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Oil and gas fields of the southern gulf coastal plains of Texas

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OIL AND GAS FIELDS
OF THE
SOUTHERN GULF COASTAL PLAIN OF TEXAS

BY

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C O N T E N T S

PART II.

(Oil and Gas Fields of the Southern Gulf Coastal Plain of Texas.)

PART III.

(Oil and Gas Fields of the Southern Gulf Coastal Plain of Texas.)

INTRODUCTION.

The purpose of this report is to furnish a general outline of the oil and gas fields of the Southern Gulf Coastal plain of Texas. To properly cover the subject, the report is divided into three major parts, the first part dealing with the present and past producing territory, the second part dealing with the factors influencing the producing territory and the third section relating to geology and its associated subjects covering the area as a whole.

The first part deals exclusively with the producing fields and sets forth the discovery, resume of operations, structural geological features and various horizons producing.

The second part attempts to segregate the territory as covered by the accompanying map, into two classes, viz: territory favorable for the accumulation of oil and gas, and territory not considered favorable at the present time. Part two deals also with factors influencing the accumulation in the area.

In the third section an attempt has been made to discuss the geology of the whole area and covering in general the kindred subjects such as paleontology and geo-

physics. The type geological section, is here discussed and described.

NOTE: In answer to some of the questions above mentioned, many scientific arguments are involved. New discoveries may completely change each opinion, but the author will attempt, at the present time, to base his conclusions on his own experience and knowledge of the territory.

P A R T O N E

O I L A N D G A S F I E L D S

O F T H E

SOUTHERN GULF COASTAL PLAIN OF TEXAS.

The Southern Gulf Coast Plain oil and gas fields, as covered by this report, comprises all the present producing fields lying in that territory South and Southwest of Lavaca, Wharton and Matagorda Counties, Texas, and extending South and Southwestward along the Gulf of Mexico to the Republic of Mexico, bounded on the Northwest and West by the approximate geologic contact of the Yegua and Cook Mountain formations.

This area comprises twenty five counties, namely: Jackson, Calhoun, DeWitt, Victoria, Karnes, Bee, Goliad, Refugio, Aransas, Live Oak, McMullen, San Patricio, Nueces, Jim Wells, Duval, Webb, Kleberg, Zapata, Jim Hogg, Brooks, Kenedy, Starr, Hidalgo, Willacy and Cameron, for a total area of more than twenty six thousand four hundred fifty square miles.

Thirty five major oil and gas fields have been developed within this territory to the present time, not including approximately ten fields of minor importance. The probabilities are that as many more

will be developed at a future date.

These fields are briefly covered by separate chapters and since most of the fields have been ably handled in various reports of Geological Societies, the United States Geological Survey, and the State Geological Survey, no detailed topographic or structural contour maps will be incorporated in this report.

The separate field descriptions, which follow, briefly discuss the discovery, resume of drilling operations, type of structure, age of productive sands and total production for each of the fields of this Southern Texas Gulf Coastal Plain area.

R E F U G I O F I E L D

REFUGIO COUNTY

TEXAS

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The Refugio Oil and Gas Field, located in the central portion of Refugio County, near the town of the same name, was discovered during the fall of 1919 when the Texas Gulf Oil and Gas Association, a small stock company, completed their Heard No.1, better known as the Bessie Beryl Well, as a large gas well from a sand at 1900 feet.

Since that time and subsequent to the completion of the first oil well by the Texas Gas Company in July 1928 on the Clint Heard land, the field has grown until it is now the largest oil and gas producer in the Southern Gulf Coastal area.

During 1928 the field produced approximately ninety eight thousand barrels of oil and the total production to April 1st, 1930, has been more than five million barrels. The oil ranges in gravity from 28 to 35, dependent upon the depth of the sand since the various sands produce different gravity oil.

Commercial gas production from the field began in September 1925 when the Houston Pipe Line Company connected its main line into the field. Since that time the withdrawals have been more than seventy five

billion cubic feet of gas and since the field is only partially depleted, should produce a maximum of two hundred billion cubic feet. The field, however, has supplied gas for the towns of Refugio and Woodsboro and for the many drilling wells, which production is not included in the above figures.

Blowouts, craters and wild wells have been common in the field due to the high pressure in the shallow sands above twenty five hundred feet and much gas has been wasted through this source.

The field has at least fifteen known producing oil or gas sands above the present depth of the deepest well which was drilled to sixty five hundred feet. The deepest producer of the Texas Gulf Coast at the present time, is the No.1 Rose Lambert, drilled by the Union Producing Company to a depth of sixty four hundred seventy five feet from where it is now producing.

As of April 1st, 1930, there were one hundred seventeen producing oil wells with a daily average of forty thousand barrels of oil for the field and more than fifty gas wells producing over fifty million cubic feet daily.

From the surface geology of the area, the Refugio

field is represented by a re-entrant or nose of the Lissie Sands coming in from the Northwest and protruding through the overlying Beaumont clays. This condition merely shows the presence of a local high, the extent of which is not reflected in the surface formations sufficient to map.

On the subsurface the Refugio Field represents a large plunging anticlinal nose with the major axis striking twenty degrees Northeast and Southwest and with the steeper dip to the Northwest. The structure of the deeper sands, seems to conform to that of the upper ones but spreads out farther to the East and would represent a shifting of the axis Eastward with depth. This shifting to the East might be caused by faulting, of which there is little evidence, but more probably is due to the directional force of the structure making influence coming from the Southeast or East. Owing to the deltaic and lenticular nature of the producing sands, it is impossible to correlate from sand to sand in the producing wells, but based on zones and zonal correlation, the field has a minimum structural closure of one-hundred-twenty feet.

The producing sands are of Miocene, Oligocene and Eocene age, the more prolific gas production being from the Miocene, while the oil is from sands of Oligocene and Eocene age. The producing zones are divided about as follows:

FORMATION	DEPTH	AGE	PRODUCTION
Oakville	1000-3500	Miocene	Gas
Gueydan-Frio	3500-6000	Oligocene	Oil
Fayette-Jackson	6000-6500	Eocene	Oil

L U C A S F I E L D

LIVE OAK COUNTY

TEXAS

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The Lucas Gas Field is located in Southeastern Live Oak County along the course of the Nueces River and is so named by its proximity to the station of Mount Lucas on the San Antonio, Uvalde and Gulf Railway.

The geology of the area was worked by Mr. A. S. Henley during the summer of 1922 and in December the same year, the Houston Oil Company of Texas, who owns the whole field, began the drilling of their Cartwright No. 1. This well blew in wild for a large gas well estimated as making fifty million cubic feet daily from a depth of eight-hundred-fifty feet during the latter part of January 1923, and blew wild for eight days but was finally capped, plugged and abandoned. Following this, the same Company's Cartwright Wells Nos. 2 and 3 were drilled to a gas sand at 2100 feet, where they blew out making a large volume of gas, and were subsequently plugged and abandoned.

Since the discovery of the field, thirty-two wells

have been drilled, of which twenty-three have been completed as gas producers of from twenty-five to fifty million cubic feet openflow and with a reservoir pressure of from nine-hundred to one-thousand pounds. Five of the nine non-productive wells have been off structure, the others have been lost by blowouts, faulty casing or junked holes. One deep well has been drilled, the Dunning No.2, having been carried to five-thousand-one-hundred-thirty-five feet depth, where it was lost with stuck drill stem.

Four gas sands have been developed in the field between fifteen-hundred and twenty-two-hundred feet depth, which are probably Midde Oligocene in age.

Structurally, the field represents a steep anticline, striking approximately twenty degrees Northeast and Southwest with a structural nose extending out from the Southeast side of the anticline. In some respects, the structural features represent a quaquaversal fold with one arm (the West side) missing. There is a minimum of one-hundred-seventy-five feet of closure to the West side of the structure, with gas accumulation much farther down the slope to the East than to the West.

The Lucas field has produced approximately twenty five or thirty billion cubic feet of gas from a producing area of about thirty four hundred acres, and at the present time is only partially depleted.

C O L E B R U N I F I E L D

WEBB AND DUVAL COUNTIES

TEXAS

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The Cole-Bruni Gas and Oil Field is located in Southwestern Duval County, extending into Webb County and centers just East of the town of Bruni, Webb County. The discovery well of the field was the Cole Petroleum Company's, Benavide No. 4, which was completed in July 1924 at a depth of seventeen-hundred feet, as a large gas well of about seventy million cubic feet openflow. The well blew out while drilling, blew wild several days and in attempting to put under control, the well caught fire and burned about forty days but was finally extinguished and shut in by the Border Gas Company.

Subsequent development, which has been carried on in a vigorous but normal manner, has extended the field until the producing area is approximately eight miles long and from one to three miles wide at the present time. This field, comprising all that productive area near the town of Bruni, is the largest gas field and gas producer of the Southern Coastal Plain area.

Production is obtained from two sand horizons, being the Cole sand and the Mirando sand. The former,

which is encountered near seventeen hundred feet, is basal Oligocene in age, while the latter is near the base of the Fayette (Eocene) formation at a depth near twenty six hundred feet. Oil production in the field has been disappointing, although six wells have been completed in a slight synclinal fold on the East side of the structure and have produced a few thousand barrels of oil.

Gas and oil accumulation in the Cole-Bruni Field, is caused by a combination of sand lensing and folding. Both productive sands, although not vertically below each other, lense out in a distinct line North twenty degrees East and Southwest and are not found West of this position. Where this lenticular sand is crossed by Northwest - Southeast transverse folding, as in this field, gas accumulation is found, which is afforded by the closure against the sand lense. The productive sands are much thicker on the flanks and off the fold than on the top, indicating that some of the folding and movement took place prior to the complete deposition of the sand.

It is the author's view that the sand condition represents deposition along a very straight but oscillating shore line, and it would be normal to suspect a thinning of the sand nearest the shore. An oscillating shore line would also account for the position of the two sands, one West of the other although on the same transverse fold. This could be accounted for by an uplift from a marine sea after a shale deposition with a change of sedimentation influencing a sand deposit lensing out at the shore line, and subsequently a submergence with a second shale deposition, sealing the lower sand on the West. Following this, a second uplift of greater magnitude with a sand deposition along a shore line farther East and another submergence and sealing as above described, with the transverse folding at a later geologic time.

The wells average about five-hundred pounds rock pressure in the upper or Cole sand, and approximately seven-hundred pounds in the lower or Mirando sand, which is influenced by the hydrostatic water head.

There are no surface indications of the structure and it has only been outlined and determined by drilling of numerous wells.

Total gas production as of January 1st, 1930, has been more than fifty billion cubic feet and the field has only been partially depleted. Five gas pipe lines make connections to the field.

