MISSISSIPPI
STATE GEOLOGICAL SURVEY

E. N. LOWE, Director

OIL AND GAS PROSPECTING IN MISSISSIPPI

By E. N. LOWE

1919

ERRATA

Under "Acknowledgements," in the line next to the last, the word "or" should be inserted so as to read, "or about individual wells."

Page 17, next to the last line, read "fissures" instead of "fisures."

Page 23, line 2,—read "perceptible" instead of "preceptible."

Page 64, 6th line from bottom,—after "although," insert the words, "the hole was full of mud and water."

Page 71, last two lines—
"Salt water at 3254

3259-3264 Grading back to blue chalk---------- 5"
belong in the log of Mildred Well No. 1, and should be put in its proper place in that log.

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BULLETIN NO. 15

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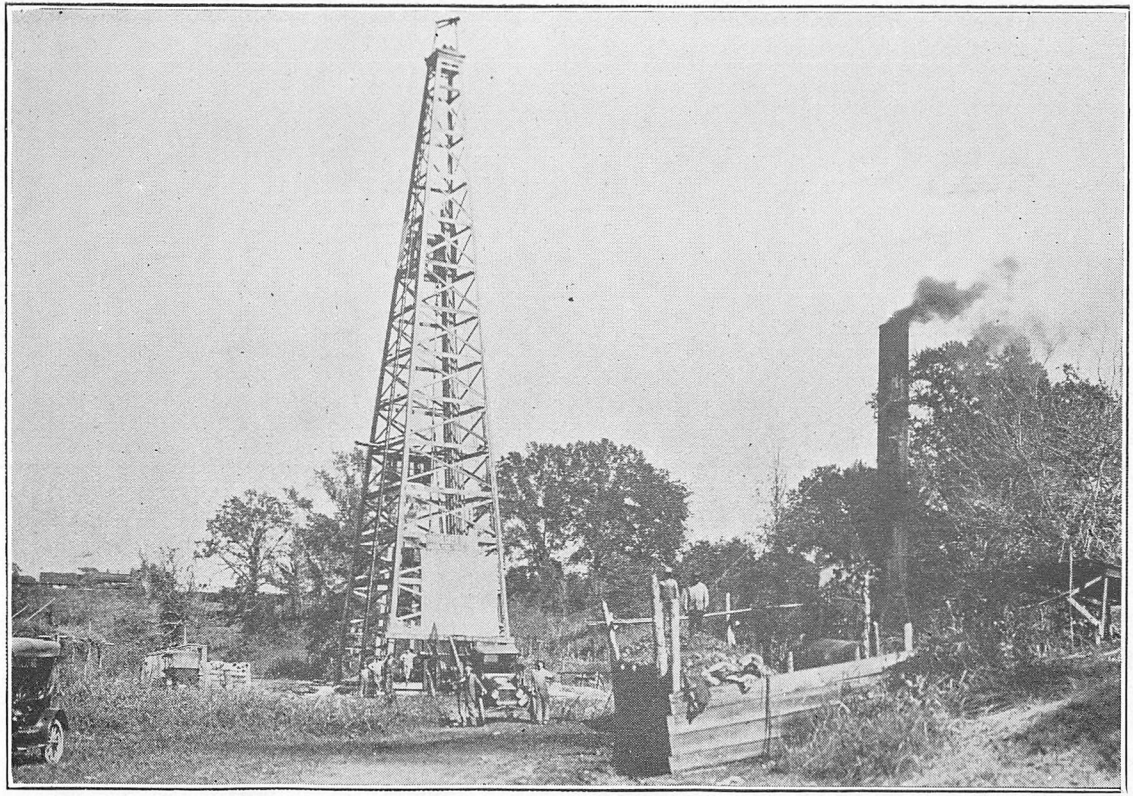

DERRICK OF MILDRED WELL No. 1, VICKSBURG.

STATE GEOLOGICAL COMMISSION:

His Excellency, Theodore G. Bilbo_____*Governor*

Hon. Dunbar Rowland _____*Director of Archives and History*

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W. L. Kennon _____*Assistant Geologist*

W. C. Morse_____*Assistant Geologist*

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E. Malcom Jones_____*Soil Surveyor*

Miss Frances H. Walthall_____*Secretary and Librarian*

LETTER OF TRANSMITTAL.

Office of Geological Survey,
Jackson, Mississippi.
February 25, 1919.

To Governor Theodore G. Bilbo, Chairman, and Members of the Geological Commission:

Gentlemen:

Within recent years a number of drillings have been made in this State with a view to discover oil and gas, but so far without success. Interest persists, however, in Mississippi as a possible future oil territory, as evinced by numerous requests from all over the country for information on oil and gas prospects in the State. Such inquiries are received at the office of the Geological Survey almost daily. These inquiries, together with the manifest interest of our own citizens in the oil and gas possibilities of the State, have determined the Geological Survey to collect, tabulate, and issue in a brief bulletin such data as are available on this subject.

This Bulletin is the result of these examinations, and is presented with the hope that it may stimulate and in some degree direct effort that may yet be made in the State along these lines.

Very respectfully,

E. N. LQWE, Director.

ACKNOWLEDGEMENTS.

In preparing this Bulletin, various sources of information have been consulted. We wish especially to acknowledge the use of Oklahoma Geological Survey Bulletin No. 19, Part 1; Ohio Geological Survey, Bulletin No. 1, Fourth Series; West Virginia Geological Survey Report, Vol. 1 (a), 1904; Dorsey Hager's Practical Oil Geology; U. S. Geological Survey Prof. Papers 98-L, 98-M, and 108-H, on some stratigraphic structures in Mississippi. Hopkins report on the Vicksburg-Jackson area (U. S. G. S. Bulletin 641-D) has been consulted in the discussion of the region embraced in the report. Of course the field notes of the State Geological Survey have been freely used in the preparation of this Bulletin.

Numerous citizens throughout the State have kindly furnished information about their several localities, about individual wells. To all of these I wish to express my indebtedness for help received.

INTRODUCTION

WHEN we decided to prepare this bulletin, which is supposed to give all the available information on oil prospecting and oil prospects in Mississippi, we realized how little information we really had, and how unreliable much of what we have necessarily is. After getting together all available data we realize even more than before how meagre and unsatisfactory it is.

Dorsey Hager says: "The importance of well-kept records must not be underestimated, as accurate conclusions cannot be obtained upon inaccurate data." This is absolutely true, and particularly so in a state like Mississippi where we are so dependent upon well records for information about our underground structure. We would like to impress upon our well-drillers, whether for water, or for oil and gas, that if oil and gas are ever to be found in Mississippi, and this is especially true of South Mississippi, it will be done upon data furnished by accurate well records. Oil and gas are practically never found except associated with certain geological structures, and to discover these structures the geologists are very largely dependent upon well records.

We feel it important to urge upon all drillers to keep accurate logs of all wells, and to furnish either a copy of the driller's log, or better still, cuttings from the wells, to the State Geological Survey for examination. Examinations of all cuttings will be made and reported to the well owners free of charge. The office of the Geological Survey should be a clearing house of all such information, receiving well data from all drillings within the State, and giving out information to all interested parties. In California every well drilling is reported and log filed in the office of the Geological Survey, and all drillers go there for information. The arrangement is mutually helpful, and to the satisfaction of all drillers and oil prospectors.

Mississippi suffers and is undeveloped largely because of the lack of co-operation along these lines, whereby both the state and the individual oil prospector and driller will receive benefit. Realizing the State's handicap in this respect and looking to the removal of the unsatisfactory existing conditions, the State Geologist had a bill introduced in the Legislature of 1918 providing for the registration of all public well drillers operating in the State, and requiring them to furnish the office of the State Geological Survey an accurate log of each drilling made in the State, the records of the Geological Survey being, on the other hand, open to the inspection of all drillers.

It was a meritorious bill, and should have become law. It passed the House, but was pigeon-holed in the Senate.

We feel sure that if drillers realized the mutual helpfulness of filing accurate logs of their wells in the office of the Geological Survey, they would be more thoughtful in that respect than they have been in the past.

OIL AND GAS PROSPECTING IN MISSISSIPPI.

The State Geological Survey is so constantly plied with inquiries about oil and gas possibilities in Mississippi, both by citizens of the State and by oil prospectors from the country at large, that it has seemed desirable to assemble in a brief bulletin all the facts in hand that might throw light on that problem, together with such inferences as might be reasonably drawn from those facts.

While interest in Mississippi as prospective oil territory has naturally extended to us from the adjacent fields of Louisiana, Arkansas, Oklahoma, and Texas, comparatively little actual prospecting has been undertaken. So far as the Geological Survey has been able to determine, only 18 wells have been sunk for oil and gas in Mississippi at various times and places. One of these wells, drilled at Vicksburg, reached a depth of 3462 feet, which is the deepest boring that has ever been made in the State.

Most of these borings have been undertaken without scientific consultation, and in only a few cases have we been able to get any thing like complete data on the wells. We feel constrain-

ed to say that in view of the haphazard way in which many of them have been located, the failure to discover oil or gas in the State up till now, presents a weak argument against the occurrence in our territory of commercial deposits of these hydrocarbons.

It was once believed that petroleum and natural gas occurred only in the older stratified rocks of this country, but more recently they have been found in rocks as recent as the latest Tertiary, and between these extremes, at numerous horizons. The oil and gas fields of Louisiana and the coastal regions of Texas, have presented such boundless supplies of these fuels, that it would seem a strange freak of nature if Mississippi, into which extend the same formations that furnish oil and gas in those rich fields, should prove to be barren territory. Hence it would not be unreasonable to expect that a careful search for oil and gas in Mississippi, where structural conditions are favorable, would reveal their presence in commercial quantities.

ORIGIN OF OIL AND GAS.

Petroleum (rock oil) and Natural Gas are hydrocarbons found under certain conditions in commercial quantities in the rocks of the earth. The two are chemically related, and almost surely are of identical origin, which is borne out by the fact that they usually occur together, although either may occur without the other.

Science is not a unit on the origin of oil and gas. Two theories have been promulgated, and each has its advocates. These two theories are the *inorganic* and the *organic*. Advocates of the first find convincing evidence that oil and gas have been formed by the interaction of inorganic chemical compounds deep within the earth; those who advocate organic (second) theory believe the weight of evidence is in favor of the derivation of these hydrocarbons from organic remains, animal, or vegetable, or both, by the process of destructive distillation of their tissues at low temperatures, and probably under water, before they were finally entombed in the earth's structures.

Inorganic Theory—The specific gravity of the earth impels

us to the belief that the interior portions are denser and heavier than rocks at the surface, hence are probably richer in metals. Some eminent chemists have assumed that the interior of the earth, far removed from surface oxidizing agencies, and under high temperatures, contains unoxidized alkali metals, and these, uniting at high temperatures with carbonates, form Acetylides, which, if acted upon by water vapor, yield hydrocarbons resembling petroleum. Mendelief, in 1877, published a theory assuming the existence of iron carbides within the earth, to which water, gaining access, thereby generates hydrocarbons like oil and gas.

Other variations of the inorganic theory have been advanced, but all agree in that oil and gas are produced by chemical reactions independent of organic tissues, at great depths within the earth, and at high temperatures. In the laboratory results have seemed to verify the theory in that hydrocarbons like petroleum have been produced by the action of water upon metallic carbides.

This may be called the Chemical Theory, and is accepted by few geologists. Many objections are urged against it, a few of which are here stated:

1. All known oil fields occur in regions of stratified rocks; no oil or gas deposit of consequence occurs in igneous rock, whereas the reverse should be true according to this theory.

2. The high temperatures incident to the intense chemical reactions of this theory are never found in oil fields, nor metamorphism of the associated rocks, as would be expected if oil were formed under conditions required by this theory.

3. Hydrocarbons are very rarely found associated with volcanic emanations, and never in quantity.

4. Oil and gas are usually associated with shales rich in organic matter.

5. If petroleum originated in the manner assumed by this theory it would have passed through many thousands of feet of rock to reach its present position near the surface. Much of

this vertical distance would have been through impervious beds, after passing through which there is no reason why the oil should not have risen to the surface and escaped.

Organic Theory—By this theory petroleum has been derived from organic matter, though the processes by which the transformation is made are not definitely known. By laboratory experimentation products closely resembling petroleum have been made from both animal and vegetable matter. The changes from organic tissue to petroleum have taken place out of contact with air, perhaps under water, or embedded in oozes saturated with water, which in some cases, at least, seems to have been salt water. Unusual temperatures do not seem to have entered into the process, but pressure caused by entombing the formations within the earth's structures, perhaps exerted an influence. Bacterial action is believed by Dr. Chas. B. Morey, of Ohio, to have been the chief agent in the production of petroleum from organic matter. He says: "My reasons for believing that oil and gas have arisen in this way may be summarized as follows:

"1. Bacteria produce just these decompositions when acting in the absence of air.

"2. Bacteria were present in the formations along with other organic matter.

"3. Bacteria are the only agents known which can produce such decompositions, except heat.

"4. The action of heat (in the Ohio fields at least) is excluded by geologic evidence."

Whether this organic matter was animal or vegetable has been a matter of considerable discussion, but it seems now as if there is little doubt but that both had a part in the production of oil and gas. It has been found that the oil of some fields has a paraffin base, that of other fields has an asphaltic base. The consensus of opinion now is that petroleums having a paraffin base are of vegetable origin, those with an asphaltic base—especially when containing sulphur and nitrogenous compounds—are of animal origin.

It is also believed by those who accept the organic theory of

the origin of oil and gas that these hydrocarbons, so far from having been transferred from great depths within the earth toward the surface, are stored within the formations where they originated, or at most have suffered only slight change of position.

The Organic Theory is accepted by nearly all geologists, because it meets the field conditions under which oil and gas are found the world over. A few reasons for this acceptance are here given:

1. All oil and gas fields occur in regions of stratified rocks.

2. Except in one or two cases they are far removed from volcanic or other igneous activity, present or past.

3. The rocks associated with the hydrocarbons never show evidences of unusual heat, which we would expect if the inorganic theory were correct.

