECIALLY THE SABINE UPLIFT AND THE SALINE DOMES AND THEIR PROBABLE INTERRELATIONSHIP.

southward he finds younger and younger rocks at the surface; in other words, the Cretaceous and Tertiary rocks lie deeper and deeper as the Gulf is approached.

This simple, broad conception must be somewhat modified to fit the conditions now existing in this region. Crustal movements have produced faults and displacements, as may be noted most clearly along the Balcones fault line and the Sabine uplift, as depicted on Plate I. The domes themselves appear to be situated at the junction of fault lines. The Tertiary beds along the Gulf border, though for the most part 2,000 feet below the surface, may on the flanks of these local domes lie at depths of only 600 feet or perhaps even less. It is not intended to suggest that this near approach to the surface of the usually deep-lying Tertiary rocks is due to anticlinal or quaquaversal structure brought about solely by crustal movements of the general type just referred to. But for reasons that have been stated in full in the papers already cited and are referred to briefly in the present report, it is evident that the domes are located at places of weakness brought about by crust-fracturing stresses. The domes should, therefore, correspond in alignment with the broad structural features of the region. Moreover, where their dimensions are great, indicating the accumulation and concentration of salts and hydrocarbons from vast areas, it is natural to expect that they will be separated from one another by broad stretches of undisturbed, unfractured, undomed territory.

COMPOSITION.

The nuclei of such domes as have already been penetrated sufficiently deep to admit of a decisive determination are pretty generally found to be made up of solid, crystalline rock salt. The lateral extent of a nucleus may be from a few yards to a mile and a half, and the thickness 1,000, 2,000, or perhaps many thousand feet. The apex of the salt may be slightly above sea level, as at Petite Anse; slightly below sea level, as at Grande Cote; some distance below, showing truncation by near-surface water, as at Anse la Butte; or far below, as at Spindletop, where it is well protected from erosion and solution by surface waters not only by a thick, calcareous oil-bearing layer, but by 1,000 feet of clay and sand. Anhydrite is common, here and there, more or less intercalated in the salt masses in the domes, as at Belle Isle, but generally in great bodies by itself. Crystalline cavernous limestone, clearly a secondary formation, without traces of fossils and of very small lateral extent, is a common dome material. At Spindletop it approaches within 1,000 feet of the surface; at Pine Prairie and at the "marble" quarry just west of Winnfield it is well exposed in surface outcrops. Gypsum is a common dome material, and native sulphur is often found in minor quantities. In one or two places pure sulphur in important masses alternates with gypsum.

THE DOMES IDEAL STRUCTURES FOR CONCENTRATING OIL AND GAS.

As the above-mentioned substances have crystallized from warm supersaturated solutions, crystalline growth has exerted an almost irresistible force that has bulged up all superjacent beds in these peculiar domelike forms. The reasons for the writer's belief in this mode of origin of these structures have been given in the papers above cited.[a] The important point in the present discussion is the excellent character of the structure for concentrating oil and gas. The oil or gas may have collected in a concavo-convex porous crystalline limestone capping of the saline nucleus, as at Spindletop. This is the bed that furnished the gusher production. Some oil may travel upward into pervious sands and there be held by overlying clays. The shallower "sands" at Spindletop and all the "sands" at Jennings are of this type. Again, the oil may be entrapped as it ascends in a porous stratum that has been tilted up and pinched out by the upward movement of the saline plug. Anse la Butte is an excellent example of this type of occurrence. In some places the saline plug is not overlain by pervious or impervious layers and neither oil nor gas is now to be found near it. Grande Cote, Petite Anse, and Cote Carline are good examples of such barren domes.

DOME ALIGNMENT.

As oil and gas occur in southern Louisiana and southeastern Texas in commercial quantities in the vicinity of saline domes a few hundred acres in extent, most of such localities being separated by barren regions scores of miles wide, it is highly important for future development that the manner of occurrence of these salines should be care-

[a] As a matter of scientific interest it may here be mentioned that there is no need for supposing that the high temperatures postulated for the saline solutions are due to the propinquity of molten rocks. The saline beds are undoubtedly very deeply buried and have normally a temperature sufficiently high to account for all the warmth required in dome building. No surface rock nor deep borings from these domes have ever shown the slightest trace of volcanic rocks. Nor do the domes produce local variations in terrestrial magnetic forces, as do the foci of volcanic activity generally. However, no one can seriously doubt that a laccolith may cause such dome structure in the overlying beds as to aid materially in the concentration of various hydrocarbons. That basaltic cores or plugs may perform the function of saline masses may be readily conceived. In fact such phenomena have been observed in Mexico, as indicated in the following communication to the Oil Investors' Journal (April 6, 1909, pp. 31-32): "The formation in the northern part of Vera Cruz and lower Tamaulipas is entirely different from that on the Isthmus. The surface consists of immense shale beds lying almost level. Below these shale beds is a calcareous marl several hundred feet thick. These marl beds are laminated, being hard and soft, with streaks as hard as a Trenton rock. What oil has been found so far has been found in soft streaks in the marl. Scattered over the country there are protruding out of the shale many sugar-loaf dikes of basalt, generally a hundred feet high or so. Immense seepages of asphalt are found at the base of these dikes. On account of the igneous character of these dikes geologists for a number of years refused to believe that oil in any quantity would be found in the territory. It now looks as if these dikes were pushed up during seismic disturbances which occurred after the formation of the oil beds. The only wells found of any consequence in the territory referred to have been located near the base of these basaltic dikes. It would seem, therefore, that the mother bed of the oil is at a much greater depth than any well has ever reached and that the oil produced is that which has escaped up alongside the dikes and worked itself out in lateral crevices. These lateral crevices furnish the oil. As there are many seepages scattered through the country where there are no protruding dikes, it is reasonable to suppose that the dikes exist but do not come near enough the surface to show themselves."

It may be suggested that the buried dikes referred to in this note could probably be located by a careful magnetic survey.

fully studied, so that probably productive territory may be separated from territory in which the discovery of oil or gas is unlikely. In the effort to hit upon the right 40 acres in a parish of many hundred square miles where there is no good reason for supposing that oil exists there is one chance of success to several thousand of failure.

Though the available information may never be sufficiently complete to insure accuracy in the location of oil pools in advance of actual drilling in these coastal regions, it is believed that much help may be derived from a careful inspection of the main structural features of the lower Mississippi region, already briefly outlined. This great delta-shaped area, bordered on the east and west by the Cretaceous-Tertiary contact line and on the south by the Gulf, is characterized by northeast-southwest and northwest-southeast structural features, as indicated on Plate I. To suppose for an instant that the orderly rectilinear mode of occurrence of the saline domes is merely the work of chance is extreme folly. That the Sabine uplift has the general form indicated on Plate I is indicated by irregularities in forces of terrestrial magnetism, by the clearest kind of paleontologic evidence, and by direct stratigraphic proof. The Balcones fault line and the Red River faults are at the surface, can be seen, and admit of no question as to their existence. The Jennings and Five Island low anticline makes itself felt in the position of the submarine contour lines in the Gulf; the lower reaches of the Mississippi turn to the southeast above Baton Rouge and follow a synclinal depression to the Gulf. The oil pools in the Gulf platted by the Hydrographic Office show a parallel arrangement. Clearly, the varied wrenching and warping suffered by the rocks of this great delta region have given rise—and naturally so—to structural features more or less parallel to the shores of the old Cretaceous terranes to the northeast and northwest. In the opinion of the writer all the saline domes are located along lines of fracture in the deep-lying Mesozoic and Paleozoic rocks, and in general their location seems to be at the crossing of such lines. Prospecting for new fields should, it is believed, be carried on with a due consideration of these facts.

PROSPECTING IN AND AROUND SALINE DOMES.

From the nature or composition and the structure of saline domes as outlined above important deductions can be made as to the proper method of exploiting them for oil and gas. The sinking of a well into a salt nucleus whose upper termination is at or close to the surface of the ground may have the interesting though unprofitable result of showing the astonishing vertical dimensions of such nuclei, but even mere crevices in them containing oil and gas "showings" are likely to be rare. Such unsuccessful wells have been drilled at Goldonna, Anse la Butte, Petite Anse, Belle Isle, and other localities.

If the saline nucleus in its upward movement has pierced, bent up, and turned aside pervious and impervious strata of whatever age, from Cretaceous to Quaternary, inclusive, that have never contained hydrocarbons in any form, the resultant domes can not be expected to yield oil or gas. The large salt "islands" near the coast, and perhaps many of the saline domes in northern Louisiana and northeastern Texas, may prove to be of this type.

If the salt nucleus, though approaching the surface centrally, has at depths of several hundred or even a thousand feet or more passed through pervious and impervious layers, some of which contain hydrocarbons, the chances are that the upbended margins of the pervious layers next to the rising salt nucleus will be so sealed or compressed as to produce local pockets wherein oil and gas may collect. Anse la Butte is an excellent example of this type; Pine Prairie, Goldonna, Winnfield, and Coochie very likely fall into this category also. After a saline nucleus has been brought up near enough to the surface to be subjected to extensive underground flows of fresh water, more or less of the saline matter may be removed by solution, and accumulations of oil and gas may be set free and lost forever. Clearly, the proper manner of testing such saline domes for oil and gas is not by wasting money in a deep salt hole centrally located, but by searching for local pockets just outside the gas indications or circle of brine springs so common about these domes. Where the nucleus of a dome is volcanic matter, as described in the footnote on page 8, no one would think of drilling in the igneous mass. Then why should one drill in a salt nucleus? The supposed reason for the enterprise is not difficult to see. It rests wholly on a preconceived erroneous idea as to the origin and nature of the salt masses. They have been looked upon as kinks, sharp anticlines, or quaquaversals protruding upward from some widely extended salt sheet, and it is natural to suppose that under such structures oil and gas may be found. It has been stated in the papers already cited that in all probability the lower layers of the saline nuclei are far from anticlinal in structure—in fact, that they are very likely synclinal. The hope of obtaining a large supply of oil or gas by penetrating the Gulf coast salt domes can, in the writer's opinion, never be realized. As already remarked (p. 8), if the saline nucleus is many feet beneath the surface—say 1,000 feet, as at Spindletop, or at an unknown greater depth, as at Jennings—and if between these depths and the surface there are pervious layers overlain by extensive impervious layers, the conditions are favorable for the collection of oil and gas, particularly at or near the apex of the dome, where they are obtained easily and in immense quantities. The heavy gravity of the oil in such domes may perhaps be explained by its proximity to the surface and consequent loss of more volatile matter. This fact, taken in connection with the

known mode of occurrence of oil in deep-lying lateral pockets about salt domes, as at Anse la Butte, points to the possibility of obtaining a very much higher grade of oil at great depths around the periphery of such fields as Spindletop. Quite naturally, salt water would be the material found in most of such test wells, yet there is no reason why good quantities of superior oil may not be hopefully looked for.

A further word must be said in connection with exploitation about saline domes. Scores of wells have been sunk "near" certain oil-producing domes in the groundless hope that somehow the influence of the domes might extend for several miles in every direction. Here, too, the real origin and extremely local nature of dome structure has been entirely overlooked. It is true that where the focus of disturbance is very deep seated and extensive, giving rise, as in the Jennings field, to a fault line perhaps half a mile in length, and where the impervious layers are not extensively developed, the oil and gas ascending through the fault fissure may spread out in many directions in certain "sands" for half or three-quarters of a mile, or perhaps even more. This is an unusual case, however. Generally the oil must be looked for immediately above the saline crystalline masses or, where these are truncated at the surface, in the highly tilted peripheral layers. Great saline masses may be surrounded by beds wholly lacking in hydrocarbons, as at Petite Anse, Grande Cote, or Jefferson Island. Both actual exploitation and theoretical considerations show clearly that the circle of influence of each saline uplift may be drawn with a radius scarcely ever a mile in length, generally far less.

SYNOPSIS OF SALINE-DOME STATISTICS.

On a glance over the following notes on saline domes, it will be at once apparent how few of these structures have produced oil or gas in commercial quantities. Their present relative importance is indicated by the tables on page 26.

The saline domes of northern Louisiana have yielded so far little oil or gas. But they have been very slightly exploited, especially in the light of present knowledge regarding their structure. The Woodbine sand, being the most extensive producer of oil in the Caddo field and extending doubtless throughout northern Louisiana, may well be looked for on the lateral slopes of the salines at no great depths, for the Annona chalk beds or the "Saratoga" chalk member of the Marlbrook marl outcrop around many of these buried domes. A few known facts about each of these domes are given below:

ANSE LA BUTTE.

Location.—St. Martin Parish, La.; 6 miles from Lafayette, 3 miles from Breaux Bridge, on highway between the two places.

Topography.—A small quadrilateral depression (anse), usually filled with water, flanked by ground or elevations somewhat above the level of the surrounding prairie,

especially on the north side, where a "butte" rises 16 feet above the swamp. (See map, Pl. II.)

Indications.—Gas bubbling in margin of swamp and the "butte."

Development.—Taken under consideration as oil territory, 1893; unsuccessfully drilled into under Captain Lucas, 1899; Heywood No. 1 developed small production (40 barrels), fall of 1902; first important well, Lake No. 7, November 14, 1907, a 3,000 to 4,000 barrel gusher. For production, see page 26. A 4-inch pipe line was constructed to Breaux Bridge in March, 1906; the field has use of the Evangeline line to the Atchafalaya, November, 1907. The Lafayette and Baton Rouge branch of the Southern Pacific Railroad skirts the north edge of the field.

Area.—Between 100 and 150 acres.

Geology.—A central salt dome 1,000 feet in diameter at upper truncated portion, covered by infilling of 200 to 300 feet of recent material; laterally salt shelves occur; oil and gas apparently occupying upturned edges of pervious layers pinched out against salt dome by upward movement of the dome. Dips wherever measured are away from center, generally at high angle. Oil and gas in various layers from surface downward, but especially below salt ledge at 1,100 feet (Heywood No. 1) and in "deep sand" at 1,800 feet (Lake No. 7 and others).

References.—Louisiana Geological Survey, Rept. 1899, p. 38, Pl. II; Rept. 1902, p. 266; Rept. 1907, pp. 87–91. Bull. U. S. Geol. Survey No. 212, pp. 63, 130–131; No. 282, pp. 105–110. Oil Inv. Jour., August 15, 1902, p. 7; March 1, 1903, p. 5; February 18, 1906, pp. 12–13; November 19, 1907, pp. 1, 2; many other references to the field are made in this journal.

BARBERS HILL.

Location.—Chambers County, Tex., 20 miles south of Dayton.

Topography.—A plateau-like circular elevation several thousand acres in extent; about 20 feet above surrounding prairie.

Indications.—Escaping gas.

Development.—This low elevation was prospected soon after the Spindletop development; ten wells were put down before March, 1905, some to about 2,000 feet. Patillo Higgins alone sunk five wells here; McCann's 2,000-foot test well abandoned in January, 1905; Guffey test well abandoned at 1,400 feet, October, 1907.

Geology.—Clays, gravel, sand, some limestone layers and gypsum in flakes; nodules or concretions abundant. Guffey 1,400-foot test well abandoned in solid rock salt. Oil and considerable quantities of sulphur reported from about 1,000 feet. Some oil recorded at other depths.

References.—Bull. U. S. Geol. Survey No. 282, p. 83. Oil Inv. Jour., January 18, 1905, p. 3; October 19, 1907, p. 11.

BATSON.

Location.—Western Hardin County, Tex., 7 miles southwest of Saratoga, 13 miles northwest of Sour Lake.

Topography.—In open prairie with saline swamp not far distant; there is no dome here like that at Spindletop.

Indications.—Bubbles of gas rising through pools of water; formerly said to be seepages of oil.

Development.—Paraffine Oil Company brought in first successful well October 31, 1903, from a depth of 790 feet; second well in December had an initial flow of 4,500 barrels daily; production of 1904 nearly 11,000,000 barrels—greater than for all years since.

Area.—Important developments within 250 acres; scattering over 500 acres.

Geology.—As a rule a slightly undulating crystalline porous limestone layer, locally 30 feet thick, lies beneath clay and sand beds at a depth of about 1,100 to 1,200 feet; another layer, 5 or 6 feet thick, is reported at about 600 feet here and there. As at Spindletop, the great gusher production was derived from lower limestone; after salt-water invasion upper sands and thin limestone layer were worked; porous limestone not encountered beyond limits of field.

Oil and gas.—Oil remarkably light for saline-dome oil, 20° to 29.9° B.; yields 6.5 per cent gasoline, 20.4 per cent kerosene, 14.4 per cent solar oil, 46.7 per cent lubricating oil, and 6 per cent asphaltum. Gas encountered in quantity in wells situated along anticlinal axes. For production see page 26.

References.—Bull. U. S. Geol. Survey No. 282, p. 53. Eng. and Min. Jour., vol. 78, p. 139. Oil Inv. Jour., December 1, 1903, p. 2; January 1, 1904, p. 1.

BAYOU BOUILLON.

Location.—At the junction of Bayou Bouillon and Atchafalaya River, 30 miles northeast of New Iberia, La.; exploitation on both sides of the river.

Topography.—Slight mounds on both sides of the river.

Indications.—Gas bubbling in the vicinity, especially along a line crossing the river.

Development.—Maxwell & Sherwood erected a derrick on the west bank and Heywood one on the east bank, summer, 1902; several shallow test wells, and three of 1,000 feet or more, put down before 1905; Robert Martin went back to old Heywood test well, fall, 1907; another old test well deepened, 1908.

Geology.—Logs of wells very different in near-by locations; sand, clay, and gravel predominating; a 300-foot limestone stratum from 850 to 1,150 feet in Maxwell & Sherwood well; hot water reported in a well from 1,200 to 1,280 feet deep; oil and gas showings at various depths.

Oil and gas.—Oil obtained in several bucketfuls in Heywood well; very viscid, dark brown, specific gravity 0.859. Gas 93.72 per cent hydrocarbons; proportion of marsh gas not stated; no hydrogen sulphide.

References.—Oil Inv. Jour., June 21, 1902, p. 3; August 15, 1902; December 5, 1907. Bull. U. S. Geol. Survey No. 282, pp. 112–113.

BAYOU CASTOR.

Location.—Eastern Winn Parish, La., about 5 miles north of Rochelle, near line between secs. 15 and 22, T. 10 N., R. 1 E.

Topography.—Broad, flat, barren stretches like second bottom lands along small bayou branches; pronounced elevation located centrally; marginal slopes steep and wooded.

Remarks.—Vicinity not yet prospected for oil or gas; no indications reported. Presence of salt domes in this vicinity also indicated by salt water in well 400 feet deep at Selma; water yields 3 per cent chloride of sodium.

BIG HILL.

Location.—Western Jefferson County, Tex.

Topography.—Low crescentic rise of several thousand acres in area in coastal prairie.

Indications.—Domelike elevation.

Development.—Two deep wells have been sunk on the hill, also one deep one to the west and one to the east of the hill.

Geology.—Guffey No. 1 well, on east slope of hill, light-gray crystalline dolomite interbedded with gypsum, 350–1,400 feet; below to 2,200 feet gypsum and seams of sulphur; some oil showings. Well a few miles west, at Winnie, finds no rock to bottom, 1,600 feet. Well 1¼ miles northeast abandoned at 1,300 feet. Second deep well on mound goes 2,496 feet to solid limestone, with gypsum and pyrite; rock penetrated 34 feet and well abandoned.

References.—Bull. U. S. Geol. Survey No. 212, p. 126; No. 282, p. 79. Eng. and Min. Jour., July 28, 1904, p. 139. Oil Inv. Jour., June 3, 1905, p. 4; April 13, 1906, p. 27.

BISTINEAU.

Location.—Southern Webster Parish, La., north of Lake Bistineau, south of Vicksburg, Shreveport and Pacific Railway, secs. 25, 26, 35, and 36, T. 18 N., R. 10 W.

Topography.—In Bistineau bottom lands, with brine springs and licks arranged in a circular form, practically duplicating Drake's saline (p. 17).

Remarks.—Not yet tested for oil or gas.

References.—Louisiana Geol. Survey, Rept. 1902, pp. 81–90; Bull. No. 7, p. 56.

BROOK'S SALINE.

Location.—Southwestern Smith County, Tex., 17 miles southwest of Tyler.

Remarks.—Very similar to Steen's, Palestine, and Grand salines, which see.

References.—Texas Geol. Survey, Second Ann. Rept., p. 223. Eng. and Min. Jour., July 28, 1904, p. 137.

BROWN'S SALINE.

Location.—Eastern Winn Parish, La., 18 miles southeast of Winnfield, 6 miles west of Tullos, on north bank of Dugdemone River.

Remarks.—Location as given at Rochelle; place not yet prospected.

BRYAN HEIGHTS.

Location.—Southern Brazoria County, Tex., near mouth of Brazos River, 1 mile from the Gulf and 3 miles from Velasco.

Topography.—A 300-acre moundlike area rising 19 feet above surrounding plain, which is 11 feet above tide.

Indications.—Fragments and small chunks of asphaltic "sea wax" frequently mentioned from this region; the mound is also suggestive of a saline dome.

Development.—Little accomplished of late; seven wells drilled before the fall of 1904; fresh water and an enormous flow (6,000,000 cubic feet daily) of gas, mainly hydrogen sulphide, have been found; some oil found in crystalline limestone, nonproductive; below are sulphur and gypsum.

Geology.—Apparently similar to Spindletop, without the oil; very hard rock layers a few feet thick occur in sand and clay; drill reported as dropping in rock crevice from 598 to 611 feet.

References.—Bull. U. S. Geol. Survey No. 212, p. 127; No. 282, p. 87.

BLUE RIDGE.

Location.—Eastern Fort Bend County, Tex., 15 miles southwest of Houston. Name "Blue Ridge" sometimes used generally for territory from Pierce Junction, 8 miles southwest of Houston, to Missouri City, 17 miles in southwest direction, including Reamers Ridge. Blue Ridge proper is 6 miles south from Pierce Junction.

Development.—A favorite district for "wildcatting," especially between 1904 and 1907. One well drilling in 1904, another in 1905; near-by wells in 1906 and 1907.

Geology.—Well of 1904 reports conglomerate from 200 to 600 feet, with gypsum and dolomitic matrix. Pyrite and sulphur crystals and gas with petroleum odor also reported. Wells from Pierce Junction to Missouri City abandoned at 1,050 to 1,500 feet. Rock salt reported in Beatty well at about 750 feet.

Oil and gas.—Traces of oil found at Blue Ridge and Missouri City; gas in a well at Reamers Ridge and enough gas for a blow-out at Pierce Junction. Oil samples said to be of 17° B. gravity.

References.—Eng. and Min. Jour., July 28, 1904, p. 139. Oil Inv. Jour., June 3, 1905, pp. 4, 18; July 18, 1905, p. 3; May 3, 1905, p. 11; August 18, 1905, p. 3; April 3, 1906, p. 27; January 3, 1907, p. 13; November 5, 1907, p. 12.

COAL BLUFF SALINE.

Location.—Western Sabine Parish, La., about 6 miles northwest of Negreet saline, sec. 33, T. 6 N., R. 13 W.

Remarks.—A small open "lick" showing a few old furnaces. See Negreet (p. 21).

COOCHIE BRAKE.

Location.—Southwestern Winn Parish, La., in sec. 30, T. 10 N., R. 4 W., 5½ miles west of Atlanta station.

Topography.—An uplifted and highly tilted pyritiferous sandstone on the north side of a swamp.

Remarks.—Though various persons have sought for "gold" (pyrite) at this place with some degree of energy, its capabilities as an oil or gas field have not yet been tested. The great uplift here evident, together with the large amount of pyrite in the sandstone, should cause the locality to be carefully studied and properly tested by drilling. Here, as at the marble quarry near Winnfield, there are no brine springs, though doubtless rock salt could be encountered in places by boring a few hundred feet. Similar conditions prevail at Pine Prairie (p. 21).

References.—Louisiana Geol. Survey, Rept. 1899, p. 60; Bull. No. 5, p. 19.

COTE BLANCHE.

Location.—Western St. Mary Parish, La., on Cote Blanche Bay.

Topography.—A nearly circular mound about 2 miles in diameter, rising out of the coastal marsh to a height of 100 feet. (See Pl. XXV, Bull. Louisiana Geol. Survey No. 7.)

Geology.—This, one of the so-called Five Salt Islands, has never been sufficiently exploited to determine its capabilities as an oil or salt producer. Many wells from 300 to 500 feet deep have been sunk in search of salt or water, but so far nothing of importance has been encountered—no hard layers, no salt water, no escaping gas. That this "island" is in reality a saline dome there can be no doubt; to what extent it may become an oil or gas producer is yet undetermined.

References.—Louisiana Geol. Survey, Bull. No. 7, p. 27, Pls. XXVI, XXVII, XXVIII.

COTE CARLINE.

Location.—Iberia Parish, La., 12 miles west of New Iberia; a short distance north of the Bob Acres flag station on the Abbeville branch of the Southern Pacific Railroad.

Topography.—A rudely elliptical mound about three-fourths of a mile in major diameter, rising out of the level coastal plain on the south side of Lake Peigneur to a height of about 70 feet.

Development.—Salt was discovered on this "island" in 1895 in a well at 334 feet, being sunk for fresh water, mineral water, or whatever might be of value; eight test wells were sunk to ascertain the contour of the salt mass.

Geology.—Salt approaches in places within 91 feet of the surface. It was on this island that the great depth of these coastal salt masses was first determined. Diamond-drill cores to a depth of 2,090 feet showed only solid rock salt. So far no oil or gas indications of importance have been reported on this dome.

References.—Eng. and Min. Jour., vol. 62, pp. 463–464. Louisiana Geol. Survey, Rept. 1899, p. 254; Rept. 1907, p. 86, Pl. XXIX.

DAMON.

Location.—Northwestern Brazoria County, Tex.

Topography.—A rudely circular mound rising in its most elevated portion 75 feet above the surrounding prairie; diameter nearly 2 miles.

Indications.—Sour dirt or "vitæ ore" formerly shipped from this mound in carload lots for medicinal purposes; presumably resulting from decomposition brought about by escaping sulphurous gases.

Development.—At least five wells drilled, showing remarkably varying records.

Geology.—Shows typical dome material, especially in central portions. The Herndon well gave the following:

	Feet.
Gypsum	171– 549
Sulphur and gypsum	549– 579
Loose sand, very coarse	579– 587
Salt	587–1,160

References.—Bull. U. S. Geol. Survey No. 212, p. 36; No. 282, p. 90. Eng. and Min. Jour., July 28, 1904, p. 138.

DAVIS HILL.

Location.—Northern Trinity County, Tex., on right bank of Trinity River.

Topography.—Various hills or rises reported as 250 feet above the surrounding prairie.

Indications.—Escape of sulphurous water and inflammable gas.

Development.—Four wells drilled in 1905 and 1906.

Geology.—One well reported as "twisted off" at 1,000 feet, with good oil showing at that depth. Rock at 1,000 feet in the Cherry well was supposed for a time to be oil bearing; came in a gusher of hot black sulphur water, February 9. Others at 1,100 feet show water at various horizons but no oil.

References.—Oil Inv. Jour., January 18, 1906, p. 6; March 18, 1906, p. 8. Bull. U. S. Geol. Survey No. 212, p. 127.

DAYTON.

Location.—Scene of interest is about 8 miles west-northwest of Dayton, southwest-central Liberty County, Tex.

Topography.—Poorly defined elevated region, 6 miles wide and 10 miles long, rising 20 to 30 feet above surrounding prairie.

Indications.—Abundant gas escapes in springs, ponds, post holes, shallow wells, etc.

Development.—Several years before oil was found at this locality in 1904 T. R. McGowan used his shallow gas wells for domestic purposes. The Willard-Bullard well reached a shallow sand at about 400 feet, producing perhaps 25 barrels daily. A Higgins-Paraffin was the first successful well, April, 1905, rated as 100 barrels; first gusher, Higgins-Paraffin No. 4, from 740-foot sand, August 28, 1905; for production later, see page 26.

Geology.—Sections of wells various; typical saline-dome material found in some wells; coastal clays and sands to 580 feet, limestone to 590, gypsum to 799, rock salt to 1,299 feet; elsewhere rock salt is sometimes mixed with sand. Higgins No. 2 obtains oil from rock; No. 4 from sand 20 to 30 feet thick.

Oil and gas.—Oil from Higgins-Paraffin No. 1, 17.1° B., from No. 4, 24° B. Gas encountered from surface to bottom of wells, especially in northwestern part of field; blow-outs often referred to.

References.—Bull. U. S. Geol. Survey No. 212, p. 126; No. 282, p. 85. Oil Inv. Jour., April 15, 1904, p. 1; September 3, 1905, p. 1.

GOLDONNA (DRAKE'S SALINE).

Location.—West margin of Winn Parish, La., about the center of T. 12 N., R. 5 W.

Topography.—Several flat barren "licks" surrounded by low steep banks; many of them moundlike. (See p. 49.)

Development.—Besides the old artesian well and various shallow wells, all of very uncertain depths, two important wells are known at this locality. The most interesting is that of Savage Brothers and Morrical, sunk in 1905–6 to a depth of 2,342 feet, showing 1,410 feet of rock salt. A second well, half a mile north of first, showed no salt but some oil and gas; other details lacking.

Geology.—Appears to be a salt-dome uplift, truncation of dome resulting from enormous thickness of overlying concretionary cavernous limestone. (See p. 50 for an ideal section through this locality.)

References.—Louisiana Geol. Survey, Rept. 1902, pp. 51–64; Bull. No. 7, p. 501.

GOOSE CREEK.

Location.—Southeast corner of Harris County, Tex., across San Jacinto Neck from La Porte.

Topography.—Seemingly a low mound eroded on the one side by San Jacinto Bay, on the other by Goose Creek.

Development.—Houston people prospecting at this locality in summer of 1907 found enough oil in first well between 1,000 and 1,100 feet to supply fuel for second well. Considerable gas and a blow-out are recorded at 1,500 feet. Goose Creek No. 4 first gusher. Wells have been carried to depths of 1,925 and 2,500 feet, but the total production is small, about 11,000 barrels for last half of 1908.

Geology.—Stated by Hager to be a real dome in structure, with the usual dome materials, in spite of the fact that the oil "sand" is unusually deep (about 1,600 feet) for Gulf border production.

Oils.—Cedar color, heavy gravity, 17.5° B. in 1,600-foot wells, 23° B. in 1,700-foot well.

References.—Oil Inv. Jour., November 19, 1907, p. 9; February 5, 1908, p. 5; March 5, 1908, p. 12; May 5, 1908, p. 7; June 19, 1908, p. 3, and especially July 6, 1908, p. 21.

GRAHAM'S AND STIVER'S SALINES.

Remarks.—Given on Hager's map (Eng. and Min. Jour., July 24, 1904, p. 137) as in southern Angelina County, Tex. The writer has no personal knowledge of these salines.

GRANDE COTE (WEEKS ISLAND).

Location.—Southwestern Iberia Parish, La., on east side of Weeks Bay, an eastern lobe of Vermilion Bay, 15 miles south of New Iberia.

Topography.—Nearly circular dome 125 feet in height, 2 miles in diameter, and, like all other domes, more or less dissected.

Development.—Exploited particularly for salt since 1897. About fifty shallow holes have been sunk to determine contour of salt. Myles Salt Company has opened a large salt mine on this island.

Geology.—This, like Petite Anse (Averys Island), is known only as a salt island, no important indications of oil or gas having ever been noted.

References.—Louisiana Geol. Survey Bull. No. 7, pp. 5–14, Pls. XIII, XVII.

GRAND SALINE.

Location.—Van Zant County, Tex., on Texas and Pacific Railroad.

Remarks.—This large saline, 1 mile long by half a mile wide, is regarded by Veatch as due to salt in regular bedding, that is, not redeposited in dome structure (Prof. Paper U. S. Geol. Survey, No. 46, 1906). That rock salt occurs here in thick masses is proved by borings. A showing of oil in a water well of the Southern Salt Company has been reported (Oil Inv. Jour., February 3, 1907, p. 13). (See First Ann. Rept. Texas Geol. Survey, p. 35.)

HACKBERRY ISLAND.

Location.—Cameron Parish, La., 33 miles southwest of Lake Charles, between Black Lake and Calcasieu Lake.

Topography.—Low elevation of 35 feet in an area of about 8,000 acres.

Indications.—Escape of gas and sulphureted waters.

Development.—Three wells; Louisiana-Texas Oil Co. No. 2 on Northwest side of island, depth 1,830 feet; Nos. 1 and 3 on east side, 1,460 feet.

Geology.—No. 2, thin layers of rock only to a depth of 1,565 feet, then a 45-foot bed of cavernous limestone; below, 10 feet of pure black sand and 210 feet of "gypsum." Nos. 1 and 2 with "rock" in thin layers at intervals below depth of 900 feet. A 7-foot lignite bed recorded at 1,421 feet in No. 1; an oil showing at 1,460 feet. Salt water and an oil showing supposed to have come from black sand bed of No. 2.

References.—Bull. U. S. Geol. Survey No. 212, p. 131; No. 282, p. 111.

HIGH ISLAND.

Location.—Southeastern Chambers County, Tex., 1 mile from the coast and halfway between Sabine Pass and Galveston.

Topography.—More or less circular elevation 48 feet above Gulf level and about 1¼ miles in diameter; considerably dissected.

Indications.—Inflammable and sulphurous gases and moundlike appearance.

Development.—Many shallow test wells for fresh water were put down early, because waters are all either saline or sulphurous. Showings of oil noted at 505, 972, and 1,200 feet. Several deep wells record very thick deposits of gypsum. Some small quantities of oil obtained at 1,200 feet, but salt water soon drowned it out.

Geology.—A typical saline dome; a Guffey well passed through gypsum from 600 to 1,200 feet. Another encountered gypsum from 900 to 1,300 feet, then rock salt to 2,600 feet, bottom of well. Sulphur, galena, sphalerite, barite, etc., are common.

References.—Bull. U. S. Geol. Survey No. 212, p. 123; No. 282, p. 81. Oil Inv. Jour., February 5, 1908, p. 18.

HOCKLEY.

Location.—Northwestern Harris County, Tex., 4 miles south of Hockley station, on Houston and Texas Central Railroad.

Development.—Five test wells reaching depths from 500 to 850 feet were put down at this locality in 1906 by Patillo Higgins. His No. 1 is reported as passing through rock from 14 to 524 feet; rock appears to be white limestone. Last test well in salt at shallow depth; operations abandoned.

References.—Oil Inv. Jour., June 5, 1906, p. 17; August 18, 1906, p. 2; September 3, 1906, p. 10; July 19, 1907, p. 6; July 20, 1908, p. 20.

HOSKINS.

Location.—Eastern Brazoria County, Tex., between Chocolate and Eastrop bayous.

Topography.—A mound 700 acres in area elevated 30 feet above the surrounding plain.

Development.—Drilling followed by a blow-out recorded in 1904. Up to summer of 1907 the Mound Company had drilled thirteen wells; the No. 2 was the first successful one, drilled in November, 1905, but kept secret till May, 1906. Production for all wells, 1908, 15,875 barrels.

Geology.—Well No. 2 produced 60 to 125 barrels daily for over a year, from a depth of 582 feet. Rock layers occur at 600 to 800 feet and below, some described as sand cemented by carbonate of lime. Rock salt in well No. 9 at 1,350 feet. Rock salt in one well from 1,250 to 1,700 feet.

Oil.—Greenish, low in sulphur, 21.5° B. Good gas wells are secured.

References.—Bull. U. S. Geol. Survey No. 282, pp. 86, 138. Oil Inv. Jour., May 3, 1906, p. 1; June 3, 1906, p. 14; June 5, 1907, p. 19; August 5, 1907, p. 18; December 19, 1907, p. 9.

HUMBLE.

Location.—Harris County, Tex., 18 miles north of Houston, 1½ miles east of Humble station, on Houston East and West Texas Railway.

Topography.—Part of Echols Ridge, 100 feet above sea level. This is the largest saline-dome oil field of this region and extends in a northeast-southwest direction for 2 miles.

Indications.—Gas escapes.

Development.—Begun by a shallow well terminating in a blow-out, 1902; some oil and gas found between 1,000 and 1,250 feet, December, 1904; the gusher, Beatty No. 2, completed January 7, 1905, producing over 8,000 barrels daily for several days; by March 1 the field was producing 90,000 barrels daily and shortly salt water appeared. For remarkable production of 1905 and decrease since, see page 26.

Geology.—Beatty No. 2 encountered its 80-foot cap rock at a little more than 1,200 feet. Thin rock layers at several places are mentioned in the logs.

Gas and oil.—Field is remarkable for its gas pressure at 800-foot level; gas below with oil is poisonous; oil of heavy coastal saline-dome type mainly; also a light-green oil of 20° B. gravity; a few showings of 29° B. oil occur.

References.—Oil Inv. Jour., November 5, 1904, p. 1; December 1, 1904, p. 1; January 1, 1905, p. 10; February 3, 1905, p. 5; June 3, 1906, p. 1; June 3, 1906, pp. 1–4.

JENNINGS.

Location.—Western Acadia Parish, La., 6 miles northeast of Jennings station, on the Southern Pacific Railroad.

Topography.—Broad erosional depression 10 feet above sea level west of a low hill or mound rising 32 feet above sea level.

Indications.—Gas escape in a spring in a comparatively elevated position.

Development.—First regarded as a favorable locality for oil after the famous Lucas well at Spindletop was brought in, January 10, 1901. A local concern, the Jennings Oil Company, hired the Heywood Brothers to sink the first well; well stopped in "pay sand" at 1,822 feet in August, 1901; flowed spasmodically, proving the existence of oil in considerable quantities. First really great wells obtained as the operations advanced to the south and east in 1904. For production, see page 26. Over 450 wells have been sunk in this field. Increase of production was accompanied by the building of wooden, steel, and earthen storage tanks, especially the last, of enormous dimensions. The field was also connected by pipe line with the Southern Pacific Railroad at Jennings, Mermentau, and Egan; the Kansas City Southern Railway at Lake Charles; and Atchafalaya River.

Area.—About 1 square mile, unusually great for a saline-dome oil field.

Geology.—East-northeastern third of the field with *Rangia johnsoni* Miocene fauna within 1,000 feet of the surface—that is, below but 1,000 feet of Quaternary beds; in the west-northwestern half, Quaternary deposits extend to 2,200 feet or even deeper. Great gusher production along or near the north-northeast and south-southwest fault line; material in general exceptionally coarse along this line, and lenses of rock very numerous near the north end of the line in the productive field; oil evidently ascends through fault fissure and spreads out into various pervious sands, in places nearly reaching the surface.

Oil and gas.—Oil heavy, with less sulphur than in Spindletop oil. Gas pressure less than at Spindletop.

References.—Bull. U. S. Geol. Survey No. 212, p. 127; No. 282, p. 94. Louisiana Geol. Survey, Rept. 1902, p. 268; Bull. No. 7, p. 33. Oil Inv. Jour., all numbers from 1901 to 1909, inclusive.

KING'S SALINE.

Location.—Southern Bienville Parish, La., secs. 34 and 35, T. 15 N., R. 8 W.

Topography.—Low bottom lands along Bayou Castor; Cretaceous outcrop with fossils present.

Remarks.—Vicinity not yet tested for oil and gas.

References.—Louisiana Geol. Survey, Rept. 1902, p. 76; Bull. No. 7, p. 56.

KISERS MOUND.

Location.—Western Brazoria County, Tex., 3 miles northwest of Columbia, just west of Brazos River.

Topography.—A mound rising 30 feet above the surrounding plains, more or less irregular in outline.

Development.—Six or eight wells drilled on mound or vicinity, dating from 1901; one well reported to have reached depth of 1,050 feet; a flow of 5 barrels daily of lubricating oil was obtained from one well for sixteen months from a depth of 480 feet; other small showings are noted; some gas and occasional blow-outs are recorded.

Geology.—Rock may be encountered at depth of 60 to 400 feet; irregularly below; porous limestone, sulphur, sandstone with streaks of salt, dolomite in regular masses, pyrite, artesian water, all noted in this true saline dome.

References.—Bull. U. S. Geol. Survey No. 212, p. 125; No. 282, p. 88. Eng. and Min. Jour., July 28, 1904, p. 138. Oil Inv. Jour., February 18, 1907, p. 5; March 5, 1907, p. 17; May 19, 1907, p. 3.

MANY.

Location.—Northeastern Sabine Parish, La., near Rock Spring Church, NE. ¼ sec. 24, T. 8 N., R. 11 W.

Remarks.—Dome structure is inferred here on account of the occurrence of fossils of decided Midway Eocene aspect in region of Wilcox ("Sabine") Eocene. See Louisiana Geol. Survey, Rept. 1899, p. 63.

MARKHAM.

Location.—Matagorda County, Tex., 6 miles northwest of Markham station, 12 miles from Bay City.

Topography.—Low domelike elevation but little elevated above the level of the surrounding plain; axis northeast-southwest.

Development.—Field opened up by Hardy well No. 1, June, 1908; seventeen wells drilled in 1908, five producing, twelve dry, thirteen abandoned.

Geology.—Oil first found in sandy strata in shale, between 1,306 and 1,370 feet; amount of clay remarkable; thickness of oil sand not determined; Hardy No. 1 apparently on south flank of buried northeast-southwest fold (Hager); productive area limited to a few hundred feet. Some wells attain a depth of 1,900 feet.

References.—Oil Inv. Jour., June 19, 1908, p. 1; July 6, 1908, p. 20; February 6, 1909, p. 22.

MATAGORDA.

Location.—Big Hill, Matagorda County, Tex., near mouth of Colorado River, 5 miles northeast of the village of Matagorda.

Topography.—Dome of about 100 acres, rather flat-topped, rising 36 feet above Gulf level, or 20 to 24 feet above the coastal plain.

Development.—Activities in this field increased through 1903 and 1904, culminating in December, 1904, when the field went largely to salt water. Thirty wells had been drilled, about one-half of which were producing. The 4-inch pipe line to the Santa Fe Railway was taken up in 1907. Production: 1904, 80,591 barrels; 1905, 46,471 barrels; 1906, 8,000 barrels; 1907, 4,500 barrels; 1908, 2,000 barrels.

Geology.—A typical coastal saline dome; sections show sand and clay mostly to 800–1,000 feet, according to location on dome; then a cavernous limestone, "cap rock;" sulphur crystals common; best gas and oil obtained near apex of dome; one gas well estimated to flow 5,000,000 cubic feet a day, mostly H_2S mixed with SO_2; hot sulphurous water (99.6° F.) sometimes encountered.

References.—Oil Inv. Jour., April 15, 1904, p. 1; January 19, 1908, p. 12. Bull. U. S. Geol. Survey No. 282, p. 63. Eng. and Min. Jour., July 28, 1904, p. 138.

NEGREET.

Location.—Western Sabine Parish, La., about half a mile above mouth of Negreet Bayou, in the SW. ¼ sec. 24, T. 5 N., R. 13 W.

Topography.—Level, barren stretches on banks of bayou, without vegetation; vegetation killed by brine seepages; strongest brine, however, in bayou.

Remarks.—It is quite probable that the secondary structural features brought about by this and the Coal Bluff saline are responsible for the local concentration of oil and gas mentioned under "Negreet," page 32.

PALESTINE.

Location.—Anderson County, Tex., 6 miles southwest of Palestine.

Topography.—Lowland surrounded by hills 60 feet high, showing Cretaceous beds with fossils; highest surrounding rocks, red sandstone.

Remarks.—Rock salt here has been penetrated to a depth of more than 100 feet; thickness unknown; oil and gas possibilities undetermined.

References.—Texas Geol. Survey, First Ann. Rept., p. 35. Eng. and Min. Jour., July 28, 1904, p. 137.

PETITE ANSE.

Remarks.—Petite Anse, or Avery's Island, as it is frequently called, is a well-known and important salt "island," but so far the writer has learned of no occurrences of oil indications upon or about it. It is situated in western Iberia Parish, La., on a branch of the Southern Pacific Railroad. For description of test wells, salt shaft, etc., see Louisiana Geol. Survey, Bull. No. 7, pp. 14 et seq.

PINE PRAIRIE.

Location.—Northwestern St. Landry Parish, La., on Bayou Chicot; often referred to as Bayou Chicot or St. Landry "marble" quarry.

Topography.—An irregularly eroded district in the border of the hill lands just north of the coastal prairies of southern Louisiana. A few limestone ledges are seen cropping out on a northward-facing hillside.

Indications.—Black, fine asphaltum particles filling limestone pores, in limestones at surface outcrops.

Development.—Limestone worked and burned before the civil war; scores of shallow hand-drill holes about the limestone outcrops to determine extent of limestone. Myles Mineral Company began drilling for oil in June, 1909; several shallow wells sunk through surface rock; wells more than 500 feet deep reach rock salt; a third deep test well is being sunk.

Geology.—The light concretionary limestone of the type seen at Winnfield and encountered in so many coastal wells here comes to the surface; center of uplift is a salt dome; some small quantities of a heavy oil have already been obtained.

References.—Louisiana Geol. Survey, Bull. No. 7, p. 35.

PRICE'S SALINE.

Location.—Northern Winn Parish, La., on Dugdemona Creek, in sec. 30, T. 13 N., R. 4 W., and sec. 25, T. 13 N., R. 5 W.

Topography.—More or less domelike hill half a mile in diameter, 90 feet high, surrounded by low salt licks.

Remarks.—So far as known, no tests for oil or gas have been made in the vicinity of this saline.

References.—Louisiana Geol. Survey, Rept. 1902, pp. 64–70; Bull. No. 7, p. 54.

RAMBO SALINE.

Location.—Northeastern Marion County, Tex., 2½ miles west of Texas-Louisiana state line, very nearly due west of Vivian, La.

Remarks.—This is not an extensive saline, nor do the bordering higher lands rise so abruptly from the flats as is generally the case. However, the smooth, flat barren areas bordered by stunted growths of spinose shrubbery would clearly indicate the true nature of this desolate spot, even though the ruins of former salt works were removed. This saline seems to be some distance north of the northern limit of the Sabine uplift, evidently bearing the same relation to the northward slope of this great subterranean plateau that Bistineau, King's, Drake's, etc., do to the eastern slope. This saline is not known to be mentioned in literature, and hence no references can be given. The writer visited the region in December, 1908.

RAYBURN'S SALINE.

Location.—Southeastern Bienville Parish, La., in sec. 13, T. 15 N., R. 5 W., about 8 miles southeast of Bienville.

Topography.—Low swampy bottoms with extensive "licks." Slight rise to the east with Cretaceous fossils.

Remarks.—There is no record that any test wells have been put down for oil or gas in this vicinity, though the Cretaceous outcrop in a Claiborne Eocene region speaks clearly of the enormous uplifting that has taken place here.

References.—Louisiana Geol. Survey, Rept. 1902, pp. 71–75; Bull. No. 7, p. 54.

SARATOGA.

Location.—West-central Hardin County, Tex.

Topography.—Relief within a radius of a mile perhaps 15 or 20 feet; dissected by tributaries of Pine Island Bayou; no hill nor dome noticeable.

Indications.—Gas escapes and oil seepages; also sulphureted and sour waters.

Development.—Earliest drilling, done by spring pole, obtained a few gallons of heavy oil for medicinal purposes; Savage Brothers drilled a 250-foot well in 1896, yielding an artesian flow of oil and water. Serious attempts toward developing the field commenced after the 1901 success of Beaumont; Hook's No. 1 in 1902 flowed from about 1,000 feet, the Brice well from 400 feet; it became generally understood in 1903 and 1904 that the best horizons were between 800 and 1,000 feet and a large number of wells were sunk to these depths; a second and deeper sand was developed in southwestern part of field early in 1905, producing large amounts of oil for a few weeks, going to salt water. For production, see page 26.

Geology.—Certain rocky layers have been mentioned as reaching the surface in and by a small lake, corresponding evidently to the "lake" at Sour Lake. Fenneman gives few references to consolidated matter in a large number of wells drilled to 1905; sand and clay predominate, with an unusually large percentage of the former; geology of field clearly of Jennings type, though fossils of no greater age than Quaternary were said to have come from just above the shallow oil (800 feet). Salt-dome action is shown in tilting of rocks in the lake.

References.—Oil Inv. Jour., June 1, 1903, p. 3; August 15, 1903, p. 10; January 1, 1905, p. 2; February 3, 1905, p. 1. Bull. U. S. Geol. Survey No. 282, p. 57.

Oil and gas.—Shallow oil, 16° to 18° B.; deeper, 22° B. Suitable for fuel, mostly used for that purpose. Gas found especially above oil, in pockets, under great pressure.

SOUR LAKE.

Location.—Southern Hardin County, Tex., 20 miles in a direct line west-northwest of Beaumont.

Topography.—Dome structure not appreciable at surface; sunken area of Sour Lake somewhat noteworthy; relief scarcely 10 feet.

Indications.—Gas and oil escapes, asphaltum-like masses at the surface, "sour" waters.

Development.—Locality known as a health resort as early as the fifties, the sour-water springs being the attraction; Savage Brothers drilled shallow wells and got some heavy lubricating oil in 1895; a small refinery was opened in 1898, for manufacture of lubricating oil. Serious development began early in 1901; Guffey Company struck gas pocket at 822 feet and found good oil sand at 1,400 feet in summer of 1901; simultaneously, Atlantic and Pacific Company developed oil horizon at 700 feet; new wells, railway connection with Southern Pacific Railroad, pipe lines, steel and earthen tankage soon in operation; over 8,000,000 barrels produced in 1903; present production about 1,500,000 barrels annually.

Geology.—Logs of wells to 1,600 feet or more show usually clays and sands, with thin "rock" layers; oil from various sands. A small east-west area 250 by 700 feet in Wirt, Davis & Gilbert tract underlain by porous oil-bearing crystalline limestone, 20 to 100 feet thick, dipping northeast, at depths of 660 to 880 feet. Rock salt encountered not far beneath porous limestone. Jackson Eocene fossils obtained from Atlantic and Pacific to Cannon tracts, at depths ranging from 1,500 to 1,000 feet or less; Oligocene species from Sour Lake Hotel to Shoestring tract at 800 to 600 feet and probably less.

Oil and gas.—Oil like that at Spindletop, averaging 22° B.; shallow oil, 16° to 18° B.; deep oil (1,300–1,400 feet), 24.7° B. Gas abundant, that from cavernous limestone with oil, poisonous; utilized by gas engines.

References.—Bull. U. S. Geol. Survey No. 212, p. 113; No. 282, p. 88. Louisiana Geol. Survey, Rept. 1902, p. 273. Oil Inv. Jour., August 15, 1903. p. 10; November 1, 1904, p. 3. Eng. and Min. Jour., July 28, 1904, p. 139. Jour. Franklin Inst., vol. 154, p. 234.

SPINDLETOP.

Location.—Northern Jefferson County, Tex., 3 miles south of Beaumont.

Topography.—More or less circular mound about 225 acres in extent, rising in places 15 feet above the level of the prairie.

Indications.—Gas escapes in pools of shallow water; incrustations of sulphur in soil, this being doubtless the controlling indication leading to the sinking of the Lucas well (for sulphur).

Development.—Higgins attempts abandoned (1892) at 300 feet for lack of proper drilling devices; other attempts—Sharp & Co. (1894), J. Loomey (1896), Savage Brothers (1898)—unsuccessful; Lucas interests Guffey Company in probable value of field for sulphur, drilling began on discovery well in October, 1900. Famous Lucas gusher brought in January, 1901, obtaining oil from 1,120 to 1,139 feet; estimated flow, 75,000 barrels daily; fifteen wells completed by July 1, 1901; marvelous development and rapid decline of field shown by statistics of production on page 26.

Geology.—Deeply buried salt dome (1,650 to 1,950 feet), covered by perhaps 600 feet of gypsum, 20 feet of oil-bearing porous crystalline limestone, and 1,000 feet or more of clay, sand, gravel, and hard-rock lenses or layers. Dome flattened centrally, dipping strongly along margins. Oil limestone seemingly not extending beyond pronounced dome structure. Famous gusher product from limestone; later developments in more shallow sands; pyrite and sulphur abundant. All fossils seen latest Tertiary or Quaternary, probably the latter.

Oil and gas.—Gravity 22°-24° B. Average refined products, gasoline 1.8 per cent, kerosene 17.1 per cent, solar oil 15.4 per cent, lubricating oil 52.2 per cent, asphalt, 7.5 per cent. Gas just above oil rock, in enormous quantities, harmless; that in oil rock under great pressure, poisonous.

References.—Trans. Am. Inst. Min. Eng., Richmond meeting, February, 1901; idem, 1902, p. 31. Univ. Texas Min. Survey, Bull. No. 1, p. 8. Louisiana Geol. Survey, Rept. 1902, p. 273; Rept. 1907, p. 100. Bull. U. S. Geol. Survey No. 212, pp. 69–85; No. 282, pp. 18–38. Oil Inv. Jour., all numbers.

STEEN'S SALINE.

Location.—Smith County, Tex., 14 miles north of Tyler, 5 miles east of Lindale.

Topography.—A long, narrow prairie (1 to 2 miles in length) surrounded by hills 30 to 60 feet high showing limestone outcrops.

Remarks.—The writer is not aware that the oil and gas possibilities of this saline dome have been investigated.

References.—Texas Geol. Survey, Second Ann. Rept., p. 223. Eng. and Min. Jour., July 28, 1904, p. 137.

SULPHUR.

Location.—West-central Calcasieu Parish, La., 3 miles northwest of Sulphur station, on the Southern Pacific Railroad.

Topography.—Relief but slight, swampy depression present.

Indications.—Oozing of petroleum, escape of gas, presence of sulphur springs.

Development.—Louisiana Oil Company formed about 1868 to bore for oil; slight quantities obtained at 380 feet; immense sulphur deposits encountered at 443 feet. Importance of sulphur deposits overshadows all else; oil not developed.

Geology.—Apparently a saline dome with an unusually large amount of crystalline sulphur in the porous limestone and gypsum beds.

References.—Louisiana Geol. Survey, Rept. 1899, pp. 25, 126; Rept. 1902, p. 272. Bull. U. S. Geol. Survey No. 212, p. 133.

VINTON.

Remarks.—This low, broad, rock-core dome, located in the coastal prairie about 3 miles southwest of Vinton station, on the Southern Pacific Railroad in western Calcasieu Parish, La., though interesting geologically, has thus far furnished but very small amounts of oil, and these from very shallow depths. See detailed report, page 103.

WELSH.

Location.—Eastern Calcasieu Parish, La., about 3 miles northwest of Welsh station, on Southern Pacific Railroad.

Topography.—A slight swell in the open prairie, due largely to differential erosion.

Indications.—Gas bubbling up in Mr. Wood's irrigation well.

Development.—A well in 1902 encountered some oil at a little more than 1,000 feet; about 25 wells on the slight mound have proved small producers; considerable prospecting in surrounding territory has been without results.

Geology.—Very little consolidated material here encountered; structure unknown, except that certain oil sands in southeastern part of field seem to dip southward; oil in sand about 1,000 feet deep generally.

Oil and gas.—Oil of common heavy saline-dome type, but usually regarded as exceptionally good for lubrication. Gas found over greater area than oil; several remarkable blow-outs recorded.

References.—Bull. U. S. Geol. Survey No. 212, p. 136; No. 282, p. 102. Oil Inv. Jour., December 19, 1907, p. 8.

WINNFIELD (CEDAR CREEK SALINE).

Location.—Winn Parish, La., 3 miles southeast of Winnfield, in secs. 30 and 31, T. 11 N., R. 2 W.

Topography.—Several barren "licks" near Cedar Bayou nearly surrounded by rather abruptly rising irregular, moundlike elevations 5 to 15 feet in height.

Indications.—Gas bubbling up in considerable quantities through springs and shallow water pools.

Development.—Besides several shallow wells, two important test wells have been sunk. The first, in 1904, depth 750 feet, by Winnfield Oil Company, experienced blow-out, lifting 4 inches from hole. Now yields much gas and salt water. The second, in 1907, by Pace Oil Company, encountered rock at 78 feet; after seven months of hard work in rock attained a depth of 1,000 feet; reported as stopped in igneous rock, but will deepen.

References.—Louisiana Geol. Survey, Bull. No. 5, p. 10. Oil Inv. Jour., July 1, 1904, p. 10; April 5, 1907, p. 24.

WINNFIELD (MARBLE QUARRY).

Location.—Winn Parish, La., secs. 19 and 24, T. 11 N., R. 3 W.

Topography.—Rugged, with relief of 70 feet, cavernous crystalline limestone cropping out extensively.

Remarks.—Once extensively worked as a limestone quarry; various reports, not confirmed, that attempts are in progress to test by drilling. This is by far the greatest surface outcrop of the light-blue and white crystalline cavernous limestone so frequently mentioned as a cap rock or oil reservoir in the salt domes of Louisiana and Texas.

References.—Louisiana Geol. Survey, Rept. 1899, p. 56; Bull. No. 5, p. 14, pl. I.

PRODUCTION.

Saline-dome production to January 1, 1909.[a]

[In barrels of 42 gallons each.]

Year.	Louisiana.			Texas.	
	Jennings.	Welsh.	Anse la Butte.	Spindletop.	Sour Lake.
1901				3,593,113	
1902	548,617			17,420,949	[b] 44,838
1903	892,609	25,162		8,600,905	[b] 8,848,159
1904	6,683,066	35,892		3,433,842	6,442,357
1905	8,891,416	10,000	9,000	1,652,780	3,362,153
1906	9,025,174	23,936	23,708	1,077,942	2,156,010
1907	4,895,905	47,316	76,938	1,699,943	2,353,940
1908	4,856,889	43,976	219,265	1,741,070	1,580,655
	35,793,676	186,342	328,911	39,220,544	24,788,112

Year.	Texas.				
	Saratoga.	Batson.	Dayton.	Humble.	Other fields.
1903	150,000	4,518			
1904	739,239	10,904,737			151,936
1905	3,125,028	3,774,841	60,294	15,594,310	46,471
1906	2,182,057	2,289,507	92,850	3,571,445	80,591
1907	2,130,928	2,164,453	108,038	2,929,640	29,286
1908	1,700,986	1,584,500	39,901	3,777,316	94,904
	9,878,238	20,722,556	301,083	25,872,711	[c] 403,188

[a] From Oil Investors' Journal, February, 1909.
[b] Includes production of Saratoga.
[c] Includes 151,936 barrels produced at Matagorda in 1904; 46,471 barrels produced at Matagorda in 1905; 80,591 barrels produced at Matagorda and Hoskins Mound in 1906; 13,267 barrels produced at Matagorda and Hoskins Mound and 16,019 barrels produced at Piedras Pintas and San Antonio (Mission field) in 1907; 15,875 barrels produced at Hoskins Mound, 11,160 barrels produced at Goose Creek, 5,000 barrels produced at San Antonio, and 2,000 barrels produced at Matagorda in 1908.

STRATUM OIL AND GAS.

OCCURRENCE.

The general mode of occurrence of oil and gas at clearly defined geologic horizons, extending in a somewhat continuous manner over vast areas, is well understood. Given water, oil, and gas in a pervious layer sealed above and below by impervious layers, difference in gravity will cause these three substances to be so separated that the water will be below, oil in the middle, and gas on top. Anticlines and quaquaversals of the usual types will naturally cause local concentrations, if the pervious layer is homogeneous throughout.

The large amounts of gas and oil found in the Caddo field, Louisiana, appear to be simply following east and north slopes of a great uplift, and concentrating or reconcentrating along slight anticlinal ridges. Figure 1, taken in connection with the section shown in figure 2, shows these simple stratigraphic conditions very clearly. The writer is not personally familiar with the Corsicana field, but

from written descriptions would judge that the trapping of the oil and gas of that field is brought about by the change in character of the eastward-dipping Cretaceous beds, whereby oil and gas, though urged upward and westward for some distance in coarse-grained layers, are finally stopped by the fineness and compactness of the material they encounter. Hopes may be entertained of finding oil

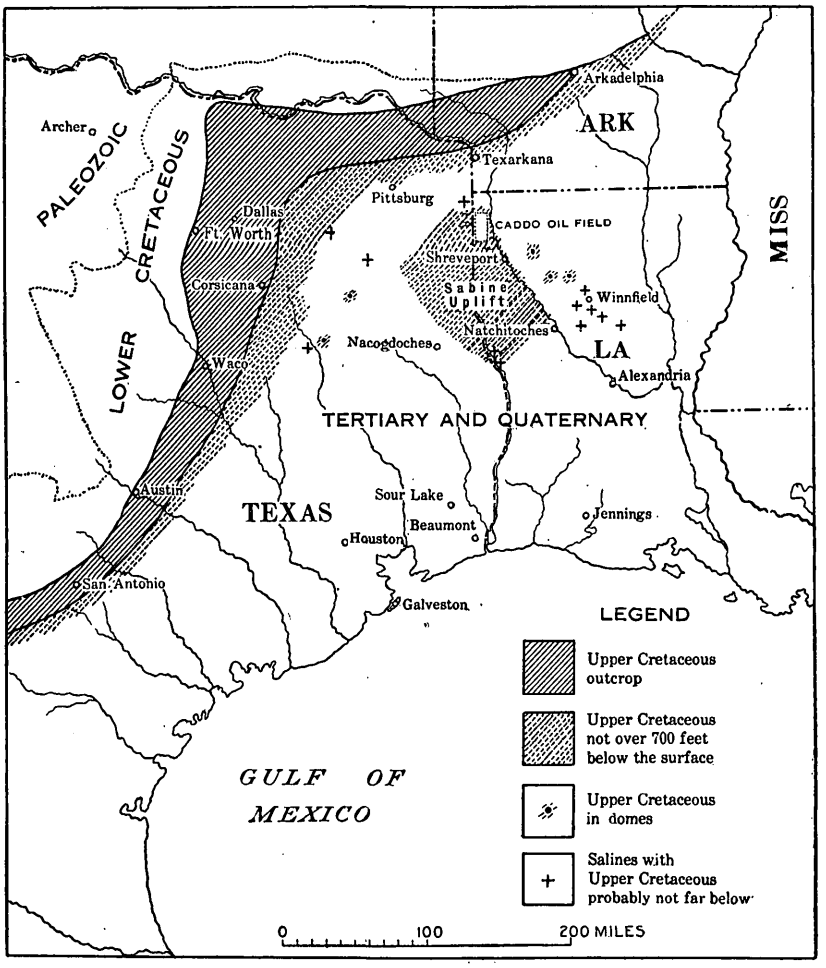


FIGURE 1.—Map showing the important structural features in the Upper Cretaceous (gas and oil bearing) formations in eastern Texas and Louisiana. These formations dip beneath younger (Tertiary and Quaternary) deposits to the southeast. The extensive crustal movements in the vicinity of the Sabine uplift have brought Upper Cretaceous beds up within less than 700 feet of the surface over a large area. This movement has brought about structural features of prime importance in oil and gas concentration.

and gas so entrapped in wells sunk in various places near the Eocene-Cretaceous contact from Arkadelphia to and beyond San Antonio.

The middle Eocene deposits of Sabine Parish, La., and Nacogdoches and Anderson counties, as well as to the south of Austin and San Antonio and near Laredo, Tex., are supposed to contain oil,

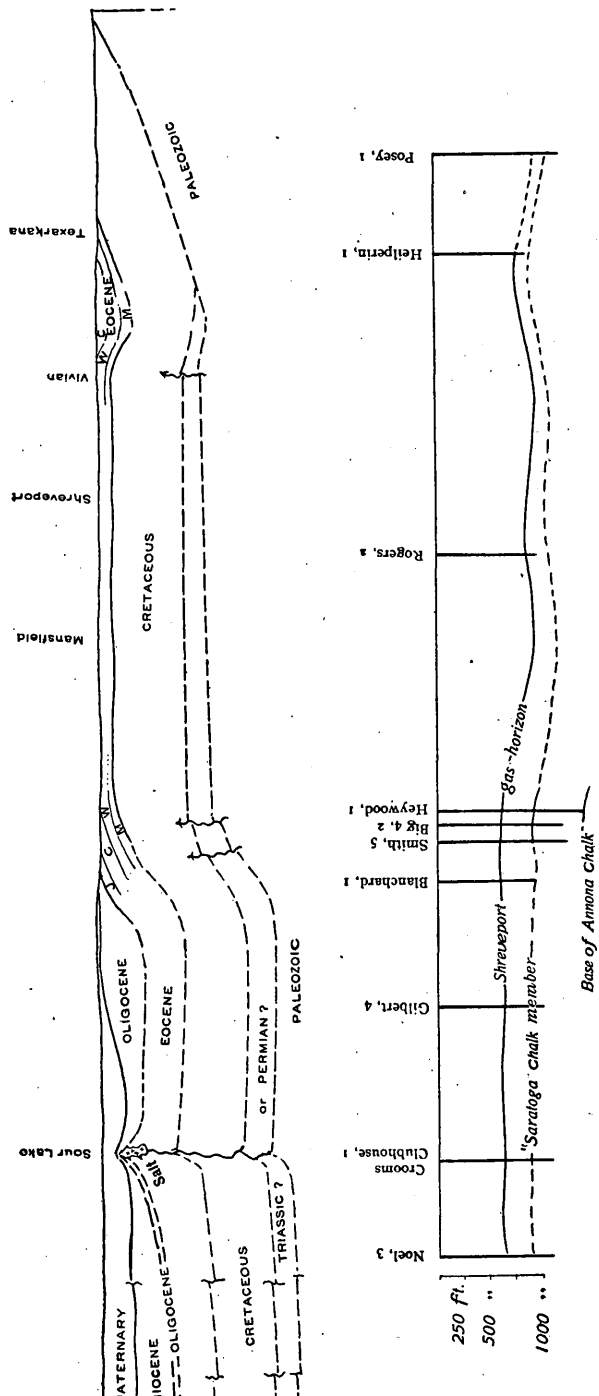


FIGURE 2.—North-south sections through the Sabine uplift. Upper section extending from the Paleozoic outcrop in Arkansas, north of Texarkana, through the Caddo field, and Sour Lake to the Gulf near Galveston. Lower section showing slight folds in Upper Cretaceous beds in the Caddo field, from Posey No. 1 well near Vivian to Noel No. 3 well near Mooringsport.

locally at least, of the wide-extended or stratum type. The geology of these deposits, however, is not clearly understood, and the presence of salines near some of the oil localities renders their classification by no means certain.

SYNOPSIS OF STRATUM OIL AND GAS STATISTICS.

ARRANGEMENT.

The saline domes were discussed in alphabetic order, for each structure of that type is separate and independent, without any connection whatever with similar structures of neighboring or distant districts. This arbitrary arrangement is inapplicable or at least undesirable for the stratum oil and gas occurrences, which have a direct, well-understood stratigraphic continuity from one field to another. The primal classification and subsequent arrangement of the statistics should be made on a stratigraphic basis. In a general way, even ten years ago, the division of eastern Texas petroleum products into Cretaceous and Eocene was often made and well understood. A surprisingly small amount of work has been done, however, in eastern Texas, in referring oil-bearing strata to definite stages or formations. Not one occurrence, so far as the writer is aware, has been so fixed beyond doubt. In view of these facts it seems most logical to treat, first, the comparatively well understood Cretaceous oil and gas horizons of Louisiana, then the ill-determined fields of Texas, and last the less important Eocene occurrences in the two States.

CRETACEOUS.

CADDO.

Location.—North-central Caddo Parish, La., 20 to 30 miles northwest of Shreveport.

Topography.—Low, undulating, slightly dissected stretches between the raft period Ferry Lake and Red River bottoms. Contains many of the much-discussed small "mounds."

Indications.—Gas escapes in pools of water and even in Caddo Lake.

History.—Gas piped to hut of pioneer and used for domestic purposes for several years before drilling was undertaken; this, with indications mentioned above, led to drilling.

Development.—Savage, Morrical & Savage erected first derrick, May, 1904; high-grade oil (35° to 37° B.) at length found at depth of 1,556 feet; subsequent development slow on account of the lack of great gushers. Gas in great quantities, under great pressure, at several horizons, causing notorious blow-outs, "burning wells," and "geysers," and making the district unhealthful. About two hundred wells drilled to close of 1908, producing in 1908 one-half million barrels of oil and furnishing Shreveport and Texarkana gas for all fuel purposes. Most of the gas wells capped, but 70,000,000 cubic feet let run to waste daily.

Area.—Oil development covering about 23 square miles; gas nearly twice that area.

Geology.—Field located on the north corner of Sabine uplift (see fig. 1); all oil and gas from Upper Cretaceous; main gas horizon now used, Nacatoch; gas and oil of light gravity, in Annona chalk; main oil horizon, light and heavy oil, Woodbine sand, depth 2,100 to 2,300 feet. See section (p. 30).

Generalized section of Caddo field.

System and series.	Formation.	Kind of material.	Approximate thickness.	Approximate depth.
			Feet.	*Feet.*
Quaternary.		Red and gray sand, clay, gravel.	20	20
Tertiary (Eocene series).	Wilcox ("Sabine") formation.	Dark lignitic sands and clays, with calcareous bowlders.	430	450
	Midway formation.	Dark clay, with a limestone bed here and there.	200	650
Cretaceous (Gulf series).	Arkadelphia clay.	Dark stiff clay.	150	800
	Nacatoch sand.	"Shreveport" or "Caddo" gas sand; contains some hard layers.	130	930
	Marlbrook marl.	Blue marl, with chalky layers ("Saratoga" chalk member) at about 1,150 feet.	350	1,280
	Austin group. Annona chalk.	Chalky layers with many fossil fragments, often with strong odor of oil. Occasionally good oil at about 1,575 feet. Gas common.	320	1,600
	Austin group. Brownstown marl.	Clay, chalk, and sand, with hard pyrite layers.	200	1,800
	Eagle Ford clay.	Blossom sand member. Gas at 1,800 feet.	50	1,850
		Blue tough clays, with hard limestone and pyrite layers.	350	2,200
	Woodbine sand.	Sand beds at depths ranging from 2,140 to 2,300 feet, according to local structural features. They contain the "deep" oil and gas of the Caddo fields. Salt water common.	100+	2,300+

Oil and gas.—Gravity of oil from first gas sand, Nacatoch sand, 21° B.; Annona chalk, 37°–39° B.; Woodbine sand, 22°–43.5 B. See analyses, page 131. Gas, methane, 95 per cent; nitrogen, 2.56 per cent; carbon dioxide, 2.34 per cent.

References.—Oil Inv. Jour., November 6, 1908, p. 18. Iowa Geol. Survey, Bull. No. 8. For general geology of northwestern Louisiana and adjacent territory, see Prof. Paper U. S. Geol. Survey No. 46.

MINOR LOCALITIES IN ARKANSAS AND NORTHEASTERN TEXAS.

Hope, Ark.—A. P. Dyke's test well, south of Hope, reported as setting casing in limestone at 800 feet. (Oil Inv. Jour., June 6, 1909.)

Texarkana.—Blow-out recorded in test well north of Texarkana December 6, 1908. J. D. Cook well, on College Hill, 2,300 feet deep with some gas. (Oil Inv. Jour., December 19, 1907.)

Sulphur Springs, Tex.—A 1,500-foot well noticed in Prof. Paper U. S. Geol. Survey No. 46; no mention of oil or gas indications.

Cobbs Switch, Tex.—Test wells sunk here and pronounced dry. (Oil Inv. Jour., September 19, 1907.)

CORSICANA.

Location.—Central Navarro County, eastern Texas. (See fig. 1.)

Topography.—Practically a plain, but slightly dissected.

Indications.—None at surface; oil in water well at 1,027 feet.

Development.—Oil discovered by Maj. Alex. Beaton about or somewhat prior to 1894, in water well at 1,027 feet; well sunk to 2,470 feet, but oil came up around casing. First well put down for oil 200 feet south of water well, 1895; yields 2½ barrels daily. First well of importance sunk, 1906; yields 22 barrels daily. Refinery erected, 1898, utilizing production of 62 wells then producing. Gas utilized in the town for fuel purposes. Greatest yield, 1900, 829,560 barrels; steady decline thereafter.

Area.—From 12 to 15 square miles, elliptical in shape, longer axis trending northeast-southwest.

Geology.—Oil found highly siliceous, soft gray shale at a depth of approximately 1,050 feet, bed dipping southeast, 53 feet to the mile; horizon above Austin group, but whether Navarro or Taylor (corresponding roughly with Nacatoch and Marlbrook) not yet determined. Slight differences in character of the "sand" and minor folds cause great variations in production of various wells, as in the Caddo field.

Oil and gas.—Thiele gives for Corsicana oil, naphtha, 10.8 per cent; kerosene, 54.5 per cent; residue, 34.7 per cent; gravity, 0.8206. Of 1,015 wells in 1900, but 27 were classed as gas wells; gas found also somewhat outside of oil territory; pressure in places 200 pounds a square inch.

References.—Univ. Texas Min. Survey, Bull. No. 1, pp. 6, 36. Bull. U. S. Geol. Survey No. 184, p. 38.

POWELL.

Location.—Eastern Navarro County, Tex., 8 miles east of Corsicana.

Development.—Field opened in September, 1900, and that year produced the greater part of the 6,479 barrels of heavy oil accredited to the State of Texas. Year of greatest production was 1906—673,221 barrels; a steady decline thereafter.

Geology.—Oil generally conceded to come from higher horizon than Corsicana output; beds also dip eastward; depth of wells from 700 to 1,100 feet.

Oil.—Classed as heavy, ranging in gravity from 23° to 28° B.

References.—Univ. Texas Min. Survey, Bull. No. 1, p. 39. Bull. U. S. Geol. Survey No. 184, pp. 54–55. Oil Inv. Jour., January 3, 1906.

RICE.

Remarks.—Ten miles north of Corsicana, Tex., near Rice, a small amount of light oil (38° B.) is obtained; it is evidently the geologic equivalent of the oil from the "sand" at Corsicana.

SOUTH BOSQUE.

Location.—Near Waco, McLennan County, Tex.

Remarks.—Small oil field discovered by a Mr. Prathers in shallow-water well on the Bosque, 1890. Oil rich in paraffin; 26 wells in 1908 produced 5,200 barrels. See page — for total output of field.

References.—Oil Inv. Jour., January 19, 1908; February 6, 1909.

ELGIN AND VICINITY.

Remarks.—Three 300 to 400 foot wells near Elgin, reported as furnishing good lubricating oil from Cretaceous strata. Three similar wells near Lockhart. Caldwell produced similar results (Univ. Texas Min. Survey, Bull. No. 1, p. 36). A well in the Davilla field in Milan County near the Bell County line is reported as a failure (Oil Inv. Jour., July 5, 1907).

SAN ANTONIO AND VICINITY.

Remarks.—Some oil reported from water wells in San Antonio, 500 feet deep; Dullnig wells, 7 miles south of San Antonio, produced 48 barrels in 1889; oil known from wells 10 miles southwest of San Antonio. Twelve miles south of San Antonio wells between 1,000 and 1,100 feet deep, drilled in 1906 and 1907, furnish 3 barrels daily; one shows rock pressure of 180 pounds. Calaveras, Wilson County, 20 miles southeast of San Antonio, has "showing" of oil at 750 feet.

References.—Univ. Texas Min. Survey, Bull. No. 1, pp. 4, 50. Bull. U. S. Geol. Survey No. 282, p. 92. Oil Inv. Jour., February 19, 1908, p. 4; March 5, 1907.

EOCENE.

Indications of oil and gas are found at intervals from Sabine Parish, La., to the vicinity of Laredo, Tex., on the Rio Grande, along the outcropping belt of the Claiborne or mid-Eocene beds. To this geologic horizon, perhaps, some of the gas and oil occurrences may be referred with as much assurance as the various Cretaceous oils have been correlated with certain horizons in that system. But too little is known regarding the geologic details of most of these Eocene localities to admit of positive and final reference. Moreover, the presence, known or suspected, of saline domes in close proximity to the oil and gas occurrences thus far known in the Eocene formations tends to give the impression that these may be seepages from Cretaceous rocks several hundred, if not several thousand, feet below.