W H I T E P O I N T F I E L D

SAN PATRICIO COUNTY

TEXAS

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The White Point Gas Field, locates at White's Point, the high bluff on the North side of Nueces Bay, was first drilled in 1904 by Randolph Robertson, whose attention was drawn to the area by gas showings in shallow water wells and by the presence of native sulphur on the surface. The field proper lies about five miles Northwest of the City of Corpus Christi and just North across the bay from the Saxet Field, which may possibly be an extension to the South.

The earliest wells, which were rather shallow, report gas showings but the real discovery well was drilled by the White Point Development Company on the Rachel lands and was lost as a blowout from a sand at nineteen hundred feet during the year 1911. Following this the field had a vigorous development and about twenty wells were drilled, of which more than half were lost by blowouts or improper drilling.

Following this development between the years 1911 and 1917, the field rested until the year 1925

when the entry of gas pipe lines into the area with the concurrent search for gas reserves, brought about the re-development in the area. Between the years 1926 to 1929, inclusive, approximately twenty-five gas wells were completed and two pipe lines were connected to the field.

The wells now completed are producing from several sands, namely; 1900, 2100, 2300 and 2500 feet and range from twenty to forty million cubic feet open-flow volume with reservoir pressures of from eight-hundred to eleven-hundred pounds. The producing sands are lenticular but sands encountered on the structure are generally productive.

Structurally the field represents a broad anticline striking fifteen to twenty degrees Northeast and Southwest and with accumulation in lenticular sands on the anticlinal fold. On surface geological features, the folding is suggested by abnormal drainage to the North and Northeast, by uplifted river terraces, by crystals of sulphur on the surface and by the presence of high topography locally. There is also noted sea shells

and oyster beds on top of the bluff, which would suggest uplift.

The producing sands are of Pliocene and Miocene age and probably belong to the Lagarto and Oakville Formations. Total gas production as of January 1st, 1930, has been about ten billion cubic feet.

No wells have yet been drilled sufficiently deep to encounter the known productive Oligocene and Eocene sands.

S A X E T F I E L D

NUECES COUNTY

TEXAS

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The Saxet Gas Field is located on the South side of the Nueces Bay, a few miles West of the City of Corpus Christi, in Eastern Nueces County, and although it is not connected by producing wells, it probably represents a continuation of the White Point Field on the North side of the Bay.

Prior to 1922, the Pioneer Oil Company drilled a well on the John Dunn land to a depth of thirty-one-hundred feet, reporting a heavy gas show at twenty-four-hundred feet but the discovery well of the field was completed by the Saxet Oil Company when their Dunn No.1 was finished in December 1922, making considerable gas and salt water from a sand at twenty-four-hundred and four feet.

Since discovery, sixteen wells have been drilled in the field, of which twelve have been completed as gas wells of from twenty to forty million cubic feet open-flow with a reservoir pressure of approximately eight-hundred pounds. The gas sands, however, are very closely associated with sand carrying salt water and

many wells have, by necessity, been plugged and abandoned after completion.

Structurally the field represents a very broad anticline striking about eighteen degrees Northeast and Southwest or about parallel to the strike of the formations. The producing horizons are lenticular sands and sandy shales in the basal Pliocene or upper Miocene formations, and more probably the latter. There is no surface geological expression of the subsurface folding other than a very slight topographic high of not more than ten feet.

Development has been slow, and although discovered in 1922, it was not until the summer of 1929 that the field was extended, and this when E. P. Zoch et al, Baldwin No.1 was brought in as a gasser,about two miles to the Southwest.

This field has supplied the towns of Corpus Christi, Taft, Robstown and Sinton with gas for a number of years, and the total production as of January 1st, 1930, has been about three and onehalf billion cubic feet. There has been no oil production and no very deep drilling has been done.

The author believes that systematic development and operation would here prove profitable, since past work has been very carelessly handled.

S I M M O N S C I T Y F I E L D

LIVE OAK COUNTY

TEXAS

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The Simmons Gas Field is the newest oil or gas development in Live Oak County, Texas, and is located near the Nueces River, about three miles West of the town of Simmons City, in the Western part of the County.

During 1923 and 1924, while working in conjunction with Dr. Thos. L. Bailey, Geologist of the University of Texas, on the stratigraphy of the Gueydan Formation, Mr. H. Coquat of Three Rivers was attracted to the possibility of this area as an oil or gas territory and began leasing acreage. The structure was noted and mapped on sandstone beds of the middle Oligocene or middle Gueydan formation.

Ten wells have been drilled in the field proper, of which two were completed during 1927 as gas wells of about ten to fifteen million cubic feet capacity with rock pressures of about five-hundred pounds. Subsequently these wells were connected to the Southern Gas Company's pipe line supplying San Antonio, but developed water trouble during 1928 and were plugged and abandoned. The

field has never been economically important and due to the early abandonment, by necessity, of most of the wells, the field has had no development during the past several months.

Based on surface geology, the field represents an anticlinal fold striking North forty five degrees East and Southwest as ascertained by beds of the Gueydan formation. Subsurface evidence indicates the same condition exists and possibly connected with some minor local faulting. Sufficient drilling has not been done to thoroughly exploit the field.

Production is from sands in the basal part of the Fayette or Jackson formation at a depth of thirteen hundred feet and only one well has been drilled to the Cook Mountain formation. A small oil show was encountered in one of the shallow wells at thirteen hundred feet, but there has been no oil produced from this field. The total gas production as of January 1st, 1930, has been about two hundred million cubic feet with no wells producing at that time.

K I N G S V I L L E F I E L D

KLEBERG COUNTY

TEXAS

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As early as the oil discovery and excitement at Spindletop in 1903, with the subsequent search for undiscovered domes, attention was drawn to the present site of the Kingsville Field as a possible salt dome, owing to the failure of water tests in that area. The first well, though not productive, was drilled to fourteen-hundred feet, reporting gas at that depth, during the year 1917 by Holleman et al. Following this, Mr. Charles Flato, an associate of Holleman's in the first company, organized the Kleberg County Oil and Gas Company, which drilled the discovery well of the Field, Rosse No.1, during 1919. The well blew out at a depth of twenty-one-hundred-forty-three feet but was saved and completed as a small gas well, estimated twenty million cubic feet openflow and original rock pressure of seven-hundred-fifty pounds. This well brought about the development of the area and warranted the entry of the Humble Oil and Refining Company and other companies into the Field.

The Kingsville Field is located about seven miles

Southeast of the town of that name and near the junction of San Farnado Creek and Baffins Bay.

More than forty wells have been drilled in the area with productive sands outlined at 2120, 2250, 2400, 2930 and at 3600 feet. These sands are of Pliocene and Miocene age and during 1929, the Humble Company drilled a well to near 7000 feet on the structural high but to no success.

As of January 1st, 1930, nine wells were producing oil for a total daily production of two-hundred-fifty barrels, and four wells were producing gas which is supplying Kingsville and surrounding towns. Total production at that time had been approximately four-hundred-seventy-five-thousand barrels of oil and figures on gas withdrawals are not available, but there has never been any large commercial gas production from the field.

There is little, if any, reflection of the structure in the surface formations and on subsurface data seems to outline production in lenticular sands over a very deep seated structure. It is impossible to correllate sands from well to well in this field, which hinders a conception of the structural features. The field, how-

ever, roughly represents an anticlinal fold striking approximate North South.

There is no development in the area at the present time, April 1st, 1930, and the field is probably on the decline though future deep drilling may change its status.

E D N A F I E L D

JACKSON COUNTY

TEXAS

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The Edna Gas Field is located near and surrounding Alligator and Horseshoe lakes just West of the Lavaca River, about five miles Northwest of the town of Edna, Jackson County.

During the rush leading to discovery of many of the salt domes of the Gulf Coast during the years 1912 to 1915, Mr. S. G. Druschel, a local banker of Edna, was attracted to the shapes of the lakes and surface topography of the area, which led him to suspect the presence of a dome. In March 1916, Druschel, in partnership with a Mr. Rodgers, started the first well to be drilled in the field, which was completed after drilling to thirteen hundred ten feet, as an artesian water well from a sand at nine hundred fifty feet, making sufficient gas to heat and light several houses. A sample of the gas was analyzed by the U. S. Bureau of Mines and pronounced petroleum gas.

Subsequently, through the efforts of Mr. Druschel, the Jackson County Oil Syndicate was formed and two deep wells were started during May 1921. The first well,

Druschel No. 1, reached a depth of twenty-six-hundred-seventy feet, blew out, sanded up and was abandoned late the same year.

Since the discovery of the deep sand, more than twenty wells have been drilled in the field with little success. Most of the wells have had good shows of gas but have been improperly completed and only three are now producing. Blowouts have been frequent and numerous and when these have happened, the wells have not been properly plugged, permitting leakage from the deeper sands into the shallow water sands.

Through the drilling of the many wells, three gas sands have been developed, being at twenty-six-hundred-fifty feet, thirty-two-hundred feet and thirty-nine-hundred feet in depth. Two of these are now producing gas into the Houston Gulf Gas Company's pipe line.

Judging from the nature of the wells drilled in the field, it is believed that the gas accumulation has been in lenticular sands of the Oligocene Formation with a very small amount of structural folding present. The latter can be accounted for by a very deep seated anti-

clinal folding or possibly from a very deep salt dome.

The field, since the completion of the last wells late in March 1930, has been producing approximately eight hundred thousand cubic feet of gas daily into the pipe line with a total production to April 1st, 1930, of approximately three hundred fifty million cubic feet of gas.

In view of the past development and the number of dry abandoned wells, the Edna Field is practically condemned for commercial production above four thousand feet depth, but subsequent deep drilling may develop a very large deep field. The present producing sands are very closely associated with sands carrying salt water and since there is not a very definite line of demarcation between the two, it is doubtful if these sands are extensively developed.

M A T H I S F I E L D

SAN PATRICIO COUNTY

TEXAS

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The Mathis Gas Field was discovered in August 1924 by the Plateau Oil Company when their Freeman No.1 blew out and was lost from a sand at twenty-four-hundred feet. The well blew wild for thirty-four days with an average openflow of approximately thirty million cubic feet and a closed in pressure of about eight-hundred-forty pounds.

The Field is located in the Western part of San Patricio County, about five miles West of the town of Mathis and along the Nueces River. Development in the area has been spasmodic and erratic since ten wells have been drilled with the completion of three of them as commercial gas wells which have been connected to the Southern Gas Company's pipe line. These wells have produced a total of nine-hundred million cubic feet of gas, not including wastage from blowouts and wild wells which would swell the total another billion cubic feet.

During 1929 the Magnolia Petroleum Company drilled a well to a depth of fifty-five-hundred-twenty-six feet, slightly off the crest of the structure to

the East and abandoned it at that depth. A few small shows were noted but not sufficient to warrant other drilling. This well suggests that the field is probably of minor importance and practically depleted.