4. The beds containing oil and gas are open-textured sedimentary rocks, and usually overlie shales rich in organic matter from which the oil has been derived. The shales themselves are often rich in oil, which can be distilled from them.

CONDITIONS OF OCCURENCE OF OIL AND GAS.

After all, the question of importance to the practical oil prospector is not so much how oil and gas originated, as the question under what conditions may they be found in commercial quantities within the earth. Can Geology prescribe rules determining with reasonable assurance that these hydrocarbons may be expected to occur at one place rather than at another? "Geology answers, that by careful attention to her precepts, much of the waste that characterized the first three decades of the search for petroleum can be avoided, but that it is beyond her powers to foretell absolutely as to whether any particular boring will yield either oil or gas in commercial quantity. The careful geologist can eliminate many of the factors of uncertainty, and thus limit the search to regions having a peculiar geologic structure where experience has shown that the occurrence of oil

and gas is most probable, but further than this, geology cannot go, and no skilled geologist has ever claimed otherwise."[1]

"By whatever class of reactions petroleum is generated, it doubtless appears first in a state of dissemination."[2]

"Disseminated petroleum is well-nigh universal; the accumulations are rare."[3]

Anticlinal Structure.—Disseminated petroleum never yields commercial deposits of oil. Experience has proved that these occur only in certain areas, usually quite restricted, where the rocks have been folded up into elongated ridges or "hog backs," called anticlines, or certain variations of this structure. The source of petroleum and gas may be a shale or highly bituminous limestone, but it is accumulated in open-textured rocks like sandstones, conglomerates, or some limestones. When an area is folded into an anticline of considerable size, the rocks are folded to great depths, the petroliferous beds along with those above and below it.

The same porous beds that carry oil also are usually water-bearing, and since water is heavier than oil, the water occupies the troughs between the folds, while oil is forced by the pressure of the water up under the anticline. If gas also is present, the water, oil, and gas are arranged according to their gravity, the gas being pressed up under the crest of the anticline, oil occupying the slopes or limbs of the anticline, and water occupying the trough or syncline.

In order that the hydrocarbons under pressure from below may not escape at the surface, there must be an impervious layer overlying the oil sands, often called the "cap rock." Clay, shale, and dense limestones form good cap rocks to hold the oil and gas under pressure. Oil and gas, elaborated by nature's hidden processes, may slowly accumulate under this cap rock until the pressure, due to the hydrostatic pressure below and the expansive force of the imprisoned gas, becomes so great as to produce

[1] I. C. White, W. Va. Geological Survey, Vol. 1, 1899, p. 158.
[2] F. W. Clarke, Data of Geochemistry, 1911, p. 704.
[3] Ibid., p. 703.

great "gushers" should borings tap the reservoir. It will be readily seen that if a well should tap the reservoir, as the oil-bearing rock is called, at the highest point of the anticline, gas alone will probably rush out; if the oil-rock is tapped lower down the slope of the anticline, oil, with gas will gush out, and the well will be a "gusher" until the pressure is relieved by the escape of the gas confined above, after which it will cease to gush, and the well will require pumping; when the well approaches exhaustion the pump brings up water—usually salt water—with the oil.

Gas and oil wells, even the great gushers, are comparatively quickly exhausted because the reservoir becomes emptied, and the shale beneath yields its oil too slowly to be economically important. The length of life of a well depends upon the size of the reservoir, which is determined chiefly by, 1, the thickness of the oil-bearing stratum; 2, the degree of porosity of the rock; 3, the angle of dip of the limbs of the anticline; 4, the length of the anticline. Other factors will enter into the problem, but the above four are chiefly important.

In an ordinary loose sandstone the pore space is equivalent to almost one-third of its bulk. A good oil rock will hold 6 to 12 pints of oil per cubic foot, but not more than 50% of that can be extracted by tapping the rock.

At Beaumont, Texas, the Lucas Well spouted 75,000 barrels per day, but the field is now largely exhausted. Here the structure has a dip of 125 feet in every 500, a condition almost necessarily arguing a small reservoir. The structure at Beaumont is a dome, a type of anticline which, as the name implies, is an arching up of the strata with approximately equal diameters.

Dome Structure.—The dome, especially the saline dome—with a solid core of salt rock—is very characteristic of the oil fields of the Gulf Coastal region. These domes are seldom more than a mile in diameter, and are often much less. The oil is found overlying the salt core where this is several hundred or a thousand feet beneath the surface; where the salt approaches the surface the oil is found in the upturned edges of the porous strata that have been broken through by the ascending salt core.

The history of the Gulf Coast oil fields has been very spec-

tacular, many great gushers having been brought in on these salt dome structures; but, as before said, each field is limited in extent, and is soon exhausted. The longer lived fields belong to other types of structure.

Monocline—Besides the anticline and the dome, one or two other structures are of sufficient importance to demand mention. A monocline is a bending of horizontal beds along one axis to a lower level, then again becoming horizontal. The monocline is a structural bench or terrace, and offers favorable conditions for the accumulation of oil and gas. Strata bearing oil may be broken or faulted by internal stresses. If the fault remains open the oil and gas will escape, but if the fault should become sealed by any of several ways the oil and gas would remain imprisoned near the fault, especially on the upthrown side of a normal fault. Hydrocarbons may accumulate in the basin of a syncline if a small anticlinal crumpling occurs at that position, as sometimes happens. There seems little doubt that oil and gas sometimes accumlate in lenticular porous beds imprisoned in impervious formations, but such deposits are liable to be small.

CHARACTER AND IMPORTANCE OF SURFACE INDICATIONS.

Oil Seepages.—No sign of oil is so good as a little oil escaping at the surface, and yet this sign must be taken in connection with structural conditions. Seepages of oil are encouraging as showing that somewhere below are petroliferous strata, but give no index as to whether the quantity is much or little. Without the presence of favorable structural conditions, a boring made on the evidence of escaping oil alone stands a good chance of finding no more oil below than at the surface. Escaping oil and structure combined form conditions to delight the heart of the driller, as eliminating, so far as possible, in advance of a drilling, the chances of failure.

It must be borne in mind by the uninitiated that petroleum as it comes from the earth has neither the odor nor the appearance of kerosene, but resembles more closely common lubricating oil. The color is dark brown to black ,often with a green-

ish cast, and is often thick and tarry, giving rise sometimes to so-called "tar springs." Where the escape is merely enough to make a slight show on water the iridescent films characteristic of oils are present. Films of iron oxide often show similar iridescence, and are frequently mistaken for oil show. These films may even at times be made to rise from the bottoms of quiet pools of water, break at the surface, and spread out in iridescent rings, very closely simulating oil films. As a sign of petroleum, iridescent or "oily" films covering pools of water, are not a very reliable sign of oil. In Mississippi in at least 99% of cases, such films would be iron oxide instead of oil.

Inflammable Gas—Inflammable gas escaping from the earth or bubbling up on the surface of lakes, springs, or permanent pools of water on high land, is a suggestive sign of hydrocarbons. This sign is very frequent in the oil fields of the Gulf Coastal region of Louisiana and Texas. But it must be remembered that marsh gas is inflammable and that it is a constant emanation from swamps, marshes, and low grounds generally. This gas is of surface origin and no index to the presence of oil or natural gas. Fully 99% of gas escapes from low marshy ground are escapes of this gas.

Iridescent iron films, or burning marsh gas, or both, have led to the drilling of most of the wells that have been put down for oil in Mississippi, and needless to say the borings have resulted in failure.

While the State Geological Survey has examined a great many so-called "oil signs" in Mississippi, we have never seen a real oil escape, and perhaps once have seen a real gas escape. But some of the great oil fields of the country have been developed on the evidence of structure alone, without a vestige of oil or gas at the surface. While these signs have their value when present, their absence is not particularly important, and territory cannot be condemned because of their absence. Other signs of more or less reliability are the outcrops of bituminous rocks, the presence of asphaltum or ozokerite in the rocks of a region, the presence of sulphur in fisures or cavities of the rock, and the escape from the ground of sulphurous or salt water. Any or all

of these taken together with favorable structural conditions would justify exploration of the region with the drill.

STRUCTURAL AND EROSIONAL RIDGES SOMETIMES CONFUSED BY THE LAITY.

While the anticline, the dome, or the fault, is the structure to be looked for determining the location of oil or gas accumulations, such structure is by no means always evident at the surface. An anticline is a structural ridge; that is, the formations are bulged up into a ridge, but it often happens that surface erosion has deformed the surface so that what corresponds to the axis or top of the anticline may be a valley, or a level plain, in which case, the anticline is made out by the careful examination of the outcropping strata, ascertaining the direction and angle of their dip beneath the surface. The difference between a structural and an erosional ridge should be kept clearly in mind. Most of the hills and ridges of Mississippi are erosional, not structural, but there are anticlines in Mississippi. The city of Jackson is located in a valley for the most part, and yet it is built on a structural dome, or broad anticline. In some oil fields the anticlinal or dome structure can be made out only by comparison of many drillings in the area, using some key formation of wide distribution beneath the surface in the region as an index for comparison.

AREAS IN MISSISSIPPI WITH STRUCTURES FAVORABLE FOR OIL AND GAS.

The Cincinnati Uplift.

The extensive arching of the Cincinnati Anticline passes through central Kentucky and Tennessee into northwestern Alabama, and finds expression in the rocks of northeast Mississippi. Only in Tishomingo and Itawamba Counties have the old Paleozoic rocks been found in Mississippi. These are limestone, sandstone, and shale beds of the Mississippian or Subcarboniferous, representing what are called in Alabama, Lauderdale Chert, Tuscumbia Limestone, and Hartselle Sandstone.

These formations, representing here the southern and west-

ern edge of the uplift, have a general dip toward the south and west, though the dip is not uniform, showing in places distinct undulations. Both limestones and sandstones are often bituminous, and in adjacent counties of Tennessee and Alabama oil shows, gas, and tar springs are frequent.

Eastport.—A well was drilled for oil about 1903 or 1904 on land belonging to Mrs. M. E. Higdon, in S. 26, T. 2, R 11, one and one-half miles south of old Eastport landing on the Tennessee River. The development company was from the North, and was represented by Capt. —— Bady. This well was reputed to have passed through limestone until the Devonian shale was struck (one foot thick) at a depth of about 400 feet, at which depth a little oil was encountered. In attempting to enlarge the hole the drill is reported to have become stuck in the rock, and after fruitless efforts to disengage it, work was suspended. Operations were never resumed, and the well was definitely abandoned at a depth of 752 feet. The old machinery is still to be seen on the site of the well.

This well, so far as our examination shows, is not located on any definite structure. It was begun in the valley of a small creek tributary to Bear Creek, and after a few feet of alluvium, entered the cherty limestone of the Carboniferous, which outcrops in the bed of the creek farther down.

No log of this well is available, the above information being given by Dr. F. T. Carmack, of Iuka.

Cypress Pond.—Six miles east of Tishomingo City, Tisho mingo County, at the Southward Homestead (called by Hilgard Suddard) is a low swamp semicircular area called Cypress Pond. This occupies most of Section 17 and part of Section 18, T. 5, R. 11. The semicircle, except toward the east and southeast, is bordered by precipitous hills 40 to 60 or more feet high, the lower parts of which consist of carboniferous limestones and sandstones. At the northern extremity of the "Pond" heavy-bedded bituminous, fossiliferous limestone forms the most prominent feature of the rim. This has a strong dip toward the north and east. In the southern part of the amphitheater surrounding the "Pond", just back of Southward's house the entire wall

is sandstone, 40 to 50 feet high, no limestone being in sight. The contact cannot be seen, but if this sandstone is the same as reported by Hilgard as underlying the limestone at the north side of the "Pond," (but which is not visible now) its dip here must be about 5 degrees. The condition suggests a fault; if there is no fault, there is at least decided local bending of the strata.

At Southward's Spring near Bear Creek, and about two miles south of the Cypress Pond, the sandstone is exposed noticeably dipping toward the southwest. Sandstone exposed in Bear Creek at Southward's Ford, half-a-mile farther south is black with bituminous matter. This bituminous rock probably lies below the limestone at Cypress Pond.

The evidence of these opposite dips as shown at Cypress Pond and at outcrops on Bear Creek and at Southward's Spring, point to a folding of the formations into an anticline with axis between Southward's Spring and Cypress Pond, tending northeast and southwest. The limits of the anticline have not been worked out, but its presence is undoubted. No deep wells have been put down in this region, and prospecting might give good results.

Bay Springs—In southwestern Tishomingo County, at the site of old Bay Springs on Mackey's Creek, the Hartselle Sandstone again outcrops in the stream banks in vertical cliffs 30 feet high at the bridge. The rocks in this vicinity all dip northeast at a rate of 90 feet to the mile. At Dr. H. L. Tyne's residence on Bear Creek, three miles southeast of Bay Springs, the top of the rock is 60 feet higher than at the bridge at Bay Springs, and dips toward the northwest at a rate of more than 100 feet to the mile.

Here, then, the Carboniferous rocks are distinctly folded, and it is probable that an examination of the dips in the adjacent parts of Prentiss County, to the west of Bay Springs, would show the strata again falling toward the southwest, revealing an anticlinal fold, with trend northeast to southwest. It would look as if extending down from the Tennessee River through Tishomingo County, and perhaps farther south, the old rocks are distinctly folded up into ridges whose trend is northeast and southwest.

We have no data showing how much farther south the folding goes, but it looks probable that they extend into Itawamba and Monroe, and probably into northern Lowndes County. Deep borings, penetrating in the Cretaceous-Carboniferous contact in Monroe and Lowndes, if located on favorable structures, would prboably give promising results.

CRETACEOUS AREAS.

The extension of the undulations of the older rocks beneath the Cretaceous would give favorable conditions for oil and gas accumulations. How far these extend we do not at present know, because very few borings have been made in the Cretaceous area that reach down to the contact with the Carboniferous rocks, and those few have been along the eastern border of the region.

No marked foldings of the Cretaceous beds themselves have been recorded, and even gentle undulations are infrequent. The lower surface of the Selma Chalk is sufficiently sharply defined to constitute a good key formation for working out structure, yet so far as available literature shows, little attention seems to have been given to this problem. Available well data throws no definite light on the question.