LINCOLN PARISH, LA.

Waterworks well and Ruston Oil and Development Company test well at 785 feet pass and case off a "sand" yielding 5 or 10 barrels a day; the Ruston well obtained nothing below to depth of 1,879 feet (Oil Inv. Jour., Ausust 23, 1907). As fossils coming from this well at depths of more than 700 feet are of Claiborne age, there is little reason for supposing that there is here an oil-collecting uplift in underlying Cretaceous strata, as in the Caddo field.

SABINE PARISH, LA.

Negreet.—Two or three miles southwest of Negreet about half a dozen shallow wells, sunk by Doctor Foster, yielded small quantities of oil and gas; the Producers' Oil Company is reported to have taken the matter in hand for future exploitation.

Columbus.—Near Columbus, in sec. 12, T. 4 N., R. 12 W., J. M. Guffey put down a well 500 feet, July, 1906. One-fourth mile from this well, on Chris Anthony's farm, a gas "showing" was reported between 400 and 500 feet, February, 1909.

Fort Jessup.—Near Fort Jessup the Sabine Valley Oil Company "twisted off" at 1,375 feet after passing oil showing at 1,200 feet. This prospect is near the old hole drilled by Mrs. Van Epps about five years ago, known as the Fort Jessup Oil Company test, which was abandoned after reaching a depth of 1,568 feet on account of a twist-off that could not be fished out. P. M. Schuman did the drilling (Oil Inv. Jour., July 6, 1909).

VERNON PARISH, LA.

Leesville.—Test well at Leesville by Beaumont people reported at a depth of 960 feet August 4, 1909.

SABINE COUNTY, TEX.

East Texas Oil and Timber Company's 1,250-foot test well near Sabine River, 1 mile below Robinsons Ferry, found no encouraging indications (Prof. Paper U. S. Geol. Survey No. 46, pp. 37, 324).

ANGELINA COUNTY, TEX.

Vicinity of Lufkin well exploited during past five years. Layne & Fowler encountered oil "showings" at about 1,200 feet. Same showing found in O'Brien well, but was cased off and well deepened to 1,700 feet without favorable results, July 20, 1909.

NACOGDOCHES COUNTY, TEX.

Location of oil field.—From 14 to 18 miles southeast of town of Nacogdoches.

Topography.—Two groups of wells, one in the valley of Mast Creek, the other about 2 miles to the southwest, in the bottom lands of a tributary of this creek, at Oil City.

Indications.—"Boiling water," caused by the escape of gas; iridescent films on the surface of the water; sulphureted waters.

Development.—Discovered in 1867; few wells sunk till 1887; 90 shallow wells put down between 1887 and 1890. First pipe line in Texas, about 14½ miles long, connected this field with town of Nacogdoches. Field practically abandoned of late; Higgins Oil and Fuel Company's 2,000-foot well (1907) showed no "indications" below 285 feet.

Area.—Most of the wells in two groups, each occupying nearly a square mile.

Geology.—Predominant surface rock greensand of Claiborne (mid-Eocene) age, in places weathered reddish; oil apparently in similar, somewhat pervious beds between clayey layers; wells 70 to 200 feet deep; local heavy dips abundant.

Oil.—Heavy (0.9179 at 62.6° F.), asphaltic, similar to saline-dome oil, used for manufacture of lubricants.

References.—Univ. Texas Min. Survey, Bull. No. 1, pp. 1–5. Bull. U. S. Geol. Survey No. 282, pp. 70–72. Oil Inv. Jour., June 19, 1907.

Cushing.—In northern Nacogdoches County, at Cushing, a test well was recorded in rock at 850 feet, July 20, 1908.

ANDERSON COUNTY, TEX.

Palestine.—At Palestine water wells 500 to 600 feet deep show no signs of oil or gas; but 10 to 12 miles east three shallow wells afforded some heavy oil (Oil Inv. Jour., August 20, 1908).

BURLESON COUNTY, TEX.

Caldwell.—About 16 miles southeast of Caldwell, Mound Prairie Oil and Gas Company report indications of oil at 400 feet, but nothing below to bottom of well. 2,000 feet (Oil Inv. Jour., June 19, 1907).

GONZALES COUNTY, TEX.

Ottine.—Vicinity of Ottine has been much prospected; before 1906 nine wells were sunk within 3 miles of town; some oil obtained from shallow wells; gas reported abundant at 900 feet. This field is remarkable for showing "mounds" in process of formation. Heywood Company test well is 1,630 feet deep on Brown Company's land (Oil Inv. Jour., November 19, 1907). Now being deepened by Producers' Oil Company.

WEBB COUNTY, TEX.

Aguilares.—North of Aguilares, 30 miles east of Laredo, a 5,000,000-foot gas well reported; pipe line contemplated to Laredo (Oil Inv. Jour., December 20, 1908).

Remarks.—Too little is known regarding the stratigraphy of the geologic formations in southern Texas along the Rio Grande to admit of drawing any well-founded conclusions regarding probable locations of oil and gas fields. But the extraordinary broadening of the Claiborne beds along this river, the size of the gas well at Aguilares, and the presence of a well-defined salt dome at Piedras Pintas, in Duval County, not

far to the east, at least suggest a striking parallelism with the Sabine uplift in northwestern Louisiana, with scarcely no southern dip for 100 miles and with its great gas wells and saline domes to the east.

PRODUCTION.

Production of stratum oil fields in Louisiana and eastern Texas.[a]

Year.	Corsicana.	Powell.	South Bosque.	Caddo.
1896	1,450			
1897	65,975			
1898	544,620			
1899	668,483			
1900	829,560	6,479		
1901	763,424	37,121		
1902	571,059	46,812		
1903	401,817	100,143		
1904	374,318	129,329		
1905	311,554	132,866		
1906	332,622	673,221	1,300	4,650
1907	226,311	596,897	8,000	48,266
1908	211,335	398,649	5,200	513,504
	5,302,528	2,121,517	14,500	566,420

[a] From Oil Investors' Journal, February 6, 1909.

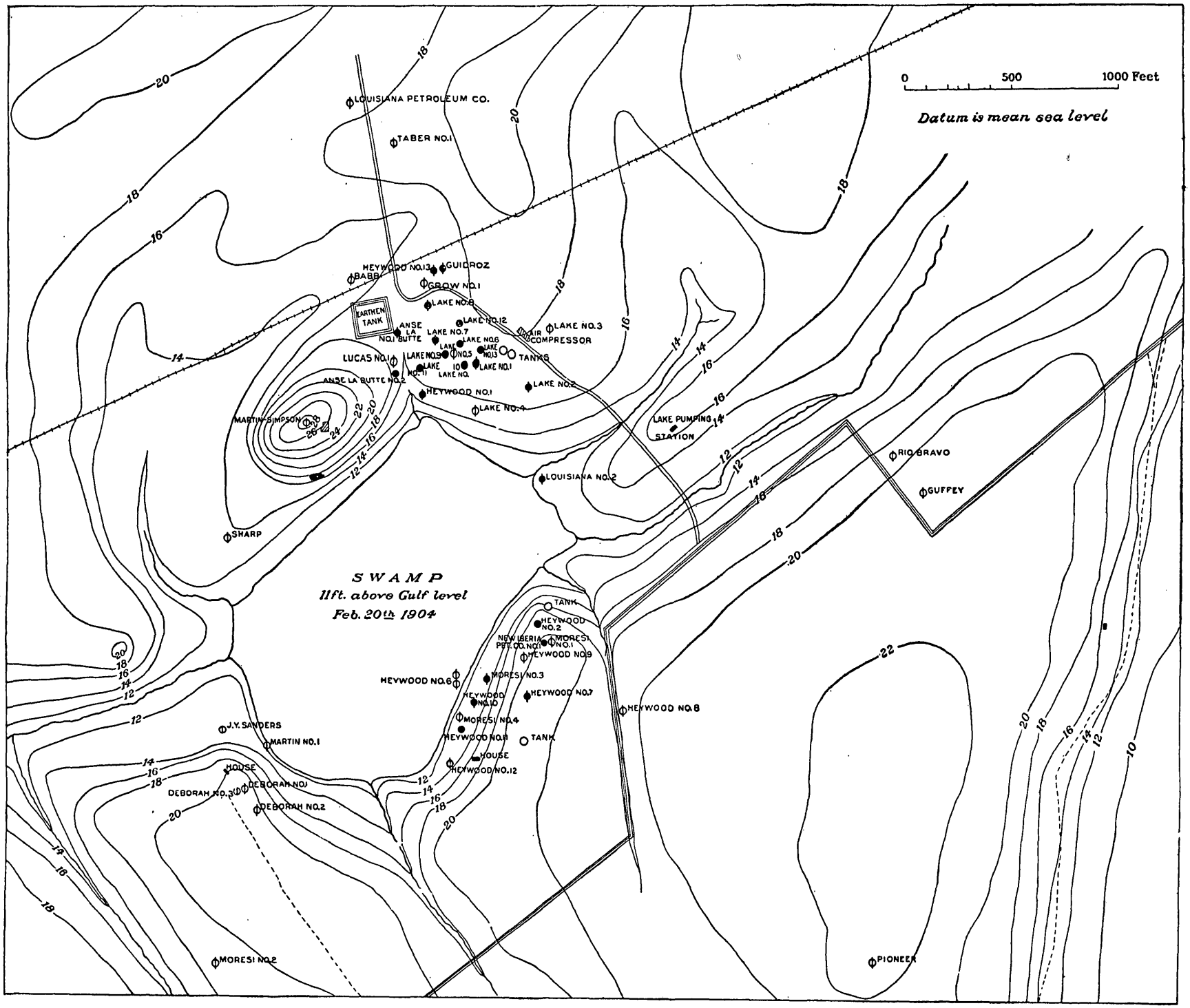
DETAILS OF OIL AND GAS FIELDS AND PROSPECTS IN LOUISIANA.

SALINE-DOME FIELDS AND PROSPECTS.

ANSE LA BUTTE.

Location and topography.—The Anse la Butte field is located on the highway between Lafayette and Breaux Bridge, about 6 miles from the former and 3 from the latter, in St. Martin Parish. About 3 miles to the east, flowing southward, is the navigable Bayou Teche; about 1 mile to the west is the smaller stream, Bayou Vermilion, flowing likewise in a southerly direction. Between the borders of the main streams (the bayous) and the various smaller streams (the coulées) the country is a very slightly rolling prairie. Except for the "butte" itself, the field is remarkably low, only a few feet above sea level. (See contours on map, Pl. II, also Pl. III.) Temporary bench marks on a line of approach to the field from Lafayette or Breaux Bridge serve to emphasize this fact.

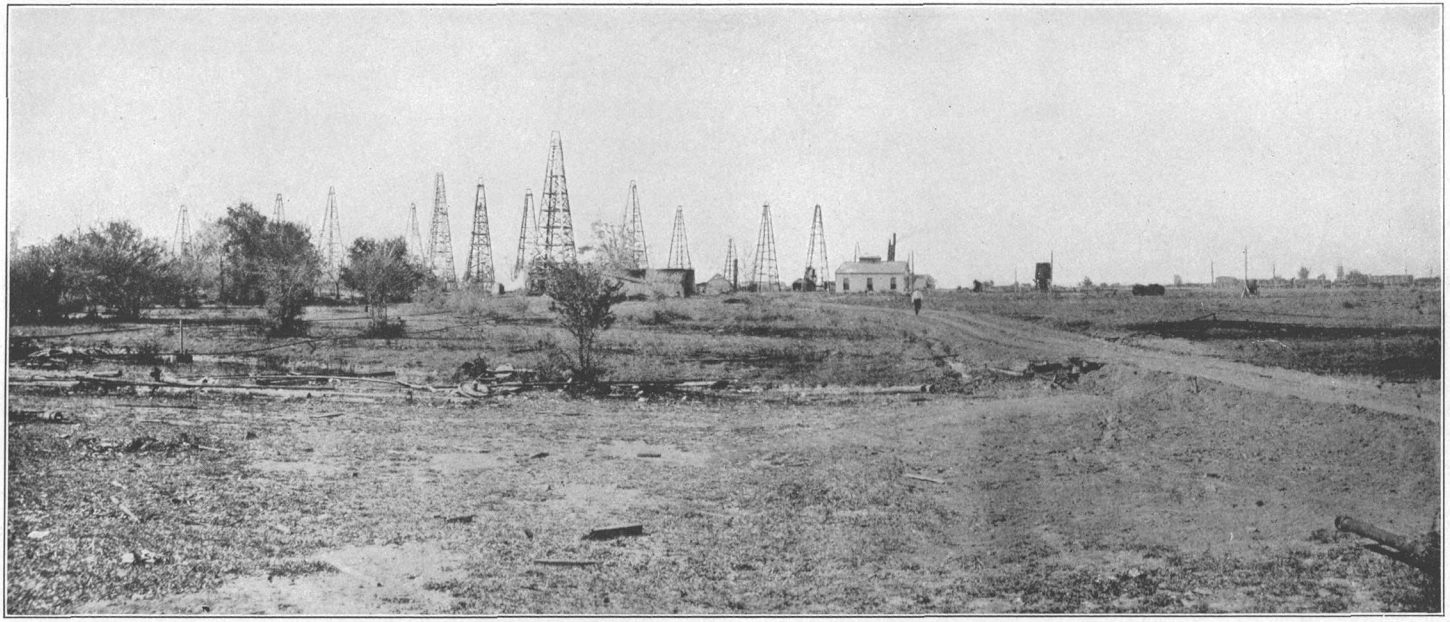
	Feet.
Lafayette, top of rail, Southern Pacific Railroad station	40
First angle in road, one-half mile northeast	39.2
Third angle, 1½ miles east	39.9
First small coulée bridge, 2 miles east, floor	31.5
Big bayou, between fourth and fifth angles in road, 3 miles east:	
Top of bridge railing, right side going east	27.2
Water	22.3
Long bridge over overflow channel one-half mile west of Bayou Vermilion bridge, floor	15.5



Drilling Dry hole Producing Abandoned producer

TOPOGRAPHIC MAP OF ANSE LA BUTTE OIL FIELD.

Observe the slight relief of the field, the quadrangular form of the swamp, and the slight elevations close to the swamp, especially the "butte" to the north. Most of the "abandoned producers" have never produced much oil.



ANSE LA BUTTE OIL FIELD, LOOKING NORTHWEST.

The swamp underneath which the solid rock-salt dome is located may be seen at the extreme left; the low "butte" lies immediately beyond, hidden by foliage; the curved outline of the depression, the cove, the "anse" and the slight elevation, the "butte," gave the field its name. Most of the successful wells are located centrally in the group of derricks shown. An "air plant," the Lafayette and Baton Rouge branch of the Southern Pacific Railroad, and loading racks can be seen at the right.

	Feet.
Bayou Vermilion bridge:	
Floor	15
Water, January 6, 1903	10.6
January 15, 1909	4
Nail head in gum tree cut off for gate post, entrance to oil field	18.7
Bayou bridge 1 mile east of oil field, floor	13
Railway, top of rail	25.6
Breaux Bridge railroad station, top of rail	27.5

History.—The first references to any serious effort to develop the mineral resources of the Anse la Butte field have been kindly furnished by Mr. Charles S. Babin, jr., of Lafayette, La. It appears that as early as April 4, 1893, Mr. Babin was appointed special agent to "sell, rent," or in any way advantageously manage the "mines" of "coal, oil, sulphur, iron, gas, or whatever else may be found" on the lands of Mrs. Emma Pelletier (42 arpents) and Honoré Breaux (40 arpents). Interest in the field was aroused solely on account of the quantities of inflammable gas that came out from the marsh lands surrounding the principal "butte." Paul Ledanois was the first to attempt boring, with the aid of a machinist, but he encountered some difficulties, and at a depth of 40 or 50 feet discontinued the undertaking. In 1899, as shown in Plate XI of the Louisiana State Survey report for that year, two iron pipes thrust into the ground for a few feet at this locality conducted gas to a height of 6 or 8 feet, where it was lit and at night furnished light for a local gathering. During the same year Capt. A. F. Lucas was on the ground attempting to drill an oil well in spite of poor tools and meager financial support. He soon left for Beaumont, Tex.

The finding of oil at Spindletop early in 1901 caused renewed activity at Anse la Butte. The Moresi Brothers, of Jeanerette, drilled their Pioneer well during the fall of that year. During the following summer they drilled their No. 1 close to the "swamp." Heywood No. 1, on the north side of the swamp, very near the point where the gas had always been most noticeable at the surface, was the first to show that oil existed in considerable quantities at Anse la Butte. However, the extreme fineness of the sand was supposed to be an insurmountable obstacle in the way of oil production, and the Heywood rig was moved over to No. 2, on the south side of the swamp, but met with no marked success. The rig was then moved back to No. 1, the well was bailed, and for the first time a clear stream of oil gushed 25 feet high, convincing that a new oil field had been discovered.

Wells of less than 100 barrels were brought in now and then for the next few years, but little attention was given to Anse la Butte till late in 1907 (November 14), when the Lake Oil Company brought in its No. 7, with an initial capacity between 3,000 and 4,000 barrels daily. In spite of the fact that enough drilling had been done about the field to show that it was an extremely local uplift with a salt core

coming very close to the surface and with exceedingly steep local dips immediately about this core, old oil producers invested heavily and commenced putting down wells as far as three-fourths of a mile from the swamp. The failure of such undertakings, together with the growing importance of other fields, notably Caddo, caused attention again to be directed elsewhere. However, the Lake Company has put down 16 wells in all, most of which have been producers. Nearly all the successful wells have been within less than 500 feet from the swamp. So far as the writer is aware none more than 900 feet from the swamp can be classed as producers.

Structural features.—Study of the local salt masses in Louisiana and eastern Texas [a] proves that the very presence of such material in any considerable quantity indicates a pronounced dome structure with quaquaversal dip. The drillers speak of "drilling a little distance away from the swamp, where the strata are less disturbed." Fenneman remarks: [b]

> A 6-inch core of rocks taken from one of the wells on the east side of the swamp shows markings which are inclined at a high angle, presumably toward the southeast. These lines have been supposed by some to represent bedding and therefore to indicate a pronounced uplift near the center of the field. From an examination of the core referred to the inference is believed to be not wholly established. The markings resemble joints or fractures which have been recemented quite as much as bedding planes.

Even if the correctness of this inference is granted (though the writer believes it incorrect) there still remains the necessity of admitting some very serious disturbances whereby solid rocks could be shattered along planes dipping 45°.

Lake Grow continued to obtain good oil from Lake well No. 9 when No. 7 had practically gone to salt water, even though No. 9 was drawing from a slightly deeper level than No. 7. Evidently the two wells were not yielding oil from the same bed; the upper, outer bed was being flooded with salt water, while the lower, inner one was still bearing oil.

A bed of very characteristic univalve shells was encountered in Grow well No. 1 at a depth of 1,920 feet, and in Lake well No. 8, 100 feet nearer the swamp, at 1,910 feet, showing a dip to the north of 1 in 10. The top of the oil sand in Lake No. 9 is at a depth of 1,841 feet; in No. 6, 7 feet to the northeast, it is at 1,848 feet, showing a northeasterly dip of about 1 in 11. Hard rock cores brought up in Lake No. 2, according to Mr. Grow, proved a dip of 10° away from the swamp. The heavy gravel bed extends in Lake No. 9 to a depth of 460 feet; in Grow No. 1, but 370 feet away, it extends to 620 feet. The André Martin well, on the south side of the swamp, is said to

[a] Bull. Louisiana Geol. Survey No. 7, 1907.
[b] Bull. U. S. Geol. Survey No. 282, 1906, p. 109.

have passed through very much disturbed salty masses. The Deborah wells are reported as passing through great rock masses at comparatively shallow depths. A slight distance from the swamp, however, the beds are probably quite horizontal. The Guffey and the Heywood No. 8, drilled at about the same time, are reported to have passed through the same kinds of material at the same depths.

Central salt mass.—Salt in a somewhat disturbed condition occurs in the André Martin well on the south side of the swamp at depths from 245 to 1,530 feet, the bottom of the well. Salt has also been struck in at least one of the wells on the southeast margin of the swamp, but exact data regarding depth are not available. From Louisiana well No. 2 (see map, Pl. II) no salt has been reported. Lake No. 4, on the north side of the swamp, passed through alternating beds of salt and gypsum from about 375 to 2,187 feet, the bottom of the well. Heywood No. 1 went through salt between depths of 268 and 540 feet, and again between 1,350 feet and the bottom of the well, 1,550 feet. In the original Lucas well a bed said to contain some salt was encountered at 290 feet. Salt is reported as extending from 283 feet for about 100 feet in Anse la Butte No. 2, again at 1,600 and at 1,784 feet, but at 1,910 feet occurs an "oil sand" that has yielded 30 barrels a day on air pressure. The Martin-Simpson well on top of the hill passes through salt from 390 to 570 feet and again from 578 to 790 feet, below which, strangely enough, sand and gravel are reported. According to Fenneman, the Sharp well entered salt at 220 feet and continued in it to the bottom at 1,803 feet. It is true that well sections obtained from various sources from one to six or eight years after the wells have been put down are unreliable, and many of the figures given above are doubtless wrong, and so likewise may be the sections given in figure 3. Nevertheless, certain general conclusions can be drawn from them as a whole. No salt appears in the Lake No. 9, only 300 feet from the margin of the swamp. The record of Lake No. 11 is not at hand, but salt is reported in both Anse la Butte No. 2 and Heywood No. 1, as stated above. From the records of the Sharp, Martin-Simpson, Anse la Butte No. 2, Heywood No. 1, and Lake No. 4 (fig. 3, a), it is evident that in general the nearer the swamp is approached the more salt is encountered. Figure 3, b, shows the supposed stratigraphic relations of the beds between Lake No. 4 and Anse la Butte No. 2.

Plate IV gives four well sections from the north edge of the swamp northward for about 650 feet. These show conclusively how impossible it is to predict the depth of "pay sand" at any given locality. Aside from the gravel and sand stratum near the top of each section, there is nothing that can be traced with certainty from well to well.

Plate V shows sections of wells south, east, and north of the swamp at distances varying from one-fourth to one-half mile. These wells

show a general preponderance of clay beneath the superficial gravel and sand. Owing probably to a lack of care in taking samples frequently, the sections of the Moresi No. 2 and Pioneer doubtless indicate less sand than these wells really contain. The Heywood-Sharp well, near the north limit of the area mapped on Plate II, was drilled by H. H. Jones, who is unusually careful in his log records. The section compiled from his records doubtless represents the usual run of sand and clay beds in this portion of the State.

Occurrence of oil.—Coarse, shallow sands on the southeast side of the swamp have furnished a small amount of oil for the past six years. Heywood No. 2 showed oil sand at 400 to 485 and 570 to 593 feet. This well was drilled in 1903. The New Iberia Petroleum Company's well (740–760 feet) was finished in January, 1909, and furnished in February 50 barrels daily on air pressure. Moresi No. 1 gave salt water at 1,150 feet; Heywood No. 8 furnished 5,000 barrels of salt water at 2,406 feet; Heywood No. 11, credited with a depth of 840 feet, furnished for over a year about 100 barrels of oil daily, together with 800 barrels of salt water; Heywood No. 12 tested salt water at 1,100 and 1,300 feet, and was abandoned in April, 1908.

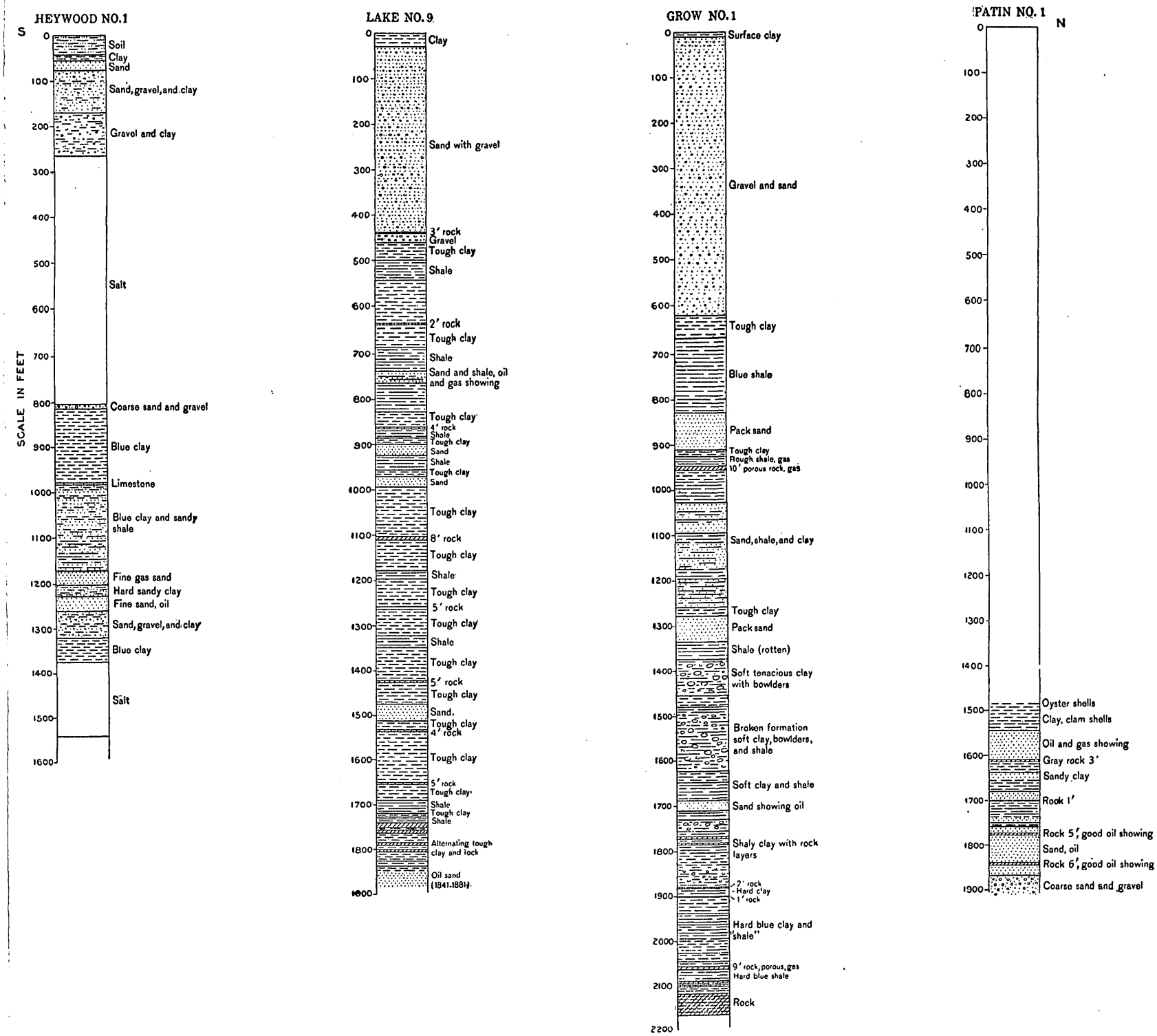
The Deborah wells, on the south side of the swamp, have all been abandoned, so far as can be learned at depths ranging from 600 to 1,000 feet, on account of salt water. Deborah No. 3 showed very favorable signs of being a producer at about 900 feet when the writer visited the field in November, 1908.

Heywood No. 1 furnished oil through a slit in the casing at about 1,000 feet from an oil pocket caught under a salt mass. (See fig. 3, *B*.) The original Lucas well showed some oil between 250 and 350 feet. Anse la Butte No. 2, 1,910 feet deep, furnished in February, 1909, 30 barrels of oil and 300 of salt water daily.

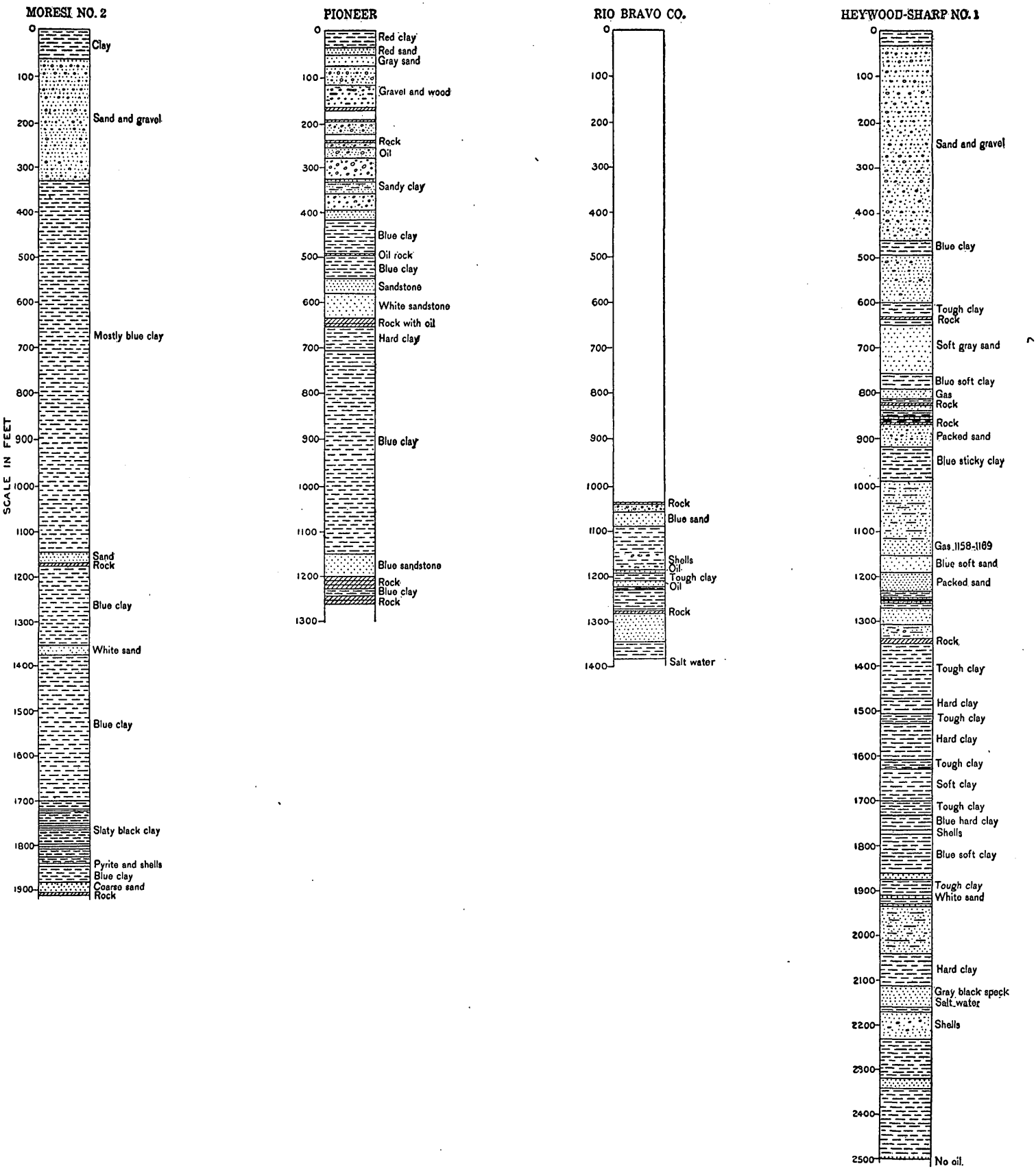
Lake No. 7 is said to have penetrated 30 feet of oil sand between 1,835 and 1,865 feet; above the sand are "regular formations with much good gumbo." The 6-inch casing was set at 650 feet and the well drilled with a diameter of 4 inches the rest of the way. The Oil Investors' Journal remarks (vol. 6, No. 12, p. 1):

> Ordinarily it would be considered next to impossible to complete a well with one string of pipe and shut off the water as has been done in the case of this hole. It is stated that the strainer—No. 40 Keystone— was screwed onto the 4-inch pipe and a gunny sack wrapped around the top of the screen to make a tight joint above the sand. The wash pipe was lowered into the well, and when the upper portion of the strainer had been cleaned out oil appeared, going over the derrick.

This was November 14, 1907. This well flowed for ten days, making from 3,000 to 4,000 barrels daily, but on November 24 stopped for half an hour, then flowed again by heads. It then made 2,400 to 2,700 barrels daily, including fine sand and about 35 per cent of water. The temperature of the oil was 130° F.; it tested 22.5° Baumé when re-



WELL SECTIONS IN THE NORTHWESTERN PORTION OF THE ANSE LA BUTTE OIL FIELD.



WELL SECTIONS IN THE VICINITY OF ANSE LA BUTTE, ABOUT HALF A MILE FROM THE CENTER OF THE UPLIF

duced to 60° F. Three months after this well was drilled it was producing about 1,300 barrels daily of liquid, about half of which was oil.

The success of Lake No. 7 in the so-called "deep sand" was the signal for the commencement of extensive operations in this field. Besides a great amount of "wildcatting" in surrounding territory, old wells were cleaned out and deepened. Among those so operated

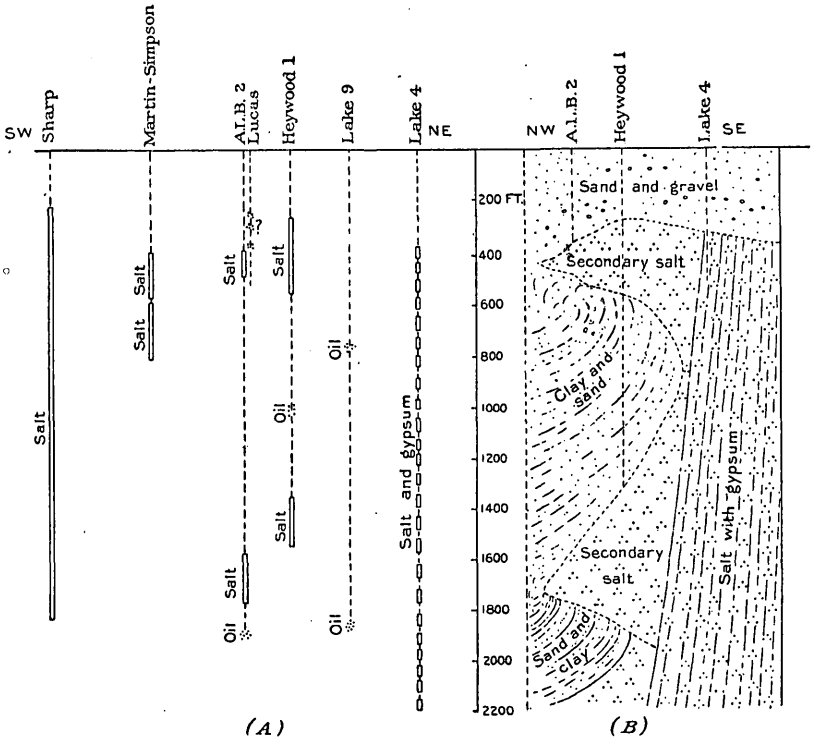


FIGURE 3.—*A*, Sections near the northern margin of the salt mass, Anse la Butte. *B*, North margin (hypothetical) of salt mass at Anse la Butte.

may be mentioned the Lake No. 6, a small producer, from a depth of 1,800 feet. The record of the lower portion of this well, from the field manager's notes, is as follows:

Log of lower portion of Lake well No. 6, Anse la Butte.

	Feet.
Hard sand	1809–1811
Gumbo	1811–1821
Shale	1821–1826
Rock	1826–1828
Gumbo	1828–1832
Oil-bearing clay	1832–1841
Rock	1841–1848
Oil sand	1848–1889

Stopped 8 inches in hard rock.

This well made 1,765 barrels the first day with little water. It rapidly grew salty, and in a few days was producing only about 500 barrels of oil. The oil is described as "steaming hot."

Lake No. 8, though carried to a depth of more than 2,000 feet, going through much "rock" from 1,000 down, is still, so far as can be learned, unproductive.

Lake No. 9 started off at the rate of 300 barrels daily, but soon dropped to 60 barrels of oil and 250 barrels of salt water. (See section Pl. IV.)

Lake No. 10 commenced flowing September 11, 1908, at an estimated rate of 4,000 barrels daily, but soon dropped to 1,500 barrels with an equal amount of salt water. This well, No. 11, and No. 12 appear to be shallower than No. 7, though exact data on the subject are not at hand. In amount and manner of production they seem to be very much alike.

Gas.—Strong gas pressures have been recorded in several wells in the field and some distance away. Heywood No. 1 was a famous "gasser." It would roar for hours, throwing water and sand 225 feet high. The Martin-Simpson well, on top of the hill, is supposed to have shown a pressure of 700 pounds at a depth of 800 feet. Lake No. 5 was a famous "gasser," and the gas took fire and destroyed the derrick. Heywood No. 8 found good gas at 1,300 feet. The Heywood & Guffey well, on the Louisiana Petroleum Company's lease, reached a porous gas rock at 800 feet that produced a large amount of gas, blowing water and sand out in great quantities, burying the machinery 5 feet deep.

Few other wells within 1,000 feet of the swamp and none outside that limit are economically important.

Conclusions.—The conclusions of the present writer regarding the occurrence of oil in this field are that within 500 feet of the edge of the swamp all the underlying beds are badly disturbed, being in many places more nearly on edge than in a horizontal position. This disturbance of beds that were doubtless deposited more or less horizontally is believed to be due to the upthrust of the central salt mass, as described in Bulletin No. 7 of the Louisiana State Geological Survey. The presence of oil in the central portion of the field near the swamp and its absence even at great depths in the adjacent surrounding territory afford proof of a dome structure in the field. Again, the high temperature of the oil speaks clearly for its very deep-seated origin. The oil is evidently coming up through porous layers to places where these layers have been cut off or pinched out by the disturbance just referred to. In some places in close proximity to the central salt mass oil pockets are found beneath bodies of salt, as indicated by figure 3, *B*.

The writer has continually held, publicly and privately, that there is practically no hope of finding oil a few hundred feet away from the margin of the swamp. Drilling about the field has amply justified this position. That the edges of porous, oil-bearing sand beds truncated by impervious layers lie about the field within less than 2,000 feet of the surface there is little doubt. Systematic investigation on all sides of the field with a large amount of capital would probably result in considerable profit, but mere haphazard drilling anywhere within a mile of the field is a waste of money.

Production.—As tabulated by the Oil Investors' Journal, the production of the Anse la Butte field has been as follows:

Production of oil in Anse la Butte field, 1905–1908.

	Barrels.
1905	9,000
1906	23,708
1907	76,938
1908	219,265

Storage.—Besides the four steel tanks in the field and the small earthen one, as shown on the map (Pl. II), the Gulf Pipe Line Company prepared a 100,000-barrel earthen tank 1½ miles east of the field.

Pipe lines.—The Heywood Brothers Oil Corporation and the Lake Oil Company had a 4-inch pipe line completed to Breaux Bridge in March, 1906. Both barges and cars are loaded at that point.

The Evangeline 4-inch pipe line, but 1,500 feet from the field, passing from Jennings to the Atchafalaya, was connected with the Lake Company's wells in November, 1907.

Loading rack and transportation facilities.—A 20-car loading rack was established on a siding on the Baton Rouge branch of the Southern Pacific Railroad passing through the field. Motor-car service over this line to the field from Lafayette continued but a few months in 1907–8.

BAYOU BOUILLON.

Location.—The locality usually designated Bayou Bouillon in oil and gas publications is at the junction of Bayou Bouillon with Atchafalaya River, about 30 miles northeast of New Iberia. A few years ago a small boat made regular trips to this place from the crossing of the Atchafalaya at Melville, on the Texas and Pacific Railway, down that river to Bayou Bouillon or Larumpe. Large steamers reach this place by way of the Atchafalaya from Morgan City.

History and geology.—Early in the summer of 1902 Maxwell & Sherwood erected a derrick on the west bank of Atchafalaya River, on what seemed to be the line of the strongest gas escapes. Their site was characterized by a Spindletop-like mound. On the opposite or east side, also along the line of gas seepage and on a mound, the Heywood

Brothers Oil Corporation soon afterward had a derrick erected. By July 1 the Maxwell & Sherwood well was in rock at a depth of 350 feet, with good oil "showings" in many places. Before the end of July Heywood Brothers had reached a stratum 10 feet thick, from which they obtained several bucketfuls of oil. Other wells were put down in this vicinity, but so far as known only three ever reached depths of more than a few hundred feet. Some details of these wells, as given by Fenneman,[a] are as follows:

Samples of the gas were analyzed by Professor Metz, of Tulane University, who finds 93.72 per cent to be hydrocarbons. It is not stated what proportion of the whole is marsh gas. Professor Metz finds no hydrogen sulphide, which is so common a constituent of the gas of the Texas oil fields. The gas is very similar to that which is found elsewhere in the delta and coastal region of Louisiana.

The oil, which has been found in small quantities at shallow depths, has also been analyzed by Doctors Metz and Eustis. It is of a dark-brownish or black color, very viscid, and having a specific gravity of 0.859. The fractional distillation of this oil resulted as follows:

Fractional distillation of oil from Bayou Bouillon, Louisiana.

Temperature.	Product.	Percentage by volume.
Below 150° C.	Chiefly water	4.3
Below 300° C.	Illuminating oil	28.4
Above 300° C.	Lubricating oil	42.0
	Asphalt and coke	15.5
	Loss	9.8
		100.0

The few logs obtained, though taken from wells not far apart, are very different. This diversity may be supposed to indicate that no one bed has any considerable lateral extent. If this be true, it may be inferred that no large oil body could be retained below the horizon protected by the surface clays and above the depth at which the wells stopped. From the meager data at hand it is not possible to state positively that the continuous clay beds which are necessary as cap rocks are wanting, but the amount of clay reported in the Maxwell & Sherwood well is very small. There is frequent mention of clay mixed with sand, but the beds distinguished as pure clay are never more than 5 feet in thickness. Under such beds a showing of oil was generally noted. A 300-foot limestone is reported in this well between the depths of 850 and 1,150 feet. The Shelbourne well, whose log is given below, shows much more clay or gumbo. A stratum 173 feet thick was encountered at a depth of 390 feet, and most of the material between that depth and 810 feet is clay or contains a considerable admixture of clay. In each of these wells a number of thin plates of rock were passed. In another well, not specifically named, a sandy bed between 1,200 and 1,280 feet yielded salt water said to be hot enough to burn the hand.

[a] Bull. U. S. Geol. Survey No. 282, 1906, pp. 112–113.

Logs of wells on Bayou Bouillon, Louisiana.

SHELBOURNE WELL.

[Received from Mr. Robert Martin.]

	Formation.	Thickness.	Depth.		Formation.	Thickness.	Depth.
		Feet.	*Feet.*			*Feet.*	*Feet.*
1	Clay	62	62	13	Hard gumbo	21	632
2	Sand	176	238	14	Soft gumbo, with some gas, showing a little oil	24	656
3	Hard gravel and sand	10	248	15	Gumbo	24	680
4	Fine sand and gravel	50	298	16	Very soft gumbo	55	735
5	Rock	4	302	17	Gumbo, with fine gravel and shells	27	762
6	Sand	28	330	18	Rock	1	763
7	Heavy gravel	2	332	19	Gumbo, with gas and some showing of oil	17	780
8	Rock	2	334	20	Rock or hard gravel	4	784
9	Sand	56	390	21	Sand and gravel, showing oil	36	820
10	Gumbo	173	563				
11	Gumbo, gravel, and pockets of gas, showing some oil	43	606				
12	Gumbo	5	611				

MAXWELL & SHERWOOD WELL.

1	Sand	5	5	22	Sand and gumbo	4	311
2	Red clay	15	20	23	Sand and gravel	6	321
3	Gumbo and sand	80	100	24	Sand	10	331
4	Gray sand and gas	5	105	25	Sand showing oil	6	337
5	Sand and clay	58	163	26	Small gravel	8	345
6	Gravel and shell	3	166	27	Grave land gumbo	14	359
7	Gray sand	4	170	28	Small gravel	30	389
8	Fine sand and gumbo	38	208	29	Gumbo, gravel, and sand	81	470
9	Rock	2	210	30	Gumbo	3	473
10	Sand	4	214	31	Coarse gravel	134	607
11	Gravel	14	228	32	Gumbo and fine gravel	20	627
12	Gumbo	3	231	33	Sand	30	657
13	Coarse white sand showing oil	8	239	34	Gravel and gumbo	30	687
				35	Coarse gravel	10	697
14	Fine sand showing oil	4	243	36	Sand	30	727
15	Gumbo	1	244	37	Gumbo and gravel	20	747
16	Sand showing oil	9	253	38	Sand and gravel	70	817
17	Gumbo	2	255	39	Coarse gravel	20	837
18	Gumbo and sand mixed	18	273	40	Rock (lime)	20	857
19	Gravel	20	293	41	Coarse sand	300	1,157
20	Sand	10	303	42	Sand	140	1,297
21	Sand showing oil	8	311	43	Blue sand (rock)	265	1,562

Water was salty below 1,000 feet. From 1,150 to 1,200 feet water overflowed pipe.

In the fall of 1907 Robert Martin went back to deepen the old Heywood hole, and on December 5, 1907, was reported (Oil Investors' Journal) to have reached a depth of 1,200 feet and found showings of oil and gas. A year later another attempt was made to deepen an old hole and preparations were being made to sink a new well on the east bank of the bayou.

BELLE ISLE.

Location.—Belle Isle is located about three-fourths of a mile north of Atchafalaya Bay, in the midst of the low sea marshes about 8 miles west of the mouth of Atchafalaya River. It is well shown on Coast and Geodetic Survey chart No. 199.

Topography.—On the chart just referred to this "island" is shown with a quadrilateral aspect, the northwest side being the longest. The interesting topographic and geologic features of the island are in

its northwestern portion. Here an elevated ridge, much contracted centrally, extends in a northeast-southwest direction for about three-fourths of a mile, here and there rising to 60 or even 80 feet above tide. The topographic details are shown on Plate XXI of the Louisiana Geological Survey report of 1899, and Plate XXV of the report of 1907.

Development.—The early history of the development of this island, up to the year 1899, is well given by Veatch.[a] The thirteen holes and shaft then put down by the Gulf Company he located and discussed, especially with regard to their bearing on the occurrence of rock salt. Another set of holes, designated A to J inclusive, were afterwards sunk and their important geologic features were pointed out in the Louisiana Geological Survey report for 1907, pages 76 et seq. In this same year (1907) the New Orleans Milling and Mining Company put down two deep wells on the northern margin of the island for the purpose of ascertaining its oil possibilities.

The investigations made on the island in 1907–8 by I. N. Knapp and associates consisted of sinking one well to the great depth of 3,020 feet near the first salt shaft and two others one-twentieth and one-half mile farther south; also of collecting all the data possible regarding the occurrence of rock salt in the wells thus far drilled and from them constructing a large-scale map indicating the contours of the underlying salt domes.

Geology.—A topographic ridge three-fourths of a mile long, extending along the northwest side of the "island," has already been mentioned. Underneath this ridge there is a salt ridge or series of salt domes with two or perhaps three noteworthy elevations. The most northeasterly, next the canal, has been most thoroughly investigated. The history and geology of the "shaft" next the canal and of the oil well designated I, near the southwest limit of this first salt dome, have been fully discussed in state reports, but the first Knapp well, 100 feet south of the old shaft, must be described here. The section is as follows:

Section of Knapp well No. 1, Belle Isle.

[From Mr. Knapp's section.]

	Feet.
Shale of varying hardness; at 75–80 feet went through old mine timber; at 100 feet pyrites showed	0– 114
Whitish limestone	115– 122
Shale	122– 128
Gravelly shale	128– 133
Hard lime	133– 142
Oil sand; oil at 143 feet	142– 145
Shale and specks of sulphur	145– 159
Hard streak of lime; gas from 150 to 160 feet	159– 160

[a] Rept. Louisiana Geol. Survey for 1899, pp. 221-229, with map and figs.

	Feet.
Shale showing oil	160– 186
Blue clay; *Rangia cuneata*, fish bones, and lignite at 186–189 feet	186– 187
Rotten limestone	187– 200
Probably salt	200– 211
Salt of varied character	211– 912
Salt with strong oil odor and taste to 700 feet.	
Salt, impure, with anhydrite, 418–767 feet.	
Puff of gas, 838 feet.	
Anhydrite, 844, 864 feet.	
Salt, varied	912–1,790
Slight bubbling of gas at 1,090 feet.	
Gas enough to give flame 2 or 3 feet above 10-inch pipe at 1,348 feet; this gas has a strong odor of crude oil; does not react for H_2S with acetate of lead; came from salt dirty with black shale; similar gas at 1,423 feet; both the puffs of gas lasted for a couple of days and then died out.	
Clear, clean salt at 1,425–1,790 feet.	
Greenish shale; mixed salt, gypsum incrusting salt, also black sand at 1,800 feet	1,790–1,800
Impure gypsum; gas held in salt crystals, which give a crackling noise when dissolving	1,800–1,806
Gas sand	1,806–1,810
Impure gassy salt	1,810–1,840
Soft gypsum	1,840–1,850
Impure salt showing a little gas and oil	1,850–1,904
Probably impure salt; overflow frothing with gas and showing oil	1,906–1,965
White salt	1,965–2,030
White salt with gas and oil showing; dark amber oil at 2,100 feet	2,030–2,112
Bits of pyrite and lime	2,112–2,114
Opaque salt with puffs of gas; fine amber oil obtained by straining scum at 2,190 feet	2,114–2,190
Salt, varied, clear and white or opaque and dirty with gas; oil obtained by straining froth at 2,500 feet	2,190–2,520
Salt, particles of galena and pyrites of iron and copper	2,520–2,606
Salt, anhydrite, and sulphur	2,606–2,628
Salt, impure and crystal; varying hardness; good oil showing; puff of gas at 2,722 feet threw water up 20 feet	2,628–2,740
Black sand—magnetite	2,740–2,745
Gas throwing water up 40 feet in derrick	2,783
Dark-red oil in salt	2,900
Anhydrite	2,940–3,005
Bottom of well	3,050

The extreme abruptness with which the salt mass pitches off to the north from this locality is apparent when the logs of the two wells of the New Orleans Mining Company are examined. Though these wells are but 870 and 1,030 feet north and a little west from the Knapp well and go to depths of 2,411 and 1,740 feet, respectively, these wells

show only normal coastal sands and clays. A few points relating to the deeper of these wells, as gathered from Mr. Knapp's blueprints, are as follows:

Partial section of New Orleans Milling and Mining Company's well No. 3 (location No. 10 of Knapp's notes).

	Feet.
First oil showing	1,396
Oil showing increasing	1,506
Big gas showing; good oil showing	1,584
Small gas showing	1,786
Small gas showing	1,930
Gas and oil in sand	2,190
Last 80 feet give pronounced oil showing	2,270
Biggest pyrite showing; good oil showing	2,389
Total depth	2,411

No salt reported in this well.

As Mr. Knapp's notes give a somewhat different version of the log of Well I than that published in the Louisiana report of 1907, they are given here.

Notes on Well I, Belle Isle (location No. 12 of Knapp's notes).

	Feet.
Hard rock, one-third sulphur	203
Salt	375
Salt, limestone, and oil sand	430
Quicksand	450
Sulphur and hard shale	485
Sulphur rock	503
Sand rock with showings of gas and oil	550
Salt	585
Hard material, no salt	655
Sand rock, showings of gas and oil	675
Improving showings of gas and oil	700
Flint rock of the hardest kind	735
Salt	840
Hard material	856
Material softer, good showing	1,010
Gas pressure; brown sand rock and blue shale containing oil; gas flame 25 feet high	1,165
Loose brown oil sand and slate	1,202
Bottom of 4-inch pipe	1,210
Gas blowout; oil showing improving	1,230
Increase in gas	1,375
Diamond drill installed	1,430
Rock salt	1,455
Iron sand; probable depth from sample left in bottle	1,550
Gas blew water out of well; oil showing on slush tank	1,575
Salt	1,625
Strong gas pressure; better oil showing	1,945
Salt, with showing of gas and oil to bottom	2,035
Total depth	2,359

Knapp No. 2, Belle Isle, was a comparatively shallow well, regarding which Mr. Knapp has furnished the following data:

Notes on Knapp well No. 2, Belle Isle.

	Feet.
Sand, gravel, clay, streaks of limestone to sulphur rock	0–290
Gypsum and sulphur rock	290–390
Sulphur, gypsum, and anhydrite, very porous	390–880
Salt	880–890

Remarks: Average sulphur, 7.5 per cent; best sample, 35 per cent; slight showing of oil at 390 feet, where porous rock began. Well was 430 feet southwest of first and about 100 feet southeast of the little blacksmith shop, in flat back of salt works.

Regarding well No. 3 Mr. Knapp writes:

The third Belle Isle well is about 2,800 feet from the first on the salt dome, and about south from it, and 150 feet southeast from old farmhouse. I have no record of it in Philadelphia, but it is about as follows:

Log of Knapp well No. 3, Belle Isle.

	Feet.
Stiff clays	0–127
Streaks of sand, clay shale, gravel, wood, and wood fiber	127–460
Lime rock	460–475
Gypseous material, clay, and salt	475–550
Impure salt	550–620
Clear salt	620–800

Not a particle of oil or gas showed; nor any sulphur.

When the topographic features of Belle Isle, as shown on Plate XXI of the Louisiana Geological Survey report of 1899, are considered in connection with all known well sections in this field, it is evident that this saline dome is compound in structure and origin, that the upward-flowing saline solutions producing the dome in all probability found their exit from the deeply buried beds below through faults trending northwest-southeast and northeast-southwest, and that the old shaft and Knapp No. 1 are close to the fault-line intersection. (See general structural lines in southern Louisiana as shown on Pl. I of the present report.)

Mr. Knapp has frequently commented on the tendency of the drill to run laterally in well No. 1, as if trying to follow soft layers in a mass nearly on edge. This tendency is amply accounted for by the concretionary growth of this saline mass as a whole, for where the materials are so various a vertical section near the outer shells of this mass might well show vertical seams, and in fact the drill might pass through the same shell near the surface and again several hundred or thousand feet below.

The fact that this and other saline nuclei are of concretionary growth and not portions of a widespread bed that has been crumpled up and somehow mysteriously disappeared everywhere except at critical points is, from the oil operator's standpoint, worthy of the

most serious consideration. For the upper half of a concretionary mass might be a dome with ideal structure for the concentration of hydrocarbons, whereas the lower portion might show that structure inverted, a most hopeless prospect for oil or gas. To determine the approximate radius of a salt mass, and hence the depths to which wells outside of the mass may be sunk and still meet with upturned and not downturned edges of sedimentary, pervious, oil-bearing strata, an expensive hole centrally located might perhaps be justifiable, but it should be understood that the sinking of a deep well through a great salt nucleus must necessarily be without direct financial results.

Oil and gas.—In 1899 Veatch[a] wrote as follows regarding two shallow wells across the canal to the east of the first shaft: "In hole No. 10 gas was struck at a depth of 120 feet in sufficient quantities to throw sand all over the derrick. It is now bubbling out of the hole, where it can easily be collected and ignited. A small amount of gas and oil was struck in hole No. 4."

In the state report of 1907[b] was given a description of the specimens saved at various depths from well I, with remarks on samples made by the driller in charge. Oil was noted at depths of 1,160, 1,212, 1,220, and 1,365 feet and the "best oil showing yet" at 1,370 feet. Knapp's notes give the depth of the "amber oil" as 1,840 feet. It is said to be of paraffin base and to become nearly solid paraffin on one day's exposure to the sun.[c] The same is true of the oil coming in small quantities from the Knapp well No. 1.

Well H, across the canal, northeast from the shaft, is said to show an oil sand at 420 feet, the lowest sand mentioned in the log given on page 83 of the state report for 1907.

In well D, 425 feet east of the shaft or 200 feet west of well H, a dark oil occurs at 384 feet.

Conclusions.—That the oil possibilities of Belle Isle are exhausted should not for a moment be supposed. When the origin of the saline mass is taken into consideration, inasmuch as its known depth is great and oil and gas manifestations are abundant, there is every reason to believe that just outside of the compressed and slickensided upturned edges of the sedimentary strata in contact with the uplifting saline mass there are pools of oil and gas not yet tapped because deep drilling has been done only into the salt mass itself or too far away, into undisturbed strata. A well put down 100 or 200 feet east of well D or north of well I to a depth of 1,800 feet would more nearly give the island a fair oil test.

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[a] Rept. Louisiana Geol. Survey for 1899, p. 224.

[b] Idem, 1907, pp. 80-81.

[c] Ueberloddhe, Oil Inv. Jour., December 20, 1908.

GOLDONNA.

Location.—The little hamlet of Goldonna is on the Louisiana and Arkansas Railway, in the western part of Winn Parish, about a mile west of the center of the extensive stretch of salt springs long known as Drake's salt works or saline. Veatch's map of this saline is reproduced here as figure 4.

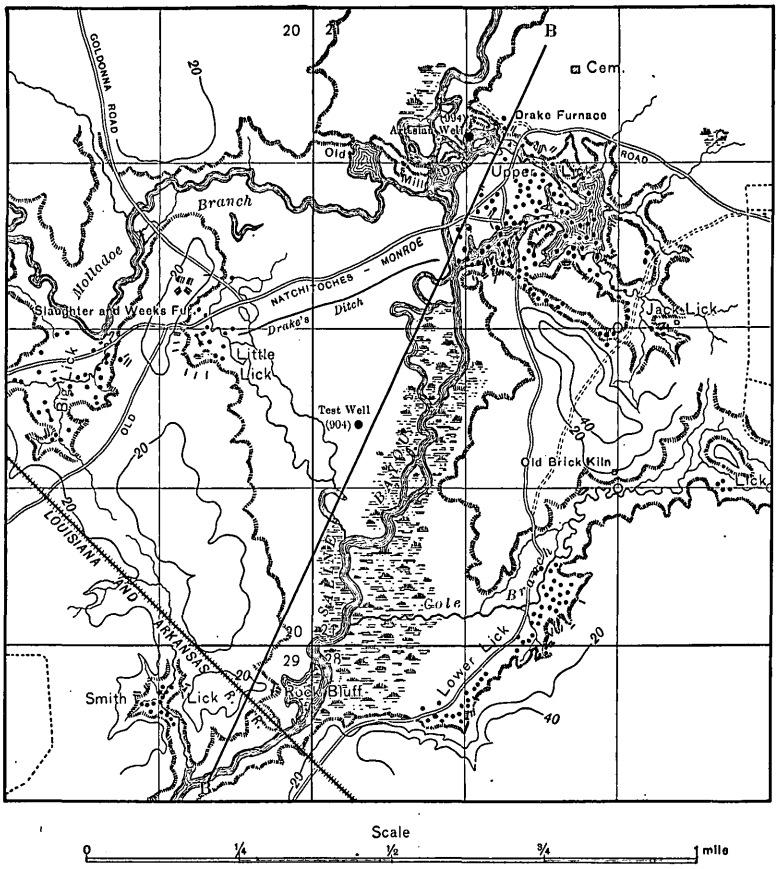

FIGURE 4.—Map of Drake's salt works, Winn and Natchitoches parishes (1899), showing characteristic symmetrical circular arrangement of shallow brine wells around the truncated domes of northern Louisiana.

History and geology.—The "test well" in the center of the area mapped was sunk by Savage Brothers and Morrical in 1905–6, evidently on the supposition that the nearer they came to puncturing the crown of the dome the more sure they would be to strike quantities of oil or gas.

The writer's interpretation of these domes, as shown in figure 5, which indicates the salt-water seeps circularly or marginally arranged, would lead to the expectation of finding whatever pockets of oil and

gas there may be about the dome in the flanking strata, whose porous members have been pinched out by the upward movement of the salt mass. Indeed, a letter from the postmaster at this locality says: "They have put down another well one-half mile north of the first and have found quite a lot of gas and some oil, but no salt."

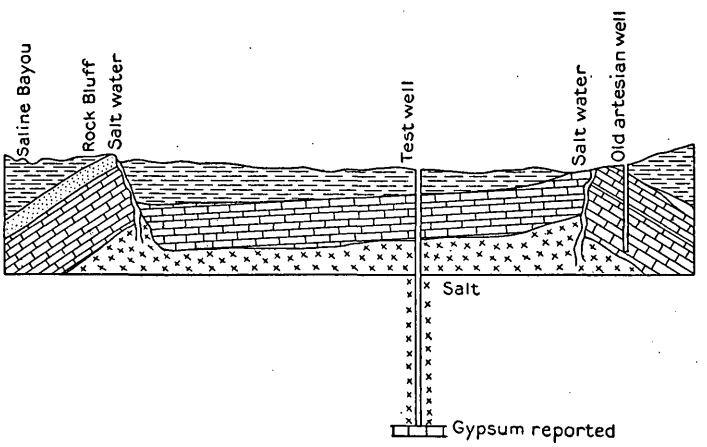

FIGURE 5.—Hypothetical cross section of Drake's saline.

According to the driller in charge of the well March 24, 1906, the time of the writer's visit, the log of the completed well may be stated in outline thus:

Log of well at Goldonna.[a]

	Feet.
Soil, muck, pebbles, logs	0– 303
Limestone (like marble at Winnfield)	303– 910
Salt	910–2,320
Gypsum bed at bottom	2,342

Here is evidently another Anse la Butte in general structure, except that the salt mass has not been truncated by fresh, near-surface waters, but by the resistant rock strata above.[b]

JENNINGS OIL FIELD.

LOCATION.

The Jennings oil field is located in Acadia Parish, southern Louisiana, near the center of T. 9 S., R. 2 W. It is reached most conveniently by private conveyance from the village of Jennings, a station on the Southern Pacific Railroad, about 188 miles west of New Orleans. The oil field is about 6 miles northeast of Jennings. The stations Egan on the branch road and Mermentau on the main line are slightly nearer the field in a direct line than Jennings, but communication with the field from these points is roundabout and extremely unsatisfactory.

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a Rept. Louisiana Geol. Survey for 1907, p. 52.

b For discussion of the different types of salt cones, together with their manner of growth, see Econ. Geology, February, 1909, pp. 21–30.

TOPOGRAPHY.

To one accustomed to rugged topography, the slight undulations shown on the Jennings sheet (Pl. XI, Rept. Louisiana Geol. Survey for '1907) seem insignificant in the extreme. The country seems monotonously flat. Many of the 5-foot contour lines are long distances apart. Near the bayous, however, as might well be expected, there are some slight declivities; but there are no bluffs; no rock exposures. In the bayous the Gulf tides are felt, and during dry seasons the level of these streams is practically that of the Gulf. The area shown on the map just referred to is one that in late Quaternary time was occupied by the Gulf waters; in other words, it is but a portion of the Gulf floor that has been raised a few feet above tide and is now slightly dissected by sluggish meandering streams.

From the above statements it may be safely concluded that the region about the Jennings field shows no topographic features that could be properly referred to differential orogenic movements. Southern Louisiana as a whole has in recent geologic time appeared above the Gulf level either by a slight upward movement of the continental area or by a slight withdrawal of the sea.

But the eye experienced in discerning topographic forms quickly catches the low hill or mound flanking the oil field on the east. (See Pl. VII.) This hill rises to an elevation of 32 feet above the Gulf, though comparatively close to Bayou des Cannes and hence naturally more subjected to erosive agencies than, for example, Mamou Prairie, 1 to 3 miles to the northwest. Like the mounds at Anse la Butte and at Spindletop, this is the highest land for miles around. It seems clearly due to dome structure of extremely small lateral extent.

West of the mound, near the central portion of the old productive area, there was formerly a swampy tract. Recent developments have more or less obscured the topographic features of this tract, but traces of its depressed character are still discernible. Small streams coming in from the northeast and the northwest traverse this lowland and after uniting pass the southern limits of the proved field with comparatively high banks on either side (Pl. VI). In other words, contour lines that are near together in this outlet channel tend to spread out and inclose a great area in the swampy northern reaches of these streams. Here too, then, as at Anse la Butte, there are evidences of local uplifting across the main stream channel, uplifting that has gone on at the same time as the degrading of the channel.

The oldest inhabitants maintain that within their earliest recollections the swampy character of the lowlands to the west of the mound was far more pronounced than in late years, and that good-sized trees were common there. The salt water, oil, and noxious gases have swept away the last traces of the primeval woodland. Whether this

desiccation in comparatively recent years is due to a general increasing aridity of climate in this region, or to the lowering of the stream beds so that the moist lands have become drained, can not at present be determined.

The Jennings oil field is accordingly located close to the scenes of extremely local orographic phenomena, which have taken place in comparatively recent times in a generally uninteresting, monotonous coastal plain.

DISCOVERY OF THE FIELD.

A spring not many yards north of the first well in the field, "Jennings Oil Company No. 1" (see map, fig. 6), had been known even to

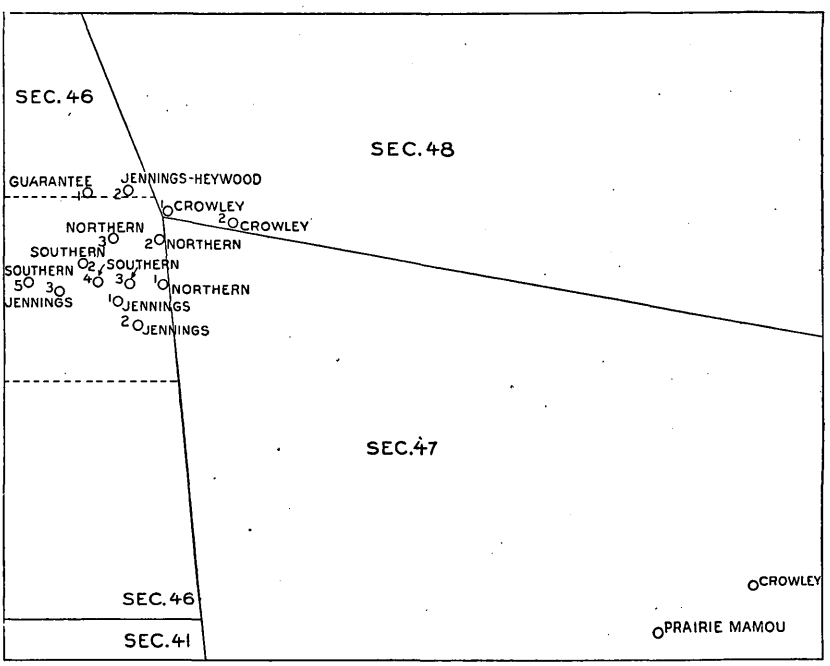
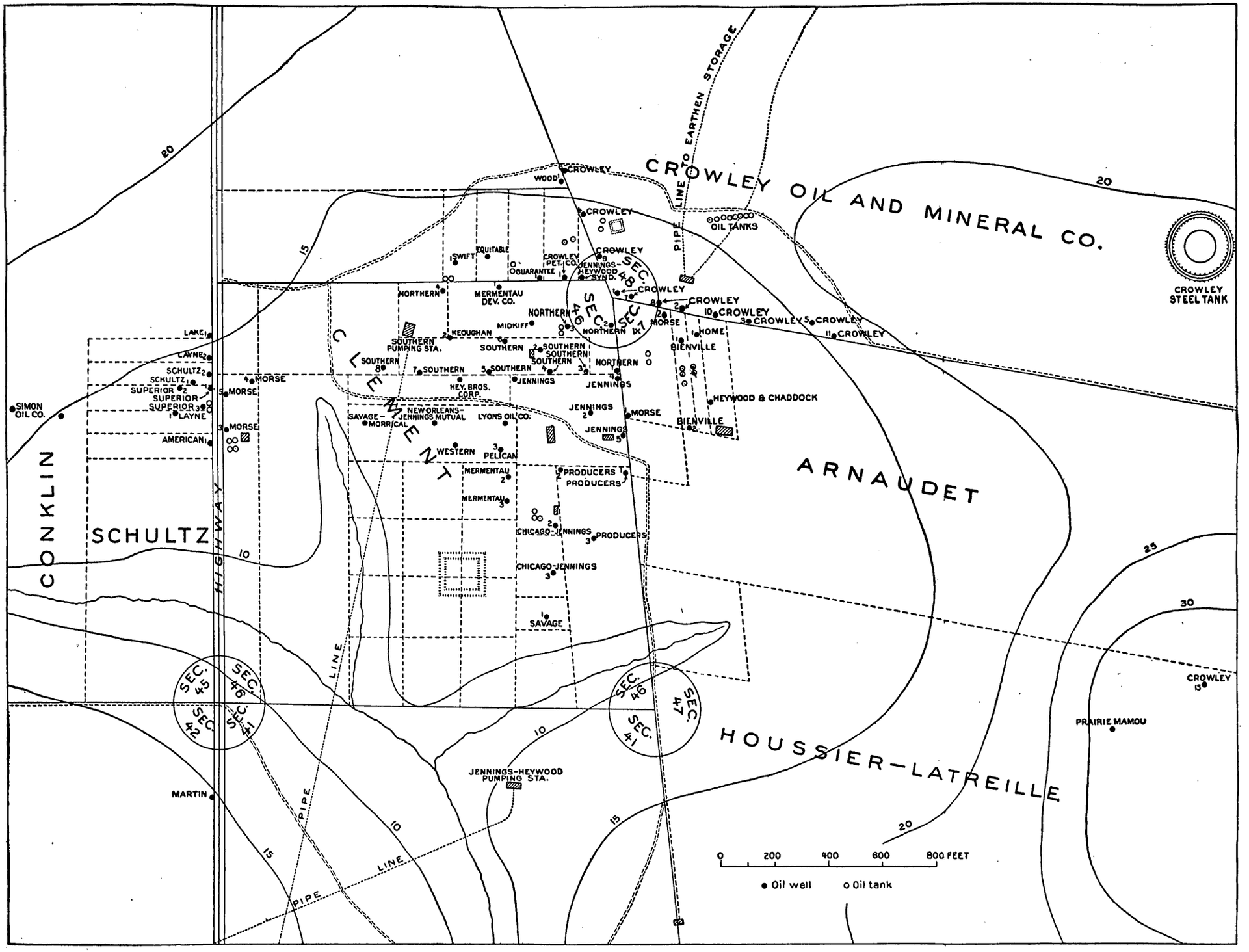


FIGURE 6.—Map of the Jennings oil field, January-February, 1903.

the earliest settlers as being somewhat remarkable in that it was apparently located on high ground and the water was always agitated by escaping gas. As the locality showed a mound, a depression, and gas emanations, in accordance with the signs at Beaumont (Spindletop), it is little wonder that immediately upon the discovery of oil at the latter locality in January, 1901, the "Mamou" region should be looked upon with favor. The Jennings Oil Company procured the services of the Heywood Brothers, successful operators in the Spindletop field, to put down a test well. In August, 1901, it had reached "pay sand" and was down 1,822 feet.[a] It gushed oil and sand

[a] Oil Inv. Jour., June 21, 1902, p. 7; October 15, 1904, p. 5. Fenneman (Bull. U. S. Geol. Survey No. 282, 1906, p. 95) applies practically the same data to a well of the "Southern Oil Company."



MAP OF JENNINGS OIL FIELD, MARCH, 1904.

spasmodically for seven hours and then clogged up. Though this well was not successful financially, it proved the presence of oil and gas in considerable quantities in the Mamou region.

HISTORY OF DEVELOPMENT.

Southern No. 1 was soon started in the woods 2 miles south of the pioneer Jennings well, but though it attained, according to reports of the time, a depth of 2,600 feet it was not a success. The materials brought out from near the bottom of the well showed no characteristic extinct species of shells and had a decidedly fluviatile appearance. Southern No. 2, close to the pioneer Jennings, was the next to come in. Oil was said to be coming from a depth of approximately 1,785 feet, though some shells shown to the writer were reported to have come from about 1,800 feet. Drillers accustomed to obtaining oil from the porous limestone at Spindletop at first did not know how to manage the fine incoherent sand at Jennings. Southern No. 2 had no strainer, hence it is no wonder that it did not gush after the Spindletop fashion. However, as remarked by the Oil Investors' Journal, "The flow of oil was sufficient to further convince the Jennings people and the Heywoods that they had found another Spindletop."

The relation of the "hill" or mound in the Jennings field to the pool of oil was quickly found to be very different from the analogous relation in the Spindletop field. In March, 1902, the Mamou well, on the "hill," and the Crowley well, just to the east, were practically abandoned. (See fig. 6.) The former was then reported to have attained a depth of 2,400 feet, the latter about 2,200. The Mamou well may have attained a depth of 2,200 feet, but the Crowley well probably did not exceed 1,200 feet. They were both unsuccessful so far as oil is concerned, but the Crowley well showed among other fossils *Rangia johnsoni*, a typical upper Miocene species. The importance of this discovery in the study of the southern oil fields was noted in the Louisiana Geological Survey report for 1902.

Before midsummer of 1902 Jennings No. 3, Pelican No. 1, and Home Oil Company No. 1 had been drilled along the road from the oil field to Jennings, along a "supposed line of the anticline," [a] without remunerative results. The field was therefore regarded as extending for but a moderate distance about the pioneer Jennings and Southern No. 2, west of the "hill," near the central part of T. 9 S., R. 2 W. In other words, the Jennings field seemed to be located in a hollow, whereas Spindletop was on a hill. In this "proved field" Southern Nos. 3 and 4 were fairly successful as gushers, though the former had two strings of pipe within the 6-inch casing and the latter was but a 4-inch well. Jennings No. 2, brought in by the Heywood

[a] Hayes and Kennedy, op. cit., p. 128.

Brothers June 28, 1902, was perhaps the first really satisfactory well in the field. Its 6-inch casing was carried down 1,800 feet, and great pains were taken to perfect and lower the strainer or "liner" to the oil sand.

Profiting by the mistakes of the Spindletop and Sour Lake fields, those interested in the Jennings field had built a well-equipped 4-inch pipe line to Jennings before these successful gushers had been brought in. In midsummer, 1902, oil was being loaded at Jennings into Southern Pacific tank cars. The Heywood Transportation Company operated 25 barges and 6 steamers and tugs on Mermentau River and its tributaries, and rice growers for miles around took away hundreds of barrels of oil daily to burn in their irrigating plants. The prices ranged from 30 to 40 cents a barrel, according to the quantity sold.

In 1903 the proved field was extended at least 1,000 feet westward by the Superior Company, and the Crowley company was rapidly extending its bounds to the northeast. (See Pl. VI.) A 6-inch pipe line from the field to Mermentau station, on the Southern Pacific Railroad, was completed and equipped with pumping stations, loading racks, and steel tanks, but owing to high pipe-line rates the Crowley company found it necessary to construct a 4-inch line to the Eunice branch of the Southern Pacific Railroad. This was completed before the middle of 1904. In the meantime (January 14, 1904) the famous Chicago-Jennings well No. 2 had been brought in, giving the field over 2,000 barrels of new production and extending its bounds several hundred feet to the south. The remarkable success of this well was attributed by some to the fact that the superior Getty "liner" was used in it. The fair success of the Jenkie well, still farther south, led development rapidly in that direction. There were 33 producing wells in this field February 5, 1904.