Based on subsurface correllation, since surface geological work is impossible, the Field represents an anticline striking slightly Northeast and Southwest with steeply dipping flanks. It is possible however, that lenticular sands hold the gas with the accumulation due to contact source beds. This fact, however, is not substantiated by pressure decline curves of the wells, which show a drop suddenly from about five-hundred-fifty pounds to zero with the encroachment of the hydrostatic water level.

The producing sand is of middle Oligocene age and to the present time only the one sand has been developed.

P E T T U S F I E L D

BEE COUNTY

TEXAS

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The Pettus Field located at and near the town of Pettus, in Northeastern Bee County, has made new oil history in Southwest Texas and has opened the first commercial pool in Bee County.

Early during the year 1929, Dr. H. E. Hewitt encountered about two million cubic feet of gas with a reservoir pressure of eleven hundred pounds in a sand at twenty six hundred seventy eight feet depth, in his wildcat well, the No.1 Ray. This well, however, went to water shortly after completion and was abandoned.

Subsequently, the Moody-Seagraves interests took over the Hewitt Tract, drilled several wells and completed their Ray No2 for a thirty million cubic foot well, with a rock pressure of eight hundred pounds from a sand at twenty eight hundred ninety feet. Their Ray No.3 well was drilled just across the line in Goliad County and was completed as a very small gas well making about fifteen barrels of forty-two gravity oil daily from a sand at four thousand fifty four to four thousand sixty two feet. The latter well, however,

was drilled below six-thousand feet before completing at the above depth.

It was not until the latter part of January 1930, though, that the first commercial oil well was finished. The Houston Oil Company of Texas drilling on an Humble Oil and Refining Company lease, brought in their McKinney No.1 as a seven-hundred-fifty barrel oil well from a sand at thirty-nine-hundred-fifty-seven to thirty-nine-hundred-seventy-one foot depth. The oil has a gravity of forty-two degrees Baume.

As of April 1st, 1930, there were three completed oil wells in the field with a daily average of about fifteen hundred barrels, and three wells are nearing the pay horizon.

From the meagre information now known of the Pettus Field, it presents a unique problem of oil accumulation. The field may represent an anticlinal nose striking Northeast, faulted on the Northwest with the down thrown side on the Southeast. The faulting may also assist the structure - in that there has probably been an adjustment and folding of the strata subsequent to the faulting, thereby, making a closed structure on the down

thrown side. One well drilled on the North has checked the subsurface top of the Jackson Formation high but has proven non-productive. This field and the Kauffman Field in Goliad County (to the East) present similar structural conditions. There is no surface indication of folding or faulting in the Pettus Field, all information being based on subsurface stratigraphy.

The oil production is from a sand of the Upper Yegua, Upper Claiborne, or Eocene age, and is the first prolific high gravity oil production from this horizon in the area. A few fields in the Mirando City district have produced a small amount of oil from a sand of similar age but were not of such high gravity. The gas production, as outlined, is from the Oligocene.

A pipe line connects the field to a loading rack at the town of Pettus but there had been no oil runs as of March 1st, 1930. The Magnolia Gas Line also has connections to the Field, facilitating a ready market for the gas.

The surface formation is the Reynosa lime and sands and makes surface geological determinations impossible.

K A U F F M A N F I E L D

GOLIAD COUNTY

TEXAS

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The Kauffman Field is located in the Western part of Goliad County, just South of the San Antonio River.

The original discovery well of the field was completed early in December, 1929, when the F. P. Zoch et al, Kauffman No.1 was completed as a small gas well, of estimated twenty million cubic feet open-flow, spraying gasoline, from a sand at forty one hundred fourteen to forty one hundred thirty feet. The field was discovered on geological work by Herschel Cooper of San Antonio, Texas, who mapped a surface fault striking North eighty degrees East just North of the producing well.

This field presents one of the most remarkable cases of oil and gas accumulation in the Southern Gulf Coastal Plain of Texas, since the production is on the Southeast or downthrown side of a fault which is sealed to the Northwest by an adjustment of the beds to the faulting. The fault plane dips about seventy

degrees to the South and the beds on the South, or downthrown side of the fault, apparently dip Northwest into the fault plane, causing an anticlinal structure or nose just South of the line of faulting.

Only the one producer has been completed in the field which now makes approximately three barrels of gasoline daily as a fluid accumulation while blowing the gas. A second well drilled about a mile to the Northwest, has checked the subsurface structurally low and is thought to be on the South and downthrown side of the fault.

The field is in the earliest stages of its development and little can be ascertained as to the probable future. There has been no gas or oil withdrawals from the field as yet.

The producing sand is of Yegua, Upper Claiborne or Eocene age and is thought to be about one-hundred-fifty feet stratigraphically lower than the oil producing sand in the Pettus Field to the West.

P A L O B L A N C O F I E L D

BROOKS COUNTY

TEXAS

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The Palo Blanco Field, so named because of its location on the ranch and original Mexican land grant of the same name, is situated in the Northwestern corner of Brooks County and represents the first successful oil or gas development in the County.

The discovery of the field is directly attributable to the seismograph, since it was first noticed by the possibility of an uplift based on a seismological reconnaissance of the area. The "shooting" crew were operating for the Shell Petroleum Corporation out of the Houston office.

Subsequently a large block of leases were secured and the first well was drilled by the Houston Oil Company of Texas, the Lassiter No.1, which was completed as a large gas well spraying a very high gravity oil resembling gasoline from a sand at forty one hundred twelve to forty one hundred seventeen feet, in September, 1929. This well, however, due to the high gasoline content of the gas, has since partially filled

with fluid and is not producing gas at the present time. A second well drilled South of the first well, has developed a good gas sand at thirty eight hundred feet and a potential oil sand at forty two hundred feet. The latter was tested and came in making two hundred barrels of forty four gravity oil daily but soon went to water and has been drilled deeper, the present drilling depth being below fifty five hundred feet.

An analysis of the gas from the Lassiter No.1 well was made by Dr. A. J. Hartsook of the Chemical Engineering Department of Rice Institute and is as follows:

Oxygen	O-2	.05 to	.09 per cent
Nitrogen	N-2	.62 to	.83 per cent
Methone	CH-4	99.00 to	99.10 per cent
Higher Hydrocarbons		.19 to	.12 per cent.

The computed specific gravity of the above sample was .560 but field computations made at the well show an average specific gravity of .66 and that the gas would yield an average of .368 gallons of gasoline per thousand cubic of gas.

Paleontological determinations from the cores and samples from the two wells drilled in this field, indicates a large uplift based on the top of the Jackson

Formation of Eocene age. The producing zones as are now known, are probably all of Oligocene deposition. Since the field is in its earliest stages of development, little can be ascertained as to the future of the field, or its probable economic value.

There has been no commercial production from the field as of March 1st, 1930.

T H R E E R I V E R S F I E L D

LIVE OAK COUNTY

TEXAS

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The Three Rivers Gas field is located just Northwest of the town of Three Rivers, Live Oak County, from which it gets its name, and near the junction of the Nueces, Atascosa and Frio Rivers.

The first well was drilled by Glasco and Faulin, a small stock company, and was completed during the summer of 1925 as a small gas well of ten million cubic feet openflow capacity, and a reservoir pressure above three hundred pounds from a sand at six hundred sixty two feet. This well, Tipps No.1, blew out from the producing sand and was lost on account of water and bad casing.

Approximately fifteen wells have been drilled in the area following the gas discovery, of which only a few were completed as commercial producers of from five to twenty million cubic feet openflow. The reservoir pressure was approximately three hundred pounds in the six hundred fifty foot sand and near four hundred pounds in the eight hundred sixty five foot sand. During 1925 two wells were completed as small oil wells of

two to five barrels each of twenty gravity oil from a depth of eight hundred fifteen feet. These wells, however, soon went to water and were abandoned.

Up until late in 1927 this field supplied gas for the town of Three Rivers, the glass factory and other industries, but since that time there has been no withdrawals, and is practically depleted.

Total production has been about three billion cubic feet of gas and a very small amount of oil from the three sands, which are Upper and Middle Fayette, Eocene Age.

The structure of the field can be partially mapped at the surface in beds of the Gueydan or Oligocene Formation. The subsurface represents a small anticline striking approximately North forty five degrees East and Southwest. Some minor faulting may be connected with the field although there is only slight evidence. Only a few wells have been drilled below the shallow producing depths and only one has been drilled to the Cook Mountain Formation, which was reached at twenty four hundred feet.

G R U B S T A K E O R C A L L I H A M F I E L D

McMULLEN COUNTY

TEXAS

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The Grubstake or Calliham Oil and Gas Field, located in Northeastern McMullen County just South of the Frio River, near the town of Calliham, was discovered early in 1918 by the Grubstake Investment Company when their No.1 Brown was completed as a gas well from a depth of eight hundred fifty feet, and estimated to have an openflow capacity of thirty million cubic feet.

During the period of development of the field, oil was discovered and an extensive development was inaugurated. However, the field proved spotty and wells soon depleted until now there is little, if any, activity in the area other than daily pumping of wells.

In June 1926, the daily production reached a maximum of about five hundred barrels from about fifty producing wells. The earliest wells drilled in the field were completed as gassers, and in November 1922, the Southern Natural Gas Company completed a twelve inch line from this field to the City of San Antonio. The gas production was not sufficient to supply the demand

and in 1926 the line was connected to the Cole-Bruni Field.

Structurally the field represents an anticlinal fold striking Northeast and Southwest with the productive horizon, being Fayette (Upper Eocene) age. Deep wells have been drilled in the field proper but have been of no success.

It is doubtful if there will be any development in this field in the future since the gas is wholly depleted and there is little oil production at the present time.

C R O W T H E R F I E L D

McMULLEN COUNTY

TEXAS

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The Crowther Oil Field, located in Northeastern McMullen County, represents the oldest oil development in the County, having been discovered in 1897 by a local ranchman, a Mr. Van Meter, when he discovered oil while drilling for water near his ranch house about one mile South of the present town of Crowther. Shortly thereafter, the Van Meter Ranch was purchased by Messrs. Crowther, et al, who organized the King-Crowther Oil Company and began development of the property. Prior to 1905, nineteen wells were drilled on the structure, five of which were producers and one of which still produces.

Subsequently, this field has been partially developed by the Boston-Texas Oil Company in 1916, the Plymouth Oil Company in 1917, the Possum Hills Oil Company from 1918 to 1922, the Elliott Jones Company in 1923, F. J. Darling et al from 1924 to -26, and by E. R. Marts et al from 1927 to the present time. The latter Company is now operating the property.

The field has had a total of more than thirty wells drilled since its discovery, of which seven now produce a daily average of fifty to seventy five barrels of fifteen gravity oil from a depth of five-hundred to six-hundred feet. Gas has been encountered in some of the shallower stratas and has been utilized in operating lifting power for the pumping wells.