Corinth—The general dip of the Cretaceous formations, like those of the Coastal Plain generally, is toward the south and west. Crider[1] mentions an eastward dip of the Selma Chalk on the Southern Railroad 3 1-2 miles east of Corinth. The observed dip was 26 feet to the mile toward the east (or probably northeast), while the normal dip of the formation is about 30 feet to the mile toward the southwest.

The natural inference is that a bending or anticlinal ridge is developed somewhere to the west of the observed point, probably between that point and Corinth. Such a structure, if verified and outlined by detailed survey of the region, would be favorable structure to explore for oil.

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[1]Crider, A. F., U. S. G. S. Bull. No. 283, Geol. & Min. Res. of Miss., p. 15.

TERTIARY AREAS.

The greater part of the state is embraced in the area of outcrop of the Tertiary formations, from Eocene to Pliocene, inclusive. While the rocks of this large area are of varied kinds and unequal hardness, giving rise, under the action of surface erosional agencies, to considerable irregularities of surface, the beds in general have an approximately horizontal position, the prevailing dip being 25 or 30 feet toward the south and west. Deviations from this normal attitude are known at a number of places throughout the state. Striking reverse dips have been observed at several places, and monoclinal or anticlinal structures are known at several points in the Tertiary area.

Maben.—Three and a half miles north of Maben, Webster County, on the New Orleans, Mobile, and Chicago Railroad, a cut 150 feet long exposes Wilcox beds dipping at an angle of 4° toward the north (and probably, west). All the beds exposed in this cut dip in the direction given, and form the north limb of an anticline, the south limb of which is exposed in a cut one mile farther south. Two and a half miles north of Maben this second cut, which is 250 to 300 yards long, shows the same structures as the first, with the beds dipping south 20° east at an angle of 4°. From the two limbs the anticline can easily be theoretically reconstructed, but along the Railroad it has been truncated to almost a level plain.

No oil indications have been noted in the vicinity, but the structural conditions are favorable for oil accumulations, and a deep well might reach the Cretaceous-Carboniferous contact which offers hope of oil and gas. The Carboniferous rocks are rich in hydrocarbons in Alabama to the east and northeast, at no great distance and dip beneath this region, and the Selma Chalk would form a good confining rock, if it shared in the anticlinal folding, which is probable. This anticline would seem then, a reasonably good "wild-catting" proposition.

Kosciusko—In the railroad cuts at Kosciusko, Attala County, the Claiborne beds exhibit monoclinal folding. Seventy-five yards east of the railroad station, at the wagon bridge over the track, a cut exposes the Claiborne sands and clays, the stratifi-

cation of which can easily be made out on the north side of the cut. The beds show a preceptible bending, with a dip of 100 feet to the mile toward the southwest. In the great cut on the Aberdeen branch of the Illinois Central Railroad, one mile east of the station at Kosciusko, the sandstone strata can be readily seen to dip toward the southwest at a rate of 73 feet to the mile. A mile and a half along the railroad track to the southwest of Kosciusko, exposures of Claiborne sands and clays show either approximate horizontality or dip toward the east.

It would appear that a monoclinal folding begins in the vicinity of Kosciusko and affects the strata towards the east, which probably approach horizontality 3 or 4 miles east of Kosciusko.

Winona.—In the vicinity of Winona, Montgomery County, at the intersection of the Illinois Central and Southern Railroads, a considerable disturbance of the strata is apparent. The formations are of Claiborne age, consisting for the most part of Indian red fossiliferous sands. In a deep cut at Elliott, on the Southern Railroad, 3 1-2 or 4 miles east of Winona, these formations are seen to dip at a rate of 262 feet to the mile toward the west. Two miles west of Winona on the same railroad these red Claiborne beds have a distinctly eastern dip. At Vaiden, 10 miles south of Winona, similar red, fossiliferous, glauconitic sands outcrop in the northern edge of the town above track level, but at the southern end dip beneath the deep cut which exposes thick beds of gray clay and clayey sands, all dipping strongly to the south. At Beatty, five miles to the south of Vaiden, the ferruginous glauconitic Claiborne beds are again 10 or 12 feet above track level. It has not been satisfactorily determined whether these are identical with the beds outcropping at Winona and Vaiden; if they are identical, very decided undulations of the strata occur in this region. At all events, the bending of the strata between Elliott 3 1-2 miles east of Winona, and a point two miles west of Winona, is evident, and careful and detailed prospecting would probably discover encouraging anticlinal structures. Of course it is not to be inferred that the mere presence of anticlinal structure is a guarantee of oil accumulation beneath the anticline, but it limits the areas within which

prospecting might be worth while, and eliminates much larger areas where prospecting would be futile.

Meridian.—An examination of a recent geological map of Mississippi will show at Meridian a small area of Wood's Bluff Marls of the Wilcox, surrounded by later formations. This island is suggestive of an anticlinal structure at that point. It is located in a small valley surrounded by higher lands, on the north, east, south, and southwest by very high broken hills and ridges. This topography is largely responsible for the Wood's Bluff outcrop, but an examination of the beds for dips has revealed an appreciable dip toward the south from Perdue's Cut on the Meridian and Memphis Railroad, two miles southeast of Meridian. From that point a dip has been noted (barometric reading) toward the north at a rate of 50 feet to the mile, indicating anticlinal folding, with the axis just north of Perdue's Cut. This anticline, if confirmed by more detailed survey, is worthy of investigation, as artesian wells furnish sulphur water, and we have had unconfirmed reports of gas escapes.

Jackson Area—The areas around Jackson and Vicksburg present structures which have commanded the greatest amount of attention within the last two or three years. It has long been known that local uplifts in central Mississippi have disturbed the Jackson and Vicksburg formations, and on the strength of that knowledge together with escapes of inflammable gas from a deep well in the city of Jackson, and the occurence of pockets of black concreted bitumen in the Jackson Calcareous clay, the present writer, in 1910, addressed an assemblage of Jackson business men on the possibilities of the accumulation of oil and gas in the Jackson area. A Birmingham company offered to develop the field, and for a while the prospect of development looked bright, but the project finally fell through.

The definite anticlinal structure had not then been worked out. No special interest had been manifested in the Jackson field since that date until a report was issued by the United States Geological Survey on the Vicksburg-Jackson Area, in 1916. This report, (U. S. G. S. Bulletin 641-D, Structure of the Vicksburg-Jackson Area, Mississippi, with Special Reference to Oil and Gas, By O. B. Hopkins), described for the first time

the nature of the structural deformations in the Jackson area.

According to this Report the city of Jackson is "situated near the center of a broad, gentle fold, which shows a dome-like arch in cross section from northwest to southeast, and a terrace-like form from northeast to southwest. . . . . Near the southwestern and southern parts of the anticline the dips are steepest, as much as 60 to 70 feet to the mile; and in the northwestern and southwestern parts the dips are gentle, at a rate of 30 feet and less per mile."

The general slope of the uplift is more that of an arch or dome than an anticline, although a supposed axis of the structure is shown running in a northeasterly direction between the Illinois Central Railroad and Pearl River. This axis is not defined, and by some oil geologists is supposed to run in a direction more nearly east. There is little evidence of its extension in either direction, the observable and definable structure being a broad, dome-like arch, with an axis northeast and southwest somewhat longer than in other directions. This arch is several miles in diameter, and the northern edge of Jackson is a little south of the center, as mapped in Hopkins' Report.

The publication of Hopkins' Report was a signal for a rush of oil prospectors into the Jackson area. Leases were taken by numerous companies, and two finally blocked up territory enough to begin drilling. The Atlas Oil Company, of Shreveport, Louisiana put down their Garber Well No. 1, in S. 18, T. 6, R 1 E. about four miles north of Jackson. This well was sunk to a depth of 3079 feet and abandoned June 7, 1917. Four miles east of this well the Arkansas Natural Gas Company, a branch organization of the Benedum-Trees Company of Pittsburg, Pa., put down their Swearengen, or "Big Ben" Well. This also was abandoned after reaching a depth of about 3000 feet. The failure of these two wells discouraged further drilling, although numerous other leases had been taken. Interest in the field has subsided for a time.

With the logs of these two wells before him, the writer can definitely state that both of these wells stopped in the Selma Chalk. The Tuscaloosa Sands, 300 or 400 feet below the Selma

Chalk, is the horizon corresponding to the Woodbine Sand of the North Louisiana fields, and oil was not expected in the Jackson area until that horizon was reached. It can therefore be stated with considerable assurance that neither of these wells went deep enough to test the possibilities of the field.

Further than this, it appears from the best evidence we now have at hand, that neither of the wells was favorably located on the anticline. In testing a new field, it is always good practice to place the first test wells upon the highest part of the anticline. Evidence now at hand strongly indicates that neither of these wells was so placed.

The most reliable horizon to be used as a key in working out structure in this field is the contact of the Moody's Branch Marl with the Jackson Clay overlying it. The two formations are conformable, yet the transition from the gray-green, highly fossiliferous sandy marl to the buff-colored, massive overlying Jackson Clay, is sharply defined. Over all the interior terrace region upon which the city of Jackson is located, and which corresponds to the broad flat top of the anticline, the Jackson Clay is the surface formation, with the Moody's Branch Marl everywhere underlying it.

The recent study by the State Geological Survey of the few scattered exposures of this easily recognized marl, and its occurrence in wells whose logs are available, has demonstrated that the top of the marl along a north-south line rises regularly from the mouth of Town Creek in south Jackson to a point north of Jackson near the old Water Works plant on Pearl River, and then drops down again toward the north. An outcrop of this marl bed at the mouth of Town Creek in south Jackson shows the top of the marl to be between 250 and 260 feet above sea level. Assuming 255 feet elevation to be correct, several outcrops in ravines cutting through river bluffs, show a steady rise toward the north until the highest point is reached in a ravine 1-4 of a mile north of the old Water Works plant, almost due east of the Insane Hospital. Here the top of the marl bed is 45 feet higher than at Town Creek, the distance between the two points being about 2 1-2 miles.

No further outcrops of the marl are observable toward the north, but the two wells drilled by the Atlas and Arkansas Natural Gas Companies respectively are both located on an east and west line four miles north of Jackson, and about five miles north of the Town Creek outcrop of the marl. In the "Big Ben", or Swearengen Well of the Arkansas Natural Gas Company, the top of the marl bed was struck at a depth of 120 feet. The mouth of this well is approximately 340 feet above sea level. This would make the elevation of the top of the marl at this well 220 feet above sea level, or 35 feet lower than at Town Creek and 80 feet lower than at the old Water Works plant.

In the Garber Well of the Atlas Company the mouth of the well is 342 1-2 feet above sea level, and the top of the marl was reached at 150 feet depth, which would give it here an altitude of 192 1-2 feet above sea level. This would make the top of the marl here 62 1-2 feet lower than at Town Creek, and 107 1-2 feet lower than at the ravine near the old Water Works plant.

From the above evidence it is plain that both wells missed the highest, and therefore the most favorable part of the anticline, which on the river front is nearly due east of the Insane Hospital, and probably takes a northeast and southwest direction. Our reason for believing in a northeast and southwest trend of the anticline is based upon the fact that of the two wells, which are on an east-west line about four miles apart, the Swearengen or most easterly well, is more favorably located on the anticline than the Garber Well, being nearly 30 feet vertical height farther up the slope than the Garber Well.

The Jackson dome or anticline is so broad that it is entirely possible that its top may have been crumpled into several minor folds of which we have as yet no evidence. In this case it might be that borings in different parts of the field would reveal minor undulations on the greater arch which would determine the local accumulation of oil and gas.

Suggestions of minor foldings that appear to radiate from the center of the large dome in the Jackson area are found at Clinton on the west, Forest Hill School on the southwest, and Plain on the south. Cross anticlines cutting into a main anti-

clinal axis are usually regarded as favorable for oil prospecting, the point of intersection being especially favorable. These minor anticlines have not been very definitely worked out, and no borings have been made on them.

Vicksburg Area.—The folding in the Vicksburg area is of a different nature from the doming up of the Jackson area. In the region of uplands bordering the Mississippi Delta at Vicksburg and northward ,the Vicksburg limestone, which forms an easily followed horizon, is seen to be folded into two broad, steep folds; that is, the beds of limestone which are approximately horizontal in this region, drop, by a sudden bending, down to a lower level, maintaining practically horizontality for a number of miles, then drop down again to a lower level, thus forming two broad steps or terraces. The more northerly of these monoclinal folds, as they are called by geologists, appears in the vicinity of El Dorado about 15 miles north of Vicksburg, and extends toward the southeast to Big Black River; the southern fold is traceable from Vicksburg northeast to Big Black River. Monoclinal folds are regarded by oil geologists as structures favorable to oil accumulation. Most of the oil pools of southeastern Ohio occur under monoclinal folds.

The publication of Hopkins' report excited interest in these folds, especially the southern one, and large territory was leased on both folds, chiefly by a company organized in Vicksburg, the Mississippi Oil, Gas & Investment Company. This company proceeded in a conservative and thoroughly scientific manner to develop the oil possibilities of the fold nearest Vicksburg. This fold was selected because of the greater facilities for development as well as because the fold was most evident in that vicinity, and other conditions were equally favorable. The company, after a careful search, employed two thoroughly reliable drillers, bought machinery, and began operations three miles east of Vicksburg. Operations were open to the public at all times, and the greatest care was taken to keep an accurate log of the drilling. Cuttings were submitted daily to the State Geological Survey and to the United States Geological Survey at Washington for examination, and the drilling proceeded upon the evidence of the structures penetrated. At a depth of 3462 feet the

first well was abandoned, and a second was drilled on the same fold about three miles north of Vicksburg. This was abandoned at a depth of 2630 feet.

While this Company failed in their efforts to discover oil in Mississippi, they deserve this brief notice of their work, which we believe was an honest and reliable effort on the part of a Mississippi company to discover a possible valuable resource of the state.

The logs of these two Vicksburg wells, as well as those put down in the Jackson area, will be given on a later page. The northern monocline has not yet been prospected.