Production from the deep (1,900 feet) sands in the southeastern part of the field was begun by the Morse Company in July, 1904. Producers (Latreille 40-acre tract) No. 1 was a 4,000-barrel addition to the field, and extended its limits 500 feet to the southeast. Bass & Benckenstein's No. 1, though scarcely extending the limits of the Jennings field, set a new pace for single-well production in the field, furnishing about one-half the 28,000 barrels produced daily by the whole field in October, 1904. In the fall of 1904 the Heywood Oil Company brought in its famous No. 1, which furnished a new production of 10,000 barrels. Early in 1905 Bass & Benckenstein completed a 6-inch pipe line to Egan, on the Eunice branch of the Southern Pacific Railroad, and before the middle of the year had a 4-inch extension from Egan to Atchafalaya River and were shipping thence by barges up and down the Mississippi. This line is said to be 54 miles long. In the fall of 1905 Bass & Benckenstein, with

Mr. Carns, formed the Evangeline Oil Company of New Jersey, and thereafter all their holdings were known by that designation.

The season of 1905 was discouraging in many ways. Most of the wells had become "pumpers" and in many wells large quantities of salt water were brought to the surface with the oil. Although somewhat more oil was produced in 1905 than in the previous year, prices were such that the total value of the production was but two-thirds what it had been when the large gushers were most active.

In 1906, however, the Heywood Oil Company brought in its No. 1 on the Crowley lease, which proved to be a spouter of first quality, yielding 8,000 barrels daily without salt water. This added 500 feet to the proved territory on the northeast. The Jennings-Heywood Oil Syndicate's $100,000 air plant was installed in the autumn of 1906. In spite of decreased production from individual wells and the large amount of salt water appearing in many, prices were somewhat more encouraging and this year marks the maximum production of the Jennings field—a trifle over 9,000,000 barrels. The year was also marked by the completion of the Texas Company's 6-inch pipe line to Lake Charles, on the Kansas City Southern Railway. Oil was turned into this line on March 13, and for the first time in the history of the field oil could be shipped on a railroad other than the Southern Pacific.

Though the Crowley Oil and Mineral Company had extended the field perhaps 200 feet to the north by bringing in its No. 21, a shallow gusher of black oil, the failure of its deep well 3,000 feet to the north, toward the residence of Mr. Clement, early in 1907, discouraged prospects in that direction. About the same time the Teche Development Company again proved the comparative barrenness of the "hill" to the east of the proved field. The appearance of the field at this time is shown in Plate VII. Scott Heywood proved that the old part of the field was not entirely exhausted by bringing in two fair wells within its limits; but the important development was the Producers Oil Company's No. 13, in the Latreille 40-acre tract, yielding 1,300 barrels daily. This well extended the field one-fourth mile to the southeast and, although not to be compared with some of the 1904 gushers for quantity of oil produced, must be regarded as a record well for value of production. With oil at $1 a barrel it netted its owner $42,000 the first two weeks. A limit to the extension in a southeasterly direction was established by the completion of the Duson & Lyons well, south of the Producers, in salt water, and the lack of production in the Guffey well, on the King tract southeast of the Producers, though it went down 2,000 feet. The Franklin well, three-fourths of a mile east of the field, drilled in 1906, was finally abandoned. Though prices were on an average much more satisfactory in 1907 than they had been in 1906, the

increase of salt water and the necessity of finding storage for it on account of the complaints of the rice growers in the surrounding country caused the cost of production to advance rapidly.

Early in 1908 considerable activity was directed to that portion of the field lying a fourth of a mile west of the old developments, in and about the Eunice-Crowley lease. This was brought about by the satisfactory results of the Noble Company's well No. 1. In general, the production of the wells was decreasing, salt water was increasing, salt-water storage was again called for during the rice irrigating season, prices were depressed, and, except perhaps in the Producers 40-acre Latreille lease, the end of production seemed fast approaching. Perhaps the most noteworthy event of the year was the withdrawal of the Heywood Brothers from active interest in the operations of the field. They sold out to the Gulf Refining Company for $300,000 cash and certain royalties. The purchasers at once took active steps to develop their holdings, but apparently have so far met with no marked financial success.

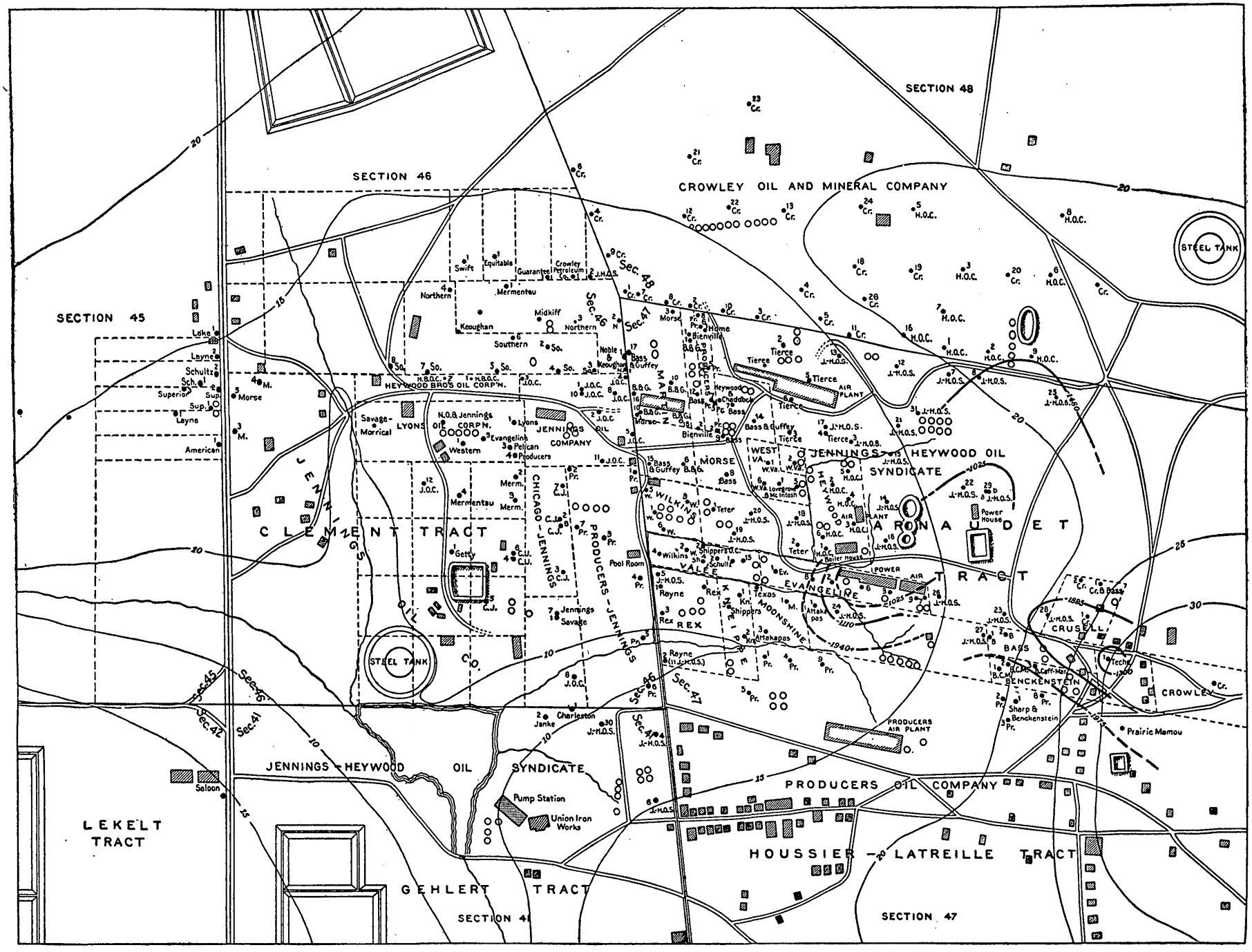
STRATIGRAPHY OF THE FIELD.

In the state report of 1902 it was inferred that there were probably considerable irregularities in the stratigraphy of the Jennings oil field, and *Rangia johnsoni*[a] was cited as indicating a Miocene horizon for the oil-bearing sands. Yet at that time there were but few wells in this field and no facts regarding the dip were known. During the field work in mapping the Jennings area, L. Reinecke was delegated to collect oil-well data for the present report. His work was admirably done, but the poor state of preservation of small, soft fossil remains in rotary drillings renders paleontologic investigations extremely difficult. However, the fossils have been placed in the competent hands of Miss C. J. Maury and her observations and conclusions are herewith given:

In the Jennings oil field fossils were collected by Mr. Reinecke from 31 wells. Twenty-five genera were represented, but most of the fossils were so fragmentary and worn that only 13 species could be determined. Some of these are found in the Miocene; others range from the Miocene, Pliocene, or post-Pliocene to the Recent. The species occurring most commonly in the wells are *Rangia johnsoni* and *Rangia cuneata*. [See figs. 7 and 8.]

It is generally thought that *Rangia cuneata* does not descend below the Pliocene and that *Rangia johnsoni* is upper Miocene, but the two species occur together at various levels in the Jennings-Heywood Oil Syndicate's wells Nos. 27 and 29 and in the Teche No. 1, where they are associated to depths exceeding 2,100 feet. Mr. Aldrich also reports *Rangia cuneata* from the Miocene, although he regards *R. johnsoni* as Pliocene. This extension of the time range of *R. cuneata* to the Miocene largely destroyed its value as a guide in determining the stratigraphy of the oil field.

[a] Rept. Louisiana Geol. Survey for 1902, p. 269. Late Miocene or early Pliocene, according to Doctor Dall (January 10, 1909).



MAP OF JENNINGS OIL FIELD, MARCH, 1907.

The horizontal and vertical distribution of *Rangia johnsoni* in these wells has been traced. The highest levels at which the species occurred in all the wells in which it was found were marked on a map of the field. Two interesting facts were thus brought to light—first, that the *Rangia johnsoni* strata are penetrated only by wells in the eastern part of the field; second, that the levels at which the strata were reached lie more or less radially and show a progressive deepening from certain centers. [See heavy contours, Pl. VII.]

FIGURE 7.—*Rangia johnsoni*. *A*, Interior, right valve; *B*, exterior, left valve.

Thus, taking as the first center the Jennings-Heywood Syndicate's No. 29, we find at this point the *Rangia johnsoni* strata at their highest level in the whole field—that is, at 1,040 to 1,120 feet below the surface [not below sea level, shown in Pl. VII]. At the Syndicate's well No. 24 the level is at 1,125 to 1,185 feet. Farther north, at the Syndicate and Caffery & Martel's well No. 25, it deepens to 1,500 feet; and at the Heywood-Crowley No. 9, in the same arc, we find it at 1,503 to 1,519 feet. The horizon deepens to the southeast, at the Syndicate's well No. 27, to 1,970 to 1,980 feet. [Compare Pl. VII.]

The second center is at the Teche No. 1 well, where the *Rangia johnsoni* strata reach the third highest level in the field—1,322 to 1,363 feet. This level deepens to the

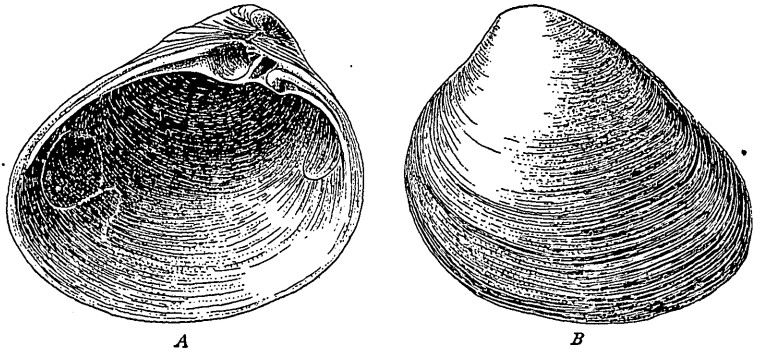


FIGURE 8.—*Rangia cuneata*, left valve. *A*, Interior; *B*, exterior.

northwest, at the Syndicate's well No. 28, to 1,710 feet, and on the west, in the Benckenstein, Caffery & Martel No. 3, to 1,990 feet, while far to the east, in the Franklin No. 1 well, the level sinks to 2,183 to 2,204 feet.[a]

The presence of two mounds in the *Rangia johnsoni* strata is thus indicated. These are oriented nearly at right angles to one another. [See Pl. VII.]

In addition to the two species of *Rangia* the only shell occurring with much frequency in the Jennings wells is *Mulinia quadricentennialis*. This shell was found and described by Professor Harris from the upper Miocene of the Galveston artesian well at a depth of 2,236 to 2,871 feet. It is fairly common in the Jennings wells, but usually not in those in which *Rangia johnsoni* is found. In the exceptional cases it was once above and once below *Rangia johnsoni*. It occurs at levels varying from 1,680 to 2,012 feet. Strata characterized by *Mulinia quadricentennialis* outskirt the *Rangia johnsoni* beds and extend westward to Zeigler No. 15 (Valée), northward to Crowley No. 24, and southward to Producers Nos. 3 and 4.

A curious new species which we have named *Rangia mamouensis* was found in the Heywood (Crowley lease) No. 8 well at 2,050 and 2,115 to 2,131 feet, in the same company's No. 9 at 1,670 feet, and in Producers No. 8 (Latreille) at 1,990 to 2,012 feet.

[a] See Bull. Louisiana Geol. Survey No. 6, 1907. Well is outside of the area shown on the map.

In tracing the distribution of the remaining species the striking fact was observed that not a single characteristically Miocene species has been obtained from the wells in the western part of the field with the exception of a *Spisula* which is doubtfully referred to as *S. quadricentennialis* Harris, and this shell was found far to the west, in the Duson & Lyons No. 1 well, at 1,860 to 1,910 feet. Except for this doubtful shell, from all the wells east of the Zeigler No. 15 (Valée) we have Miocene species and from all the wells west of the Zeigler No. 15 we have only species which are still in existence in the Recent fauna, although fossils were obtained from some of these wells to a depth of 1,800 to 1,900 feet. A similar absence of Miocene species was noted south of Producers wells Nos. 3 and 4.

In conclusion, the writer believes that there is a Miocene dome underlying the eastern part of the Jennings oil field; that the center of this dome consists of strata characterized by *Rangia johnsoni;* that these strata form two mounds extending northeast-southwest and northwest-southeast, approaching each other at the west; that the *Rangia johnsoni* strata are surrounded on the north, south, and west by other upper Miocene strata, characterized by *Mulinia quadricentennialis,* which form the boundary of the Miocene dome; that the parts of the field lying to the west and south of the dome, where no strictly Miocene species have been found to a depth of 1,800 to 1,900 feet, are post-Pliocene; and that the break between the Miocene dome and the post-Pliocene areas is marked by two faults nearly at right angles to each other, the chief fault running northeast and southwest just west of the Zeigler No. 15, and the minor fault running northwest and southeast south of Producers wells Nos. 3 and 4. [See Pl. VII for location of wells and domes.]

It is quite probable that the general surface of the Miocene *Rangia johnsoni* zone is, in this vicinity, but little more than 2,000 feet below the present surface of the ground, for half a mile north of the field, in Crowley No. 25, this fauna is found abundantly from 1,960 feet to more than 2,600 feet. Still this may be the locus of a slight uplift, or the Miocene character of the fauna may be imparted to Quaternary deposits by the inwash from near-by Miocene uplifts.

Along with these data, mainly paleontologic, may well now be considered certain others that have been often commented upon but rarely explained; all are so related that the main features of the geologic history of the field can no longer be regarded as obscure. It is well known that the area from the Heywood well No. 1 on the Crowley lease southwestward to a point south of the Chicago-Jennings wells was the great gusher area of the field. In the northeastern part of this tract indurated masses of pyritiferous sands and clays occur and vary greatly both as to thickness and lateral extent.

It is also well known that the oil-bearing sands range in depth from 100 to 2,400 feet, especially in the western part of the field, though the main producers are from 1,800 to 2,100 feet deep. The shallowest bed of all has been developed farthest away from the gusher territory in the extreme southwestern part of the field.

The unusually large amount of sand and gravel encountered throughout the field in sinking wells has been noted [a] but not explained.

[a] Bull. U. S. Geol. Survey No. 282, 1906, p. 98.

The commingling of *Rangia cuneata*, supposed generally to be a Quaternary form, with *R. johnsoni*, a late Miocene or early Pliocene form, has been looked upon as strange and as indicating that *R. cuneata* must necessarily be regarded as beginning in the Miocene, in this region at least. But there is another explanation, as will appear below.

The absence of a porous limestone containing oil, like that at Spindletop, and the depressed surface in the center of the field, in marked contrast to many other saline-dome areas, are other features that have been considered unusual.

All these facts receive a ready explanation if it is assumed that the field had a saline-dome origin. In early Quaternary time a more or less quadrangular block was being pushed up unequally, the west corner the most rapidly. The movement gave rise to a fault along the northwest and southwest sides of the uplift and through the fault fissure hydrocarbons from below escaped into the edges of the newly-formed Quaternary beds on the west and the Miocene beds on the east. The Miocene area was rising rapidly and was perhaps being eroded, furnishing its Miocene fossils with other material for Quaternary deposition. This may account for the seemingly strange commingling and alternation of fossils belonging to such distinct periods. The eastern or Miocene area was pushed up in places at least 1,000 feet above beds of similar age in the western part of the field.

At the east the Quaternary beds are but 1,000 feet thick, but in most parts of the field they exceed 2,000 feet. In later Quaternary time the unequal uplifting was less intense and the Miocene beds were carried down, with the surrounding Quaternary beds, beneath 1,000 feet of more recent deposits. Still, the uplifting forces have continued during late Quaternary time and, as remarked before, have doubtless been somewhat active up to the present day. Their tendency to keep this area above or about at sea level while surrounding regions were rapidly sinking furnishes a ready explanation of the coarseness of the deposits here, proved by logs of the Jennings wells as compared with records of wells but a few miles away. Slightly elevated or exposed points, like Point au Fer, are to-day being surrounded by very much coarser material than is being deposited in Atchafalaya Bay, only a few miles distant. Let Point au Fer be held from sinking quite as rapidly as the surrounding areas by the growth of a saline dome beneath, and in course of time a well sunk near the location of the point would pass through surprisingly coarser materials than would be found in wells sunk a few miles away in any direction. The depression in the west-central part of the field is readily accounted for by the gradual settling of 2,000 feet of Quaternary deposits in juxtaposition to beds composed of 1,000 feet of

Quaternary and 1,000 feet of older Miocene and hence more compact deposits.

Along with the hydrocarbons escaping upward through the main fault fissure already defined would naturally go (*a*) various saline solutions causing local indurations (rock), (*b*) an ever-ready near-by quantity of salt water seeking by most unexpected and circuitous routes to occupy all space possible, (*c*) here and there a supply of hot water, and, finally and most naturally, (*d*) gas escaping even at the surface.

The minor details of the occurrence of oil and gas, pyrite, and indurated calcareous masses, salt and hot waters, as well as many other valuable statistics, have already been published by the United States Geological Survey in Bulletin 282 and hence need not be repeated here. The general scheme or plan of the field—the stratigraphy—however, has never before been explained.

CONCLUSIONS.

That the oil in the Jennings field has come up through a crevice or fault fissure and spread laterally into Quaternary and Miocene beds there can be no doubt. Though the best producing "sands" in the central portion of the field lie about 1,800 to 2,100 feet beneath the surface, others to the west, some even but 100 feet below the surface, have been filled by seepages from the central fissure. To the east the Miocene beds descend rapidly and little seepage could take place in that direction.

So far as easily attainable new production is concerned the Jennings field is not promising.

The angular area uplifted in the eastern part of the field, seemingly bounded on two sides by fault lines, suggests that the deep-lying saline dome is probably capped by a layer of considerable rigidity, somewhat after the manner shown in figure 5. This may be a porous limestone similar in origin to that which furnished the gusher production at Spindletop. An experimental well sunk to prove the presence of such a rock within attainable depths should naturally be begun in the east-central portion of the field, where uplifting has been most pronounced.

WELLS IN THE JENNINGS FIELD.

In the following list of wells in the Jennings field to December, 1908, the dates given have been obtained almost exclusively from the reports appearing during the past eight years in the Oil Investors' Journal. The well sections were obtained mainly by Mr. Reinecke, and those which are merely copies of records are duly accredited to the driller in charge. The fossils have been identified by Miss C. J. Maury. The location of wells has been determined by the

Louisiana Geological Survey for various periods in the history of the field, as shown on the maps (fig. 6, Pls. VI, VII, and VIII). Minor inconsistencies undoubtedly exist in the data represented on the various maps, made several years apart under widely varying circumstances. Some of the locations are not as accurate as could be desired. Wells are drilled and are abandoned sometimes without leaving definite marks for location. Some wells have been missed entirely. Under the circumstances, however, it has been impossible to do more.

In the subjoined list the name given after the section number is that of the subdivision or tract in which the well is located. The map numbers are those used on Plate VIII.

Annotated list of wells in the Jennings field.

American Oil Company, No. 1; sec. 45; Schultz subdivison; drilled, summer, 1903; map No. 436.

Arlington Oil Company, No. 1; sec. 47; Moonshine 1 acre; drilled, December, 1907; salt water; map No. 268.

Arlington Oil Company, No. 2; sec. 47; Moonshine 1 acre; drilled, February, 1908; yield 300 barrels in March, 1908; map No. 247.

Arlington Oil Company, No. 3; reported, 1908, under name of Great Southern, No. 1; location not determined.

Attakapas Oil Company, No. 1; sec. 47; Moonshine subdivision; drilling, fall, 1904; stopped by injunction; map No. 272.

Attakapas Oil Company, No. 2; sec. 47; Moonshine 1 acre; drilled, spring, 1905; map No. 246.

Bass (T. H.) & Co., No. 1; sec. 42; Mattison subdivision; drilled early in 1908; produced daily 400 barrels of oil, then oil with salt water; producing in November, 1908; map No. 28.

Bass No. 1, sec. 47; Bass subdivision; not producing in 1908; map No. 234.

Bass & Guffey, No. 1; sec. 47; Guffey Petroleum Company; drilled, spring, 1903; yield, 5,000 barrels in June, 1903; deepened, 1905; yield, 1,000 barrels in March, 1905; formerly known as Morse No. 1; map No. 357.

Bass No. 2; sec. 47; Guffey Petroleum Company; drilled, summer, 1903; produced, 1903–4; deepened and produced, 1905; formerly known as Morse No. 2; map No. 350.

Bass No. 2; sec. 47; Bass; made 1,500 barrels of oil and went to salt water, January, 1907; map No. 235.

Bass No. 2; sec. 42; Mattison lease; drilled, spring, 1908; 250 barrels in March, 1908; producing, November, 1908; map No. 38.

Bass Nos. 3, 4, 5. See Morse Nos. 3, 4, 5.

Bass No. 6; sec. 47; Martin; drilled, spring, 1904; 6,400 barrels in June, 1904; 200 in April, 1905; 125 in May, 1905; deepened, produced, and sanded up, fall of 1905; map No. 386.

Bass No. 7; sec. 47; drilled, spring, 1904; first deep well on Arnaudet tract; flowed from July, 1904, to close of 1905; producing, 1908; map No. 368.

Bass No. 8; sec. 47; Morse; drilled, summer, 1904; 7,500 barrels in November, 1904; 400 in May, 1905; producing, fall of 1906; map No. 364.

Bass No. 9; sec. 47; Morse; drilled, fall, 1904; 500 barrels in April, 1905; not producing, June, 1906; abandoned 1907; map No. 363.

Bass No. 10; sec. 47; Guffey Petroleum Company; drilled early in 1905; produced in 1905; abandoned, 1907; map No. 351.

Bass No. 11 (Ladies No. 1); sec. 47, Home; drilled, spring, 1905; salt water; map No. 366.

Bass No. 12; sec. 47; Home; drilled, spring, 1905; a pumper; map No. 355.

Bass No. 13; sec. 47; Home; drilled, fall, 1905; map No. 415.

Bass No. 14; sec. 47; Morse; drilled, fall, 1905; produced some oil and salt water; deepened, summer, 1906; map No. 369.

Bass No. 17; sec. 47; Guffey Petroleum Company; drilled, spring, 1906; salt water; deepened, August, 1906; map No. 358.

Bass No. 16. See Gulf Refining Company No. 16.

Bass No. 18; sec. 47; Guffey Petroleum Company; drilled before 1907; data lacking; map No. 360.

Bass No. 18; sec. 47; Guffey Petroleum Company; drilled, summer, 1906; a 2,000-barrel well; abandoned, 1908; map No. 128.

Bass No. 19; sec. 47; Guffey Petroleum Company; drilled, winter, 1906–7; 75 barrels in February, 1907; abandoned, 1908; map No. 356.

Benckenstein, Caffrey & Martel No. 1; sec. 47; Benckenstein; drilled, summer, 1906; 1,000 barrels on air, July, 1906; abandoned, 1908; map No. 230.

Benckenstein, Caffrey & Martel No. 2; sec. 47; Benckenstein; small pumper, 1906; map No. 231.

Benckenstein, Caffrey & Martel No. 3; sec. 47; Benckenstein; drilled, fall, 1906; dry hole, deepened and twisted off twice; map No. 232.

Benckenstein and Sharp. See Sharp and Benckenstein.

Bienville No. 1; sec. 47; Home; drilled, summer, 1903; produced, 1903–4; map No. 431.

Bienville No. 2; sec. 47; Home; drilled, summer, 1903; produced, 1904; deepened, 1904; map No. 361.

Caffrey & Martel No. 1; sec. 47; Moonshine 1 acre; map No. 245.

Carencro No. 1; sec. 45; Conklin; drilled, spring, 1908; salt water; deepened, May; pumping, November, 1908; map No. 8.

Carencro No. 2; sec. 75; Conklin; producing, 1908; map No. 441.

Carencro No. 3; sec. 45; Conklin; drilled, fall, 1908; salt water reported, October, 1908; map No. 7.

Charleston No. 1; sec. 41; Syndicate Fee Simple; drilled, spring, 1904; too deep; salt water; map No. 409.

Chicago-Jennings No. 1; 1½ miles northwest of oil field, Garrould tract; depth 2,230 feet; dry; see section, Bull. U. S. Geol. Survey No. 282, p. 97.

Chicago-Jennings No. 2; sec. 46; Chicago-Jennings; brought in January 14, 1904; produced 2,500 to 3,000 barrels daily for over a month; pumping, October, 1906; deepened, 1906; map No. 86. *Rangia cuneata* was found at 1,518 feet.

Section of Chicago-Jennings well No. 2.

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Clay	43	43	Gumbo and gravel	60	1,470
Sand	175	218	Pyrite and gumbo	40	1,510
Sand and clay	580	798	Shale, gravel, and gumbo	82	1,592
Sand	80	878	Rock	18	1,610
Gravel	41	919	Gumbo and shale, oil traces	74	1,684
Gumbo	175	1,094	Rock, shale, and gumbo, good oil showing	73	1,757
Gumbo and gravel	100	1,194	Shale and pyrite, good oil showing	40	1,797
Gravel and rock	55	1,149	Coarse sand and pyrite, abundance of oil	53	1,850
Gumbo	40	1,289			
Gravel, gumbo, and shale	91	1,380			
Shale and pyrite	30	1,410			

Total depth 1,854 feet; Getty liner.

Chicago-Jennings No. 3; sec. 46; drilled, spring, 1904; producing, fall, 1904; deepened, 1906; abandoned, 1907; map No. 408.

Chicago-Jennings No. 4; sec. 46; Chicago; drilled, spring, 1904; accidentally ruined; map No. 433.

Chicago-Jennings No. 5; sec. 46; Chicago; drilled, summer, 1904; salt water; abandoned, 1905; map No. 74.

Chicago-Jennings No. 6; sec. 46; drilled in 1903 and produced in 1905; deepened to salt water, 1907; map No. 75.

Chicago-Jennings No. 7; sec. 46; Chicago-Jennings; drilled to salt water, summer, 1906; deepened, 1908; produced 500 barrels, November 1908; map No. 432.

Chicago-Jennings No. 8; sec. 46; Chicago-Jennings; drilled, January, 1907; 200 barrels, February, 1907; producing, November, 1908; map No. 85. Fossils, collected by L. Reinecke and identified by C. J. Maury: *Rangia cuneata*, 60–540, 1,239–1,860 feet; *Ostrea*, 1,238–1,378 feet; crinoid stem (Carboniferous drift), 832–875 feet.

Section of Chicago-Jennings well No. 8.

	Thickness.	Depth.
	Feet.	*Feet.*
Yellow and blue clay	63	63
Green sand, becoming coarser below, with few shells	133	196
Gravel, growing coarser below; pebbles coated with pyrites	534	730
Gravel with fine sand and shell fragments; also a few pieces of limestone	102	832
White sand	63	895
Gravel, more or less pyrite coated	70	965
Blue clay with some gravel	45	1,010
Fine white sand with black specks, pyrite, showing oil	69	1,079
Blue sticky clay with a few pyrite-coated pebbles	160	1,239
Blue plastic clay with many shell fragments; below 1,378 feet pyrites and gravel	366	1,605
Pyrite, gravel, shell fragments	78	1,683
Pyrite, shells, and limestone fragments	34	1,717
Finely ground blue limestone with pyrites	30	1,747
Pyrites and shells	18	1,765
Shells and blue lime fragments; shells over 50 per cent of the whole	23	1,788
Crumbling pyrite fragments and shells	42	1,830
Fine greenish sand, shells and pyrite to 1,860 feet	53	1,890

Eight-inch casing set at 1,752 feet; 6-inch casing set at 1,712 feet; screen, 166.5 feet of 4½-inch; packer at 1,679 feet.

Chicago-Jennings No. 9; sec. 46; Chicago; drilled, spring, 1907; 200 barrels, July, 1907; producing, November, 1908; map No. 406.

Chicago-Jennings No. 10; sec. 46; Chicago-Jennings; location, fall, 1908; map No. 87.

Crescent No. 1 (Wood's well); sec. 46, extreme northern edge of field; drilled, fall, 1903; dry; map. No 140.

Crowley Oil and Mineral Company No. —; sec. 48; Crowley; no data; map No. 316.

Crowley Oil and Mineral Company No. —; sec. 48; Crowley; new derrick, fall, 1908; map No. 320.

Crowley Oil and Mineral Company No. 1; sec. 48; Crowley; drilled, fall, 1902, to spring of 1903; 300 barrels, March, 1903; map No. 354.

Section of Crowley Oil and Mineral Company's well No. 1.

[I. B. Grow, driller.]

	Thickness.	Depth.
	Feet.	*Feet.*
Quicksand and gravel	1,050	1,050
Blue shale	150	1,200
Rock	125	1,325
Blue shale	175	1,500
Shell and gravel	25	1,525
Sand showing oil	10	1,535
Blue shale	40	1,575
Sand, little gas	5	1,580
Blue shale, mixed with some shell rock	103	1,683
Blue hard gumbo	12	1,695
Oil sand	15	1,710
Blue shale, with 6 feet of oil sand at 1,740 feet	50	1,760
Oil sand	65	1,825

Screen, 108 feet.

Crowley Oil and Mineral Company No. 2; sec. 48; Crowley; drilled, winter, 1902–3; produced, 1903; map No. 346.

Section of Crowley Oil and Mineral Company's well No. 2.

	Thickness.	Depth.
	Feet.	*Feet.*
Not given	.....	598
Sand	362	960
Blue shale	87	1,047
Small gravel	203	1,250
Blue shale	245	1,445
Shale and sand, showing of oil	10	1,505
Blue shale, with 127 feet of hard rock at 1,530 feet	220	1,725
Blue shale, with slight showings of oil; thin streaks of sand	36	1,761
Oil sand	48	1,809

Screen, 85.75 feet wire-wound copper-gauze strainer.

Crowley Oil and Mineral Company No. 3; sec. 46; Crowley; drilled, summer, 1903; 5,000-barrel gusher; producing, 1905; map No. 337.

Section of Crowley Oil and Mineral Company's well No. 3.

[Lake Grow, driller.]

	Thickness.	Depth.
	Feet.	*Feet.*
Clay	60	60
Quicksand and gravel	840	900
Blue shale	43	943
Gravel	207	1,150
Blue shale	210	1,360
Gravel	50	1,410
Blue shale	20	1,430
Gravel	12	1,442
Blue shale	98	1,540
Shell rock, gravel, and fine sand	20	1,560
Shell and gumbo	32	1,592
Fine white quartz sand and a few flinty pebbles	26	1,618
Coarse oil sand, mixed with gravel and dry asphalt	69	1,687
Blue shale	73	1,760
Oil sand, very hard	40	1,800
Shell and blue shale	10	1,810

Screen, 43 feet of 9-inch, from 1,810 feet up; 100 feet of 7-inch, from 1,647 feet up.

Crowley Oil and Mineral Company No. 4; sec. 48; Crowley; produced, 1903–4; abandoned, 1907; map No. 416. A few fossils were collected from 1,663 to 1,670 feet: *Rangia cuneata*, *Natica*, *Cylichnella bidentata*, and *Arca ponderosa?*

Crowley Oil and Mineral Company No. 5; sec. 48; Crowley; drilled, summer, 1903; salt water; deepened and found good oil, 1904; 150 barrels daily, 1905; abandoned, 1908; map No. 412.

Section of Crowley Oil and Mineral Company's well No. 5.

[Lake Grow, driller.]

	Thickness.	Depth.
	Feet.	*Feet.*
Clay	60	60
Quicksand and gravel	750	810
Blue shale	90	900
Gravel and shell	160	1,060
Blue shale	120	1,180
Gravel and rock	20	1,200
Blue shale	75	1,275
Gravel	25	1,300
Blue shale	100	1,400
Rock, hard gumbo, and shell	100	1,500
Rock	1	1,501
Blue shale	79	1,580
Hard sand; no oil	40	1,620
Gumbo	30	1,650
Hard, fine white sand; no oil	20	1,670
Sand, with pyrite, and good oil showing	30	1,710
Hard sand	24	1,734
Gumbo	6	1,740
Shell rock, top of oil sand		1,740
Almost solid oil sand; salt water in this stratum above the oil	80	1,820

Screen, 82 feet.

Crowley Oil and Mineral Company No. 6; sec. 48; Crowley; drilled, 1903; produced, 1903–1905; abandoned, 1907; map No. 417.

Crowley Oil and Mineral Company No. 7; sec. 48; Crowley; drilled, spring, 1903; produced, 1903–1905; map No. 352.

Crowley Oil and Mineral Company No. 7; new outfit close to No. 7; producing, 1908; map No. 352.

Crowley Oil and Mineral Company No. 8; sec. 48; Crowley; drilled in latter part of 1903; map No. 353.

Crowley Oil and Mineral Company No. 9; sec. 48; Crowley; drilled, fall, 1903; produced, 1904; abandoned, 1907; map No. 425.

Crowley Oil and Mineral Company No. 10; sec. 48; Crowley; drilled, fall, 1903; produced, 1904–5; abandoned, 1907; map No. 338.

Section of Crowley Oil and Mineral Company's well No. 10.

	Thickness.	Depth.
	Feet.	*Feet.*
Clay	60	60
Quicksand and gumbo	1,100	1,160
Blue shale	490	1,650
Oil sand; mixed with streaks of gumbo; screen set at 1,725 feet	75	1,725
Blue shale	10	1,735
Salt water, sand	30	1,765
Blue shale	20	1,785
Oil sand	180	1,965

Crowley Oil and Mineral Company No. 11; sec. 48; Crowley; drilled, 1904; deepened and produced 6,000 barrels daily, January, 1905; 2,300 barrels, October, 1905; abandoned, January, 1908; map No. 325.

Section of Crowley Oil and Mineral Company's well No. 11.

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Unknown		1,300	Sand, not very hard, oil showing	30	1,790
Gumbo	150	1,450	Hard sand, iron pyrites, shells, slight oil showings	40	1,830
Rock, sand, and gumbo	150	1,600	Sand, not very hard	30	1,860
Salt-water sand	95	1,695	Good oil sand, not very hard; iron pyrites and shell	30	1,890
Gumbo	25	1,720	Gumbo	25	1,915
Soft sand, no oil; looks salty	10	1,730	Good oil sand; fairly hard	50	1,965
Gumbo	10	1,740			
Hard sand with pyrite, no oil	20	1,760			

Screen (Lane No. 40), 2½-inch, 82 feet; 3-inch, 126 feet.

Crowley Oil and Mineral Company No. 12; sec. 48; Crowley; drilled, summer, 1905; 2,000 barrels, July, 1905; deepened and yielded 4,000 barrels, November, 1905; map No. 342. Shells between 1,630 and 1,690 feet: *Rangia* cf. *johnsoni* but probably new, *Rangia cuneata*, *Olivella*, *Natica*.

Section of Crowley Oil and Mineral Company's well No. 12.

[Lake Grow, driller.]

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Clay	60	60	Oil sand	6	1,446
Water, sand, and gravel	215	275	Blue shale	29	1,475
Quicksand	800	1,075	Sand, gas, salt water	95	1,570
Blue shale	275	1,350	Blue shale	36	1,606
Gravel and shale	76	1,426	Oil sand, hard at first, softer below	90	1,696
Blue shale	15	1,439	Blue shale, with shell	10	1,706

Screen (Geddy No. 60), 101 feet; oil turned into tank May 12, 1904.

A detailed statement of the lower oil-sand bed is as follows:

	Feet.
Fine white sand	20
Sandy shale with shell fragments	10
Fine white sandy shale with shells	10
Fine white sand with wood fragments and shells	10
Fine white sand without wood	10
Sand, fine, more shell fragments	10
Very fine white sand; traces of pyrite	10

Crowley Oil and Mineral Company No. 13; sec. 48; Crowley; operating 1904–5; map No. 317.

Section of "deepened" portion of Crowley Oil and Mineral Company's well No. 13.

[I. B. Grow, driller.]

	Thickness.	Depth.
	Feet.	*Feet.*
Old well		1,903
Gumbo	21	1,924
Very hard oil sand	100	2,024

Screen (Lane), 2½-inch, 60 feet; 3-inch, 40 feet, June 4, 1905.

Crowley Oil and Mineral Company No. 14; sec. 48; Crowley; drilled since 1904; producing and deepened in 1905; map No. 418.

Section of Crowley Oil and Mineral Company's well No. 14.

[I. B. Grow, driller.]

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Clay	40	40	Rock, shell, and gumbo	240	1,440
Quicksand and gravel	718	758	Oil sand	10	1,450
Gumbo	42	800	Gumbo	90	1,540
Gravel, shell, and water sand	120	920	Hard shell and gumbo	15	1,555
Gumbo	250	1,170	Oil sand	120	1,675
Sand and gravel	30	1,200	Gumbo	8	1,683

Screen, 4½-inch, 124 feet.

Crowley Oil and Mineral Company No. 15; sec. 47; Latreille; "old well on the hill;" referred to by Harris in Rept. Louisiana Geol. Survey for 1902, p. 269, and by Hayes and Kennedy in Bull. U. S. Geol. Survey No. 212, p. 129; deepened from 1,600 to 2,474 feet, March, 1905; reached "oil sand," producing 300 barrels of oil and 6,000 barrels of salt water, the latter soon drowning out the oil; known also as the Crowley Latreille No. 1; map No. 237. No specimens were obtained from the deeper portion of this well, but the shallower part, less than 1,600 feet, yielded plenty of *Rangia johnsoni* and hence was well down in late Tertiary beds.

Section of deepened portion of Crowley Oil and Mineral Company's well No. 15.

[Drilling ascribed to Lake Grow and George Little.]

	Thickness.	Depth.
	Feet.	*Feet.*
Gumbo	20	1,620
Pyrite and shell rock	5	1,625
Shells, with very little sand	120	1,745
Gumbo	15	1,760
Blue limestone (or slate ?) and two small sand "cavities," one 3 and one 2 feet thick	60	1,820
Compact flint sand	40	1,860
Blue limestone (or slate ?) with one 4-foot and one 2-foot sand "cavity" (pocket ?)	80	1,940
Fine white water sand	30	1,970
Blue limestone or slate	80	2,050
Coarse white water sand	90	2,140
Blue shale with shells, pyrite, and some sand	70	2,210
Very fine water sand, with some shells	85	2,295
Very hard rock, with some pyrite and shells	6	2,301
Oil sand, with pyrite and shells	173	2,474

Crowley Oil and Mineral Company No. 17; sec. 48; Crowley; 2,000 feet north of the field; drilling, fall, 1905; 6-inch set at 1,800 feet; twisted off, December, 1905; not productive; map No. 318.

Crowley Oil and Mineral Company No. 18; sec. 48; Crowley; drilled, spring, 1906; 400 barrels hourly at first and sanded up; 1,200 barrels, on air, April, 1906; deepened, 1907; dry; map No. 319.

Crowley Oil and Mineral Company No. 19; sec. 48; Crowley; drilled, summer, 1906; 4,000–1,500 barrels, July, 1906; map No. 419.

Crowley Oil and Mineral Company No. 20; sec. 48; Crowley; drilled, summer, 1906; 600 barrels, September, 1906; 30 barrels, November, 1907; pumping, November, 1908; map No. 311. *Rangia cuneata* and *Ostrea* were collected between 1,789 and 1,810 feet.

Section of Crowley Oil and Mineral Company's well No. 20.

[J. H. Harrison, driller.]

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Sand and clay	57	57	Rocks	4	1,752
Gravel and bowlders	800	857	Gumbo	60	1,812
Gumbo	180	1,037	Pyrites and gumbo	22	1,834
Gravel and water sand	78	1,115	Soft shale, good oil showing	14	1,848
Gumbo and gravel	130	1,245	Hard gumbo	40	1,888
Bowlders	80	1,325	Hard shale with pyrites	35	1,923
Gumbo	123	1,448	Gumbo	13	1,936
Hard shale	35	1,483	Good oil sand	6	1,942
Pyrites, gumbo, and sand	35	1,518	Shale, pyrites, good oil showing	21	1,963
Gumbo and gravel	230	1,748	Tough gumbo	8	1,971

Screen, 4½-inch, 86 feet.

Crowley Oil and Mineral Company No. 21; sec. 48; Crowley; drilled, summer, 1906; 300 barrels, September, 1906; map No. 343.

Section of Crowley Oil and Mineral Company's well No. 21.

[J. Lee, driller.]

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Clay	40	40	Gumbo	47	1,447
Sand and gravel	660	700	Shale and sand	68	1,515
Gumbo	20	720	Gumbo	63	1,578
Sand and some gumbo	542	1,262	Oil sand	20	1,598
Gumbo	45	1,307	Gumbo	10	1,608
Shell and gumbo	93	1,400	Oil sand and gumbo	60	1,668

Screen from 1,660 to 1,662 feet.

Crowley Oil and Mineral Company No. 22; sec. 48; Crowley; drilled, fall, 1906; flowed 300 barrels daily, October, 1906; deepened, summer, 1907; 20 barrels, June, 1907; map No. 341.

Section of Crowley Oil and Mineral Company's well No. 22.

[J. Lee, driller.]

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Not given	40	40	Sand and gravel with shells	45	1,120
Sand and gravel	690	730	Gumbo	95	1,215
Gumbo	20	750	Sand and gravel	67	1,282
Sand and gravel	280	1,030	Gumbo	93	1,375
Gumbo	45	1,075	Gravel and some sand	125	1,500

Total depth of well, 1,563 feet. Screen, 4½-inch, 52 feet.

Crowley Oil and Mineral Company No. 23; sec. 48; Crowley; drilled, fall, 1906; 150 barrels, October, 1906; map No. 410.

Section of Crowley Oil and Mineral Company's well No. 23.

[J. H. Harrison, driller.]

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Sand and clay	70	70	Bowlders and gravel	50	1,370
Sand and gravel	644	724	Hard gumbo and rock	70	1,440
Gumbo	70	784	Gravel and sand	80	1,520
Sand	105	889	Hard gumbo	85	1,605
Gumbo	125	1,014	Pyrites and good oil showing	25	1,630
Sand and gravel	43	1,057	Gumbo and hard shale	14	1,644
Soft gumbo	82	1,139	Oil sand	12	1,656
Sand and gravel	61	1,200	Gumbo	21	1,677
Gumbo	120	1,320	Sand and gravel	10	1,687

Screen, 4½-inch, 64 feet.

Crowley Oil and Mineral Company No. 24; sec. 48; Crowley; drilled, fall, 1906; flowed at 800-barrel rate at first and suddenly stopped; deepened, 1906; map No. 315. Specimens of *Mulinia quadricentennialis* were collected from 1,923 to 1,935 feet.

Section of Crowley Oil and Mineral Company's well No. 24.

[J. O. Lee, driller.]

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Clay	40	40	Gumbo	6	1,890
Sand and gravel	793	833	Oil sand	70	1,960
Gumbo	87	920	Set 62 feet of 4½-inch screen.		
Sand and gravel, with some gumbo	136	1,056	Shale	10	1,970
Gumbo and some rock	113	1,169	Pyrites and sand	54	2,024
Oil showing	10	1,179	Set 63.5 feet of 3-inch screen.		
Gumbo, with some sand	705	1,884			

Crowley Oil and Mineral Company No. 25; no complete log obtained, but Reinecke collected a large number of fossils from the overflow between 2,400 and 2,650 feet; fossils identified by C. J. Maury: *Rangia johnsoni*, common from 1,960 to 2,650 feet; *Mulinia quadricentennialis*, 1,830 to 1,860 feet; *Amnicola*, 2,440 to 2,500, 2,528 to 2,565, 2,585 to 2,650 feet; *Ostrea*, 2,468 to 2,500 feet; *Neverita duplicata*, 2,468 to 2,500 feet; *Spisula quadricentennialis*, 2,585 to 2,600 feet.

Crowley Oil and Mineral Company No. 26; sec. 48; Crowley; drilled, winter, 1906–7; 300 barrels, February, 1907; producing, 1908; map No. 319. The following fossils were collected: *Rangia cuneata*, 1,660 feet; *Mulinia quadricentennialis*, 1,680 to 1,880 feet.

Crowley Oil and Mineral Company No. 27; sec. 48; Crowley; drilled, summer, 1907; dry.

Crowley Oil and Mineral Company No. 28; sec. 48; Crowley; drilled, spring, 1907; 200 barrels on pump; not producing, 1908; map No. 321.

Crowley Oil and Mineral Company No. 29; sec. 48; Crowley; drilled, summer and fall, 1907; 30 barrels, November, 1907; map No. 310.

Crowley Oil and Mineral Company No. 30; sec. 48; Crowley; drilled, summer, 1907; map No. 339.

Crowley Oil and Mineral Company No. 31; sec. 48; Crowley; drilled, summer, 1907; map No. 340.

Crowley Oil and Mineral Company No. 32; sec. 48; Crowley; drilled, fall, 1907; 300 barrels, October, 1907; map No. 345.

Crowley Oil and Mineral Company No. 33; sec. 48; Crowley; drilled, fall, 1907; dry; map No. 344.

Crowley Oil and Mineral Company No. 35; sec. 48; drilled, spring, 1908; producing, 1908; map No. 323.

Crowley Oil and Mineral Company No. 36; sec. 48; Crowley; drilled, spring, 1908; salt water; map No. 324.

Crowley Oil and Mineral Company No. 37; sec. 48; Crowley; drilling, fall, 1908; map No. 306.

Crowley Oil and Mineral Company No. 38; sec. 48; Crowley; drilled, summer, 1908; producing, November, 1908; map No. 305.

Crowley Oil and Mineral Company No. 39; sec. 48; Crowley; drilling, summer and fall, 1908; map No. 304.

Crowley Petroleum Company No. 1; sec. 46; Bettison half acre; producing, 1904; deepened, 1906; abandoned, 1906; map No. 131.

Crusell (et al.) No. 1; sec. 47; Arnaudet; operating, January, 1907; abandoned, 1908; map No. 277.

Crusell & Bass No. 1; sec. 47; Arnaudet; drilled, fall, 1906; salt water; abandoned, spring, 1907; map No. 278.

Crusell No. 2; sec. 47; Arnaudet; location only known; map No. 279.

Duson & Lyons No. 1; sec. 45; drilled, summer, 1907; small pumper; abandoned, December, 1907; map No. 395. Fossils collected by L. Reinecke, identified by C. J. Maury: *Rangia cuneata*, 1,530 to 1,860 feet; *Spisula* cf. *quadricentennialis*, 1,860 to 1,910 feet.

Section of Duson & Lyons's well No. 1, sec. 45.

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Clay	30	30	Gumbo?	110	1,200
Sand	450	480	Fine white sand, with some pyrite	100	1,300
Coarse, greenish quartz sand	100	580	Shale and some rock fragments	60	1,360
Sand	160	740	Shale, with few rock fragments	70	1,430
Rather fine sand	40	780	Shaly sand with sandstone fragments	100	1,530
Gumbo	20	800	Broken shells, with gravel and shale	50	1,580
Sand with some clay and limestone flakes	40	840	Shells, with limestone fragments	100	1,680
Gumbo	40	880	Sand, with wood fragments	20	1,700
Coarse sand with some blue clay	40	920	Not given	80	1,780
Apparently clay	50	970	Pyrite and broken limestone	15	1,795
Blue brittle clay, with fragments of white clay, not calcareous	60	1,030	Gumbo	5	1,800
Sand, pyrite, and some clay	20	1,050	Pyrite and broken sandstone fragments	20	1,820
Blue clay, like second bed above	20	1,070	Sand, some pyrite, plenty of shells	90	1,910
Sand with pyrite, like second bed above	20	1,090	Blue clay, with much pyrite	15	1,925

Duson & Lyons No. 1; sec. 47; King tract; drilled, fall, 1907; salt water, October, 1907; abandoned.

Duson No. 2; sec. 45; Schultz; drilled, fall, 1907; abandoned, December, 1907; map No. 396.

Duson No. 3; sec. 45; Schultz; no additional data; map No. 397.

Equitable No. 1; Rowson & Haber; sec. 46; drilled before 1905; long extinct; map No. 136.

Eunice-Crowley Oil Company No. 1; sec. 42; Heywood-Acadia lease; drilled, fall, 1903; near site of No. 33.

Evangeline Oil Company No. 1; sec. 47; Evangeline; drilled, fall, 1904; from September 8 to October 1 flowed 260,000 to 300,000 barrels; 1,000 barrels, on air; November, 1905; not producing, 1908; map No. 288.

Evangeline Oil Company No. 2; section 47; Evangeline; drilled, fall, 1904; 5,000 to 7,000 barrels; salt water, September, 1905; abandoned, 1906; map No. 285.

Evangeline Oil Company No. 3; sec. 47; Evangeline; drilled, fall, 1904; salt water; 1,500 barrels on air; July, 1905; not producing, 1908; map No. 283.

Evangeline Oil Company No. 3′; sec. 47; Evangeline; an old producer, abandoned in 1908; map No. 287.

Evangeline Oil Company No. 4; sec. 46; Producers-Evangeline; drilled, spring, 1905; 10 barrels, November, 1905; deepened, 1906; map No. 99.

Evangeline Oil Company No. 5; sec. 46; Producers-Evangeline; dry hole, abandoned, 1905; map No. 98.

Evangeline Oil Company No. 6; sec. 47; Evangeline; drilled, summer, 1905; 2,000 barrels on air; salt water, September, 1905; abandoned, May, 1908; map No. 284.

Evangeline Oil Company No. 7; sec. 47; Evangeline; drilled, spring, 1906; salt water, abandoned; map No. 281.

Evangeline Oil Company No. 8; sec. 47; Evangeline; drilled, summer, 1906; 800 barrels on air; deepened, fall, 1907; abandoned, 1908; map No. 286.

Section of Evangeline Oil Company's well No. 8.

	Thickness.	Depth.
	Feet.	*Feet.*
Yellow clay	20	20
Water sand	10	30
Sand and clay beds	90	120
Beds of loose gravel and sand	780	900
Shale and gumbo	860	1,760
Oil and gas sands	60	1,820
Oil sand and pyrite	80	1,900

Evangeline Oil Company No. 9; sec. 47; Evangeline; drilled, fall, 1906; 200 barrels on air, 1906; map No. 282.

Section of Evangeline Oil Company's well No. 9.

	Thickness.	Depth.
	Feet.	*Feet.*
Yellow clay	30	30
Water sand and streaks of gumbo	40	70
Sand and gravel	670	740
Gumbo	80	820
Strata of salt-water sand, gumbo, and shale	920	1,740
Tough gumbo	40	1,780
Pyrite and oil sand in thin strata	195	1,975

Franklin Oil Company No. 1; east of the field; drilled, fall, 1906; traces of oil; abandoned, March, 1907. Fossils, collected by L. Reinecke, identified by C. J. Maury: *Rangia cuneata*, 784–876, 1,238–1,322, 1,431–1,621 feet; *Rangia johnsoni*, 2,183–2,584 feet; *Arca* (fragment), 1,238–1,322 feet; *Ostrea*, 1,238–1,322 feet; *Amnicola*, 1,238–1,322, 2,183–2,204, 2,480–2,497, 2,654–2,664 feet; *Bittium*, 2,505–2,524 feet.

Section of Franklin Oil Company's well No. 1.

[W. Brown, driller.]

	Thickness.	Depth.
	Feet.	*Feet.*
Fine yellowish silty clay, becoming greenish toward bottom	175	175
Fine greenish sand, somewhat silty to 314 feet, then decidedly silty, but becoming coarser below	701	876
Fine green sand, broken flinty hard flakes	43	919
Sandy clay, with numerous shell fragments and some flint pebbles	84	1,003
Fine green sand, with pure white quartz grains and black specks; wood and a few shell fragments below	150	1,153
Tough blue clay, containing flint pebbles, some sand, and shell fragments	257	1,410
Tough blue sandy clay, with plenty of shells at 1,440–1,473 and 1,495–1,510 feet; fragments below may have been picked up by drill from beds above, according to driller	190	1,600
Generally white sand (becoming clayey with shells between 1,623 and 1,640 feet)	85	1,685
No record	25	1,710
Tough blue clay with pieces of bark and shell fragments, becoming sandy below	39	1,749
Blue clay with vegetable fiber	42	1,791
No record	22	1,813
White sand with flint pebbles, gravelly below (shells, 1,856–1,898 feet)	190	2,003
No record	10	2,013
Greenish, rather coarse sand, with flint and quartzite pebbles	61	2,074
No record	109	2,183
Green marl with plenty of shells	10	2,193
Green shell marl, shaly	11	2,204
No record	22	2,226
Blue marly clay, many shells	11	2,237
No record	21	2,258
Crumbly blue clay, hard to dissolve in water	22	2,280
No record	104	2,385
Blue tough shell marl	13	2,397
No record	32	2,429
Greenish sandy marl, very calcareous, with shells	30	2,459
No record	21	2,480
Green marl, full of shells	12	2,492
Fine greenish marly sand, few shells	120	2,612
Hard limestone	6	2,618
Sand with good oil indications	28	2,646
White calcareous sand, with shells	10	2,656
Sand	36	2,692

Getty No. 1; sec. 46; Getty; interesting as being a producer of usual depth (1,700–1,800 feet), 1904; deepened to test lower strata to 2,400 feet. Said to make 100 barrels oil, with about 5,000 barrels of salt water, daily; not a producer in 1908; map No. 73.

Guarantee No. 1; sec. 46; Guarantee; drilled, 1902; producing, 1903; map No. 133. (For section, see Bull. U. S. Geol. Survey No. 282, p. 96.)

Gulf Refining Company No. 1 (Jennings-Heywood Oil Syndicate No. 56); sec. 46; Syndicate-Clement; drilled, spring, 1908; 500 barrels, April, 1908; map No. 56.

Gulf Refining Company No. 1 (J. H. O. S. No. 4); sec. 41; Syndicate Fee Simple; drilled, spring, 1905; reported salt water, 1905; 3,500 barrels on air; map No. 149.

Gulf Refining Company No. 1; sec. 46; drilled, 1908; map No. 80.

Gulf Refining Company No. 2 (J. H. O. S. No. 57); sec. 46; Syndicate-Clement; drilled, spring, 1908; 1,000 barrels, April, 1908; producing, November, 1908; map No. 57.

Gulf Refining Company No. 2 (J. H. O. S. No. 7); sec. 47; Arnaudet; 100 feet from Heywood No. 1; drilled, spring, 1906; 10,000-barrel gusher; some salt water; producing, 1908; map No. 301.

Gulf Refining Company No. 3 (J. H. O. S. No. 61); sec. 46; Syndicate-Clement; drilled, spring, 1908; 800 barrels on air, May, 1908; producing, November, 1908; map No. 59.

Gulf Refining Company No. 3; sec. 47; Arnaudet; history not known; map No. 336.

Gulf Refining Company No. 4 (J. H. O. S. No. 12); sec. 47; Arnaudet; drilled, summer, 1906; produced 500 barrels and went to salt water, July, 1906; 100-barrel pumper, 1907; producing, November, 1908; map No. 326.

Gulf Refining Company No. 5 (J. H. O. S. No. 37); sec. 41; Syndicate Fee Simple; drilled, summer, 1907; 2,500 barrels on air; producing, 1908; map No. 150.

Gulf Refining Company No. 5; sec. 46; Syndicate-Clement; drilled, spring, 1908; 500 barrels on air, May, 1908; map No. 60.

Gulf Refining Company No. 6 (J. H. O. S. No. 14); sec. 47; Arnaudet; drilled, summer, 1906; flowed at 8,000-barrel rate and went to salt water; map No. 292.

Gulf Refining Company No. 7 (J. H. O. S. No. 15); sec. 47; Arnaudet; drilled, summer, 1906; 5,000 barrels and falling rapidly, September, 1906; map No. 294.

Gulf Refining Company No. 7; sec. 46; Syndicate-Clement; salt water; not producing, 1908; map No. 61.

Gulf Refining Company No. 4 (J. H. O. S. No. 62); sec. 46; Syndicate-Clement; drilled, spring, 1908; salt water, May, 1908; map No. 58.

Gulf Refining Company No. 1 (J. H. O. S. No. 48); sec. 42; Lekelt; drilled, January, 1908; 400 barrels water, February, 1908; producing, November, 1908; map No. 48.

Gulf Refining Company No. 2 (J. H. O. S. No. 51); sec. 42; Lekelt; drilled, spring, 1908; 200 barrels, March, 1908; map No. 45.

Gulf Refining Company No. 2; sec. 46; Jennings-Heywood; drilled, fall, 1908; producing, November, 1908; map No. 123.

Gulf Refining Company No. 3 (J. H. O. S. No. 55); sec. 42; Lekelt; drilled, spring, 1908; salt water, April, 1908; map No. 44.

Gulf Refining Company No. 3 (Jennings Oil Company, Clement No. 13); sec. 46; drilled, spring and summer, 1908; producing, November, 1908; map No. 69.

Gulf Refining Company No. 4 (Jennings Oil Company No. 14); sec. 46; Jennings-Clement; drilled, spring, 1908; 200 barrels on air, May, 1908; map No. 67.

Gulf Refining Company No. 4 (J. H. O. S. No. 59); sec. 42; Lekelt; drilled, spring, 1908; 150 barrels, May, 1908; map No. 49.

Gulf Refining Company (Wilkins) No. 4; sec. 47; Valée arpent; drilled, summer, 1905; flowed 3,000 barrels and sanded up, September, 1905; map No. 258.

Gulf Refining Company No. 5 (Jennings Oil Company No. 15); sec. 46; Jennings-Clement; drilled, summer, 1908; 100 barrels, July, 1908; producing, November, 1908; map No. 66.

Gulf Refining Company No. 5 (J. H. O. S. No. 13); sec. 47; Arnaudet; drilled, summer, 1906; reported salt water; operating, 1908; map No. 327.

Gulf Refining Company No. 5; sec. 42; Lekelt; drilled, spring, 1908; small producer; map No. 50.

Gulf Refining Company No. 6; sec. 46; Jennings-Heywood; drilled, summer, 1908; 150 barrels, September, 1908; pumping, November, 1908; map No. 79.

Gulf Refining Company No. 6; sec. 42; Lekelt; drilled, spring, 1908; small producer; map No. 51.

Gulf Refining Company No. 6 (Keoughan et al. No. 2); sec. 46; Zeigler; producing, November, 1908; map No. 115.

Gulf Refining Company No. 7; sec. 46; Jennings-Heywood; drilled, fall, 1908; 100 barrels, October, 1908; pumping, November, 1908; map No. 78.

Gulf Refining Company No. 8; sec. 46; Zeigler; drilled, fall, 1908; producing, November, 1908; map No. 114.

Gulf Refining Company No. 8; sec. 46; Jennings Oil Company, Clement; drilling, 1908; 350 barrels, October,; map No. 68.

Gulf Refining Company No. 9; sec. 46; Jennings-Clement; drilled, fall, 1908; 100 barrels, November, 1908; map No. 108.

Gulf Refining Company No. 9 (J. H. O. S. No. 17); sec. 47; Arnaudet; drilled, September, 1906; 95 per cent salt water, October, 1906; packer inserted and 300 barrels oil daily, November, 1906; not producing, 1908; map No. 334.

Gulf Refining Company No. 10 (J. H. O. S. No. 19); sec. 47; Arnaudet; drilled, fall, 1906; producing, November, 1908; map No. 380.

Gulf Refining Company No. 10 (J. H. O. S. No. 42); sec. 41; Syndicate Fee Simple; drilled, fall, 1907; 200 barrels, December, 1907; map No. 151.

Gulf Refining Company No. 10; sec. 46; Jennings-Clement; drilled, fall, 1908; 75 barrels, November, 1908; map No. 82.

Gulf Refining Company No. 11 (J. H. O. S. No. 20); sec. 47; Arnaudet; drilled, fall-1906; 400 barrels, November, 1906; producing, November, 1908; map No. 378.

Gulf Refining Company No. 11 (Jennings-Clement No. 8); sec. 46; Jennings-Clement; drilled, fall, 1908; operating in November, but reported as dry in December, 1908; map No. 76.

Gulf Refining Company No. 12; sec. 46; Jennings-Clement; drilled, fall, 1908; pump ing, November, 1908; map No. 71.

Gulf Refining Company No. 12 (J. H. O. S. No. 21); sec. 47; Arnaudet; drilled, fall, 1906; 1,200 barrels on air, November, 1906; producing, November, 1908; map No. 295.

Gulf Refining Company No. 13; sec. 46; Jennings-Clement; drilled, fall, 1908; pumping, November, 1908; map No. 72.

Gulf Refining Company No. 13 (J. H. O. S. No. 50); sec. 41; Syndicate Fee Simple; drilled, February, 1908; 1,000 barrels, March, 1908; being worked November 8, 1908; map No. 53.

Gulf Refining Company No. 14 (J. H. O. S. No. 53); sec. 41; Syndicate Fee Simple; drilled, spring, 1908; 1,000 barrels, April; producing, November, 1908; map No. 54.

Gulf Refining Company No. 14; sec. 46; Jennings-Clement; drilling, November, 1908; map No. 70.

Gulf Refining Company No. 15 (J. H. O. S. No. 54); sec. 41; Syndicate Fee Simple; drilled, spring, 1908; cleaning, November, 1908; map No. 159.

Gulf Refining Company No. 15 (J. H. O. S. No. 35); sec. 47; Arnaudet; drilled, summer, 1907; producing, November, 1908; map No. 296.

Gulf Refining Company No. 15 (J. H. O. S. No. 31); sec. 47; Martin; drilled; spring, 1907; 150 barrels, April, 1907; deepened, summer, 1907; producing, 1908; map No. 387.

Gulf Refining Company No. 15; sec. 46; Heywood Oil Corporation; drilled, fall, 1908; producing, November, 1908; map No. 102.

Gulf Refining Company No. 16 (Bass No. 16); sec. 47; Guffey Petroleum Company; drilled, spring, 1906; 3,000 barrels, May, 1906; producing, 1908; map No. 358.

Gulf Refining Company No. 16; sec. 41; Syndicate Fee Simple; location only known; map No. 160.

Gulf Refining Company No. 16 (J. H. O. S. No. 32); sec. 47; Arnaudet; drilled, summer, 1907; producing, November, 1908; map No. 297.

Gulf Refining Company No. 16; sec. 46; Jennings-Clement; drilled, fall, 1908; pumping, November, 1908; map No. 81.

Gulf Refining Company No. 17 (J. H. O. S. No. 36); sec. 47; Arnaudet; drilled, summer, 1907; 500 barrels, August, 1907; producing, November, 1908; map No. 291.

Gulf Refining Company No. 17 (J. H. O. S. No. 60); sec. 41; Syndicate Fee Simple; drilled, spring, 1908; 500 barrels on air, May, 1908.

Gulf Refining Company No. 18 (J. H. O. S. No. 42); sec. 47; Arnaudet; drilled, fall, 1907; 200 barrels, December, 1907; not producing, November, 1908; map. No. 293.

Gulf Refining Company No. 18; sec. 41; Syndicate Fee Simple; no data; not producing, November, 1908; map No. 161.

Gulf Refining Company No. 19; sec. 47; Arnaudet; drilled, summer, 1908; producing, November, 1908; map No. 299.

Gulf Refining Company No. 20; sec. 47; Guffey Petroleum Company; drilled, fall, 1907; producing, 1908; map No. 359.

Gulf Refining Company No. 20 (J. H. O. S. No. 68); sec. 41; Syndicate Fee Simple; drilled, summer, 1908; 100 barrels; not producing, November, 1908; map No. 153.

Gulf Refining Company No. 21; sec. 41; Syndicate Fee Simple; drilled, summer, 1908; salt water, 1908; map No. 156.

Gulf Refining Company No. 22 (J. H. O. S. No. 70); sec. 41; Syndicate Fee Simple; drilled, summer, 1908; salt water, 1908; map No. 158.

Gulf Refining Company No. 23 (J. H. O. S. No. 71); sec. 41; Syndicate Fee Simple; drilled, summer, 1908; 70 barrels and much salt water, August, 1908; map No. 52.

Gulf Refining Company No. 24 (J. H. O. S. No. 72); sec. 41; Syndicate Fee Simple; 200 barrels, fall, 1908; producing, November, 1908; map No. 55.

Gulf Refining Company No. 25; sec. 41; Syndicate Fee Simple; drilled, summer, 1908; salt water; map No. 147.

Gulf Refining Company No. 26; sec. 41; Syndicate Fee Simple; drilled, fall, 1908; salt water; map No. 154.

Gusher Oil Company; old well in northwest corner sec. 48, given on Hayes and Kennedy's map of the field as No. 1.

Haifleigh No. 1; sec. 47; Attakapas; reported as being deepened, October, 1907; salt water, November, 1907; map No. 273.

Haifleigh No. 2; sec. 47; Latreille; location only known; map No. 233.

Haifleigh No. 3; sec. 47; Attakapas; drilled, fall, 1907; salt water, November, 1907; map No. 270.

Harry No. 1; sec. 47; Valée arpent; drilled, spring, 1908; abandoned; map No. 260.

Heywood Brothers & Chaddock No. 1; sec. 47; Morse; drilled, summer, 1903; map No. 370.

Heywood Oil Company No. 1; sec. 42; Acadia; map No. 36.

Heywood (Bass) No. 1; map No. 63.

Heywood Brothers Oil Corporation No. 1; sec. 46; Heywood-Clement; drilled, spring, 1903; produced, 1904–5; map No. 413.

Heywood Brothers Oil Corporation No. 2; sec. 46; Heywood-Clement; drilled, spring, 1907; abandoned, summer, 1908; map No. 103.

Heywood Brothers Oil Corporation No. 3; sec. 46; Heywood-Clement; drilled, summer, 1907; abandoned, summer, 1908; map No. 104.

Heywood Brothers Oil Corporation No. 4; sec. 46; Heywood-Clement; drilled, spring, 1906; 500 barrels, June, 1907; map No. 108 (location of Gulf Refining Company, No. 9).

Heywood Oil Company No. 1; sec. 47; Arnaudet; drilled, fall, 1904; 10,000 barrels, October, 1904; 3,000 barrels, April, 1905; abandoned, 1906; map No. 389.

Heywood Oil Company No. 1; sec. 42; Eunice-Crowley; drilled late in 1907 or early in 1908; 500 barrels, February, 1908; map No. 29.

Heywood Oil Company No. 1; sec. 48; Crowley; drilled, January, 1906; 8,000-barrel gusher, February, 1906; 3,000 barrels, April, 1906; producing, 1908; map No. 424.

Section of Heywood Oil Company's well No. 1, sec. 48, below bottom of 6-inch casing (1,805 feet).

[H. H. Jones, driller.]

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Gumbo	7	1,812	Rock	4	1,879
Sand	3	1,815	White sandstone	7	1,886
Rock	1	1,816	Soft clay	10	1,896
Oil sand	4	1,820	Gumbo	13	1,909
Gumbo	35	1,855	Oil in streaks (as usual in field)	53	1,962
Oil sand	20	1,875			

Heywood Oil Company No. 1; sec. 45, Lyons; drilled, spring, 1907; salt water, April, 1907; map No. 19.

Heywood Oil Company No. 2; sec. 47; Arnaudet; produced poor oil, 1906; producing, 1908; map No. 392.

Heywood Oil Company No. 2; sec. 48; Crowley; drilled, spring, 1906; 2,000 barrels, May, 1906; map No. 302. Oil is dark and different from that of the best part of the field.

Section of Heywood Oil Company's well No. 2, sec. 48, below depth of 1,818 feet.

[H. H. Jones, driller.]

	Thickness.	Depth.
	Feet.	*Feet.*
Gumbo	38	1,856
Oil sand	8	1,864
Gray clay	31	1,895
Oil sand	15	1,910
Gumbo	26	1,936
Oil sand	32	1,968

Six-inch casing set at 1,843 feet. This well showed fragments of rock from 1,331 feet down, but was especially noteworthy for the rock between 1,450 and 1,495 feet, which it required fifty-two days to penetrate and which used up 150 bits.

Heywood Oil Company No. 2; sec. 42; Acadia; drilled, spring, 1908; 500 barrels, March, 1908; map No. 37.

Heywood Oil Company No. 3; sec. 47; Arnaudet; drilled, summer, 1905; produced 1,200 barrels in four hours, November, 1905; affected No. 4 decidedly; 300 barrels, December, 1905; abandoned, 1908; map No. 390.

Heywood Oil Company No. 3; sec. 48; Crowley; drilled, summer, 1906; 3,000 barrels June, 1906; pumping, November, 1908; drilled, map No. 312.

Section of Heywood Oil Company's well No. 3, sec. 48, below depth of 1,822 feet.

[H. H. Jones, driller.]

	Thickness.	Depth.
	Feet.	*Feet.*
Gumbo	41	1,863
Oil sand	8	1,871
Pyrites	33	1,904
Oil sand	6	1,910
Gumbo	21	1,931
Oil sand	4	1,935
Gumbo	13	1,948
Oil	14	1,962

Six-inch casing set at 1,849 feet.

Heywood Oil Company No. 3; sec. 42; Acadia; drilled, spring, 1908; 200 barrels, May, 1908; producing, November, 1908; map No. 33.

Heywood Oil Company No. 3; sec. 42; Eunice-Crowley; drilled, spring, 1908; map No. 30.

Heywood Oil Company No. 4; sec. 47; Arnaudet; drilled, spring, 1905; 8,000 barrels, June, 1905; 4,800 barrels, November, 1905; stopped flowing, December, 1905; deepened, 1907; map No. 391.

Heywood Oil Company No. 4; sec. 48; Crowley; drilled, summer, 1906; salt water; deepened, 1907; this or a well in about the same location producing in 1908; map No. 322.

Heywood Oil Company No. 4; sec. 42; Acadia; drilled, spring, 1908; 175 barrels, May, 1908; map No. 23.

Heywood Oil Company No. 4; sec. 42; Eunice-Crowley; drilled, spring; 1908; 175 barrels, May, 1908; map No. 32.

Heywood Oil Company No. 5; sec. 47; Arnaudet; drilled, summer, 1906; 4,000-barrel gusher for four days and then sanded up; producing, 1908; map No. 393.

Heywood Oil Company No. 5; sec. 48; Crowley; drilled, summer, 1906; salt water, August, 1906; map No. 314.

Heywood Oil Company No. 5; sec. 42; Acadia; drilled, spring, 1908; 250 barrels, April, 1908; map No. 25.

Heywood Oil Company No. 5; sec. 42; Eunice-Crowley; drilled, spring, 1908; salt water, May, 1908; map No. 31.

Heywood Oil Company No. 6; sec. 47; Arnaudet; drilled, fall, 1906; 400 barrels, November, 1906; abandoned, 1908; map No. 388.

Heywood Oil Company No. 6; sec. 42; Acadia; drilled, spring, 1908; 200 barrels, April, 1908; not producing, November, 1908; map No. 34.

Heywood Oil Company No. 6; sec. 42; Eunice-Crowley; drilled, spring, 1908; 100 barrels, 1908; producing, November, 1908; map No. 46.

Heywood Oil Company No. 6; sec. 48; Crowley; drilled, summer, 1906; 1,000 barrels for one day only, July, 1906; map No. 308.

Heywood Oil Company No. 7; sec. 42; Acadia; drilled, fall, 1908; 100 barrels, November, 1908; map No. 35.

Heywood Oil Company No. 7; sec. 42; Eunice-Crowley, drilled, summer, 1908; salt water, July, 1908; map No. 42.

Heywood Oil Company No. 7; sec. 48; Crowley; drilled, fall, 1906, to spring, 1907; map No. 313.

Heywood Oil Company No. 8; sec. 42; Eunice-Crowley; drilled, summer, 1908; 100 barrels, July, 1908; producing, November, 1908; map No. 40.

Heywood Oil Company No. 8; sec. 48; Crowley; drilled, fall, 1906; 100 barrels on air, December, 1906; abandoned, March, 1907; map No. 309. Fossils collected by L. Reinecke and identified by C. J. Maury: *Mulinia mamoucnsis* n. s., 2,050, 2,115–2,131 feet; *Ostrea*, 2,050 feet; *Turritella*, 2,050 feet; *Divaricella*, 2,050 feet.

Section of Heywood Oil Company's well No. 8, sec. 48.

	Thickness.	Depth.
	Feet.	*Feet.*
Clay	120	120
Sand and gravel	480	600
Gumbo	40	640
Sand and gravel	165	805
Gumbo, sand, and gravel	837	1,642
Hard, rough stones, pyrite, and shells	205	1,847
Gumbo	6	1,853
Hard matter	7	1,860
Gumbo	80	1,940
Rock (gas)	35	1,975
Gumbo and sand	43	2,018
Sand (traces of oil)	7	2,025
Rock	15	2,040
Sand, gumbo, shells, pyrite. Gas blew out through hole in casing at 2,050 feet, erupting fragments of blackish shale with shells, blue sandy limestone with pyrite and shells, and blue clay	75	2,115
Black shaly clay	16	2,131

Heywood Oil Company No. 9; sec. 48; Crowley; drilled, winter, 1906–7; not producing, November, 1908; map No. 303.

Heywood Oil Company No. 9; sec. 42; Eunice-Crowley; drilled, summer, 1908; dry, August, 1908; map No. 41.

Heywood Oil Company No. 10; sec. 48; Crowley; drilled, summer, 1907; blowing gas July, 1907; map No. 307.

Hill No. 1; sec. 45; Schultz; drilling, January, 1908; 500 barrels, February, 1908; map No. 403.

Hill (C. D.) No. 1; sec. 47; Kneiffe; drilled, fall, 1907; 150 barrels, November, 1907; abandoned, 1908; map No. 243.

Hill (C. D.) No. 2; sec. 47; Kneippe; drilled, fall, 1907; 150 barrels, October, 1907; abandoned; map No. 250.

Hill (C. D.) No. 4; sec. 46; Guarantee; drilled, fall, 1907; dry; map No. 134.

Hill (C. D.) No. 5; sec. 46; Bettison half acre; drilled, spring, 1908; salt water, March, 1908; map No. 132.

Home Oil Company, east of Jennings, at cemetery; given as No. 9 on Hayes and Kennedy's map; at least 1,700 feet deep; no results.

Home Oil Company No. 1; sec. 45; Conklin; drilled before 1904; map No. 400.