The production in this field has been dependent on salt water flooding of the oil sand from a lower sand and none of the wells have proven productive until this method was used. In most cases the oil sand and salt water horizon is separated by only a very thin strata of hard rock.

The field proper has a general trend twenty degrees Northeast and Southwest, approximately paralleling the strike of the formations. There is evidence for believing that a normal fault upthrown on the Southeast, has sealed the producing sand. The surface formation is Upper or Middle Fayette and the productive horizon is Lower Fayette or Upper Yegua in age.

The Crowther Field has never been economically important since the total production to date (March 1st, 1930), has not been greater than two-hundred-fifty-thousand barrels. No pipe line connections have been made to the Field.

The whole of the production from this field has been from the five-hundred foot sand and no deep wells have been drilled. Future deep production is possible.

GOVERNMENT WELLS FIELD

DUVAL COUNTY

TEXAS

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Discovery of the Government Wells Oil Field, located in the old Government Wells Ranch in the Northwestern part of Duval County about thirty-five miles Northwest of the town of San Diego, is directly attributable to surface geological work by Mr. R. F. Schoolfield who mapped the area in 1925. The field takes its name to the proximity to water wells drilled by the Government along a former main traveled wagon trail.

Drilling was begun in the latter part of 1926 when H. B. Schlesinger, et al began their No.1 Hall in Survey Seventy-Six. This well and five subsequent ones in the general area, were failures. The S and O Oil Company (Schoolfield and O'Bryne), however, completed its No. 1 Norton, Survey No. Two-Hundred-Fifty, a short distance West of these dry holes, in August, 1928, as a twenty-five-hundred barrel well in a sand at twenty-three-hundred-fifty feet depth, and was the discovery well of the Field.

During 1928 and 1929, more than sixty wells were drilled of which forty-eight were producing oil on January 1st, 1930 with a daily average production of about forty barrels per well. Total production from the field since date of discovery to January 1st, 1930, has been nearly six-hundred-thousand barrels. The oil has a gravity of about twenty-one Baume.

Based on surface geological mapping, the subsurface structure is noted by a re-entrant of the formations, by a retarding of the Reynosa Escarpment to the Southeast and by Chalcelony or Quartzite veins and masses, suggestive of faulting. The latter theory is carried out by subsurface contouring which suggests an anticlinal nose faulted and sealed on the West side. The field strikes about North South with a productive area now outlined, about one mile long and one-half mile wide.

The productive horizon consists of two or more sands separated by thin shale strata near the middle of the Fayette or Jackson (Upper Eocene) formation.

The field marks a continuation of the productive trend to the Northeast in close proximity to the Reynosa Escarpment, a marked topographic feature of Southwestern Texas.

One well has been drilled below five thousand feet on the structure and has proven unproductive. This, however, does not condemn deeper possibilities.

A V I A T O R S F I E L D

M I D O J U E L O S F I E L D

M I R A N D O C I T Y F I E L D

S C H O T T F I E L D

W O L C O T T F I E L D

A N D R E W S F I E L D

WEBB COUNTY

TEXAS

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The Mirando City, Schott, Wolcott, Mid Ojuelos, Aviator's and Andrews Fields represent one continuous line of development from the town of Mirando City Southward to the Webb-Zapata County line in Southeastern Webb County.

The Mirando City pool was opened in November 1921 by the Laredo Oil Company and subsequent operations have opened the other pools as follows; Schott Oil Company discovered the Schott pool in December 1921; aviators from Kelly Field, San Antonio, opened the Aviator's Pool in June 1922; Alonzo Junior Oil Producers Company completed their well for the discovery of the Mid-Ojuelos Field; the Wolcott Pool was opened by J. W. Russell et al in May 1923, and in March 1924 the Andrews Petroleum Company completed their No. 1 well as a large gasser.

Although separated by field names, the six producing areas are very closely connected to each other and in some cases represent actual extensions of the producing area under different field names.

Structurally, the fields represent accumulation in a lenticular sand condition that is probably closely connected to faulting and possibly some structural folding. The producing area is from onehalf to one mile in width for a total length of more than twelve miles.

Total production from the six fields to January 1930 from date of discovery, has been more than ten-million-five-hundred-thousand barrels. The fields have been thoroughly explored in the present producing sands, which are Fayette and Yegua, of Eocene age, and the fields are now on the decline. There has been many deep wells drilled in this area but none have proven productive.

There is no surface expression of the structural condition.

M I R A N D O V A L L E Y F I E L D

ZAPATA COUNTY

TEXAS

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During the year 1920, L. T. Harned, who had considerable experience in the oil industry and who had drilled a number of water wells in the local district, induced Mr. O. W. Killam to secure a block of leases on land that now comprises the Mirando Valley Oil Field.

The first two tests were failures, though reporting good oil showings, and it was not until the completion of the third test in April 1921, for an initial production of one-hundred barrels, that the actual discovery of the field was made.

This field, located in Northeastern Zapata County, is the original discovery oil field of the area, and has assisted the vigorous development in the Laredo district the nine years just past.

Production is obtained in an anticlinal nose striking North South in a sand at fifteen-hundred feet which is middle or lower Fayette, Upper Eocene in age.

Development in this field reached its maximum during 1927 and the field is now on the decline and

practically depleted in the known productive horizons. However, during 1929, the field produced more than twenty seven thousand barrels of oil from seventeen wells to swell the total production from discovery to January 1930, to more than four hundred thousand barrels. The oil averages about twenty one gravity.

A few deep wells have been drilled in the field but no deeper production has been obtained.

H E N N E W I N C H F A R R I S F I E L D

Including:

KITZELMAN-ST. ALBAINS and ALBERCAS FIELDS.

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JIM HOGG, WEBB and ZAPATA COUNTIES,

TEXAS.

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The Henne-Winch-Farris Field is located in Northwestern corner of Jim Hogg County, partially overlapping to both Webb and Zapata Counties, and was discovered by a company of the same name upon the completion of their No. 1 well as a large gasser of sixty million cubic feet openflow volume, in June 1924. The discovery oil well of the field, however, was the No. 3 well which came in for an initial production of thirty-five-hundred barrels from a depth of two-thousand feet, during November, the same year.

The latter well is located on what has since proven the center of the field and a gradual extension has been made both North and South until the present productive area is more than a half mile wide and eight miles long. The oil productive area of this field has been fairly well defined but the gas acreage has not as yet been delimited.

Structurally, the field represents a faulted condition where a slightly Northeast-Southwest striking normal

fault, dipping to the West and with the upthrown side on the East has sealed the structure. Gas is produced on the structural high with oil along the flank to the Eastward down dip. The dip of the producing sand in this field and for a few miles toward the East, is about one-hundred-fifty feet per mile as compared to a normal dip for the district of about ninety feet per mile.

The productive horizon of this field is a sand at two-thousand to twenty-one-hundred feet depth and is Middle or Lower Fayette, Upper Eocene in age, correlating with the productive sands of some of the fields farther West.

During 1929 the field rapidly declined and only produced a total of thirty-eight-thousand barrels from the fifty-nine producing wells. The field, however, has produced more than two-million,-eight-hundred-thousand barrels since date of discovery to January, 1930.

A few deep wells have been drilled but have not proven productive.

The Kitzelman- St. Albains and the Albercas Fields, although sometimes separated by field reports,

are really Northward and Northeastward extensions of the Henne-Winch-Farris pool. Scructurally the three fields are one and the same but production statistics have been separated and give the Albercas Field a total of one million six hundred thousand barrels of oil production since discovery. Combining the two oil recovery figures would indicate that the field is one of the largest of the Laredo District pools, or a gross total production of four million five hundred thousand barrels of oil to January 1930.

R A N D A D O F I E L D

JIM HOGG COUNTY

TEXAS

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The Randado Field, located in West-central Jim Hogg County near the town of the same name, was discovered in September 1925, when the No. 2 well drilled by Conway-O'Bryne-Minahan and Bailey was completed for an initial flow of about one-hundred barrels daily of twenty-one gravity oil.

This field has been one of the most productive of the Laredo District and has produced, since discovery, nearly three-million barrels of oil. The field, however, is now on the decline and during 1929 produced only four-hundred-eighty-thousand barrels from one-hundred-thirty-nine producing wells on an average of about seven barrels per well per day.

Structurally, the field represents an East West transverse fold, crossing a lenticular sand condition similar to the Cole Field and has afforded closure on the North and South. This factor is the primary one influencing accumulation since many wells have been drilled West of the field and the producing

sand does not continue Westward beyond the sand lensing boundary.

The producing horizon at a depth near thirteen-hundred feet depth, correllates with the sand of the Cole-Bruni Field and is basal Oligocene in age or very near the top of the Eocene formation. Several tests have been drilled to the other known productive sands of the Laredo District, being in the Fayette, Yegua and Cook Mountain formations, but they have not proven productive in this field.

The subsurface structure is reflected in the surface geology by a large re-entrant within the Reynosa Escarpment and by Quartzite Masses, the latter suggesting filling in tensional cracks along the crest of the folding. The surface formation is basal Miocene or upper Oligocene in age.

V A L D E Z F I E L D

WEBB COUNTY

TEXAS

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The Valdez Oil Field, sometimes called the New Cole-Bruni Field, is located in Eastern Webb County, about four miles West of the Cole-Bruni Field and eight miles East of the Reynosa Escarpment.

This field was opened in 1927 and development was prosecuted vigorously during 1928, subsiding somewhat during 1929. More than seventy wells have been drilled in the field, of which fifty-five were completed as oil wells and nine as commercial gas wells.

Oil production since date of discovery, has totaled more than a million barrels from statistics as of January 1st, 1930. The field, however, is now on the decline.

Structurally, the field represents a similar condition as in the Cole-Bruni Field to the East, being a lenticular sand deposited along an Eocene shore line crossed by a transverse fold or nose which has afforded accumulation in the sand. Production comes from a sand at twenty-three-hundred-fifty feet near the base of the

Fayette, Upper Eocene, formation.

During 1928 the productive area was extended Northward by completed gas wells but no oil production has been obtained in this direction. Similiarly, the field has been extended Northeastward by a gas well producing from a sand at twenty-two-hundred-fifty feet and probably a new producing horizon.

The field strikes North South with an oil productive area slightly more than a mile in length. No deep wells have been drilled on the structure to date.

Original discovery of the field belongs to the Cole Petroleum Company upon the completion of their No. 36 well as a large gas well spraying oil in April, 1927.

K O H L E R A N D D I N N F I E L D S

DUVAL COUNTY

TEXAS

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Owing to their close proximity to each other and the similiarity of both to the same type structural features, the Dinn Gas Field and the Kohler Gas and Oil Field, are being discussed together.

Both fields are located in Southwestern Duval County near the Western boundary of the County and just North of and in the same structural trend as the Cole-Bruni Field.