Anticlinal folds involving the Vicksburg and subjacent formations, as in the Vicksburg and Jackson areas, occur in southwestern Alabama, and it is possible that detailed work between the Mississippi and Alabama areas of disturbance will reveal other folds in Mississippi worthy of investigation.

South Mississippi.—South of the Vicksburg outcrop little evidence of foldings favorable for oil accumulation has been found. In the Catahoula formation some minor undulations have been observed, but for the most part not far south of its contact with the Vicksburg limestone. One such structure is noticeable on the Illinois Central Railroad four or five miles north of Crystal Springs, where County Line Bridge spans a deep cut of the railroad. Here the Catahoula sandstone is seen to form a distinct arch, dipping north and south from the bridge. This anticline is only a few hundred yards across, and trends in an east and west direction.

Matson, who has studied the south Mississippi formations[1] says: "The Catahoula sandstone has undergone little deformation, and presents no marked structural features. From the attitude of the sandstones gentle folds of small extent may be inferred at many places, but it is not everywhere easy to distinguish between cross-bedding on an extensive scale and inclination of beds. . . . . ."

[1]Matson, G. C., & Berry, E. W., U. S. G. S. Prof. Paper 98-M, The Catahoula Sandstone and Its Flora, 1916, p. 217.

"The absence of saline domes on the outcrop of the Catahoula is noteworthy when it is considered that such structures occur in Louisiana in the area north of the Catahoula sandstone, where Eocene beds are exposed, and also in the area to the south, where the Pleistocene and younger Tertiary formations overlie the Catahoula."

Natchez Anticline.—In the latitude of Natchez a broad gentle upfolding of the formations has taken place in the western part of the state. In this region Pliocene and Pleistocene river terraces, that normally have a gentle southward dip, are here seen to be 75 feet higher than in the latitude of Vicksburg and at Woodville and Centerville. On the river front at Natchez the Natchez formation is exposed to a thickness of 75 or 80 feet, but in a few miles dips below stream level both to the north and to the south.

In this region an axis of uplift trends toward the northeast and probably toward the southwest, where it is hidden beneath the river alluvium of the Delta.

The uplift is so broad that minor folds may exist in the area which might prove profitable prospecting.

What has been said of the Catahoula is true of all the south Mississippi formations so far as we at present know. Salt dome structures, such as have furnished the spectacular oil fields at Beaumont, Humble, Jennings, and Sour Lake, occur rather widely on the low coastal regions of Louisiana and Texas, but have not been found east of the Mississippi. These structures have been rather diligently and carefully looked for by the State Geological Survey and by visiting geologists, but so far without success.

In Texas and Louisiana the saline domes have an alignment corresponding with certain great faults that traverse the terrane. These faults may be limited to the western section of the Mississippi embayment. It seems more probable, however, that they traverse the country without particular regard to the embayment, in which case they may exist east of the Mississippi.

Since saline domes have not yet been found in Mississippi,

Alabama, or Florida, although diligently looked for, we are safe in assuming either that they do not exist in these states, or that they are concealed from view. In south Mississippi the low coastal flats, corresponding to the salt dome areas of Louisiana and Texas, are covered with recent sands to a depth of from a few feet to 15, 20, or more feet. Beneath these sands what we call Biloxi clays extend down to 200 feet depth. These clays correspond in physical characteristics and stratigraphic relations to the clays that are found at the surface throughout the salt dome areas of Louisiana and Texas. Detailed study from the Louisiana oil fields eastward to the eastern Gulf coast may establish the identity of these clays. If this should prove to be so, as appears most likely, then the recent coating of sand over the clays has covered up and concealed any salt domes that might exist on the Gulf coastal region east of the Mississippi.

Under these conditions the discovery of salt dome structures, if they exist along our coast, will be very largely a matter of accident, unless a large number of well records become available. Oil or gas escapes might reveal their presence, but so far no oil seepages and no gas escapes of known deep origin have been discovered. Salt springs or sulphuretted springs might be regarded as hopeful signs pointing to a hidden dome.

Suffice it to say that prospecting for oil and gas in the low coastal region of Mississippi is purely guess work until these dome structures are found.

Possible Oil Horizons—In the later Cretaceous areas of the state oil might be obtained where structure favors its accumulation, in the sands toward the base of the Cretaceous or at the Cretaceous-Carboniferous contact where the bituminous Hartselle sandstone lies beneath the Tuscaloosa clays.

In the Eocene and Oligocene areas, including all the Tertiary area of the state north of and including the Vicksburg, the Cretaceous-Carboniferous contact is perhaps too deep to be reached, but a favorable horizon is the Eutaw, or Tuscaloosa sands toward the base of the Cretaceous. The Tuscaloosa sands of Mississippi correspond to the Woodbine sand of Caddo, the Ripley or upper Cretaceous sand corresponding to the Nacotoch

sand of the Caddo field, the Woodbine sand being the oil member.

The oil of the salt domes is produced from different horizons. Oil at Beaumont is found in the Cretaceous; at Jennings, Louisiana, in the Pascagoula of the Miocene Tertiary. The gusher at Jennings obtained oil at a depth of 1820 feet from the Miocene. At Anse-Le-Butte oil was found at 801 1-2 feet depth in the Catahoula formation. Wells at Humble, Texas obtain oil at a depth of 1100 or 1200 feet depth from a cap rock of cavernous limestone of secondary origin.

Most of the formations which constitute oil horizons of the Louisiana fields we have in Mississippi, but whether they are oil or gas bearing remains as yet undetermined, for the reason that only four wells have been bored on actual anticlinal or monoclinal structures, and considering the extent of these folds, especially the Jackson anticline, these borings are not sufficient to disprove the presence of oil or gas in commercial quantities, as the history of oil development on the Gulf Coastal Plain definitely shows. The 13 other wells drilled in the state for oil were not located on any structure, so far as we know, and were undertaken, in our opinion, on spurious evidence.

PROSPECTING BY COUNTIES

ATTALA COUNTY

Attala Oil and Mineral Company, composed of local parties, are reported to have leased 15,000 acres of land in the vicinity of the little village of Gregory, in northeast Attala County. Indications determining their location on this territory were reported to have been, escapes of inflammable gas, sulphuretted springs, salt springs, reddish-yellow films on standing water, lignite, iron pyrites, and, as reported by their geologist, "a northeast and southwestwardly trending interfoliated anticline."

It may be noted that this region is in the area of outcrop of the highly ferruginated deposits of the Tallahatta, and it is almost sure that the films were of iron oxide, the sulphur springs probably resulted from the oxidation of marcasite which is rather common in the lignitic deposits of the Claiborne, and the burning gases were most probably marsh gas, as they seem to have been escapes from low, marshy ground. Driller, S. B. McAdams, on whose land the well and townsite were located. Geologist, Chas. H. Drake.

This Company seems never to have begun drilling, but their literature inspired a Kosciusko company to form and lease territory. This Company, the Home Oil Company, located and began drilling in March, 1911, on N. E. qr., Sec. 5, T. 15 N., R. 9 E., on land of J. R. Dill, three miles north of the new townsite of Gladys, on the Aberdeen Branch of the Illinois Central Railroad. Depth reported by Chas. H. Drake, April 24, 1911, 1020 feet. Gas bubbles were reported to have been escaping at that depth.

Apparently, money was exhausted and drilling stopped at this depth, with no further oil indications than the gas bubbles mentioned above.

(A recent communication from Mr. R. J. Stubblefield, of French Camp, states that this well was put down to a depth of 1900 feet, before abandonment.)

CLARKE COUNTY.

Log of the first well of the Alabama-Mississippi Investment & Development Company, at Enterprise, Mississippi.

Was drilled in the spring of 1903. Elevation 258 feet (approximately.)

This well was located 1-4 mile east of the Mobile and Ohio Railroad Station at Enterprise.

	FEET
Glauconitic sandy marl	30
Light gray sandy clay, noncalcareous	100
Light gray silicious claystone	140
Light gray clayey sand with particles of lignitic clay	151
Dark gray lignitic sandy clay	500- 620
Gray sandy clay, fossiliferous	1065
A good oil sand reported (no cuttings, character not given) at	795
Gray fossiliferous clay, with coarse sand intermixed	1085
Light silicious sand, grains coarse and rounded	1390
Subangular grit and fine gravel of quartz of various colors	1400
Coarse subangular quartz grains, lignitic grains, lignitic clay, lignite, and shell fragments	1450
(A small fragment of dark brown, fine-grained sandstone from this horizon has the appearance of being saturated with oil, but gives out no hydrocarbon odor.)	
Gray fine-grained silicious sand	1530
Dark gray sandy clay, slightly micaceous	1621
Black lignitic clay, with large proportion of lignite	1675
Gray lignitic clay	1680
Dark gray lignitic clay, with fragments of light gray shale	1720
Very light gray, soft chalky limestone, no recognizable fossils	1806
Dark gray soft limestone cuttings	1812
Lignite and marcasitic lignitic clay	1806-1812

Dark brownish-gray lignitic clay, noncalcareous--	1822
Lignite, marcasite, and hard brown glauconitic sandstone, slightly calcareous ----------	1842
Hard black sandstone, bituminous (?) ----------	1842-4 in.
Gray sand (depth not given.)	
Very fine gray sand (depth not given)	
Glauconitic sand (depth not given.)	

The above log was made from cuttings kindly loaned by Judge John L. Buckley of Enterprise, Mississippi.

The cuttings were taken at too long intervals and in too small quantity to furnish adequate basis for a satisfactory log of the well.

Judge Buckley reports distinct "oil show" at 900 feet and again at about 1600 feet. But having faith in striking a "gusher" at greater depth, these horizons were cased off and the well drilled to the depth of 1842 feet when the drill broke off. An attempt was then made to draw the casing so as to test the 900 foot pocket, but it was found the casing could not be extracted.

The company reorganized in 1904 under the name of the Mississippi Crude Oil Company and sank a six inch well on the west side of the Chickasawhay River below Enterprise. At 400 feet a gushing artesian well was struck, and further drilling was abandoned.

CHOCTAW COUNTY.

At Blanton's Gap, 1 1-4 miles northeast of Ackerman, on the Aberdeen Branch of the Illinois Central Railroad, the big cut exposes outcropping lower Wilcox beds. These beds dip gently toward the west at the west end of this long cut. Toward the middle of the cut there is a distinct reverse dip, and toward the east end the dip is again toward the west at a rate of 10 feet in 100. Our field notes say: "The beds are easily seen to undulate, but the crest of the ridge seems to be the crest of an anticlinal uplift." The top of this ridge (railroad level) is 547 feet, with a gentle slope toward the west, but a very pronounced slope toward the east, the track level dropping down in

3 or 4 miles to 333 feet. How much of this is due to anticlinal folding, as suggested in the above note, and how much to differential erosion, remains still unknown. Certain it is, however, that the crest of the ridge is a zone of appreciable folding on a limited scale, and it may be that the whole ridge represents an anticlinal fold on a larger scale. It is a region worthy of more detailed study for oil structure.

COVINGTON COUNTY.

Seminary Oil Well, 1-4 mile S. E. of Seminary, on land of O. W. Conner, Seminary, Miss.

Location of well: On S. W. 1-4 of N. E. 1-4 of Sec. 22, T. 7 N., R. 15 W.;

Elevation, approximately 240 feet;

Developing Company, Seminary Oil and Gas Company;

Driller, J. W. Champion, Pine Prairie, La.

Drilling began on July 9, 1914, and well was abandoned in September of the same year, at a depth of 3300 feet.

No log of this well is available. Three or four samples of cuttings have been examined in the office of the Geological Survey, but furnish little definite information. These specimens of cuttings were sent by Mr. G. R. Ellis of Seminary, who gives us all the information we have of this well.

A dark gray lignitic clay is reported by Mr. Ellis to have come from a depth between 1500 and 2500 feet; a light gray, almost white, siliceous limestone Mr. Ellis reports as coming from a depth of 1800 or 2000 feet. A sample of green clay came from the bottom of the hole, at 3300 feet.

Beds of sea shells are reported to have been encountered between 2500 and 3000 feet depth.

Salt water and oil show are reported to have been struck, but at what depth is not stated.

FOREST COUNTY.

A deep well was put down for oil near Hattiesburg some years ago. This (Tatum Well) is reported to have gone down to a depth of 4,000 feet and to have encountered a strong flow of warm salt water which for a while was run into a reservoir and used for salt baths. No further data on the well are available.

GEORGE COUNTY.

Extending through eastern George county in a generally northeast direction from the lowlands skirting the Gulf, is a notable ridge, or region of uplands from 285 to 325 feet above sea level. This ridge is "remarkably straight and regular as compared with other watershed ridges in the coastal region, occasionally widening and flattening to a plateau of several square miles." Deep wells which have been sunk in the county within the last two years, according to the drillers reports, strike a hard, flinty rock stratum at a depth of about 750 feet on top of this ridge or plateau, and in the regions both east and west of it, some 15 or 20 miles, apparently the same flinty stratum is encountered at depths ranging from 1000 to 1200 feet.

While the information is somewhat hazy as to general structures, the driller "was always able to recall and give approximate figures regarding this dreaded rock stratum." (Letter of Mr. A. G. Holder, Jr., Lucedale.)

If these observations are correct, this may be a broad anticline, or possibly a faulted uplift like the Sabine Uplift of the north Louisiana oil fields.

Mr. A. G. Holder of Lucedale, in his practical engineering work in George county, has discovered an unusual amount of variation in the magnetic declination in this region. This we know is found in practically all oil fields, and while it may have no such bearing here, this, taken with the drillers' data showing a broad uplift coextensive with the surface ridge or plateau, makes this region of Mississippi one worthy of careful investigation by oil geologists.

HANCOCK COUNTY

One or more wells prospecting for oil were sunk in the vicinity of Gulfport ten or fifteen years ago, but we have been unable as yet to get any data on them. The result of the experiment was a failure.

HINDS COUNTY.

Log of Garber Well No. 1 drilled by Atlas Oil Company of Shreveport, La.

Location, S. W. cor. of S. E. sq. of S. W. sq. Sec. 18, T. 6, R. 1 E.

