THE HISTORY OF THE EAST TEXAS OIL FIELD

by

Lucile Silvey

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THE HISTORY OF THE

EAST TEXAS OIL FIELD

A THESIS

Presented to the Faculty of the Graduate School of
Hardin-Simmons University in Partial Fulfillment
of the Requirements
For the Degree of
Master of Arts

by

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Overton, Texas
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INTRODUCTION

A complete history of the East Texas Oil Field would be too voluminous for a study of this kind. Most writings pertaining to the East Texas Oil Field have been presented in the form of technical discussions in the various petroleum trade journals. These publications fail to reach the majority of the reading public. In presenting this work it is hoped that it will serve to supplement what has already been published with new material that will be of interest to the general reader.

An attempt has been made in this study to give a brief history of the development of the oil industry in East Texas from its beginning at Oil Springs, Nacogdoches County, through the first eight years of the discovery of the East Texas Field.

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CHAPTER I

EARLY EXPLORATION

The task of depicting the story of oil development in Texas is less than piecing together fragments of pre-historic paleontological specimens, but greater than a mere chronological account of successive discoveries in the order of their occurrence. There is a story attached to every discovery of note, and one delving into the distorted facts connected with each is put to the task of segregating the truth from the false, by no means a simple process.

From the beginning man has pitted himself against great odds, and the story of every major strike in Texas is one of challenge. Barriers of seeming insurmountable magnitude always bars the way of the wildcatters seeking to tap deep embedded subterranean vaults of oil millions—always in the face of overwhelming odds.

Facts, or legends have given rise to many colorful characters since the days of Spindletop at the beginning of this century. Today's chronological book of oil development in Texas contains many such living characters whose names stand out in bold relief against the background of Texas oil history.

From a lowly beginning, with more than twenty years marking the time between the first discovery well and the beginning of active development, Texas today claims honors of the largest oil producing state. With discovery after discovery pyramiding production totals to a height staggering to the most fanciful imagination, Texas has an output today under rigid proration regulations of about forty percent of the world's total. Since Texas produces about forty percent of the world's crude oil, competition in this state is keen and developments in this area affect the entire world.

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THE PIONEERS OF EXPLORATION

When the East Texas Field was discovered in 1930 Texas was already the leading oil producing state of this nation. The discovery of the great field was not an isolated event separate and apart from the greater story of the development of the petroleum industry but rather a new chapter making a great part of a long story. Hence an adequate account of the East Texas Field must be prefaced by a sketch of petroleum discovery in Texas.

Texas oil history revolves around four companies, Gulf, Texas, Magnolia and Humble, all having their origin in early Gulf Coast discoveries. These companies gained a toehold almost simultaneously and expanded to their present proportions as if propelled by a magical force with an Aladdin-like charm that marked each conquest only by greater successive strides.

Credits for new oil reservoirs must go to the independent operator and not to any particular company. In most cases, with little more than resolute determination in the way of resources to spur him onward, the wildcatter scored discovery after discovery from the Salt Dome area of the Gulf Coast region to North Texas, Northcentral Texas, along the Balcones Fault, back to the Gulf Coast, north again to the Panhandle and West Texas, and finally, East Texas—his life's crowning achievement scored in one master stroke.

Planters in South Texas, ranchers in West Texas, cotton farmers in East Texas—from the north to the south, to the east and the west—all have witnessed the transformation of broad fertile or barren acres almost overnight to raging, gushing, torrential oil geysers. All have known poverty's joyful, sudden right-about-face to copious abundance emitted from the soil that years of tilling or grazing had rewarded its owners with little more that backaches or depleted herds.[1]

[1] P. W. McFarland, "Oil Fields of Texas", *American Association of Petroleum Geologist,* Vol. XV, July, 1931, p. 843.

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For the most part, drilling and development progress in Texas has been marked by rapid strides. Much of this is due to the spirit of cooperative willingness of landowners in pooling their holdings in immense lease blocks for drilling and development purposes. With wide open areas Texas has welcomed immigrant capitalists, industrialists, skilled craftsmen, promoters and flotsam from the world's far places—welcomed and nurtured one and all. They have come empty-handed and remained to share her millions lavished in prolific measure upon the fortunate. Many have stayed to become an integral part of this thriving industry and lent their aid to the growth and plane of attainment which oil in Texas enjoys today, while others have wandered away to spend their gains throughout the world's marts.