The Dinn Field was opened in 1926, when the Simms Oil Company completed their Dinn No.1. Since discovery, approximately twelve gas wells have been completed with estimated open flows of from fifteen to twenty-five million cubic feet and a reservoir pressure of five-hundred pounds. Structurally this pool is a small eastward plunging nose about eight miles basinward from the Reynosa Escarpment and with a similiar lensing out and sealing of the productive sand to the West as in the Cole-Bruni Field. The latter feature is probably the cause of the local accumulation at seventeen-hundred-seventy feet, a sand of basal Oligocene age.

In the Kohler Field, just North of the Dunn Field

which was discovered in 1927 by the Humble Oil and Refining Company, a similiar structural feature is present. Gas and oil are produced from two sands at eighteen hundred and twenty eight hundred feet from sands of the basal Oligocene or Upper Fayette (Eocene) and basal Fayette (Eocene) age respectively. More than forty five wells have been drilled, of which fifteen are now gas wells and thirteen are now producing oil. The field has only recently had gas pipe line connections and there has not been much gas withdrawal, but has produced to January 1st, 1930, more than seventy thousand barrels of oil.

As mentioned above, the structure of the Kohler pool represents a lenticular sand crossed by a transverse fold or nose and is dependent on the lensing out of the sand to the West for closure of the structure in that direction.

Neither of the above fields have been exploited for probable deep production.

C A R O L I N A - T E X A S F I E L D

WEBB COUNTY

TEXAS

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The Carolina-Texas Field, named from the small company who discovered it, is located along the Reynosa Escarpment about eight miles North of Mirando City in East-central Webb County.

Gas was discovered in this field in a shallow well during 1921 but the first commercial gas production was from the Carolina-Texas Oil and Gas Trust's, Barnsley No. 1 which was completed March 18th, 1922, from a sand at two thousand feet, where it produced an openflow volume of twenty five million cubic feet. Following discovery the field was partially developed and during June 1926, the Associated Oil Company completed their No.2-A Webster in Survey 684, flowing approximately eight hundred barrels of thirty six gravity oil from a sand at twenty six hundred feet. Oil production in the field fell off rapidly and subsequent tests drilled on all sides of the oil well were failures with the exception of a well to the West completed as a gas well. Since the first oil discovery, one small pumper has been completed in the three thousand

foot sand, making forty five gravity oil, but has not proven commercial.

Three sands are proven productive in the Carolina-Texas Field; namely, 2000, 2600 and 3000 feet. The first is equivalent to the lower sand in the Cole Field and is basal Fayette or Eocene in age. The other sands are thought to be Cook Mountain in age, although the 2600 foot sand may belong to the basal portion of the Yegua. This field is one of the very few places where the Cook Mountain formation has yielded commercial production.

Structurally, this field represents an anticlinal fold, striking Northeast Southwest cut off on the West by a normal fault. This fault has a displacement of approximately two hundred feet, as determined by well logs, and is downthrown toward the Southeast. Subsurface contouring indicates that the faulting is the controlling feature of the structure and that the West dip noted toward the fault is due mainly to an adjustment of the strata Eastward, coincident with the slipping of the fault block down. The fault plane dips about

forty five degrees Southeastward and changes its course near the West central part of the field.

Total oil production from the field has been approximately sixty five thousand barrels and it has also produced approximately five billion cubic feet of gas. These figures are as of January 1st, 1930.

R E I S E R F I E L D

WEBB COUNTY

TEXAS

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The first gas wells drilled in Webb County and the first commercial production obtained, was by Frank Reiser who was drilling on his ranch near the present town of Reiser, on the Tex-Mex Railroad, in central Webb County. Mr. Reiser was drilling for water and discovered gas in shallow sands between four hundred and nine hundred feet, during the year 1908.

Subsequently the Producers Oil Company, a subsidiary of The Texas Company, began development of the area and completed twelve wells as gas producers from the shallow depth sands. The Border Gas Company then made pipe line connections to the wells, which supplied the City of Laredo, and towns enroute, for a number of years. At the present time the field is practically depleted and the abundance of high pressure gas in the surrounding area, has caused its almost complete abandonment.

Structurally the field represents a broad gentle anticline striking North South which is only

slightly indicated by surface features. The productive sands are basal Fayette (Eocene) age and may possibly extend into the Upper Yegua (Eocene). They correllate on general subsurface work with the lower sand in the Cole-Bruni Field. Well logs and records are not available of the field due to the date of discovery, hence a more definite idea of the structure is not possible.

Several deep tests have been drilled to the Cook Mountain formation on the structure and oil shows have been encountered but no commercial oil production has yet been found.

There are no available figures on the past withdrawals of gas from this field but probable figures place an estimate well up in the billions of cubic feet.

J E N N I N G S F I E L D

ZAPATA COUNTY

TEXAS

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The Jennings Gas Field located in Northeastern Zapata County, about twenty one miles South of Mirando City, was discovered in 1914 when J. D. Jennings drilled a test water well on his ranch in that area. The well reached a depth of fourteen hundred ten feet, where it blew out and ran wild several days without casing in the hole.

The Border Gas Company, a subsidiary of the Producers Oil Company or The Texas Company, then began operations in the field and proceeded with development. A rather large gas area was outlined and partly from this source, the Border Gas Company has supplied the border towns with natural gas during the past fifteen years. During recent years however, the field has been connected to the Rio Grande Valley Gas Company's pipe line and now supplies gas to the towns and cities of the Lower Rio Grande Valley.

Structurally, the field represents an anticlinal nose with a trend and longer axis, nearly North - South, parallel to the strike. Early production from the

field was obtained from the thirteen hundred or fourteen hundred foot sand, which is basal Fayette or Eocene age. Later developments, however, have outlined a sand at nineteen hundred feet and many wells have been completed from this horizon. The latter sand correllates with the deeper sand of the Carolina - Texas Field which is thought to be basal Yegua or Upper Cook Mountain, Eocene age.

A few good showings of oil and gas have been found in sands near four thousand feet depth in some of the deep wells drilled. These have not been definitely assigned an age correllation but are thought to be from near the base of the Claiborne group and probably Mount Selman in character.

Recently a Southeastward extension to the Jennings pool has developed an oil field known as the Cuellar pool. At the close of 1929, twenty five wells were producing oil with a total daily production of about fifteen hundred barrels. This extension has produced more than two hundred thirty thousand barrels of oil at that date.

Gas production from the Jennings and Cuellar pools has probably been well up in the billions of cubic feet since both have been producing for such a long time.

C H A R C O R E D O N D O F I E L D

ZAPATA COUNTY

TEXAS

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The Charco-Redondo Oil Field, located in Southeastern Zapata County about twenty miles Southwest of Randado, has not proven very productive, although many wells have been drilled.

As of January 1, 1930, a total of one hundred sixty seven wells had been drilled to the shallow sand horizon at one hundred sixty to one hundred seventy feet and at that time one hundred twenty one wells were producing an average of one barrel of eighteen gravity oil each per day. Total production from date of discovery to that time, has only been about eighty five thousand barrels and the field is now on the decline.

Actual discovery, so far as is known, is not attributable to any special reason although it is thought ranchmen drilling water wells deserve credit for opening the field.

Structurally the field represents a small anticline striking North - South with the productive zones at one hundred sixty and nine hundred seventy five feet

belonging to the Fayette and Yegua formations respectively. The latter sand was discovered late during the year 1928 and has never been thoroughly exploited as to future possibilities because the discovery wells produced gas.

Two comparatively deep wells have been drilled on the structure to depths near two thousand feet and were abandoned as dry holes.

This field is really of minor importance and cannot be compared with the prolific production secured in other fields of the Laredo district farther North.

A G U A D U L C E F I E L D

NUECES COUNTY

TEXAS

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The Agua Dulce Field, located about four miles Southeast of the town of Agua Dulce, from which it takes its name, was discovered by the first well drilled in the area; namely, the Grimm and Morris et al, Garrett No. 1, which was completed in August 1928, with an estimated openflow of thirty five million cubic feet of gas and a rock pressure of eight hundred sixty pounds. The discovery well was located in the Northeast corner of Section No. 34, and the productive sand is at two thousand sixteen to two thousand twenty three feet depth.

Fifteen wells have been drilled in the area with the completion of twelve of them as gas wells with an average of twenty five million cubic feet open-flow each and reservoir pressures of about eight hundred fifty pounds. Dry holes have been drilled about two miles to the North and Southeast, indicating the limits of the field and subsurface data from the wells drilled, would suggest probable closer limits on the outline.

Discovery of the field was attributable to the

subsurface contour work on shallow salt water sands, and the deeper drilling indicates that the structure continues approximately in shape with depth, being an anticline with the major axis, striking about ten degrees Northeast and Southwest. Only about fifty feet of closure is noted on the two producing sands at nineteen hundred to two thousand feet depth, which are probably Lower Pliocene or Upper Miocene in age. The structure is not reflected in the surface formations other than by a slight topographic high in the area.

The gas from this field carries a high sulphur content which necessitates working and treating of the gas prior to delivery to pipe line. The towns of Alice and Agua Dulce are being supplied with gas from the field by the Houston Natural Gas Company, and during the Fall of 1929, the Magnolia Gas Line made connections to the wells but due to the sulphur content, has found it un-economical to handle.

No deep wells have been drilled where structurally high and it is quite possible the future of the field may develop many new productive sands.

The total gas production as of April 1st, 1930, has been about four hundred fifty million cubic feet of gas.

O A K V I L L E F I E L D

LIVE OAK COUNTY

TEXAS

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The Oakville Gas Field represents one of the newest shallow gas developments of Live Oak County, Texas. Mr. Lloyd North, while doing geological reconnaissance work for The Texas Company in 1922, was attracted to the possibilities of a structure in the area and leasing was completed late during the year 1922. The field lies about two miles Northeast of the town of Oakville and on the Southeast side of Sulphur Creek.

The Texas Company commenced drilling operations in the field during 1924 and drilled four wells, three of which were shallow, before abandonment and surrendering of leases about December 1st, 1925. The field then lay dormant until 1927 when Mr. H. Coquet and associates (connected with the Simmons Oil Company), started taking leases and subsequently began drilling operations. The latter company has completed five gas wells in the area at depths near three hundred feet with estimated openflows of from three to five million cubic feet each and reservoir pressures near eighty pounds.

The Simmons Oil Company recently secured a franchise for the city of Three Rivers and have completed pipe line connections to the city which, including the glass factory and other industires, consumes approximately fifteen to eighteen million cubic feet monthly.

The surface formation in the Oakville Field is the Oakville sands of Miocene age, which is approximately eighty to one hundred feet thick though partially eroded off. The producing horizon is Oligocene in age and is probably from near the middle of that formation.