Near Jackson, Hinds County, Mississippi.
Elevation, 342.51 feet.

Began drilling, March 8 1917, finished drilling, June 7, 1917.

Feet:

60	Yellow clay
130	Yellow clay and gravel
150	Soft yellow shale
165	Hard gumbo
185	Blue clay
220	Shale and boulders
240	Gumbo
260	Soft shale and boulders
288	Yellow shale
310	Gumbo: set 8'' casing at 302'
330	Red clay
343	Hard gumbo
350	Yellow shale
386	Fine gray sand
445	Yellow gumbo
458	Black sand
490	Gumbo
530	Streaky shale
550	Gumbo
556	Rock

820	White sand, artesian flow
835	Shale
873	Sand
965	Hard packed sand
1028	Hard gumbo
1035	Hard rock
1084	Hard gumbo
1100	Gumbo
1125	Hard shale
1184	Gumbo
1213	Hard gumbo
1215	Black shale
1220	Sand rock
1237	Gumbo and shale
1240	Gumbo
1280	Hard broken sand rock and packed sand
1300	Hard sand rock
1315	Blue gumbo
1336	Packed sand
1348	Hard sand rock
1386	Soft shale
1392	Gumbo
1414	Soft shale
1426	Hard sand rock
1440	Gumbo and ''gyp''
1458	Shale and boulders
1461	Gumbo
1558	Shale and boulders
1560	Hard sand rock, set 8'' casing
1565	Hard sand rock
1590	Gray sand
1630	Sticky shale
1650	Hard gumbo
1678	Shale
1681	Lignite
1705	Gummy shale
1723	Shale
1725	Hard sand rock
1726	Sand rock with pyrites

1737 Hard gumbo
1742 Hard rock
1751 Soft sand
1753 Hard sand rock
1754 Hard rock
1768 Lignite coal and shale
1800 Soft sand
1823 Packsand—rock at 1823
1825 Sand rock with pyrites
1840 Hard gumbo
1865 Pack sand
1874 Gumbo
1900 Hard gumbo
1920 Gummy shale
1940 Sandy shale
1964 Sand and lignite coal
1994 Lignite
1997 Sand packed
2025 Packed sand, hard
2045 Sand and lignite coal
2060 Fine shale
2061 Hard sand rock
2075 Packed sand at 2075, rock at 2065
2078 Sand rock
2088 Packed sand
2089 Sand rock
2095 Packed sand
2097 Hard sand rock
2120 Packed sand and sand rock
2140 Packed sand and boulders
2145 Gumbo
2165 Hard gumbo
2200 Packed sand, hard
2210 Hard sand rock
2225 Hard gumbo
2272 Gyp gumbo
2275 Gumbo
2339 Packed sand
2359 Sand rock and packed sand; at 2359 hard rock

2363 Hard rock
2365 Hard sand rock
2370 Hard packed sand; at 2370 hard rock
2371 Rock
2375 Hard sand rock
2377 Hard sand rock
2405 Hard sand rock
2446 Packed sand
2448 Hard sand rock
2450 Hard rock
2451 Hard sand rock
2462 Sand rock
2482 Hard gumbo
2524 Lime rock with breaks in it
2552 Lime with breaks
2558 Lime with breaks
2585 Lime rock
2630 Lime and chalk rock; at 2610 hard chalk
2634 Hard rock
2670 Chalk rock and gumbo
2700 Lime and gyp rock
2722 Lime rock, gummy
2755 Lime rock
2758 Gumbo
2760 Hard chalk rock
2775 Gypsum
2779 Hard lime
2795 Hard chalk rock
2820 Hard chalk
2855 Hard chalk rock
2880 Hard chalk
2910 Chalk rock hard and soft breaks
2935 Chalk rock
2945 Hard chalk
2975 Hard chalk
3002 Chalk rock and brown shale; hard broken formation
3001 Hard rock
3010 Hard chalk and pyrites; iron ore
3030 Sand and boulders; iron boulders

3074 Chalk rock
3075 Rock
3066 Hard chalk and pyrites of iron
3076 Hard rock
3076 Hard sand rock with iron pyrites
3076 Hard rock
3079 Hard rock
Abandoned.

This well stopped in the Selma chalk, and should have gone at least 300 feet farther to strike the Tuscaloosa sand, which is Woodbine sand of Caddo.

(Copied from log furnished by the Atlas Co.)

Log of Benedum-Treese, Swearengen, or "Big Ben" Well, near Jackson, Hinds Co., Mississippi. Sec. 14, T. 6 N., R 1 E. Elevation 300 feet. Begun in March, 1917.

(This log is made from cuttings furnished the State Geological Survey by the Drillers of the well.)

Yazoo Clay of Jackson Group:

Feet:	
0- 20	Yellowish-gray clay with some loose silt and small rounded, quartzy gravel
20- 40	Yellowish-gray clay with deeper yellow mottlings
40- 60	Gray clay, less deeply stained with yellow
60- 80	Grayish-yellow clay slightly silty
80- 100	Gray clay, highly calcareous, somewhat friable and marly
100- 120	Darker, greenish-gray, calcareous, friable, marly clay

Moodys Branch Marl, of Jackson:

120- 140	Dark, green-gray, sandy, friable marl. Glauconitic and highly fossiliferous
140- 160	Dark, green-gray marl like above, but more sandy, fossiliferous
160- 180	Same as above but more clayey and finer sand
180- 200	Sandy, fossiliferous, calcareous marl of lighter gray color

200- 220	Gray clayey marl mottled with yellow, slightly glauconitic and fossiliferous
220- 240	Same as above, but slightly lighter color
240- 260	Gray, sandy, fossiliferous marl, highly calcareous
260- 280	Same as above, but more sandy and less fossiliferous
280- 300	A lighter gray, marly sand, grading into next below
300- 320	Gray, highly calcareous sand, somewhat fossiliferous
320- 340	Gray-green, sandy, glauconitic fossiliferous marl
	Cockfield Claiborne:
340- 360	Gray to brown calcareous sand, slightly lignitic
360- 380	Same as above, somewhat clayey, lignitic and darker
380- 400	Dark brown lignitic shale or clay, with some lignite
400- 480	Dark-brown lignitic clay
480- 500	Dark-brown lignitic clay, slightly sandy and highly calcareous
500- 520	Same as above, slightly more sandy
520- 240	Lighter brown lignitic clay, becoming more sandy
540- 560	Brownish-gray fine sand, slightly clayey
560- 580	Same as above
	Lisbon of the Claiborne:
580- 600	Very fine brownish-gray sand, highly calcareous
600- 620	No record
620- 640	Brownish-gray clay, slightly sandy, with yellow mottlings
640- 660	Same as above, slightly darker
640- 680	Same as above, slightly more sandy
680- 700	Dark gray sand, noncalcareous
700- 720	Same as above
720- 740	Dark gray fine sand, slightly clayey, calcareous
740- 760	No record
760- 780	Light gray sand, slightly micaceous, calcareous
780- 800	Darker gray and coarser-grained sand, calcareous
800- 820	Same as above
820- 840	Same as above
840- 860	Sand somewhat darker, otherwise like above
860- 880	Sand finer and lighter colored
880- 900	Same as above

Tallahatta Claiborne:

900- 920	Dark brown lignitic clay
920- 940	Brown lignitic clay, slightly sandy
940- 960	Same as above, more sandy
960- 980	Brown lignitic clay, somewhat sandy
980-1000	Dark brown lignitic clay or shale
1000-1020	Same as above
1020-1040	Same as above
1040-1060	Lignitic clay of slightly lighter color than above
1060-1080	Lignitic clay, darker, with lighter mottlings, calcareous
1080-1100	Lignitic clay, with whitish, limey mottlings, calcareous, the whitish parts sparingly glauconitic
1100-1120	Same as above, in all particulars
1120-1140	Same as above
1140-1146	Gray limey clay, proportion of lime much greater
1146-1147	Gray-green glauconitic sand, with particles of lignitic clay
1147-1167	Highly calcareous lignitic clay with some glauconite
1170-1182	Gray, slightly lignitic clay, highly calcareous
1182-1192	Ligh gray clay, mottled with white limey material
1190-1214	Darker lignitic clay with light lime mottlings
1214-1227	Fine grayish-brown sand, with yellowish streaks, calcareous
1227-1238	Dark grayish-brown lignitic clay with light mottlings calcareous
1238-1258	Gray clayey marl, somewhat glauconitic
1238-1260	Same as above
1260-1268	No record.
1268-1270	Gray, marly clay slightly glauconitic
1270-1290	Same as above, more clayey
1290-1310	Dark gray fossiliferous marl, slightly sandy
1310-1345	Dark gray sandy marl, sparingly fossiliferous

Wilcox:

1345-1365	Dark gray lignitic clay with whitish streaks, noncalcareous
1365-1382	Dark gray lignitic clay, with light mottlings, calcareous

1382-1384	Grayish-green glauconitic sandy marl
1386-1404	Dark gray sandy marl, slightly glauconitic, sparingly fossiliferous
1404-1424	Same as above
1424-1444	Gray calcareous fine sand
1444-1464	Dark gray marly sand
1464-1484	Friable dark gray sandy marl, fossiliferous
1484-1504	Same as above, slightly more clayey
1504-1524	Gray sandy marl, somewhat clayey and lignitic
1524-1544	Gray lignitic sandy clay, with particles of lignite, calcareous
1544-1564	Same as above, with more lignite
1564-1584	Same as above
1584-1604	Gray sand, calcareous, with large proportions of lignite
1604-1610	No record
1610-1635	Dark brown lignitic clay
1635-1655	Lighter brown clay, slightly lignitic and sandy
1655-1675	Same as above
1675-1685	Gray sandy clay, slightly lignitic and calcareous
1685-1705	Same as above, but with more sand of coarser grain, calcareous
1705-1725	Gray lignitic clayey sand, with particles of lignite
1725-1735	Same as above
1735-1755	Gray marly clay, with reddish oxidized stains, calcareous
1755-1787	Brown lignitic clay, sandy and calcareous
1787-1790	Coarse sand, largely quartzose, with cutting of hard fine grained sandstone, a few flakes of black shale, green sand grains, etc., and one small spiral univalve shell
1790-1799	Lignitic brown clay, with some lignite
1799-1803	Lignitic clay, lighter brown to gray
1803-1823	Same as above, more sandy
1823-1843	Dark brownish-gray sandy clay
1843-1857	Dark gray fine sand, slightly clayel and calcareous
1857-1877	No record
1877-1897	Dark gray sandy clay

1896-1910	Dark gray clay and sands, with cuttings of lignite and hard rock, greenish-gray sandstone, marcasite, etc.
1910-1930	Dark gray lignitic clay
1930-1945	Brownish-gray lignitic sandy clay
1945-1965	Gray sandy clay with lignitic stains
1965-1985	Same as above
1985-2005	Dark gray clayey sand
2005-2030	Same as above
2030-2037	Same as above, but more clayey
2037-2057	Gray lignitic clay, with yellowish-brown oxidized streaks, calcareous
2057-2074	Same as above, Midway
2074-2084	Dark gray lignitic clay, with whitish streaks, non-calcareous
2084-2104	Brownish-gray lignitic sandy clay
2104-2121	Dark gray fine sand
2121-2141	No record
2141-2161	Dark brownish-gray clayey sand
2161-2181	Dark gray clayey sand, with some yellowish-brown oxidized clay
2181-2201	Dark gray lignitic clay, with some lignite, calcareous
2201-2221	Dark gray sandy clay
2221-2224	Darker brownish-gray sandy clay
2224-2238	Dark gray sand with some light gray sandstone cuttings
2238-2250	Dark gray, fine lignitic sand, with some lignite, calcareous

No cuttings furnished for depth lower than 2250 feet.

(Continued from Driller's Log)

Ripley

2270	Sandy shale
2344	Packed sand with streaks of hard rock
2386	Shale and streaks of sand rock
2389	Sand rock
2399	Gumbo
2409	Lime rock

2420 Tough gumbo
2480 Hard gumbo, and streaks of lime rock 4'' to 8'' thick
2438 Shale and lime rock
2532 Hard shale, streaks of lime rock
2544 Hard shale
2564 Hard gumbo
2596 Gumbo
2597 Rock

Selma Chalk.

2626 Hard chalk
2667 Hard chalk with layers of gypsum
2842 Hard chalk
2864 Chalk rock showing some sand
2945 Chalk rock
2956 Hard chalk rock
2970 Hard crystalized lime
2983 Broken sand rock, chalky
3043 Shells, lime and chalk
Abandoned at 3043 feet.

Well stopped in the Selma chalk. At a depth of 2640 feet limestone saturated with petroleum is reported to have been taken from this well.

JACKSON COUNTY

Log of well at Bellevue, South Pascagoula, Jackson County, Miss., on land of Mr. W. A. Pollock, Jr. Elevation 10 feet.

White sand	1 to 15 feet
Blue clay	30 feet
Quick sand	60 feet
Blue clay and shells	70 feet
Gray sandstone—tough	86 feet
Hard sandstone—shells	94 feet
Sand and shells	100 feet
Sharp white sand	200 feet
Sandstone—fine white	225 feet
Sandstone—white	230 feet
Soft stone, white marl	234 feet

Soft stone, gray marl	242 feet
Blue clay, hard	252 feet
Sand, gravel	267 feet
Clay—sand—blue	294 feet
Gumbo	319 feet
Sand, water	321 feet
Tight sand, clay	318 feet
Hard white marl	352 feet
Soft sand, blue clay	356 feet
Blue clay,—marl, hard	376 feet
Tight sand, fine micre (mica?)	396 feet
Hard blue clay	398 feet
Greensand—fine	408 feet
Gray sand, finer, odor gas	425 feet
Soft blue marl	430 feet
Hard blue marl	436 feet
White sand	450 feet
Blue clay	456 feet
Hard sand, salt	466 feet
Boulder,—hard side	467 feet
Hard blue marl	500 feet
Gray strict (?) mica, oil sand	512 feet
Blue marl, hard	517 feet
Fine gray sand, hard; oil sand	525 feet
Hard rock, marl	560 feet

35 feet of oil bearing sand.