Home Oil Company; sec. 47: Producers half acre; drilled, fall, 1904; 16,000-barrel gusher, October 1, 1904; ceased to flow, December, 1904, but always responds to the bailer; map No. 348.

Interstate No. 1; sec. 45; Schultz; not producing, 1908; map No. 18.

Interstate No. 2; sec. 45; drilled, spring and summer, 1908; not producing, November, 1908; map No. 13.

Ismerie No. 2; sec. 45; Schultz; drilled, spring, 1908; salt water; map No. 14.

Ismerie (Duson & Lyons) No. 1; sec. 45; Schultz; drilled, spring, 1908; 1,200 barrels, March, 1908; map No. 423.

Ismerie No. 3; sec. 45; Schultz; abandoned, May, 1908; map No. 11.

Jaenke (F. R.) No. 2; sec. 41; syndicate Fee Simple; drilled, summer, 1904; found 45 feet of the "sand," extending the known field 300 feet to the south; produced 200 barrels, 1904; map No. 145.

Jennings Oil Company No. 1; sec. 46; Jennings; drilled, summer, 1901; first well in the field; produced some in 1901 and 1902; sand said to be 1,800 feet deep; map No. 120.

Jennings Oil Company No. 2; sec. 46; Jennings-Clement; drilled, spring, 1904; 6-inch casing set at 1,800 feet; gushed and burned fiercely from July 15 to July 21, 1902; produced, 1903–4; abandoned, 1907; map No. 122.

Jennings Oil Company No. 3; sec. 46; Clement; producing, June, 1903; old screen sidetracked September, 1903; producing, 1904; extinct, 1908; map No. 109.

Jennings Oil Company No. 4; sec. 46; Jennings-Clement; drilled, spring, 1903; operating, 1903–4; map No. 124.

Jennings Oil Company No. 5; sec. 46; Jennings-Clement; producing, 1903; deepened, 1906; blew out and destroyed derrick; abandoned, 1908; map No. 141.

Jennings Oil Company No. 7; sec. 46; Jennings-Clement; drilled, spring, 1906; producing, 1906; abandoned, 1908; site of Savage No. 1; map No. 432.

Jennings Oil Company No. 8; sec. 46; Jennings-Clement; drilled, spring, 1906; dry, June, 1906; map No. 77.

Jennings Oil Company No. 10; sec. 46; Jennings-Clement; drilled, summer, 1906; salt water; map No. 121.

Jennings Oil Company No. 11; sec. 46; Jennings-Clement; drilled, fall, 1906; 150 barrels, October, 1906; abandoned, 1908; map No. 426.

Jennings Oil Company No. 12; sec. 46; Jennings Fee Simple; drilled, summer, 1907; 350 barrels, November, 1907; map No. 92.

Jennings-Heywood Oil Syndicate No. 1; an old test well put down southwest of the field in 1902.

Jennings-Heywood Oil Syndicate No. 2; sec. 46; Syndicate's half acre on east margin of the section; drilled, 1902; producing, 1903, abandoned, map No. 130.

Jennings-Heywood Oil Syndicate No. 5 (Gulf Refining Company No. 1); sec. 47; Rex; drilled, fall, 1905; 1,500 barrels on air, October, 1905; producing, 1907; not producing, 1908; map No. 257.

Jennings-Heywood Oil Syndicate No. 6 (Gulf Refining Company No. 2); sec. 41; Syndicate Fee Simple; drilled early in 1906; hot salt water, July, 1906; deepened, 1907; not producing, 1908; map No. 152.

Jennings-Heywood Oil Syndicate No. 8; sec. 47; Arnaudet; drilled, spring, 1906; abandoned, June, 1907; not producing, 1908; map No. 300.

Jennings-Heywood Oil Syndicate No. 11 (Gulf Refining Company No. 2); sec. 47; Rex; drilled, summer, 1906; 500 barrels, October, 1906; producing November, 1908; practically site of "Rayne Planters No. 2" of Bull. U. S. Geol. Survey, No. 282; map No. 239.

Jennings-Heywood Oil Syndicate No. 16; sec. 47; Arnaudet; drilled, summer, 1906; 3,000 barrels at first, then sanded up; map No. 444.

Jennings-Heywood Oil Syndicate No. 18; sec. 47; Arnaudet; drilled, fall, 1906; abandoned, fall, 1907; map No. 381.

Jennings-Heywood Oil Syndicate No. 21; sec. 47; Arnaudet; drilled, fall, 1906; 1,200 barrels on air, November, 1906; map No. 443.

Jennings-Heywood Oil Syndicate No. 22; sec. 47; Arnaudet; drilled, fall, 1906; terrific blowout, November, 1906; salt water, December; map No. 290.

Jennings-Heywood Oil Syndicate No. 23; sec. 47; Arnaudet; drilled, fall, 1906; 2,500 barrels at first, then 1,200 barrels on air, November, 1906; abandoned, 1907; map No. 275.

Jennings-Heywood Oil Syndicate No. 25; sec. 47; Arnaudet; drilled, fall, 1906; twisted off and abandoned, spring, 1907; map No. 298.

Jennings-Heywood Oil Syndicate No. 26 (Gulf Refining Company No. 13); sec. 47; Arnaudet; drilled, fall, 1906; 300 barrels on air, December, 1906; producing, 1908; map No. 280.

Jennings-Heywood Oil Syndicate No. 27; sec. 47; Latreille; drilled, fall, 1906; 450 barrels, January, 1907; map No. 175. Fossils from 1,970 to 1,980 feet: *Rangia johnsoni*, *R. cuneata*, *Ostrea*, *Venus*.

Jennings-Heywood Oil Syndicate No. 28 (Gulf Refining Company No. 14); sec. 47; Arnaudet; drilled, spring, 1907; salt water; deepened, fall of 1908; map No. 276. Fossils collected by L. Reinecke and identified by C. J. Maury: *Rangia cuneata*, 800–1,100 feet; *Rangia johnsoni*, 1,710, 1,890–1,892 feet; *Ostrea*, common from 800 to 1,890 feet; *Mactra*, fragment of large species.

Jennings-Heywood Oil Syndicate No. 29; sec. 47; Arnaudet; drilled, January-March, 1907; blowout, etc.; map No. 289. Fossils collected by L. Reinecke and others and identified by C. J. Maury: *Rangia cuneata*, 200–400, 800–870, 1,540–1,560, 1,855, 1,920–1,940 feet; *Rangia johnsoni*, very abundant, 1,040–1,960 feet; *Ostrea*, 1,120–1,220, 1,240–1,300, 1,420–1,500, 1,540–1,560, 1,941–1,961 feet; *Mytilus*, 1,120–1,220, 1,420–1,500 feet; *Amnicola*, 1,540–1,560, 1,920–1,940, 1,960–1,980 feet; *Corbula contracta*, 1,920–1,940, 1,960–1,980 feet; *Mulinia quadricentennialis*, 1,941–1,961 feet; *Crassatellites* (young), 1,941–1,961 feet; *Cardium* (fragment), 1,941–1,961 feet; *Lucina crenulata*, 1,960–1,980 feet; *Arca campechensis*, 1,960–1,980 feet; *Natica emimulcides*?, 1,960–1,980 feet; *Balanus*, 1,840–1,920 feet; cypress wood, becoming carbonized, 300–400 feet; crinoid stems in gravel from Paleozoic, 740–760 feet.

Section of Jennings-Heywood Oil Syndicate's wells Nos. 29 and 29a.

[George Little, driller.]

	Thickness.	Depth.
	Feet.	*Feet.*
Upper beds not carefully measured	200	200
White and black quartz sand, becoming gravelly below 340 feet; calcareous and pyrite particles rare	240	440
Fine black and white quartz sand	50	490
Gravel, with pyrite; 3-foot layer of gumbo toward bottom	280	773
Gumbo	7	780
Fine green sand, with a few pebbles toward bottom	160	940
Blue shaly sand	60	1,000
Sand as in second bed above	20	1,020
Sandy blue clay	20	1,040
Blue clay, with some sand, pyrite, and plenty of shells	80	1,120
As above, harder	180	1,300
Fine green sand, with shells	140	1,440
Sandy clay, with shells; lower 20 feet with much pyrite	80	1,520
Plastic blue clay	20	1,540
Fine greenish-white sand with shells	20	1,560
Blue clay, with pyrite and shells	20	1,580
Fine greenish sand, with finely divided particles of pyrite and some shells	20	1,600
Sandy clay	20	1,620
Fine green sand; plenty of pyrite and a few shells; hard calcareous sandstone at 1,650 feet. Derrick moved over 20 feet east; well No. 29a did not encounter the hard layer at 1,650 feet.	30	1,650
Clay	30	1,680
Plastic blue clay, some sand and shells	100	1,780
Gumbo	20	1,800
Clay and sand as in second bed above; sand with pyrite, 1,820–1,840 feet; sand with pyrite and shells, 1,880–1,900 feet	120	1,920
Black and white sand, shells, and pyrite	40	1,960
Very fine white sand, shells, and pyrite	20	1,980

Jennings-Heywood Oil Syndicate No. 30; sec. 41; Syndicate Fee Simple; drilled, spring, 1907; salt water; map No. 146. Fossils collected by L. Reinecke, identified by C. J. Maury: *Natica* sp., 1,080–1,730 feet; *Unio* sp., 1,080–1,127, 1,403–1,483 feet; *Rangia cuneata*, 1,360–1,483, 1,527–1,611, 1,632–1,716, 1,840 feet; *Ostrea*, 1,840 feet; lignite, 1,277–1,362, 1,403–1,483 feet.

Section of Jennings-Heywood Oil Syndicate's well No. 30.

[Kid Connelly, driller.]

	Thickness.	Depth.
	Feet.	*Feet.*
Clay	30	30
Sand and gravel	720	750
Gumbo	50	800
Sand, streaked with gumbo	280	1,080
Blue sandy clay, full of shells	47	1,127
Greenish-white sand, shells in upper 20 feet	42	1,169
Blue sand and gravel, with some shells	129	1,298
Sand, with clay and shells; shells in sand	62	1,360
Greenish sand, with limestone fragments	43	1,403
Sand, with limestone fragments and numerous shells	187	1,590
Blue clay, with some fine sand	5	1,595
Sand, as in second bed above	16	1,611

Jennings-Heywood Oil Syndicate No. 33; sec. 41; Syndicate Fee Simple; drilled, summer, 1907; salt water; map No. 148.

Jennings-Heywood Oil Syndicate No. 34 (Gulf Refining Company No. 34); sec. 47; Rex; drilled, summer, 1907; 2,500 barrels, June, 1907; produced, 1908; map No. 241.

Jennings-Heywood Oil Syndicate No. 35; sec. 47; Latreille; location only known; map No. 147.

Jennings-Heywood Oil Syndicate No. 38; sec. 41; Syndicate Fee Simple; drilled, summer, 1907; 200 barrels an hour at first, and then sanded up; location near that of map No. 159.

Jennings-Heywood Oil Syndicate No. 39; sec. 47; Latreille; location only known; map No. 173.

Jennings-Heywood Oil Syndicate No. 40; sec. 47; Rex; drilled, summer, 1907; 250 barrels, August, 1907; abandoned, 1908; map No. 255.

Jennings-Heywood Oil Syndicate No. 41 (Gulf Refining Company No. 19?); sec. 41; Syndicate Fee Simple; drilled, fall, 1907; abandoned, 1907; map No. 155.

Jennings-Heywood Oil Syndicate No. 44 (Gulf Refining Company No. 3); sec. 47; Rex; drilled, fall, 1907; 300 barrels, 1907; producing, November, 1908; map No. 240.

Jennings-Heywood Oil Syndicate No. 45; sec. 41; Syndicate Fee Simple; drilled, fall, 1907; 1,500 barrels; location close to that of map No. 153.

Jennings-Heywood Oil Syndicate No. 47; sec. 41; Syndicate Fee Simple; no data; location close to that of map No. 155.

Jennings-Heywood Oil Syndicate No. 57; sec. 41; Syndicate Fee Simple; location near that of map No. 160.

Keoughan & Noble No. 1; sec. 46; Noble; completed, 1905; map No. 126.

Keoughan No. 2; sec. 46; Zeigler; producing, 1903; map No. 114.

Keoughan No. 3; sec. 46; Zeigler; producing, 1903–4; map No. 435.

Kneippe No. 1; sec. 47; Kneippe; drilled, January, 1905; 1,000 barrels; abandoned, 1906; map No. 249.

Kneippe No. 2; sec. 47; Kneippe; 3,000 barrels, March, 1905; map No. 244.

Laguerre No. 1; sec. 47; Kneippe; drilled, December, 1907; dry; map No. 242.

Lake No. 1; sec. 45; Schultz; drilled, 1903; said to have produced in 1903 and to have been drilled all in the daytime "so that the section could be well studied;" drilled by J. T. Newton (Oil Inv. Jour., September, 1903, p. 8); map No. 422.

Layne No. 1; sec. 45; Schultz; drilled, summer, 1903; map No. 394.

Layne Oil No. 2; sec. 45; Schultz; producing, 1904; deepened and dry, June, 1906; map No. 398.

Lovegrove & McIntosh No. 1; sec. 47; West Virginia; drilled, fall, 1904; 3,000-barrel gusher, December, 1904; 400 barrels, April, 1905; 500 barrels, June, 1905; 100 barrels, December, 1905; map No. 377. Gulf Refining Company No. 1 in same locality, producing, 1908.

Lyons No. 1; sec. 46; Evangeline; drilled, summer, 1903; producing, 1904; deepened, 1905; map No. 100.

Mahaffey No. 1; sec. 47; West Virginia; this well seems to be West Virginia No. 1 or "Virginia" of Bull. U. S. Geol. Survey No. 282; came in September, 1904, and sanded up after going "wild;" map No. 414.

McFarland Oil Company; sec. 45; Conklin; drilled before 1904; deepened by Higgins Oil and Fuel Company, 1906; map No. 440.

Mattison No. 1; sec. 47; Attakapas; drilled apparently late in 1907; map No. 271.

Mattison No. 2; Latreille, King tract; drilled, fall, 1907; dry.

Mattison No. 3; sec. 42; Mattison; drilled, spring, 1908; 500 barrels, March; not producing, November, 1908; map No. 26.

Mattison No. 3; sec. 45; drilled, February, 1908; nonproducing, November, 1908; map No. 12.

Mattison No. 4; sec. 42; drilled, spring, 1908; 300 barrels, March; nonproducing, November, 1908; map No. 27.

Mermentau Development Company No. 1; sec. 46; Zeigler; produced, 1903–4; map No. 135.

Mermentau Development Company No. 2; sec. 46; Jennings Fee Simple; drilled summer, 1903; produced spectacular blow out; nonproducing, 1908; map No. 89.

Mermentau Development Company No. 3; sec. 46; Jennings-Clement; probably drilled in 1903; deepened, summer, 1906; 75 barrels, 1906; map No. 88.

Mermentau Development Company No. 4; sec. 46; Jennings Fee Simple; drilled, 1904; deepened, 1906; abandoned, 1907; map No. 90.

Moonshine No. 1; sec. 47; Moonshine acre; 1,000 barrels on air, April, 1905; abandoned, October, 1905; map No. 267.

Morse Nos. 1 and 2. See Bass & Guffey No. 1; Bass No. 2.

Morse No. 3; sec. 46; Heywood; drilled, summer, 1903; producing, 1904, 1908; map No. 62.

Morse No. 4; sec. 46; Morse; drilled, summer, 1903; flowed above derrick, August, 1903; nonproducing, 1908; map No. 65.

Morse No. 5; sec. 46; Morse; drilled, summer, 1903; 500 barrels, 1903; nonproducing, 1908; map No. 64.

Morse Nos. 6 and 7. See Bass Nos. 6 and 7.

National Oil Company No. 1; sec. 45; Schultz; 3,000 barrels, April, 1908; map No. 21.

National Oil Company No. 2; sec. 45; Schultz; drilled, spring, 1908; 400 barrels, April; nonproducing, November, 1908; map No. 16.

National Oil Company No. 3; sec. 45; Schultz; drilled, spring, 1908; 300 barrels; map No. 22.

National Oil Company No. 4; sec. 45; Conklin; drilled, summer, 1908; 800 barrels; map No. 4.

National Oil Company No. 5; sec. 45; McFarlain; drilled, summer, 1908; 100 barrels, August, 1908; worked on, November, 1908; map No. 10.

National Oil Company No. 6; sec. 45; Conklin; drilled, fall, 1908; 150 barrels; map No. 2.

National Oil Company No. 7; sec. 45; Conklin; drilled, fall, 1908; salt water; map No. 1.

New Orleans-Jennings Mutual No. 1 (Producers-Evangeline No. 2); sec. 46; drilled, spring, 1905; 40 barrels daily; map No. 101.

Heywood (Noble) No. 1; sec. 46; Noble; drilled, spring, 1905; poor producer; map No. 117.

Noble No. 2; sec. 46; Noble; drilled, spring, 1907; abandoned, June, 1907; map No. 129.

Noble No. 2; sec. 42; Eunice-Crowley; drilled, January-February, 1908; 500 barrels, February, 1908; map No. 39.

Northern No. 1; sec. 46; Noble; drilled, fall, 1902; producing, 1903–4; map No. 125.

Northern No. 2; sec. 46; Noble; drilled, 1902; producing, 1903–4; map No. 127.

Northern No. 3; sec. 46; Noble; drilled, spring, 1903; producing, 1904; abandoned, 1907; map No. 116.

Northern No. 4; sec. 46; Syndicate-Clement; drilled, 1903; producing, 1903–4; map No. 138.

Pelican Oil Company No. 1; sec. 63; halfway from Jennings field to Jennings; drilled in 1902; dry; No. 3 of Bull. U. S. Geol. Survey No. 212. Mr. Reinecke obtained a log of this well to depth of 2,512 feet; the log does not differ greatly from the general run of logs of the Jennings field, but it is styled "doubtful" in Mr. Reinecke's notes.

Pelican No. 2; Mr. Reinecke obtained a log (which he styles "unreliable") of a well by this number with a depth of 400 feet; location not known to the writer.

Pelican No. 3; sec. 46; Producers-Evangeline; drilled, summer, 1903; sometimes styled Pelican No. 1; map No. 97.

Prairie Mamou No. 1; sec. 47; Latreille; one of the early wells of the field; on the "hill;" dry at a depth of more than 2,200 feet, the "sand" said to have been found at that depth; map No. 411.

Producers No. 1; sec. 47; Latreille; drilled, summer, 1904; 5,000 barrels, August, 1904; 1,850,000 barrels in 54 days; stopped flowing, April 20, 1905; producing, November, 1908; map No. 223. Fossils collected by L. Reinecke and identified by C. J. Maury: *Rangia cuneata*, 1,688–1,895 feet; *Cerithium*? sp., 1,688–1,695 feet; *Cerithium*, 1,800–1,860 feet; *Mulinia quadricentennialis*, 1,720–1,860 feet; *Mulinia* sp., 1,688–1,695 feet.

Section of Producers well, No. 1.

[From Charles Clayton, field manager.]

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Clay	30	30	Rock	2	1,716
Sand	182	212	Rock and pyrite	18	1,734
Gumbo	583	795	Gumbo	17	1,751
Clay	58	853	Rock and pyrite	18	1,769
Sand	67	920	Gumbo	41	1,810
Gumbo	60	980	Sand, with oil indications	11	1,821
Sand	50	1,030	Gumbo	11	1,832
Gumbo	170	1,200	Soft shaly rock	6	1,838
Sand (slight oil showing)	50	1,250	Gumbo (6-inch casing set on this bed)	44	1,882
Gumbo	190	1,440	Sand, with oil and gas	88	1,970
Gumbo and bowlders	81	1,521	Gumbo.		
Gumbo	193	1,714			

Screen, 1,882–1,991 feet.

Producers No. 2; sec. 47; Latreille; hole only, November, 1908; map No. 227.

Producers Oil Company No. 1; sec. 46; Jennings-Clement; producing, 1903–4, 1905; map No. 162.

Section of Producers Oil Company's well No. 1, Jennings-Clement tract, sec. 46.

[Charles Dawson, driller.]

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Record to	.....	1,735	Sand	21	1,912
Sand	10	1,745	Gas rock	2	1,914
Pyrite and clay	10	1,755	Clay and sand	5	1,919
Sand	65	1,820	Hard sand	16	1,935
Clay	30	1,850	Clay	12	1,947
Sand	8	1,858	Clay and bowlders	11	1,958
Clay	17	1,875	Sand and shells	60	2,018
Sand	13	1,888	Clay.		
Rock	3	1,891			

Screen, Layne, 102 feet.

Producers Oil Company No. 1; sec. 42; Eunice-Crowley; drilled, spring, 1908; salt water, April, 1908; map No. 47.

Producers Oil Company No. 1; sec. 46; Evangeline; abandoned location; map No. 101.

Producers Oil Company No. 2; sec. 46; Jennings-Clement; producing, 1903–4; deepened, 1906; abandoned, 1908; map No. 83.

Producers Oil Company No. 1; sec. 42; Eunice-Crowley; drilled, spring, 1908; salt water, March, 1908; map No. 43.

Producers Oil Company No. 2; sec. 47; Producers half acre; drilled before 1907; map No. 362.

Producers Oil Company No. 3; sec. 46; Jennings-Clement; drilled, summer, 1903; wild well; finished without screen; blew carloads of sand; producing, 1903–4; deepened, 1906; map No. 434.

Producers Oil Company No. 3; sec. 47; Producers half acre; drilled before 1907; map No. 367.

Producers Oil Company No. 3; sec. 47; Latreille; deepened, June, 1905; map No. 226. Fossils collected: *Rangia cuneata*, 1,760–1,772 feet; *Mulinia*, 1,760–1,772, 1,925 feet; *Mulinia quadricentennialis*, 1,975 feet; *Ostrea*, 1,925–1,975 feet; *Cerithium*, 1,925 feet.

Producers Oil Company No. 4; sec. 46; Producers-Evangeline; drilled, summer, 1906; deepened; 200 barrels daily; map No. 96.

Section of Producers Oil Company's well No. 4, Producers-Evangeline tract, sec. 46.

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Clay	80	80	Bowlders and gumbo	11	1,750
Sand and gravel	710	790	Gumbo	30	1,780
Gumbo	35	825	Sand	6	1,786
Sand and gravel	211	1,036	Gumbo and bowlders	34	1,820
Gumbo	40	1,076	Shells	4	1,824
Shell	44	1,120	Shale	21	1,895
Gumbo	45	1,265	Pyrite and sand	15	1,860
Rock	8	1,273	Gumbo	12	1,872
Gumbo	77	1,350	Pyrite and sand	10	1,882
Hard shale and bowlders	70	1,420	Pyrite and gumbo	23	1,905
Gumbo and bowlders	110	1,530	Pyrite and sand	12	1,917
Pyrite	15	1,545	Sand	17	1,934
Gumbo	30	1,575	Gumbo	6	1,940
Sand and gravel	30	1,605	Shells	6	1,946
Gumbo	95	1,700	Gumbo	2	1,948
Gumbo and bowlders	37	1,737	Shale, shells, and sand	18	1,966
Rock	2	1,739			

Strainer, 1,816–1,966 feet.

Producers Oil Company No. 4; sec. 47; Latreille; drilled, fall, 1904; deepened, summer, 1905; map No. 445.

Producers Oil Company No. 4; sec. 47; Producers half acre; drilled before 1907; map No. 365.

Producers Oil Company No. 4; sec. 46; Jennings-Clement; drilled, spring, 1906; 600 barrels, April, 1906; producing, November, 1908; map No. 142.

Producers Oil Company No. 5; sec. 47; Producers half acre; drilled before 1907; map No. 372.

Producers Oil Company No. 5; sec. 46; Jennings-Clement; drilled, spring, 1906; salt water; deepened, 1906; abandoned, spring, 1907; map No. 143.

Section of Producers Oil Company's well No. 5, sec. 46.

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Clay	25	25	Sand	14	1,375
Sand	225	250	Gumbo	280	1,655
Gravel	277	527	Sand	15	1,670
Gumbo	5	532	Gumbo	59	1,729
Sand	6	538	Sand	16	1,745
Gravel	200	738	Gumbo	31	1,776
Gumbo	14	752	Sand	14	1,790
Gravel	72	824	Gumbo	25	1,815
Shell	4	828	Sand	17	1,832
Gumbo	37	865	Soft gumbo	18	1,850
Sand	40	905	Soft rock	5	1,855
Gumbo	159	1,064	Sand	53	1,908
Sand	21	1,085	Pyrite and sand	17	1,925
Gumbo	148	1,233	Rock	1	1,926
Sand	27	1,260	Sand	38	1,964
Gumbo	101	1,361			

Strainer, 4½-inch, 190 feet.

Producers Oil Company No. 5; sec. 47; Latreille; 6,500 barrels, May, 1906; not producing, November, 1908; map No. 222. From a depth of 1,800 feet the following forms occur: *Ostrea*, *Neritina* (like *picta*), *Cerithium*, and *Mulinia*.

Section of Producers Oil Company's well, No. 5, sec. 47.

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Clay	30	30	Rock	6	1,578
Sand	395	425	Sand	66	1,644
Sand and gravel	331	756	Gumbo	91	1,735
Gumbo	90	846	Gumbo and pyrite	20	1,755
Sand	180	1,026	Sand	35	1,790
Gumbo	38	1,064	Pyrite	2	1,792
Rock	5	1,069	Gumbo	38	1,830
Soft gumbo	221	1,290	Sand	12	1,842
Sand	30	1,320	Sand and pyrite	26	1,868
Gumbo	155	1,475	Gumbo	2	1,870
Gumbo and bowlders	79	1,554	Sand	67	1,937
Sand	18	1,572			

Strainer, 3-inch; 1,830–1,937 feet.

Producers Oil Company No. 6; sec. 46; Jennings-Clement; deepened, summer, 1906; salt water; abandoned, spring, 1907; map No. 144.

Producers Oil Company No. 6; sec. 47; Producers half acre; map No. 349.

Section of Producers Oil Company's well No. 6, Producers half-acre tract, sec. 47.

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Clay	14	14	Rock	3	1,644
Sand and gravel	696	710	Gumbo, rock below	9	1,653
Gumbo	30	740	Rock	4	1,657
Gravel	170	910	Clay	70	1,727
Clay	20	930	Pyrite	8	1,735
Marl	20	950	Clay	3	1,738
Gumbo	150	1,100	Sand	20	1,758
Clay and gumbo	67	1,167	Clay; 6-inch casing set at 1,770 feet	18	1,776
Pyrite and clay	165	1,332	Sand and shale	8	1,784
Sand and shale	9	1,341	Gumbo	24	1,808
Hard rock	3	1,344	Sand and shale	18	1,826
Clay	20	1,364	Sand	9	1,835
Sand and shale	36	1,400	Clay	11	1,846
Hard clay	50	1,450	Clay and pyrite	19	1,865
Clay and bowlders	129.5	1,579.5	Sand	60	1,925
Rock	10.5	1,590	Clay	5	1,930
Clay and pyrite	22	1,612	Sand	15	1,945
Rock (drilled on three days)	5	1,617			
Clay	24	1,641			

Screen, 4½-inch, 128 feet.

Producers Oil Company No. 6; sec. 47; Latreille; drilled, fall, 1905; salt water, January, 1906; deepened; not producing, 1908; map No. 178.

Section of Producers Oil Company's well No. 6, Latreille tract, sec. 47.

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Clay	35	35	Rock	2	1,497
Sand	35	70	Gumbo	153	1,650
Gumbo	30	100	Rock and shale	22	1,672
Sand and gravel	705	805	Gumbo	108	1,780
Gumbo	65	870	Rock and shells	8	1,788
Sand and gravel	152	1,022	Gumbo	6	1,794
Gumbo	58	1,070	Rock and shells	4	1,798
Shale	20	1,090	Pyrite and shells	32	1,830
Rock	1	1,091	Sand and shells	73	1,903
Shale	159	1,250	Fine sand	14	1,917
Gumbo	140	1,390	Sand	55	1,972
Rock	2	1,392	Sand and shells	10	1,982
Gumbo	103	1,495			

Screen, 4½-inch, 147 feet.

Producers Oil Company No. 7; sec. 47; Producers half acre; drilled before 1907; map No. 371.

Producers Oil Company No. 7; sec. 47; Latreille; derrick erected, 1906; drilling, 1907; abandoned, 1908; map No. 177.

Section of Producers Oil Company's well No. 7, Latreille tract, sec. 47.

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Clay	32	32	Gumbo	4	1,812
Sand	198	230	Hard shale	18	1,830
Gravel	230	460	Pyrite and rock	10	1,840
Gumbo	4	464	Gumbo	8	1,848
Gravel	211	675	Rock	1	1,849
Gumbo	31	706	Sand	4	1,853
Gravel	132	838	Gumbo	3	1,856
Gumbo	35	873	Sand	9	1,865
Sand	142	1,015	Pyrite and rock	22	1,887
Gumbo and shale	440	1,455	Sand	16	1,903
Gumbo	170	1,625	Pyrite	1	1,904
Rock	2	1,627	Gumbo	5	1,909
Gumbo	13	1,640	Sand	18	1,927
Rock	5	1,645	Gumbo	7	1,934
Gumbo	155	1,800	Sand	67	2,001
Pyrite	8	1,808			

Strainer, 1,938–2,001 feet.

Producers Oil Company No. 7; sec. 46; Clement; drilled, spring, 1907; 150 barrels; map No. 442.

Producers Oil Company No. 8; sec. 47; Latreille; drilled, spring, 1906; dry; deepened, fall, 1906; abandoned, 1908; map No. 229. Fossils: *Mulinia quadricentennialis*, *M.* cf. *mamouensis*, 1,990–2,012 feet.

Section of Producers Oil Company's well No. 8, Latreille tract, sec. 47.

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Clay	30	30	Gumbo	2	1,920
Sand	235	270	Pyrite and shells	44	1,964
Gravel	155	425	Pyrite and rock	16	1,980
Rock	2	427	Sand	5	1,985
Gumbo and bowlders	91	518	Pyrite	13	1,998
Rock	6	524	Blue shale	42	2,040
Gumbo and bowlders	144	668	Shells (loose)	6	2,046
Rock	3	671	Rock	1	2,047
Gumbo and bowlders	69	740	Shale	11	2,058
Gumbo	112	852	Gumbo	12	2,070
Sand	41	893	Pyrite and shells	15	2,085
Gumbo	19	912	Sand and pyrite	12	2,097
Sand	46	958	Gumbo and pyrite	30	2,127
Gumbo	57	1,015	Rock	1	2,128
Sand	30	1,045	Pyrite	8	2,136
Shale	96	1,141	Rock	3	2,139
Rock	5	1,146	Sand	20	2,159
Shale and bowlders	70	1,216	Rock and pyrite	2	2,161
Gumbo	77	1,293	Sand	5	2,166
Rock	2	1,295	Rock and pyrite	1	2,167
Gumbo	115	1,410	Sand	2	2,169
Shale	45	1,455	Rock	1	2,170
Gumbo and bowlders	65	1,500	Rock	3	2,173
Sand	120	1,640	Sand	6	2,179
Rock	3	1,643	Gumbo. Pipe sidetracked and well redrilled from 1,970 feet.		
Gumbo	47	1,690			
Sand	30	1,720			
Pyrite	5	1,725	Sand	20	1,990
Gumbo	71	1,796	Pyrite	10	2,000
Sand	14	1,810	Shale	32	2,032
Rock	2	1,812	Shells	10	2,042
Gumbo	33	1,845	Rock	5	2,047
Rock and pyrite	10	1,855	Sand	13	2,060
Gumbo	20	1,875	Pyrite and sand	15	2,075
Rock and pyrite	15	1,890	Gumbo and pyrite	15	2,090
Gumbo	20	1,910	Sand	13	2,103
Pyrite with shells	6	1,916	Gumbo	17	2,120
Soft rock	2	1,918			

Producers Oil Company No. 8; sec. 47; Producers half acre; apparently drilled about 1906; map No. 347.

Section of Producers Oil Company's well No. 8, Producers half-acre tract, sec. 47.

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Clay	40	40	Rock	10	1,575
Sand	420	460	Clay	5	1,580
Sand and gravel	270	730	Rock	10	1,590
Clay	30	760	Clay	10	1,600
Shale	20	780	Pyrite and clay	15	1,615
Sand	205	985	Clay and bowlders	15	1,630
Clay	185	1,170	Clay	58	1,688
Clay and bowlders	50	1,220	Pyrite and sand	12	1,700
Clay	120	1,340	Clay	45	1,745
Clay and bowlders	84	1,424	Pyrite	3	1,748
Clay	16	1,440	Clay	20	1,768
Clay and bowlders	49	1,489	Sand	28	1,796
Rock	2	1,491	Clay	57	1,853
Gumbo	74	1,565			

Six-inch pipe set at 1,675 feet; blank pipe 150.5 feet long.

Producers Oil Company No. 9; sec. 47; Latreille; drilled, spring, 1906; salt water; deepened, 1,000 barrels, July, 1906; producing, 1908; map No. 225.

Section of Producers Oil Company's well No. 9.

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Clay	40	40	Sand	40	1,410
Sand	100	140	Gumbo	224	1,634
Gravel	723	863	Sand	52	1,686
Gumbo	10	873	Gumbo	59	1,745
Sand	27	900	Pyrite	27	1,772
Gumbo	340	1,240	Gumbo	20	1,792
Pyrite	5	1,245	Sand	126	1,918
Sand	30	1,275	Gumbo	20	1,938
Gumbo	95	1,370	Sand and shells	57	1,995

Strainer, 3-inch, 105 feet.

Producers Oil Company No. 10; sec. 47; Latreille; drilled and abandoned, fall, 1906; second drilling, June, 1907; 800 barrels; cleaning, November, 1908; map No. 171.

Section of Producers Oil Company's wells Nos. 10 and 10b.

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Clay	20	20	Rock	13	1,203
Sand	291	311	Sand	120	1,323
Clay	24	335	Gumbo	17	1,340
Gravel and bowlders	376	711	Shale	40	1,380
Gumbo	29	740	Shells and sand	77	1,457
Sand and gravel	135	875	Hard shale	23	1,480
Gumbo	61	936	Shells and sand	15	1,495
Sand	20	956	Sand	5	1,500
Shale	81	1,037	Rock	28	1,528
Shale and gumbo	58	1,095	No. 10b, derrick moved 30 feet west.		
Gumbo and bowlders	117	1,112			
Sand	12	1,124	Clay	12	12
Gumbo and bowlders	10	1,134	Sand	637	649
Shale	4	1,138	Gumbo	41	690
Sand	12	1,150	Sand	195	885
Rock	15	1,165	Gumbo	105	990
Sand	5	1,170	Gumbo and shale	95	1,085
Soft rock	3	1,173	Rock	2	1,087
Hard rock	13	1,186	Gumbo	38	1,125
Sand	4	1,190	Rock. Hole left incomplete.		

Producers Oil Company No. 11; sec. 47; Latreille; drilled, fall, 1907; 2,000 barrels, October, 1907; map No. 170.

Producers Oil Company No. 12; sec. 47; Latreille; drilled, June, 1907; 600 barrels, August, 1907; deepened, December, 1907; producing, 1908; map No. 172.

Producers Oil Company No. 13; sec. 47; Latreille; drilled, summer, 1907; 3,000 barrels, August; deepened, December, 1907; salt water, January, 1908; dead, November, 1908; map No. 168.

Producers Oil Company No. 14; sec. 47; Latreille; drilled, summer, 1907; deepened, September, 1907; 2,950 barrels, September, 1907; producing, November, 1908; map No. 219.

Producers Oil Company No. 15; sec. 47; Latreille; drilled, summer, 1907; 2,000 barrels, September, 1907; producing, 1908; map No. 220.

Producers Oil Company No. 16; sec. 47; Latreille; drilled, fall, 1907; 2,000 barrels, October, 1907; map No. 165.

Producers Oil Company No. 17; sec. 47; Latreille; drilled, fall, 1907; 2,000 barrels, October, 1907; map No. 167.

Producers Oil Company No. 19; sec. 47; Latreille; drilled, fall, 1907; 1,000 barrels, October, 1907; producing, 1908; map No. 214.

Producers Oil Company No. 20; sec. 47; Latreille; drilled, fall, 1907; gas at first, then 100 barrels oil, November, 1907; producing, 1908; map No. 215.

Producers Oil Company No. 21; sec. 47; Latreille; drilled, fall, 1907; abandoned, December, 1907; map No. 187.

Producers Oil Company No. 21; sec. 47; Latreille; drilled, spring, 1908; 4,000 barrels, June, producing, November, 1908; map No. 192.

Producers Oil Company No. 22; sec. 47; Latreille; drilled, fall, 1907; 1,500 barrels, November, 1907; not producing, November, 1908; map No. 166.

Producers Oil Company No. 23; sec. 47; Latreille; drilled, fall, 1907; 800 barrels, November, 1907; producing, November, 1908; map No. 221.

Producers Oil Company No. 24; sec. 47; Latreille; drilled, fall, 1907; 1,500 to 3,500 barrels, December, 1907; not producing, November, 1908; map No. 216.

Producers Oil Company No. 25; sec. 47; Latreille; drilled, fall, 1907; 150 barrels, December, 1907; producing, 1908; map No. 224.

Producers Oil Company No. 26; sec. 47; Latreille; drilled, December, 1907; 500 barrels, January, 1908; not producing, November, 1908; map No. 218.

Producers Oil Company No. 27; sec. 47; Latreille; drilled, fall, 1907; 1,200 barrels, December, 1907; producing, November, 1908; map No. 207.

Producers Oil Company No. 28; sec. 47; Latreille; drilled, December, 1907; 3,000 barrels, January, 1908; producing, November, 1908; map No. 205.

Producers Oil Company No. 29; sec. 47; Latreille; drilled, spring, 1908; abandoned, April, 1908; map No. 169.

Producers Oil Company No. 30; sec. 47; Latreille; drilled, January, 1908; 1,000 barrels, February; producing November, 1908; map No. 217.

Producers Oil Company No. 31; sec. 47; Latreille; drilled, spring, 1908; 3,000 barrels, May; not producing, November, 1908; map No. 198.

Producers Oil Company No. 32; sec. 47; Latreille; drilled, January, 1908; strong gas well, February; not producing, November, 1908; map No. 186.

Producers Oil Company No. 33; sec. 47; Latreille; drilled, January, 1908; 500 barrels, February; cleaning, November, 1908; map No. 210.

Producers Oil Company No. 34; sec. 47; Latreille; drilled, January-February, 1908; salt water, March, 1908; map No. 211.

Producers Oil Company No. 35; sec. 47; Latreille; drilled, spring, 1908; producing, November, 1908; map No. 212.

Producers Oil Company No. 36; sec. 47; Latreille; drilled, February, 1908; 2,500 barrels, March; producing, November, 1908; map No. 209.

Producers Oil Company No. 37; sec. 47; Latreille; drilled, spring, 1908; 500 barrels, April; producing November, 1908; map No. 208.

Producers Oil Company No. 39; sec. 47; Latreille; drilled, spring, 1908; not producing, November, 1908; map No. 206.

Producers Oil Company No. 40; sec. 47; Latreille; drilled, spring, 1908; 4,000 barrels, April, 1908; not producing, November, 1908; map No. 197.

Producers Oil Company No. 41; sec. 47; Latreille; drilled, spring, 1908; flowed at first at the rate of 4,800 barrels daily, then dropped to 4,000 barrels on air; producing, November, 1908; map No. 196.

Producers Oil Company No. 42; sec. 47; Latreille; drilled, spring, 1908; dry; deepened and produced 500 barrels, June, 1908; producing, November, 1908; map No. 203.

Producers Oil Company No. 43; sec. 47; Latreille; drilled, spring, 1908; 5,000 barrels, May; producing, November, 1908; map No. 195.

Producers Oil Company No. 44; sec. 47; Latreille; drilled, summer, 1908; 500 barrels, June, 1908; map No. 163.

Producers Oil Company No. 45; sec. 47; Latreille; drilled, spring, 1908; 3,000 barrels, June; producing, November, 1908; map No. 213.

Producers Oil Company No. 46; sec. 47; Latreille; drilled, summer, 1908; producing, November, 1908; map No. 179.

Producers Oil Company No. 47; sec. 47; Latreille; drilled, summer, 1908; 300 barrels, July; producing, November, 1908; map No. 176.

Producers Oil Company No. 48; sec. 47; Latreille; drilled, summer, 1908; salt water, July, 1908; map No. 193.

Producers Oil Company No. 49; sec. 47; Latreille; drilled, summer, 1908; 400 barrels, July; producing, November, 1908; map No. 199.

Producers Oil Company No. 50; sec. 47; Latreille Derrick; map No. 172.

Producers Oil Company No. 51; sec. 47; Latreille; drilled, summer, 1908; lost, fall, 1908; map No. 204.

Producers Oil Company No. 53; sec. 47; Latreille; drilled, summer, 1908; 300 barrels, July; producing, November, 1908; map No. 202.

Producers Oil Company No. 54; sec. 47; Latreille; drilled, summer, 1908; 1,000 barrels, August; producing, November, 1908; map No. 201.

Producers Oil Company No. 55; sec. 47; Latreille; drilled, summer, 1908; 1,000 barrels, August; producing, November, 1908; map No. 194.

Producers Oil Company No. 56; sec. 47; drilled, summer, 1908; 500 barrels, July; producing, November, 1908; map No. 183.

Producers Oil Company No. 57; sec. 47; Latreille; drilled, summer, 1908; 100 barrels, September; producing, November, 1908; map No. 200.

Producers Oil Company No. 58; sec. 47; Latreille; drilled, summer, 1908; 250 barrels, September; producing, November, 1908; map No. 188.

Producers Oil Company No. 59; sec. 47; Latreille; drilled, fall, 1908; 3,000 barrels, September, 1908; map No. 184.

Producers Oil Company No. 60; sec. 47; Latreille; drilled, fall, 1908; 400 barrels, October; producing, November, 1908; map No. 185.

Producers Oil Company No. 61; sec. 47; Latreille; drilled, fall, 1908; 200 barrels, October; producing, November, 1908; map No. 189.

Producers Oil Company No. 63; sec. 47; Latreille; drilled, fall, 1908; 400 barrels, November, 1908; not producing late in November; map No. 190.

Producers Oil Company No. 64; sec. 47; Latreille; drilled, fall, 1908; 2,000 barrels, November, 1908; map No. 180.

Producers Oil Company No. 65; sec. 47; Latreille; drilling, November, 1908; 900 barrels on air, December; map No. 181.

Producers Oil Company No. 66; sec. 47; Latreille; drilling, fall, 1908; map No. 191.

Producers Western No. 1; sec. 46; Producers-Evangeline; drilled, summer, 1908; producing, November, 1908; map No. 94.

Producers-Western; sec. 46; Producers-Evangeline; producing, 1908; map No. 95.

Rayne No. 1; a pumper, March, 1904. (See Rex No. 2.)

Rayne Planters No. 2; shown on map in Bull. U. S. Geol. Survey No. 282 on the site of Jennings-Heywood Oil Syndicate No. 11; map No. 239.

Rex; sec. 47; Rex; map No. 254.

Rex No. 1; sec. 47; Rex; drilled, spring, 1905; 4,000 barrels, May; 3,200 barrels, September; 2,500 barrels, November; producing, 1906; abandoned, 1908; map No. 253.

Rex No. 2; sec. 47; Rex; seems to be in the place of "Rayne Planters No. 1;" producing, 1904; deepened by the Rex people, 1905; long since abandoned; map No. 256.

Rex No. 3; sec. 47; Rex; abandoned producer; map No. 252.

Rex No. 4; sec. 47; Rex; located, July, 1907; abandoned; map No. 251.

Rowson and Haber No. 1; sec. 45; Schultz; old well drilled before 1904; map No. 402.

Savage No. 1 (Savage-Thompson-Savage Oil Syndicate); sec. 46; Jennings-Clement; brought in March 14, 1904; producing, 1904; map No. 432.

Savage-Morrical-Savage No. 1; sec. 46; Jennings Fee Simple; oil well drilled before 1904; map No. 93.

Schultz No. 1; sec. 45; Schultz; early well, drilled, before 1904; map No. 405.

Schultz No. 2; sec. 45; Schultz; early well, drilled, before 1904; map No. 399.

Schultz No. 2; sec. 47; Valée arpent; drilled, 1904–5; flowed 28,000 barrels from April 12 to April 30 and stopped; flowed 500 barrels, November, 1905; producing, 1908; map No. 263.

Schultz No. 2; sec. 47; Valée; producing, 1908; map No. 274.

Sharp & Benckenstein No. 1; sec. 47; Latreille; drilled, fall, 1906; salt water November, 1906; map No. 228.

Shippers Oil Company No. 1; sec. 46; Noble; drilled and operated, 1905–6; map No. 118.

Shippers Oil Company No. 2; sec. 47; Valée arpent; drilled, summer, 1906; 1,200–2,500 barrels, August, 1906; producing, 1908; map No. 262.

Shippers Oil Company No. 3; sec. 47; Kneippe; drilled, fall, 1906; salt water; map No. 248.

Shippers Oil Company No. 4; sec. 47; Valée arpent; drilled, spring, 1907; salt water; map No. 261. *Rangia cuneata* common, 1,240–1,493 feet.

Simons Oil Company No. 1; sec. 45; Conklin; dry in 1904; map No. 401.

Southern Oil Company, given as No. 10 on Hayes and Kennedy's map. According to Kennedy the oil sand was reached at a depth of 1,635 feet.

Southern Oil Company No. 1; 2 miles south of the field; given as No. 11 on Hayes and Kennedy's map. Oil sand said to occur at about 2,000 feet.

Southern No. 2; sec. 46; Syndicate-Clement; second well in the field; 4-inch; drilled, fall, 1901; producing, 1904; sand at 1,850 feet; reported as deepened to 1,950 feet in December, 1904; map No. 112.

Southern No. 3; sec. 46; Syndicate-Clement; drilled, summer, 1902; producing, 1903–4; map No. 119.

Southern No. 4; sec. 46; Syndicate-Clement; 4-inch, drilled by Charles Noble in fourteen days; producing, 1903–4; map No. 111.

Southern No. 5; sec. 46; Syndicate-Clement; producing, 1903–4; map No. 110.

Southern No. 6; sec. 46; Syndicate-Clement; drilled, spring, 1903; producing, 1904; map No. 113.

Southern No. 7; sec. 46; Syndicate-Clement; drilled, summer, 1903; producing, 1903–4; map No. 106.

Southern No. 8; sec. 46; Syndicate-Clement; drilled, summer, 1903; producing, 1903–1905; map No. 105.

Superior No. 1; sec. 45; Schultz; drilled, spring, 1903; producing, 1903; deepened, 1906; map No. 437.

Superior No. 2; sec. 45; Schultz; drilled, summer, 1903; producing, 1903–4; deepened by Longrove, 1906; map No. 439.

Superior No. 3; sec. 45; Schultz; drilled, summer, 1903; map No. 438.

Swift No. 1; sec. 46; Rowson & Haber; drilled, fall, 1903; dry; map No. 137.

Teche Development Company No. 1; sec. 47; Latreille; dry, February, 1907; abandoned, March, 1907; map No. 236. Fossils, collected by L. Reinecke and identified by C. J. Maury: *Rangia cuneata*, 876–1,158, 1,158–1,199, 1,322–1,363, 1,820–1,824, 1,954–1,997?, 2,040–2,074?, 2,084–2,106 feet; *Rangia johnsoni*, 1,322–1,363, 1,363–1,406, 1,406–1,489?, 1,820–1,824, 1,954–1,997, 1,997–2,074 feet; *Ostrea* (fragments, apparently *virginica*), 876–1,199, 1,322–1,406, 1,820–1,824, 1,954–1,997, 2,019–2,075, 2,084–2,106 feet; *Mulinia* cf. *quadricentennialis*, 158–1,199 feet; *Anachis obesa*, 1,158–1,199 feet; *Amnicola*, 1,363–1,406, 1,997–2,019 feet.

Section of Teche Development Company's well No. 1.

[W. O. Todd, driller.]

	Thickness.	Depth.
	Feet.	*Feet.*
Plastic bluish and yellowish clay	50	50
Yellowish to greenish sand, very fine at first but becoming coarser to a depth of 300 feet, then coarser with gravel	421	471
Blue plastic clay (gumbo)	26	497
Fine greenish sand, with numerous shells, especially between 522 and 544 feet, becoming a sandy clay	83	580
Gumbo	41	621
Blue sandy clay, with shell fragments	79	700
Gumbo	176	876
Plastic blue clay, with pebbles and shell fragments. A 3-foot rock at 1,085 feet, approximately	282	1,158
Blue clay, containing a large amount of sand and shells to 1,199 feet; less sand and shells below	311	1,469
Blue clay, little sand, many shell fragments to 1,575 feet; shells and sand disappearing below	186	1,655
Rock, probably limestone	3	1,658
Blue clay, shaly, with some shells and a little sand	127	1,785
Rock	5	1,790
Blue sandy shale, with shell fragments (with pieces of limestone, probably from above)	51	1,841
Not given, probably same as above	11	1,852
Blue shale and sand, latter full of pyrite	40	1,892
Blue sandy shale	62	1,954
Sand with shell fragments (and pyrite to 1,975 feet)	43	1,997
Blue shaly sand, with pyrite full of shells	22	2,019
Yellowish green sand with large amount of pyrite, with shells	59	2,078
Gumbo	7	2,085
Pyrite, broken limestone, and shells	21	2,106
Blue marl, with shell fragments	43	2,149
Hard, blue shale	16	2,165
Sandstone and pyrite	38	2,253
Blue shale	52	2,255
Sandstone and pyrite	14	2,269
Coarse, white sand	43	2,312

Records kept by L. Reinecke to 2,150 feet; that below taken from driller's notes.

Teche Development Company No. 2; sec. 47; Attakapas; drilled, summer, 1907; 1,500 barrels, October, 1907; producing, 1908; map No. 269.

Teche Development Company No. 2; sec. 47; Latreille; map No. 238.

Teeter No. 1; sec. 47; Arnaudet; drilled, summer, 1904; 4,000 barrels, March, 1905; 3,000, May; 50, September; abandoned, November, 1905; map No. 379.

Teeter No. 2; sec. 47; Arnaudet; drilled, fall, 1904; operating, 1905; map No. 381a.

Texas No. 1; sec. 47; Moonshine; producing, 1904; map No. 266.

Tierce No. 1; sec. 47; Arnaudet; drilled, summer, 1904; deepened, 1905; abandoned, 1906; map No. 335.

Tierce No. 2; sec. 47; Arnaudet; producing, 1904; deepened, 1906; map No. 329.
Tierce No. 3; sec. 47; Arnaudet; drilled, summer, 1904; came in blowing sand, wrecking derrick and then flowing oil, November, 1904; map No. 331.
Tierce No. 4; sec. 47; Arnaudet; drilled, fall, 1904; 6,000 barrels on air, April, 1905; map No. 332.
Tierce No. 5; sec. 47; Arnaudet; drilled, summer, 1905; 2,000 barrels, September, 1905; abandoned, December, 1907; map No. 328.
Tierce No. 6; sec. 47; Arnaudet; drilled, summer, 1905; 2,500 barrels, September; 2,500 barrels, November, 1905; map No. 330.
Tierce No. 7 (Jennings-Heywood Oil Syndicate No. 3; Gulf Refining Company No. 1); sec. 47; Arnaudet; derrick up, September, 1907; producing, 1908; map No. 333.
Union Oil and Development Company. So designated in Hayes and Kennedy's report (No. 12).
Undesignated well No. 2; sec. 46; Jennings-Clement; map No. 91.
Undesignated location, Valée arpent; map No. 265.
Western Oil Company No. 1; sec. 46; Producers-Evangeline; drilled, 1904: site of Producers No. 1; pumping, 1908; map No. 95.
West Virginia No. 1. See Mahaffey No. 1.
Wilkins No. 1; sec. 47; Wilkins; drilled, summer, 1904; 8,000 barrels, December; pumped, January, 1905; map No. 384.
Wilkins No. 2 (Gulf Refining Company No. 2); sec. 47; Valée arpent; drilled, fall, 1904; 20,000 barrels, November 20; stopped flowing, January 1, 1906; producing, 1908; map No. 259.
Wilkins No. 3; sec. 47; Wilkins; drilled, January-February, 1905; producing, 1905; deepened, 1906; producing, 1908; map No. 382.
Wilkins No. 4. See Gulf Refining Company No. 4; map No. 258.
Wilkins No. 5; sec. 47; Wilkins; drilled, spring, 1906; 5,000 barrels, April; producing, 1908; map No. 383.
Wilkins No. 6; sec. 47; Wilkins; drilled, fall, 1906; not producing, 1908; map No. 385.
Wood. See Crescent.
Zeigler No. 1; sec. 45; Schultz; not producing, 1908; map No. 17.
Zeigler No. 2; sec. 47; West Virginia (Gulf Refining Company No. 2); producing, 1906–1908; map No. 375.
Zeigler No. 2; sec. 45; Schultz; drilled, spring, 1908; 3,000 barrels, April; pumping, November, 1908; map No. 20.
Zeigler No. 3; sec. 45; Schultz; 400 barrels, March, 1907; map No. 404.
Zeigler No. 4; sec. 47; Valée; map No. 264.
Zeigler No. 3; sec. 45; Schultz; drilled, spring, 1908; 1,000 barrels, April; not producing, November, 1908; map No. 15.
Zeigler No. 5; sec. 45; Conklin; drilled, spring, 1908; 50 barrels (pumping), November, 1908; map No. 9.
Zeigler No. 5; sec. 47; West Virginia; producing on air, 1908; map No. 376.
Zeigler No. 6; sec. 47; West Virginia; drilled, fall, 1906; 400 barrels, November, 1906; map No. 374.
Zeigler No. 7 (Gulf Refining Company No. 4); sec. 47; West Virginia; drilled, spring, 1907; producing, November, 1908; map No. 373.
Zeigler No. 7 (Wheat and Wilson); sec. 45; Schultz; drilled, summer, 1908; 200 barrels, August; pumping, November, 1908; map No. 6.
Zeigler No. 8; sec. 45; Schultz; drilled, summer, 1908; 75 barrels, September; pumping, November, 1908; map No. 5.
Zeigler No. 9; sec. 45; Conklin; drilling, fall, 1908; map No. 3.

MAP OF JENNINGS OIL FIELD, DECEMBER, 1908

Explanation of map numbers (Pl. VIII).

1. National Oil Co. No. 7.
2. National Oil Co. No. 8.
3. Zeigler No. 9.
4. National Oil Co. No. 4.
5. Zeigler No. 8.
6. Zeigler No. 7.
7. Carencro No. 3.
8. Carencro No. 1.
9. Zeigler No. 5.
10. National No. 5.
11. Ismarie No. 3.
12. Mattison No. 3.
13. Interstate No. 2.
14. Ismarie No. 2.
15. Zeigler No. 3.
16. National No. 2.
17. Zeigler No. 1.
18. Interstate No. 1.
19. Heywood Bros. No. 1.
20. Zeigler No. 2.
21. National No. 1.
22. National Oil Co. No. 3.
23. Heywood-Acadia No. 4.
24. Mattison No. 6.
25. Heywood-Acadia No. 5.
26. Mattison No. 3.
27. Mattison No. 4.
28. Bass No. 1.
29. Heywood Eunice-Crowley No. 1.
30. Heywood Eunice-Crowley No. 3.
31. Heywood Eunice-Crowley No. 5.
32. Heywood Eunice-Crowley No. 4.
33. Heywood-Acadia.
34. Heywood-Acadia No. 6.
35. Heywood-Acadia No. 7.
36. Heywood-Acadia No. 1.
37. Heywood-Acadia No. 2.
38. Bass (T. H.) No. 2.
39. Noble Eunice-Crowley No. 2.
40. Heywood Eunice-Crowley No. 8.
41. Heywood Eunice-Crowley No. 9.
42. Heywood Eunice-Crowley No. 7.
43. Producers No. 2.
44. Gulf Refining Co. No. 3 (J. H. O. S. No. 55).
45. Gulf Refining Co. No. 2 (J. H. O. S. No. 51).
46. Heywood Eunice-Crowley No. 6.
47. Producers No. 1.
48. Gulf Refining Co. No. 1 (J. H. O. S. No. 48).
49. Gulf Refining Co. No. 4 (J. H. O. S. No. 59).
50. Gulf Refining Co. No. 5.
51. Gulf Refining Co. No. 6.
52. Gulf Refining Co. No. 23.
52′. Jennings-Heywood Oil Syndicate No. 47.
53. Gulf Refining Co. No. 13 (J. H. O. S. No. 50).
54. Gulf Refining Co. No. 14 (J. H. O. S. No. 53).
55. Gulf Refining Co. No. 24.
56. Gulf Refining Co.-Clement No. 1 (J. H. O. S. No. 56).
57. Gulf Refining Co.-Clement No. 2 (J. H. O. S. No. 57).
58. Gulf Refining Co.-Clement No. 4 (J. H. O. S. No. 62).
59. Gulf Refining Co.-Clement No. 3 (J. H. O. S. No. 61).
60. Gulf Refining Co.-Clement No. 7.
61. Gulf Refining Co.-Clement.
62. Morse No. 3.
63. Morse No. 1.
64. Morse No. 5.
65. Morse No. 4.
66. Gulf Refining Co. No. 5 (J. O. Co. No. 15).
67. Gulf Refining Co. No. 4 (J. O. Co. No. 14).
68. Gulf Refining Co.-Clement No. 8.
69. Gulf Refining Co. No. 3 (J. O. Co. No. 13).
70. Gulf Refining Co. No. 14.
71. Gulf Refining Co. No. 12.
72. Gulf Refining Co. No. 13.
73. Getty No. 1.
74. Chicago-Jennings No. 5.
75. Chicago-Jennings No. 6.
76. Gulf Refining Co. No. 11.
77. Jennings-Heywood-Clement No. 8.
78. Gulf Refining Co. No. 7.
79. Gulf Refining Co. No. 6.
80. Gulf Refining Co. No. 1.
81. Gulf Refining Co. No. 16.
82. Gulf Refining Co. No. 10.
83. Producers-Heywood No. 2.
84. Chicago-Jennings No. 7.
85. F. I. Getty (Ch.-Jen.) No. 8.
86. Chicago-Jennings No. 2.
87. Chicago-Jennings No. 11.

Explanation of map numbers (Pl. VIII)—Continued.

88. Mermentau.
89. Mermentau No. 2.
90. Mermentau No. 4.
91. Jennings Oil Co.
92. Jennings Oil Co. No. 12.
93. Savage-Morrical No. 11.
94. Producers-Evangeline No. 1.
95. Producers No. 1.
96. Producers-Evangeline No. 4.
97. Pelican No. 1.
98. Evangeline No. 5.
99. Evangeline No. 4.
100. Lyons No. 1.
101. Producers-Evangeline No. 2.
101′. An old abandoned Producers-Evangeline.
102. Gulf Refining Co. No. 15.
103. Heywood No. 2.
104. Heywood No. 3.
105. Southern No. 8.
106. Southern No. 7.
107. Heywood Oil Corporation No. 4.
108. Gulf Refining Co. No. 9.
109. Jennings Oil Co. No. 3.
110. Southern No. 5.
111. Southern No. 4.
112. Southern No. 2.
113. Southern No. 6.
114. Keoughan (?) No. 2.
114′. Gulf Refining Co. No. 8.
115. Keoughan-Midkiff No. 2.
116. Northern No. 3.
117. Heywood No. 1.
118. Shippers Oil Co. No. 1.
119. Southern No. 3.
120. Jennings-Clement No. 1.
121. Jennings-Clement No. 10.
122. Jennings-Clement No. 2.
123. Gulf Refining Co. No. 2 (in place of Jennings No. 9).
124. Jennings-Clement No. 4.
125. Northern No. 1.
126. Keoughan & Noble No. 1.
127. Northern No. 2.
128. Guffey Petroleum Co., Bass No. 18.
129. Noble No. 2.
130. Jennings-Heywood Oil Syndicate No. 2.
131. Crowley Petroleum Co. No. 1
132. Hill No. 5.
133. Guarantee No. 1.
134. C. D. Hill No. 4.
135. Mermentau No. 1.
136. Equitable No. 1.
137. Swift No. 1.
138. Northern No. 4.
139. C. D. Hill No. 3.
140. Crescent No. 1.
141. Jennings-Clement No. 5.
142. Producers-Jennings-Clement No. 4.
143. Producers-Jennings-Clement No. 5.
144. Producers-Jennings-Clement No. 6.
145. F. R. Jaenke No. 2.
146. Jennings-Heywood Oil Syndicate No. 30.
147. Gulf Refining Co. No. 25.
148. Jennings-Heywood Oil Syndicate No. 33.
149. Gulf Refining Co. No. 1 (J. H. O. S. No. 4).
150. Gulf Refining Co. No. 5 (J. H. O. S. No. 37).
151. Gulf Refining Co. No. 10 (J. H. O. S. No. 42).
152. Gulf Refining Co. No. 2 (J. H. O. S. No. 6(?)).
153. Gulf Refining Co. No. 20 (J. H. O. S. No. 45).
154. Gulf Refining Co. No. 26.
155. Gulf Refining Co. No. 19.
156. Gulf Refining Co. No. 21.
157. Gulf Refining Co. No. 17.
158. Gulf Refining Co. No. 22.
159. Gulf Refining Co. No. 15.
160. Gulf Refining Co. No. 16.
161. Gulf Refining Co. No. 18.
162. Producers No. 50.
163. Producers No. 44.
164. Producers No. 38.
165. Producers No. 16.
166. Producers No. 22.
167. Producers No. 17.
168. Producers No. 13.
169. Producers No. 29.
170. Producers No. 11.
171. Producers No. 10.
172. Producers No. 12.
173. Jennings-Heywood Oil Syndicate No. 39.
174. Jennings-Heywood Oil Syndicate No. 35.
175. Jennings-Heywood Oil Syndicate No. 27.
176. Producers No. 47.

Explanation of map numbers (Pl. VIII)—Continued.

177. Producers No. 7.
178. Producers No. 6.
179. Producers No. 46.
180. Producers No. 64.
181. Producers No. 65.
182. Producers No. 18.
183. Producers No. 56.
184. Producers No. 59.
185. Producers No. 60.
186. Producers No. 32.
187. Producers No. 21.
188. Producers No. 58.
189. Producers No. 61.
190. Producers No. 63.
191. Producers No. 66.
192. Producers No. 21.
193. Producers No. 48.
194. Producers No. 55.
195. Producers No. 43.
196. Producers No. 41.
197. Producers No. 40.
198. Producers No. 31.
199. Producers No. 49.
200. Producers No. 57.
201. Producers No. 54.
202. Producers No. 53.
203. Producers No. 42.
204. Producers No. 51.
205. Producers No. 28.
206. Producers No. 39.
207. Producers No. 27.
208. Producers No. 37.
209. Producers No. 36.
210. Producers No. 33.
211. Producers No. 34.
212. Producers No. 35.
213. Producers No. 45.
214. Producers No. 19.
215. Producers No. 20.
216. Producers No. 24.
217. Producers No. 30.
218. Producers No. 26.
219. Producers No. 14.
220. Producers No. 15.
221. Producers No. 23.
222. Producers No. 5.
223. Producers No. 1.
224. Producers No. 25.
225. Producers No. 9.
226. Producers No. 3.
227. Producers No. 2.
228. Sharp & Benckenstein No. 1.
229. Producers No. 8.
230. Benckenstein, Kaffrey & Martel No. 1.
231. Benckenstein, Kaffrey & Martel No. 2.
232. Benckenstein, Kaffrey & Martel No. 3.
233. Harfleigh No. 2.
234. Bass No. 1.
235. Bass No. 2.
236. Teche Oil Co. No. 1.
237. Crowley Oil and Mineral Co. No. 15.
238. Teche No. 2.
239. Gulf Refining Co. No. 2 (J. H. O. S. No. 11).
240. Gulf Refining Co. No. 3 (J. H. O. S. No. 44).
241. Gulf Refining Co. No. 34 (J. H. O. S. No. 34).
242. Leguerre (Kneippe) No. 1.
243. C. D. Hill No. 1.
244. Kneippe No. 2.
245. Caffery & Martel No. 1.
246. Attakapas No. 1.
247. Arlington No. 2.
248. Shippers No. 3.
249. Kneippe No. 1.
250. C. D. Hill No. 2.
251. Rex No. 4.
252. Rex No. 3.
253. Rex No. 1.
254. Rex (undesignated).
255. Jennings-Heywood Oil Syndicate No. 40.
256. Rex No. 2.
257. Jennings-Heywood Oil Syndicate No. 5 (G. R. Co. No. 1).
258. Gulf Refining Co. (Wilkins) No. 4.
259. Gulf Refining Co. (Wilkins) No. 2.
260. Harry (Valée) No. 1.
261. Shippers No. 4.
262. Shippers No. 2.
263. Schultz No. 2.
264. Valée No. 3.
265. Valée (undesignated).
266. Texas (Moonshine) No. 1.
267. Moonshine No. 1.
268. Arlington (Attakapas) No. 1.
269. Teche Nos. 1 or 2.
270. Harfleigh No. 3.
271. Mattison No. 1.
272. Attakapas No. 1.

Explanation of map numbers (Pl. VIII)—Continued.

273. Harfleigh No. 1 (near J. H. O. S. No. 20).
274. Schultz No. 1.
275. Arnaudet No. 23.
276. Gulf Refining Co. (Arnaudet) No. 14.
277. Crusell et al. No. 1.
278. Crusell & Bass No. 1.
279. Crusell No. 2.
280. Gulf Refining Co. (Arnaudet) No. 13.
281. Evangeline No. 7.
282. Teter No. 1.
283. Evangeline No. 3.
284. Evangeline No. 6.
285. Evangeline No. 2.
286. Evangeline No. 8.
287. Evangeline No. 3.
288. Evangeline No. 1.
289. Jennings-Heywood Oil Syndicate No. 29.
290. Jennings-Heywood Oil Syndicate No. 22.
291. Jennings-Heywood Oil Syndicate No. 36.
292. Jennings-Heywood Oil Syndicate No. 14 (G. R. Co. No. 6).
293. Gulf Refining Co. No. 18 (J. H. O. S. No. 42).
294. Gulf Refining Co. No. 7 (J. H. O. S. No. 15).
295. Gulf Refining Co. No. 12.
296. Gulf Refining Co. No. 15 (J. H. O. S. No. 31).
297. Gulf Refining Co. No. 16.
298. Jennings-Heywood Oil Syndicate No. 25.
299. Gulf Refining Co. No. 19 (J. H. O. S. No. 43).
300. Jennings-Heywood Oil Syndicate No. 8.
301. Gulf Refining Co. No. 2 (J. H. O. S. No. 7).
302. Heywood Oil Co. No. 2.
303. Heywood Oil Co. No. 9.
304. Crowley Oil and Mineral Co. No. 39.
305. Crowley Oil and Mineral Co. No. 38.
306. Crowley Oil and Mineral Co. No. 37.
307. Heywood No. 10.
308. Heywood No. 6.
309. Heywood No. 8.
310. Heywood No. 9.
311. Heywood No. 20.
312. Heywood No. 3.
313. Heywood No. 7.
314. Heywood No. 5.
315. Crowley Oil and Mineral Co. No. 24.
316. Crowley Oil and Mineral Co. No. 25
317. Crowley Oil and Mineral Co. No. 13.
318. Crowley Oil and Mineral Co. No. 17
319. Crowley Oil and Mineral Co. No. 26.
319′. Crowley Oil and Mineral Co. No. 18.
320. Crowley Oil and Mineral Co.
321. Crowley Oil and Mineral Co. No. 28.
322. Heywood No. 4.
323. Crowley Oil and Mineral Co. No. 35.
324. Crowley Oil and Mineral Co. No. 36.
325. Crowley Oil and Mineral Co. No. 11.
326. Gulf Refining Co. No. 4 (J. H. O. S. No. 12).
327. Gulf Refining Co. No. 5 (J. H. O. S. No. 13).
328. Tierce No. 5.
329. Tierce No. 2.
330. Tierce No. 6.
331. Tierce No. 3.
332. Tierce No. —.
333. Gulf Refining Co. No. 1 (J. H. O. S. No. 3; Tierce No. 7).
334. Gulf Refining Co. No. 9 (J. H. O. S. No. 17).
335. Tierce No. 1.
336. Gulf Refining Co. No. 3 (J. H. O. S. No. 13).
337. Crowley Oil and Mineral Co. No. 3.
338. Crowley Oil and Mineral Co. No. 10.
339. Crowley Oil and Mineral Co. No. 30.
340. Crowley Oil and Mineral Co. No. 31.
341. Crowley Oil and Mineral Co. No. 22.
342. Crowley Oil and Mineral Co. No. 12.
343. Crowley Oil and Mineral Co. No. 21.
344. Crowley Oil and Mineral Co. No. 33.
345. Crowley Oil and Mineral Co. No. 32.
346. Crowley Oil and Mineral Co. No. 2.
347. Producers No. 8.
348. Home No. 1.
349. Producers No. 6.
350. Bass No. 2.
351. Bass No. 10.
352. Crowley Oil and Mineral Co. No. 7.
352′. Crowley Oil and Mineral Co. No. 7′.
353. Crowley Oil and Mineral Co. No. 8.
354. Crowley Oil and Mineral Co. No. 1.
355. Bass No. 12.
356. Bass & Guffey No. 19.
357. Bass & Guffey No. 1.

Explanation of map numbers (Pl. VIII)—Continued.

358. Gulf Refining Co. (Bass) No. 16.
359. Gulf Refining Co. (Bass) No. 20.
359′. Bass No. 17.
360. Bass No. 18.
361. Bienville (Home) No. 2.
362. Producers No. 2.
363. Bass No. 9.
364. Bass (Morse) No. 8.
365. Producers No. 4.
366. Bass (Home) No. 11.
367. Producers No. 3.
368. Bass (Morse) No. 7.
369. Bass (Morse) No. 14.
370. Heywood & Chaddock No. 1.
371. Producers No. 7.
372. Producers No. 5.
373. Gulf Refining Co. No. 4 (Zeigler No. 7; W. Va.).
374. Zeigler (W. Va.) No. 6.
375. Zeigler (W. Va.) (G. R. Co.) No. 2.
376. Zeigler (W. Va.) No. 3 (G. R. Co. No. 3).
377. Longrove & McIntosh No. 1.
378. Gulf Refining Co. No. 11 (J. H. O. S. No. 20).
379. Teter (G. R. Co.) No. 1.
380. Jennings-Heywood Oil Syndicate (Arnaudet) No. 19.
381. Jennings-Heywood Oil Syndicate (Arnaudet) No. 18.
381′. Teter.
382. Wilkins No. 3.
383. Wilkins No. 5.
384. Wilkins No. 1.
385. Wilkins No. 6.
386. Bass (Morse) No. 6.
387. Gulf Refining Co. No. 15.
388. Heywood No. 6.
389. Heywood No. 0.
390. Heywood No. 3.
391. Heywood No. 4.
392. Heywood No. 2.
393. Heywood No. 5.
394. Layne No. 1.
395. Duson & Lyons No. 1.
396. Duson No. 2.
397. Duson No. 3.
398. Layne Oil Co. No. 2.
399. Shultz No. 2.
400. Home Oil Co. No. 1.
401. Simons Oil Co. No. 1.
402. Rowson & Haber No. 1.
403. Hill.
404. Zeigler No. 3.
405. Schultz No. 1.
406. Chicago-Jennings No. 9.
407. Chicago-Jennings No. 10.
408. Chicago-Jennings No. 3.
409. Charleston No. 1.
410. Crowley Oil and Mineral Co. No. 23.
411. Prairie Mamou No. 1.
412. Crowley Oil and Mineral Co. No. 5.
413. Heywood Oil Corporation No. 1.
414. Mahaffey (W. Va.).
415. Bass (Home) No. 13.
416. Crowley Oil and Mineral Co. No. 4.
417. Crowley Oil and Mineral Co. No. 6.
418. Crowley Oil and Mineral Co. No. 14.
419. Crowley Oil and Mineral Co. No. 19.
420. Crowley Oil and Mineral Co.
421. Crowley Oil and Mineral Co. No. 27.
422. Lake No. 1.
423. Ismerie (Duson, Lyons & Co.).
424. Heywood Oil Co.
425. Crowley Oil Co. No. 9.
426. Jennings (Clement) No. 11 (close to G. R. Co. No. 10).
427. Jennings-Heywood Oil Syndicate No. 45 (close to No. 153).
428. Jennings-Heywood Oil Syndicate No. 47′ (close to No. 155).
429. Jennings-Heywood Oil Syndicate No. 38.
430. Jennings-Heywood Oil Syndicate No. 51′.
431. Bienville No. 1.
432. Savage No. 1 (site of J. H. O. S. No. 7).
433. Chicago-Jennings No. 4.
434. Producers No. 1.
435. Keoughan (Zeigler) No. 3.
436. American Oil Co. No. 1.
437. Superior (Schultz) No. 1.
438. Superior (Schultz) No. 3.
439. Superior No. 2.
440. McFarlain Oil Co.
441. Carencro No. 2.
442. Producers (Clement) No. 7.
443. Jennings-Heywood Oil Syndicate No. 21.
444. Jennings-Heywood Oil Syndicate No. 16.
445. Producers (Latreille) No. 4.

PINE PRAIRIE.

Location and topography.—A few limestone outcrops in northwestern St. Landry Parish, near Bayou Chicot, have long been known to geologists; and the limestone has often been referred to as the Bayou Chicot or St. Landry marble deposit. To the northeast of the small stream traversing the area open prairie prevails, with gentle slopes or slight undulations. To the south the slopes are abrupt.

History and development.—The limestone at this place furnished material for several rude kilns even before the war, but until recently very little has been done toward investigating this locality. In the last few years a sufficient amount of prospecting with hand tools has been done to prove that within 100 feet of the surface the limestone masses are very irregular and could not be regarded as offering great inducements for limestone quarrying, at least while no railroad was within 10 miles of the place. The advent of the Rock Island road within about 2 miles of the quarries, with a station at Pine Prairie, changed the situation somewhat, and the Myles Mineral Company has for the past year been systematically exploiting the area. Two wells reaching depths of more than 500 feet and about a dozen shallow test holes are sufficient to show something of the geology of the area and to give some hints as to its financial possibilities.

Geology.—The two important outcrops in quarries of the limestone rocks referred to are shown on Plate XXX of the Louisiana Geological Survey's Bulletin No. 7. These rocks consist of the whitish-blue, crystalline, cavernous material so characteristic of saline-dome areas, notably west of Winnfield at the surface, or in many of the oil fields at various depths. It is unfossiliferous and evidently of secondary origin, but is very pure. In the lower quarry, near the bayou, small black specks are seen in the light limestone, and these when heated smoke and give a strong asphalt or petroleum odor. Deep well No. 2 is but a few hundred feet northwest of this outcrop and showed, according to Mr. Journée, of the Myles Mineral Company, a log in outline as follows:

Log of deep well No. 2, near Pine Prairie.

	Thickness.	Depth.
	Feet.	*Feet.*
Unconsolidated material	102	102
Bowlder	3	105
Blue gumbo and shale	150	255
Solid rock; good oil prospect at 400 feet; sulphur abundant	255	510
Salt.		

The first deep well was put down on the hill above the upper quarry and showed, according to Mr. Journée, the features following.

Log of deep well No. 1, near Pine Prairie.