There is exposed on Sulphur Creek just Northwest of the field, an aragonite dike that strikes about forty three to forty seven degrees Northeast and Southwest and dips about eighty seven degrees to the Northwest. This dike probably represents a fault with the downthrown side on the Southeast and with a probable adjustment of the strata subsequent to faulting, causing an anticlinal fold Southeast of the fault. The fold strikes North forty five degrees East and Southwest and closure is afforded by dip toward the fault

plane and also by faulting. The surface formations are not sufficiently well bedded to afford surface mapping of the structure.

Total gas production to April 1st, 1930, has been about two hundred million cubic feet from six producing wells.

D R I S C O L L F I E L D

DUVAL COUNTY

TEXAS

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The Driscoll Oil and Gas Field is owned in fee by the heirs of the late Robert Driscoll, who developed and operated the field until the time of his death in 1929. The field proper is located in the central portion of the Driscoll Ranch, which comprises approximately sixty seven thousand acres in the Southwestern part of Duval County, six miles West of the town of Sweden on the Texas-Mexican Railroad.

The early history of the Driscoll Field parallels that of most of the fields in Southwest Texas, in that it was discovered while drilling for water for ranch purposes. Six wells were drilled to a depth of about five hundred feet, five being completed as small gas wells of two to five million cubic feet open flow with rock pressures of about one hundred eighty to one hundred eighty six pounds, from a sand at that depth. These shallow wells partially outlined a subsurface structure with a flattening of the strata from West to East and a steep dip to the East.

The first deep well was brought in in October 1927, when the Driscoll Fee No. 7 was completed from a sand at twenty four hundred forty eight to twenty four hundred sixty eight feet, as a large gas well with a spray of oil. This well was improperly cemented and completed, however, and was plugged and abandoned shortly thereafter on account of salt water.

Subsequent to the deep sand discovery, nine wells were drilled in the field proper, six of which were completed as large gas wells and two of which made oil wells. The gas wells have estimated openflows of from thirty to seventy five million cubic feet daily, with rock pressures of from nine hundred to twelve hundred pounds, and the original completion of the two oil wells give a daily production of about two hundred fifty barrels each of twenty three to twenty five gravity oil.

Four gas or oil producing sands have been developed above three thousand feet, the present deepest well. These are the twenty eight hundred ninety foot oil sand, and the five hundred foot, twenty four hundred foot and twenty nine hundred

fifty foot gas sands. The field is only partially outlined and is limited only by dry holes on the East and Northeast. The five hundred foot sand is probably of Oakville, Miocene age, the twenty four hundred foot sand is Oligocene, and the twenty eight hundred ninety and twenty nine hundred fifty foot sands are thought to be Jackson or Eocene in age.

Structurally, the Driscoll Field represents an anticlinal nose pitching to the East and trapped on the West by either lensing of the sands, faulting or folding. Since the producing sands lie vertically beneath each other, it is not thought that the closure is caused by lenticular sands such as might be laid down along an oscillating shore line, but more probably by some folding thereby sealing the structure on the West. The subsurface formations strike fifteen to twenty degrees Northeast and Southwest and dip about one hundred feet to the mile East.

The production from this field as of March 1st, 1930, has been about five hundred million cubic feet of gas and approximately eighty six thousand barrels of oil.

N O L E D A O R P I E D R A S P I N T A S D O M E

DUVAL COUNTY

TEXAS

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In one sense, Southwest Texas vies with Pennsylvania and the Drake well for the introduction of the petroleum industry of the United States. The same year that the Drake well was completed in Pennsylvania, 1859, a shallow water well sixty feet deep discovered oil on the present site of the Piedras Pintas Dome, near the town of Noleda, in East central Duval County. The initial production was about eight barrels of heavy asphalt base oil, and during the Civil War and until the advent of better methods, was used to grease the wagon trains of the Southwest, as torches for camp purposes, and also for medicinal purposes.

The dome takes its name from the presence of numerous quartzite or chalcedony veins or dikes, which after exposed to the weather, present all the colors of the rainbow, hence the Spanish name, Piedras Pintas, meaning painted rocks.

Following discovery,a few additional wells were completed as small oil wells, but it was not until

after the Spindle Top rush, that the field became active. Subsequently the field suffered several minor booms with the development of much cap rock production, and during the Fall of 1926, flank production was discovered around the dome. The Humble Oil and Refining Company's Walsh No. 4 was completed as a five thousand barrel well from a depth of thirty six hundred feet. A second well was also completed and these two produced more than one hundred fifty thousand barrels of fifty two degree gravity oil during 1926 and 1927, and is the total deep production to date. Many other wells have been drilled to deeper depths but have proven unproductive.

The early history of this dome is not available, as many operators have been active in the field at one time or other. The cap rock production, which was never large, reached its flush production about 1915, from wells less than one thousand feet depth. A small refinery was built at the field during 1919 and 1920, but was never operated.

The Piedras Pintas Salt Dome is consistent with

other domes of the Gulf Coast, being a salt core about one and onehalf miles in diameter, protruded through a portion of the overlying sediments and formations and overlain by a cap of gypsum, anhydrite or limerock. The top of the salt lies at a depth of about thirteen hundred fifty feet below the surface.

The salt dome is reflected at the surface by higher topography locally and by deflected stream courses. Many quartzite or chalcedony dikes are present, as mentioned above, and are probably vein or fracture fillings in cracks caused by the uplift of the salt mass.

There is no activity in this field at the present time and the cap rock has been thoroughly explored for the presence of sulphur by the Union Sulphur Company.

P A L A N G A N A D O M E

DUVAL COUNTY

TEXAS

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Palangana Salt Dome, the name taken from Spanish, meaning small bowl, from which the dome takes it's name by reason of its surface expression, was discovered in 1916 by the Empire Gas and Fuel Company by their Singer No. 1 well. The dome is located about three miles North of the Piedras Pintas Dome in East-central Duval County.

Following discovery, the Simms Oil Company, the National Oil Company and the Humble Oil and Refining Company, have been active in the area and have drilled numerous dry holes; all of the wells drilled, however, by the above companies, have proven unproductive. The dome had been thoroughly tested for both cap rock and peripheral production but a well drilled in 1928 by the National Oil Company, while exploring for sulphur, was completed for a sixty barrel initial flow of fourteen gravity oil. This one well produced approximately three thousand barrels total production and surrounding tests were failures.

A well developed strata of sulphur, has been dis-

covered above the top of the dome at five hundred feet, and at the present time is being mined by the Duval Texas Sulphur Company, who have about abandoned operations.

Topographically, the dome is represented by a surface basin within an inward facing escarpment except on the Southeast, where drainage has cut a channel through the higher ridges. Structurally, the dome is similiar to the Piedras Pintas Dome and other domes of the Gulf Coast, being a salt plug intruded through the overlying sediments, having a salt diameter of about two miles.

Aside from the operations of mining sulphur, there is no activity at the present time although deeper flank production is probable.

F A L F U R R I A S D O M E

BROOKS COUNTY

TEXAS

The Falfurrias Salt Dome, sometimes known as "Las Cuevas", "Gyp Hill" or "Loma Blanco", is located about seven miles Southeast of the town of Falfurrias, in Northeastern Brooks County. This dome presents a novel feature in that it is one of the few domes where the cap rock is exposed at the surface and the only one in which the gypsum of the cap rock can be studied directly.

The dome proper, is expressed at the surface by a roughly circular hill about one mile in diameter and slightly elongated in a Northwest - Southeast direction. The hill rises about eighty feet above the Laguna Salada (Sour Lagoon or Lake), which partially surrounds it and about fifty feet above the general terrain level.

Gyp Hill is composed almost wholly of very pure gypsum, which occurs as long elongated crystals with the longer axis nearly vertical, in which the crystals vary to eight inches in diameter and eighteen inches in length. On the South slope of the hill

there is an open sink hole which leads into a cave about ten feet in diameter.

Development and drilling operations have been rather spasmodic in the area, beginning as early as 1911 when the Producers Oil Company drilled three wells on the Southwest slope of the hill. Since that time, approximately twenty wells have been drilled near the hill and no commercial production has been obtained although numerous shows of oil and gas have been reported. One well has been drilled below four thousand feet in depth.

As yet, the Falfurrias Dome has not been proven definitely to be a salt dome as the salt mass has not been penetrated with the drill. However, based on the purity of the gypsum mass, the size and shape of the hill and the position of the hill above the general terrain level, Gyp Hill appears to be a salt dome cap. A few years ago, however, a detailed seismograph study of the hill was completed and locations based on the seismograph report, which were thought to be off the edge of the dome, encountered the gypsum mass at depths less than three hundred feet. It is

quite possible that the gypsum hill represents a lenticular mass deposited, is a former lagoon, and since it's uplift to a land body, has retarded erosion sufficient to remain as a local hill. The circular shape and size of the mass, however, condemns this feature.

M I N O R P R O D U C I N G A R E A S :

LOWE FIELD - McMULLEN COUNTY

ROMA FIELD - STARR COUNTY

ALWORTH FIELD - JIM HOGG COUNTY

NURSERY FIELD - VICTORIA COUNTY

TEXAS

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A few areas of minor importance have been discovered in the Coastal Plain area of Southern Texas, but these have not been of sufficient importance to warrant handling in separate chapters. These minor producing areas are here being grouped together.

LOWE FIELD

One of the most interesting of these smaller fields is the Lowe Field, located in Central McMullen County on the Lowe Ranch. Approximately six wells are here producing an average of one barrel per well per day of high content Icthyol oil from a depth of about five hundred feet. The oil has a potential value of from Fifty to Seventy-five Dollars per barrel as medicinal purposes when marketable, but the demand is not as great as the supply and the field has not been greatly developed during the long time that it has been known.

ROMA FIELD

Near the town of Roma, in Southwestern Starr County, a small semi - productive area has been out-

lined. A rather large structure has here been mapped by surface geology and subsequently outlined by core drilling. Several shallow gas wells have been drilled, one being completed as a small oil well during 1928. This area has a very good future.

ALWORTH FIELD

The Alworth Field in Western Jim Hogg County, represents a minor extension of the productive area at Randado. The field has never been active and represents accumulation in a lenticular sand crossed by a small transversal fault, similiar to the Randado Field. The field has never been economically important and few wells are now producing in the area.

NURSERY FIELD

During 1926, the Humble Oil and Refining Company outlined a structure Southeast or East of Nursery, in Northern Victoria County, by core drilling. This is mapped on a shallow gas sand at six hundred feet, reached by core drilling. During 1928, a deep well was started, which has had several shows of oil and gas and is now drilling below six thousand feet.

PART TWO

OIL AND GAS FIELDS

OF THE

SOUTHERN GULF COASTAL PLAIN

OF TEXAS

P A R T T W O

NO. 1.