(Signed) A. T. SUHREN, Driller.

March 4, 1913.

(Well ceased at 560 feet because Company was out of money.)

LOG OF ARTESIAN WELL ON BELLEVUE PROPERTY.

Near Pascagoula, Jackson County, Miss.

	Depth: Feet	Feet
Yellow sand	0 to	35
Black mud	13 to	35
White sand	35 to	47
Soft blue clay	47 to	55

White sand	55 to 75
Hard clay	75 to 97
White sand and gravel	97 to 157
Sand and mud	157 to 195
Hard clay	195 to 216
White sand	216 to 236
Sand and mud	236 to 270
Hard clay	270 to 440
Fine gray sand	440 to 443
Clay	443 to 550
Gray sand	550 to 604
Clay	604 to 668
Sand	668 to 678
Clay	678 to 700
Water sand	700 to 810

JOHN FORD, Driller.

December 11, 1914

Test of well after completion showed a flow of 135 gallons per minute, and the natural pressure through a 3-inch pipe threw a column of water above the surface 44 feet. The temperature of the water is "blood heat;" in cold weather the vapor rises from the flow and is plainly visible.—(Note by Mr. W. A. Pollock.)

This well is located very near the Bellevue Oil Well, and is inserted here for comparison. It will be noted that this well went down some deeper than the oil well.

LOG OF DELAMORTON WELL No 1.

At Laine, 4 miles east of Pascagoula, Jackson County, Miss.
Drilled by the Pascagoula Development Company.
Drilling commenced at 10:15 a. m., May 23, 1911.
A. J. Johnson, driller;
10 inch casing set.
Elevation 10 feet (according to Matson.)

	From Ft.	From In.	To Ft.	To In.
Pleistocene				
Surface sand	0		34	

Sand	35		74	
Sand and logs	74	9	101	2
Sand and logs	101	2	153	4
Gumbo	153	4	240	9
Citronelle				
Shale	240	9	250	9
Three feet of sand showing a little oil and iron; would probably make a very small pumper.				
Gumbo	253	9	469	4
Shale	469	4	494	8
Gumbo	494	8	545	10
Sand (oil gas)	545	10	548	10
Shale	548	10	568	10
Gumbo	568	10	608	8
Gravel	608	10	615	8
Sand and shells	615	8	626	8
Gumbo	626	8	725	11
Pascagoula Clay				
Sand and water (Artesian flow)	725	11	756	3
Gumbo	756	3	825	9
Blue shale	825	9	858	4
Gumbo	858	4	880	4
Set 10 inch casing at 881 feet				
Blue marl, shells	881		919	5
Sand	919	5	930	5
Rock	930	5	932	5
Sand	932	5	937	5
Rock	937	5	939	7
Sand	939	7	941	7
Shale and shells	941	7	1020	10
Shale and wood	1020	10	1030	10
Gumbo	1030	10	1041	6
Sand	1041	6	1082	2
Gumbo	1082	2	1088	2
Shale	1088	2	1099	0
Gumbo	1099	0	1119	7

Shells, pyrites, a little gas	1119	7	1134	7
Gumbo	1134	7	1164	5
Hattiesburg Clay				
Blue marl, shells	1164	5	1205	3
Gumbo	1203	4	1225	9
Blue marl and shells	1225	9	1342	9
Soft gumbo	1342	0	1476	6
Sand and shells	1476	6	1502	1
Gumbo	1502	1	1527	0
Sand and shells	1527	0	1545	4
Soft gumbo	1545	4	1630	7
Sand, good looking, should have shown oil	1630	7	1655	8
Catahoula				
Gumbo	1655	8	1673	8
Rock	1673	8	1674	8
Gumbo	1674	8	1701	3
Artesian water and sand	1701	3	1772	4
Gumbo	1772	4	1845	4
Sand and shells	1845	4	1874	8
Gumbo	1874	8	1904	8
Vicksburg Limestone				
Shells and gravel	1904	8	1933	5
Rock	1933	5	1939	5
Shells and boulder	1939	5	1957	9
Gumbo	1957	9	1976	9
Sand and shells	1976	9	1998	11
Gumbo	1998	11	2005	4
Rock	2005	4	2005	10
Sand and shells	2005	10	2021	10
Gumbo	2021	10	2042	6
Gumbo	2042	6	2072	6
Gumbo, shale and blue marl	2072	6	2134	0
Gumbo, hot salt water, blue marl and a gas	2134	0	2258	7
Gumbo showing oil and gas	2258	7	2300	6

Drillers changed; E. Daboval takes charge.

Log of well continued:

Shells	2340	0	2535	0
Sweet water sand	2535	0	2541	0
Gumbo and gravel	2541	0	2661	0
Sand and gravel	2661	0	2690	0
Lime rock	2690	0	2700	0
Gumbo	2700	0	2740	0
Gravel	2740	0	2745	0
Sand	2745	0	2760	0
Gravel and gumbo	2760	0	2770	0
Gravel	2770	0	2800	0
Sand and shale	2800	0	2820	0
Sand and Gumbo	2820	0	2845	0
Blue marl	2845	0	2875	0
Gumbo	2875	0	2900	0
Blue marl	2900	0	2940	0
Blue marl	2940	0	3010	0

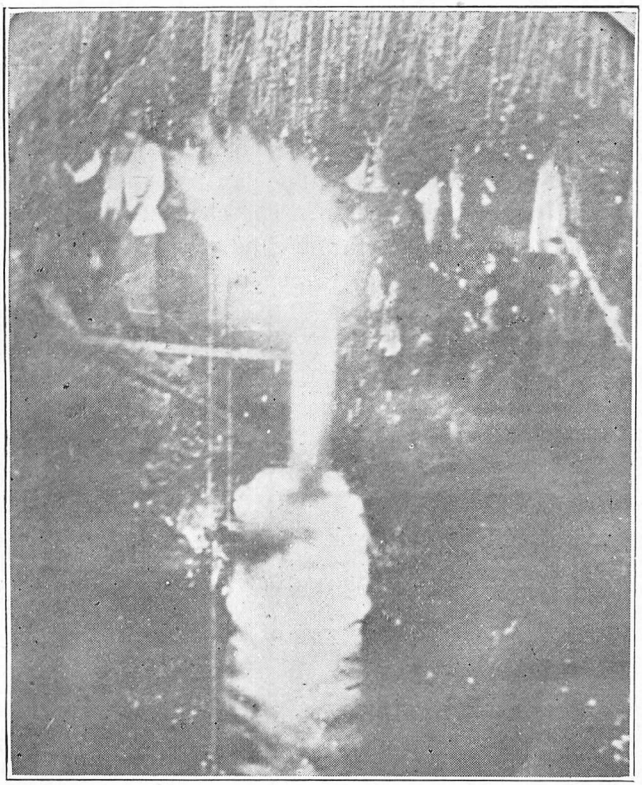
This completes the Log to October 25, 1911, when well was abandoned.

The above log was copied from records sent to the Survey office by Judge C. E. Chidsey of Pascagoula, Jackson County, Mississippi.

The geological interpretation of the log is that of Geo. C. Matson as given in U. S. G. S. Professional Paper 98-L, "The Pliocene Citronelle Formation of the Gulf Coastal Plain and Its Flora." The thickness of the Vicksburg (1106 feet) given by him seems excessive, and may well be questioned. It is more probable that the mass of material embraced in that thickness includes both Vicksburg and Jackson, and possibly part of underlying formations. Unfortunately no cuttings were available for determining horizons.

At about 2250 feet a flow of warm salt water and gas was encountered in this well. The amount of gas escaping was estimated at about 150,000 cubic feet per day. "This well burned for 7 or 8 months and then the flow of gas and water was

stopped by a cave-in, as there was only 1400 or 1500 feet of pipe in the well, the balance of the well being walled up by gumbo." (Letter of T. G. Hibbler).



GAS ESCAPING FROM DE LA MORTON WELL NO. 1, NEAR PASCAGOULA, JACKSON COUNTY.

In a communication of December 29th, 1913, after the abandonment of both the De Lamorton Wells, Prof. G. D. Harris after an examination of the field conditions in Jackson county, says:

"Personally we were very favorably impressed with the showing made at the first De Lamorton Well, four miles east of Pascagoula. It suggested an analogy to the southern expansion of gas southward down the dip from the Caddo field to the gas and salt-water wells at Shreveport. A test well syste-

matically put down and carefully watched, say one mile north of this old well, would yield very valuable data as to prevalence of gas in the old well, and would stand a chance of being a producer itself."

De Lamorton Well No. 2 was put down by the same developing company 700 feet west of the first well immediately after abandonment of the first well. This well reached a depth of 2240 feet (according to Mr. T. G. Hibbler of Pascagoula), and was abandoned. The drilling stopped in a sour-smelling sand, which on test gave a trace of oil. The chemists report on this sand is given below. Sample of oil sand marked 2251-2255.

From Geo. R. Thompson, Pascagoula, Miss.

CERTIFICATE OF ANALYSIS.

This sample contains a trace (0.035 per cent.) of mineral oil. In my opinion this is a good indication of the presence of oil in the immediate vicinity of the origin of this sand.

Respectfully,

J. C. MIMS, Analytical Chemist.

825 Gravier Street, New Orleans.

LOG OF H. E. WOODMAN WELL, No. 1.

Drilled by Atlas Oil Company of Shreveport, La

Location, S. W. cor. of S. W. qr. of N. E. qr., Sec. 15, T. 6 S., R. 7 W. Near Vancleave, Jackson Co., Miss.

Elevation, 20 feet (approximately.)

Began drilling, March 31, 1917; finished drilling May 25, 1917.

Feet	
120	Sand
150	White clay
165	Brown sand
230	Clay
250	Clay
290	Sand
326	Gumbo
361	Clay and sand
384	Gumbo
500	Yellow clay

580	Gumbo
650	Shale
700	Shale
760	Shell and water sand
825	Gummy shale
831	Gumbo
840	Gumbo
888	Sand
892	Gumbo
937	Sand
995	Soft shale
1015	Bed of shells
1059	Shale
1089	Gumbo
1100	Shale
1155	Gumbo
1165	Gumbo
1180	Blue shale
1213	Sand and shells
1225	Gummy shale
1235	Gummy shale
1325	Gummy shale
1380	Blue gummy shale
1440	Water sand
1464	Tough gumbo
1528	Blue shale
1530	Shale
1594	Sand and gravel
1613	Sand and gravel
1630	Shale
1675	Sand and shale
1689	Sandy shale
1691	Sand rock
1712	Sand and shale
1731	Sandy gumbo
1754	Gumbo
1790	Sand
1821	Shale

1889 Sand
1895 Sand
1905 Gumbo
1911 Gummy shale
1953 Sand and shale
1968 Rough sand and rock
1974 Rough sand and rock
1990 Sand
2005 Sandy gumbo
2030 Sand and boulders
2054 Shale and gumbo
2068 Gumbo
2095 Gumbo
2113 Gumbo
2135 Gumbo
2138 Rock
2205 Rock and sand
2225 Gumbo
2289 Hard and broken sand
2327 Sand and boulders
2371 Gumbo
2391 Gumbo
2411 Gumbo
2422 Gumbo
2431 Sand
2433 Rock
2435 Rock
2448 Sand
2452 Rock
2474 Gumbo and boulders
2478 Hard lime rock
2480 Lime rock
2499 Sand rock
2505 Sand rock
2513 Sand rock
2522 Rock
2526 Gumbo
2549 Broken sand rock

2575 Gumbo
2596 Sand rock and gumbo
2600 Sand rock
2603 Sand rock
2620 Gumbo
2630 Gumbo and sand rock
2640 Sand rock
2652 Lime rock
2660 Sand rock
2682 Sand rock
2709 Hard sand
2730 Shale
2755 Shale
2762 Sand rock
Abandoned.

LOG OF WOODMAN WELL No. 2,

Drilled by Atlas Oil Company, of Shreveport, La

Location, N. E. qr. of Sec. 20, T. 6 R. 6; on Sand Island in Pascagoula River, 10 miles north of Pascagoula, Jackson County, Mississippi. Elevation, 10 feet.

Began drilling, July 3d, 1917; finished drilling, Aug. 7th, 1917. (Data obtained from drilling reports by W. S. Norton, Sept. 27th, 1917).

	Feet
Sand	55
Clay	120
Sand	125
Clay	130
Yellow clay	145
Sand	190
Yellow clay	216
Gumbo	250
Set 10'' casing.	
Gumbo	276
Gumbo	295
Shale and shells	330
Gumbo and shale	375

Sand and shale, broken formation	425
Sand	447
Blue shale	467
Sand	584
Gumbo and clay	600
Sand and shells	615
Gumbo	655
Sand	675
Gumbo, sandy shale, and soft	710
Gumbo (set 10'' and cemented)	740
Sandy shale and shells	805
Gumbo	834
Gummy shale	1024
Sand and shale	1064
Sandy shale	1084
Gumbo	1105
Gummy shale and sand	1230
Gummy shale	1257
Sand and shells, showed gas	1279
Gummy shale, showed gas	1305
Sand and shale	1360
Gummy shale	1400
Sandy shale	1429
Gumbo	1487
Sandy shale	1497
Gummy shale	1565
Sand and shells	1587
Packed sand	1642
Packed sand, show of gas	1690
Shale—struck rock	1704
Gummy shale	1710
Soft sand	1727
Sand and shale	1733
Gumbo	1746
Set 8'' casing, and cemented	1750
Gumbo	1760
Sand and shells	1840
Gummy shale	1845

Gumbo	1852
Sand and shale	1873
Rock	1875
Lime rock	1878
Blue shale	1937
Lime rock	1940
Sand and rock	1968
Shale	1973
Sand rock	1976
Shale	1988
Gumbo	1998
Shale and gumbo	2040
Sand	2053
Gumbo	2110
Rock sand	2112
Sand rock	2114
Water sand	2250
Gumbo	2260
Gumm shale	2265
Loose sand	2300
Hard sand	2332
Hard sand	2342
Gumbo	2352
Shale	2363
Shale	2368
Sand	2400
Sand rock	2403
Hard sand rock	2407
Broken sand rock	2427
Sand rock	2431
Sand rock	2434
Sand rock	2456
Sand rock, gumbo, and shale	2500
Broken sand rock	2512
Sand rock with breaks	2530
Sand rock	2545
Sand rock with breaks	2557
Sand rock	2568

Sand rock ----------2588
Hard sand rock ----------2589
Hard sand rock ----------2593
Broken sand rock ----------2607
Sandy shale ----------2654
Bottom of hole.