	Thickness.	Depth.
	Feet.	*Feet.*
Sand and clay	80	80
Blue gumbo, showing oil and gas	6	86
Sand and clay	18	104
Porous rock, showing oil and gas	30	134
Very hard rock, dry	10	144
Porous or broken rock, showing oil and gas	2	146
Hard, dry, flinty rock	20	166
Porous rock, crevices filled with water sand	100	266
Nearly continuously in rock to salt; sulphur water abundant, 400–420 feet; oil showing abundant and continuous, 420–505 feet; last 75 feet showed much oil, but in rather dense rock	254	520
Salt.		

The shallow wells on the hill and in the flats suffice to prove the secondary, concretionary nature of the limestone in this vicinity, for although rock is found in many test holes at less than 20 feet from the surface, in others depths of 50 feet or more are required to attain consolidated materials. The so-called bedding planes shown in the outcrops at the quarries have probably not been formed by the usual method of deposition. They are merely the traces of the shells of different materials in the concretionary structure. The folds and high dips in the limestone have consequently no bearing on the structural features of the region in general.

Economic products.—The concretionary or secondary growth of the crystalline materials of this vicinity is clearly evident. Where oil or gas has been found in paying quantities in crystalline calcareous rock in such dome structures it has usually been found at greater depths than those at which rock salt has been reached here. The thickness of capping in this area may be scarcely sufficient for the retention of oil and the lack of gas pressure indicates the same thing. Oil and gas may and probably will be found, however, in pockets at the sides of the salt mass or masses, as explained on page 11.

Because of the occurrence of salt but 500 feet below the surface, beneath a capping of solid rock, so that mining could be advantageously carried on; the occurrence near and at the surface of pure calcium carbonate, which suggests the manufacture of soda ash; and the presence of sulphur to the extent, according to Mr. Journée, of 1½ per cent of the rock mass in places, which suggests the possibility of finding other and thicker deposits of purer sulphur, the region is one that deserves careful and thorough investigation.

SULPHUR MINE.

Location.—Sulphur is extracted in large quantities under the Frasch process by the Union Sulphur Company at a point about 3 miles west of Sulphur City, on the Southern Pacific Railroad, or about 15 miles west of Lake Charles, Calcasieu Parish.

History and general geology.—The first authentic geologic information concerning this vicinity is contained in the report of Hilgard's thirty-day reconnaissance in western Louisiana in 1868.[a] He reported the boring of two artesian wells "on two small islands in the (fresh water) marsh which forms the head of the Bayou Choupique," a small tributary of Calcasieu River. One, being sunk by the Louisiana Petroleum Company, had reached a depth of 1,230 feet, and another, by Dr. Kirkman, 450 feet. The sections of these wells and Hilgard's interpretations are herewith republished. The assignments under the head of "Formations" are decidedly different from those that would now be given to the several parts of the sections; but the fact that such geologic data as are here given were gathered at so early a date under most trying circumstances does great credit to Hilgard, the father of Gulf coast geology.

Profile of artesian wells, West Fork of Calcasieu River.[b]

Kirkman's well.			Louisiana Oil Co.'s well.			
Depth.	Thickness.	Materials.	Depth.	Thickness.	Materials.	Formations.
Feet. 354	*Feet.* 354	Blue and yellow clay; some sand strata.	*Feet.* 160	*Feet.* 160	Blue clay, sometimes with layers of sand soaked with petroleum.	Port Hudson group.
446	92	Sand, with clay laminæ, 36 feet. Sand and gravel, 56 feet.	333	173	Loose sand and gravel; 138 to 153 feet very pebbly; 153 to 173 feet finer material.	Orange Sand group.
450	4	Sandy pipe clay.	343	10	Gray laminated clay ("soapstone").	Vicksburg group.
			383	40	Blue, sandy, nodular limestone, with marine shells, petroleum, and gas.	
			443	60	Soft white crystalline crumbling limestone; tube driven through.	Cretaceous formation.
			543	100	Pure crystalline sulphur.	
			690	147	Sulphur and gypsum; alternating; about one-third sulphur. 5-foot sulphur bed at 650 feet; 10–15-foot bed at 680 feet.	
			1,230	540	Pure gypsum, dense, granular, and coarsely crystalline, grayish or white.	

[a] Hilgard, E. W., Am. Jour. Sci., 2d ser., vol. 48, 1869, pp. 331–346.
[b] Idem, p. 344.

Small quantities of oil were found in the Louisiana Oil Company's well at a depth of 380 feet, but its slight value in comparison with the great sulphur deposits was at once recognized.

An expensive and disastrous attempt was made under Gen. Jules Brady to reach this sulphur deposit by sinking an iron caisson through the gravel and quicksand, which are more than 400 feet thick. Huge tubular sections were brought by water from France, unloaded on the west bank of Calcasieu River below Lake Charles, in part hauled by ox teams to the "mine," in part left on the river's bank for years, till they were obtained by the Myles Salt Company for casing its salt shaft on Weeks Island. In sinking this caisson to a depth of 110 feet several miners were overcome by poisonous gases and finally the undertaking was abandoned.

About 1892 the Diamond Prospecting Company made a very careful diamond-drill test of this locality, which showed that there is a far more frequent alternation of gypsum and sulphur beds than Hilgard's section seemed to indicate.[a] However, the latter closely resembles the sections[b] furnished to W. W. Clendenin, state geologist of Louisiana in 1894–95, by J. C. Hoffman, superintendent of the works. They read as follows:

Section of present working hole at sulphur mine near Sulphur City, La.

	Feet.
Clay, sand, and gravel	300
Shelly (bastard) limestone	80–100
Solid limestone	6– 7
Sulphur	110
Soft white rock	200

Section of bore hole at sulphur mine.

	Thickness.	Depth.
	Feet.	*Feet.*
Yellow and blue clay	80	80
Sandy blue clay	55	135
Almost pure clay with many sand pockets	30	165
Fine gray sand, water-bearing	135	300
Coarse gravelly sand	45	345
Coarse gray sand	10	355
Marl (oil and tar)	2½	357½
Blue sandy limestone	30½	388
Calcareous marl	4	392
Hard, rough gray calcareous marl	5	397
White saccharoidal calcareous marl	10	407
Same, reduced to sand	7	414
Hard, compact limestone	25	439
Sulphur	112	551

[a] Bull. U. S. Geol. Survey No. 212, 1903, p. 134.

[b] Geol. and Agr. Louisiana, pt. 3, 1896, p. 345.

The writer's section, gathered from samples taken from a boring at the "mine," is as follows:

Section at sulphur mine.[a]

		Thickness.	Depth.
		Feet.	*Feet.*
1	Dirt and sand	25	25
2	Clay and sand	175	200
3	Quicksand	181–190	380–390
4	Gravel	25–60	410–450±
5	Broken rock and limestone	40	490
6	"Pepper and salt" sands with sulphur crystals	10	500
7	The same, more sulphur	2	502
8	Fine, whitish, black-specked sandy layers with grains of sulphur	3	505
9	Sulphur and gypsum	3	508
10	Same as No. 8	3	511
11	Sulphur and gypsum	3	514
12	Soft sandy clay and sulphur	6	520
13	Light-gray fine material and sulphur	6	526
14	The same, more coarsely crystalline	4	530
15	Same as No. 12	10	546
16	Coarse dark-gray gypsum and crystalline sulphur	3	536
17	Same as No. 12	10	540
18	Nearly pure sulphur with some gypsum	22	568
19	Crystalline sulphur and gypsum	8	576
20	Whitish, soft (clay?)	4	580
21	Sulphur and some gypsum	14	594
22	Same as No. 20	3	597
23	Sulphur and gypsum	7	604

[a] Rept. Louisiana Geol. Survey for 1902, p. 272.

Structure.—A dome structure in the underlying beds at this locality has been affirmed by Veatch [a] and by Hayes and Kennedy.[b]

Oil and gas.—Mention has already been made of oil in the original Louisiana Oil Company's well at 380 feet. In the Hoffman section given above "oil and tar" are noted at 357 feet. One well is said to have gushed oil 65 feet into the air. In 1900 a thick black tar-like oil, said to be an excellent lubricating oil, would flow slowly from a well when the valve was opened.

A special report to the Oil Investors' Journal, January 18, 1905, reads:

> Investigation brought out the fact that a flow of very heavy oil had been struck at a depth of about 600 feet. The oil came out of the 10-inch casing with the water and showed up in considerable quantity. No attempt was made to finish a well in the oil sand, the object of drilling being to get the sulphur. * * * A sample of the oil was tested at a Beaumont refinery and it was found to be 17° gravity, Baumé; flash point 270.

Poisonous gas has been referred to in connection with the attempt to sink a caisson at the mine. The existence of gas pressure is apparent from the fact that some of the small quantities of oil found here flow or gush. In various test holes a few miles from the mine considerable gas has been encountered. (See p. 24.)

[a] Rept. Louisiana Geol. Survey for 1902, p. 98. [b] Bull. U. S. Geol. Survey No. 212, 1903, p. 134.

One factor, perhaps the chief one, in the success of sulphur mining in Calcasieu Parish has been the cheap oil, first from Beaumont and afterward from Jennings. The writer is not aware that any attempt has been made to utilize to any considerable extent the oil on the holdings of the Union Sulphur Company.

VINTON.

Location and geographic features.—The exact location of the Vinton dome may be seen by consulting figure 9. It is about 3 miles southwest of Vinton station, on the Southern Pacific Railroad, in Calcasieu Parish. The sink or depression in the dome, now occupied by a shallow lake, is a noteworthy feature. As seen from a distance this is one of the most prominent domes along the Gulf coast. It rises conspicuously above the coastal prairie lands and its form is certainly suggestive of unusual structural and topographic features for this region.

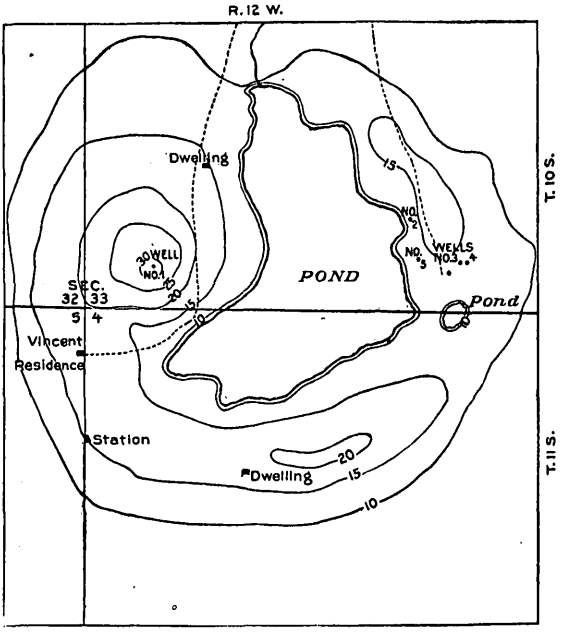


FIGURE 9.—Map of the Vinton dome, Calcasieu Parish.

History and general geology.—Early in the days of the great excitement at Spindletop, which lies but a short distance to the west, this dome, on account of its size and form and its gas and "sour" water seepages, was regarded as a most likely locality for finding oil in immense quantities. It is rumored that Mr. Vincent's holdings of several thousand acres in this vicinity were actually bargained for at a rate of $300 an acre. The transaction, however, was never completed.

W. B. Sharp and Ed. Prather drilled on this dome in 1902, and oil was reported from the same region in that year at a depth of 280 feet. The T. C. Stribling well, also of early date, was noted by Hayes and Kennedy,[a] who reported that a depth of 1,000 feet was said to have been reached, though the log was complete to 454 feet only, and who mentioned the characteristic features of this locality—

[a] Bull. U. S. Geol. Survey No. 212, 1903, p. 135.

a heavy bed of very coarse gravel between 400 and 500 feet, almost impossible of penetration with the rotary drill; a strong artesian flow of black sulphur water from this gravel; and oil very near the surface, beneath the 20-foot stratum of surface clay.

Fenneman[a] notes six attempts in 1902 to 1904, inclusive, to penetrate the bowlder or gravel bed; three were successful, attaining depths of 1,100 to 1,200 feet. He observed the occurrence of gypsum and native sulphur crystals, but failed to obtain a complete and characteristic log of any well in the region. The following log of the Vinton Oil and Sulphur Company's well No. 2 was obtained through the courtesy of Mr. Vincent and of Mr. O. W. Myers, who was in charge of the drilling.

Log of Vinton Oil and Sulphur Company's well No. 2.

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Soil and sand	60	60	Rock and gravel	9	396
Joint clay	5	65	Rock; gravel present	7	403
Sand, oil-showing	7	72	Hard conglomerate	12	415
Wood, oil-showing	3	75	Black gravel and sulphur	58	473
Sand	15	90	Hard white rock	2	475
Tough clay	11	101	Hard sand rock	30	505
Sand	22	123	Hard white rock	36	541
Blue tough clay	13	136	Rock with sulphur	2	543
Sand, good showing of oil	14	150	White rock	138	681
Tough clay	15	165	Sand rock; water and gas	9	690
Oil sand (and gas)	7	172	Hard white rock; showing of sulphur	65	755
Tough clay	4	176	Very hard rock	20	775
Tough clay, oil showing	6	182	Softer rock, with showing of sulphur	7	782
Tough clay	5	187	Soft sand rock	40	822
Wood and oil	3	190	Hard sand rock and white rock	35	857
Tough clay	14	204	White rock	18	875
Wood (little oil)	2	206	Hard white rock	11	886
Sand rock, soft	59	265	White rock with sulphur	12	898
Gravel	4	269	Hard rock	38	936
Porous sand	37	306	Sand with sulphur	4	940
Gravel	39	345	Soft sand (?) rock	60	1,000
Porous sand	15	360	Hard rock (anhydrite)	16	1,016
Gravel	15	375			
Rock layer, with gravel	6	381			
Gravel	6	387			

Specimens seen at the well indicate that a large amount of the "rock" is crystalline anhydrite. The sulphur, water, and gas first appeared in this well at 580 feet. One serious difficulty encountered, besides the conglomerate layer already mentioned, is due to the cavernous character of the rock layers. For days, in spite of filling in with quantities of mud, there is no "return."

In 1907, Wilkins, Zeigler & Rowson started a test hole on the Caffal farm, adjoining the Vincent tract, but after reaching a depth of 700 feet abandoned the enterprise and moved to Anse la Butte.[b]

[a] Bull. U. S. Geol. Survey No. 282, 1906, p. 110.

[b] Oil Inv. Jour., November 5, 1907.

Oil and gas.—In various shallow wells east of the large pond shown in figure 9 oil of a very dark, heavy appearance can be obtained by hand pumps. Eighteen or 20 such wells yield 15 gallons of oil daily, and it is used as lubricating oil by the surrounding farmers. Such gas as has been so far liberated seems to be mainly hydrogen sulphide.

WELSH FIELD.[a]

LOCATION AND OUTLINE OF DEVELOPMENT.

The Welsh field is located in secs. 21 and 22, T. 9 S., R. 5 W., about 3 miles northwest of Welsh, a town on the Southern Pacific Railroad in Calcasieu Parish, about 10 miles west of Jennings. (See fig. 10.) In an area 1,500 feet square 21 wells have been drilled since the summer of 1902, 17 of which have produced oil at some time or other. No one of these wells has ever been a large producer for any great period. In 1903 the production of the field was 25,162 barrels, a daily average of about 69 barrels. In August, 1904, the daily average production was between 300 and 400 barrels, the production for that year being 35,892 barrels. The production since then has been as follows: 1905, 10,000 barrels; 1906, 23,996 barrels; 1907, 47,316 barrels; 1908, 43,976 barrels, an average for the six years of 85 barrels a day. The gravity of the oil varies from 18° to 22° Baumé. The greater proportion of the production of the field is taken by the Welsh refinery and the Southern Pacific Railroad, the oil being converted into valuable lubricating products. The average price obtained for the oil is between 75 cents and $1 a barrel.

TOPOGRAPHY.

The site of the Welsh field is a gentle elevation on the otherwise flat coastal plain. This elevation is distinctly visible from a distance, rising between 5 and 10 feet above the plain, but its boundaries are not easily defined within narrow limits. The developed oil field coincides approximately with the elevated area. Around the edges of the developed field a sufficient number of dry wells (see list and description below) have been drilled to prove that the productive area is not very extensive.

GEOLOGY.

The sections on page 107, taken within the productive field and beyond its limits, show clearly the character and vertical distribution of the sediments passed through by the drill.

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[a] By I. Perrine. See Bull. U. S. Geol. Survey No. 212, 1903, p. 136; idem, No. 282, 1906, pp. 102-105; Rept. Louisiana Geol. Survey for 1907, p. 35.

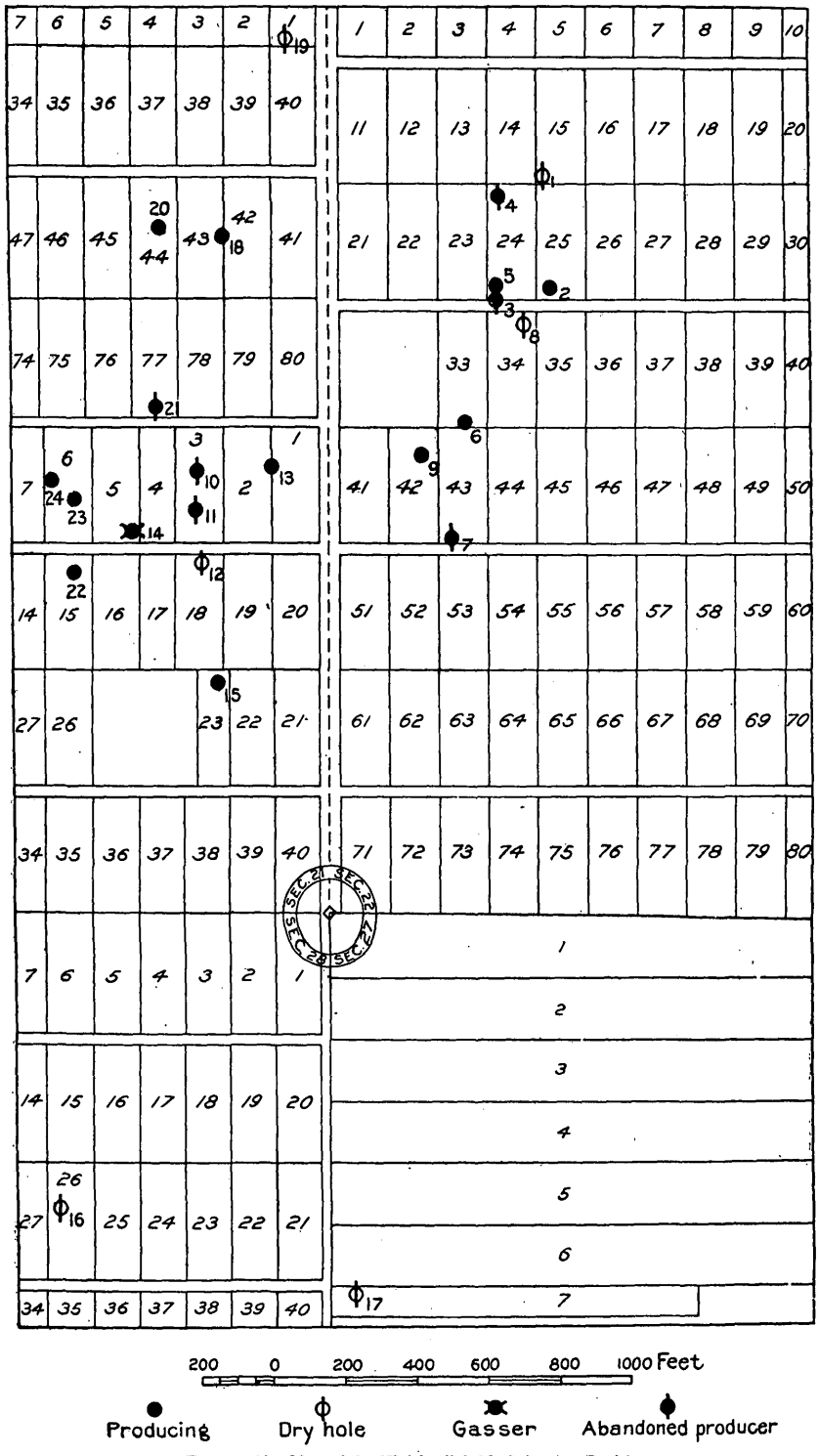


FIGURE 10.—Map of the Welsh oil field, Calcasieu Parish.

Logs of wells in and near Welsh field.

BUTLER No. 2 WELL.

[Received from J. H. Bowen, driller.]

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Clay	65	65	Blue sand	40	702
Shale	83	148	Gray sand	40	742
Sand	150	298	Gravel	21	763
Gravel	107	405	Sand	58	821
Gumbo	20	425	Shale	21	842
Gravel	22	447	Sand	19	861
Sand	22	469	Gravel	63	924
Gravel	22	491	Gumbo	58	982
Gumbo	87	578	Shale	39	1,021
Shale	84	662	Oil sand	21	1,042

BUTLER No. 3 WELL.

[Received from J. H. Bowen, driller.]

Clay	48	48	Shale	46	610
Shale	47	95	Sand	103	713
Sand	211	306	Gravel	208	921
Gravel	189	495	Gumbo	105	1,026
Gumbo	69	564	Oil sand	25	1,051

WELSH LAND AND OIL DEVELOPMENT COMPANY'S WELL No. 5.[a]

[Received from J. H. Bowen, driller.]

Clay	44	44	Blue shale	68	659
Shale	107	151	Shale	22	681
Sand	43	194	Sand	40	721
Gravel	98	292	Gravel	109	830
Sand	24	316	Gumbo	21	851
Gravel	148	464	Gravel	43	894
Gumbo	64	528	Gumbo	75	969
Gravel	63	591	Oil sand	17	986

[a] Completed July 14, 1906. The well blew out at 986 feet and has since been deepened to 2,000 feet, finding 200 feet of oil sand with shells. Oil was found at 986, 1,200, 1,400, 1,700, and 1,800–2,000 feet. From 1,000 to 2,000 feet the drill passed through gumbo, shale, shells, and sand.

BIG MOUND OIL AND GAS COMPANY'S WELL, 7 MILES SOUTHEAST OF WELSH.

[Received from W. N. West, driller.]

Red clay	95	95	Blue clay	25	785
Very fine sand with water	51	146	Sand	320	1,105
Blue clay	84	230	Gumbo	15	1,120
Sand and gravel with much water	230	460	Sand	45	1,165
Blue clay	12	472	Blue clay	105	1,270
Sand	38	510	Sand	38	1,308
Blue clay	55	565	Blue clay	102	1,410
Sand	35	600	Sand	65	1,475
Blue clay	95	695	Shale	55	1,530
Sand	65	760	Sand (well abandoned)	21	1,551

INDEX AND DESCRIPTION OF WELLS.

WELLS IN THE WELSH OIL FIELD.

The numbers at the left in the subjoined list correspond to those used on the map, figure 10.

1. Proven field; never produced; hole only remains.
2. Hilltop No. 1; producing very little oil; passed through 7 feet of good sand, as did other Hilltop wells.
3. Hilltop No. 2; hole full of junk; produced at the rate of 12 barrels an hour for seven days.
4. Hilltop No. 3; hole only remains; formerly produced from 5 to 10 barrels per day.
5. Hilltop No. 4; producing scarcely any oil.
6. Southern Pacific No. 1; 1,006 feet deep; fishing for tools lost; will pump later if successful in recovering tools.
7. Southern Pacific No. 2; abandoned producer; hole only remains.
8. Southern Pacific No. 3; a dry hole.
9. Metropolitan; 996 feet deep; pumping 20 to 25 barrels a day.
10. Welsh Oil and Land Development Company No. 1; abandoned producer; only hole remains.
11. Welsh Oil and Land Development Company No. 2; abandoned producer; hole alone remains.
12. Welsh Oil and Land Development Company No. 3; a dry hole; ruined by blow-out at 1,100 feet.
13. Welsh Oil and Land Development Company No. 4; 1,020 feet deep; will be repaired; was a 40-barrel producer when pumped.
14. Southwestern Oil Company No. 1; gassed three or four hours when brought in, but has never produced either oil or gas since.
15. Boss & McFadden; 1,030 feet deep; best well in the field at present (November 15, 1908); fishing for screen.
16. Texas Company No. 1; a dry hole at 1,200 feet.
17. Decatur Oil and Mineral Company; a dry hole at 2,012 feet; passed through 40 feet of good sand at 1,140 feet, and had a show of oil at 1,400 feet and at 1,600 feet.
18. Colorado-Texas; a dry hole at 2,340 feet; on being shut off to a depth of 1,000 feet a producing well was brought in; a strainer was being put in the hole November 15, 1908, and the well may be called a producer.
19. Brown-Lively; a dry hole at 1,100 feet; produced some water, but no oil.
20. Taber No. 1; 1,025 feet deep; will be a producer; repairs being made November 15, 1908.
21. Welsh Oil and Land Development Company No. 5; 2,000 feet deep; hole only remains; passed through good sand between 1,800 and 2,000 feet.
22. Butler No. 1; pumping.
23. Butler No. 2; pumping.
24. Butler No. 3; pumping. All three Butler wells combined produce about 40 barrels a day on the average.

WELLS DRILLED AROUND THE FIELD PROPER.

The Decatur Company drilled two wells 6 miles north of the field to depths of about 1,200 feet and found no oil.

Near the Decatur wells the Spindletop well, 1,700 feet deep, found only a showing of gas at about 1,000 feet.

The Boss-McFadden well 1,500 feet northeast of the field was drilled to a depth of 2,000 feet, and, though a dry hole, is reported to have found a showing of oil at 1,400 and 1,600 feet.

A well put down one-fourth mile due east of Southern Pacific No. 1 to a depth of 2,000 feet struck no oil sand. Farther east at Roanoke, 5 miles east of Welsh, are two dry holes between 1,100 and 1,200 feet deep.

The Texas Company drilled a well 2,000 feet deep 1½ miles southeast of the field and got a dry hole.

About 6 or 7 miles southeast of Welsh the Big Mound Oil and Gas Company drilled a dry hole 1,551 feet deep.

A water well 2 miles south of the center of the field struck gas with about the same pressure as in the field at 250 feet.

The Texas Company got a dry hole at 1,100 feet about 800 feet west of the McFadden well.

The Wildcat well, 1½ miles west of the field, found no traces of oil.

GAS.

All of the oil in the Welsh field is found at depths differing little from 1,000 feet, in uncompacted sands overlain by a single thick bed of gumbo or by a succession of beds in which gumbo is prominent. Gas is found in considerable quantities, its presence in a water well about 250 feet deep on the Wood farm being the principal indication which led to drilling, though the existence of the mound itself must have been regarded as significant. The gas is found at the same horizon as the oil.

SALT WATER.

The amount of salt water pumped with the oil at Welsh is considerably greater than that of the oil itself. Trouble has been experienced in the separation of the oil from the water accompanying it, the process requiring an inconveniently long time and a high temperature. After the separation the oil may be used for fuel, though in its constitution it differs sufficiently from the other Coastal Plain oils to cause a slight inconvenience in using it in the same burners. The oil obtained in the Welsh field is said to be the best for lubricating purposes in the whole southern region.

CEDAR SALINE.

Location.—The Cedar saline lies 3 miles southeast of Winnfield, Winn Parish, in secs. 30 and 31, T. 11 N., R. 2 W. For details of the surroundings, see Plate I of the Louisiana Geological Survey's report for 1907 (Bulletin 5). A view of this saline is given in Plate IX of the present volume.

History and geology.—Extended barren salt licks, salt-water springs, and an abundance of gas bubbling up through the saline waters have tended to draw attention to this remarkable locality and to encourage

the hope that it may some day prove to be an oil and gas field. As early as the summer of 1904 one well at least had attained a depth of 750 feet and had experienced a decided blow-out. Another well was only 100 feet deep, a 10½-inch bit being held fast in the hole. In 1907 the amount of gas escaping from the deeper well was noteworthy; it was accompanied by a strong flow of salt water. There seems to be no doubt that a very fair gas well could be obtained here. However, all energy so far has been directed to finding oil. During the spring of 1907 J. D. Pace, of Winnfield, and Brown Brothers, drillers, were engaged on a well in which they struck, at 78 feet, rock of the toughest type for drilling, which continued practically to 1,000 feet. Work was discontinued at a depth of a little more than 1,200 feet, where the drill encountered "volcanic rock." Specimens sent to the writer by Mr. Pace, however, showed clearly that the supposed igneous rocks consisted of gypsum and limestone, darkened by hydrocarbons and pyrites. It is understood that the well will be deepened. The location of the well seems not unfavorable to furnish a fair test of the oil capabilities of the vicinity, and it is reasonable to expect that gas and probably oil will eventually be found locally in commercial quantities somewhere in this neighborhood.

Details regarding the geology of this region are given in the Louisiana Geological Survey's report for 1907 (Bulletin 6), page 10.

STRATUM OIL AND GAS FIELDS AND PROSPECTS.

It has already been stated that oil and gas occur in Louisiana in normally stratified rocks belonging to well-known geologic horizons. These horizons, so far as known, are Upper Cretaceous, lower Eocene, and Quaternary. A synoptical summary of such occurrences appears on pages 29–34. Details for the benefit of those actually working in these various fields are given below.

CRETACEOUS HORIZONS.

CADDO OIL AND GAS FIELD.

GENERAL LIMITS AND LOCATION.

For general purposes the Caddo field may perhaps be defined as a more or less quadrangular area in Caddo Parish, La., extending from Mooringsport on the south to Vivian on the north, and from the Louisiana-Texas state line on the west to Dixie on the east. It is located in the north corner of the Sabine uplift. (See fig. 1.) The areas of greatest present development are shown on the index map (fig. 11) and on figures 12 to 15. However, even as far south as Shreveport gas has been found in considerable quantities at depths of less than 1,000 feet, and there are reasons for hoping that in

CEDAR SALINE, 3 MILES SOUTHEAST OF WINNFIELD.

various places throughout this great structural unit gas and oil may have been collected in paying quantities. Between such fields of future development there are doubtless extensive barren areas, and the localities that are productive will doubtless receive special names. In the Caddo field as above defined there are large areas

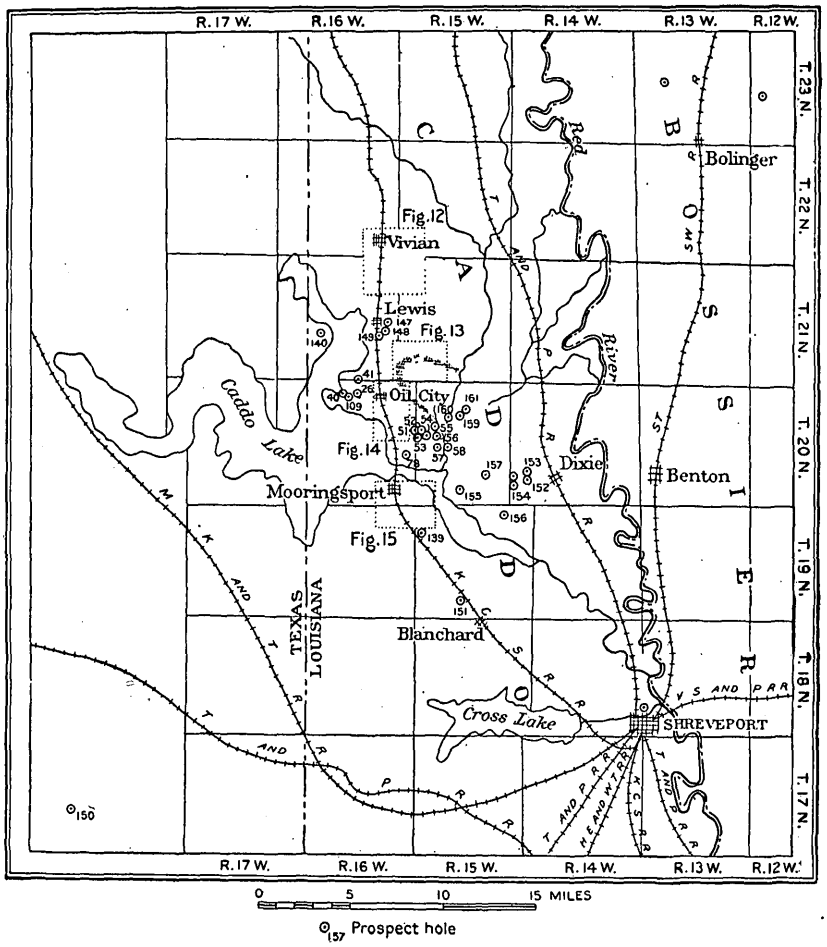


FIGURE 11.—Index map showing areas mapped in figures 12 to 15, also widely scattered prospect wells near the Caddo oil field, Caddo Parish. (See list of numbers, pp. 112–117.)

that are barren of oil or gas. This brings about the local usage of such names as the Vivian, Lewis, Pine Island, Oil City, and Mooringsport fields; but the limits of such subdivisions are ill defined.

The numbers of the wells shown on figures 11, 13, 14, and 15 correspond to those in the list following.

Index to wells shown on figures 11 and 13–15.

1. Offenhauser No. 1, small derrick, Caddo Gas and Oil Co.
2. Offenhauser No. 2, Caddo Gas and Oil Co.
3. Smith No. 2, Caddo Gas and Oil Co.
4. Smith No. 3, Caddo Gas and Oil Co.
5. Big Four No. 2.
6. Big Four No. 1.
7. Producers No. 1.

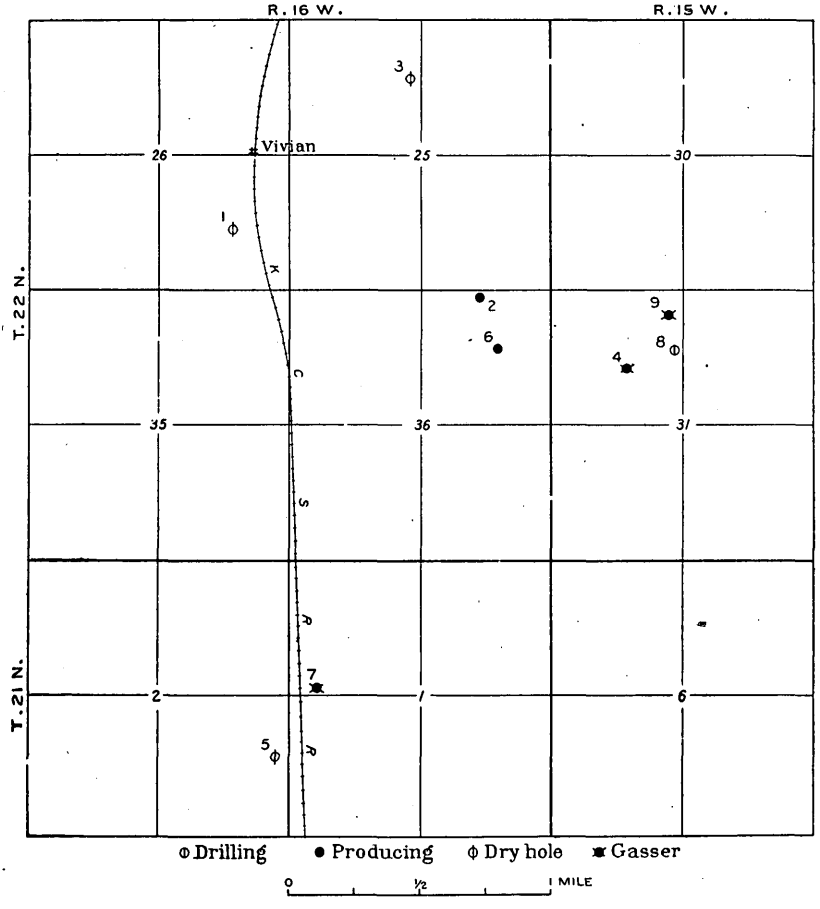


FIGURE 12.—Map of Vivian district, Caddo oil field. (See index maps, figs. 11 and 16.) 1, Caddo Gas and Oil Co., Hiner No. 1; 2, Vivian Oil Co., Edwards No. 1; 3, B. G. Dawes and Gulf Refining Co., Posey No. 1; 4, B. G. Dawes and Gulf Refining Co., Heilperin No. 1; 5, Producers, Harrell No. 1; 6, Vivian Oil Co., Childs No. 1; 7, Caddo Gas and Oil Co., Pardue No. 1; 8, McCann & Harper, Pitts No. 1; 9, McCann & Harper, Pitts No. 2.

8. Brown Brothers No. 1.
9. Smith No. 1, Caddo Gas and Oil Co.
10. Producers No. 6, Caddo Oil and Mining Co.
11. Producers No. 5, Caddo Oil and Mining Co.
12. Producers No. 1, Murray et al.
13. Producers No. 1, Black Bayou.
14. Richardson No. 1, Pitts, Reliance No. 1.

15. Richardson No. 2, Pitts, Reliance No. 2.
16. Shreveport Petroleum Co. No. 1, Townsite.
17. Savage Brothers & Morrical, No. 1.
18. Texla No. 2.
19. Texla No. 3.
20. Daniels & Alday No. 1, Watkins.
21. Producers No. 2, Heilperin & Liebman.
22. Producers No. 1, Heilperin & Liebman.
23. Smith No. 4, Caddo Gas and Oil Co.
24. Offenhauser No. 3, Caddo Gas and Oil Co.
25. Producers No. 1, Evans.
26. Producers No. 1, Ruddersdorf.
27. Producers No. 1, Homestead.

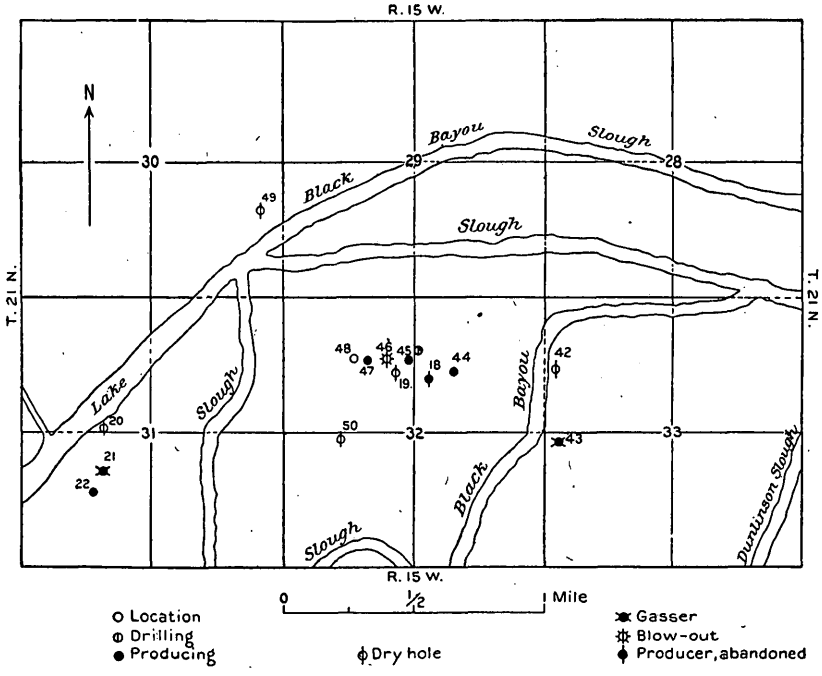


FIGURE 13.—Map of Pine Island district, Caddo oil field. (See index maps, figs. 11 and 16, and list of numbers, pp. 112–117.)

28. Blanchard No. 1, Surrey.
29. Blanchard No. 2, Surrey.
30. Jolly No. 1; Culliman & Jolly No. 1.
31. Producers No. 8, Caddo Oil and Mining Co., derrick only.
32. Producers No. 2, Murray et al.
33. Producers No. 7, Caddo Oil and Mining Co.
34. Lillie No. 1.
35. Enterprise No. 2.
36. Enterprise No. 1.
37. Smith No. 5, Caddo Gas and Oil Co.
38. C. G. Dawes Trustee No. 1.
39. C. G. Dawes Trustee No. 2.

40. Atlanta and Shreveport No. 1; old No 2; Latex No. 1.
41. Blanchard No. 1; Graham.
42. Dixon Oil and Pipe Line Co. No. 1.
43. Dixon Oil and Pipe Line Co. No. 2.

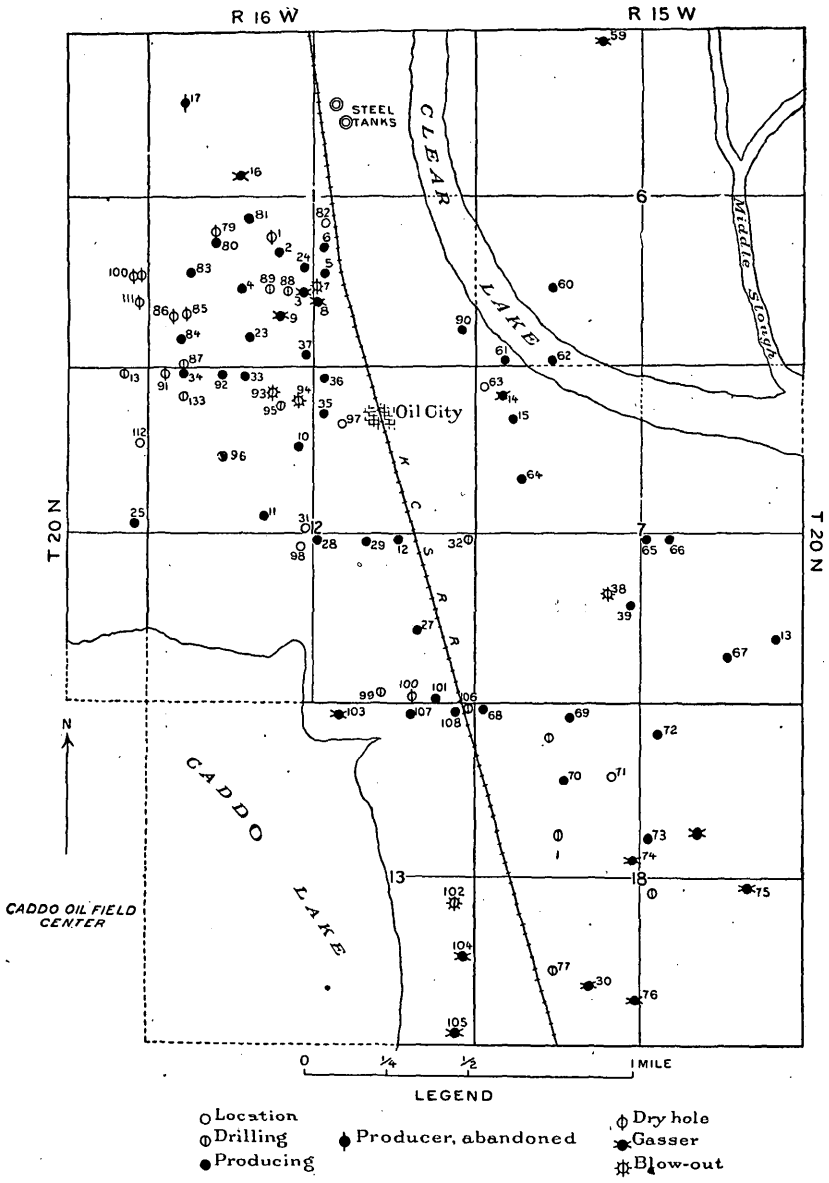


FIGURE 14.—Map of central part of Caddo oil field. (See index maps, figs. 11 and 16, and list of numbers, pp. 112–117.)

44. Texla No. 1.
45. Richardson No. 5.
46. Richardson No. 3.
47. Richardson No. 4.

48. Richardson No. 6.
49. Producers No. 1, Harrel 3,000 feet.
50. Trees No. 1, Heilperin & Liebman.
51. Jolly No. 2, Louisiana Gas Co.
52. Crawford No. 1, McGuire.
53. Huckaby No. 1, McGuire.
54. Byron No. 1, McGuire.
55. School No. 2, McGuire.
56. School No. 1, McGuire.
57. Barnhart No. 1, McGuire.
58. Barnhart No. 2, McGuire.
59. Producers No. 1, Leonard.

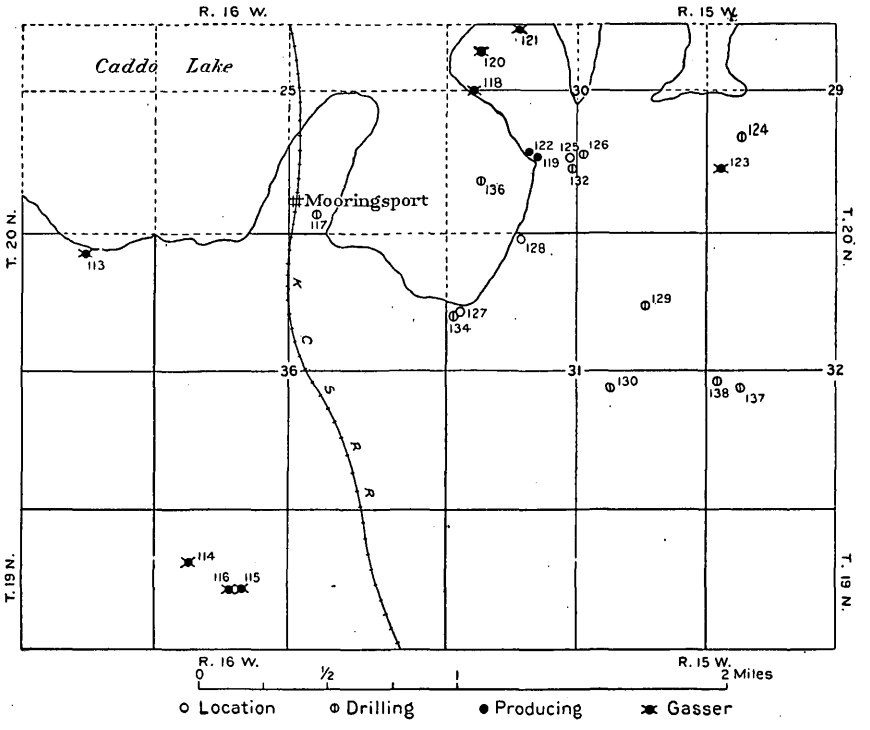


FIGURE 15.—Map of Mooringsport district, Caddo oil field. (See index maps, figs. 11 and 16, and list of numbers, pp. 112-117.)

60. Merchant No. 1.
61. Broussard No. 1, Fee.
62. Broussard No. 2, Fee.
63. Guffey No. 1, Pitts.
64. Reliance No. 3, Pitts.
65. Filer No. 2, sec. 7.
66. Filer No. 1, sec. 7.
67. Producers No. 2, Black Bayou.
68. Producers No. 1, Murray, Colquitt & Hardy.
69. Producers No. 2, Lane.
70. Producers No. 4, Lane.
71. Producers No. 3, Lane.

72. Filer No. 1, sec. 18.
73. Producers No. 3, Black Bayou.
74. Evans No. 2, McGuire.
75. Evans No. 3, McGuire.
76. Evans No. 1, McGuire.
77. Broussard No. 1, Brown.
78. Gulf Refining Co. No. 1, Curtis.
79. Brown No. 1.
80. Offenhauser No. 1, Caddo Gas and Oil Co.
81. Offenhauser No. 4, Caddo Gas and Oil Co.
82. Heywood No. 1, Fee.
83. Hunter No. 2, Smith No. 1.
84. Caddo Lake Oil and Pipe Line Co. No. 1, Caddo Gas and Oil Co.
85. Caddo Lake Oil and Pipe Line Co. No. 2, Caddo Gas and Oil Co.
86. Richardson No. 1, D. C. Richardson.
87. Caddo Lake Oil and Pipe Line Co. No. 3, Caddo Gas and Oil Co.
88. Smith No. 6, Caddo Gas and Oil Co., Location.
89. Location of derrick torn down.
90. Mansfield No. 1.
91. Lillie No. 2.
92. Producers No. 1, T. M. Richardson.
93. Producers No. 2, Blowout, Caddo Oil and Mining Co.
94. Producers No. 3, Blowout, Caddo Oil and Mining Co.
95. Producers No. 4, Caddo Oil and Mining Co.
96. Producers No. 1, Lane.
97. Enterprise No. 3.
98. Blanchard No. 4, Surrey.
99. Blanchard No. 3, Surrey.
100. Producers No. 2, Homestead.
101. Producers No. 3, Homestead.
102. Gilbert No. 1, gas, Caddo Gas and Oil Co.
103. Gilbert No. 2, gas, Caddo Gas and Oil Co.
104. Gilbert No. 3, gas, Caddo Gas and Oil Co.
105. Gilbert No. 4, gas, Caddo Gas and Oil Co.
106. Gilbert No. 5, gas, Caddo Gas and Oil Co.
107. Gilbert No. 1, oil, Caddo Gas and Oil Co.
108. Gilbert No. 2, oil, Caddo Gas and Oil Co.
109. Old No. 3, Atlanta and Shreveport No. 2, Latex No. 2.
110. Heywood & Savage No. 1.
111. Producers No. 1, J. W. Holt.
112. Lillie No. 3, Hill tract.
113. Croom Clubhouse No. 1, Caddo Gas and Oil Co.
114. Noel No. 2, Caddo Gas and Oil Co.
115. Noel No. 1, Caddo Gas and Oil Co.
116. Noel No. 3, Caddo Gas and Oil Co.
117. McCormick No. 1, Croom.
118. Hostetter No. 1, Caddo Gas and Oil Co.
119. Hostetter No. 2, Caddo Gas and Oil Co. (Guffey No. 1).
120. Hostetter No. 3, Caddo Gas and Oil Co.
121. Hostetter No. 4, Caddo Gas and Oil Co.
122. Guffey No. 2, Hostetter.
123. Harris No. 1, Caddo Gas and Oil Co.
124. Gulf Refining Co.
125. Gulf Refining Co.
126. Producers No. 1, Producers.

127. Thompson No. 1, McCormick.
128. Guffey No. 1, Christian.
129. Caddo Gas and Oil Co.
130. Caddo Gas and Oil Co.
131. Busch-Everett No. 1, Etchison.
132. Gulf Refining Co., Hostetter No. 3.
133. Lillie No. 3.
134. Staiti No. 1, Ward tract.
135. Gulf-Broussard.
136. Gulf Refining Co., So. Relle, No. 1.
137. Cook No. 1, Caddo Gas and Oil Co.
138. Gulf Refining Co., Cook No. 1.
139. Producers No. 1, Milam.
140. Heywood No. 2, Savage.
141. Curtis No. 1, May Oil Co.
142. Producers No. 1, White.
143. Richardson No. 7, Pine Island.
144. Gulf Refining Co., Plantation No. 1.
145. Filer No. 2, sec. 18. Gas well.
146. Rogers No. 1, Lewis, La.
147. Rogers No. 2, Lewis, La.
148. Rogers No. 3, Lewis, La.
149. Trees Oil Co., Styles No. 1.
150. Blocker well, Tex.
151. Marshall Gas Co. No. 1, Cole, Blanchard, La.
152. Dixie Oil and Pipe Line Co. No. 3.
153. F. Hauser, North No. 1.
154. Dixie Oil and Pipe Line Co. No. 2.
155. Benedum & Tree Co., Ballard Oil Co. No. 1.
156. Dixie Oil Co., Glassell & Adger No. 1.
157. G. F. Hausener, J. C. Dixon No. 1.
158. Brick-yard well, Shreveport.
159. Black Bayou Oil Co. No. 1, Glassell.
160. Black Bayou Oil Co. No. 2, Alexander.
161. Black Bayou Oil Co. No. 3.
162. Cooper & Heard, Winnfield, La.
163. Ruston oil well.

From a point 2 miles south of Vivian northward, from James Bayou westward, and from Mooringsport southward the rolling and locally dissected uplands of the Tertiary formations may be found. Rarely, however, does an area of any considerable size pass above the 300-foot contour. Plate XI, *B*, is reproduced from a photograph of a portion of the steep bank at Potters Point, on the north shore of Caddo Lake, just over the Texas line. This particular bank, above the point where the man is shown in the picture, has been rendered unusually abrupt by a landslide that has carried down hundreds of tons of earth and formed a short terrace with a basin-like depression behind. The large trees and the man are in this depression. Near the base of the bluff the sharply incised wave-formed cliffs of the "raft period," so well described by Veatch,[a] are clearly

[a] Prof. Paper U. S. Geol. Survey No. 46, 1906, pp. 60–63.

shown. It is very evident that, as Veatch maintains, the steep banks to be seen some distance above the usual level of the lakes in this part of Louisiana were carved out by wave erosion during the period when the main Red River channel was clogged by a log jam or "raft." Yet it is interesting to note that but two years ago the surface of Caddo Lake stood for weeks almost at "raft period" level, as the débris in the foreground of Plate XI, *B*, clearly shows. It is stated that seventeen years ago the waters of this lake stood several feet higher still. Plate X, *A*, shows a part of the lake.

At present the general level of Caddo Lake must be gradually lowering, for the "rapids" at the southeast terminus of Soda Lake are gradually lowering the outlet for all this system of lakes and bayous. (See Pl. XI, *A;* also fig. 11.) It is quite evident, therefore, that in the future Caddo Lake and the connected bodies of water will show a far greater range in stages of water than formerly. They will stand for a short time occasionally at "raft period" level, but will drop quickly to medium or low stages.

CLIMATE.

Although the subject of climate is not mentioned in most geologic reports, it is evident that in attempting to show the conditions that must be met in the production of oil or gas in a particular field, certain climatic peculiarities may be worthy of serious consideration. The figures obtained by Observer Wright at the United States Weather Bureau station at Shreveport indicate fairly well the conditions in the Caddo field, though Caddo is somewhat hotter and more humid. The Shreveport figures are as follows:

Temperature, monthly average for twenty years:

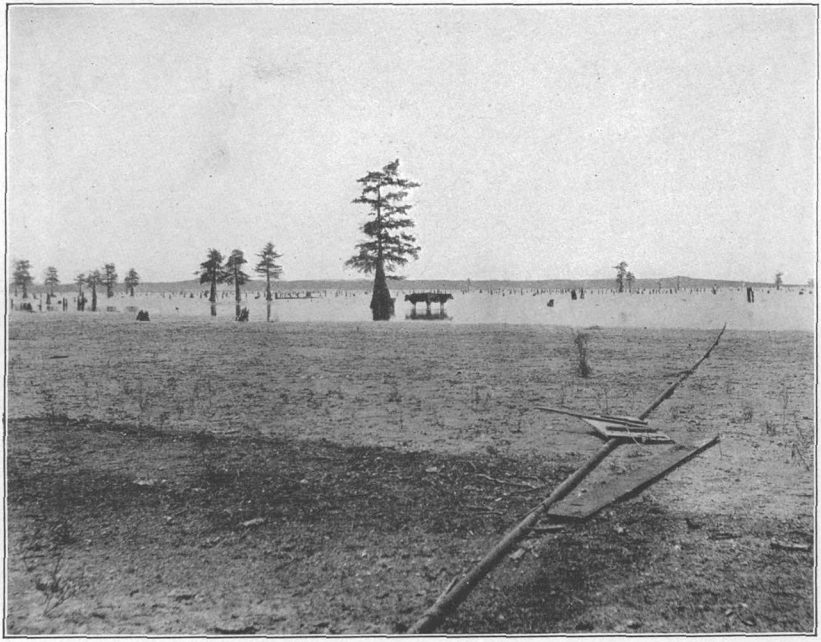
	°F.		°F.		°F.
January	45.8	May	73.3	September	74.8
February	51.5	June	79.9	October	65.4
March	58.1	July	82.7	November	54.2
April	66.1	August	81.5	December	49.5

General average for twenty years, 65.2° F. Hottest days in the year generally in July, showing maxima of 96° to 107° F.

Precipitation, monthly average for twenty years, 4.3 inches. August has but little over 2 inches; April has 5.5 inches.

Relative humidity, 72.5—that is, the air contains on an average 72.5 per cent of the moisture it is capable of holding at the various temperatures when observations were made.

In general it may be said that the months October to January are delightful, February to May tolerable, but June to September trying to even strong constitutions. Malaria is very prevalent, owing doubtless to the swarms of mosquitoes that infest the region. Ticks and "red bugs" add greatly to the discomfort of the workmen. Drinking water is scarce and generally of a very inferior quality.



A. CADDO LAKE, LOOKING SOUTH FROM A POINT ABOUT 1 MILE SOUTHWEST OF OIL CITY.

B. LANDSLIDE TERRACE ON NORTH BANK OF CADDO LAKE, JUST WEST OF TEXAS-LOUISIANA STATE LINE.

A. THE RAPIDS, AT MOUTH OF SODA LAKE, 10 MILES SOUTHEAST OF MOORINGSPORT.

B. POTTERS POINT, NORTH SHORE OF CADDO LAKE.

Showing wave-formed bluff of raft-period stage of water level and débris left by recent high waters.

GEOLOGY OF THE CADDO FIELD.

GENERAL OUTLINE.

The areal geology of northwestern Louisiana, eastern Texas, and southwestern Arkansas has been excellently set forth in Professional Paper 46 of the United States Geological Survey, by A. C. Veatch. The map herewith given as Plate XII is a copy of a map appearing in that paper, modified in only a few details. The section at the left of the plate is also a modified form of Veatch's section.

In the mapping the Quaternary, Tertiary, and Cretaceous systems, already described in outline, are subdivided into series and formations. In the territory extending from Mooringsport to Vivian, besides the more or less omnipresent Quaternary veneering, the Eocene Wilcox ("Sabine") formation and Claiborne group constitute the surface rocks. Section A–A′, at the left of Plate XII, shows that many other formations underlie the Caddo field within less than 2,000 feet of the surface. These formations must be briefly described before an intelligent description of the geology of the Caddo field can be given. As the younger beds above are penetrated before the older lower beds in the process of drilling, the description will observe this natural sequence. The generalized section given on page 30 shows what formations are penetrated in drilling in the Caddo field and about at what depths.

QUATERNARY SYSTEM.

An excellent discussion of the history of this and adjacent regions during Quaternary time is given by Veatch in the paper already cited. On Plate XII of the present volume the more conspicuous Quaternary deposits are indicated. Between Mooringsport and Oil City there are no less than 30 feet of red and gray sands and clays that are referable to these comparatively recent deposits. (See Pl. XIII, *B*.) Their reddish hues are more pronounced toward the base and owe their origin clearly to the characteristic color of the deposits of Red River. Calcareous nodules are abundant in certain layers; no fossils have thus far been seen. So far as the oil industry is concerned, the Quaternary deposits are of little moment, save perhaps in some places where the tenacious red-clay layers furnish good impervious material in which to excavate earthen storage tanks.

TERTIARY SYSTEM.

Of the four series of the Tertiary system, only the oldest, the Eocene, is represented in the Caddo field. Moreover, only the two lower formations of this series occur extensively within the boundaries of the proved field. In the generalized section given above only the Wilcox ("Sabine") and Midway formations are mentioned, but Plate XII and the accompanying section show that certain areas of Claiborne deposits occur in the vicinity of Vivian.

There are no sharp lines of division between the different Eocene formations in the Caddo field. The Claiborne group is, however, not only usually more fossiliferous then the underlying Wilcox, but also more ferruginous. The Wilcox is especially characterized by considerable beds of lignite and large, bowlder-like calcareous concretions. The Midway in the Caddo well is but slightly different from the darker lignitic layers of the Wilcox above or the tough dark Arkadelphia clay below. In some of the wells a limestone is struck that appears to be of the Midway horizon.

Claiborne group.—Plate XII shows how the Claiborne group borders the Sabine uplift. It is represented only by patches in Gregg, Marion, and Cass counties, Tex., and Caddo and Bossier parishes, La., where it has been for the most part carried away by long-continued erosion. It spreads out extensively in Rusk and Nacogdoches counties, Tex., and Bienville and Winn parishes, La., where the dip is slight, but it narrows down in Sabine Parish, where a steep dip carries it beneath the later Tertiary deposits.

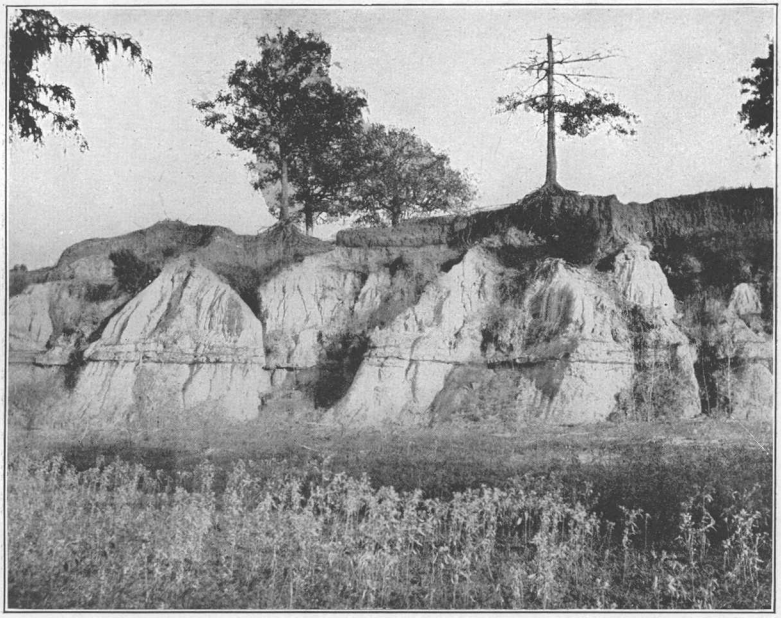
In the Caddo field, as already defined, marine Claiborne fossils have been found in but one locality, by the roadside about one-fourth mile east or east-southeast of the railway station at Vivian. Here, as at Roberta, Bolinger, and Plaindealing, in Bossier Parish, and in Ouachita County, Ark., the fossils are in the form of casts in very ferruginous indurated layers. From their appearance, which is very different from that of the fossil species so abundant and characteristic of the Claiborne from Bienville Parish to Nacogdoches County on the south, it is inferred that either these northern forms existed under considerably different conditions from their southern relatives or they represent a somewhat older type of life.[a] It is possible that the

[a] Seventeen years ago the writer collected at Walnut Bluff, Ouachita County, Ark., and near Plaindealing, La., a few fragments of fossils that were referred to a lower Claiborne horizon. Recently he has collected somewhat more extensively in the locality from Plaindealing northward. At Pope Joy cut, between Plaindealing and Bolinger, in a friable red sandstone on the east side of the railway, were found casts of small *Venericardia planicosta*, *Cytherea* cf. *bastropensis*, and what seems to be the smooth valve of *Ostrea sellæformis*.

Just north of the old Roberta station, in a cut between Bolinger and Arkana, in an oolitic ferruginous slightly indurated sandstone on the east side of the track the writer collected a number of casts and practically exhausted the available material. These casts show *Venericardia planicosta*, *Cytherea bastropensis*, *Tellina mooreana*, *Barbatia*, *Yoldia* (*Adrana*) cf. *aldrichiana*, *Modiola texana*, *Levifusus trabeatus*, *Volutilithes petrosus*, *Turritella carinata*, *Fusus bastropensis*, *Cancellaria tortaplica*, *Cornulina armigera* (very small), *Natica*, *Corbula*, *Tornatellæa*, fish scale, coral (*Balanophyllia angustidens*). A few miles to the northeast of this locality in ferruginous beds of this horizon *Pteropsis conradi* and a species of *Flabellum* have been found. The fauna collected at Walnut Bluff contains *Venericardia planicosta*, several forms of *Cytherea*, *Tellina*, probably *T. mooreana*, *Levifusus trabeatus*, *Cardium harrisi*, and a *Terebra*, probably *T. houstonia*, though very small and imperfect.

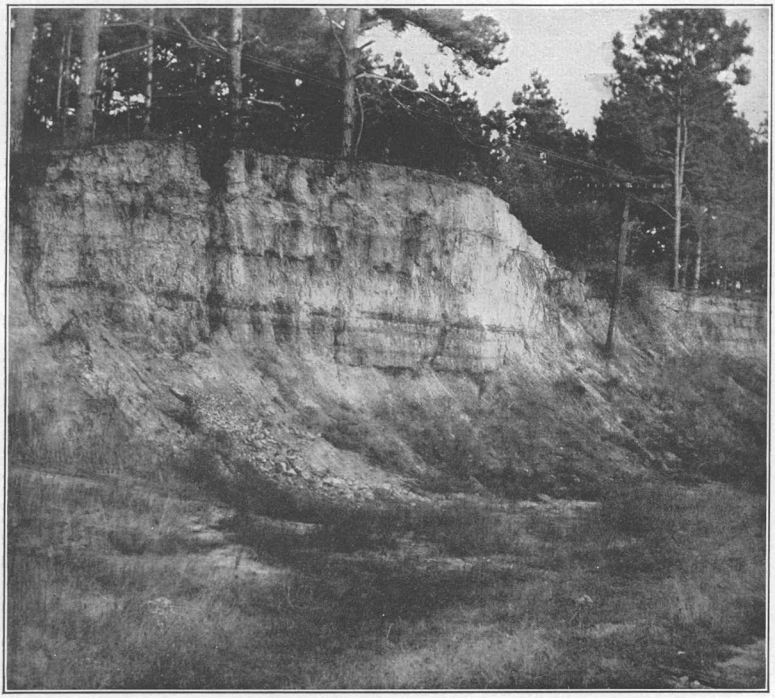
This fauna of the Red Lands of northern Bossier Parish, appearing again at Walnut Bluff, Ark., comprises a very different assemblage of species from the ordinary lower Claiborne *Ostrea falciformis*—*Orbitolina* fauna. In fact, Wilcox affinities are suggested. The small *Cornulina armigera* is of the archaic form, with one row of spines; *Cardium harrisi* belongs with the *C. toumeyi* and *C. hatchetigbeense* section of *Cardium*. *Fusus bastropensis* is related to *F. ottonis*. However, *Terebra houstonia*, *Flabellum* (upper Eocene type) and the abundance of good-sized *Cytherea* indicate that these Red Lands may with propriety be left in the lower Claiborne, where they were placed seventeen years ago.

The Claiborne group of southern Arkansas and northern Louisiana has hitherto been divided into the Cockfield formation and the so-called "Lower Claiborne." For the latter the name St. Maurice formation, from one of the places where the "Lower Claiborne" is typically exposed, has recently (Science, new ser., vol. 31, April 1, 1910, p. 502) been introduced.

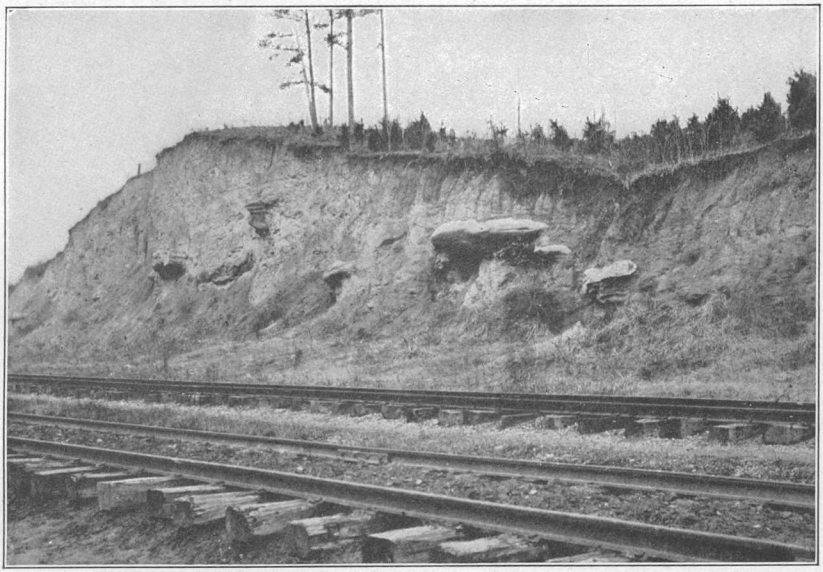


A. SOUTH BANK OF CADDO LAKE AT MOORINGSPORT.

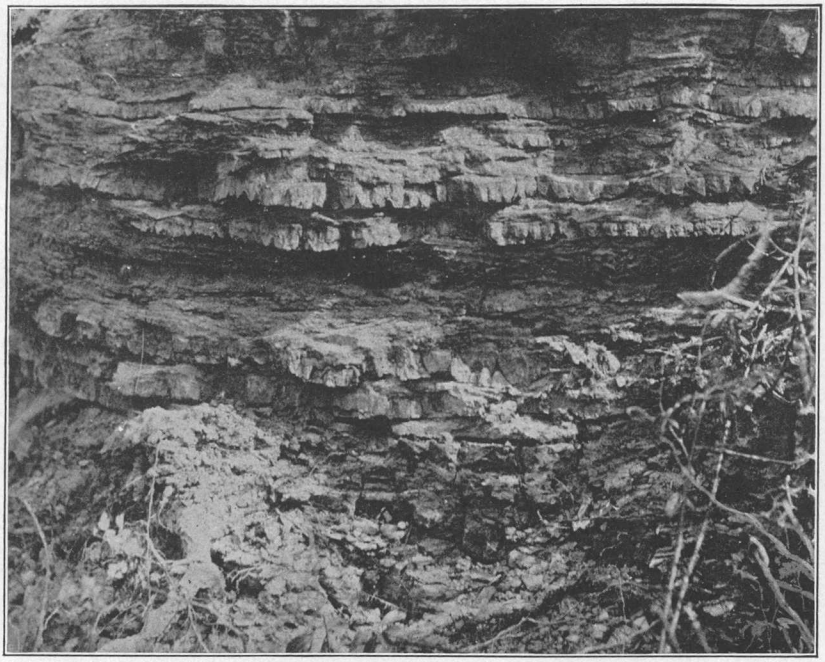
Showing Eocene Wilcox beds to 1 foot above ferruginous ledge at left and to 2 or 3 feet above same ledge at right; deposits above are all white and red clays, sands, and gravel of Quaternary age. This is a wave-formed bluff dating from the "raft period."



B. RED AND GRAY CLAY AND LOAM BEDS (QUATERNARY), EAST BANK OF RAILROAD CUT, 1½ MILES NORTH OF MOORINGSPORT.



A. CALCAREOUS CONCRETIONS IN SANDS OF WILCOX ("SABINE") FORMATION, SHREVEPORT.



B. CONE-IN-CONE STRUCTURE SHOWN IN CALCAREOUS CONCRETION AT SLAUGHTERPEN BLUFF, SHREVEPORT.

Sabine uplift was more or less manifest in early Eocene or perhaps even late Cretaceous time. Desoto Parish, La., as well as Shelby, Panola, and Harrison counties, Tex., may have constituted an island in Claiborne time. The ferruginous, more or less brackish waters to the north of the island would naturally contain a very different fauna from that flourishing in the pure sea water to the south.

From what has already been said it will be seen that whereas the Claiborne group is poorly represented and seemingly of no special significance in the Caddo field its generally fossiliferous beds have been of great value during the past ten years in helping to determine the limits of the Sabine uplift in northwestern Louisiana and eastern Texas, an area whose economic importance is now beginning to be appreciated.

Wilcox ("Sabine") formation.—To the Eocene Wilcox are referred the greater portion of the beds forming the surface rocks over the Sabine uplift. In the bluffs about Shreveport, in many of the railway cuts from Shreveport to Mooringsport, and in the steep banks of Caddo and Soda lakes Wilcox beds are well exposed. (See Pl. XIII, *A*.)

The Wilcox beds are usually characterized, not only by a considerable amount of lignitic matter, locally in the form of seams several feet thick, but also by the number and size of the hard, gray, more or less calcareous concretions they contain. "Hard bowlders" are of common occurrence in Caddo well sections. As a rule they are not encountered below 450 feet, so in the general section of the field the dividing line between the Wilcox and Midway has been drawn at that depth. The appearance of these huge concretions in artificial excavations is well shown in Plate XIV, *A*. The cone-in-cone structure noticeable in many fragments from such concretions brought out by the drill in the Caddo field is shown in Plate XIV, *B*.

Although the sea was not far away during the deposition of the Wilcox beds in the Caddo field, as shown by the presence of a few Ledas and other small marine bivalves in Slaughterpen Bluff at Shreveport and by the selenitic particles in the lower portion of the bluff shown in Plate XIII, *A*, the presence of great numbers of dicotyledonous leaves and even thick beds of lignite and the marked cross-bedded structure of the sand beds point strongly toward local pond and subaerial deposition.

The Wilcox formation is not known to be of economic importance in the Caddo field. Certain layers are used for the manufacture of brick at Shreveport. Farther south, in the Dolet Hills especially, east of Mansfield, extensive beds of lignite occur in the Wilcox formation. Small quantities of oil have been found in this formation near Many. Brine from which salt has been manufactured occurs in the pervious Wilcox beds in the western part of the Sabine Parish.

Here the formation also contains extensive beds of lignite and in places beautifully preserved marine fossil shells. Along the roadside one-half mile west of Leigh, Tex., the sand beds of the Wilcox formation show not only most remarkable cross-bedded structure, but also concretion-like balls of semilignitic, semiasphaltic black matter, some of them a foot in diameter. (See Pl. XV, *A*.)

Midway formation.—The Midway formation, like the various Cretaceous formations described below, does not outcrop at the surface in the Caddo field. Owing to the lack of fossils in most of the Caddo wells in the beds above the Cretaceous, the limits of the Midway are here ill defined. The dark tough clays to a depth of perhaps 650 feet, in places containing a limestone layer around the 600-foot level, are provisionally referred to the Midway formation. Farther to the south in the Sabine uplift territory—for example, along the Texas and Pacific Railway for over a mile in the vicinity of Marthaville—*Ostrea sellæformis*, a very characteristic fossil of the basal Wilcox formation, occurs in great abundance. As the strata in that vicinity dip to the south, though but slightly, it is evident that Midway beds must occur at the surface over a considerable area to the north. Their geographic distribution has not yet been worked out. Fossils apparently of Midway age were found by the members of the Louisiana State Geological Survey at Rocky Springs Church, 6 miles southwest of Marthaville, ten years ago.[a] It would seem, therefore, that in this region the various formations occurring in the Caddo field should be about 450 feet nearer the surface than they are there.

CRETACEOUS SYSTEM.

Of the Cretaceous system only the upper portion, or Gulf series, occurs in the Caddo field, where it is represented by various formations, as indicated in the generalized section (fig. 17).

Arkadelphia clay.—The stiff black Arkadelphia clay, together with the Eocene Midway deposits, makes an excellent capping for the gas that occurs in great quantities in the sands below. Naturally, owing to the omnipresence of the thick Tertiary formations in this part of the State, there are no outcrops of the Arkadelphia clay in the Caddo field. These clays, however, are excellently displayed in bluffs and ravines in Arkansas just north of the Iron Mountain Railroad between Arkadelphia and Hope, where they are in places very fossiliferous.

Nacatoch sand.—The Nacatoch sand furnishes practically all the gas now being used from the Caddo field. About 800 feet may be taken as the average depth to the upper surface of this sand, though gas showings are sometimes found at several horizons before this depth is

[a] Rept. Louisiana Geol. Survey for 1899, p. 63.

A. LIGNITE BALLS OR CONCRETIONS IN SANDS OF THE WILCOX ("SABINE") FORMATION, LEIGH, TEX.

B. EAST BANK OF CUT ON WASHINGTON-HOPE (ARK.) PUBLIC ROAD, 1¼ MILES SOUTHEAST OF WASHINGTON.

Showing (below and to the left) Nacatoch sand with burrow of some Cretaceous reptile, now filled by later deposits (above and to the right).

reached. This sand is frequently styled the Caddo or the Shreveport gas horizon. It contains gas not only in the porous sandy layers, but also in the calcareous shelly seams. It is usually unnecessary, and in fact not good policy, to penetrate the sand for more than 2 or 3 feet. Enormous quantities of gas are obtained from it without accompanying salt water. These beds may be seen in surface outcrops in Arkansas, especially near Nacatoch, on Little Missouri River, and about and to the south of Washington. Along the Iron Mountain Railroad the Nacatoch sand is of great economic importance on account of the vast quantities of pure water it contains. Some layers or lenses of calcareous and quartzitic rocks among the sands are known in Arkansas as "water rocks."[a] Similar layers are encountered in the wells of the Caddo field.