GENERAL TERRITORY COVERED:

The territory dealt with in this report, consists of all that land comprising twenty five counties, an area of more than twenty-six-thous-sand -four-hundred-fifty square miles, lying ad-jacent to the Gulf of Meixco in Southwestern Texas, bounded on the Southwest and South by the Republic of Mexico, on the West and Northwest by the approximate geologic boundary of the Yegua - Cook Mountain formations, and on the Northeast by Lavaca, Wharton and Matagorda Counties, Texas. The latter counties mark the approximate Western limit and boundary of the great geo-synclinal fold, of which the City of Houston marks the approximate center.

NO. 2

SOURCE OF THE OIL AND GAS:

The writer is of the opinion that the oil and gas produced in the more than thirty fields of the Southern Gulf Coastal Plain, is indigenous to

the sands within which it is found or at least has had its origin in the organic shales directly overlying and underlying the sands. This fact is borne out by a study of the chemical analysis of the various oils produced.

In the Laredo District, the various sand horizons, even though in different fields, produce almost the same type and gravity oil in the same respective sands, while deeper sands will present a different gravity oil. Likewise, the Yegua sands of the Laredo District, do not produce the same kind of oil as is produced in the Yegua formation at the Pettus Field.

That oil and gas will migrate laterally, is a drawn conclusion, but vertical migration, except through faults or fissures, in the area here discussed, is not considered plausable in view of the above arguments presented. The organic theory of distillation of animal and vegetable matter as the origin of the oil and gas, is accepted and the writer believes that the gravity and kind of oil produced, is dependent entirely upon the source beds above and below the productive horizons.

NO. 3.

FACTORS INFLUENCING THE ACCUMULATION OF THE OIL AND GAS IN THE SOUTHERN COASTAL PLAIN OF TEXAS.

Oil and gas are known to migrate upward along the dip in porous strata and this factor is predominant among the fields of the district. Structurally, the Southern Gulf Coastal plain of Texas, represents a large geo-syncline dipping toward the Gulf of Mexico from every direction. The normal dip of the Eocene beds, the best markers of the district, is about one hundred feet per mile.

Folding and deformation of the beds causing structures, anticlines, domes, etc., increases the dip or slope in every direction from the central highest point. Oil and gas in small quantities around these highs, immediately starts upward migration due to variations in capillary attraction, specific gravity, and other less important features. Since all of the formations, and more especially the sands, carry salt water, the oil and gas seek their higher level due to specific gravity. In most every field discovered to date, however, the original reservoir

pressure has been slightly in excess of hydrostatic pressure caused probably by the liquids seeking their respective levels.

It has been suggested that oil and gas fields require a large gathering on generating area. The author feels that this is untrue and that the local accumulation in any field, is dependent entirely on the source beds and their accompanying percentage of animal and vegetable matter that will permit oil distillation. In this line it has been noted that where the Marine Oligocene beds are missing, little oil is found in the Oligocene sands except in the basal part. For the above reason, it might be expected to find fields very close to each other, up or down dip, dependent entirely upon subsurface conditions.

NO. 4

SAND CONDITIONS:

Sand conditions undoubtedly play a great part in the oil and gas accumulation of Southwestern Texas, and more especially so in Laredo district of this area. In some of the fields folding has apparently been much less than in some of the other fields, and sand conditions have been responsible for a portion of the accumulation such as are suggested below.

In the White Point, Saxet and Kingsville Fields, it is thought that the deformation has not been large and that the accumulation has been dependent upon lenticular sands overlying the folding. In the Laredo district, especially the Cole-Bruni and Randado Fields, accumulation is assisted by a lensing out of the sand to the West along an Eocene and Oligocene shore line, affording closure on the West that would not have been so pronounced except for this feature.

Lenticular sands are suggested by the spotty shallow gas production of the Refugio Field and the oil

producing horizon here present at thirty seven hundred feet suggests a past Oligocene delta and the deposition of crossbedded sands that dip at high angles, separated by thin shale partings. The latter is suggested by the inconsistent correllation of the sands in this field and more especially so, this producing sand horizon.

Sand conditions in the Oligocene have also assisted accumulation by their great thickness and the consistency of the sands to be deposited uniformly over large areas.

NO. 5

DISTRIBUTION OF PRESENT KNOWN FAVORABLE AND UNFAVORABLE RESERVOIRS:

Many attempts have been made to draw lines along major folds and cross folds, with the hope of being able to give some indication of territory likely to contain other fields. No success has been had in this line as yet and it is the opinion that this can only be worked in the future.

Development in the area during the past, has been contingent on places where drilling operations would economically reach the more productive known sands of the Oligocene or Eocene. Where the productive horizons are excessively deep or too shallow, little work has been done, since in the former case, correllation of the beds are impossible and small structures may never be noted by the subsurface data derived from wildcat wells. In the latter case where the productive horizons are shallow, correllation is quite easy and the productive sands are quite easily reached by drilling operations, but in this

case, the sands have not been so prolific and deeper horizons have never been found.

It is believed by the author, that all of that territory lying East and Southeast of the Oligocene - Eocene geologic contact, has possibilities for producing oil and gas and more especially along the lines of folding, which are discussed below under separate headings.

NO. 6

WHITE POINT ANTICLINE:

The White Point anticline is suggested by a general line of fields from Refugio County to Kleberg County. This comprises the Refugio, White Point, Saxet and Kingsville Fields, which roughly are in a straight line, paralleling the Gulf of Mexico.

From Government levels carried along the railroads of the area, there is noted a general higher topography along this line of supposed folding, than either to the Northwest or Southeast.

The author believes that it is quite possible for many more productive areas to be opened up along this structural trend.

NO. 7

REYNOSA ESCARPMENT:

It can be noted from the accompanying geological map showing the oil and gas fields, that there is a general trend of fields along and adjacent to the Reynosa Escarpment, which is a distinct geological feature of the area. In light of the prominence of this escarpment Southwest of the Nueces River and the many fields of this area, it is thought probable that the feature is accompanied by some general structural condition such as folding or faulting. The area is marked by fields from the Alworth Pool in Western Jim Hogg County, for more than a hundred miles, to the Pettus and Kauffman fields in Northern Bee and Goliad Counties. Productive areas are not yet as well known in this Escarpment area Northeast from the Government Wells Field, as they are Southwest from there.

NO. 8

TERRITORY NOT CONSIDERED FAVORABLE:

The author, in view of field work in the area and the known development of the whole district West and Northwest of the Oligocene Eocene geologic contact, considers all that territory as very unfavorable for the accumulation of oil and gas. Numerous surface structures have been mapped in the area here mentioned and many dry holes have been drilled on the surface expression of the folding, but no prolific production has been obtained.

This unproductiveness is considered wholly as a matter of paucity of productive sands due entirely to insufficient source beds. The beds below the Oligocene contain an abundance of mineral matter, principally ferruginous material and it is the opinion of the writer, that this foreign material has hindered the distillation of the oil or gas.

Productive horizons are known to exist beneath the territory here considered unfavorable, but

their depth is beyond the reach of present drilling methods,and exploratory work at such depths, would be prohibited by reason of costs.

PART THREE

OIL AND GAS FIELDS

OF THE

SOUTHERN GULF COASTAL PLAIN

OF TEXAS

PART THREE

NO.1

GEOLOGY:

Surface geology, as it applies to plane table work, mapping beds and dips, carrying elevations, etc., is inpractical in most of the Southern Texas Coastal Plain area. Many difficulties are encountered when such work is undertaken. The lack of fossil evidence, the paucity of true exposures of the subsurface formations, the lack of good contour maps, the dense vegetion, the nature of the formations to grade laterally changing their lithologic character, and the scarcity of roads and trails, affords many difficulties. Added to this is the fact that subsurface beds as correllated from well logs, cannot be discriminated with reference to comparison with the outcropping beds.

When the beds that are now exposed in the area, were deposited in the sea, they lay practically horizonal but since their deposition, the inland part of

the region paralleling the Gulf of Mexico, has been gradually uplifted until the beds now dip gently toward the coast in every part of the area. In the Rio Grande Valley, the dip is slightly North of East, in the Laredo District, nearly due East, and in the area near Bee County is Southeastward.

Since the deposition of the beds and the subsequent elevation, the streams have dissected and eroded the area, and the surface does not now correspond with the surface of the most recent bed but has beveled each bed and now the oldest of the formations outcrops farther from the coast line and the most recent nearest to it. The dip of all the formations is not the same since the Eocene beds dip about one hundred feet per mile, and the Pliocene and Pleistoce beds dip about thirty five to fifty feet per mile.

Neither has the deposition of the younger beds been consistent with that of the older ones in lateral extent, and there has been much overlapping. The most noted example of this, is the Reynosa Line formation of Upper Pliocene, which in some cases has overlapped the Miocene and a portion of the Oligocene.

This is probably due to differential tilting of the beds permitting deposition at one point and not at another.

Nearly all the beds above the Eocene, are separated by unconformities indicating uplift, erosion and submergence prior to the deposition of the younger bed. The beds below the top of the Eocene, however, were probably laid down in a receding marine sea with only slight uplift. This is suggested by the conformity of the beds, the thickening of the formations down dip and the apparent similiarity of the Eocene beds in their chemical and physical properties.

A large geosynclinal condition is suggested with the axis striking East - West through Northern Brooks and Kenedy Counties, and is confirmed by subsurface work.

The Reynosa Escarpment, a prominent feature of the area, is thought to be purely an erosional feature although it may possibly be associated to minor faulting and folding. Southwest of the Nueces

River, the escarpment is more prominent than to the Northeastward. This is due mostly to a lithologic change to the Northeast, where the formation becomes softer, permitting partial erosion and the escarpment is not so pronounced.

NO. 2

VALUE OF INFORMATION DERIVED FROM WELL LOGS:

With the exception of very local areas and in the fields proper, little value or information can be ascertained from well logs of the district. If a well is carefully cored and colors are noted on the log, it is possible to pick the lithologic breaks between some formations, more especially those that have distinct color breaks, such as that contact between the Oligocene light green clays and the underlying black shales of the Fayette or Jackson formation of Eocene age. This color difference has been most valuable since many of the productive fields lie in such a position that the basal Oligocene or Eocene sands are producing and this lithologic break is noted.

The unconsolidated sediments that are present in this Southern Coastal Plain district, will not permit the use of cable tools for drilling purposes; hence all of the wells are drilled by rotary methods

and fewer samples are obtained.

In the Laredo District, where many of the fields are closely spaced, it has been possible, due to the paucity of sands and the consistency of the producing horizons - together with the uniform shale separations, to correllate over a large area by carrying the interval between sand bodies either up or down the section. This has assisted more development in that area since it is possible to note minor changes in dip and strike. Correllation of this nature, has not been possible in the area farther Northwest from the Laredo District, due to the rapid change in the character of the sediments from one point to another.

NO. 3

COMPARISON OF WELL LOGS AND SECTIONS FROM VARIOUS FIELDS:

It is interesting to note here, a comparison of the well logs and stratrigraphic sections from the various parts of the Gulf Coastal Plain.