In a letter to Pascagoula parties of date December 29, 1913, G. D. Harris, after examining this spot, says: "The amount of gas here being emitted is by far greater than any marsh gas escapement with which the writer is acquainted. It seems like a duplication of escapements in the alluvial lands of Terrebonne Parish, La., long known as marvels to look upon, but so far proving of no value, economically speaking.

"Very unfortunately for this 'showing' it appears in a sand bar formed by an eddy in West River, at the mouth of Dead River. Hence there is every reason to suppose that there is entombed much organic matter, especially as twigs and buried trees protrude at present from the surface of the bar. Again, one cannot help questioning why this gas elects to come up through an addtional 10 or 20 feet of sand, gravel or silt, instead of bubbling up through the clear deep water close by. It certainly seems a remarkable coincidence that at the very place where decaying vegetation would collect and be entombed, here deep-seated gas should make its appearance."

Prof. Harris further says: "Were it not for the remarkable amount of gas escaping from the bar at the mouth of Dead River, one might not be favorably impressed by these various 'showings.' Chemical analyses should throw much desired light on the subject. Again, it seems to us that here is a case in which a few hundred dollars spent in putting down a shallow well at the 'bar' would be a cheap and easy means of determining whether the gas were coming from below, say, 100 feet; if it is, then the escapement is of prime importance; if not, it is of no serious consideration."

Acting upon the suggestion contained in the above communication from Prof. Harris, interested parties collected samples of the gas and sent to Prof. A. L. Metz, of New Orleans,

for analysis. The result of analysis is given below:

Analysis of Gas from Gas Escapement, Pascagoula River.

Carbon Dioxide	4.30 per cent
Oxygen	1.12 per cent
Carbon Monoxide	0.00 per cent
Methane	88.40 per cent
Nitrogen	6.10 per cent

The percentages of Carbon Dioxide and Nitrogen are higher than the average natural gas of the Gulf Coastal Plain, and would suggest vegetable decomposition as the source of the gas, and the result of the Atlas Company's boring on the island would tend to confirm this suggestion.

JEFFERSON COUNTY.

Lake Truly Well, No. 1.

Located on land of Judge Jeff Truly, 16 miles west of Fayette, on alluvium of the Mississippi Delta.

Elevation, 80 feet (approximately.)

Signs determining the location of the well were escaping inflammable gas from the surface of Lake Truly.

Drilling began December 3, 1915, and well abandoned in the summer of the following year

LOG OF LAKE TRULY WELL, No. 1.

From surface to 332 gumbo.
332 to 343 hard shale and boulders
343 to 350 gip rock
350 to 353 hard rock
353 to 375 packed sand
375 to 395 gumbo
Ten inch casing set at 390.
395 to 417 soft shale
417 to 435 hard sand
435 to 455 gumbo
455 to 470 soft shale
470 to 505 gumbo
505 to 510 soap stone

510 to 513 sand rock
513 to 517 hard shale
517 to 560 sand and boulders
560 to 575 gumbo
575 to 590 hard sand
590 to 605 gumbo
605 to 623 soft shale
623 to 628 hard sand rock
628 to 640 packed sand
640 to 645 gumbo
645 to 665 soft shale
665 to 675 gumbo
675 to 705 soft shale
705 to 709 gyp rock
709 to 719 hard sand
719 to 740 gumbo
740 to 780 soft shale
780 to 870 gumbo
870 to 885 hard sand rock
Showing some gas.
885 to 920 hard shale and boulders
920 to 925 gyp rock (gypsum?)
925 to 940 sand rock
940 to 949 gumbo
949 to 965 shale
965 to 975 gumbo
975 to 990 shale
990 to 998 gumbo
998 to 1020 shale
1020 to 1027 gyp rock
1027 to 1040 gumbo
1040 to 1045 hard shale boulders
1045 to 1078 gumbo
1078 to 1103 hard shale
1103 to 1178 soft shale and shells with a little strip of gyp now and then
1178 to 1305 shale
1305 to 1318 gumbo

1318 to 1360 soft shale and shells
1360 to 1365 gyp rock
1365 to 1380 gumbo
1380 to 1410 shale and shell
1410 to 1415 gyp rock
1415 to 1465 shale and shells
1465 to 1485 gumbo
1485 to 1510 soft shale
1510 to 1524 hard shale and boulders
1525 to 1540 soft shale
1540 to 1560 hard shale and boulders
1560 to 1575 sand rock
1575 to 1580 gumbo
1580 to 1605 soft shale
1605 to 1615 chalk rock
1615 to 1640 sand rock
1640 to 1644 gumbo
1644 to 1675 sand rock
1675 to 1681 shale and shell
1681 to 1735 sand rock
1735 to 1745 gumbo
1745 to 1760 shale and shells
1760 to 1770 gumbo
1770 to 1780 sand rock
1780 to 1785 hard shale and shell
1785 to 1816 gumbo
Six inch Casing set at 1816 and operations suspended on account of high water.
Found bottom of hole 1843
1843 to 1886 shale
1886 to 1925 pack sand
1925 to 1933 gumbo and boulders
1933 to 1996 gumbo
1996 to 2003 soft sand stone
2003 to 2033 gumbo
2033 to 2039 boulders
2039 to 2041 boulders
2041 to 2133 gumbo

2133 to 2135 rock
2135 to 2143 gumbo
2143 to 2145 rock
2145 to 2149 gumbo
2149 to 2151 boulders
2151 to 2185 gumbo
2185 to 2205 blue gumbo
2205 to 2207 rock
2207 to 2240 blue gumbo and boulders
2240 to 2253 gumbo and lime
2253 to 2267 gumbo
2267 to 2360 gumbo "hard and brittle"
2360 to 2377 gumbo
2377 to 2438 brown gumbo
2438 to 2470 blue gumbo
2470 to 2472 hard rock
2470 to 2482 sand
2482 to 2561 gumbo and boulders
2561 to 2568 tough brown gumbo
2568 white sand.
Total depth 2575.

LAUDERDALE COUNTY.

Data on well of Pioneer Oil and Gas Co., Toomsuba, Lauderdale Co., Mississippi.

Location, two miles southwest of Toomsuba, on land of T. J. Knox.

Driller, W. H. Martin; date of drilling, 1914.

Depth, 2850 feet.

At 2808 feet a good showing of gas was encountered, the gas burning 12 inches high at the mouth of the well, although

This well was abandoned, and the Company went out of business.

The following year, 1915, The Meridian Oil and Gas Company put down two wells near the well of the Pioneer Oil and Gas Company's well. These wells went down to about 2300

feet, but not deep enough to make further test of the gas horizon struck in the first well.

The wells were abandoned at the depth given, and the Company went out of business.

Informant, W. H. Martin.

WARREN COUNTY.

Log of Mildren Well No. 1. Vicksburg, Warren County, Mississippi. Sec. 32, T. 16 N., R. 4 E.

This well is the property of the Mississippi Oil, Gas and Investment Company, of Vicksburg, Mississippi.

Drilling began August, 1916, ended November, 1916.

Drillers, L. R. Pevetoe and L. A. Pyle.

Elevation 180 feet.

Located on the Kimball Ferguson Farm.

Copied from official log furnished by the Mississippi Oil, Gas and Investment Company. This log had been carefully studied and revised by E. N. Lowe, State Geologist, assisted by A. F. Crider, F. B. Vanhorn and H. H. Nowlan.

LOG OF MILDRED WELL No. 1.

Vicksburg, Miss.

Depth Feet:	Catahoula Formation.	Thickness Feet:
1- 15	Alluvium, brown loam	15
15- 30	Brown loam	15
30- 32	Sand, brown loam, fossiliferous	2
32- 109	Loess and calcareous yellow loam	77
109- 121	Loess and yellow loam	12
121- 125	Sand, gravel and clay	4
125- 127	Clay and gravel	2
127- 130	Sand and gravel	3
130- 132	Clay and gravel	2
132- 135	Sands, sandstones and lignite	3
135- 140	Sandstone	5

	Vicksburg:	
140- 170	Gray, silicious clay, with some limestone	30
170- 190	Impure limestone, with marine shells	20
190- 206	Gray clay and limestone, marine shells	16
206- 220	Limestone with marine shells	14
220- 310	Limestone and marl, marine shells	90
	Jackson:	
310- 410	Gray clay and limestone, fossiliferous	100
410- 510	Gray clay and marl	100
510- 630	Clay and limestone, marine shells	120
630- 715	Clay with fossiliferous limestone	85
715- 895	Limestone and clay, marine shells	180
895- 915	Limestone and clay, marine shells	20
915- 951	Sand and limestone, marine shells	36
951- 990	Sands and clay, with some limestone	39
990- 998	Calcareous sands	8
998-1078	Gray clayey sand	80
	Claiborne:	
1078-1093	Lignitic clays and sands	15
1093-1164	Marl with fossils	71
1164-1205	Sandy clay	41
1205-1235	Sandy clay, fossiliferous, lignitic	30
1235-1250	Sandy clay	15
1250-1270	Fine clayey sand, lignitic	20
1270-1290	Lignitic clay, sandy	20
1290-1373	Lignite and lignitic sand	83
1373-1393	Fine gray sand	20
1393-1433	Fine gray sand	40
1433-1500	Lignitic sands and clays (no samples)	67
1500-1520	Fine gray sand	20
	Wilcox:	
1520-1560	Gray clay, lignitic, calcareous	40
1560-1600	Lignitic clay, calcareous	40
1600-1630	Lignitic clay, calcareous (more lignite)	30
1630-1670	Lignitic clay, calcareous; some marcasite	40
1670-1700	Gray clay with fossils	30
1700-1720	Lignitic sand, with sand predominating	20

1720-1740	Lignite	20
1740-1780	Gray sandstone	40
1780-1820	Marly sand, calcareous	40
1820-1845	Dark gray sand, fine, with small traces of marcasite	25
1845-1860	Same as above (off bit)	15
1860-1861	Fine dark gray sand, traces of marcasite	1
1861-1881	Dark gray micaceous sandstone	20
1881-1901	Dark gray sandy clay, micaceous, lignite traces	20
1901-1940	Sandstone with traces of marcasite	39
1940-2005	Dark micaceous sandy clay	65
2005-2047	Marly sand	42
2047-2060	Micaceous marly sand	13
2060-2085	Sandy clay	25
2085-2105	Sandy limestone, with some lignite	20
2105-2185	Calcareous sandstone—a few lignitic plates	80
2185-2220	Lignitic sand	35
2220-2225	Lignitic sand, somewhat lighter	5
2225-2364	Lignitic sand	139
2364 (Bit)	Lignitic sand; gave litmus paper test for crude petrolem. Analyzed .372 of one per cent oil.	
2364-2388	Lignitic sand, changing to more sand, more mica	24
2388-2445	Lignitic sand changing to more sand, more mica	57
2445-2494	Lignitic sand, with some glauconite	49

Midway:

2494-2500	Gray silicious clay, nonfossiliferous, calcareous, with lignite from amove	6
2500-2576	Light gray sand, with salt water	76
2576-2587	Same as above	11
2587-2612	Gray sand—good sand	25
2612-2628	Gray clayey sand	16

Ripley:

2628-2768	Dark gray calcareous sandy clay	140
2768-2805	No record	37
2805-2845	Hard shale, gray non-calcareous	40
2845-2875	Clay shale, calcareous	30

Selma Chalk:

2875-2900	White chalky limestone	25
2900-2990	Clay shale, very calcareous	90
2990-3025	Harder shale, more laminated, very calcareous	35
3025-3041	Clay shale, more laminated, very calcareous, with some broken fossils	16
3044-3116	Laminated clay shale, very calcareous, no fossils	72
3116-3126	Same as above, with some pyrite present	10
3126-3184	Laminated clay shale, very calcareous, non-fossiliferous	60
3184-3189	Laminated clay shale, very calcareous, non-fossiliferous; typical blue rock of Selma	5
3190-3200	Same as above, with some fossils	10
3200-3208	Laminated clay shale, calcareous, no fossils	8
3212-	Typical Selma chalk, blue	

"Salt water at 3254

3259-3264 Grading back to blue chalk 5"

	sandy	35
3264-3270	Blue chalk, more sandy, salty	6

Eutaw:

3270-3276	Blue chalk, very glauconitic	6
3276-3286	Glauconitic sand, calcareous	10
3286-3312	Glauconitic sand, calcareous	26
3312-3357	No record	45
3357-3378	Glauconitic sand, calcareous	21
3378-3380	Same as preceding, showing broken fossils	2
3380-3391	Calcareous glauconitic sand	11
3391-3398	Glauconitic sand, calcareous, more blue shale	7
3398-3408	Glauconitic sand, calcareous, less glauconite	10
3408-3417	Glauconitic sand, calcareous, more sandy	9
3417-3419	Glauconitic sand, calcareous, with more clay	2
3419-3425	Same as above, with mica and pyrite; clayey	6
3425-3438	Calcareous, glauconitic sand	13
3438-3445	Same as preceding, but more sandy	7
3445-3462	Sand, glauconitic and calcareous	17

Bottom of hole—3462 feet.

Later study has shown that the above log should be corrected to show the top of the Vicksburg at 30 feet from the surface. The sandy marl from 30-32 feet furnishes Vicksburg fossils, and the materials below that should be put in the Vicksburg, although anomalous in character. Comparing this well with the second Mildred Well, it will be seen that the Vicksburg is reached in that well at a depth of 48 feet. Allowing for difference of elevation of the two wells, the Vicksburg fossiliferous marl is struck at practically the same depth in both.