Owing to the generally slight induration of the Nacatoch sand it quickly weathers into sand resembling ordinary superficial Quaternary material. This feature is admirably shown about Washington and along the highway to the south toward Hope. (See Pl. XV, *B*.) The calcareous matter of fossil remains soon leaches out through such porous sands, and fossils can rarely be seen in exposures of any considerable age. New cuts and deep ravines show that the original color of the Nacatoch beds is slightly greenish and that fossil remains have doubtless once been abundant in places where now no evidence of them appears. Particularly noticeable are long tubular ferruginous casts, doubtless once formed about roots or plant stems. Many of these can be traced for several feet. In some places whole cycad leaves have been incased in ferruginous matter and the form may be well preserved. In the uppermost layers, just beneath the Arkadelphia clay, great numbers of *Pectunculus* occur. (See Pl. XV, *B*.)

At Lewis, west of James Bayou and also east of Vivian, these sands furnish some oil, usually with large quantities of salt water. The oil is of a heavy grade, as may be seen by consulting No. 7 in the table of analyses of Caddo oil, page 131. At Powell, Tex., a similar oil is obtained apparently from this horizon.

Marlbrook marl.—The Marlbrook marl is decidedly more calcareous than any of the other formations so far described. Though composed largely of blue, chalky, somewhat glauconitic marls, it contains chalky layers locally 20 feet in thickness, found in the Caddo wells usually at a depth of about 1,150 feet. This is the "Saratoga" chalk member. The Marlbrook marl may be seen to good advantage about Marlbrook and Washington, Ark. It probably corresponds to the Taylor marl of the Texas sections farther west. A partial generalized section of the Austin region is given in the table following for comparison.

[a] Veatch, A. C., Prof. Paper U. S. Geol. Survey No. 46, 1906, p. 27.

Partial generalized section of the Austin (Tex.) quadrangle.[a]

System.	Series or group.	Formation.	Kind of material.	Approximate thickness.
Quaternary.			Silt, sand, and gravel.	*Feet.* 0–90
Tertiary.	Neocene.	Uvalde.	Gravel.	0–70
	Eocene.	Lytton.	Clay, sand, and sandstone.	300+
Cretaceous (Upper).	Montana.	Webberville.	Black, slaty, bituminous clays with occasional harder layers. Contains green sand particles. Slightly impregnated with oil and gas. The oil-bearing formation of the Corsicana field.	400±
		Taylor.	Blue, unctuous marly clay ("joint clay") weathering into yellow subsoil and black soil.	540±
	Colorado.	Austin.	White chalk, with conchoidal fracture. Marly in upper portion.	410±
		Eagle Ford.	Blue clay and flaggy limestone. Oil traces.	30±

[a] Hill, R. T., and Vaughan, T. W., Austin folio (No. 76), Geol. Atlas U. S., U. S. Geol. Survey, 1902.

According to Adams, it is these beds that furnish the high-grade oil in the Corsicana field.

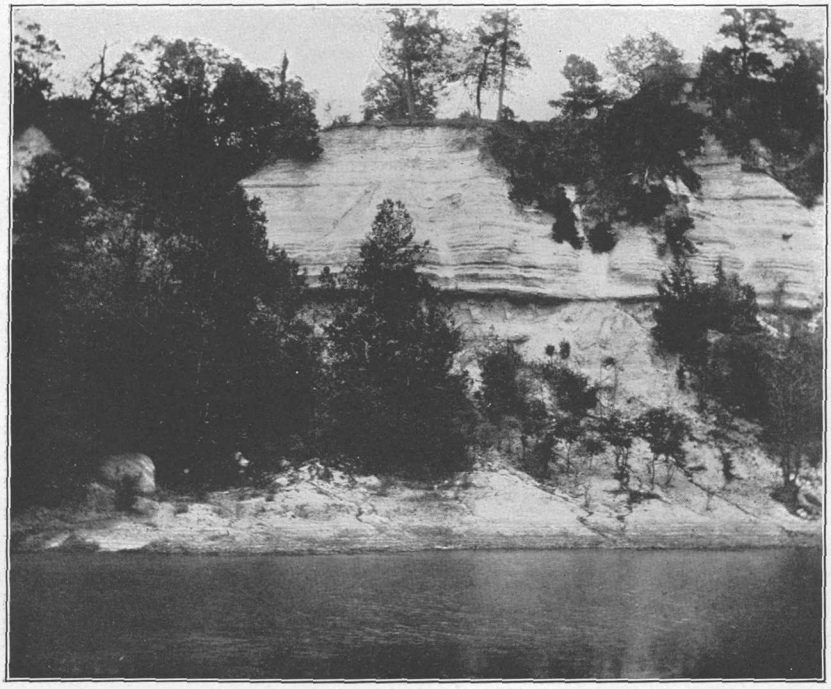
Austin group.—At depths ranging usually from 1,275 to 1,300 feet extensive deposits of chalk are encountered in the Caddo wells. They continue with slight clayey interruptions for more than 300 feet. These beds are the Annona chalk, the upper formation of the Austin group. Below are about 200 feet of fossiliferous chalky and marly clays with hard pyrite concretions known as the Brownstown marl and composing the lower formation of the Austin group. These various deposits, as they outcrop to the north in Arkansas, have been well described by Veatch in Professional Paper 46, previously cited. According to Gordon,[a] they are included in the Austin chalk farther west. The general relationship of these contiguous beds may be seen by consulting the generalized section given in figure 16.

Plate XVI, *B*, shows the appearance of the basal Annona chalk and upper Brownstown marl at White Cliff, Howard County, Ark. This bluff is on the left bank of Little River and is 130 feet high. About 1½ miles east of Clarksville, Tex., the Annona chalk forms the surface rocks and is well exposed in a field several acres in extent. This is the best locality the writer has seen for obtaining fossils from this formation. Plate XVI, *A*, shows the white appearance of the fields where such rocks crop out, and likewise the marked conchoidal fracture of these rocks.

[a] Am. Jour. Sci., 4th ser., vol. 27, 1909, pp. 369-373.

A. ANNONA CHALK OUTCROP 1½ MILES EAST OF CLARKSVILLE, TEX.

Showing conchoidal fracture.



B. ANNONA CHALK OVERLYING BROWNSTOWN MARL AT WHITE CLIFF, HOWARD COUNTY, ARK.

In two or three places in the Caddo field the Annona chalk has furnished a good quantity of high-grade oil from a depth of about 1,575 feet. Gas also is encountered in considerable quantity at about this depth.

Eagle Ford clay.—The Eagle Ford clay is characterized in its upper part by sandy layers, the "sub-Clarksville" sand of Veatch, or the Blossom sands of Gordon. In this report they are called the Blossom sand member. There are good indications of heavy oil from these sands at a depth of about 1,800 feet, though so far no paying wells have been obtained from this zone. The Eagle Ford clay, some 350 feet in thickness, is generally blue and tough and contains hard pyrite and limestone lenses. It serves the purpose of a cap rock for the oil and gas in the Woodbine sand below.

Woodbine sand.—The Woodbine sand consists of sand with clay layers, the former containing large quantities of oil, gas, and salt water. It is reached in the Caddo field usually at depths ranging from 2,140 to 2,300 feet, according to local stratigraphy and topography. So far this formation has been developed in the Caddo field only from Mooringsport to Caddo City. A number of wells between Oil City and Mooringsport have obtained light oil from practically the same depths as those at which the heavy oil is usually found in the Caddo field. (See table of analyses, No. 41.) The gas from this formation, though abundant, has not thus far been utilized to any extent.

STRUCTURE.

In studying the details of the Caddo field the reader should have constantly before him the index map here given as figure 16, which shows the location of areas covered by the Vivian, Pine Island, Oil City, and Mooringsport special maps (figs. 12 to 15) and of the lower section in figure 2 and the sections in figure 17 and Plates XVII, XVIII, and XIX. Figure 16 shows the depths to certain important strata along a north-south line from Texarkana to Shreveport. The lower section in figure 2 shows in greater detail that portion relating to the Caddo field proper. On Plate XVII are shown in detail some of the well sections on which the general deductions given in figure 17 are based. The records of certain wells along lines B–B and D–D of figure 16 are given in detail in Plates XVIII and XIX.

A study of the well records from Texarkana to Shreveport shows (1) a large syncline between Vivian and Texarkana, rendering the possibilities of obtaining good oil and gas wells between those places extremely meager; (2) a much smaller syncline between Vivian and Oil City, with an anticlinal fold in the syncline at Lewis; (3) an anticline just south of Vivian; (4) gently undulating, nearly horizontal

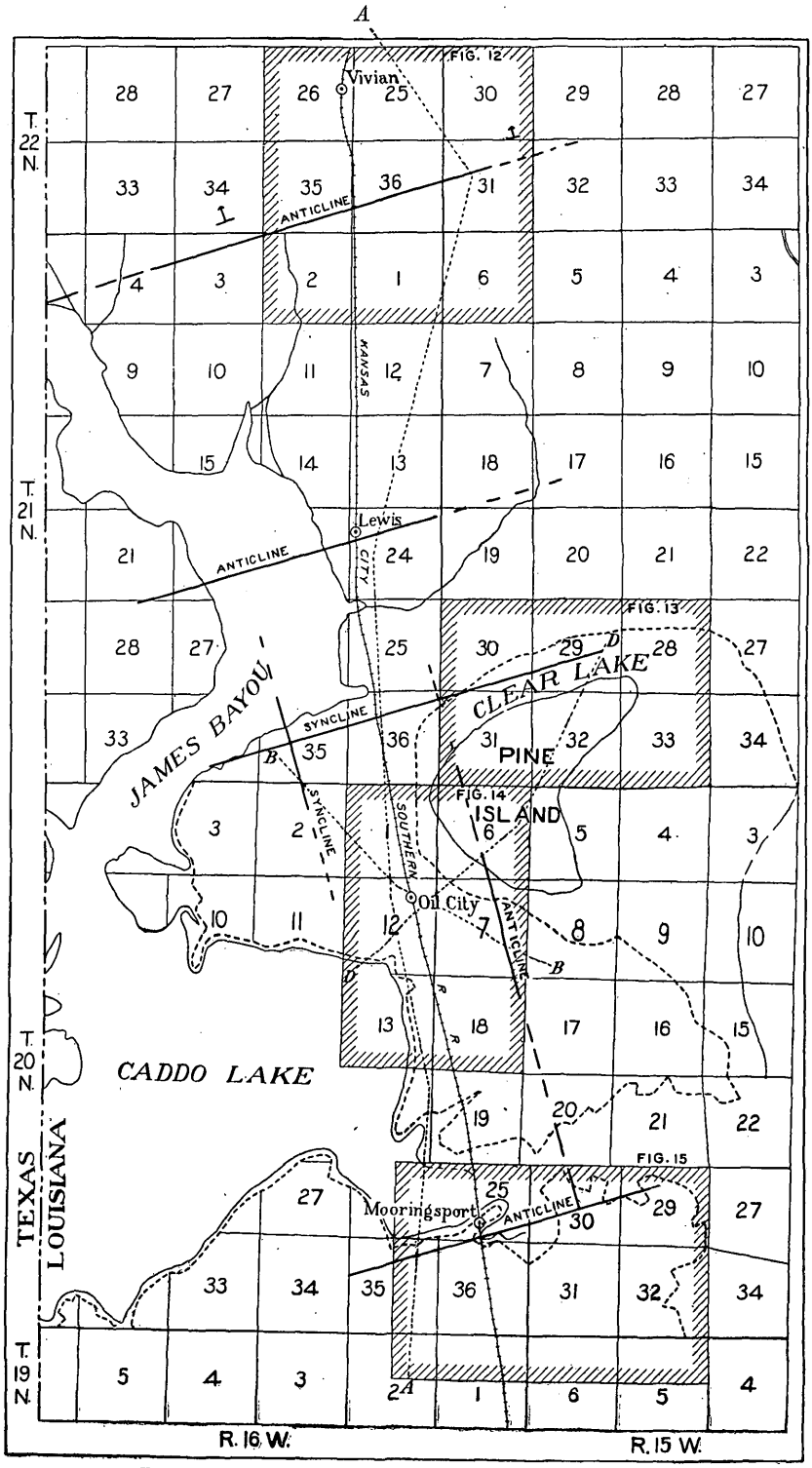
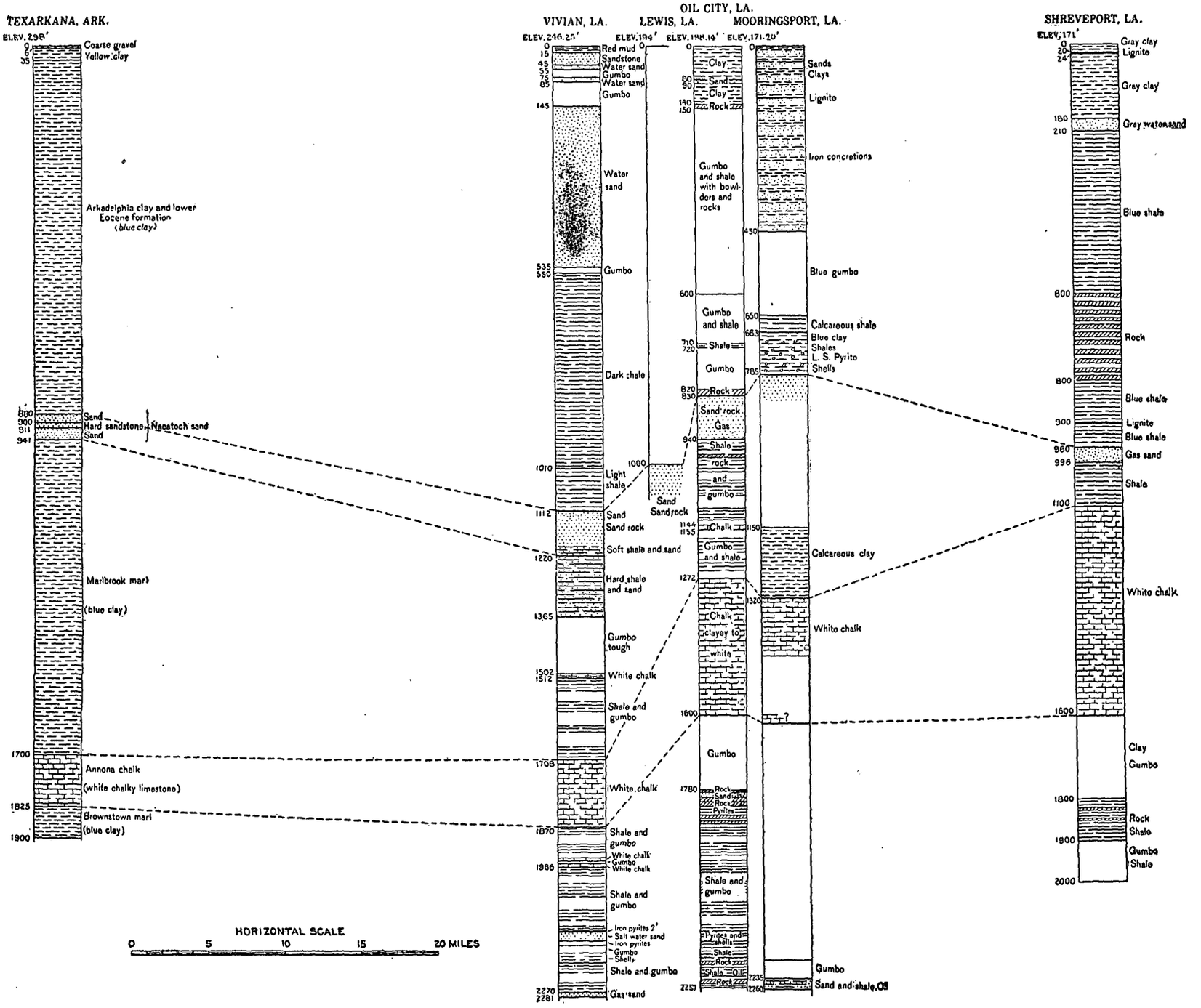
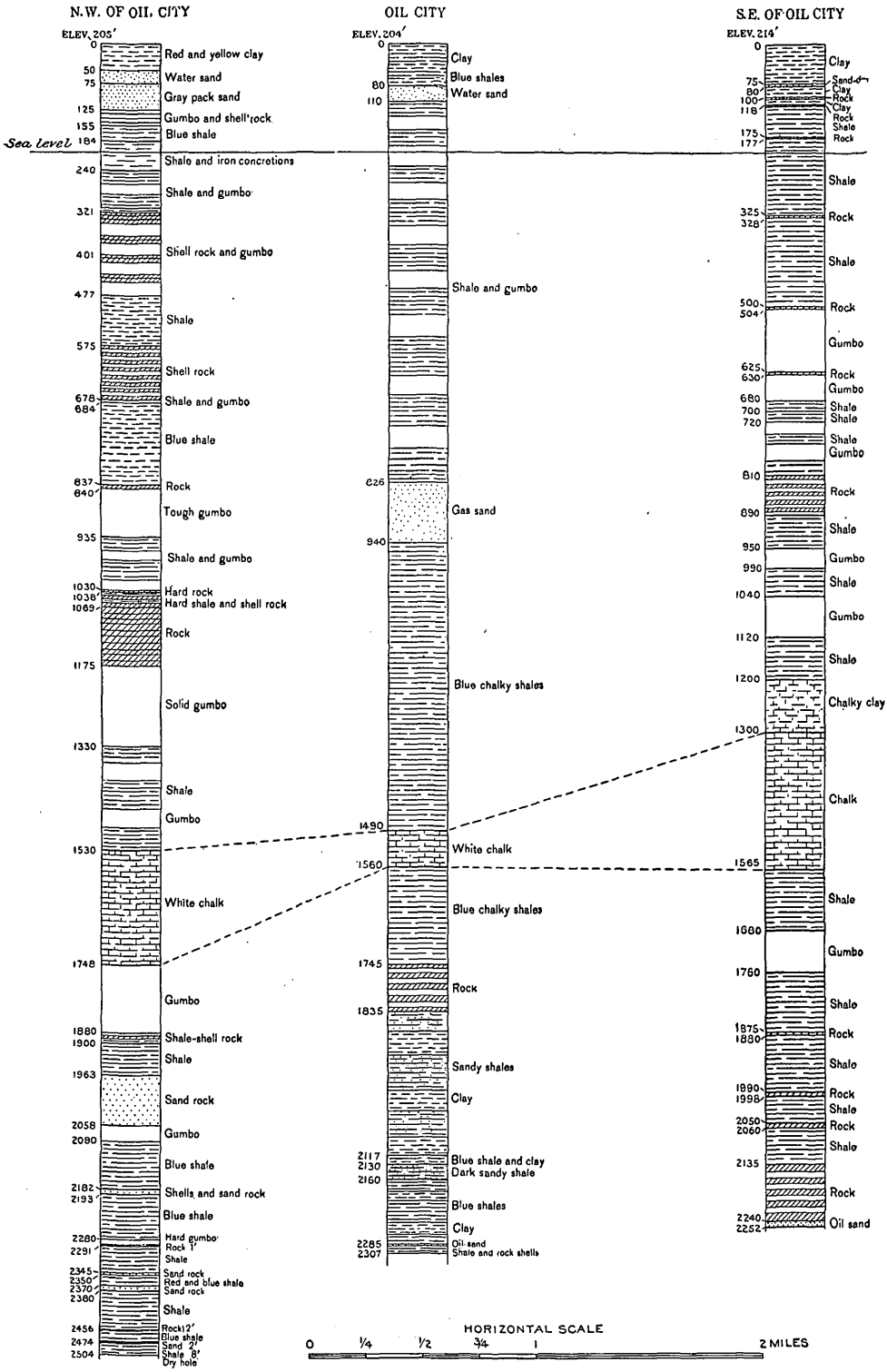


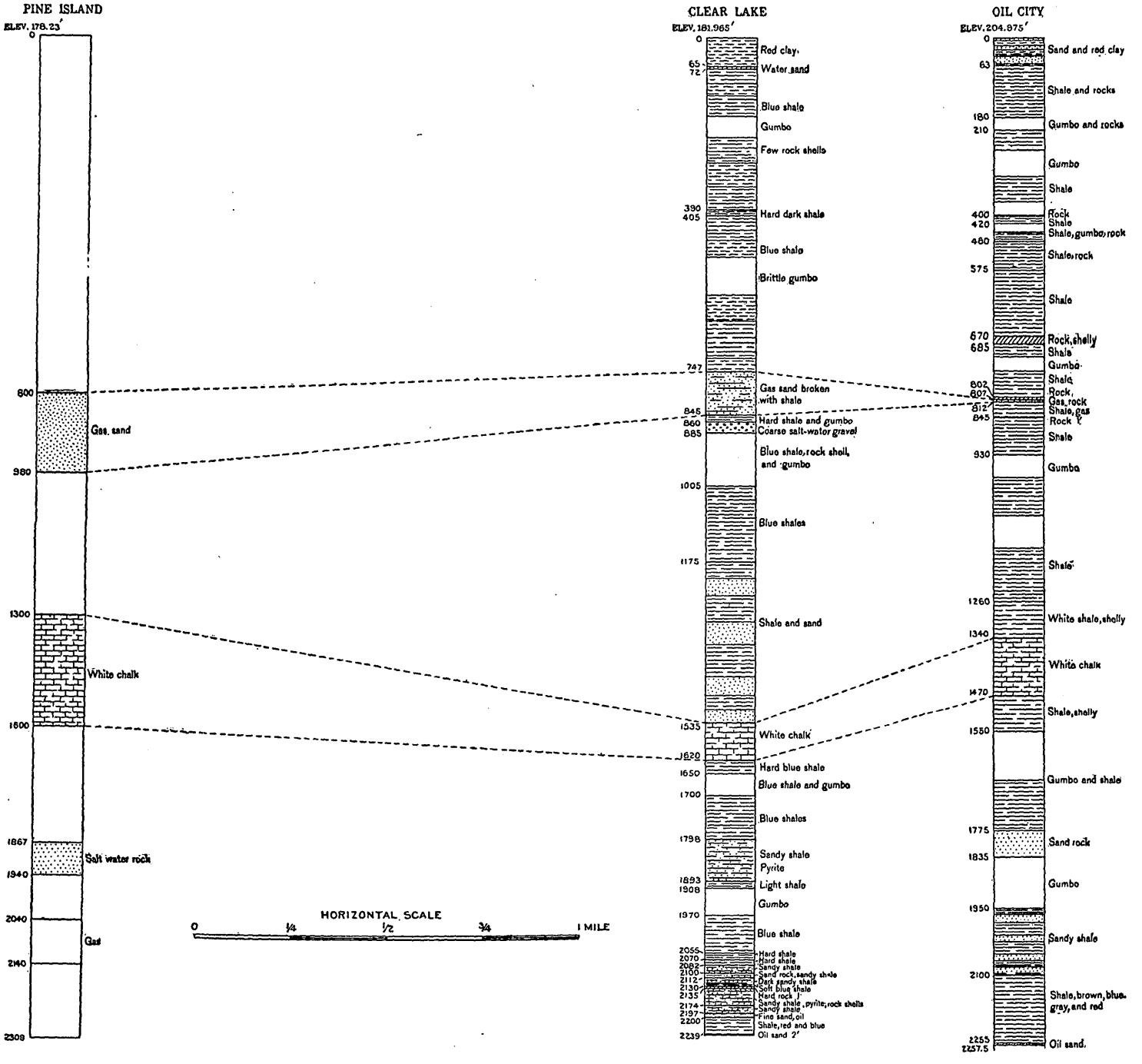
FIGURE 16.—Index map of the stratigraphy of the Caddo oil field.



DETAILS OF SECTIONS FROM TEXARKANA TO SHREVEPORT, SHOWING DATA ON WHICH THE GENERALIZED SECTION (FIG. 17) IS BASED.



DETAILS OF SECTIONS ALONG LINE B-B OF INDEX MAP OF CADDO OIL FIELD (FIG. 16).



DETAILS OF SECTIONS ALONG LINE D-D OF INDEX MAP OF CADDO OIL FIELD (FIG. 16).

strata between Oil City and Mooringsport; (5) a very slight syncline between Mooringsport and Shreveport.

In the Gulf regions, where the surface rocks are composed largely of unconsolidated material, in many places unfossiliferous, practically no means of determining the structure are at hand, except well records and surface relief. Therefore, some easily identifiable bed or beds must be chosen for general reference, and all others must be studied from this as a base. In the Caddo field there are two formations which are fairly uniform in character and which occur over the whole field. These are the Nacatoch ("Caddo gas") sand and the Annona chalk. Drillers are advised to note carefully the depths at which these formations are encountered and their thicknesses. Such careful notes will be of much more value in determining the structure at any locality in the field than loosely kept, poorly written logs of all the formations encountered.

In working out the relations of the oil and gas bearing strata, the formations just named were traced throughout the field, so far as was

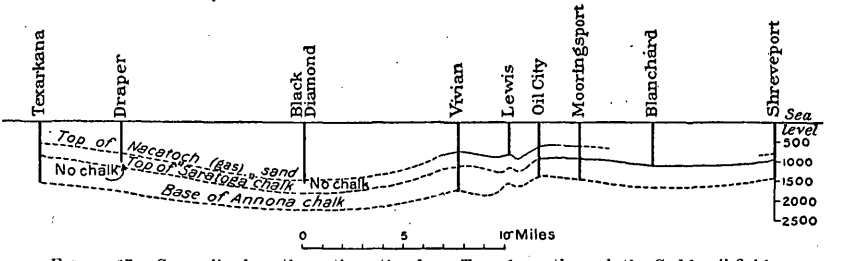


FIGURE 17.—Generalized north-south section from Texarkana through the Caddo oil field.

possible with the scanty data available, and the positions of the anticlines and synclines marked on the index map (fig. 16) were determined solely from the facts thus ascertained. Errors due to misinterpretation of well records, mistakes in log readings, etc., may have rendered the positions assigned to some of the anticlines slightly inaccurate, but in general the main structural features of the field are as indicated on the map.

OCCURRENCE OF OIL AND GAS.

Four fairly well-defined oil and gas bearing zones are believed to be recognizable in the Caddo oil field. Of these at least two are found in practically every part of the field, although all vary more or less in thickness, composition, and yield from well to well. These zones are the Nacatoch ("Caddo gas") sand, the Annona chalk (porous in places), the Blossom sand member of the Eagle Ford clay, and the Woodbine sand. Of these, all but the Annona contain gas in considerable quantities and the Annona and Woodbine are in the main oil-producing beds. The beds of each zone are capped by thick deposits of clay or marl.

The Nacatoch is the zone from which practically all the gas now being used is obtained. The gas is for the most part clean and dry, but occasionally salt water works in and ruins a well. This stratum is usually found at a depth of 800 feet, more or less. At Lewis and farther west oil is found at this horizon.

In the Annona chalk there are here and there porous layers overlain by hard siliceous limestones that act as cap rock to confine oil in considerable quantities. One of the best wells in the field was brought

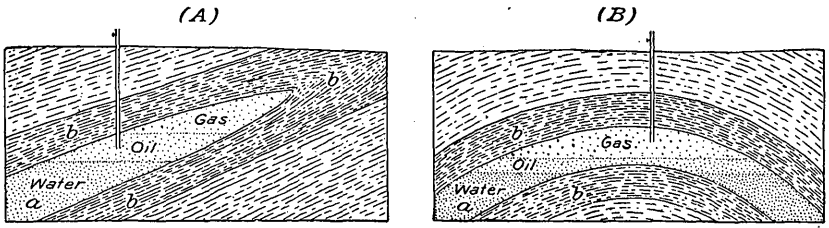


FIGURE 18.—Types of oil and gas reservoirs. *A*, Inclined bed of sandstone (*a*) sealed in by shales (*b*) but somewhere in communication with water under hydrostatic pressure. *B*, Sandstone bed (*a*) interstratified with impervious beds (*b*) and forming an arch or anticline, somewhere in communication with water under hydrostatic pressure.

in from this zone, but it furnishes very few producing wells. The first well in the field was drilled into the Annona chalk and was a producer for a short time.

The Blossom sand member, though containing gas in large quantities, has as yet been little developed, owing to the ease with which gas is obtained from the shallower Nacatoch sand. The Brownstown marl forms an excellent cap rock for this member, and if salt water does not drown out the sand it will provide an admirable reserve supply of gas.

The lowest zone, or Woodbine sand, contains oil in abundance, and it is at this horizon that most of the oil is being obtained. Most

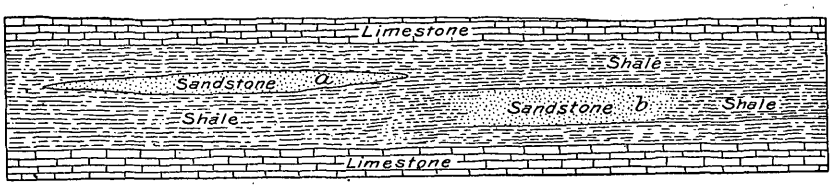


FIGURE 19.—Sketch illustrating disappearance of sandstone beds. *a*, Lenticular sandstone which disappears by thinning out; *b*, sandstone which grades into shale.

of the wells producing from this zone range in capacity from 25 to 500 barrels daily, and one or two wells are reported to be making from 1,000 to 1,200 barrels.

The oil and gas are obtained from the folds in the Cretaceous beds and occur in dome-shaped, anticlinal, or inclined sandstone reservoirs sealed in by clay and gumbo. (See fig. 18.) The fact that the logs of near-by wells differ materially may best be illustrated by an ideal sketch of the occurrence of sandstones in a shale formation.

In figure 19 the sandstone lettered *a* is lenticular in shape and thins out, disappearing entirely from the section and having no equivalent, and the sandstone lettered *b* grades over into a shale which is its equivalent. Sandstone *a* is apparently the result of sedimentation at a time when only sand was being deposited. Sandstone *b* apparently represents a period of sedimentation in which both sands and muds were being laid down, according to the local variation in the strength of the currents which assorted the material.

OIL OF THE CADDO FIELD.

PRODUCTION.

The following figures, taken from the Oil Investors' Journal, give a very fair idea of the production of the Caddo field: 1906, 4,650 barrels; 1907, 48,266 barrels; 1908, 513,504 barrels.

The same journal furnishes the following estimates of daily production at semimonthly intervals during the year from May, 1908, to May, 1909:

Daily production of oil in the Caddo field at semimonthly intervals, 1908–9.

1908.	Barrels.	1908.	Barrels.
May 15	1,450	December 15	3,750
May 31	2,010	December 31	3,000
June 15	2,200	1909.	
June 30	2,285	January 15	3,275
July 15	2,000	January 31	2,700
July 31	1,700	February 15	2,100
August 15	2,000	February 28	2,580
September 15	2,000	March 15	3,000
September 30	4,500	March 31	2,850
October 15	2,700	April 15	3,100
October 31	3,600	April 30	2,930
November 15	3,100	May 15	2,650
November 30	1,900	May 31	3,100

The production of the Caddo field for 1909 was about 1,000,000 barrels. This means that in oil alone it somewhat surpassed the maximum output of the Corsicana and Powell fields.

Concerning the probable amount of oil in the Caddo field and its manner of occurrence, no reason has appeared for modifying the views expressed by the writer in the Oil Investors' Journal, November, 1908:

> It is a most important fact to note that this field is not one of extreme local concentration. It has nothing in common with Beaumont or Jennings, but everything, save age, in common with those of western Pennsylvania, West Virginia, Ohio, and Illinois. Its vastness speaks well for both quantity of oil and gas and the longevity of the field.

The comparative slowness of development in the Caddo field has frequently been commented upon. It is due to the fact that the earlier, shallow wells were troubled with heavy gas pressure and furnished little oil. The first really successful deep wells produced heavy oil.

Richardson No. 2, on the Etcheson and Mayfield land, in sec. 32, T. 21 N., R. 15 W., was a fine producer at the start, being rated at 300 barrels an hour when it came in October 25, 1908. It went to mud and water and in a day or so sanded up. September 6, 1908, the Caddo Gas and Oil Company's well No. 1, on the Gilbert tract, came in with a daily production of 400 barrels of high-grade oil. (See table of analyses.) Producers' Nos. 1 and 2, on the Lane tract, in sec. 18, T. 20 N., R. 15 W., were also soon brought in, showing high-grade oil in greater quantity than the well on the Gilbert tract. Similar high-grade oil was known to exist on the Hostetter place east of Mooringsport for some time before the exciting days of the completion of Guffey-Hostetter No. 2. It was rumored that this was a 10,000-barrel well when completed in December, 1908. Shipments from Mooringsport, however, soon showed that it was yielding about 3,000 barrels daily. On the whole, Producers' No. 2, on the Lane tract, has been the best well in the field. It commenced flowing in September, 1908, at a reported rate of nearly 1,000 barrels, and as late as March 1, 1909, was still flowing about 500 barrels daily.

Good quantities of high-grade oil have been produced from the "deep sand" (Woodbine) in secs. 13 and 18 about a mile south of Oil City and in sec. 30 east of Mooringsport. Other localities furnish a lower-grade oil, often with much salt water, from this zone.

Local porous lenses in the Annona chalk in sec. 1, three-fourths of a mile northwest of Oil City, may furnish a fair supply of high-grade oil.

Small quantities of heavy oil are found in the Nacotoch sand west of James Bayou, in secs. 27 and 22. Three wells furnish about 85 barrels daily; the Rogers wells, at Lewis, 30 barrels; the Vivian Oil Company's three wells in sec. 36, near Vivian, 150 barrels.

Until the summer of 1908 practically all oil shipments had to be made by the Kansas City Southern Railway. Loading racks were constructed at Caddo, Oil City, and Mooringsport. A 6-inch pipe line has been constructed from the field to Grigsbys Island, south of Shreveport. This will permit railway shipments over at least half a dozen different roads as well as water transportation on Red River. Doubtless, too, the field will be connected with the Standard pipe line from Oklahoma in the near future.

ANALYSES.

The samples analyzed as shown below were collected in the Caddo field in December, 1908. They well represent the geographic extremes of the field from Mooringsport to Vivian, and from a locality west of Oil City to sec. 10, 4 miles to the east. They also show the character of oil from the "shallow" sands at Vivian; the Annona chalk horizon; the 1,600-foot stratum west of Oil City (sample No. 4); and the Woodbine "deep" oil, heavy (Nos. 5, 6, 9, 10) and light (Nos. 1 and 2).

January 21, 1909, D. T. Day, of the United States Geological Survey, wrote as follows concerning the oil samples sent in for analysis:

The analyses of these oils were very difficult on account of the unusual proportion of water contained in several of them. The results are rather remarkable in several other respects. For example, the burning oil is of unusually low specific gravity, rendering it more suitable for burning in lamps than other oils in Louisiana or the oils from Texas. There is practically no sulphur in the oil.

The water in the oil is held rather obstinately, because it is intimately emulsified with hydrated clay, which also gives off its water at about 160°. In one case, No. 8, this hydrated clay amounted to 0.7 per cent of the sample. * * * The amount of paraffin wax is considerable. Except for the unusual proportion of water, which can be removed in ordinary practice quite easily by the use of steam, the oils are very satisfactory.

Analyses of oils from Caddo field, Louisiana.

No. of specimen.		Location of well.	No. of well.	Depth of well (feet).	Physical properties.			
					Gravity at 60° F.		Color.	Odor.
					Specific.	Baumé (°).		
La.	1	Hostetter farm, Mooringsport	1	±2,210	0.8187	41.0	Black...	Like Okla.
	2	Caddo Oil and Mineral Co., Gilbert lease, NE. ¼ NE. ¼ sec. 13, T. 16 N., R. 20 W.	1	±2,245	.8264	39.4	...do.....	Do.
	3	Frank Filer lease, NW. ¼ SE. ¼ sec. 7, T. 15 N., R. 20 W.	1	2,250	.9211	22.0	...do.....	Do.
	4	Old Caddo Oil and Gas Co., E. K. Smith's land.	1	1,620	.8723	30.5	...do.....	Do.
	5	Richardson well, NW. ¼ NW. ¼ sec. 7, T. 15 N., R. 20 W.	2	2,245	.8929	26.8	...do.....	Do.
	6	Black Bayou Oil Co., SW. ¼ sec. 10, T. 15 N., R. 20 W.	1	2,220	.9150	23.0	...do.....	Do.
	7	Dawes well, 1 mile southeast of Vivian, NW. ¼ NE. ¼ sec. 36, T. 22 N., R. 16 W.	1	1,050	.9253	21.3	...do.....	Do.
	8	Caddo Oil and Gas Co., E. K. Smith's farm.	4	2,260	.9211	22.0	Brown..	Do.
	9	Producers' Oil Co., NE. ¼ NW. ¼ sec. 12, T. 20 N., R. 16 W.	6	.....	.8889	27.5	Black...	Do.
	10	Richardson Oil Co., NE. ¼ NW. ¼ sec. 32, T. 15 W., R. 21 N.	4	2,132	.9121	23.5	...do.....	Do.

No. of specimen.		Distillation by Engler's method.							Sulphur.	Paraffin.	Asphalt.	Remarks.	Geologic horizon, by G. D. Harris.
		Begins to boil at (°C.)—	By volume.										
			To 150° C. (cubic centimeters).	150°-300° C.		Residuum.		Total (cubic centimeters).					
				Cubic centimeters.	Specific gravity.	Cubic centimeters.	Specific gravity.						
La.	1	138	3.0	55.0	0.7778	40.4	0.8866	98.4	0	1.70	0.09	.....	Woodbine.
	2	136	1.5	49.0	.7778	49.1	.8805	99.6	0	5.30	.25	.....	Do.
	3	200	.....	12.0	.8510	82.9	.9061	100.9	0	7.78	.91	Contains water...	Do.
	4	210	.....	28.0	.8299	69.5	.8895	97.5	0	7.32	.14	.....do.....	Austin.
	5	173	.....	20.0	.8408	79.0	.9061	99.0	0	5.29	.50	.....do.....	Woodbine.
	6	210	.....	18.0	.8450	81.2	.9138	99.2	0	.....	.24	.....do.....	Do.
	7	265	.....	17.0	.8406	85.9	.9302	102.9	0	.....	.22	.....do.....	Nacatoch.
	8	200	.....	14.0	.8142	59.0	.8974	73.0	0	3.64	.34	20 per cent water, 0.7 per cent clay.	Woodbine.
	9	220	.....	18.0	.8406	79.4	.9003	97.4	0	4.78	.64	Much water.....	Do.
	10	220	.....	16.5	.8713	66.6	.9241	83.1	0	.....	.54	.....do.....	Do.

JAMES BAYOU DEVELOPMENTS IN 1909-10.

By DAVID T. DAY.

Recent developments on the west side of the Caddo field have entirely changed the economic conditions since this report was submitted for publication, and a brief review of these developments is necessary in order that the conditions in the Caddo field may be clearly understood as they exist at the present time. During July, 1909, the J. C. Trees Oil Company, operating on the Stiles tract, in sec. 17, T. 21 N., R. 16 W., began to deepen its well No. 4, located on the western edge of the section. This work was delayed by many causes and the well was reported as shut down November 1, 1909, after having been drilled from 1,100 to 2,200 feet in depth in an experimental effort to test the deep sands of this region corresponding to the Woodbine sand, which is productive 5 miles to the southeast. On November 12 this well had been continued below 2,300 feet and began to yield oil at the rate of over 2,000 barrels per day before the drill stem had been removed from the hole. After a month the production dropped to half its initial rate; but gradually increased again to nearly 3,000 barrels per day and has continued, varying between 1,000 and 2,000 barrels, up to the present time. The Gulf Pipe Line Company, owning a large tract of land 2½ miles southwest of the Trees well No. 4 referred to above, at once began to drill 700 feet over the line in Texas, the well being designated as No. 1, Burr tract. In April, 1910, at a depth of 2,225 feet, this well began to flow by heads 2,000 barrels a day. The oil is 43.6° Baumé in gravity, and gives the following analysis:

Analysis of oil from Gulf Pipe Line Company's well "No. 1, Burr tract."

	Cubic centimeters.	Specific gravity.
Distillation by Engler's method.		
Begins to boil at 95° C.		
To 150° C	15	0.7275
150°–300° C	47	.7770
Residuum	40	.8739
	102	.....

	Per cent.
Paraffin	7.02
Asphalt	7.02
Unsaturated hydrocarbons:	
Crude	12.8
150°–300° C	5

After several interruptions in the flow this well is still making nearly 2,000 barrels per day. The Producers Oil Company immediately began developments in the territory between Guffey's No. 1, Burr tract, and the Trees well No. 4, obtaining a well larger than any

of the preceding ones (estimated at 11,000 barrels) in sec. 27, T. 21 N., R. 16 W. This was at once offset by a well (No. 9, Stiles tract) 95 feet west, which showed a greater yield than the Producers well near by, but the production of each well was influenced by the other. A well northeast of Trees No. 4, sunk by the Producers Company, showed salt water, and this, with several dry holes brought in on the northwest side of the developed territory, has led to the general belief that the field is narrow to the northeast, broadening to the

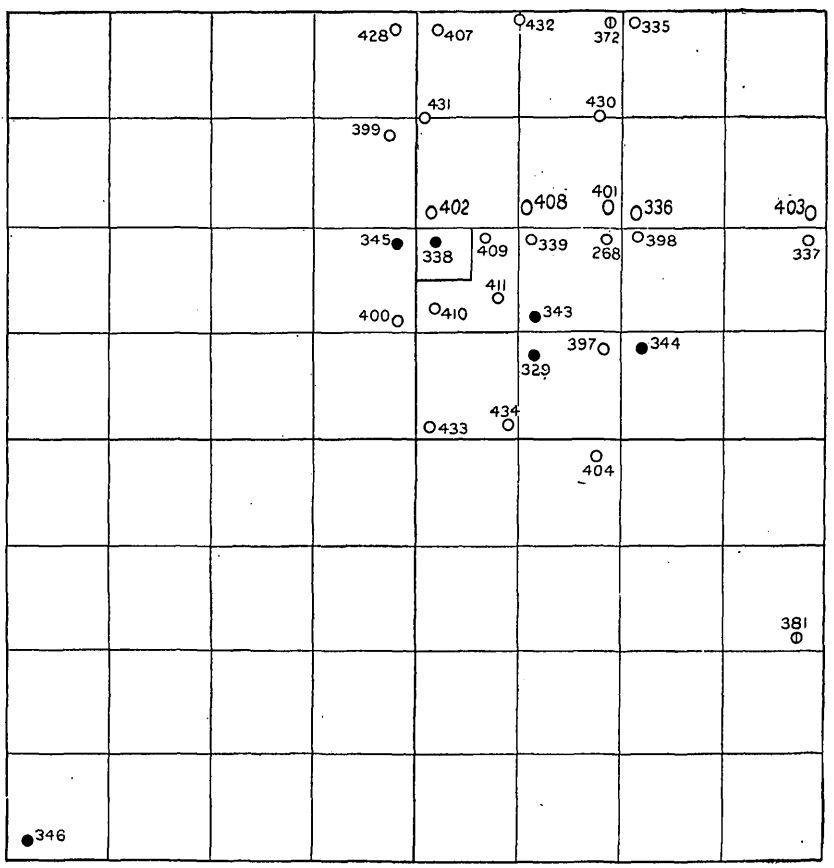


FIGURE 20.—Map of sec. 33, T. 21, R. 16, showing location of wells.

southwest. Late in June the Producers Oil Company brought in its No. 6, in sec. 33, T. 21 N., R. 16 W., and it proved a larger producer than any of the others. Claims have been made for this well at 12,000 to 20,000 barrels, but so far as is known its actual yield has not yet been definitely tested, on account of a leaking nipple and a subsequent fire. The well was struck by lightning June 19 and was skillfully extinguished June 21. The depths at which the pay sand has been encountered in this James Bayou pool vary from 2,207

feet to somewhat more than 2,300 feet. The thickness of the oil-bearing sand has not been determined. Salt water is reported at 2,351 feet. Little can be said as to the prospective life of these wells, although all of them have kept up their high production for a surprisingly long time. The field is being prospected for more than 5 miles to the west in Texas, and generally to the southwest. The Standard Oil Company has connected its Baton Rouge pipe line with the Trees wells, while the Producers and Guffey interests are caring for their production through tank-car shipments from their tank stations in Oil City. The Guffey Company has begun a 6-inch pipe line to connect at Lufkin, Tex., with its main lines to Beaumont.

Considerable interest is being shown in the Vivian extension north of the Caddo field, where a few wells of 500 barrels a day have been developed from the shallow sand. The total production in the Caddo field on July 1, 1910, was more than 30,000 barrels a day.

The following data of producing wells cover new development in Louisiana and East Texas:

MARION COUNTY, TEX.

No. 305: Gulf Refining Company, Burr No. 1, depth 2,244 feet, set 2,230 feet, 6-inch casing, flowing 1,500 to 1,800 barrels of oil a day (May 10, 1910).

No. 324: Gulf Refining Company, Burr No. 2, set 1,040 feet 8-inch casing. Drilled in July 17, 1910, pumping heavy mud in hole; closed gate and moved rig. Had some showing, but did not bail; 6-inch casing set.

LOUISIANA.

Sec. 5, T. 20 N., R. 16 W.—No. 351: Gulf Refining Company, on Reaves; came in flowing on June 2, 1910, making 500 barrels.

No. 354: Gulf Refining Company, Mason No. 1; came in flowing by heads May 30, 1910, making probably 800 barrels. Set 1,140 feet 8-inch casing. Sealed in 6-inch. Set 4½-inch casing. Flowing 550 barrels (June 2, 1910).

Sec. 33, T. 21 N., R. 16 W. (see fig. 20).—No. 346: Trees Oil Company, No. 14; came in flowing approximately 1,200 to 1,500 barrels; depth approximately 2,200 feet.

No. 345: Trees Oil Company No. 12; came in flowing about 1,500 barrels with drill pipe in hole; flowing approximately 600 barrels (July 5, 1910).

No. 338: Sun Company No. 5; flowing 400 barrels July 7, 1910.

No. 343: Producers Mason No. 2; flowing July 7, 1910; small well.

No. 329: Busch-Everett Company; set 2,240 feet 6-inch casing; set 4-inch casing at 2,337 feet; showing at 2,205 feet; came in about June 17, 1910, flowing 600 barrels of oil, 75 barrels of water (estimated).

No. 344: Producers Oil Company, Levee Board No. 6; flowing June 17, 1910; struck by lightning June 20, 1910; good for 15,000 barrels.

Sec. 28, T. 21 N., R. 16 W.—No. 307: Trees Oil Company; came in 10 a. m., June 1, 1910, flowing 500 to 600 barrels by heads; very little gas pressure; will drill deeper.

Sec. 27, T. 20 N., R. 16 W.—No. 235: Trees Oil Company No. 4; made test at 1,900 feet; got salt water; set 4-inch casing at 2,140 feet; came in flowing 2,500 barrels of oil, 42° gravity, no water; fell off to 600 barrels of oil about December 29, 1909; blew loose and made 1,000 barrels; flowing 1,200 barrels January 22, 1910; flowing 2,500 barrels February 23, 1910; flowing 85 to 90 barrels per hour May 13, 1910.

No. 287: Trees Oil Company, came in flowing 2,000 to 3,000 barrels, strong gas pressure, depth 2,300 to 2,350 feet; flowing 1,000 barrels March 26, 1910; flowing 60 barrels per hour May 13, 1910.

No. 165: Trees Oil Company, salt-water well.

Nos. 138, 173, and 204: Trees Oil Company, making about 35 to 40 barrels oil per day.

No. 309: Trees Oil Company, No. 9; came in flowing 6,000 to 7,000 barrels 41° gravity oil; very strong gas pressure; came in about May 9, 1910; flowing 4,500 to 5,000 barrels up to May 25; flowing 1,000 barrels May 31; drilling deeper; flowing 1,200 barrels June 10, 1910.

No. 297: Producers Oil Company; flowing 1,500 barrels April 26, 1910; flowing 100 barrels an hour May 1, 1910; quit flowing when Trees Oil Company No. 309 came in; drilled deeper; well started flowing again after first bailer was run and flowed for probably five minutes, when it choked off again; washed out with oil May 13, 1910; bailing May 16; came in flowing about 8,000 barrels (reported); No. 309 making 5,000 to 6,000 barrels; flowing 6,000 barrels June 10; flowing 7,500 barrels June 27; flowing 7,000 barrels July 5, 1910, and showing some roily oil, probably on account of the effort to bring in No. 313 just south of it.

No. 314: Producers Oil Company; bailed April 29, 1910; got some salt water with very little showing of oil; drilling deeper; used 133 joints of 2-inch extra heavy drill stem; plugging off salt water May 6; flowing with gas, showing some oil, July 5, 1910.

Sec. 31, T. 22 N., R. 15 W.—No. 255: Vivian Oil Company; came in September 29, 1909, flowing 100 barrels of oil, 300 barrels of water; 300 feet of 8-inch, 1,050 feet of 6-inch casing; flowing through 6-inch casing; flowing 450 to 500 barrels of oil, 3,000 barrels of water, October 17, 1909; flowing 200 barrels, February 5, 1910.

No. 285: Vivian Oil Company; blowing dry gas with slight spray of oil January 2, 1910; blew in January 3, flowing probably 2,000 barrels of salt water with 60 to 75 barrels of oil, gradually increasing; flowing 125 to 150 barrels of oil February 1, 1910.

No. 383: Gulf Refining Company; abandoned.

No. 269: Busch-Everett, Pitts No. 1; 1,046 feet deep; showing of oil; capped.

Sec. 30, T. 22 N., R. 15 W.—No. 312: Gulf Refining Company; flowing 30 to 40 barrels of oil, no water; very weak gas pressure, March 7, 1910; flowing 20 barrels May 28, 1910.

No. 328: Gulf Refining Company.

No. 286: Sun Company; flowing 180 barrels.

No. 298: Sun Company; gas well.

No. 362: Sun Company; flowing with gas, 50 barrels.

No. 412: Sun Company; flowing 200 barrels.

No. 366: Sun Company; flowing 250 barrels.

No. 363: Sun Company; flowing 100 barrels.

No. 267: Caddo Gas and Oil Company; small oil well; capped.

No. 387: Caddo Gas and Oil Company; flowing 800 barrels.

No. 364: Caddo Gas and Oil Company; flowing 500 barrels.

No. 415: Caddo Gas and Oil Company; flowing approximately 1,000 barrels June 28, 1910.

Sec. 29, T. 22 N., R. 15 W.—No. 311: Producers Oil Company; flowing approximately 75 barrels.

Sec. 23, T. 22 N., R. 15 W.—No. 320: Arkansas Gas and Development Company; flowing about 250 barrels of roily oil, about 40 to 50 per cent BS.; very little gas pressure, May 12, 1910.

GAS IN THE CADDO FIELD.

PRODUCTION.

Gas in immense quantities seems to have a more general distribution than oil in the Caddo field. For years gas has been obtained from the Nacotoch sand beneath Shreveport, but in the last five years gas has been found in enormous quantities in the region from Mooringsport north to Vivian and from points west of James Bayou east to Dixie.

This field first attracted the attention of the general public by its famous burning gasser. Producers' No. 2 blew out in May, 1905, with terrific force. The gas caused the waters in and about the well to assume a boiling, churning motion that loosened the earth for a distance of some yards, so that the derrick and machinery were engulfed in a mass of mud. On June 18 the gas was lighted, and for five months thereafter this well was known as the "geyser," attracting visitors from all parts of the country. Maj. Frank M. Kerr visited the place on behalf of the State to see what might be done to check the waste of gas, and in his report to the governor says in part:

> On the day of this visit the well presented a scene of magnificent energy and surprising spectacular effect. A basin or bowl of water some 250 feet in diameter had resulted from the action of the escaping gas and the roll of the waves from the mouth of the orifice toward the rim of the basin, like waves on a sea beach in stormy weather, from the center of which leaps a flame some 30 feet in diameter and equally high. This, with the monster upheaval of water and leaping of spray, presented a spectacle which might readily have been likened to the display of a prismatic fountain of unusual magnitude and superb effects.

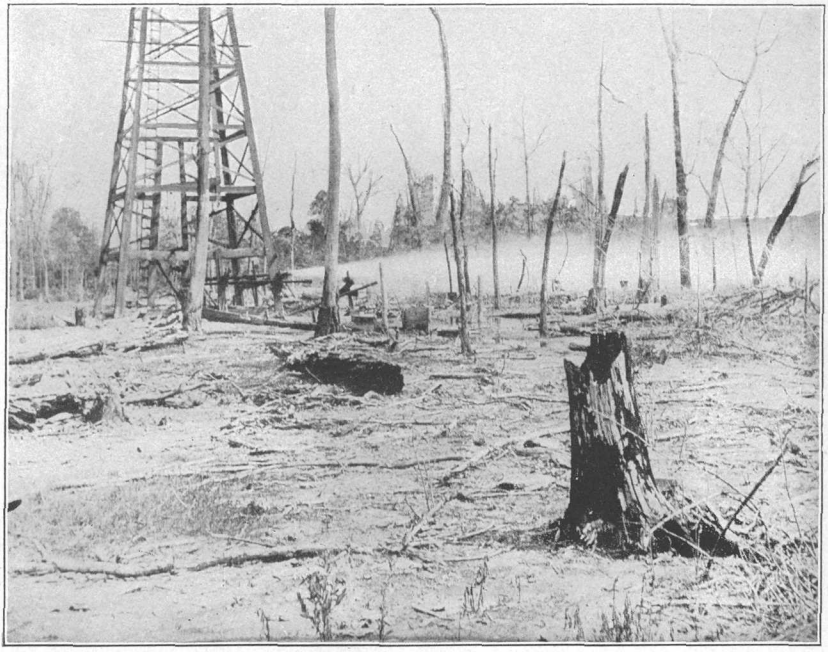
Plate XX, *A*, shows the present appearance of this locality.

Producers No. 3, in the same vicinity, a few hundred yards west of Oil City, repeated the history of No. 2 in a somewhat milder form, during the latter part of 1905 and the early part of 1906.

The Caddo Gas and Oil Company's well on the Gilbert tract, in the eastern part of section 13, perhaps 200 yards west of the Kansas City Southern Railway tracks, or $1\frac{1}{4}$ miles south of Oil City, has had a remarkable history as a "geyser," or "wild well." After a period of over three years of constant eruption it still appears vigorous, as shown by Plate XXI, *A*. The description of Producers No. 2 given above fits this well with but slight modifications of detail. When the gas is lighted the heat of the flames raises the water to the boiling point. The tumbling and seething of the waters, the roar of the escaping gases, and the light and heat of the leaping flames produce an impression long to be remembered. The details of the boiling, red, muddy waters appear more clearly when the gas is not lighted, as shown in the illustration. When the gas is lighted, the flames cover the greater part of the dark "boiling" space shown in the central part of the illustration and reach an equally great height.

A. SCENE OF THE FIRST FAMOUS BURNING GAS WELL (PRODUCERS NO. 2) IN THE CADDO FIELD.

Photograph taken in the fall of 1908.



B. PRODUCERS WELL NO. 1, CADDO FIELD, BLOWING SALT-WATER SPRAY AND GAS A DISTANCE OF SEVERAL HUNDRED FEET.

Photograph taken December, 1908.

Another famous burning or "wild" well was that known as Dawes Trustee, No. 1, in the NE. ¼ SW. ¼ sec. 7, T. 20 N., R. 15 W. A brief history of the well is given on page 143 in the list of wells in the Caddo field. This well alone probably wasted about 40,000,000 cubic feet of gas daily between the middle of May, 1908, and February 12, 1909. (See Pl. XXI, *B*.)

The daily waste in the Caddo field during the latter part of the year 1908 was estimated as about 70,000,000 cubic feet.

In June, 1907, the Oil Investors' Journal listed the producing gas wells of the Caddo field as follows:

Producers Oil Company, Heilperin & Liebman, sec. 6, 2,200 feet, 2½-inch hole, 8,000,000 gasser, rock pressure 900 pounds.
McGuire No. 1, Barron, sec. 17, 802 feet, 20,000,000 gasser.
McGuire & Evans No. 2, sec. 18, 812 feet, 15,000,000 gasser.
McGuire & Evans No. 3, sec. 18, 2,000 feet north of No. 2, 15,000,000 gasser.
McGuire No. 4, Barnhardt, sec. 21, 812 feet, 15,000,000.
McGuire No. 5, Huckaby, sec. 17, 823 feet, 25,000,000.
McGuire No. 6, Walter Crawford, sec. 15, 1,500 feet north of McGuire No. 4, 15,000,000.
McGuire No. 7, Barnhardt, sec. 21, half mile east of McGuire No. 4, 795 feet, 15,000,000.
J. B. & W. S. Atkins, NE. ¼ NW. ¼ sec. 18, Evans, 15,000,000.
J. M. Guffey Petroleum Company, No. 1, Hostetter, 810 feet, 15,000,000.
Dixie Oil and Pipe Line Company No. 2, southeast part of Pine Island, 800 feet, small gasser.

Since June, 1907, the following gas wells have been announced in the Journal:

McGuire No. 9, school land, sec. 16, 805 feet, 20,000,000.
Cullinan & Jolly No. 1, 810 feet, 25,000,000.
McGuire No. 10, school land, sec. 16, 285 feet, 20,000,000.
Dixie 2, Glassell, 5½ miles east of Mooringsport, a gasser, sec. 36.
McGuire No. 11, school land, gasser, 25,000,000.
Producers No. 2, Murray, NW. ¼ SW. ¼ sec. 7, T. 20 N., R. 15 W., gasser.
Caddo Gas and Oil Company No. 1, Pardue (Vivian), 2,500,000.
Caddo Gas and Oil Company No. 9, Mooringsport, 8,000,000.
Caddo Gas and Oil Company No. 10, Mooringsport, 10,000,000.
Caddo Gas and Oil Company No. 11, Smith, 15,000,000.
McCann & Harper No. 1, Pitts, NE. ¼ NW. ¼ sec. 31, T. 22 N., R. 15 W. (Vivian), 50,000,000.
Busch-Everett No. 1, Douglass, SW. ¼ sec. 30, T. 20 N., R. 14 W. (Dixie), 10,000,000, dry at 2,330 feet.
Busch-Everett No. 1, Vivian Mercantile Company, sec. 29, T. 22 N., R. 15 W., 60,000,000, 8-inch hole, depth 1,040 feet.

UTILIZATION OF CADDO GAS.

The amount of gas escaping at the surface near the site of the original Savage & Morricell wells is said to have been sufficient when collected to furnish heat and light for a frontiersman's cabin.

Producers No. 1, a few hundred yards northwest of Oil City, now blowing salt water and gas (Pl. XX, *B*), was the first well to furnish

a large supply of gas for drilling purposes in the field. The many new "gassers" soon brought in naturally suggested the desirability of utilizing the gas outside of the field. The Citizens Oil and Pipe Line Company, with a capitalization of $3,000,000, put down the first pipe line to Shreveport in the fall of 1905 and the spring of 1906, supplanting gas in the Shreveport lines on May 20, 1906. The price of gas for domestic purposes was established at 35 cents a thousand and for manufacturing purposes at half that rate. A second pipe line was laid in 1907, and an 8-inch line was carried as far north as Texarkana in the latter part of 1908, 47 miles being completed November 27, 1908. The price to ordinary consumers taking from this line was fixed at 27½ cents a thousand; for manufacturing purposes at 10 cents. Dixie began to use gas from its wells near by in the fall of 1908, and started a line northward to Belcher.

By far the greatest project for utilizing Caddo gas is that undertaken by the Busch-Everett syndicate, of St. Louis, which has entered into a contract to furnish New Orleans with natural gas within less than two years and a half from 1909. To lay a 16, 20, or 24 inch pipe successfully for a distance of somewhat over 400 miles, crossing bayous, swamps, and Atchafalaya and Mississippi rivers, is certainly a considerable undertaking, involving doubtless an expenditure of $10,000,000. Prices for gas in New Orleans will vary from 35 to 45 cents a thousand, in accordance with the amount used.

Even St. Louis has been mentioned as a possible market for Caddo gas.

ANALYSIS OF GAS FROM THE CADDO FIELD.

The analysis and remarks of Prof. F. C. Phillips, frequently quoted in technical journals, may be repeated here:

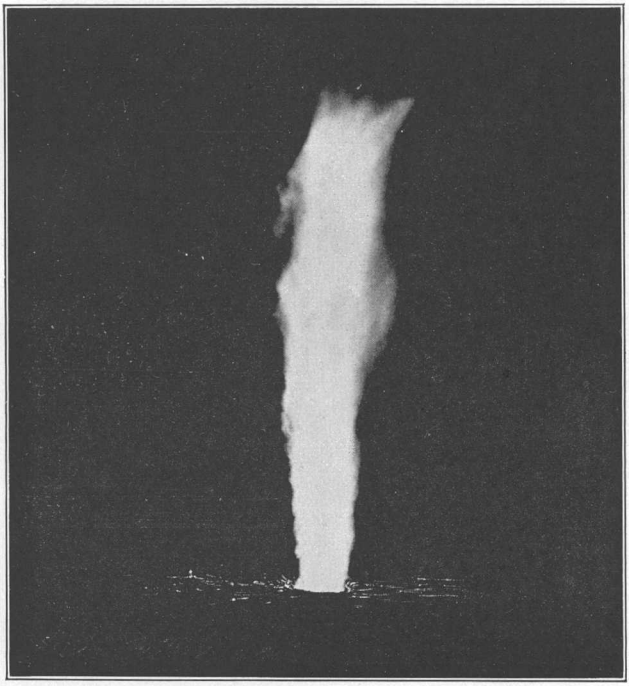
Analysis of gas from Caddo field.

Methane	95.00
Nitrogen	2.56
Carbon dioxide	2.34
Hydrogen	.00
Carbon monoxide	.00
Ethylene	.00
Sulphide (sulphide hydrogen?)	.01

I think you have a valuable fuel in this gas, well suited for household heating or for metallurgical purposes, and for all purposes to which natural gas is applied.

A. CADDO GAS AND OIL COMPANY'S WELL ON GILBERT TRACT, 1¼ MILES SOUTH OF OIL CITY, DECEMBER, 1908.

The "crater," 300 feet across, was excavated by wave action. Red, thick, muddy water is here being tossed 30 feet in the air by the force of the escaping gas. When ignited the flames are from 40 to 70 feet in height.



B. DAWES TRUSTEE WELL NO. 1, CADDO FIELD.

Burning gas well with flame 125 feet high. The small white object at the left is the outline of a man. Photograph taken at night, December, 1908.

WELLS IN THE CADDO FIELD.

The following annotated list of the wells in the Caddo field, arranged alphabetically, has been compiled by I. Perrine. Corrections and additions to the data here given will be gladly received. The information is complete as far as possible to February 15, 1909. Dates are derived mainly from the Oil Investors' Journal:

Arnell & Lee No. 1. See Lee & Arnell No. 1.

Augur & Henderson well, near Shreveport. See Henderson & Augur well.

Alday & Daniel No. 1. See Daniel & Alday No. 1.

Barnhart No. 1, McGuire; NW. ¼ NW. ¼ NW. ¼ sec. 21, T. 20 N., R. 15 W. Began drilling April, 1907. A 15,000,000-foot gasser at 812 feet June 5, 1907. Well capped.

Barnhart No. 2, McGuire; NE. ¼ NE. ¼ NW. ¼ sec. 21, T. 20 N., R. 15 W. Began drilling June, 1907. A 15,000,000-foot gasser at 795 feet June 5, 1907. Well capped.

Belcher. A well was to be drilled here, 17 miles north of Shreveport, February 3, 1907.

Benedum & Trees No. 1; on the J. Stiles place. Derrick up October 6, 1908; drilling October 20–November 20, 1908.

Big Four No. 1; NW. ¼ SE. ¼ sec. 1, T. 20 N., R. 16 W. Rig up February 3, 1907. Down 1,560 feet June 5, 1907. Produced 500–600 barrels of oil which has to be treated. Also called McCormick No. 1 on the Guy 5 acres. Well was being cleaned August 6, 1908.

Big Four No. 2; S. ½ NW. ¼ SE. ¼ sec. 1, T. 20 N., R. 16 W. Drilled to 2,240 feet by Del Southerland. Had a good showing of oil at 1,580 feet. A good producer. Well being cleaned January 10, 1909.

Black Bayou No. 1, Alexander; SE. ¼ SE. ¼ sec. 9, T. 20 N., R. 15 W. Derrick up October 20, 1908. Drilling November 6, 1908, to January 20, 1909. A 125-barrel well.

Black Bayou No. 1, Glassell; SW. ¼ sec. 10, T. 20 N., R. 15 W. Drilling June 10 to October 6, 1908. A 300-barrel well.

Blanchard No. 1, Surrey; NW. ¼ NW. ¼ SE. ¼ sec. 12, T. 20 N., R. 16 W. Formerly called Offenhauser No. 4. Drilling October 8, 1907, to February, 1908.

Blanchard No. 2, Surrey; NE. ¼ NW. ¼ SE. ¼ sec. 12, T. 20 N., R. 16 W. Completed July 6, 1908. A 100-barrel well.

Blanchard No. 3, Surrey; S. ½ SW. ¼ SE. ¼ sec. 12, T. 20 N., R. 16 W. Derrick up September 30, 1908. Drilling October 6, 1908, to February 15, 1909. The well was shut down through November and part of December, 1908, and January, 1909.

Blanchard No. 4, Surrey; NE. ¼ NE. ¼ SW. ¼ sec. 12, T. 20 N., R. 16 W. A derrick only.

Blanchard No. 1, Graham; sec. 35, T. 20 N., R. 16 W. Completed July 6, 1908. A dry hole at 2,504 feet.

Bossier City, Shreveport well. A water well owned by the Shreveport Cottonwood Company; struck gas at 500 feet and will drill deeper in search of oil.

Broussard No. 1, Brown; NE. ¼ NE. ¼ SW. ¼ SW. ¼ sec. 18, T. 20 N., R. 15 W. Drilling January 1 to February 15, 1909. Also called B. G. Dawes and others No. 1, Brown.

Broussard No. 1, fee; SE. ¼ SW. ¼ SW. ¼ SW. ¼ sec. 6, T. 20 N., R. 15 W. Owner, B. G. Dawes. Congressman Oil Company. Drilling June 1 to August 1, 1908. A 100-barrel producer. McCann & Harper, contractors.

Broussard No. 2, fee; SE. ¼ SE. ¼ SW. ¼ SW. ¼ sec. 6, T. 20 N., R. 15 W. Drilled in Clear Lake bottoms. A 100-barrel producer. Harper, driller.

Brown No. 1; S. ½ NE. ¼ NW. ¼ SW. ¼ sec. 1, T. 20 N., R. 16 W. Twisted off at 1,440 feet; hole still remains; 50 feet north of Hunter No. 1.

Brown Brothers No. 1; NW. ¼ SW. ¼ SE. ¼ sec. 1, T. 20 N., R. 16 W. Heavy oil at 900–1,000 feet; at 1,300 feet the same oil was found as in the old Moricell-Savage well, July 3, 1905. Completed at 1,560 feet, a 3 to 4 barrel well, November 3, 1905. Afterward made a 4,000,000-foot gasser, January 3, 1906. Owner, S. A. Nunnelley. Gas still being used February 10, 1909.

Busch-Everett No. 1, Douglas; SW. ¼ sec. 30, T. 20 N., R. 14 W. Dixie, La. Drilling January 20 to February 15, 1909.

Byron No. 1, McGuire; NE. ¼ SE. ¼ sec. 17, T. 20 N., R. 15 W. Equals old McGuire No. 1, his first well. A 20,000,000-foot gasser at 802 feet.

Caddo Gas and Oil Company. Black Diamond No. 1, Black Diamond, Arkansas. Drilling June to October 1, 1907. A dry hole at 1,800 feet. C. E. Latham, driller.

Caddo Gas and Oil Company. Caddo Lake Oil and Pipe Line Company No. 1; SW. ¼ SW. ¼ sec. 1, T. 20 N., R. 16 W. Quoted as C. G. O., Smith No. 6, in Oil Investors' Journal. Derrick up April 19, 1908. Drilling July 20 to December 20, 1908. A 2,500-barrel well from the 1,580-foot stratum; gravity 30° Baumé. The best well in the field.

Caddo Gas and Oil Company. Caddo Lake Oil and Pipe Line No. 2; SW. ¼ SW. ¼ sec. 1, T. 20 N., R. 16 W. Drilling December 17, 1908, to February 15, 1909.

Caddo Gas and Oil Company. Caddo Lake Oil and Pipe Line No. 3; SW. ¼ SW. ¼ sec. 1, T. 20 N., R. 16 W. Derrick up December 20, 1908.

Caddo Gas and Oil Company. Mary L. Cook No. 1; SW. ¼ sec. 32, T. 20 N., R. 15 W. Began drilling February 6, 1909.

Caddo Gas and Oil Company. Croom Club House No. 1; SE. ¼ NE. ¼ NW. ¼ NE. ¼ sec. 35, T. 19 N., R. 16 W. Drilling January 3 to January 15, 1907. A gas well at 820 feet. C. E. Latham, driller. Is at present being deepened.

Caddo Gas and Oil Company. No. 1; Dixie. Drilling January 6 to February 15, 1909.

Caddo Gas and Oil Company. Donnell No. 1, state line well, Texas, La., due west of Vivian. Derrick up June 6, 1908. Drilling July 20 to October 6, 1908. Shut down at 1,175 feet, waiting for further orders. C. E. Latham, driller.

Caddo Gas and Oil Company. Draper No. 1, Draper, Tex. Drilling March 7 to June, 1907. A dry hole.

Caddo Gas and Oil Company. Fee simple; sec. 1, T. 20 N., R. 16 W. Rig up May 5, 1908. A 200-barrel well, May, 1908.

Caddo Gas and Oil Company. Gilbert No. 1 (oil); NW. ¼ NE. ¼ NE. ¼ sec. 13, T. 20 N., R. 16 W. Drilling July 20 to September 6, 1908. A 400-barrel well. Gravity oil 43° Baumé.

Caddo Gas and Oil Company. Gilbert No. 2 (oil); NE. ¼ NE. ¼ NE. ¼ sec. 13, T. 20 N., R. 16 W. Drilling September 20 to November 6, 1908. A 90-barrel producer.

Caddo Gas and Oil Company. Gilbert No. 1 (gas); NE. ¼ NE. ¼ SE. ¼ sec. 13, T. 20 N., R. 16 W. Formerly called Citizen's Oil and Pipe Line Company No. 1 on the Gilbert tract, just north of Caddo Lake. A great blow-out; dynamited November 4, 1906, to no advantage. This well is known as the burning mud and oil geyser.

Caddo Gas and Oil Company. Gilbert No. 2 (gas); NW. ¼ NW. ¼ NE. ¼ sec. 13, T. 20 N., R. 16 W. Drilling October to November 18, 1905. A good gasser. This well was on the line to Shreveport in February, 1906, but is not used at present.

Caddo Gas and Oil Company. Gilbert No. 3; SE. ¼ NE. ¼ SE. ¼ sec. 13, T. 20 N., R. 16 W. A good gasser, 1906, over which a new derrick has recently been built.

Caddo Gas and Oil Company. Gilbert No. 4; SE. ¼ SE. ¼ SE. ¼ sec. 13, T. 20 N., R. 16 W. Drilling October 12 to November, 1906; a good gasser at 775 feet. C. E. Latham, driller.

Caddo Gas and Oil Company. Gilbert No. 5; NE. ¼ NE. ¼ NE. ¼ sec. 13, T. 20 N., R. 16 W. Also called the Henning well. A gas well.

Caddo Gas and Oil Company. Glassell No. 1; SW. ¼ SE. ¼ sec. 10, T. 20 N., R. 15 W. Drilling January 6 to February 15, 1909.

Caddo Gas and Oil Company. Harris No. 1; NW. ¼ SW. ¼ SW. ¼ sec. 29, T. 19 N., R. 15 W. Derrick up December 1, 1908. Completed December 17, 1908. A dry gasser, from the 800-foot stratum.

Caddo Gas and Oil Company. Hiner No. 1, Vivian, La.; NW. ¼ SE. ¼ SE. ¼ sec. 26, T. 22 N., R. 16 W. Drilling July 20 to September 10, 1908. A dry hole. C. E. Latham and J. E. Todd, drillers.

Caddo Gas and Oil Company. Hostetter No. 1. Drilling January 7 to January 19, 1907. A 15,000,000-foot gasser at 783 feet. W. H. Harper, driller. This well was turned into the gas line to Shreveport for a five-day test. It supplied Shreveport through 22 miles of 6-inch line and held a line pressure of 245 pounds at the Shreveport regulator station.

Caddo Gas and Oil Company. Hostetter No. 3. Drilling December 31, 1907, to January 4, 1908. A 7,000,000-foot gasser at 780 feet. On a three-minute test it held a rock pressure of 300 pounds. The gas is dry and clean. Is at present on the Shreveport line.

Caddo Gas and Oil Company. Hostetter No. 4. Drilling January 21 to February 11, 1908. A good gasser, at present on the Shreveport line. Depth 778 feet. This well was bailed at a depth of 777 feet and developed a volume capacity of 6,000,000 cubic feet a day and a rock pressure of 265 pounds on a two-minute test. The gas was dry and clean. The well when shut in developed a peculiar phenomenon, the gas working back of the 8-inch pipe and coming up to the bottom of the 10-inch pipe only 83 feet 9 inches from the surface; but the 10-inch pipe was successfully cemented and in this way the escape of the gas was cut off. However, within twelve hours from the time the well had been shut in, the gas worked through crevices in the rock shell on which the 10-inch pipe had been set and came up in a channel of Caddo Lake, extending out as far as half a mile from the well. The surface of the lake had the appearance of a violent storm, the escaping gas blowing the water as high as 20 feet in places, but as soon as the well was opened the gas came back through the 8-inch pipe and the escape by way of the lake ceased. The well was at once lubricated and killed by pumping it full of mud. The 8-inch pipe was pulled, a well packer was set 65 feet from the bottom, the casing was reduced to 6 inches, and a string of 8-inch pipe was washed over the 6-inch pipe to the well packer. As the 8-inch pipe was withdrawn, the well was filled in back of the 6-inch pipe with concrete to the top of the ground. After allowing this to set for three days the well was again bailed in and allowed to blow open for seven days to let the concrete set thoroughly. The well when shut in was in good shape, and no further escape of gas occurred. After standing for a few days it was connected with the line to Shreveport and on January 1, 1909, was supplying that city with gas. J. M. Guffey Petroleum Company and S. S. Hunter, owners; W. H. Harper, contractor; J. B. McCann, agent.

Caddo Gas and Oil Company, Hunter No. 1; E. ½ NW. ¼ SW. ¼ sec. 1, T. 20 N., R. 16 W. The first shallow well, about 1,580 feet deep. A 300-barrel well.

Caddo Gas and Oil Company, Hunter No. 2; S. ½ NW. ¼ SW. ¼ sec. 1, T. 20 N., R. 16 W. Drilling November 20, 1908, to January 20, 1909. A 65-barrel well.

Caddo Gas and Oil Company, Leary No. 1, Leary, Tex., on the Midden farm. Drilling October 22, 1907, to March 7, 1908. A dry hole at 1,800 feet.