Many of the formations which have a narrow outcrop width and rather thin section at their outcrop, thicken down dip and sometimes change their lithologic section. The most noted of these examples is the Oligocene, which has a normal outcrop thickness of from six hundred to nine hundred feet, thickens to twenty three hundred feet in the Refugio Field and becomes partly marine in that a distinct marine fauna of foraminifera has there been found. Bearing out this idea, it is interesting to note the thickness of the Oligocene at other known points which are as follows: Simmons City Field nine hundred feet; Karnes County subsurface nine hundred feet; Goliad County subsurface twelve hundred feet; Laredo district fields seven hundred to twelve hundred feet; Nursery Field, Victoria County, eighteen hundred feet; Pettus Field, Bee County, thirteen hundred feet; and in the Lucas Field, Live Oak County, approxi-

mately two thousand feet of Oligocene is present. The near shore fields at Kingsville, White Point and Saxet, have not yet been drilled sufficiently deep to penetrate the total thickness of the Oligocene.

Likewise, the Fayette formation of the Upper Eocene, changes its characteristics down dip as borne out by subsurface data. In the Laredo District, the Fayette has a thickness of about eight hundred to one thousand feet but is not separable into paleontological units. In the Palo Blanco Field, the thickness is about sixteen hundred feet, in Goliad County about fourteen hundred feet, and in the Lucas Field a thickness near seventeen hundred feet, separable into three zones, namely: the upper unfossiliferous, the middle Hockleyensis Zone and the lower Dibollensis Zone.

The above formations discussed, are the more productive ones in this Southwest Texas area, and more information has been gathered on these than on the other less productive zones. Above the Oligocene, the formations are not separable on subsurface, neither on lithology nor paleontology, and little can be accomplished by correllation of the Miocene or Pliocene beds.

Based on drillers records, the Pliocene beds are characteristically sands and shales, with sands predominating. The Oligocene is distinctly shales and clays, and the Eocene beds are sandy clays, sandy shales and thin stratas of sand.

NO. 4

USEFUL FIELD WORK:

Plane table mapping of dips and formations, is quite impossible in the area here described, except in rare cases such as the mapping of the Reynosa Escarpment and the mapping of the contacts of the lower conformable Eocene beds. However, mapping of the structure in the latter beds, would prove unwise since there are no known prolific producing horizons within the scope of drilling operations that would begin drilling at such a point in the stratigraphic section.

Above the Oligocene - Eocene contact, most of the formations overlay each other unconformably and the beds are not well stratified. Detail work on such beds is impractical since a surface structure may prove to be an unconformity and nonproductive.

Useful field work can be done on the Pliocene, Miocene and Oligocene formations by mapping the generalities of the contacts between the beds and the careful noting of re-entrants or inliers within the younger formations. The latter type work, together with careful subsurface work, has proven the boon of the geolo-

gist in the area, and has afforded a possibility for more detailed work in the future.

NO. 5

VALUE OF PALEONTOLOGY IN CORRELLATION OF SECTIONS:

Paleontology rightfully belongs as an aid to both surface and subsurface geological work. The foraminifera and fossils, but microscopic and macroscopic, noted in the formations here present, have for general purposes been separated on the basis of former work in the formations around the coastal domes of East Texas. These classifications seem to carry through the formations in Southwest Texas and it has been possible to split some of the formations into three or more zones such as the Fayette which consists of the upper portion carrying arenaceous forams, the middle Texularia Hockleyensis zone and the basal Textularia Dibollensis zone. These assist a ready correllation from field to field, where present, and are a great aid to the geologist.

However, none of the formations above the Eocene, carry distinct faunal characteristics except in rare cases the Oligocene, and only by experimental work with heavy mineral determinations, has any attempt been made to break the formations apart,

other than by lithology. Sufficient work has not yet been done on the heavier minerals to determine if any reliable separation can be made by this method.

The paleontologist, however, can, after a few years experimental work with samples of known age, suggest a possible age for well cuttings and cores that may be secured. This microscopic work is quite valuable to the geologist working in the area.

NO. 7

TYPE SECTION FROM THE SOUTHERN GULF COASTAL PLAIN OF TEXAS:

(Compiled from work by members of the United States Geological Survey and by members of the Department of Economic Geology, University of Texas.)

AGE: CENOZOIC
SYSTEM: QUATERNARY
SERIES: RECENT

Formation:

1. Recent.
This consists of fluvatile deposits of black yellow and brown silt forming low terraces of the stream; modern flood plain material consisting of sand and gravel; beach and dune sands of the coast and sand hills of Southern Texas. The formation varies from 0 to 60 feet in thickness.

AGE: CENOZOIC
SYSTEM: QUATERNARY
SERIES: PLEISTOCENE

Formation:

1. Beaumont Clay.
The formation varies from 300 to 600 feet in thickness and consists of blue and brownish calcareous clay with small nodules of lime and lenses of sand and sandy clay.

2. Lissie Gravel.
Lissie gravels comprise sand and gravel deposits derived from crystalline rocks, flint and chert pebbles, coarse sands and lime conglomerates of from 200 to 800 feet in thickness.

UNCONFORMITY

AGE: CENOZOIC
SYSTEM: TERTIORY
SERIES: PLIOCENE

Formation:

1. Reynosa Formation.

The formation consists of from 500 to 1000 feet of limey - conglomerates, limestones and sandstones, and pockets or lenses of pink limey sandy clay. The conglomeratis have a matrix of flint, jasper, quartz and limestone pebbles.

UNCONFORMITY.

2. Lagato Clay.

The Lagato clays vary from 300 to 600 feet in thickness and comprise dark colored or mottled pink, red and green clays, with numerous lime nodules and stained heavily with manganese in places. The sands are rose or rose-brown in color.

3. Lapara Sand.

This formation consists of interbedded sand and clays of about 200 feet thickness. The sands are sharp and include pebbles of clay and lime concretions; the clays are red, green and pink and in some places a conglomerate of clay pebbles is noted. Many fragments of Pliocene age fossil bones have been found in this formation.

UNCONFORMITY.

AGE:	CENOZOIC
SYSTEM:	TERTIORY
SERIES:	MIOCENE

Formation.

1. Oakville Sandstone.

The Oakville formation comprises from 200 to 800 feet of volcanic ash, tuff fragments, bentonite, clays and shales and a few

sandstones, and beds of volcanic conglomerate. This formation seems to be derived wholly from former volcanos.

2. Frio Clay.

About 200 to 400 feet of the Frio is exposed in the Gulf Coastal Plain, consisting of green and pink compact clays with small lime nodules, greenish-gray marls, concretions of silicious limestones stained with mangonese and beds of volcanic Ash.

AGE: CENOZOIC
SYSTEM: TERTIORY
SERIES: EOCENE
GROUP: JACKSON

Formation:

1. Fayette Sandstone.

The Fayette comprises 400 to 800 feet of gray sands and sandstones, brown and chocolate colored clays, lignite clays and lignite and beds of volcanic ash, kaolin like clays and fuller's earth. The clays are leaf bearing and the sandstones are fossiliferous.

AGE: CENOZOIC
SYSTEM: TERTIORY
SERIES: EOCENE
GROUP: CLAIBORNE

Formation:

1. Yegua Formation.

This formation averaging between 400 to 800 feet thick, comprises brown leaf bearing lignitic clays, dark green clays, yellow and dark sands, and lenticular beds of lignite. The clays carry beds and plates of selenite and gypsum. Marine fossils are abundant.

2. Cook Mountain Formation.

The Cook Mountain comprises beds of green sand, iron ore, lignitic clays, iron stained clays, farruginous sandstone and sands. The glauconitic sands and clays predominate, weathering to iron stained soil. About 500 to 800 feet is the thickness of this member which contains numerous marine fossils and microscopic foraminifera.

3. Mount Selman Formation.

This member, having a thickness of between 600 to 800 feet, consists of dark green, brown and yellow sands, thin seams of iron ore, lenses of lignite and clay and beds and concretions of limonite. The beds in general are highly ferruginous, and are rarely fossiliferous.

NO. 8

METHODS AND ADVANTAGES OF GEOPHYSICAL WORK:

Since the advent of Geophysical instruments into the search for new salt domes and structures of the Gulf Coast, great strides have been made with these methods. Four instruments are now in use, viz: Torsion Balance, Seismograph, Magnetometer and Gravitometer, of which the first two are the more successful. Each of the above instruments will be covered by separate paragraphs below.

The Torsion Balance, discovered by Austrian or German scientists, was first brought to America in an effort to definitely delimit the edges of known salt domes and to search for new ones. The instrument applies the principle of a very delicate balance, in which the effect of gravity causes certain torsional effects on the balance wires. This torsion effect is measured either visually or by automatic photographic methods. The Torsion Balance measures the horizontal component of

gravity and likewise a component of the curvature of the beds. In the area of this report, the Torsion Balance has located two domes which have not yet been proven by the drill. Both are in Victoria County.

The Seismograph applies a principle very old, being that used to measure the effect of earth quakes. In field practice, a charge of dynamite is exploded and by careful time and distance measuring devices, the velocity of the seismic wave can be measured. In normal sediments the velocity of the wave increases with depth, and by careful measurement, small increases in velocity can be noted. From an abundance of field work, it has been found that this increase in seismic wave speed, indicates uplift of lower beds. Likewise, Seismic waves passing through the salt mass of a salt dome, is increased through the salt and the dome is detected. In Southwest Texas the Seismograph has been responsible for two domes in Jackson County and the Palo Blanco Field in Brooks County.

The Magnetometer, on application of the age old dip needle used to locate ore bodies, has not been

successful in this area. The instrument embodies a magnetic field pivoted on a horizontal axis and measures the vertical magnetic intensity. In North and West Texas, this has been quite successful where the buried granite ridges, which have a high magnetic effect, have caused the structure. After reconnaissance over an area, isagoms of equal magnetic effects are drawn on the map. Dependent on the area where work is completed, high or low magnetic points may indicate structures.

The Gravitometer, devised by Dr. Blackburn of San Antonio, Texas, is an instrument used to measure the vertical component of gravity. This instrument is in its early stages of development and insufficient field work has not yet been done to warrant recommendation. The principle is that the gravity effect either slows or increases the speed of a radiometer which is operated by an electric current to a small light bulb. This electrical current is controlled to the milliampere, that the proportionate speed may be constant. The gravitometer has not as yet been successful in the area, but is thought to have a good future.

Of the four above mentioned instruments, the Gravitometer and the Magnetometer are not considered favorable for the area. The Seismograph has proven the faster for reconnaissance work but is not as accurate as the Torsion Balance for detail work. A combination of the two has proven the better for work in the area using the seismograph for reconnaissance work and the Torsion Balance for detail work of the discovered structural highs or domes.

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