LOG OF MILDRED WELL No. 2,

Vicksburg, Warren Co., Mississippi. Sec. T. 16 N. R. 4 E.

This well is the property of the Mississippi Oil, Gas and Investment Company, of Vicksburg, Mississippi.

Drilling began in January, 1917, ended March, 1917.

Drillers, L. A. Pevetoe and L. A. Pyle.

Elevation 197 feet.

Located on Mrs. Jennie Henry's Farm.

Near northeast corner of National Cemetery.

Copied from Log furnished by the Mississippi Oil, Gas and Investment Company. This Log was prepared in Washington, by the U. S. Geological Survey, from study of samples sent from Vicksburg and Drillers' Log.

LOG OF MILDRED WELL No. 2.

Vicksburg, Warren Co., Miss. Sec. T. 16 N., R. 4 E. On Mrs. Jennie Henry's Farm, near N. E. cor. of National Cemetery.

Feet:

0-	20	Loess
20-	48	Very fine grayish-yellow, silty, calcareous sand (related to loess)
48-	62	Medium fine grain, glauconitic, micaceous sand, with fragments of shells.
62-	69	Medium-grain, glauconitic sand and sandy shell marl

69- 78	Same as above
85	Glauconitic sandy marl with shells abundant (from bit)
95	Dark fossil clay and sandy clay (from bit)
95- 109	Gray, glauconitic, argillaceous, calcareous sand, very few fossils present
109	Medium-grain, gray, fossiliferous, glauconitic sand (label partially destroyed)
160- 205	Fine-grain, argillaceous, slightly glauconitic sand, with few shells
205- 224	Dark, fossiliferous, plastic clay and sandy clay
224- 244	Dark, fossiliferous, sandy, carbonaceous clay, streak of lignite
244- 332	Same as above
347- 370	Bluish-gray, micaceous, sandy and plastic clay
415- 437	Dark-gray plastic clay with shells very abundant
437- 458	Same as above
450- 470	Bluish-gray, calcareous clay, slightly sandy, shells abundant
470- 490	Same as above
490- 510	Bluish-gray, calcareous sandy clay
510- 530	Same as above
530- 570	Bluish-gray, calcareous sandy clay and light-gray sandy marl (Zeuglodon?)
570- 592	Bluish-gray, calcareous sandy clay
592- 616	Dark gray, calcareous sandy clay
616- 636	Fine-grained, bluish-gray, argillaceous, calcareous sand and sandy clay, with few shells
636- 656	Same as above
659- 695	Same as above
695- 715	Fine-grained, bluish-gray, argillaceous, calcareous sand and sandy clay, more sandy than that above
715- 735	Dark, greenish-gray, plastic waxy clay, and light-gray sandy micaceous clay
735- 755	Light greenish-gray sandy marl, shells abundant
755- 785	Same as above
785- 814	Same as above
813- 834	Same as above

856- 880	Medium-grain, brown, highly calcareous sand, with fossils abundant
880- 890	Sand as above, and some green plastic clay
890- 910	Greenish-gray, highly calcareous sand or sandy marl, clayey, shells abundant
910- 940	Same as above
940- 990	Fine-grained, greenish-gray, highly calcareous sand and sandy marl, shells abundant
990-1015	Pure, gray, glauconitic quartz sand, some shells and fragments of lignite
1015-1031	Glauconitic sand and clay, with shells and lignite abundant. (Is this the lignite material below the Moody Branch beds?)
1031-1058	More sandy than above and with less shells and lignite
1058-1080	Gray calcareous clay, sandy clay and fine sand, lignitic, micaceous, pyritiferous, with few shells
1080-1101	Fine brownish-gray highly calcareous, argillaceous, sand and sandy clay
1101 (from bit)	Light gray sandy marl with chalky streaks
1100-1130	Brownish-gray sand, slightly glauconitic, with few or no shells
1130-1160	Same as above
1160-1180	Brown, highly carbonaceous sand and lignite
1180-1201	Lignitic sand and sandy clay and streaks of lignite
1201-1221	Brown highly carbonaceous sand
1221-1225	Same as above
1125-1237	Gray calcareous sand, brown carbonaceous sand and streaks of lignite, few shells
1237-1258	Brown, carbonaceous sand and lignite
1258-1280	Loose, brownish-gray sand, few or no shells
1280-1300	Same as above
1300-1321	Brown sand, sandy clay and lignite
1321-1341	Brown, calcareous, argillaceous sand, lignitic
1341-1362	Same as above
1362-1370	Dark brown gummy clay and sand
	Salt water at 3254.
3259-3264	Grading back to blue chalk ---------- 5

1370-1405 Brown carbonaceous sand and lignite

1405-1448 Brown carbonaceous argillaceos sand, lignite, and light-gray sandy marl; no shells

1448 (from bit) Highly carbonaceous clay, and light-green plastic clay; no fossils

1448-1468 Highly carbonaceous clay and light-green plastic clay; no fossils

1468-1483 Highly carbonaceous sandy clay, with streaks of light-green clay

1483-1500 Brown carbonaceous sand and sandy clay; no fossils

1500-1525 Brown carbonaceous sand and argillaceous sand; no fossils

1545-1600 Brown carbonaceous sand and sandy clay, and light-gray sandy marl

1600 (from bit) Gray and greenish-gray calcareous sandy clay

1590-1510 Gray sandy marl and carbonaceous clay

1610-1630 Brown calcareous argillaceous sand with numerous shell fragments

1630-1650 Same as above

1650 (from bit) Light greenish-gray sandy marl, (or highly calcareous clay) and brownish lignitic sand

1650-1670 Greenish-gray highly calcareous plastic clay, and sandy clay

1670-1678 Brown carbonaceous, calcareous, argillaceous sand

1690-1710 Same as above

1710-1730 No record

1730-1751 Soft brownish-gray sand and clay; no shells

1751-1772 Light-gray, loose glauconitic micaceous sand; no shells

1772-1790 Brown carbonaceous sandy clay and sand

1790-1808 Light-gray, glauconitic sand and sandy clay; no shells

1800-1825 Brown medium-grained sand, (gives odor of petroleum when heated)

1825-1850 Medium-grained gray quartz sand; no shells

1850-1870 Brown carbonaceous sand and lignite

1870-1883 Same as above

1880-1900 Brown carbonaceous sand, sandy clay, lignite and light greenish-gray clay

1900-1920 Brown carbonaceous calcareous sand, sandy clay and lignite fragments

1920-1930 Same as above

1930-1950 Same as above

1950-1970 Brown carbonaceous sand and argillaceous sand

1970-1985 Brown carbonaceous argillaceous sand, and greenish-gray clay

1985-1990 Brown argillaceous sand and greenish-gray clay

1990 (from bit) Brown carbonaceous sandy clay, no fossils

1990-2000 Brown carbonaceous sandy clay, and light-green highly calcareous sandy clay

1995-2020 Brown carbonaceous argillaceous sand

2020-2031 Same as above

2031-2050 Brown carbonaceous argillaceous sand, sandy clay and light green clay, no fossils

2050-2060 Same as above

2060-2070 Same as above

2070-2090 Same as above

2090-2110 Brown carbonaceous argillaceous sand, sandy clay, and light-green clay; few shells

2110 (from bit) Brown carbonaceous argillaceous sand and lignite

2110-2131 Brown, carbonaceous argillaceous sand, and light-gray sandy clay

2131-2150 Brown, highly carbonaceous argillaceous sand

2150-2170 Brown carbonaceous argillaceous sand, and light-gray sandy clay

2170-2190 Brownish-gray, carbonaceous, argillaceous, calcareous sand, and gray clay; some shells

2190-2210 Brown carbonaceous sand and sandy clay

2210-2245 Brown carbonaceous argillaceous sand (few or no shells to 2439)

2245-2260 Brown carbonaceous argillaceous sand

2260 (from bit) Brown carbonaceous argillaceous sand and dark, highly fossiliferous clays

2260-2270 Brown carbonaceous argillaceous sand and sandy clay
2265-2285 Brown to gray, highly calcareous sand and sandy clay
2285-2300 Brown, carbonaceous argillaceous sand, greenish-gray sandy clay
2300-2320 Brown sand and greenish-gray sandy clay
2320-2340 Same as above
2336-2356 Medium-grained, loose brown sand
2356-2361 Brown argillaceous sand, sandy clay, and light-greenish gray clay
2360-2380 Same as above
2367 (from bit) Dark-green, micaceous plastic clay
2380-2400 Fine-grained, brown argillaceous sand and sandy clay
2400-2415 Fine-grained brown, argillaceous sand, sandy clay, and light greenish-gray sandy clay
2415-2436 Brownish-gray and gray argillaceous sand; and sandy clay
2439 (from bit) Fine-grained brown sandy clay, and light greenish-gray, sandy marl or calcareous clay

(PARTIAL LOG MADE FROM CUTTINGS)

6'' casing set at 2439 ft.

2439-2459 Clay and sand, dark gray, fine grained, carbonaceous no shells present
2459-2500 Sand, light-brown, fine-grained, argillaceous, gives strong odor of petroleum on heating
2500 (bit) Sand and clay, brown, fine-grained

4 1-2 inch casing set at 2525 feet

(There is a marked difference in the material above and below here.)

2532-2539 Sand, white, medium to fine-grained, chalky
2539-2544 Sand, gray, fine-grained, calcareous, few if any shell fragments
2544-2545 Sand, brownish-gray, fine-grained, argillaceous, highly calcareous, no shells
2545-2576 Sand, yellow, fine-grained, quartz with thin layers

of dark clay; no shells—non-marine

2576-2596 Same as above

2596-2618 Same as above

2618-2630 Sand, dark gray, fine-grained, argillaceous and dark micaceous clay; few if any shells.

Bottom of hole.

(Copied January 27th, 1919).

WASHINGTON COUNTY.

Log of well at Stoneville, Washington Co., Miss.

Completed 11th November, 1915.

T. B. Minyard, Driller.

Elevation approximately 120 feet.

	Feet	Feet
Loam	0 to	10
Gumbo	10 to	33
Sand	33 to	72
Gravel, heavy	72 to	101
Sandstone	101 to	145
Sand	145 to	192
Sandstone	192 to	199
Sand	199 to	230
Sandstone	230 to	236
Sand	236 to	238
Gumbo	238 to	253
Sand	253 to	257
Gumbo	257 to	333
Sand	333 to	345
Gumbo	345 to	366
Hard rock, (12 inches)	366 to	367
Gumbo	367 to	373
Hard rock, (5 inches)		
Gumbo	373 to	431
Sand	431 to	478
Sandstone and sand stratum	478 to	504
Sand	504 to	784

Sandstone	784	794
Sand	794	812
Sandstone	812	820
Hard rock, (4 inches)		
Hard shale	820	836
Sand	836	856
Hard shale	856	866
Rock, soft, (5 inches)		
Hard shale	866	920
Sandstone	920	940
Hard shale	940	960
Sand	960	965
Sandstone	965	990
Rock, (5 inches)		
Shale, hard	990	1061
Sand	1061	1140
Rock, (6 inches)		
Sand	1140	1157
Rock (8 inches)		
Shale	1157	1164
Rock, hard, (24 inches)		
Sandstone, gumbo	1164	1200
Sand	1200	1203
Gumbo	1203	1323
Shale, hard	1323	1328
Hard rock, (6 inches)		
Gumbo	1328	1375
Shale, hard	1375	1380
Hard rock, (36 inches)	1380	1383
Sand rock	1383	1395
Shale, hard	1395	1445
Gumbo	1445	1523
Rock, hard, (6 inches)		
Gumbo	1523	1527
Rock, hard	1527	1528
Shale	1528	1532
Rock, hard	1532	1534
Shale	1534	1548

Rock, soft (10 inches) ----------
Sandstone ----------1548 to 1552
Rock, medium ----------1552 to 1553
Shale ----------1553 to 1566
Rock, hard ----------1566 to 1569
Shale ----------1569 to 1572
Rock, medium, (10 inches) ----------
Shale ----------1572 to 1574
Gumbo ----------1574 to 1576
Rock (6 inches) ----------
Gumbo ----------1576 to 1585
Rock, medium, (6 inches) ----------
Gumbo ----------1585 to 1605
Sandstone ----------1605 to 1607
Rock (6 inches) ----------
Shale, hard ----------1607 to 1615
Sand, green ----------1615 to 1623
Rock, hard ----------1623 to 1625
Shale, hard ----------1625 to 1632
Rock, medium, (8 inches) ----------
Rock, soft ----------1632 to 1635
Sand ----------1635 to 1651
Gumbo ----------1651 to 1653
Sandstone ----------1653 to 1658
Shale, gumbo ----------1658 to 1669
Rock ----------1669 to 1673
Sand rock ----------1673 to 1679
Rock, hard, (8 inches) ----------
Sandstone, brittle ----------1679 to 1697
Rock, medium ----------1697 to 1698
Sandstone ----------1698 to 1701
Rock, (6 inches) ----------
Shale, hard ----------1701 to 1705
Rock, medium, (10 inches) ----------
Shale, gumbo ----------1705 to 1706
Rock, hard, (8 inches) ----------
Sand ----------1706 to 1709
Rock, soft ----------1709 to 1710

Sand	1710 to 1715
Rock, medium, (10 inches)	
Sand	1715 to 1719
Sand rock	1719 to 1723
Sand	1723 to 1737
Sandstone	1737 to 1777
Rock, medium, (8 inches)	
Sand	1760 to 1761
Shale, hard	1761 to 1765
Sand	1765 to 1768
Shale	1768 to 1779
Rock	1779 to 1780
Shale, hard	1780 to 1799
Sand	1799 to 1808
Sandstone	1808 to 1809
Sand	1809 to 1811
Shale, hard	1811 to 1813
Rock, hard	1813 to 1815
Sand	1815 to 1816
Rock	1816 to 1817
Sand	1817 to 1829
Rock	1829 to 1830
Sand	1830 to 1847
Rock, soft (10 inches)	
Shale	1847 to 1850

This well was drilled for artesian water, and is inserted here because of its unusual depth for a water well, and because no oil drilling having been made in that part of the state it is thought this log will prove instructive.

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