Caddo Gas and Oil Company, McDowell No. 1. Completed June 20, 1908. A dry hole; may drill deeper. This well was abandoned after a blowout, June 20, 1908.

Caddo Gas and Oil Company, McDowell No. 2. Completed August 20, 1908. A dry hole. May drill deeper.

Caddo Gas and Oil Company, Noel No. 1; NE. ¼ NW. ¼ SE. ¼ NW. ¼ sec. 1, T. 19 N., R. 16 W. A gas well, capped.

Caddo Gas and Oil Company, Noel No. 2; S. ½ NW. ¼ NW. ¼ sec. 1, T. 19 N., R. 16 W. Completed at 2,460 feet. A dry hole.

Caddo Gas and Oil Company, Noel No. 3; NW. ¼ NW. ¼ SE. ¼ NW. ¼ sec. 1, T. 19 N., R. 16 W. Completed December, 1906. A gas well at 860 feet.

Caddo Gas and Oil Company, Offenhauser No. 1; NE. ¼ SE. ¼ sec. 1, T. 20 N., R. 16 W. Formerly called Caddo Oil and Mining Company, Hunter & Hughes No. 1. Completed June 5, 1907. A 150-barrel well with some gas at 2,170 feet. A small derrick was used in drilling this well. The well is now producing.

Caddo Gas and Oil Company, Offenhauser No. 2; NE. ¼ SW. ¼ sec. 1, T. 20 N., R. 16 W. Formerly called Citizens' Oil and Pipe Line Company No. 2, or the Hughes-Offenhauser well. Completed May 1, 1908. A 250-barrel well.

Caddo Gas and Oil Company, Offenhauser No. 3; SE. ¼ NE. ¼ SW. ¼ sec. 1, T. 20 N., R. 16 W. Formerly called Thompson No. 1. Rig up May 5, 1908. Drilling May 19 to October 20, 1908. A 75-barrel well.

Caddo Gas and Oil Company, Offenhauser No. 4; NW. ¼ NE. ¼ SW. ¼ sec. 1, T. 20 N., R. 16 W. Formerly called Thompson No. 2. Drilling July, 1908. At present a small producer.

Caddo Gas and Oil Company, Pardue No. 1, Vivian, La.; SW. ¼ NW. ¼ sec. 1, T. 21 N., R. 16 W. Completed December 6, 1908. A 2,500,000-foot gasser.

Caddo Gas and Oil Company, Smith No. 1; SE. ¼ SW. ¼ sec. 1, T. 20 N., R. 16 W. Formerly called the McCormick gas well. A gasser from the 800-foot stratum.

Caddo Gas and Oil Company, Smith No. 2; NE. ¼ SE. ¼ SW. ¼ sec. 1, T. 20 N., R. 16 W. Formerly called the Baby well. At 1,050 feet the well was bailed January, 1905, and developed salt water, flowing 80 feet above the derrick. After 203 days' flow it developed pure gas and is at present a small gasser.

Caddo Gas and Oil Company, Smith No. 3; N. ½ SE. ¼ sec. 1, T. 20 N., R. 16 W. Drilling June 7 to October 2, 1907. After the strainer was set a big salt-water well with gas and oil developed. On trying to pull the strainer it became choked and blew out. The well flowed for several days, a 15-barrel well with much salt water, but drowned out in ten days. In setting the 4-inch pipe it parted at a collar when 100 feet from the bottom because of a defective joint under the elevator, completely plugging the hole. All the pipe but 150 feet was fished out and the hole was abandoned, June 1, 1908.

Caddo Gas and Oil Company, Smith No. 4; SW. ¼ SE. ¼ SW. ¼ sec. 1, T. 20 N., R. 16 W. Drilling November 28, 1907, to February 28, 1908. When the well was bailed in it developed from the deep sand a yield of 500 barrels. The oil was dark green in color and of 28.4° Baumé gravity at 60° F. This well was the best in the field when completed. It was cleaned out September 6, 1908, and is still a good producer.

Caddo Gas and Oil Company, Smith No. 5; SW. ¼ SE. ¼ SW. ¼ sec. 1, T. 20 N., R. 16 W. Drilling March 7 to May 20, 1908, at 2,280 feet. Salt water drowned the well; 17 feet of cement was put in the bottom without effect. The well is not now producing.

Caddo Gas and Oil Company, Smith No. 6; NW. ¼ NE. ¼ SE. ¼ SW. ¼ sec. 1, T. 20 N., R. 16 W. A derrick only.

Caddo Lake Oil and Pipe Line No. 1. Formerly called Savage Brothers and Morricell. This is the oldest well in the field. Rig up May, 1904; drilling began in June, 1904. A partial log is as follows: Lignite at 16 feet; rock, gravel, and bowlders to 300 feet; a good fresh-water well at 85 feet; gas sand at 900 feet; 6-inch pipe set at 1,400 feet; drilling stopped at 1,556 feet in cream-colored shale with pyrite April 3, 1905. The well was bailed March 28, 1905. A 5-barrel well; deepened in July, 1905; idle November, 1905; gasser January 3, 1906; oozed oil of 34.7° Baumé gravity August, 1906, but not in paying quantities. Abandoned June, 1907.

Caddo Lake Oil and Pipe Line Company No. 2. A new well started south of No. 1 May 18, 1905. A heavy oil was found at 950 feet; down 1,035 feet in shale, January 3, 1906.

Caddo Lake Oil and Refining Company. In this well rock was struck at 1,400 feet; oil at 1,546 feet, of 35° Baumé. The oil came within 700 feet of the surface February 3, 1905.

Caddo Oil and Mining Company. Rig up September 19, 1907.

Citizens' Oil and Pipe Line Company; S. ½ SE. ¼ sec. 8, T. 19 N., R. 16 W. Also called Jeter well.

Cooper & Heard No. 1, Cooper, Winnfield, La. Drilling December 20, 1908, to February 15, 1909.

Crawford No. 1, McGuire; SW. ¼ SW. ¼ NE. ¼ SW. ¼ sec. 17, T. 20 N., R. 15 W. A 15,000,000-foot gas well.

Culliman & Jolly No. 1; NW. ¼ SE. ¼ SW. ¼ sec. 18, T. 20 N., R. 15 W. Completed December 18, 1906. A 15,000,000-foot gasser at 110 feet; now owned by the Louisiana Oil Company.

Daniel & Alday No. 1; SW. ¼ SE. ¼ NW. ¼ sec. 31, T. 21 N., R. 15 W. (?). Blew out gas and salt water and is not now a producer.

C. G. Dawes Trustee No. 1; SE. ¼ NE. ¼ SW. ¼ sec. 7, T. 20 N., R. 15 W. Began drilling March 17, 1908, but was lost before being finished. On the night of May 11, 1908, during a heavy rain storm, while the 4-inch rotary pipe was being put back and was about 350 feet from the bottom, the well blew out from the gas stratum between 1,360 and 1,420 feet, making 40,000,000 cubic feet of gas a day under very high pressure and showing a small amount of salt water. While preparations were being made to lubricate and kill the well the derrick was completely destroyed by a cyclone on the evening of May 13. Deeper gas worked through the 8¼-inch casing in a defective seam or joint or under the bottom and started the 800-foot or Caddo gas stratum to blowing out. This in turn worked through a split in the 10-inch pipe 20 feet below the surface and blew out a very large hole about 20 feet deep around the top of the 10-inch pipe. After several days the drillers succeeded in getting a joint of 14-inch pipe over the 10-inch and in concreting a shoulder on the bottom of the 14-inch to the 10-inch. Then they built a concrete anchor to the 14-inch pipe, hoping in this way to be able to hold the gas long enough to lubricate and kill the well by pumping it full of mud. But the gas caught fire and burned from June, 1908, till the night of February 12, 1909. The gas was lighted the next morning, but went out again within five minutes. Some salt water appeared and with the gas forms a spray that still rises above the old hole. This well is the one which has been noted as the "burning gas well."

C. G. Dawes Trustee No. 2; SE. ¼ SE. ¼ NE. ¼ SW. ¼ sec. 7, T. 20 N., R. 15 W. Drilling June 22 to August, 1908. A 10 to 15 barrel well with much salt water. Not producing at present.

B. G. Dawes and Caddo Gas and Oil Company No. 1, Christian; Vivian, La. A location only.

B. G. Dawes and Gulf Refining Company, Heilperin No. 1; NW. ¼ SE. ¼ NW. ¼ sec. 31, T. 22 N., R. 15 W. Drilling September 29 to October 22, 1908. A 15,000,000-foot gasser. S. B. Clement, driller.

B. G. Dawes and Gulf Refining Company, Posey No. 1; SE. ¼ NE. ¼ NW. ¼ sec. 25 T. 22 N., R. 16 W. Drilling September 15 to October 28, 1908. A dry hole.

Dawes No. 1, J. W. White. Rig up July 20, 1908. Taken down since.

Dixie Oil and Pipe Line Company No. 1. A 2,250-foot well. Abandoned September 19, 1907.

Dixie No. 2, Glassell; SE. ¼ sec. 36, T. 20 N., R. 15 W., 5½ miles east of Mooringsport. A gasser September 19, 1907.

Dixon Oil and Pipe Line Company; sec. 22, T. 20 N., R. 15 W., 4 miles east of Mooringsport. Gumbo at 875 feet; shale and sand at 2,025 feet.

Dixon Oil and Pipe Line Company No. 1; NW. ¼ SW. ¼ NW. ¼ sec. 33, T. 21 N., R. 15 W., on Pine Island, one-half mile east of Texla No. 1. A blowout occurred at

2,165 feet; the well was killed and deepened to 2,500 feet. Casing pulled June 19, 1907.

Dixon Oil and Pipe Line Company No. 2; NW. ¼ NW. ¼ SW. ¼ sec. 33, T. 21 N., R. 15 W. Completed as a gasser at 840 fee . About 1,500,000 feet capacity March 19, 1907.

Enterprise No. 1, Noel; sec. 12, T. 20 N., R. 16 W. Completed June 19, 1908. A fairly good producer.

Enterprise No. 2, Noel; sec. 12, T. 20 N., R. 16 W. Completed September 6, 1908. A 10-barrel well; 70 barrels gross.

Enterprise No. 3, Noel; NE. ¼ SW. ¼ NW. ¼ SE. ¼ sec. 12, T. 20 N., R. 16 W. A derrick only.

Evans No. 1, McGuire; SE. ¼ NE. ¼ SE. ¼ SW. ¼ sec. 18, T. 20 N., R. 16 W. A 15,000,000-foot gasser at 812 feet June 5, 1907.

Evans No. 2, McGuire; E. ½ NE. ¼ SE. ¼ SW. ¼ sec. 18, T. 20 N., R. 15 W. A 15,000,000-foot gasser, 2,000 feet north of Evans No. 1, June 5, 1907.

Evans No. 3, McGuire; NE. ¼ NW. ¼ NE. ¼ SE. ¼ sec. 18, T. 20 N., R. 15 W. A good gasser, June 5, 1907.

Filer No. 1; NE. ¼ NW. ¼ NW. ¼ SE. ¼ sec. 7, T. 20 N., R. 15 W. Completed July 28, 1908. A 140-barrel well; now producing very little.

Filer No. 2; just southeast of the center of sec. 7, T. 20 N., R. 15 W. Derrick up July 20, 1908. Well completed November 6, 1908. A 30-barrel well.

Filer No. 3, or 1–18; S. ½ NW. ¼ NW. ¼ NE. ¼ sec. 18, T. 20 N., R. 15 W. Completed February 6, 1909. A 100-barrel well.

Guffey No. 1, Christian; sec. 31, T. 20 N., R. 15 W. Derrick up May 5, 1908, but was blown over by a high wind and site was abandoned.

Guffey Hostetter No. 1; SE. ¼ sec. 30, T. 20 N., R. 15 W. Began drilling January 22, 1907. On March 19, 1907, the well blew out at 2,208 feet, with 613 feet of 8-inch casing in the hole. When a depth of 2,209 feet was reached the well was shut down and preparations were made to set the 6-inch pipe, but as soon as the pump pressure was shut off the well blew out and, having at the time only 613 feet of 8-inch casing in the hole, was completely destroyed by the terrific gas pressure, developing a rock pressure of nearly 1,000 pounds. After blowing out for three days, the deep gas stratum was choked off by the collapse of the cofferdam placed around the 8-inch pipe to a depth of 29 feet on top of the first rock stratum, after a string of 12-inch pipe had been driven around the 8-inch. The well was then concreted to the top of the ground and in this way was shut in finally and the blow-out stopped. This well, when the gate was opened during the fall of 1908, began to flow, and averaged from 10 to 30 barrels of high-grade oil a day for several months, but finally stopped flowing when a well was brought in near by.

Guffey Hostetter No. 2. Drilling June to December 8, 1908. A 300-barrel well. This well was claimed to be making 10,000 barrels when first completed and caused a great stir in the field, but later reports show that its average capacity is nearer 200 barrels.

Guffey Pitt No. 1; NW. ¼ NW. ¼ NW. ¼ sec. 7, T. 20 N., R. 15 W. Derrick up July 3, 1905. Now abandoned.

Guffey No. 1, Dixon farm; NW. ¼ sec. 33, T. 20 N., R. 15 W. On Pine Island. Down 2,200 feet June 5, 1907.

Gulf-Broussard No. 1, Pitts; sec. 20, T. 20 N., R. 15 W. Began drilling February 6, 1909.

Gulf Refining Company No. 1, Christian; NE. ¼ SW. ¼ SW. ¼ sec. 30, T. 20 N., R. 15 W. Rig up February 6, 1909.

Gulf Refining Company No. 1, Curtis; N. ½ NE. ¼ SE. ¼ sec. 19, T. 20 N., R. 15 W. Derrick up January 1, 1909. Began drilling February 6, 1909.

Gulf Refining Company No. 1, Edwards; NE. ¼ sec. 31, T. 20 N., R. 15 W. Drilling February 6, 1909.

Gulf Refining Company No. 1, J. Harris; sec. 32, T. 19 N., R. 15 W. Began drilling January 6, 1909.

Gulf Refining Company No. 3, Hostetter. Began drilling February 6, 1909.

Gulf Refining Company No. 1, Mason. Began drilling February 6, 1909.

Gulf Refining Company No. 2, Mason. Derrick up January 6, 1909.

Gulf Refining Company No. 1, Nunnelley. Derrick up December, 1908. Began drilling January, 1909.

Gulf Refining Company No. 1; SW. ¼ sec. 30, T. 20 N., R. 15 W. Drilling January, 1909.

Hastings Oil Company. Rig up June 18, 1905.

Henderson & Augur, well near Shreveport, on Douglas Island. Abandoned at 2,250 feet December 3, 1905. This well produces some salt water and gas. Shoots up 10 feet in the air, and the gas when lighted will burn for a short time, but soon goes out.

Heywood No. 1, Fee; NW. ¼ NW. ¼ SW. ¼ SE. ¼ sec. 1, T. 20 N., R. 16 W. Drilling September to December, 1908. A dry hole at 2,257 feet. H. Jones, driller.

Heywood No. 1, Savage; SE. ¼ SE. ¼ NE. ¼ SE ¼ sec. 2, T. 20 N., R. 16 W. Drilling December, 1908, to February, 1909. A dry hole, with show of oil in the 1,500-foot stratum.

Hope No. 1, Hope, Ark. Drilled by A. P. Dyke on the Dyke tract. The 8-inch pipe was down 240 feet December 18, 1908.

Huckaby No. 1, McGuire; SE. ¼ SW. ¼ SW. ¼ sec. 17, T. 20 N., R. 15 W. A 25,000,000-foot gasser at 823 feet, June 5, 1907.

Jolly No. 1. See Culliman & Jolly No. 1.

Jolly No. 2, NW. ¼ NE. ¼ SW. ¼ SW. ¼ sec. 17, T. 20 N., R. 15 W. A gas well drilled in 1907. Now owned by Louisiana Gas Company.

Latex Oil and Pipe Line Company No. 1; SW. ¼ SW. ¼ SW. ¼ sec. 3, T. 20 N., R. 16 W. Twisted off at 1,800 feet, but found traces of oil July 18, 1905.

Latex Oil and Pipe Line Company No. 2, S. ½ SW. ¼ SW. ¼ sec. 3, T. 20 N., R. 16 W. The third well drilled in the field. Not producing now.

Lee & Arnett No. 1; sec. 10, T. 18 N., R. 14 W. Began drilling December, 1905. Struck gas stratum at 975 feet June 3, 1906. This well is 3 miles northwest of Shreveport and is not producing now.

Lee & Arnett No. 2; 900 feet west of No. 1; struck gas at about the same depth. Not producing now.

J. A. Libby. Had a derrick up on the S. A. Guy 30-acre tract June 18, 1905.

Lillie No. 1; N. ½ NW. ¼ NW. ¼ sec. 12, T. 20 N., R. 16 W. Completed June, 1908. A 100-barrel well. A fairly good producer.

Lillie No. 2; NW. ¼ NW. ¼ NW. ¼ sec. 12, T. 20 N., R. 16 W. Derrick up December, 1908. About January 1, 1909, the hole was lost at 1,440 feet.

Lillie No. 2, second hole; about 10 feet north of the old Lillie No. 2. Drilling February 6, 1909.

Lillie No. 3. Drilling February 1, 1909.

Mansfield No. 1; NE. ¼ SE. ¼ SE. ¼ SE. ¼ sec. 1, T. 20 N., R. 16 W. Drilling December, 1908, to February, 1909. A 125-barrel well.

Marshall Gas Company No. 1, R. T. Cole, Blanchard, La. Rig up November 6, 1908. Drilling November, 1908, to February 15, 1909. This well and a half interest in the holdings of King Brothers, the owners, were bought by Producers' Oil Company, which will drill to 1,500 feet or more. The well was down 1,100 feet in February, 1909.

Marshall Gas Company No. 1, near Blanchard. Derrick up September, 1908. Never drilled.

Marshall well; on Blocker place, 10 miles southeast of Marshall, Tex. This well was down 1,500 feet January, 1909, and was still drilling February 15.

Marshall & Hardy No. 1. See Texla No. 1.

McCann & Harper No. 1, Pitts; NE. ¼ NW. ¼ sec. 31, T. 22 N., R. 15 W. Drilling February, 1909.

McCormick No. 1, Croom. Derrick up September 14, 1908. Well completed February, 1909. A 50-barrel well. Driller, Sel Southerland.

McCormick No. 1, Mooringsport. All traces of this derrick have been removed. The derrick was blown over by a strong wind and the site was abandoned.

McCormick No. 2, Mooringsport. Also called Thompson No. 1. This derrick also was destroyed by the strong wind and the site was abandoned.

McCormick No. 1, Shreveport. Also called the Brickyard well. This well was drilled in the winter of 1904 and 1905 and is the second oldest well in the field. It was drilled to 1,650 feet in search of gas as fuel for burning brick. At 910 feet there was a show of gas, but salt water spoiled all chances of obtaining a good well at this depth. The well was later drilled to a depth of 2,000 feet, but no oil was obtained.

McGuire wells. See under the names of the individual wells.

Merchant No. 1; NE. ¼ NE. ¼ SW. ¼ SW. ¼ sec. 6, T. 20 N., R. 15 W. Derrick up December 25, 1908. Drilling February, 1909.

Nichols Oil and Gas Company No. 1; north of Paraloma, Ark. Began drilling August, 1908; down 535 feet December 14, 1908. Driller, R. H. Ferguson, Milford, Ark.

Producers No. 1, Black Bayou; SE. ¼ NE. ¼ SE. ¼ SE. ¼ sec. 7, T. 20 N., R. 15 W. Derrick up July 19, 1907. Well completed November, 1907. A 100-barrel producer, but the oil has to be cooked. This well had an initial capacity of 700 barrels.

Producers No. 2, Black Bayou; W. ½ SE. ¼ SE. ¼ sec. 7, T. 20 N., R. 15 W. Drilling April to August, 1908. A 50-barrel well with considerable gas.

Producers No. 3, Black Bayou; W. ½ SW. ¼ NE. ¼ sec. 18, T. 20 N., R. 15 W. Derrick up October, 1908. Well completed December 7, 1908. A 90-barrel producer. The gravity of the oil in this well is 37.3° Baumé.

Producers No. 1; NW. ¼ SW. ¼ SE. ¼ sec. 1, T. 20 N., R. 16 W. This well was a good gasser at 812 feet, but blew out and is now a large salt-water blower.

Producers No. 2, Caddo Oil and Mining Company. Gas was struck in this well at 750 to 850 feet. The well was completed at 830 feet, but a blow-out occurred which blew sand and mud all over the derrick, April 13, 1905.

Producers No. 3, Caddo Oil and Mining Company. Drilling June to July, 1905. A blow-out occurred in this well also and the well was lost.

Producers No. 4, Caddo Oil and Mining Company. This well was put down to kill the two blow-outs, Nos. 3 and 4, on the Caddo Oil and Mining lease. The well was completed March 9, 1906. A small gasser at 842 feet. When this well was brought in the two geysers ceased to be active, and their sites are now marked by salt lakes.

Producers No. 5, Caddo Oil and Mining Company; SW. ¼ NE. ¼ sec. 12, T. 20 N., R. 16 W. This well is 2,000 feet south of No. 2. Rock was struck at 185 feet; sand and shale at 1,650 feet, and at 2,180 feet a strong gas pressure developed. The well was completed as a 190-barrel producer August 5, 1907.

Producers No. 6, Caddo Oil and Mining Company. Drilling November 5, 1907, to June 19, 1908. A 50-barrel well.

Producers No. 7, Caddo Oil and Mining Company. Drilling April to June 19, 1908. A 100-barrel well.

Producers No. 8, Caddo Oil and Mining Company. A derrick only.

Producers No. 1, Evans; SE. ¼ SE. ¼ NE. ¼ sec. 11, T. 20 N., R. 16 W. Completed April, 1908. A 35-barrel well, which has since turned mostly to gas.

Producers No. 1, Fee; NE. ¼ sec. 30, T. 20 N., R. 15 W. Mooringsport. Began drilling January 20, 1909.

Producers No. 1, Harrell; SE. ¼ NE. ¼ SE. ¼ sec. 30, T. 21 N., R. 15 W., on Pine Island, 1 mile northwest of Texla No. 1, on the Harrell 204-acre tract. Drilling November, 1906, to June, 1907. A dry hole at 3,000 feet; since abandoned. This well is the deepest in the field.

Producers No. 2, Harrell; NE. ¼ SE. ¼ sec. 2, T. 21 N., R. 16 W. Began drilling July 1908, and was still drilling in February, 1909.

Producers No. 1, Heilperin & Liebman; SW. ¼ NE. ¼ SW. ¼ sec. 31, T. 21 N., R. 15 W., on Pine Island. A 75-barrel well at 1,400 feet (?). Deepened and producing 20 barrels February, 1908.

Producers No. 2, Heilperin & Liebman; NE. ¼ SW. ¼ NE. ¼ SW. ¼ sec. 31, T. 21 N., R. 15 W., on Pine Island, 500 feet north of No. 1; reported as a producer at 1,400 feet. A blowout occurred at 2,154 feet. The well turned to a gasser in June, 1908.

Producers No. 1, J. W. Holt; SE. ¼ NE. ¼ SE. ¼ SE. ¼ sec. 2, T. 20 N., R. 16 W. Drilling December, 1908, to February, 1909. A dry hole.

Producers No. 1, Homestead; sec. 12, T. 20 N., R. 16 W. Drilling February to May, 1908. A 100-barrel well.

Producers No. 2, Homestead; S. ½ SW. ¼ SE. ¼ SE. ¼ sec. 12, T. 20 N., R. 16 W. Began drilling September, 1908. Twisted off and abandoned.

Producers No. 3, Homestead; SW. ¼ SE. ¼ SE. ¼ sec. 12, T. 20 N., R. 16 W. Began drilling November, 1908, with the rig formerly used in drilling No. 2. Completed January 6, 1909. A 70-barrel well.

Producers No. 1, Lane. Drilling June to September, 1908. A 400-barrel well.

Producers No. 2, Lane; NW. ¼ NE. ¼ NW. ¼ sec. 18, T. 20 N., R. 15 W. Drilling June to October, 1908. A 300-barrel well. This well has been often reported to be making from 2,000 to 3,000 barrels and probably is good for 500 barrels.

Producers No. 3, Lane; SW. ¼ SE. ¼ NE. ¼ NW. ¼ sec. 18, T. 20 N., R. 15 W. Began drilling December, 1908.

Producers No. 4, Lane; SW. ¼ SW. ¼ NE. ¼ NW. ¼ sec. 18, T. 20 N., R. 15 W. Began drilling December, 1908.

Producers No. 1, Leonard; NW. ¼ NE. ¼ NW. ¼ NW. ¼ sec. 6, T. 20 N., R. 15 W., on Pine Island. Began drilling February, 1907. A 9,000,000-foot gasser at 2,128 feet, April, 1907.

Producers No. 1, J. Milam; SW. ¼ sec. 6, T. 19 N., R. 15 W. Began drilling February, 1909.

Producers No. 1, Murray; NW. ¼ NE. ¼ SE. ¼ sec. 12, T. 20 N., R. 16 W. Drilling October, 1907, to January, 1908. A 100-barrel well.

Producers No. 2, Murray; NE. ¼ NE. ¼ NE. ¼ SE. ¼ sec. 12, T. 20 N., R. 16 W. Drilling July, 1908, to February 6, 1909; a gasser.

Producers No. 1, Murray, Colquitt & Hardy; NW. ¼ NW. ¼ sec. 18, T. 20 N., R. 15 W. Drilling September to December, 1908. A 125-barrel well.

Producers No. 1, Richardson; NE. ¼ NW. ¼ NW. ¼ sec. 12, T. 20 N., R. 16 W. Drilling May to August, 20, 1908. A 50-barrel well.

Producers No. 1, Ruddersdorf; NE. ¼ NE. ¼ NW. ¼ sec. 11, T. 20 N., R. 16 W. Began drilling June, 1908. Shut down since January, 1909. Well was never completed.

Reliance No. 1; SE. ¼ NW. ¼ NW. ¼ NW. ¼ sec. 7, T. 20 N., R. 15 W. Formerly called Richardson No. 1 on the R. L. Pitts tract. Began drilling January, 1907. Was a gasser from October to December, 1907, from the 2,200-foot stratum. A blowout occurred and at present the well is a salt-water blower.

Reliance No. 2; NW. ¼ NW. ¼ sec. 7, T. 20 N., R. 15 W. Drilling November 17, 1907, to April 27, 1908. After bailing, while the 2½-inch wash pipe was being withdrawn, the well came in as a 25,000,000-foot gasser. In the confusion the 2½-inch pipe fell into the hole. All of it was got out but the last five joints. When

bailed in again it came in as a 25-barrel well and a 15,000,000 to 20,000,000 foot gasser. In a few days the gas decreased and the oil increased in volume, and on June 1, 1908, the well was yielding 12,000,000 to 15,000,000 cubic feet of gas and 175 barrels of oil. It is still a good producer.

Reliance No. 3, Pitts; SW. ¼ NE. ¼ SW. ¼ NW. ¼ sec. 7, T. 20 N., R. 15 W. Drilling December, 1908, to February, 1909; 75 barrels.

Richardson No. 1, Pitts. See Reliance No. 1.

Richardson No. 2, Pitts. See Reliance No. 2.

D. C. Richardson No. 3; SW. ¼ SE. ¼ NE. ¼ NW. ¼ sec. 32, T. 20 N., R. 15 W., on Pine Island, 600 feet northwest of Texla No. 1. Shale and sand at 1,820 feet; at 2,085 feet a blowout occurred, and on May 19, 1907, hole fell in 250 feet. At present the well is a salt-water blower with a depth of about 1,750 feet.

Richardson No. 4; SW. ¼ NE. ¼ NW. ¼ sec. 32, T. 20 N., R. 15 W. Shale and sand with oil at 2,068 feet. A 300-barrel well, November, 1907.

Richardson No. 5; SE. ¼ SE. ¼ NE. ¼ NW. ¼ sec. 32, T. 20 N., R. 15 W. Completed October 25, 1908. A 3,900-barrel well. On October 27, 1908, it went to mud and sand, and then stopped producing.

Richardson No. 6; SW. ¼ SW. ¼ NE. ¼ NW. ¼ sec. 32, T. 20 N., R. 15 W. A derrick only on Pine Island.

Richardson No. 1, Guy; NE. ¼ sec. 32, T. 20 N., R. 15 W. Drilling began January, 1909.

Richardson No. 1, Nunnelley & Richardson; SE. ¼ SE. ¼ sec. 25, T. 21 N., R. 16 W. Began drilling December, 1908.

Richardson No. 1, Richardson; SE. ¼ NW. ¼ SW. ¼ SW. ¼ sec. 1, T. 20 N., R. 16 W. Began drilling December, 1908. A dry hole January, 1909. Shot with nitroglycerine without effect.

Rogers No. 1, Rogers, at Lewis; sec. 24, T. 21 N., R. 16 W. At 2,000 feet gas began to escape through cracks in the ground and finally derrick and all fell in. Estimated capacity 40,000,000 cubic feet of gas in August, 1908. This well became a salt-water blower, but was successfully killed by Brown Brothers, the drillers. In December, 1908, operations were commenced to go deeper.

Rogers No. 2, Rogers, at Lewis; sec. 24, T. 21 N., R. 16 W. Drilling July to September 6, 1908. A big gasser (40,000,000 cubic feet) at 1,035 feet.

Rogers No. 3, Rogers, at Lewis; SW. ¼ sec. 24, T. 21 N., R. 16 W. Began drilling December, 1908.

Savage Brothers & Morricell. See Caddo Lake Oil and Pipe Line Company.

Savage & Richardson No. 1; One-fourth mile north of Savage Brothers & Morricell well, in the northeast corner of Caddo town site. A 38-foot oil sand was struck at 2,280 feet; the oil was of 27° gravity Baumé. The well was pumped at the rate of 40 barrels and turned to salt water, November 18, 1906.

Savage & Richardson No. 2; 500 feet northwest of Producers No. 1, Heilperin & Liebman, November 18, 1906.

Savage No. 2; NW. ¼ NW. ¼ sec. 1, T. 20 N., R. 16 W. Estimated at 2,200 feet, June 5, 1907.

School No. 1, McGuire; SW. ¼ SW. ¼ NW. ¼ SW. ¼ sec. 16, T. 20 N., R. 15 W. A 20,000,000-foot gasser at 805 feet, June 19, 1907.

School No. 2, McGuire; SE. ¼ SE. ¼ SW. ¼ NW. ¼ sec. 16, T. 20 N., R. 15 W. A 20,000,000-foot gasser at 825 feet, August 19, 1907.

Shreveport Petroleum Company No. 1; 1,500 feet northwest of the center of sec. 1, near Savage No. 2. Oil was found at 2,200 feet in June, 1907.

Staiti No. 1; SW. ¼ sec. 31, T. 20 N., R. 15 W. Mooringsport, on the Wrad tract. Began drilling February, 1909.

St. Louis and Southwestern Oil Company, near Mooringsport. Twisted off at 800 feet, January, 1906.

St. Louis and Pipe Line Company; south of Mooringsport. Drilled to 900 feet and shut down.

Texla No. 1; NW. ¼ NE. ¼ SW. ¼ NW. ¼ sec. 32, T. 21 N., R. 15 W., on Pine Island. The well that opened this district. A 275-barrel oil well plus 20 per cent salt water, December, 1906. When slightly deepened the well flowed by head 150 to 200 barrels of 20° gravity Baumé oil, The well was deepened to 2,264 feet and developed salt water. The casing was pulled August, 1907.

Texla No. 2; NW. ¼ SW. ¼ NE. ¼ sec. 32, T. 21 N., R. 15 W., on Pine Island, 300 feet of No. 1. Abandoned at 2,300 feet, June 5, 1907, because the well developed salt water. The casing was pulled and the hole abandoned.

Texla No. 3; NE. ¼ SE. ¼ NW. ¼ sec. 32, T. 21 N., R. 15 W., on Pine Island. Drilling April to August 20, 1908. Yield 300 barrels net, with some salt water.

Thompson No. 1. See McCormick No. 2.

Trees & Benedum No. 1. See Benedum & Trees No. 1.

Trees No. 1, Dixon. Drilling August to November 6, 1908. A dry hole.

Trees No. 2, Dixon. Shut down through June and July, 1908, because of high water.

Trees No. 1, S. A. Guy. Derrick only.

Trees No. 1, Heilperin & Leibman; NE. ¼ NE. ¼ NW. ¼ sec. 32, T. 21 N., R. 15 W., on Pine Island. Drilling June to November 6, 1908. A dry hole.

Trees No. 3, Ruddersdorf; SE. ¼ SE. ¼ NE. ¼ NW. ¼ sec. 11, T. 20 N., R. 15 W. Derrick only.

J. C. Trees Oil Company No. 1; NW. ¼ sec. 27, T. 21 N., R. 16 W., on the W. P. Stiles tract west of Lewis station. Brown Brothers, drillers. Completed December 6, 1908. Yield 50 barrels of oil with a large amount of gas at 1,060 feet, January 20, 1909. The hole was deepened and by pumping with a standard rig 300 barrels of oil and 300 barrels of water were produced daily. In February, 1909, the daily capacity was stated to be 125 barrels. This well is the farthest west in the field.

Vivian Oil Company No. 1, Childs. Owned by the Dawes Company. Drilling November to December 18, 1908. A 75-barrel well with a small amount of water.

Vivian Oil Company No. 1, Edwards. Owned by the Dawes Company. Drilling August to September, 1908. A 25-barrel well.

Below are given some logs of representative wells in the Caddo field.

Log of Filer well No. 1.

[Received from Mr. Plumb.]

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Clay	75	75	Gumbo	29	1,069
Sand	5	80	Do	51	1,120
Dark clay	20	100	Shale	80	1,200
Rock	4	104	Lime, soft	100	1,300
Clay	11	115	Lime, hard	140	1,440
Rock	3	118	Rock	10	1,450
Shale	57	175	Lime, soft	80	1,530
Rock	2	177	Rock	10	1,540
Shale	148	325	Lime, soft	25	1,565
Rock	3	328	Shale	115	1,680
Shale	172	500	Gumbo	80	1,760
Rock	4	504	Shale, hard	115	1,875
Gumbo	121	625	Rock	5	1,880
Rock	5	630	Shale	110	1,990
Gumbo	50	680	Rock	8	1,998
Shale, hard	20	700	Shale	52	2,050
Shale, soft; some gas	20	720	Rock	10	2,060
Shale and gumbo	90	810	Shale	75	2,135
Rock	80	890	Rock	5	2,140
Shale, hard	60	950	Shale	100	2,240
Gumbo	40	990	Good oil sand	12	2,252
Shale	50	1,040			

Log of Gulf Refining Company's Hostetter well No. 1.

[Received from B. G. Dawes.]

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Clay and shale	29	29	Light lime rock	13	1,173
Hard, dark sand rock	2	31	Gumbo and blue shale	148	1,320
Light gumbo and shale	74	105	Hard, white lime rock and broken shale	210	1,530
Dark lime rock	3	108	Light gumbo, mixed with kaolin and white shale	115	1,645
Light gumbo	15	123	Brown shale, mixed with pyrite	2	1,647
Sand, rock, and shell	1	124	Brown shale	14	1,661
Blue shale	176	300	Brown shale and pyrite	3	1,664
Sand rock, shells, and shale	10	310	Gumbo, turning to shale	59	1,723
Blue shale and light gumbo	338	648	Hard brown shale	19	1,742
Brown shale; much gas	27	675	Coarse brown packed sand	8	1,750
Shale and gumbo	131	806	Light brittle gumbo	30	1,780
Soft sand rock; gas	2	808	Coarse brown packed sand	6	1,786
Brown sandy shale	7	815	Light gumbo and blue shale	44	1,830
Hard brown shale, to top of Nacatoch or "Caddo gas" sand (Well bailed here, showing a capacity of about 2,500,000 cubic feet of gas per day, but salt water flooded the hole at once.)	5	820	Coarse brown packed sand, almost sandstone	10	1,840
			Stiff blue shale	68	1,908
			Brown packed sand	7	1,915
			Blue shale, turning brown	89	2,004
Gas sand	8	828	Stiff blue shale	96	2,100
Hard brown shale	32	860	Light-brown shale	105	2,205
Sand rock, with gas	2	862	Light-colored gritty sandstone, with gas and oil	4	2,209
Hard brown shale, soft at base	38	900			
Light gumbo, mixed with white shale	258	1,158			

Log of McCormick's Shreveport brickyard well.

[Received from W. McCormick.]

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Gray clay	20	20	Gumbo (pyrite in the last few days)	160	960
Lignite	4	24	Rock	2	962
Gray shale	60	84	Shale	138	1,100
Shale	16	100	White rock, with shale mixed	500	1,600
Shale and pipe clay	80	180	Clay and gumbo	200	1,800
Gray shale	120	300	Sand rock at	.....	1,800
Brown shale	100	400	Rock and shale	100	1,900
Dark shale	200	600	Gumbo and shale	100	2,000
Shale and rock	200	800			

Log of B. G. Dawes and Gulf Refining Company's Posey well No. 1, Vivian, La.

[Received from B. G. Dawes.]

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Clay and yellow sand	197	197	Gumbo	21	696
Blue sand	53	250	Soft rock and sand	1	697
Shale	8	258	Gumbo	29	726
Rock	3	261	Do	141	867
Water sand, blue and yellow	209	470	Bowlders	1	868
Lime rock	1	471	Gumbo	15	883
Rock	18	489	Bowlders	2	885
Sand	9	498	Gumbo	14	898
Bowlders	40	538	Bowlders	1	899
Bowlders, with soft places between	12	550	Black gumbo	13	912
			Black shale	20	932
Rock	5	555	Shale	64	996
Rocks with soft places between	4	559	Rock with gas	2	998
Rock	6	565	Rock with pyrite	7	1,005
Rock and sands	35	600	Gumbo	1	1,006
Rock with soft streaks	75	675	Rock	1	1,007

Log of B. G. Dawes and Gulf Refining Company's Posey well No. 1, Vivian, La.—Continued.

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Blue shale with hard streaks	11	1,018	Gray rock	1	1,136
Bowlders	2	1,020	Blue shale	29	1,165
Shale	5	1,025	Rock sand	6	1,171
Bowlders	2	1,027	Blue shale	6	1,177
Blue shale	4	1,031	Rock with soft streaks	48	1,225
Hard rock	1	1,032	Shale	63	1,287
Dark gumbo	12	1,044	Gray rock with sand	2	1,289
Rock	2	1,046	White shale	40	1,329
Gumbo	8	1,054	Sand rock	5	1,334
Blue shale	48	1,102	Blue shale	22	1,356
Gumbo	6	1,108	Gray rock, hard	4	1,360
Gray rock with sand	5	1,113	Gumbo	37	1,397
Bastard shale	11	1,124	Bowlder	1	1,398
Gray rock with sand	1	1,125	Tough blue gumbo	9	1,407
Dark shale	10	1,135			

Log of B. G. Dawes and Gulf Refining Company's Heilperin well No. 1, Vivian, La.

[Received from B. G. Dawes.]

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Surface clay	7	7	Black gumbo	8	332
White sand	21	28	Gray hard rock	4	336
Quicksand	12	40	Blue shale	6	342
Gray sand	10	50	Gray rock	1	343
Water gravel	6	56	Bastard gumbo	12	355
Dark gumbo	5	61	Gray rock	1	356
Dark water sand	24	85	Dark gumbo	20	376
Hard packed sand	17	102	Dark shale	24	400
Water sand	53	155	Gumbo	14	414
Hard rock	5	160	Shale	10	424
Blue sand	21	181	Tough gumbo	277	701
Gray rock	2	183	Shale	6	707
Dark sand	4	187	Gumbo	131	838
Soft rock	1	188	Shale with oil	22	860
Sand	4	192	Tough gumbo	8	868
Sandy rock	1	193	Blue shale	12	880
Blue sand	51	244	Dark gumbo	62	942
Rock	2	246	Gypsum, kaolin, shale, or limestone; show of oil	18	960
Rock, gray and hard	3	249	Blue gumbo	41	1,001
Blue sand	18	267	Sandy shale	9	1,010
Bastard gumbo	13	280	Black gumbo	52	1,062
Blue shale	18	298	Rock	1	1,063
Tough dark gumbo	13	311	Rock with gas	4	1,067
Bowlders	2	313	Gas sand	30	1,097
Dark shale	11	324			

Log of Heywood No. 1 well, fee.

[Received from H. H. Jones, driller.]

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Clay, variegated, soft	80	80	Rough, limelike rock with gas	10	830
Bluish sand, water bearing	10	90	Dry sand rock, with gas and oil smell	34	864
Clay, dark, soft	50	140	Rough lime rock	5	869
Hard dark rock	2	142	Dry sand rock, with oil and gas	61	930
Dark soft clay	8	150	Hard rock	2	932
Hard dark rock	3	153	Sand rock; gas from 820 to 940 feet	8	940
Gumbo and shale, dark, full of bowlders	447	600	Shales, with streaks of gumbo	39	979
Gumbo and dark shales	110	710	Rock	2	981
Shale, dark, with persistent gas	10	720	Shale and gumbo with hard streaks	163	1,144
Gumbo, dark and very tough	100	820			

Log of Heywood No. 1 well, fee—Continued.

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Chalk, white and soft	11	1,155	Shale and dark gumbo	118	2,130
Dark gumbo	53	1,208	Rocky, with pyrite and shells	13	2,143
Dark shale	21	1,229	Red and dark shale	37	2,180
Dark gumbo	43	1,272	Blue shale	16	2,196
Chalk, clayey to white; oil from 1,470 to 1,520 feet	328	1,600	Rock	2	2,198
Black rocky gumbo	100	1,700	Soft rock	2	2,200
Black sandy gumbo	80	1,780	Hard shale	24	2,224
Rock with some pyrite	5	1,785	Oil shale	3	2,227
Coarse variegated sand, with oil smell	13	1,798	Hard shale	5	2,232
Rock, in streaks sandy, and some pyrite	62	1,972	Oil shale	4	2,236
Gumbo and shale	112	1,972	Hard shale	3	2,239
Tough gumbo	40	2,012	Rock	3	2,242
			Brittle rock	10	2,252
			Shale	5	2,257

Log of Blanchard No. 1 well, Graham.

[Received from A. G. Curtis.]

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Red and yellow clay	50	50	Shale and gumbo mixed	200	1,530
Water sand	25	75	White rock or shale	218	1,748
Gray packed sand	50	125	Gumbo	132	1,800
Gumbo and shell rock	30	155	Shale with streaks of shell rock	20	1,900
Blue shale	29	184	Shale	63	1,963
Shale and iron concretions	56	240	Hard sand rock	5	1,968
Shale and gumbo	81	321	Sand rock with shells	90	2,058
Shale rock and gumbo	80	401	Very sticky gumbo	32	2,090
Shell rock	29	430	Blue shale	92	2,182
Shell and gumbo	47	477	Shells of sand rock, with oil	11	2,193
Shale	98	575	Blue shale	87	2,280
Rock	4	579	Hard gumbo, shelly	11	2,291
Shell	10	589	Hard rock	1	2,292
Shell rock	89	678	Blue shale and white clay, small shells	12	2,304
Shale and gumbo; shell rock at 684 feet	6	684	Shale, with small shells and salt water	11	2,315
Blue shale; first gas	16	700	Shale with hard streaks	26	2,341
Blue shale, with oil and gas	50	837	Brown and blue shale	4	2,345
Blue shale	87	837	Sand rock	5	2,350
Rock	3	840	Red and blue shale	20	2,370
Tough gumbo	95	935	Sand rock	10	2,380
Shale and gumbo	95	1,030	Red and blue shale	30	2,410
Hard rock	8	1,389	Shale; very thin rock at 2,425 feet	15	2,425
Hard shale with shell rock	31	1,006	Red and blue shale	5	2,430
Rock	106	1,175	Sand rock breaks	10	2,440
Solid gumbo	155	1,330			

Log of Blanchard No. 1 well, Surrey.

[Record received from A. G. Curtis.]

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Sand and red clay	63	63	Shale, gumbo, rocks	40	460
Shales and rocks	117	180	Shale and rock	115	575
Gumbo and rocks	30	210	Shale	95	670
Gumbo and shale	30	240	Rock, shelly	15	685
Shale	20	260	Shale	20	705
Shale and gumbo	80	340	Gumbo	30	735
Shale	60	400	Shale	45	780
Rock at		400	Gumbo	10	790
Shale	20	420	Shale	12	802

Log of Blanchard No. 1 well, Surrey—Continued.

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Shale	12	802	Gumbo	30	1,710
Rock	5	807	Shale	40	1,750
Gas rock	5	812	Gumbo and shale	25	1,775
Shale	6	818	Sand rock	60	1,835
Shelly; gas from 820 to 845 feet	27	845	Gumbo, with some gas	90	1,925
Rock	1	846	Gumbo	25	1,950
Shale	18	864	Sandy shale with hard streaks	25	1,975
Sandy shale rock	2	866	Hard sandy shale	25	2,000
Shale	54	920	Hard sandy shale, with streaks of gumbo	100	2,100
Sandy shale	10	930	Shale	6	2,106
Gumbo	35	965	Gumbo	17	2,123
Hard shale	25	990	Blue shale	12	2,135
Gumbo	25	1,015	Gray shale (white)	9	2,144
Shale	20	1,035	Brown shale	4	2,148
Gumbo, tough	40	1,075	Blue shale; gas rock last 6 feet	17	2,165
Gumbo and shale	105	1,180	Blue shale, hard, white	6	2,184
Shale	20	1,200	Blue shale, gas rock	16	2,200
Gumbo and shale, turning white at base	60	1,260	Soft brown shale	15	2,215
White shale, shelly, with tough streaks and show of oil and gas	80	1,340	Hard shale	5	2,220
White formation	80	1,420	White shale	5	2,225
White tough formation	50	1,470	Dark shale	5	2,230
Shale and shelly	80	1,550	Red, brown, and blue shale	13	2,243
Gumbo and shale; some gas	60	1,610	Blue shale, sandy	7	2,250
Gumbo	30	1,640	Gray shale	4	2,254
Gumbo and shale	40	1,680	Brown shale	1	2,255
			Oil-bearing beds	2½	2,257½

Log of Caddo Gas and Oil Company's Hostetter No. 1 gas well.

[Received from B. G. Dawes.]

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Brown and yellow clay	15	15	Soft sand rock shell	2	377
Gumbo and hard blue shale	11	26	Gumbo	45	422
Gray lime shale	2	28	Hard sand rock	3	425
Soft blue shale	24	52	Hard tough gumbo	65	490
Gray hard lime shell	1	53	Soft sand rock	3	493
Gumbo and soft blue shale	27	80	Gumbo and light-blue shale	144	637
Gray hard lime shell	2	82	Kaolin, white shale, or gypsum	11	648
Soft blue shale	43	125	Soft sand rock (2,500,000 to 3,000,000 foot gasser)	9	657
Gray hard lime shell	3	128	Kaolin or white shale, sandy at base	10	667
Gumbo, hard and stiff	32	160	Hard stiff gumbo	91	758
Rock shell, sandy and soft	2	162	Hard sand rock	3	761
Gumbo, blue and hard	58	220	Gumbo with sandy shale at base	16	777
Sand rock, with gas	2	222	Hard sandy shale	3	780
Stiff blue shale	58	280	Caddo gas sand, rather hard, light colored, very sharp and gritty, with much gas	3½	783½
Soft sand rock	3	283			
Sandy brown shale, with gas	27	310			
Hard sand rock	1	311			
Blue hard gumbo	64	375			

Log of Broussard No. 1 well.

[Received from B. G. Dawes.]

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Joint and red clays	65	65	Bastard lime rock, with sandy shale in places; gas	95	1,893
Water sand	7	72	Light shale	15	1,908
Rock shell	2	74	Big gumbo beads	62	1,970
Blue shale and gumbo, with rock shells	316	390	Blue shale, hard at base	85	2,055
Hard dark shale, with gas	15	405	Kaolin shale to light shale, hard	15	2,070
Blue shale and brittle gumbo, with kaolin shale at base	342	747	Hard kaolin shale	12	2,082
Caddo gas sand, broken with shale; gas	98	845	Kaolin and sandy shale, with gas	18	2,100
Hard shale and gumbo	15	860	Broken hard sand rock with sandy shale layers	12	2,121
Broken formation with coarse salt-water gravel at base	25	885	Dark sandy shale, with oil and gas	18	2,130
Blue shale, hard, with rock shells and gumbo	120	1,005	Loose soft blue shale	5	2,135
Kaolin shale beads, then blue shale	170	1,175	Hard rock	1	2,136
Kaolin shales, with some blue shale and sand; gas and oil from 1,360 to 1,520 feet	360	1,535	Sandy shale, with kaolin and a little pyrite, hard at base; gas and oil	38	2,174
Bastard lime and kaolin shale	85	1,620	Sandy shale, with oil	23	2,197
Blue hard shale	30	1,650	Fine sand, with oil	3	2,200
Blue shale and gumbo	50	1,700	Sandy shale, red at base	3	2,203
Blue shale turning to soft brown shale	98	1,798	Red shale, turning light	15	2,218
			Mixed blue and red shale	6	2,224
			Blue shale, sandy at base	7	2,235
			Sandy shale, with oil	2	2,237
			Mixed oil sand and dark shale, hard; good oil showing	2	2,239

Log of well northwest of Plaindealing, La.

[Received from G. E. Gilmer.]

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Red clay	40	40	Salt-water sand, with gas	110	2,097
Lignite	2	42	Sandy shale, with oil	106	2,203
Yellow water sand	10	52	Rotten shells	20	2,223
Clay	8	60	Rotten shale with shells	260	2,483
White water sand (artesian)	140	200	White chalky rock	45	2,528
Sandstone	2	202	Shale	4	2,532
Black packed sand	493	695	White hard chalky rock	4	2,536
Shale	300	995	Rotten shale with shells	114	2,650
Rotten shale and shells	200	1,195	Shells	10	2,660
Tough blue gumbo	420	1,615	Rotten shale with shells	17	2,677
White chalky rock, hard, with gas	8	1,623	Rock	29	2,706
Lime rock, with beds of sandy shale	364	1,987			

Gas found at 390, 1,220, 1,628, 2,000, and 2,700 feet. Oil found at 1,220, 1,630, 2,150, and 2,700 feet.

Log of Caddo Gas and Oil Company's Noel well No. 2, Mooringsport.

[Received from S. S. Hunter.]

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Red clay	20	20	Gumbo and shale	562	1,500
Water sand	15	35	White sand	45	1,545
Blue sand	35	85	Rock	1	1,546
Rock	1	86	Gumbo	57	1,603
Blue shale	19	105	Rock	8	1,611
Rock	1	106	Gumbo and shale	107	1,718
Shale	69	175	Gumbo, hard	217	1,935
Rock	1	176	Rock	1	1,936
Blue shale	345	521	Salt-water sand	14	1,950
Rock	1	522	Gumbo and shale	71	2,021
Gumbo	389	911	Rock	2	2,023
Gas sand	19	930	Salt-water sand, with gas	12	2,035
Salt-water sand	8	938	White shale	429	2,464

ALTITUDES IN THE CADDO FIELD.

In determining the stratigraphic relations of the oil and gas horizons in any region it is of the utmost importance to know the relative elevations at the mouths of the wells in that region. With that end in view the following dictionary of altitudes has been compiled. From any bench mark named in the list below it will be a comparatively easy task to run a line of levels to a near-by well or to estimate with a fair degree of accuracy the elevation of any desired point in the field. During the fall of 1908 the accompanying partial list of elevations of the wells in the Caddo oil field was obtained, with the assistance of Mr. James McDonough, of Mooringsport, La. The list of elevations of bench marks is taken from the Louisiana Geological Survey's report for 1905 (Bulletin No. 1), part 2, A dictionary of altitudes in northern Louisiana, by A. C. Veatch.

Bench marks in the Caddo field.

[NOTE.—The elevations given below vary greatly in accuracy, and they have been divided roughly into the following classes: P, Precise levels of the United States Engineer Corps, United States Coast and Geodetic Survey, and United States Geological Survey. E, Engineers' levels—levels run by United States engineers, but not classed by them as precise; in general, more accurate than railroad levels. R, Railroad levels. As there is no economic need for extreme precision in elevations in railroad construction, these levels, as a rule, may be regarded as only approximate. The error, however, is relatively small.]

Location.	Authority.[a]	Elevation.
		Feet.
Arkansas-Louisiana state line; rail end bench, 9 feet west of milepost 516	K. C. S.	P 228.80
Blanchard, 4 miles north of; rail end bench, 15 feet west of first telegraph pole north of milepost 544.	K. C. S.	P 285.33
—— 3.5 miles north of; rail end bench, 60 feet southwest of second telegraph pole south of milepost 544.5.	K. C. S.	P 305.84
—— 3 miles north of; rail end bench, 60 feet southwest of milepost 545	K. C. S.	P 292.60
—— 2.5 miles north of; rail end bench, 70 feet southwest of milepost 545.5	K. C. S.	P 286.57
—— 2 miles north of; rail end bench, 15 feet northwest of first telegraph pole south of milepost 546.	K. C. S.	P 283.77
—— 1.5 miles north of; rail end bench, 12 feet west of milepost 546.5	K. C. S.	P 270.17
—— 1 mile north of; rail end bench, 12 feet west of milepost 547	K. C. S.	P 244
—— 0.5 mile north of; rail end bench, 10 feet west of milepost 547.5	K. C. S.	P 226.43
—— rail end bench, 12 feet west of milepost 548	K. C. S.	P 227.91
—— depot; top of rail, at center	K. C. S.	R 227
—— 0.5 mile south of; rail end bench, 30 feet northwest of milepost 548.5	K. C. S.	P 223.83
—— 1 mile south of; rail end bench, 25 feet west of milepost 549	K. C. S.	P 213.19
—— 1.5 miles south of; rail end bench, 25 feet northwest of milepost 549.5	K. C. S.	P 211.65
—— 2 miles south of; rail end bench, 20 feet west of milepost 550	K. C. S.	P 203.96
—— 2.5 miles south of; rail end bench, 40 feet north of first telegraph pole north of milepost 550.5.	K. C. S.	P 201.50
—— 3 miles south of; rail end bench, 30 feet southwest of third telegraph pole south of milepost 551.	K. C. S.	P 187.84
—— 3.5 miles south of; rail end bench, 95 feet south of milepost 551.5	K. C. S.	P 186.36
—— 4 miles south of; rail end bench, 20 feet southwest of milepost 552	K. C. S.	P 195.15
—— 4.5 miles south of; rail end bench, 15 feet northwest of milepost 552.5	K. C. S.	P 195.86
—— 5 miles north of; rail end bench, 75 feet north of first telegraph pole north of milepost 553.	K. C. S.	P 191.06
—— 5.5 miles south of; rail end bench, 85 feet north of milepost 553.5	K. C. S.	P 186.56
—— 6 miles south of; rail end bench, 25 feet northwest of milepost 554	K. C. S.	P 183.68
Caddo Lake, Kansas City Southern Ry. crossing; bridge	K. C. S.	R 199
—— high water	K. C. S.	R 190
—— bed	K. C. S.	R 170
Cross Lake, Kansas City Southern Ry. bridge; top of rail	K. C. S.	R 182
—— high water	K. C. S.	R 178
—— bed of lake	K. C. S.	R 160
—— bed of channel	K. C. S.	R 155
Ferry Lake, Jeters Landing; pipestone bench near northeast corner of deserted cabin.	U. S. E.	P 197.246
—— Mooringsport; pipestone bench on north side of C. S. Croon's store	U. S. E.	P 183.135
Hendersons' Mills, Caddo Lake; pipestone bench near northwest corner of deserted house.	U. S. E.	P 244.352

[a] K. C. S., Kansas City Southern Railway; U. S. E., United States Engineers; V., S. & P., Vicksburg, Shreveport and Pacific Railway; H. & S., Houston and Shreveport Railroad; T. & P., Texas and Pacific Railway; M., K. & T., Missouri, Kansas and Texas Railway.

Bench marks in the Caddo field—Continued.

Location.	Authority.	Elevation.
		Feet.
Jeters Landing, Ferry Lake; pipestone bench near northeast corner of deserted cabin.	U. S. E.....	P 197.246
Lewis, 1.4 miles north of; rail end bench, at milepost 530.5.....	K. C. S.....	P 208.91
—— 0.9 mile north of; rail end bench, 8 feet west of milepost 531.....	K. C. S.....	P 205.93
—— 0.4 mile north of; rail end bench, 15 feet northwest of milepost 531.5.....	K. C. S.....	P 201.61
—— 0.1 mile south of; rail end bench, at milepost 532.....	K. C. S.....	P 193.87
—— 0.6 mile south of; rail end bench, 40 feet north of milepost 532.5.....	K. C. S.....	P 187.74
—— 1.1 miles south of; rail end bench, 15 feet west of milepost 533.....	K. C. S.....	P 189.49
Mooringsport, 2.8 miles north of; rail end bench, 70 feet north of first telegraph pole south of milepost 536.5.	K. C. S.....	P 202.55
—— 2.3 miles north of; rail end bench, 15 feet west of first telegraph pole north of milepost 537.	K. C. S.....	P 195.05
—— 1.8 miles north of; rail end bench, 50 feet southwest of second telegraph pole south of milepost 537.5.	K. C. S.....	P 209.87
—— 1.3 miles north of; rail end bench, 15 feet west of milepost 538.....	K. C. S.....	P 192.73
—— 0.8 mile north of; rail end bench, 7 feet west of first telegraph pole north of milepost 538.5.	K. C. S.....	P 200.12
—— 0.3 mile north of; rail end bench, 15 feet west of first telegraph pole south of bridge "B 539."	K. C. S.....	P 201.32
—— pipestone bench on north side of C. S. Croon's store.....	U. S. E.....	P 183.135
—— depot, top of rail at center.....	K. C. S.....	R 197
—— 0.2 mile south of; bench mark on northeast corner of north pedestal, east pair, water tank.	K. C. S.....	P 194.33
—— 0.7 mile south of; rail end bench, 45 feet left of track opposite milepost 540..	K. C. S.....	P 206.05
—— 1.2 miles south of; rail end bench, 20 feet west of first telegraph pole north of milepost 540.5.	K. C. S.....	P 195.06
—— 1.7 miles south of; rail end bench, 20 feet west of milepost 541.....	K. C. S.....	P 190.87
—— 2.2 miles south of; rail end bench, 25 feet west of milepost 541.5.....	K. C. S.....	P. 198.23
—— 2.7 miles south of; rail end bench, 20 feet west of milepost 542.....	K. C. S.....	P 207.53
—— 3.2 miles south of; rail end bench, 15 feet west of milepost 542.5.....	K. C. S.....	P 238.50
—— 3.7 miles south of; rail end bench, 15 feet west of milepost 543.....	K. C. S.....	P 261.90
—— 4.2 miles south of; rail end bench, 20 feet southwest of milepost 543.5.....	K. C. S.....	P 277.56
Myrtis, 0.8 mile north of; rail end bench, 15 feet north of fifth telegraph pole south of milepost 522.	K. C. S.....	P 215.86
—— 0.3 mile north of; rail end bench, 15 feet southwest of second telegraph pole north of milepost 522.5.	K. C. S.....	P 198.12
—— platform, top of rail, at south end.....	K. C. S.....	R 211
—— 0.2 mile south of; rail end bench, 10 feet west of milepost 523.....	K. C. S.....	P 207.78
—— 0.7 mile south of; rail end bench, 15 feet west of milepost 523.5.....	K. C. S.....	P 221.64
—— 1.2 miles south of; rail end bench, 75 feet north of milepost 524.....	K. C. S.....	P 212.14
—— 1.7 miles south of; rail end bench, 18 feet west of milepost 524.5.....	K. C. S.....	P 227.35
—— 2.2 miles south of; rail end bench, 17 feet west of milepost 525.....	K. C. S.....	P 234.50
Oil City, 1.6 miles north of; rail end bench, 45 feet northeast of milepost 533.5....	K. C. S.....	P 181.61
—— 1.1 miles north of; rail end bench, 12 feet west of milepost 534.....	K. C. S.....	P 190.72
—— 0.6 mile north of; rail end bench, 15 feet west of milepost 534.5.....	K. C. S.....	P 194.73
—— 0.1 mile north of; rail end bench, 15 feet west of milepost 535.....	K. C. S.....	P 196.42
—— 0.4 mile south of; rail end bench, 18 feet west of first telegraph pole north of milepost 535.5.	K. C. S.....	P 205.28
—— 0.9 mile south of; rail end bench, 60 feet north of milepost 536.....	K. C. S.....	P 206.15
Plaindealing; pipestone bench, 325 feet north of depot, 60 feet west of track.....	U. S. E.....	P 260.415
Roberta; root bench in red oak west of track, 100 feet south of wagon road crossing.	U. S. E.....	P 320.842
Shreveport, 4 miles north of; rail end bench, 15 feet west of milepost 555.....	K. C. S.....	P 163.41
—— 3.5 miles north of; rail end bench, 60 feet north of third telegraph pole south of milepost 555.5.	K. C. S.....	P 185.78
—— 3 miles north of; rail end bench, 45 feet left of track opposite milepost 556...	K. C. S.....	P 189.79
—— 2.5 miles north of; rail end bench, 85 feet north of third telegraph pole south of milepost 556.5.	K. C. S.....	P 208.34
—— 2 miles north of; rail end bench, 20 feet southeast of second telegraph pole south of milepost 557.	K. C. S.....	P 230.43
—— 1.5 miles north of; bench mark on 0.75 inch rod 1 foot west of west side of roundhouse.	K. C. S.....	P 249.124
—— rail end bench, 15 feet west of first telegraph pole north of south head block of Y.	K. C. S.....	P 219.51
—— rail end bench, 25 feet northwest of third telegraph pole south of milepost 559.	K. C. S.....	P 206.63
—— pipestone bench in yard of post-office.....	U. S. E.....	P 195.744
—— high water, 1892.....	U. S. E.....	E 176.70
—— zero, United States Engineers' gage.....	U. S. E.....	E 140.99
—— Vicksburg, Shreveport and Pacific Ry. bridge; west end, top of rail.....	V., S. & P..	R 189.3
—— "X" on lower course of top stones on south side of west abutment Vicksburg, Shreveport and Pacific Ry. bridge.	U. S. E.....	P 181.800
—— highest point in; Hicks street east of Fairfield street.....	(a)	276
—— Texas and Pacific Ry. crossing.....	H. & S.....	R 228.
—— Missouri, Kansas and Texas Ry. crossing; top of rail.....	K. C. S.....	R 238.9
—— Texas and Pacific Ry. crossing; top of rail.....	K. C. S.....	R 238.3
—— Houston and Shreveport R. R. freight station, top of rail, center of.....	H. & S.....	R 234
—— Houston and Shreveport R. R. crossing, grade.....	K. C. S.....	R 234
—— bench mark on southwest corner stone of sill door, men's waiting room at union depot.	K. C. S.....	P 208.61
—— bench mark on southwest corner of brick foundation on first bent, south end of coal chute track.	K. C. S.....	P 247.55

a Map of Shreveport showing sewer-pipe system, November, 1900.

Bench marks in the Caddo field—Continued.

Location.	Authority.	Elevation.
		Feet.
Shreveport, bench mark on corner curb, north side of Jordon street, 20 feet right of track.	K. C. S.....	P 243.86
—— junction, pipe under oak 68 feet right of track.....	T. & P.....	R 230.28
—— 0.5 mile south of; rail end bench, 12 feet west of milepost 559.5.....	K. C. S.....	P 202.64
—— 1 mile south of; rail end bench, 75 feet north of milepost 560.....	K. C. S.....	P 203.02
—— 1.5 miles south of; rail end bench, 25 feet northwest of milepost 560.5.....	K. C. S.....	P 214.88
—— 2 miles south of; rail end bench, 12 feet west of milepost 561.....	K. C. S.....	P 225.01
—— 2.5 miles south of; rail end bench, 25 feet west of milepost 561.5.....	K. C. S.....	P 210.52
—— 3 miles south of; rail end bench, 25 feet northwest of first telegraph pole north of milepost 562.	K. C. S.....	P 219.04
—— 3.5 miles south of; rail end bench, 25 feet west of milepost 562.5.....	K. C. S.....	P 206.17
—— 4 miles south of; rail end bench, 25 feet west of milepost 563.....	K. C. S.....	P 203.30
—— 4.5 miles south of; rail end bench, 25 feet northwest of milepost 563.5.....	K. C. S.....	P 202.67
Soda Lake, lower end of, right bank; pipestone bench at Albany Point in northeast corner of yard.	U. S. E.....	P 222.868
—— upper end of, right bank; pipestone bench near northwest corner of deserted house at Henderson Mills.	U. S. E.....	P 244.352
Texas-Louisiana line.....	M., K. & T..	R 261
Twelvemile Bayou, head of; right bank; pipestone bench at Albany Point in northeast corner of yard.	U. S. E.....	P 222.868
Vivian, 1.2 miles north of; rail end bench, 20 feet northwest of milepost 525.5....	K. C. S.....	P 224.35
—— 0.7 mile north of; rail end bench, 12 feet west of milepost 526.....	K. C. S.....	P 250.91
—— 0.2 mile north of; rail end bench, 65 feet south of first telegraph pole north of milepost 526.5.	K. C. S.....	P 246.28
—— depot, at center, top of rail.....	K. C. S.....	R 250.8
—— 0.3 mile south of; rail end bench, 12 feet west of milepost 527.....	K. C. S.....	P 251.36
—— 0.8 mile south of; rail end bench, 8 feet west of milepost 527.5.....	K. C. S.....	P 245.95
—— 1.3 miles south of; rail end bench, 10 feet southwest of second telegraph pole north of milepost 528.	K. C. S.....	P 247.10
—— 1.8 miles south of; rail end bench, 15 feet west of second telegraph pole north of milepost 528.5.	K. C. S.....	P 226.47
—— 2.3 miles south of; rail end bench, 20 feet west of milepost 529.....	K. C. S.....	P 215.93
—— 2.8 miles south of; rail end bench, 20 feet west of second telegraph pole north of milepost 529.5.	K. C. S.....	P 206.29
—— 3.3 miles south of, rail end bench, 45 feet north of milepost 530.....	K. C. S.....	P 206.63

Elevations of wells in the Caddo field.

[D. F., derrick floor; T. P., top of pipe; G. L., ground level. Elevations in feet.]

Caddo Gas and Oil Company, Hostetter No. 4.....D. F., 181.1; G. L., 178.9
Caddo Gas and Oil Company, Hostetter No. 3.....T. P., 181.4; G. L., 179.4
Gulf Refining Company, Hostetter No. 1..... T. P., 174.6
Gulf Refining Company, Hostetter No. 2..... D. F., 174.0
Caddo Gas and Oil Company, Hostetter No. 1..... G. L., 179
Caddo Gas and Oil Company, Gilbert No. 2 (oil)..... D. F., 182.9
Caddo Gas and Oil Company, Gilbert No. 1 (oil)..... D. F., 192.6; G. L., 189.6
Producers', Homestead No. 2..... D. F., 206
Blanchard No. 3..... D. F., 200.1
Producers', Homestead No. 1..... D. F., 210.3
Caddo Gas and Oil Company, Noel No. 1..... T. P. 221.1; G. L., 220.6
Caddo Gas and Oil Company, Noel No. 3..... T. P., 222.7; G. L., 220.2
Caddo Gas and Oil Company, Noel No. 2..... T. P., 260.8; G. L., 259.8
Blanchard No. 2..... T. P. 208.5; G. L., 207.2
Producers' No. 1, Murray..... D. F., 209.6
Blanchard No. 1..... D. F., 204.9
Producers', Caddo Oil and Mining Company No. 8..... D. F., 205
Blanchard No. 4..... D. F., 206.6
Savage No. 1, Savage Brothers & Morricell, Shreveport Petroleum Company No. 1, Townsite..... T. P., 202.4; D. F., 201.8
Caddo Gas and Oil Company, Offenhauser No. 4..... D. F., 204.2
Caddo Gas and Oil Company, Offenhauser No. 2..... D. F., 205.4
Big Four No. 1..... T. P., 205.6

Caddo Gas and Oil Company, Offenhauser No. 3..... T. P., 207.0; D. F., 206.0
Producers' No. 1..... D. F., 202.2
Big Four No. 2..... D. F., 203.3
Caddo Gas and Oil Company, Gilbert No. 1 (gas)..... G. L., 211.7
Caddo Gas and Oil Company, Gilbert No. 3 (gas)..... T. P., 217.1
Caddo Gas and Oil Company, Gilbert No. 4 (gas)..... G. L., 212.7
C. G. Dawes, Trustee No. 1..... G. L., 209
C. G. Dawes, Trustee No. 2..... D. F., 210.6
Broussard No. 1..... D. F., 181.9
Broussard No. 2..... D. F., 171.3
Reliance No. 2..... D. F., 208.4
Filer No. 1..... T. P., 215; D. F., 214
Filer No. 2..... D. F., 213.2
Caddo Gas and Oil Company, Gilbert No. 5 (Henning)..... T. P., 191.5
Producers' No. 1, Murray, Colquitt & Hardy..... D. F., 193.3
Producers' No. 2, Lane..... T. P., 199.2; D. F., 198.4
Evans No. 2, McGuire..... T. P., 221.9
Producers' No. 2, Murray..... D. F., 204
Caddo Gas and Oil Company, Smith No. 1..... T. P., 203.9
Caddo Gas and Oil Company, Smith No. 5..... T. P., 203.9
Producers' No. 1, T. M. Richardson..... T. P., 205.9; D. F., 203.2
Lillie No. 1..... T. P., 202.1; D. F., 201.6
Caddo Gas and Oil Company, Caddo Lake Oil and Pipe Line No. 1..... D. F., 201.9
Producers', Caddo Oil and Mining Company No. 7..... T. P., 208.8; D. F., 205.9
Evans No. 3, McGuire..... T. P., 220.1; D. F., 217.9
Producers', Black Bayou No. 2..... T. P., 215.1; D. F., 214.3
Producers', Black Bayou No. 1..... T. P., 210.6
Producers', Lane No. 1..... D. F., 205.6
Producers', Riddersdorf No. 1..... D. F., 204.1
Latex No. 1..... G. L., 194.5
Latex No. 2..... T. P., 198.6; D. F., 198.1
Heywood No. 1..... D. F., 198.1
Richardson No. 3 (Pine Island)..... T. P., 181.6
Richardson No. 4 (Pine Island)..... D. F., 181.0
Richardson No. 5 (Pine Island)..... D. F., 178.8
Richardson No. 6 (Pine Island)..... D. F., 181.4
Texla No. 1..... T. P., 179.6; D. F., 178.8
Texla No. 2..... G. L., 174.8
Texla No. 3..... T. P., 180.4; D. F., 179.5
Dixon's Oil and Pipe Line No. 1 (Pine Island)..... D. F., 179.9
Tree's No. 1, Heilperin & Liebman..... D. F., 178.2
McCormick No. 1, Croom..... D. F., 171.2
Broussard No. 1, Brown..... D. F., 216
Caddo Gas and Oil Company, Hiner No. 1, Vivian..... D. F., 246.2
B. G. Dawes and Gulf Refining Company, Posey No. 1, Vivian..... D. F., 213
B. G. Dawes and Gulf Refining Company, Heilperin No. 1, Vivian..... D. F., 285
Vivian Oil Company, Edwards No. 1..... D. F., 250.2

EOCENE HORIZONS.

The few notes given under Lincoln, Vernon, and Sabine parishes, page 32, include practically all that is known regarding oil and gas at Eocene horizons in Louisiana.

About the saline domes and along marginal benches of the Sabine uplift the basal Eocene beds are possible sources of oil and gas. Practically no systematic development has been carried on in beds of this series, but some haphazard drilling has been done, as will appear from the details of wells given on pages 32–33.

QUATERNARY HORIZONS.

INTRODUCTORY REMARKS.

Gas escapements are of common occurrence and wide geographic distribution in the Quaternary areas about the lower Mississippi embayment, especially in Terrebonne Parish. Plate XXII, *B*, shows a typical gas escapement on Lake Felicity in the southeastern portion of the parish. Twenty miles to the west are others, that are notable for size and activity; still others occur in the Montegut region, 10 miles to the north.

Such wide distribution of notable gas escapements naturally suggests that there are in these areas deeply buried, broad structural features tending to favor the accumulation of hydrocarbons in areas of considerable lateral extent—in other words, that here the Caddo conditions are repeated in a general way in younger beds. There may be an area of considerable extent under which the beds of a certain age are much nearer the surface than they are in surrounding areas; that is, there may be a Terrebonne uplift corresponding in a way to the Sabine uplift, already described.

Corroborative of this supposition are the irregularities noted in intensity and direction of terrestrial magnetism in this part of the State, though so little has been done along this line of investigation that definite conclusions on such data can not yet be safely drawn.

Again, the fact that a well can be put down beside a large and persistent gas escapement and find below a depth of a hundred feet or so not a trace of oil or gas seems to indicate that here the gas is not coming up from the apex of a local saline dome. In rising toward the surface its course is determined by the perviousness of the beds it encounters, after moving laterally perhaps for considerable distances in nearly horizontal beds. In the saline domes it can not move far laterally owing to the general prevalence of impervious beds with strong quaquaversal dip.

Finally, Mr. I. N. Knapp, whose work furnishes the basis of nearly all that is known regarding the geology of Terrebonne Parish, suggests folds or slopes of considerable vertical and lateral dimensions

when he maintains[a] that in well No. 7 (see fig. 20) he found the same streak of gravel with crinoid stems at a depth of 2,550 feet as in well No. 2 at 650 feet; and in No. 7 apparently the same shell streak with fresh-water individuals at 3,000 feet that occurred in No. 2 between 105 and 1,100 feet.

For the reasons above indicated the discussion of the gas and oil in Terrebonne Parish has been placed under the heading "Stratum oil and gas" and not under "Saline-dome oil and gas."

The most important developments in Terrebonne Parish are: (1) The well sunk by the H. G. Bush Petroleum Company near Montegut; (2) the Pickard and Heywood Brothers well on the Leo Lirette farm, described as "18 miles south of Houma;" (3) the five test wells put down by I. N. Knapp in various parts of the parish (see fig. 19); and (4) the Gulf Refining Company's well, near the Lirette (Pickard-Heywood) well.

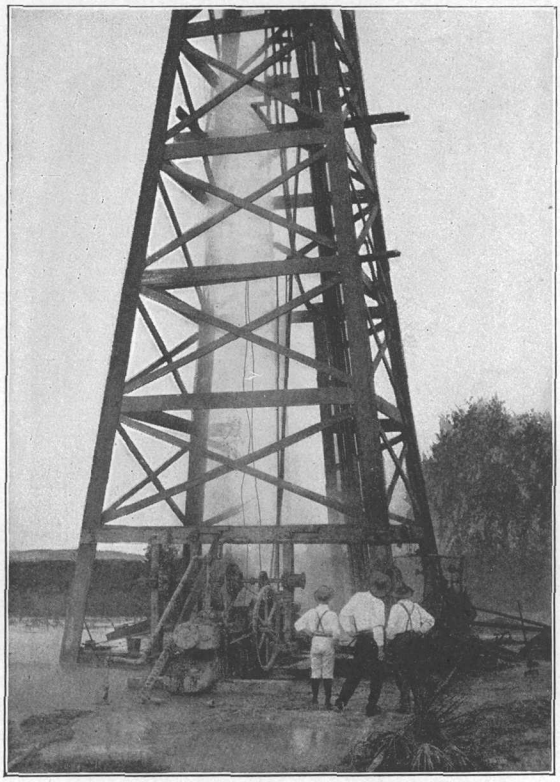
WELLS AT MONTEGUT.

The following statements concerning the "Magenta" well of the Bush Petroleum Company were received from Mr. Bush, of New Orleans. They are contained in a typewritten copy of a report that seems to have been prepared by Prof. F. C. Thiele, then of Beaumont, Tex., though the report is not signed. The descriptive and chemical notes seem to be carefully written. The identifications of horizons and fossils are rarely correct, but are given exactly as received.

Log of "Magenta" well, Montegut.

	Thickness.	Depth.
	Feet.	*Feet.*
Buff-colored sand with clay and humus	20	20
Gray sand and clay, gas (mainly sulphureted hydrogen), salt water, films of iron oxide, shell fragments. Gas was struck at 30 feet	20	40
Gray sand with shell fragments and black iron oxide containing traces of earth wax. Oil showing	20	60
Light-brown clay and sand with shell fragments. At 90 feet pieces of clay and soft asphalt	40	100
Light-brownish clay with shell fragments	20	120
Light-gray sand with shell fragments, fragments of lignitized wood, water very salty	20	140
Light-gray sand containing pieces of dark and drab colored laminated clay, shell fragments and shell *Astarte smithvillensis*	20	160
Light-gray clayey sand, red iron oxide, thick pieces of metallic iron, shell fragments, strong salt water	20	180
Light-gray clayey sand, red iron oxide, shell fragments, strong salt water	20	200
Light-gray clayey sand, red iron oxide, shell fragments, salt water	20	220
Light-gray clay, fine white sand, very small pebbles	20	240
Light-brown clayey sand, particles of black iron carbonate and coal, shell fragments, water very salty	20	260
Light-brown clayey sand, black iron carbonate and coal	20	280
Light-gray clayey sand, shell fragments. At 320 feet a ledge of black iron carbonate and coal was struck	120	400
Light-gray coarse clayey sand, shell fragments, small vein of gray shale	80	480
Gray shale, variegated pebbles, quartz, calcite, gravel and coarse sand, strong salt water	37	517
Light-gray clayey sand, shell fragments, black iron carbonate and coal	19	536
Light-gray fine sand, shell fragments, coal and mica	34	570
Variegated coarse sand, gravel, shell abundant, coal, quartz, disintegrated flint rock, mica	30	600
Fish vertebræ, calcareous concretions, petrified wood, variegated coarse gravel, quartz, disintegrated flint rock, shell abundant	20	620
Variegated coarse gravel, shell fragments, coal, quartz, lignitized wood, disintegrated flint rock, flora remains, fish vertebræ, gray clay	29	649

[a] Letter of August 5, 1909.



A. LIRETTE GAS WELL, TERREBONNE PARISH.

Photograph furnished by I. N. Knapp.

B. GAS ESCAPEMENT IN LAKE FELICITY, TERREBONNE PARISH.

Photograph furnished by I. N. Knapp.

Log of "Magenta" well, Montegut—Continued.

	Thickness.	Depth.
	Feet.	*Feet.*
Variegated coarse gravel, shell fragments, coal, calcareous concretions, disintegrated flint rock, quartz, gray clay, gas showing	21	670
Lignitized wood, gray clay, some gravel	14	684
Variegated coarse gravel, shell fragments, disintegrated flint rock, quartz, gray clay, soft flora remains, strong gas showing	16	700
Fine gray sand and mica, light-gray clay, gas and oil showing. At 742 feet a ledge of light-gray shale was struck, white quartz, variegated gravel, pebbles, lignite, manganese, black iron carbonate, strong salt water	100	800
Light-gray sand, gas showing	45	845
Light-gray sand, streak of blue clay, gas showing	20	865
Light-gray clay, white sand, disintegrated flint rock, small pebbles, variegated gravel, shell abundant, salt water, oil showing	23	888
Light-gray sand, gravel, shell fragments, wood, considerable gray clay	17	905
Light-brown clay, fine gray sand, calcareous concretions	43	948
Light-gray clayey sand, shell fragments, mica, disintegrated flint rock, flora remains	32	980
Light-gray clayey sand, shell fragments, flora remains	30	1,010
Light-gray sand, calcareous concretions, oil showings	46	1,056
Light-gray sand, shell fragments, flora remains, oil showing. Water collected on ditch at 1,056 feet with oil showing, odor of petroleum and sulphureted hydrogen	28	1,084
Gray clayey coarse sand, flora remains, shell fragments, calcareous concretions, oil showing, odor of decomposed fish, water very salty	24	1,108
Light-gray fine sand, clay, shell fragments, oil showing	16	1,124
Light-gray fine sand, shell fragments, oil showing	16	1,140
Light-gray sand, clay, oil showing	20	1,160
Gray sand, clay, shell fragments, oil showing at 1,170 feet	12	1,172
Variegated gravel, some sand, disintegrated flint rock, shell fragments, quartz	2	1,174
Variegated gravel, dolomitic rock, shell fragments, fish vertebræ. The bailer brought up light-gray sand, variegated coarse gravel, disintegrated flint rock, sand-rock fragments, oil showing, water extremely salty. (See analysis below)	3	1,177
No sample	3	1,180
Medium fine sand, quartz, calcareous concretions. At 1,181 feet a ledge of coarse gravel and dolomitic rock was encountered, also light-gray oil sand with black pebbles and pyrites. The sand contained a considerable amount of dark amber, heavy mineral oil and paraffin	10	1,190
Light-gray fine sand, pebbles, shell fragments, dolomitic rock, gravel, oil showing	10	1,200
Light-gray fine sand, dolomitic rock, mica, gravel, disintegrated flint rock	40	1,240
Light-gray sand, particles of rock, strong salt water	20	1,260
Light-gray clayey sand, calcareous concretions, very salty water	20	1,280
Light-gray clayey sand, calcareous concretions. At 1,290 feet a streak of dark clay was struck, odor strong of petroleum, considerable oil showing	20	1,300
Light-gray clayey sand, calcareous concretions. At 1,328 feet the drill brought up tenacious blue shale and large variegated pebbles. Oil showing good, water strong, salty	28	1,328
Gray clay abundant, chips of flint, calcite, gravel and iron pyrites in good quantity, pure mica, slight oil showing. At 1,388–1,398 feet a bed of shells was struck (cephalopod and pecten) containing flakes of anthracite coal	122	1,450
Gray clay abundant, variegated quartz, flakes of anthracite coal, pyrites, shell fragments, animal vertebræ	10	1,460
Red clay abundant, variegated quartz and gravel, anthracite coal and pyrites, magnesian limestone shells	3	1,463
Coarse gray sand and quartz, gravel, concretions, shells, slight oil showing, anthracite coal, and mica	4	1,467
Red clay abundant, variegated quartz, sand, fish vertebræ, shell fragments, carbonate of iron, pyrites in good quantity, slight oil showing. At 1,519 feet a ledge of Devonian flora remains. Shells *Tropidoleptus carinatus*	78	1,545
Red clay abundant, shell and wood fragments, pebbles, concretions, and fish vertebræ, slight oil showing. Samples from 1,467–1,581 feet contained pebbles, quartz, sand, shell fragments, and anthracite ferruginous carbon. The shells are from the Devonian era. Pieces of Genesee slate	36	1,581
Gray clay, gray sand, shells and quartz, oil showing	45	1,626
Gray clay and sand. Devonian shells abundant, wood remains, fish vertebræ, oil showing, water salty. From 1,600–1,670 feet flakes of black slate were encountered equal to those found in coal mines	66	1,692
Dark-gray shale, Devonian shells, fish scales, pyrites, quicksand, red iron oxide, gravel	18	1,710
Intermediate sample: Considerable oil showing, dark-brown clay, fine micaceous oil sand, pyrites abundant, large gravel, Devonian shells, quicksand, gas showing.		
Light-gray shale with oil showing, Devonian shells, fish scales, pyrites, red iron oxide, gravel	40	1,750
Intermediate sample: Dark-gray clay, gravel, Devonian shells, flora remains, red iron oxide, quicksand.		
Gray shale abundant, Devonian shells, pyrites, flora remains, quicksand, iron concretions, mica	10	1,760
Gray clay, slight oil showing, Devonian shells, mica, flora remains, quicksand	7	1,767
Gray clay abundant, slight oil showing, fish vertebræ, pyrites, white quartz, concretions, quicksand	1	1,768
Carbonate of iron abundant, fine sand, quartz, flint rock, fish vertebræ and fish teeth, Devonian shells, shell fragments, gray clay	2	1,770
Carbonate of iron, fine sand and quartz, fish vertebræ, Devonian shells, bluish-gray clay	25	1,795
Carbonate of iron, gray clay, Devonian shells, very fine quicksand, slight oil showing	35	1,830
Carbonate of iron, iron oxide, gray clay, Devonian shells, fine oil sand	15	1,845
Carbonate of iron, iron oxide, gray clay, Devonian shells, fine oil sand, oil extracted in paying quantities	12	1,857

Log of "Magenta" well, Montegut—Continued.

	Thickness.	Depth.
	Feet.	*Feet.*
Quicksand, iron carbonate, shells, concretions, oil showing, bluish-gray clay	8	1,865
Yellowish-gray clay, good oil showing, fine oil sand	17	1,882
Intermediate sample (1,880 feet): Coarse oil sand, flora remains abundant, shell fragments.		
Quicksand, carbonate and iron oxide, splendid oil showing	25	1,907
Carbonate of iron, quicksand, very good oil showings	33	1,940
Fine white micaceous sand, quartz, shell fragments, good oil showing	15	1,955
Gray clay, gray sand, iron carbonate, lignite, shell fragments	11	1,966
Ferruginous clay, gray speckled micaceous sand, good oil showing. From 1,965–1,985 feet gray oil sand	34	2,000
Ferruginous clay, gray micaceous sand, oil showing	10	2,010

Oil horizons in the "Magenta" well.

	Feet.		Feet.
Slight oil indication	60	Considerable oil indication	1,260–1,300
Do	700	Good oil indication	1,328–1,450
Good oil indication	888	Slight oil indication	1,545
Slight oil indication	1,056	Do	1,626–1,692
Do	1,108	Medium oil indication	1,710–1,750
Do	1,124	Slight oil indication	1,768
Do	1,160	Do	1,830
Good oil indication	1,190	Good oil indication	1,845–1,955
Slight oil indication	1,200		

Sample of water from the "Magenta" well, depth 1,174 to 1,177 feet: Specific gravity, 1.022; reaction, neutral; taste, extremely salty; color, clear white; small sediment. Chemical composition: Total solids in 1 United States gallon, 4,381.12 grains; sodium chloride, strong; calcium chloride, strong; aluminum chloride, strong; magnesium chloride, strong; barium chloride, small; potassium chloride, small; lithium chloride, small; sodium iodide, small; calcium phosphate, small; boracic acid, small; iron bicarbonate, small; sulphuric acid, none.

To this report on the "Magenta" well should be added Professor Thiele's analysis of and remarks on the gas from the Lower Terrebonne Refining and Manufacturing Company's "Phyllis" well, also at Montegut, as follows:

Analysis of gas from "Phyllis" well, Montegut.

	Per cent.
Methane	89.099
Olefiant gas	4.450
Carbon monoxide	.100
Carbon dioxide	1.000
Hydrogen	1.750
Nitrogen	3.500
Oxygen	.100
Sulphureted hydrogen	.001

The above analysis shows the gas found at Montegut, La., and vicinity, to be derived from subterranean deposits of mineral oil. Its composition indicates that it is generated from deposits of light-gravity oil, practically free from sulphur and sulphur compounds.

The olefiant gas contained in the Montegut natural gas is ethylene and its homologues, while acetylides, such as are found in the East Texas oils, are found in it to a

certain extent. The olefiant gases are also found in the water being brought to the surface by the drills, but on account of their volatile character they evaporate almost immediately on exposure to the air. The large amount of methane found is explained by the fact that the gas is a final product of the slow but constantly decomposing oil deposit underlying. If a sufficient quantity could be secured, the gas would prove commercially valuable for heating and mechanical purposes. The total composition of the gas proves that Montegut is oil-bearing territory. In comparison with other gases it resembles very closely the natural gas of Leechburg, Pa.

LIRETTE WELL.

A concise and interesting history of the drilling operations on the Lirette farm, in sec. 51, T. 19 S., R. 19 E., is given in the Oil Investors' Journal for September 6, 1908, page 18. The well was drilled in 1904 to a depth of 1,080 feet without satisfactory results, and operations were suspended. Pickard and Heywood Brothers commenced deepening the hole in August, 1908. Pickard set his 4-inch casing at 1,371 feet and then went down with a 2½-inch drill. During a few hours' halt at 1,710 feet, August 19, the well commenced to blow dry gas; then water coming in below the 4-inch pipe caused the well to blow salt water and some sand. The 6-inch and 8-inch casings were abraded and loosened, and a crater 15 feet in diameter was formed by August 31. The well was ignited and, like the Caddo wild wells, presented a marvelously spectacular appearance. The illustration (Pl. XXII, *A*), from a photograph furnished by Mr. Knapp, shows the well before the derrick was cut down and the gas ignited. The daily production of gas is estimated at 5,000,000 to 7,500,000 cubic feet. The record of the well below 1,080 feet, as furnished by Capt. M. H. Pickard, is as follows:

Partial record of Lirette well.

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Sand	55	1,135	Gumbo with shells in it	22	1,457
Gumbo	7	1,142	Shale	43	1,500
Sand (gas)	148	1,290	Gumbo	25	1,525
Gumbo	30	1,320	Hard shale (gas)	75	1,600
Sand	2	1,322	Loose shale and shells (gas)	25	1,625
Gumbo	23	1,345	Hard shale (gas)	25	1,650
Sand	5	1,350	Hard shale and shells (gas)	60	1,710
Gumbo (set 4-inch pipe at 1,371 feet)	68	1,418	Soft rock (gas)	2	1,712
Sand	7	1,425	Shale (gas)	14	1,726

Lost mud in soft places between 1,525 feet and 1,710 feet.

Stopped drilling on August 18, 1908, and the well blew out on August 19.

On his manuscript section of the well Pickard adds the following note:

Slush pump broke down August 18. Well blew out August 19. First twenty-four hours well reported dry, then water broke in. Well blew ninety-nine days without any apparent weakening, then shut off by a cave-in from the surface. Sand thrown out equals 3 to 4 acres 1 foot deep.

KNAPP WELLS.

As already stated, I. N. Knapp has put down five wells in various parts of Terrebonne Parish. Their locations are shown in figure 21. While drilling these wells Mr. Knapp sent to the writer a large number of fossils from various horizons in wells 1, 2, and 3. Some of these were

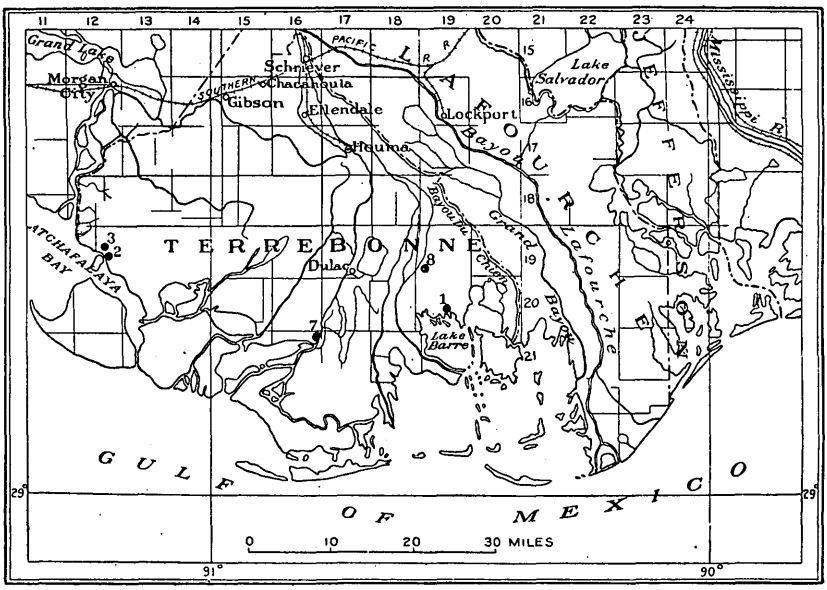


FIGURE 20.—Map of Terrebonne Parish, showing location of Knapp wells.

accompanied with statements regarding the character of material in which the fossils were found. Such statements, together with the lists of fossils from each horizon, are herewith given in full.

Knapp well No. 1, southeast part of T. 20 S., R. 19 E., on Lake Tambour, at head of Oyster Bayou.

Drilled December, 1906, to February, 1907. Datum, 1 foot above mean low water.

	Feet.
Marsh grass and roots	4
Mud	26
Bed of shells	30
Blue clay	75
Blue clay and lime concretions	100
Gas, no odor; would not tarnish silver coin; burned all night from 2-inch pipe, making flame 6 feet high	140
Blue clay	170
Sand and shells	175
Brown, woody material	180
Sandy clay	270
Soft sandy clay	320
Hard shale or clay	360
Softer	378

	Feet.
Tough clay or gumbo	390
Drilling freely	430
Drilling harder with shells showing in overflow; some crumbly sandstone found on coupling	640
Samples of blue clay got from bailer	695–700
Drilled tough, with pellets of clay in overflow	700–750
Showing of shells	750–755
Coarse reddish sand in overflow	830
Sand with shells	865
Coarse, sharp sand	880–895
Very sticky clay or gumbo	910–925
Alternating streaks of sticky and sandy clay	925
Light, coarse shales	1,130
Free-drilling sandy clay or shale	1,180–1,200
Hard, light rock	1,372–1,380
Greenish shales	1,405
Broken shells; coarse gravel on coupling	1,450–1,455
Pulled out to sharpen bit and found gravel on bit and joints below 1,400 feet	1,486
Pulled back and found gritty limestone on coupling	1,505
Bailed, no pressure	1,550
Tough clay shales and gumbo, requiring frequent spudding to free the bit. Shells: *Arca transversa, Cerithium, Corbula contracta, Dosinia, Leda acuta, Lucina acuminata, Nassa acuta, Olivella mutica*?, *Ostrea virginica, Pecten gibbus* var. *irradians, Terebra dislocata, Turritella variegata.* At 1,620 feet blue clay came in. It was supposed that the 6-inch casing was set in clay and possibly it was in a thin streak. Had the 6-inch casing held at 1,620 feet it is probable that we would have gotten much deeper	1,600–1,700
Bed of shale, showing as mud in overflow. At 1,730 feet, fossils, sent to United States Geological Survey	1,700–1,880
Cuttings of shale showing in overflow	1,900
Hard, ground like rock	1,944–1,950
Rock	1,961–1,971
Lignite, shark's tooth	2,000
Fossils obtained from indurated light-gray clay, almost shale: *Arca campechensis, A. transversa, Cardium robustum, Chione latilirata, Corbula contracta, Lucina crenella, Murex spinicostata, Nassa acuta, Oliva litterata, Pecten gibbus* var. *dislocatus, Rangia cuneata, Terebra dislocata, Tritonidea cancellaria, Vermetus*	2,001–2,150
Black peat, abundant	2,233–2,335
Shells: *Anachis, Arca campechensis, A. transversa, Cardium robustum, Chione cancellata, Chione latilirata, Corbula contracta, Eulima, Lucina crenella, L. amiana, Nassa acuta, Oliva litterata, Ostrea, Pecten gibbus* var. *irradians* and *dislocatus, Scala multistriata, Tellina alternata, Tritonidea cancellaria, Turritella variegata*?	2,250–2,450
Bottom of well	2,471

Twelve-inch casing set at 80 feet; 9-inch casing set at 620 feet; 6-inch casing set at 1,620 feet; 4-inch casing set at 2,471 feet.

Knapp well No. 2, 14 miles southeast of Belle Isle, in sec. 22, T. 19 S., R. 12 E.[a]

Drilled March 28 to August 5, 1907.

Besides the large number of organic remains found between 1,000 and 1,900 feet, there is little of special interest in this well. Its depth is 2,463 feet. From 1,900 feet to the bottom shells are said to be very scarce. From 1,800 to 2,000 feet "black, greasy shales, sand, salt water, and gas" are recorded. Between 2,030 and 2,087 feet a sufficiently indurated layer is encountered to be recorded as "rotten limestone." Finally, "Lower 112 feet, fine-grained sandy shale; fifteen days required to drill this distance." The fossils from this well and their range in depth will be found in the list given below.

Datum, 1 foot above tide.

	Thickness.	Depth.
	Feet.	*Feet.*
Soil with roots	4	4
Dark-brown soil and roots shading into gray sticky mud and shells	10	14
Light-gray mud or clay	28	42
Clean sharp sand	12	54
Grayish mud or clay with bits of rotten wood or peaty material	83	137
Sand	50	187
Clay with woody materials; some gas, 192 feet	33	220
Sand with broken shells	16	236
Clay with woody and boggy materials	114	350
Wood, bark and fiber	5	355
Stiff clay, wood and woody fiber	125	480
Wood	3	483
Stiff clay	7	490
Sand with bits of shells and crinoid stems. This sand would take clean water faster than the pumps could throw it, so had to mix mud to pump in and puddle walls of well	106	596
From 596 to 1,025 feet record indefinite, from mud used in drilling. Alternate streaks of clay, shale, gumbo, sand, shells, and woody materials occurred at 989 feet, end of 9-inch pipe in a stump or log	399	995
Shale or gumbo with lignite and wood fiber requiring spudding	64	1,059
Sand	5	1,064
Gumbo with wood fiber	26	1,090
Streaks of differently colored shale with woody fiber	80	1,170
Abundance of broken shells	5	1,175
Streaks of different colored shale with bits of lignite and bits of woody fiber. Streaks of shells	155	1,330
Sandy materials	40	1,370
Shales with streaks of shells	60	1,430
Rock	2	1,430
Greenish-gray shales	16	1,448
Rock	1	1,449
Sticky shales	21	1,470
Brick-red particles and sandy materials	5	1,475
Sticky shales	13	1,488
Rock	12	1,500
Shale	16	1,516
Rock	9	1,525
Shale	25	1,550
Shells, sand, and lignite	10	1,560
Sticky shales in light and dark gray streaks, requiring frequent spudding	70	1,630
Shale and lignite	5	1,635
Streaks of gray and greenish-gray shales or gumbo, very sticky, requiring frequent spudding. Occasional streaks of shells and woody fiber	85	1,720
Hard, like rock, probably limestone	28	1,748
Shale, abundance of coarse gravel, origin unknown; record from 1,748 to 2,300 feet indistinct and not accurate on account of thick mud used in drilling to keep back sand. Between 1,850 and 1,870 feet, 6-inch pipe perforated, giving gas, salt water, and sand; at 1,884 feet, gas with iridescence like oil	136	1,884
Harder, and decided change in fossils. Apparently gravel and shells cemented with clay	9	1,893
Shale with shells, sand, and gravel, growing whiter by depth	27	1,920
Sand, showing gas and iridescent colors; 6-inch casing set at 1,942 feet, did not hold; sand and salt water broke through underneath	20	1,940
Stiff dark shale or clay	50	1,990
Rock, fine cuttings and sand in overflow	40	2,030
Rotten rock, like limestone	57	2,087
Standard, finely broken shells in overflow	11	2,098
Hard like rock	28	2,126
Shales and sandy shales; variable hardness, no shells	74	2,200
Fragments of black shale which were lighter on drying	16	2,216
Streaks of various colored shales. Packer set at 2,242 feet	24	2,240
Rock, hard sandy materials. Test between 2,269–2,289 feet showed no gas, oil, or water	49	2,289
Shale, appearing silvery at overflow between 2,295 and 2,300 feet	20	2,309
Sand, test between 2,332 and 2,352 feet showed no gas, oil, or water	42	2,351
Sandy shales, variable in color and hardness	112	2,463

[a] This well may be located on United States Coast and Geodetic Survey sheet No. 129 by following up the left bank of Alligator Bayou about three-fourths of a mile from its mouth at Alligator Point.

Knapp well No. 3, sec. 15, T. 19 S., R. 12 E.[a]

Drilled August 3 to November 9, 1907.

At 1,032 to 1,037 feet, with a streak of shells, I got sand and an artesian water. I did not taste salt or sulphur in the flow. The temperature of the overflow was 78° F. I think the flow was not more than 50 nor less than 10 gallons per minute, and there was a little bubbling of gas with it.

There is a considerable degree of conformity between my No. 2 and No. 3 wells drilled about a mile apart. The strata that I could clearly recognize were from 40 to 160 feet higher in No. 3 than in No. 2.

	Thickness.	Depth.
	Feet.	*Feet.*
Soil and roots	1	1
Dark gray clay and roots	3	4
Gray clay, growing lighter in color	29	23
Streak of shells	1	24
Grayish clay	21	45
Soft grayish clay	9	54
Streak of shells	1	55
Gray clay with woody fiber and shells	63	118
Light-colored crumbling material	4	122
Grayish clay	16	138
Clean sharp sand with specks of shells	69	207
Yellow clay	1	208
Sand with bits of shells, growing coarser toward bottom	22	230
Clay or gumbo with streaks of shells; hard streak and spudding at 250 feet	30	260
Pieces of green shale appeared at 260 feet. Various colored shales or clay with some shells and much wood fiber	28	288
Various colored clays or shells with wood and woody fiber and a few shells and possibly streaks of sand	215	503
Mostly clean, sharp sand with a few shells and possibly streaks of clay. Exact bottom of sand indefinite. At 502 feet end of 12-inch casing. Crinoid fragments in the sand	133	636
Shale or clay	36	672
Hard, like rock	3	675
Clay or shale, variable in color and hardness	136	811
Hard streak	1	812
Clay or shale	11	823
Hard clay or shale	5	828
Probably clay, with woody fiber	54	882
Soft material, possibly sand	20	902
Clay or shale, variable in character. Spudding along about 1,000 feet; at 1,018 feet end of 9-inch casing; bit pulled back from 1,021 feet showed black sticky clay	130	1,032
Great abundance of shells	3	1,035
Sand and artesian water, possibly some gas	4	1,039
Dark-brown to black shales	33	1,072
Green to bluish-green shales, requiring frequent spudding	98	1,170
Hard shales, cutting freely	122	1,292
Hard shell	1	1,293
Hard shale	13	1,306
Hard shell	1	1,307
Shales of variable color and hardness; few shells at 1,436 feet	109	1,416
Hard shell	1	1,417
Shale	9	1,426
Hard shell	1	1,427
Sticky clay or shale	35	1,462
Abundance of broken oyster shells	10	1,472
Clay and shales, variable	49	1,521
Gritty rock, wearing bit badly	5	1,526
Clays and shales, sticky, variable hardness	49	1,575
Rocks	1	1,576
Clay or shale, sticky, requiring spudding	44	1,620
Rock	2	1,622
Clay and shale with bits of pyrite and sandstone	70	1,692
Sand with small oil showing	12	1,704
Hard light-blue shale with slight showing of oil	56	1,760
Soft clay or shales	12	1,772
Clay or shale	28	1,800
Hard shell with slight show of oil	1	1,801
Clay or shale; 6-inch casing set at 1,832 feet	36	1,836
Sand	2	1,838
Clay or shale	19	1,857
Salt-water sand	89	1,946
Hard materials	4	1,950
Hard yellowish rock, probably some kind of limestone with flint	38	1,988
Soft material, giving overflow a yellowish color. Short hollow pieces in overflow	4	1,992
Hard drilling, supposed to be gypsum	29	2,021

[a] See United States Coast and Geodetic Survey sheet No. 199, left bank, mouth of Blue Hammock Bayou.

Knapp well No. 7, sec. 1, T. 21 S., R. 16 E., on the Grand Caillou.

Drilled summer 1909, completed July 10, 1909.

No traces of oil or gas shown in well, though gas escapements at the surface near by are abundant. Measurements are from rotary jaws, 7 feet above the surface and 8½ feet above mean low tide.

	Thickness.	Depth.
	Feet.	*Feet.*
Surface	7	7
Surface mud with wood and bits of shells	63	70
Grayish clay	98	168
Sand with gas and water; water brackish but used in boilers	16	184
Clay	81	265
Sand	28	293
Blue clay; abundance of wood fiber; some shells	197	490
Sand	45	535
Grayish clay or shale	130	665
Streaks of reddish and chocolate shales in gray clay	60	725
Alternate layers of sand and clay	85	810
Sand, fine on top, growing coarse at bottom	75	885
Streaks of gray and blue shales with soft white stuff; abundance of shells; little gas	45	930
Soft gray and blue shales with wood and shells	115	1,045
Streaks of shell and stuff like gypsum	22	1,067
Alternate hard and soft streaks of gray and blue clays	68	1,135
Grayish clay	82	1,217
Sand	95	1,312
Shale, shells, and flints	83	1,385
Blue clay	10	1,395
Shale, shells, and layers of blue clay	156	1,551
Fine sand	46	1,597
Gumbo and shells	24	1,621
Clear sand (no shells)	109	1,730
Greenish shale and shells	4	1,734
Sand	4	1,738
Gumbo; mud on bit showed pyrites	43	1,795
Shale; no shells	78	1,873
Light-colored, fine-grained shale at 1887–1892 feet. Hard, like rock	29	1,902
Abundance of broken shells	3	1,905
Woody fiber in shale	.....	1,920
Dark sticky shale	82	2,002
Clay and shales	114	2,116
Wood and woody fiber abundant	2	2,118
Clay and shales	64	2,182
Shales, with shells	7	2,189
Hard shells or rock	3	2,192
Gray shales with hard streaks and lignitic wood	108	2,300
Sand and lost mud	16	2,316
Shale and wood	15	2,331
Sand and lost mud	18	2,349
Shale and lignitic wood	16	2,365
Sand	61	2,426
Dark shale at top and light at bottom; hard streaks	38	2,464
Sand and gravel, lost mud, crinoid stems	109	2,573
Light-gray shale	67	2,640
Sand	10	2,650
Light-gray shale	35	2,685
Sand	15	2,700
Alternate sand and clays	137	2,837
Alternate streaks of gray and blue clay	125	2,962
Fine sand	5	2,967
Shale and shell; fresh-water clean shells	33	3,000
Fine sand	18	3,018

Knapp well No. 8, lot 15, sec. 33, T. 19 S., R. 19 E.

Drilled July 10–September 15, 1909.

This well is about 2,000 feet from the Lirette well. It was ruined by a blow-out from gas pressure below 1,600 feet.

	Thickness.	Depth.
	Feet.	*Feet.*
Surface materials	5	5
Black sandy loam	5	10
Fine salt and pepper sand; gas	170	180
No record	60	240
Coarse water sand	21	261
Alternate layers, gray clay and water sand; gas	13	274
Sand and gravel	95	369
Light-gray clay and wood fiber alternating with coarse sand and flint	30	399
Fine sand	118	517
Light-gray clay, shaly in character; shells; no gas; set 12-inch casing at 570 feet	85	602
Sand	31	633
Shale and sand; shells	52	685
Reddish to coarse, gray sand	125	810
Gravel with flint	18	828
Gray and red clay with gas	22	850
Sand	91	941
Sand and gravel mixed with red, blue, and gray clay; large amounts of flint	108	1,049
Soft gray shale	22	1,071
Gravel with flint; black crystals	20	1,091
Soft gray shale	10	1,101
Gravel	7	1,108
Red and gray clays	13	1,121
Very soft light-gray clays; gas	47	1,168
Stiff light-gray clay	77	1,245
Stiff gray clay and shells	20	1,265
Light-gray shale, variable, sometimes sticky, sometimes balling up	165	1,430
Shells in shale	20	1,450
Gray shale of variable hardness. End of 6-inch casing at 1,495 feet	150	1,600
Sand and shells	17	1,617
Gray and green shales, hard. Bottom of 5¾-inch hole; gas blew well out	28	1,645

SHELLS FROM TERREBONNE PARISH AND THEIR BEARING ON STRATIGRAPHY AND OCCURRENCE OF OIL AND GAS.

Below is given in alphabetic order a list of the molluscan species identified by Doctor Maury from the Knapp wells of Terrebonne Parish and of those that have been identified with certainty from Point au Fer, in the same parish, as well as those from the Gymnasium well at New Orleans. The object in presenting this list is to show the basis for the statement that none of these wells have penetrated beds that can be regarded as older than Pleistocene. Some specific remarks by Doctor Maury seem pertinent here:

The only possible suggestions of affinities with a Tertiary fauna were as follows: In well No. 2 at a depth of 1,800 feet a *Pleurotoma* occurred which is somewhat like *P. quadricentennialis* Harris from the upper Miocene of the Galveston well and is possibly a varietal form, but more likely a different species. In No. 1 at 2,000 to 2,150 feet two specimens of *Chione latilirata* Conrad were found which showed the irregular sulcations which at first sight recall the Miocene type of the species. But although in the Recent fauna the form with regular sulcations is more characteristic, still the irregular, ancestral, Miocene type continues to develop and is often found living. And at the same level at which the *Chione* was found in the well there were 15 other species, all of which are Recent. In No. 3 a *Mangilia* like the recent *limonitella* Dall but more cancellate and probably a new species was found at a depth of from 1,500 to 1,525 feet.

It might seem that the presence of several new species would weaken the relationship of the well faunas to the Recent, but the Mollusca of the Gulf are not thoroughly well known and new species are being found by conchologists at the present time in Texas and west Florida.

Considering the fauna of the three wells as a whole, the conclusion is inevitable that the Pleistocene strata have in this part of Terrebonne Parish a thickness of at least 2,443 feet.

It is certainly interesting to note, in studying the shells from the Gymnasium well at New Orleans from a depth of only 1,200 feet, that they comprise more new species, or species not now known to be living in the Gulf waters, than are obtained from the much deeper wells in Terrebonne Parish. A complete illustrated description of the Gulf coast Pleistocene and Recent molluscan fauna is now in preparation. Knapp wells Nos. 1, 2, and 3 are certainly not located on prominent local uplifts, such for example as that of the Jennings oil field, where the Tertiary *Rangia johnsoni* approaches in places within 1,000 feet of the surface.

Alphabetic list of species, mainly molluscan, found in and about Terrebonne Parish, with range in depth in wells and geologic range of each species.

[Figures indicate depth in feet.]

Abra æqualis.
Knapp No. 2, 1,050–1,542.
Point au Fer.
Miocene to Recent.

Adeorbis supranitidus.
Knapp No. 2, 1,519–1,632.
Oligocene to Recent.

Anachis avara.
Point au Fer.
Pleistocene and Recent.

Anachis obesa.
Knapp No. 2, 1,050–1,800.
Knapp No. 3, 1,150–1,440.
Point au Fer.
Pliocene to Recent.

Anomia simplex.
Knapp No. 3, 1,330–1,470.
Gymnasium, 1,200.
Oligocene to Recent.

Arca campechensis.
Knapp No. 1, 2,000–2,450.
Knapp No. 2, 1,800.
Knapp No. 3, 300–900.
Gymnasium, 1,200.
Point au Fer.
Miocene to Recent.

Arca ponderosa.
Knapp No. 2, 1,519–1,842.
Knapp No. 3, 670–1,700.

Arca ponderosa—Continued.
Point au Fer.
Pliocene to Recent.

Arca transversa.
Knapp No. 1, 1,600–2,450.
Knapp No. 2, 1,050–1,842.
Knapp No. 3, 570–2,029.
Gymnasium, 1,200.
Point au Fer, 0.
Pliocene to Recent.

Astyris lunata.
Knapp No. 2, 1,050–1,790.
Knapp No. 3, 258–1,375.
Pliocene to Recent.

Barnea costata.
Knapp No. 2, 1,434–1,542.
Knapp No. 3, 510–1,375.
Point au Fer, 0.
Miocene to Recent.

Callocardia texasiana.
Knapp No. 2, 1,542–1,632.
Knapp No. 3, 570–800.
Point au Fer.
Recent.

Cardium robustum.
Knapp No. 1, 2,000–2,450.
Knapp No. 2, 1,190–1,842.
Knapp No. 3, 1,200–1,300.
Miocene to Recent.

Alphabetic list of species, mainly molluscan, found in and about Terrebonne Parish, with range in depth in wells and geologic range of each species—Continued.

Cassis inflata.
Knapp No. 1.
Knapp No. 2, 1,791–1,842.
Point au Fer, 0.
Pleistocene and Recent.

Chione cancellata.
Knapp No. 1, 2,250–2,450.
Knapp No. 2, 1,731–1,739.
Knapp No. 3, 570–1,525.
Gymnasium, 1,200.
Miocene to Recent.

Chione grus.
Knapp No. 2, 1,434 to 1,842.
Gymnasium, 1,200.
Point au Fer.
Miocene to Recent.

Chione intrapurpurea.
Knapp No. 2, 1,050–1,190.
Knapp No. 3, 700–1,043.
Pleistocene and Recent.

Chione latilirata.
Knapp No. 1, 2,000–2,443.
Miocene to Recent.

Congeria leucopheata.
Knapp No. 2, 1,542–1,570.
Knapp No. 3, 0–2,029.
Point au Fer, 0.
Pleistocene and Recent.

Corbula contracta.
Knapp No. 1, 1,600–2,443.
Knapp No. 2, 1,190–1,842.
Knapp No. 3, 570–1,739.
Miocene to Recent.

Crassatellites lunulata.
Knapp No. 2, 1,190–1,800.
Knapp No. 3, 700–1,842.
Gymnasium, 1,200.
Pliocene to Recent.

Crepidula plana.
Gymnasium, 1,200.
Oligocene to Recent.

Cylichnella bidentata.
Knapp No. 2, 1,519–1,542.
Miocene to Recent.

Cyrene floridana.
Point au Fer, 0.
Pleistocene and Recent.

Dentalium texasianum.
Knapp No. 2.
Point au Fer, 0.
Pleistocene and Recent.

Donax tumida.
Gymnasium, 1,200.
Point au Fer, 0.
Pleistocene and Recent.

Dosina discus.
Knapp No. 2, 1,519–1,542.
Knapp No. 3, 570–1,712.
Pliocene to Recent.

Drillia quadricentennialis var.
Knapp No. 2, 1,800.
Miocene to (?).

Fasciolaria gigantes.
Point au Fer, 0.
Pliocene to Recent.

Fulgur canaliculatum.
Point au Fer, 0.
Pleistocene and Recent.

Fulgur perversum.
Point au Fer, 0.
Miocene to Recent.

Labiosa canaliculata.
Knapp No. 2, 1,502–1,632.
Knapp No. 3, 1,330–1,375.
Point au Fer, 0.
Miocene to Recent.

Leda acuta.
Knapp No. 1, 1,600–1,700.
Knapp No. 2, 1,050–1,632.
Knapp No. 3, 570–1,300.
Gymnasium, 1,200.
Point au Fer, 0.
Oligocene to Recent.

Littorina irrorata.
Point au Fer, 0.
Miocene to Recent.

Lucina amiana.
Knapp No. 1, 1,600–2,450.
Knapp No. 2, 1,050–1,842.
Knapp No. 3, 800–1,839.
Gymnasium, 1,200.
Pleistocene and Recent.

Lucina crenella-multilineata.
Knapp No. 1, 2,000–2,450.
Knapp No. 2, 1,050–1,790.
Knapp No. 3, 1,150–1,525.
Gymnasium, 1,200.
Pliocene to Recent.

Mangilia cerina.
Knapp No. 1.
Knapp No. 2, 1,190–1,420.
Knapp No. 3, 1,500–1,525.
Pleistocene and Recent.

Alphabetic list of species, mainly molluscan, found in and about Terrebonne Parish, with range in depth in wells and geologic range of each species—Continued.

Mangilia limonitella.
Knapp No. 3, 1,150–1,200.
Pleistocene and Recent.

Melampus flavus.
Point au Fer, 0.
Recent.

Melampus lineatus.
Point au Fer, 0.
Recent.

Mulinea var. corbuloides.
Point au Fer, 0.
Pleistocene.

Mulinea lateralis.
Knapp No. 2, 1,050–1,842.
Knapp No. 3, 700–2,029.
Gymnasium, 1,200.
Point au Fer, 0.
Miocene to Recent.

Murex spinicostata.
Knapp No. 1, 2,000–2,150.
Knapp No. 3, 790–800.
Point au Fer, 0.
Pleistocene and Recent.

Mytilus hamatus.
Knapp No. 2, 1,434–1,726.
Knapp No. 3, 570–700.
Point au Fer, 0.
Pliocene to Recent.

Nassa acuta.
Knapp No. 1, 1,600–2,443.
Knapp No. 2, 1,050–1,842.
Knapp No. 3, 58–1,839.
Gymnasium, 1,200.
Point au Fer, 0.
Miocene to Recent.

Natica pusilla.
Knapp No. 3, 1,150–1,525.
Gymnasium, 1,200.
Pleistocene and Recent.

Neverita duplicata.
Knapp No. 2, 1,190–1,790.
Knapp No. 3, 1,150–1,839.
Gymnasium, 1,200.
Point au Fer, 0.
Miocene to Recent.

Niso interrupta var. æglees.
Knapp No. 3, 1,150–1,200.
Pleistocene and Recent.

Oliva litterata.
Knapp No. 1, 2,000–2,150; 2,250–2,450.
Knapp No. 2, 1,780–1,790; 1,791–1,842.
Knapp No. 3, 1,150–2,029.
Point au Fer, 0.
Oligocene to Recent.

Olivella mutica.
Knapp No. 1, 1,600–1,700.
Knapp No. 2, 1,050–1,842.
Knapp No. 3, 1,150–1,839.
Gymnasium, 1,200.
Point au Fer.
Pliocene to Recent.

Ostrea virginica.
Knapp No. 1, 1,600–1,700.
Knapp No. 2, 1,190–1,842.
Knapp No. 3, 570–1,700.
Point au Fer, 0.
Miocene to Recent.

Pecten gibbus var. dislocatus.
Knapp No. 1, 2,000–2,450.
Knapp No. 3, 570–1,525.
Miocene to Recent.

Pecten gibbus var. irradians.
Knapp No. 1, 1,600–2,450.
Knapp No. 2, 1,430–1,842.
Knapp No. 3, 1,700–1,712.
Pleistocene and Recent.

Pectunculus pectinatus.
Knapp No. 3, 670–780.
Pliocene to Recent.

Purpura hæmastoma.
Knapp No. 3, 1,400–1,440.
Point au Fer, 0.
Pleistocene and Recent.

Rangia cuneata.
Knapp No. 1, 2,000–2,150.
Knapp No. 2, 1,050–1,842.
Knapp No. 3, 0–1,800.
Point au Fer, 0.
Miocene to Recent.

Rangia flexuosa.
Point au Fer, 0.
Pleistocene and Recent.

Scala lineata.
Knapp No. 2, 1,550–1,739.
Point au Fer, 0.
Pliocene to Recent.

Alphabetic list of species, mainly molluscan, found in and about Terrebonne Parish, with range in depth in wells and geologic range of each species—Continued.

Scala multistriata.
Knapp No. 1, 2,250–2,450.
Knapp No. 2.
Knapp No. 3, 570–1,200.
Pliocene to Recent.
Strigilla flexuosa.
Gymnasium, 1,200.
Oligocene to Recent.
Strombus pugilis.
Point au Fer, 0.
Oligocene to Recent.
Tellina alternata.
Knapp No. 1, 2,443.
Knapp No. 3, 1,150–1,470.
Point au Fer, 0.
Pliocene to Recent.
Tellina tenera.
Knapp No. 3, 0–1,470.
Recent.
Terebra dislocata.
Knapp No. 1, 1,600–2,150.
Knapp No. 2, 1,050–1,739.
Knapp No. 3, 1,150–1,525.
Eocene? to Recent.
Tornatina canaliculata.
Knapp No. 2, 1,050–1,790.
Knapp No. 3, 258–1,525.
Tornatina canaliculata—Continued.
Point au Fer, 0.
Oligocene to Recent.
Tritonidea cancellaria.
Point au Fer, 0.
Pleistocene and Recent.
Turbonilla interrupta.
Knapp No. 2, 1,050–1,790.
Knapp No. 3, 1,150–1,839.
Miocene to Recent.
Turritella variegata.
Knapp No. 1, 1,600–2,250.
Knapp No. 2, 1,434–1,800.
Knapp No. 3, 1,330–1,375.
Pleistocene and Recent.
Unio (Quadrula) apiculatus.
Knapp No. 3, 5,000.
Pleistocene and Recent.
Venus mercenaria.
Knapp No. 2, 1,050–1,839.
Knapp No. 3, 570–1,550.
Point au Fer, 0.
Miocene to Recent.
Vermetus.
Knapp No. 1, 2,000–2,150.
Knapp No. 2, 1,190–1,726.

GULF REFINING COMPANY'S WELL.

Little information is at hand regarding the well of the Gulf Refining Company on the Lirette lease near the Lirette well, in Terrebonne Parish, save that it was drilled in the winter of 1908–9, passed safely, by casing it off, the gas stratum that wrecked the Lirette well, and was pronounced a failure at 2,555 feet. The casing was pulled and the well abandoned early in 1909.

CONCLUSIONS REGARDING TERREBONNE OIL AND GAS PROSPECTS.

1. There is a great abundance of natural gas in Terrebonne Parish, but oil is practically unknown.

2. The size and geographic distribution of gas escapements and the fact that no gas of consequence has been discovered below depths of a few hundred feet in borings located near pronounced surface indications indicate clearly the lack of local dome structure. Gas, seemingly from great depths and in enormous quantities, has zigzagged its way upward from bed to bed (lying nearly horizontal or in great anticlines) and has finally made itself manifest at the surface, not immediately above great "pools," but wherever the line of least resistance may have led.

3. Tertiary beds may possibly in some places be within 2,000 feet of the surface, though apparently nowhere much above that level. Quaternary beds evidently in places lie at more than 3,000 feet below the surface.

4. The utilization of the gas awaits the invention of some method of properly setting a casing where there is no cap rock or other natural firm bed to serve the same purpose.

EXPLOITATION IN LOUISIANA WHERE NEITHER SALINE DOME NOR STRATUM OIL OR GAS COULD WELL BE EXPECTED.

ACADIA PARISH.

CROWLEY.

The Rice Company's oil well, 1 mile west of Crowley, was sunk in the winter of 1902–3 to a depth of 2,015 feet without obtaining oil or gas. Mr. Gregg, of Crowley, furnished the record of the lower portion of the well. It is as follows:

Partial record of Rice Company's oil well, Crowley.

	Feet.
Medium fine oil sand	1,640–1,650
Extremely fine oil sand	1,650–1,660
Coarser oil sand	1,660–1,675
Very coarse sand	1,700
Green and brown clays	1,810
Four inches of rock	1,940
Green and brown clays	2,015

The mouth of the well is about 19 feet above sea level. The drilling outfit was removed in February, 1903, to the North Star well site, 3 miles north of Crowley.

Duson Brothers were reported to have attained a depth of 3,000 feet in a well 1 mile northeast of Crowley June 18, 1905.

ESTHERWOOD.

A showing of oil was reported from the Delcambre Oil and Mineral Company's well, Estherwood, at a depth of 400 feet, March 6, 1909.

IOTA.

The Foley Oil Company was reported, February 3, 1907, as deepening an old 2,000-foot hole near Iota; was about ready to set a strainer.

ASSUMPTION PARISH.

LABADIEVILLE.

About a mile southeast of Labadieville station, on the Napoleonville branch of the Southern Pacific Railroad, two test wells were put down in 1902 and 1903 by the Assumption Oil and Mineral Company.

The wells were but 20 feet apart. The log of the first, as given by Morton Rhodes, of Napoleonville, is as follows:

Log of first well of Assumption Oil and Mineral Company near Labadieville.

	Feet.		Feet.
Soil and clay	150	Gravel	845
Gumbo and sand	200	Sand	890
Sand and gravel	290	Rock and shells	908
Bowlders in sand	340	Quicksand	930
Sand and sandstone	390	Clay and shells	970
Sand and gravel	440	Sand and bowlders	995
Rock	480	Blue gumbo	1,090
Oil sand	510	Sand and bowlders	1,145
Gravel	540	Oil sand	1,190
Clay	565	Sand and gravel	1,220
Sand and rock	600	Sand	1,385
Coarse sand	665	Sand and gravel	1,430
Gumbo and clay	675	Gravel	1,510
Gravel	695	Sulphur and clay	1,730
Rock	700	Oil sand	1,800
Gumbo	730	Sulphur, clay, shells	1,850
Sand and blue shale	745	Rock, sand, and sulphur	2,000
Sand and gravel	780	Sand	2,100
Gravel and bowlders	800	Rock (drill broken).	

Captain Pickard supplied the following detailed statement of the occurrence of strata beneath 1,820 feet in the second well:

Partial log of second well of Assumption Oil and Mineral Company near Labadieville.

	Ft.	in.		Ft.	in.
Gumbo and shells	1,830		Gumbo and shale	1,997	9
Sand with oil	1,846	5	Gumbo	1,999	5
Rock	1,847	1	Rock	2,000	3
Sand and oil	1,865	11	Gumbo, shells, oil	2,019	8
Gumbo	1,873	11	Shale and shells	2,037	9
Shale and gumbo	1,884	1	Sand, shells, and gumbo	2,057	5
White sand and some oil	1,903	6	Gumbo	2,059	11
White sand	1,915	6	Water sand	2,096	5
Gumbo	1,922	9	Gumbo	2,102	5
Sand and gumbo	1,927	9	Rock	2,102	9
Rock	1,928	5	Gumbo	2,115	11
Salt-water bed	1,945	3	Gumbo	2,129	11
Sand and gumbo	1,961	1			

NAPOLEONVILLE.

The J. M. Guffey Petroleum Company put down a well near Avoca, a station on the Napoleonville branch of the Southern Pacific Railroad, during the fall of 1906, reaching a depth of 2,240 feet and finding cold salt water. Heywood Brothers repeated the test in January and February, 1907, reaching a depth of about 2,000 feet, with similar results.

AVOYELLES PARISH.

More or less detailed sections of the Natchez and Marksville well at Marksville have been given in Bulletin 1 of the Louisiana Geological Survey and Professional Paper 46 of the United States Geological Survey. These sections extend only to a depth of 1,283 feet. O. W. Myers, the driller, has furnished, under date of March 31, 1904, a record of the well to 2,631 feet, as follows:

Log of Natchez and Marksville well, Marksville.

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Soil, clay, red	18	18	Clay	18	1,372
Red sand, very fine	24	42	Sand and laminated clay	38	1,410
Coarse sand	108	150	Clay	16	1,426
Sand rock	4	154	Hard sandstone	4	1,430
Coarse sand and bowlders	24	178	White sand	4	1,434
Sand rock	5	183	Laminated clay	21	1,456
Bowlders	3	186	Clay	32	1,488
Sand and gravel	16	202	Laminated clay	17	1,505
Red clay	6	208	Clay, tough and hard	26	1,531
Fine sand	7	215	Laminated clay	60	1,591
Sand, coarse and round	8	223	Sandstone	8	1,599
Red clay	8	231	Brown laminated clay with woody fragments and sand	41	1,640
Rock	½	231.5	Clay	22	1,662
Sand and clay in thin layers	8½	240	Sand, fine and yellow	16	1,678
Gravel	27	267	Laminated clay	26	1,704
Blue clay with bowlders	59	326	Clay with thin limestone layers	14	1,718
Blue laminated clay	15	341	Laminated clay, with shells	1	1,719
Clay, red and tough	4	345	Clay	10	1,729
Blue clay	21	368	Clay, laminated with sand	42	1,771
Blue laminated clay	21	389	Clay	22	1,793
White sand	10	399	Clay, brown, laminated	8	1,801
Blue clay	15	414	Limestone, very hard	½	1,801.5
Blue laminated clay	12	426	Clay	4½	1,806
White sand	8	434	Clay, blue, laminated	18	1,824
Blue laminated clay	27	461	Laminated clay, almost white	57	1,881
Coarse sand	71	532	Clay, very hard and tough	19	1,900
Very tough blue clay	103	635	Sand or fine gravel	2	1,902
Shells in blue laminated clay	8	643	Clay	24	1,926
Blue clay	14	657	Clay, dark brown, laminated	1	1,927
Laminated blue clay	18	675	Clay with thin hard seams	94	2,021
Sand rock	1	676	Sand, coarse, white	80	2,101
Clay, more or less laminated, blue	38	714	Clay, very hard and tough	36	2,137
Clay, brown, laminated; some sand	60	774	Laminated clay, blue and brown	16	2,153
Clay	10	784	Clay	31	2,184
Sand and laminated clay	16	800	Clay, blue, laminated	13	2,197
Laminated clay	5	805	Clay, dark brown, laminated with some sand	20	2,217
Coal (lignite)	1	806	Clay, very tough	22	2,239
Very tough clay	20	826	Clay, hard joint, dry	16	2,255
Rock	2	828	Clay	9	2,264
Clay and bowlders	71	899	Clay, dark, laminated	9	2,273
Coarse sand	50	949	Sandstone	21	2,294
Soft sandstone	40	989	Sand and laminated clay	17	2,311
Sand	18	1,007	Sandstone, soft	20	2,331
Hard sandstone	28	1,035	Sand and wood, very firm when first taken out	45	2,376
Sand, gravel, and bowlders	84	1,119	Clay, blue, green, and red	127	2,503
Hard limestone	1	1,120	Brown clay, hard laminæ, lignite	44	2,547
Clay	58	1,178	Sandstone, soft, black	38	2,585
Limestone	2	1,180	Clay	22	2,607
Clay	100	1,280	Clay, laminated, with some sand and wood	24	2,631
Iron pyrites	4	1,284			
Limestone	4	1,288			
Clay	62	1,350			
Bowlders and pyrites	4	1,354			

The above is as near correct as the log can be kept where the drilling is done with the rotary process. Of course it is impossible to know to the inch the thickness of any soft stratum; but where it is hard we know the exact thickness.

The difference between this record of the well and that credited by Veatch to the driller, A. W. Myers (evidently misprint for O. W. Myers), in Professional Paper 46, is noteworthy. The record obtained by the writer in the field from samples and statements by those who were present at the time the well was put down to the depth of 1,283 feet agrees in general more closely with Veatch's record than with the one given above. However, the record from 1,283 to 2,631 feet is new and is interesting as showing that probably the basal members of the Catahoula formation are not reached at that depth. No thick beds of soft white sandstone are here recorded. The material penetrated in the lower part of this section is interpreted as the more or less lignitic sands and clays that accumulated in the upper Oligocene fresh-water trough whose northern marginal representatives constitute the Catahoula deposits. It is certainly a great pity that the "shells" encountered between 1,718 and 1,719 feet could not have been preserved and submitted to some competent authority for identification. Nowhere in Louisiana is there greater need for paleontologic data to assist in working out the general stratigraphy of the State.

BOSSIER PARISH.

The Busch-Everett test on the L. C. Bulkley land, sec. 8, T. 19, R. 13, Bossier Parish, is below 2,800 feet and is still grinding. The Gulf Companies test on the Oakland plantation, sec. 16, T. 17, R. 11, Bossier Parish, is reported to be about 1,200 feet without results.—Oil Investors' Journal, September 6, 1909.

The location and a section of the well at Plaindealing have already been given in connection with the description of the Caddo field (p. 154.)

CADDO PARISH.

The Rhodessa Land and Development Company commenced a well early in 1908 in the northernmost part of Caddo Parish. No results are yet reported.

CALCASIEU PARISH.

CASTOR SPRINGS.

A test well was sunk at Castor Springs 25 miles north of Jennings, in Calcasieu Parish, by Houston people.[a] It was abandoned at 2,100 feet April 5, 1907. It had a small gas showing.

DE RIDDER.

The McMahon prospect hole at De Ridder developed salt water January 18, 1905.

[a] Oil Inv. Jour., November 3 and December 3, 1906.

EDGERLY.

A test hole reaching a depth of 1,900 feet or more, put down by the Higgins Oil and Fuel Company in the NW. ¼ SW. ¼ sec. 28, T. 9 S., R. 11 W., blew out sand and salt water for two hours December 20, 1907. A second hole, 400 feet north of the first, was abandoned at 1,800 feet in February, 1908. A third, 1,000 feet south of the first, gave salt water and was abandoned.

FENTON.

Near Fenton, in sec. 18, T. 8 S., R. 5 W., a dry hole was sunk to 2,010 feet.

KINDER.

In the vicinity of Kinder several tests have been made for oil. In sec. 33, T. 6 S., R. 6 W., the Pearl Oil and Lumber Company obtained some showings of oil at 988 and 1,200 feet, but cased them off and went on to 2,009 feet, the depth contracted for. In the second hole by this company, drilled to 1,500 feet, "the drill went through 750 feet of gumbo, shale, and clay, without any showing of sand except 3 feet of clear white sand (no water) between 1,248 and 1,251 feet. Quantities of pyrites of iron were encountered four or five times, and in fact it appeared on the clay or gumbo. The drill was stopped in hard clay." The Vickers well showed considerable oil at 1,300 feet, but this was cased off and the hole deepened to 2,280 feet without results.[a]

LAKE CHARLES.

In 1901 two wells were sunk in the vicinity of Lake Charles. One, the Watkins No. 1, in sec. 16, T. 10 S., R. 8 W., though more than 2,400 feet deep, showed no signs of having penetrated Pleistocene formations, all the fossils found belonging to Recent species. In the Louisiana Geological Survey's report for 1902, page 270, a detailed section of this well is given. The well at Hoo Hoo Park was sunk to 1,800 feet and abandoned. In the summer of 1909 the Lake Charles Oil Company began operations on the Liedig farm, 2 miles southeast of the two wells just mentioned, but work was abandoned in August, 1909.

LAKE ARTHUR.

Log of the Mermentau River Oil Company's well near Lake Arthur.

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Top soil and clay	18	18	Sand	157	1,039
Red quicksand	20	38	Soft gumbo clay	158	1,197
White quicksand	95	133	Hard gumbo clay	79	1,276
Red shale and shell	37	170	Gravel, sand	135	1,411
White quicksand	40	210	Hard gumbo clay	22	1,433
Blue shale	36	246	Blue shale	22	1,455
Water sand	42	288	Gumbo clay	41	1,496
Sand and gravel	37	325	White sand	20	1,516
Coarse gravel, sand	302	627	Hard gumbo clay	198	1,714
Blue gumbo clay	37	664	Gumbo clay, shale	19	1,733
Coarse gravel	38	702	Oil sand, shale	16	1,749
Blue gumbo clay	180	882	Oil sand, gumbo clay	58	1,807

[a] Oil Inv. Jour., November 19, December 5, 1907, May 19, 1908.

After penetrating into the pocket of oil sand at 1,700 feet the showing of oil was continuous. The first gas pressure noticeable was encountered at 550 feet. Below 1,400 feet demonstrations were frequent, and after the screening had been placed gas roared in the pipe. The well is finished with a 4-inch pipe, screened 100 feet. A 6-inch casing is down 1,400 feet and an 8-inch casing is down 660 feet. Rotary, August 13, 1903.

SERPENT BAYOU.

The vicinity of Serpent Bayou has been looked upon as showing favorable oil signs, especially by the Barnett Brothers, of Lake Charles. The Crowley Oil and Sulphur Company is said to have a well here 2,000 feet deep, showing signs of oil and some sulphur (August 20, 1908).

ROANOKE.

Gen. J. B. Weaver put down a test well north of the Roanoke railway station in the spring of 1903 without results.

The Shippers' Oil Company is credited with drilling a well near this place to a depth of about 2,800 feet, obtaining gas and some oil indications (February 3, 1907).

SULPHUR.

A well 8 miles north of the mine at Sulphur is reported as abandoned at 1,200 feet (April 18, 1906).

Gas is reported in water wells 6 miles north of Sulphur (January 20, 1908; March 6, 1908).

The test hole on the Kerr tract, 1 mile north of the Sulphur mine, 1,000 feet deep, showed no traces of sulphur (September 19, 1907).

The Meathers Oil Company's test hole on the Eddy and Gunn place, 7½ miles north of the mine, was closed up at 1,750 feet in June, 1909.

CAMERON PARISH.

A test well was reported as being drilled on Johnsons Bayou by Fred. Pavell June 20, 1909.

CATAHOULA PARISH.

LELAND.

Two deep wells have been sunk in Catahoula Parish for oil, one at Leland, another at Trout. The former was investigated by the United States Geological Survey, and described by Veatch [a] as follows:

Mr. Thomas W. Robertson, field assistant, visited this well August 18, 1902, and obtained from Mr. A. A. Arnold, head driller, and Dr. J. C. Harden, fossils found at a depth of 1,000 to 1,250 feet. These have been pronounced Jackson (Eocene) by Prof. G. D. Harris. The depth at which they were found confirms the dip observations made on Ouachita River between Stock Landing and Carter Landing.

Doctor Harden, with whom the drillers stayed, was greatly interested in the well and kindly allowed Mr. Robertson to copy the following from his personal memo-

[a] Veatch, A. C., Prof. Paper U. S. Geol. Survey No. 46, 1906, pp. 292-293.

randum. It should be noted that it differs materially from the record furnished by the president of the company, and given below, which on the whole more nearly agrees with the known structure.

Section of well of Catahoula Oil and Development Company, Leland, Catahoula Parish, La.

[By Dr. J. C. Harden.]

	Feet.		
No record	0	–	40
Coarse gray sandstone, containing pure freestone water	40	–	60
Black clay, with pebbles	60	–	70
Soft sandstone, with water	70	–	246
Dark-green clay	246	–	546
Sandstone	546	–	559
Coarse red and white sand	559	–	601
Black and yellow clays	601	–	666
Soft sandstone	666	–	670.5
Sand, with soft, warm water	670.5	–	700.5
Black clay	700.5	–	760.5
Yellow clay	760.5	–	775.5
Fine gray sand, with water	775.5	–	800.5
Black clay	800.5	–	875.5
No record	875.5	–	1,000
Clay, with shells (Jackson)	1,000	–	1,250
No record	1,250	–	1,300
Very black formation, old seaweed, mud, and lignite (Cockfield)	1,300	–	1,500
Sand, with artesian salt water	1,500	–	1,645
Rock, "gypsum"	1,645	–	1,651
Very fine gray gypsum?; sand; water not artesian	1,651	–	1,701
Black and yellow clay	1,701	–	1,751
Rock	1,751	–	1,764
No record	1,764	–	1,864

"Pipe was withdrawn from 1,864 to 900 feet, when an explosion occurred which could be heard over three-fourths mile; then a gusher of very foul-smelling gas, mud, lignite, and salty water shot up over 100 feet. This contained some oil. Flow continued for twenty-two hours, when it stopped by choking. Before flow stopped salty water became quite clear."

The president, Mr. S. McDowell, furnished the following record in February, 1903:

Section of well of Catahoula Oil and Development Company, Leland, Catahoula Parish, La:

[By S. McDowell, president.]

	Feet.		
Gray-mottled clay	0–		60
Quicksand, with water	60–		80
Sandstone	80–		130
Blue or green clays	130–		370
Water-bearing sand	370–		
Blue or green clays			–1,550
Artesian salt water	1,550–		

No water was encountered between the 370-foot sand stratum and 1,550 feet.

TROUT.

William Buchanan employed the Clifford Well Company to drill a well 2,400 feet deep at Trout, Catahoula Parish. The best indications were said to occur at 1,925 feet. Large quantities of soft gypsum are reported (July 6, 1909).

EAST BATON ROUGE PARISH.

DEERFORD.

The Baton Rouge Oil and Natural Gas Company's well at Deerford 6 miles east of Zachary, 17 miles north of Baton Rouge, was down 2,300 feet September 1, 1909. Capt. M. H. Pickard was the driller. Several gas pockets were reported.

ZACHARY.

The Tucker Oil Company's test at Zachary, La., near Baton Rouge, was 1,400 feet deep September 1, and drilling with a 5¾ inch bit. Logs were penetrated in the hole at 60, 900, and 1,200 feet.—Oil Investors' Journal, September 6, 1909.

GRANT PARISH.

Gas has been noted in a water well at Colfax (February 6, 1909). The Colfax and Caddo Oil and Gas Company was reported to be drilling at Colfax, June 20, 1909. In view of these enterprises the log of the town well, as interpreted by Veatch,[a] may be of interest.

Section of town well at Colfax.

[By L. B. Hart.]

	Feet.
Port Hudson:	
Surface	0– 70
Water-bearing sand and gravel	70– 130
Jackson:	
Very hard clay	130– 300
Blue joint clay	300– 550
Cockfield:	
Fine quicksand	550– 650
Hard brown clay	650– 800
Sand rock	800– 835
Alternate layers of quicksand and black clay	835–1,000
Sand rock	1,000–1,060
Loose sand	1,060–1,100
Hard sandstone	1,100–1,128
Hard white clay, not passed through	1,128

"Pipe pulled back and set at 1,103 feet. This water proved to be very salty or full of soda. It seemed to be propelled by gases, the water rising in a pipe 65 feet above the surface. The natural flow is 60,000 gallons for twenty-four hours."

Mr. R. S. Cameron reports that below 150 feet gypsum and shells (principally small spirals) were quite common. No shells were found above 150 feet.

[a] Veatch, A. C., op. cit., p. 297.

IBERIA PARISH.

On account of certain seepages on the Lydia plantation, near New Iberia, Messrs. Lucas, Knapp, and others put down a test well to a depth of 1,900 feet in the fall of 1908. Below 700 feet, according to Mr. Lucas, compact clay predominated and no signs of gas or oil were found.

LAFAYETTE PARISH.

BROUSSARD.

The Lafayette-Crowley Oil Company is reported to have found a bed of "coal" in its test well 4 miles west of Broussard, at a depth of 290 feet (April 20, 1909).

LAFAYETTE.

A 1,500-foot test well was sunk on the André Martin tract, The Magnolias, 2 miles southeast of Lafayette, without obtaining oil indications, in the summer of 1903.

LINCOLN PARISH.

In passing through Ruston the writer has on several occasions examined the materials brought out of the water and oil wells, but has seen no reason for supposing that there is a local uplift of any consequence in this vicinity. The fossils obtained are all of a lower Claiborne horizon, although coming from depths of more than 700 feet. The following special dispatch to the Oil Investors' Journal under date of August 23, 1907, sums up the situation as generally understood in Ruston:

> The Ruston Oil and Development Company's test well on the Ruston, La., waterworks lot has reached a depth of 1,879 feet, the last 400 feet in gray, shaly clay, interlaid with sandstone and thin layers of limestone. Above 1,500 feet showings of oil were reported in five places. At 785 feet a streak of pay was found estimated to be good for 5 to 10 barrels a day. At the same depth oil was developed in the city well, and before it was cased off about 10 barrels came out on the water, also gas with the odor of oil. This created excitement and made it difficult to secure land. Money was at one time raised to go after the oil. L. B. Clifford, of the L. B. Clifford Well Company, is drilling the well.

OUACHITA PARISH.

MONROE.

A test well was started for "oil, gas, and water" in Forsythe Park, Monroe, in the summer of 1909, by Harper and Snell (Oil Investors' Journal, June 20, 1909). Much gas was encountered at 1,300 feet. The well was deepened to 1,500 feet and found large quantities of salt water (August 20, 1909).

CHENIERE.

The so-called Louisiana Oil Company, Consolidated, drilled a shallow well in Cheniere Brake, in the southeastern portion of sec. 11, T. 2 E., R. 17 N., shortly after the first excitement over oil prospects in the Gulf States caused by the remarkable results at Spindletop, Tex. A section of this well is given by Veatch in Professional Paper 46, page 303. The writer personally visited this place while operations were delayed for various reasons difficult to ascertain. Though a depth of 1,000 feet or more was claimed for the well, no material coming from it contained any but lower Claiborne (St. Maurice formation) fossils. They may here extend to a depth of 500 feet. Veatch gives the section to 515 feet.

PLAQUEMINE PARISH.

The well of the Algeria Oil Company at Algeria was down 1,718 feet June 6, 1909, with slight oil and gas indications. Two thin rocks were penetrated.

RAPIDES PARISH.

ALEXANDRIA.

Several well sections at or near Alexandria were published as early as 1906. One of these was made up from samples furnished by Oscar Shanks and shows clearly the great depth of the Catahoula formation at this place. Certainly no local doming is implied by this section, which is herewith republished. It seems, however, not to have deterred prospecting in this vicinity, as the notes appended below clearly attest.

Samples from asylum well, Pineville.[a]

	Feet.	
Medium to coarse reddish-yellow quartz sand	20–	24
Fine white indurated sand	24–	35
Very fine light-gray sandy silt	52–	92
Clay conglomerate, composed of small rounded clay pebbles containing considerable lime	228–	324
Fine-grained white sand	324–	328
Light-gray clay with rounded calcareous clay pebbles	328–	428
Hard gray fine-grained quartzitic sandstone	455–	461
Green clay	461–	540
Green clay and fine gray sand	540–	610
Green clay and fine gray sand, with numerous thin calcareous plates that resemble shell fragments, but which can not be definitely proved to be of organic origin	610–	650
Greenish-gray clayey sand	720–	800
Medium white sand, with a little clay	800–	806
Very fine gray clayey sand	806–	925
Rounded white calcareous concretions, lignite and gray laminated lignitic sand	927	
Greenish clay, lignite and sand; a few thin white calcareous plates similar to those in the 610–650 foot zone	925–	985
Fine greenish-gray sand	985–	1,020

[a] Veatch, A. C., Prof. Paper U. S. Geol. Survey No. 46, 1906, p. 311.

Brown Brothers completed a test well to 2,600 feet, but found no oil (Oil Investors' Journal, March 5, 1908).

The Central Louisiana Oil and Development Company's well at Alexandria was down 1,200 feet February 7, 1907; found a showing of oil and gas April 5, 1907; reached 2,500 feet December 5, 1907; was completed at 2,600 feet, with no oil, March 5, 1908.

Gas was said to issue from the Bentley Hotel well at 1,069 feet May 6, 1909.

CHENEYVILLE.

Oil and gas showings were reported from a well 1,400 feet deep 5 miles west of Cheneyville May 19, 1908; the well had attained a depth of 1,900 feet September 6, 1908.

RED RIVER PARISH.

Atkins Brothers are preparing to go deeper with the test they drilled at Coushatta, La. The hole is now 1,200 feet.—Oil Investors' Journal, June 19, 1907.

ST. LANDRY PARISH.

EUNICE.

The Wilfert Development Company, organized in 1907, in a test hole near Eunice passed through an 8-foot rock stratum at a depth of about 650 feet, then through 1 foot of clay into quicksand containing gas (January 6, 1909). The well was down 1,820 feet, with oil and gas showing, April 6, 1909.

MELVILLE.

The following section of the Latannier Oil Company's well, 12 miles south of Melville, from notes furnished by Oscar Shanks, driller, may be of value to prospective operators in this section of the country:

Section of Latannier Oil Company's well 12 miles south of Melville.[a]

	Feet.
River deposit	0– 20
Blue clay	20– 150
Gravel and bowlders	150– 232
Hard, blue flinty rock	232– 336
Caving brown gravel	336– 532
Hard, blue flinty rock	532– 537
Coarse blue sand with a large flow of pure, soft water	537– 555
Gumbo shale	555–1,452
Pepper-and-salt sand, with a strong flow of water having a slight sulphur taste	1,452–1,458
Strata of gumbo and rock containing strong artesian sulphur water	1,458–2,003

[a] Veatch, A. C., op. cit., p. 314.

OPELOUSAS.

In drilling for artesian water at Opelousas, La., Brown Brothers encountered a showing of oil between 600 and 700 feet and at 750 feet they had a blowout which sent the water 40 feet into the derrick.—Oil Investors' Journal, April 5, 1907.

The Plaisance Oil Company started a well on the Cretin farm, 3 miles southeast of Washington and 6½ miles north of Opelousas, November 10, 1908. Considerable gas was struck at 1,100 feet.

ST. TAMMANY PARISH.

The Sulphur Oil, Sulphur, and Mineral Company sank a test well to 2,500 feet without results December 3, 1906, on the Garland tract, Covington.

The St. Tammany Oil Company put down a well at Covington 2,700 feet without results July 19, 1907; W. H. Lovegrove, driller.

The Oak Ridge Oil Company was testing 13 miles west of Covington September 6, 1909.

VERMILION PARISH.

ABBEVILLE.

S. T. Hurst, drilling for the Perry Oil and Mineral Company on the farm of Alcide Le Blanc at Perry's bridge, 1½ miles east of Abbeville, La., set the 6-inch at 630 feet May 31; 20 feet of oil-bearing sand at a depth of 2,350 feet, August 6, 1909. The Abbeville Oil and Mineral Company drilled a test to 2,400 feet, 30 miles from the present site.—Oil Investors' Journal, June 20, 1909.

GUEYDAN.

The Wilkinson Development Company was reported as drilling a test hole 4 miles south of Gueydan March 20, 1909.

VERNON PARISH.

A well near Hornbeck, on the Kansas City Southern Railway, being drilled by Mr. Savage, was reported to have attained a depth of 500 feet September 3, 1906.

WEBSTER PARISH.

Drilling was reported at a point 17 miles north of Minden, by the Webster Parish Oil and Gas Company.—Oil Investors' Journal, May 19, 1908.

WINN PARISH.

Winnfield has justly been considered an interesting locality from a geologist's standpoint for many years. The peculiar dome structures showing at the surface as "salt licks" and the marble quarry are discussed elsewhere (p. 25). In the immediate vicinity of the town the Vera well has been sunk to a depth of 1,000 feet without showing any influence of the local uplifts. Mr. W. F. Cooper, the moving spirit in this enterprise, has kindly furnished the log of the

well to 1,000 feet (see below), with the following remarks: "The well is in the northwest corner of the SW. ¼ SW. ¼ sec. 24, T. 11 N., R. 3 W. I did not strike any salt water, and have set casing at 1,000 feet. I have made arrangements to go 500 feet farther." The shells mentioned in the log between 700 and 800 feet were forwarded to the writer and prove to be mid-Claiborne (Eocene) species. Therefore, as Cretaceous rocks undoubtedly come close to the surface but 3 or 4 miles to the east or west it is clear that this locality is in one sense in a synclinal trough, and prospects for oil or gas are practically eliminated.

Partial log of Vera well, Winnfield.

	Thickness.	Depth.		Thickness.	Depth.
	Feet.	*Feet.*		*Feet.*	*Feet.*
Sandy soil	6	6	Gray water sand	36	557
Sand; flow of water	32	38	Shale, thin sand layers	47	604
Sand (gray)	24	62	Hard shale	13	617
Sand, with thin strata of clay and sand rock	48	110	Rock formation	6	623
Sand, with thin strata of shale	150	260	Fine gray sand	19	642
Rock	3	263	Shale and thin layers of fine sand	32	674
Hard shale	35	298	Hard shale	11	685
Soft shale (blue)	34	332	Red gumbo (stiff)	13	698
Hard rock	2	334	Fine sand, shells, and shale	17	715
Shale	4	338	Hard shale and shells	11	726
Sand rock	3	341	Hard rock	3	729
Soapstone	4	345	Fine sand and shells	51	780
Shale and rock strata	20	365	Shale, thin layers of fine sand	27	807
Shale and soapstone	12	377	Red gumbo (stiff)	5	812
Shale and layers of shale	27	404	Shale and shells	4	816
Shale, hard and soft	16	420	Fine gray sand	12	828
Sand and layers of rock	23	443	Fine sand and shells mixed	13	841
Hard shale	3	446	Rock	5	846
Rock	2	448	Shale with layers of gumbo	74	920
Hard shale	2	450	Gumbo (blue)	14	934
Soapstone	9	459	Shale and layers of gumbo	12	946
Hard shale	18	477	Hard rock	1	947
Hard rock	2	479	Layers of shale and rock	9	956
Soapstone	19	498	Hard shale and layers of gumbo	26	982
Gray shale, thin layers of soapstone	23	521	Red gumbo (stiff), changing to blue	18	1,000

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