In the early days of Texas oil development it was the consensus of opinion and belief among oil heads that Texas afforded little promise of ever gaining particular prominence as oil producing territory. Many who were first to express this belief have lived to see the Lone Star State rise to the position it occupies today, the leading oil producing state.

The story of oil development in Texas is one of challenge, daring, faith and hope—all rolled into one.

OIL SPRINGS

The remarkable feature of oil development in Texas lies in the fact that East Texas was the first to attract the attention of the oil world to Texas as possible oil producing territory. From this section exploration spread to encompass every corner of the state and return to find the world's largest single oil reservoir.

The history of oil in East Texas dates back about seventy-five years. Before the Civil War observers noticed the presence of oil floating on the waters of Oil Springs near Chireno, in Nacogdoches County. It created but little excitement and there were no efforts to make any tests

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until 1866. The results of these tests were disappointing and it was not until 1877 that other wells were drilled.[2]

Little of the early day history of this first discovery is known. Even its discoverer's name has been forgotten. The records today reflect only a cursory review of this strike's advent followed by slow, interspersed development from time to time occasioned by changing conditions in the oil industry's forward march.

In this connection it is well to note, however, that shallow fields later discovered elsewhere in Texas have long since ceased to yield production in commercial quantity. These fields were abandoned with not a single vestige of their one-time frenzied development activity remaining to make their former productive existence. Oil Springs, however, has remained a lure to beckon the return of the hopeful. It always yielded a small measure of rich, high-gravity, lubricating oil as if, by subtle design, to spur on to more determined exploration and development.

It is significant to note that while Texas' first oil discovery was found in East Texas, never had this general area been considered favorable in the eyes of the oil world for likely commercial production.

The operators at Oil Springs encountered a sand body at approximately one hundred feet which contained a high grade lubricating oil. However, as little or no market existed for oil east of the Mississippi River at that time, active development of the field marked by this discovery did not come until twenty years later.[3]

After widespread development of oil fields in the eastern states, following Colonel Drake's famed discovery at Oil Creek, Pennsylvania, the development of Oil Springs' shallow

[2] *Henderson Daily News*, October 21, 1937, p. 2.

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field began in earnest in 1887. There were approximately ninety wells drilled during the ensuing three year period. This number was located over an area of two thousand acres divided into two, one thousand acre tracts. Production was obtained from one hundred and thirty productive acres at depths ranging between one hundred and two hundred and fifty feet, with initial production between one and six barrels per day.[4]

Later, about 1900, the Petroleum Prospecting Company, organized by New Orleans businessmen, entered the field, acquired holdings, and drilled several additional wells. They also erected five, five hundred barrel cypress tanks together with two 1,250 barrel cypress tanks for storage, and built barrels out of cypress wood for hauling the oil to Nacogdoches by ox teams. At this time Nacogdoches County's oil commanded from $4.50 to $5.00 per barrel. Before the operating concern was able to extend its field development and market further, new extensions to the Pennsylvania, Ohio and Indiana fields tended to disturb the market. The company was unable to operate profitably, thus compelling its subsequent dissolution.

With the advent of Spindletop's thundering roar down in the Gulf Coast Region in 1901, a third revival of interest was seen at Oil Springs. Businesslike leasing methods were employed, the entire area was mapped and plotted, and leases were sold throughout the United States in tracts varying in size from a few acres each down to mere drilling sites. As no development company undertook to prosecute further the drilling necessary to keep interest alive, again the Oil Springs field was deserted.[5]

Not until Ranger's sudden birth in 1917, in Eastland County, in the north central Texas area, was attention again turned to Oil Springs. The entrance of the Carolina Oil Company,

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[3] *Oil Weekly*, October 8, 1934, p, 7.
[4] *Henderson Daily News*, October 31, 1934, p. 3.
[5] Ibid.

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comprised of a group of financiers from South Carolina, again awakened desultory interest here. This concern advanced one step ahead of its predecessors' march as shown by a four hundred barrel refinery erected, together with a pipeline laid from the field to Nacogdoches, the county seat.[6]

Extended development was delayed even after this enterprising move. About this time a Mrs. Rideout, California millionairess, became interested in the project. She attempted to promote the sale of stock in the Carolina Oil Company's holdings to investors throughout the nation. She failed to take into consideration the field's limited productive output of from only thirty to sixty barrels per day from the hundred odds wells then capable of producing. Eventually realizing the futility of the project she allowed her leases to expire.

A little later, with improved drilling equipment and methods, such major companies as Gulf, Texas, Humble and Sinclair entered Nacogdoches County and assembled gigantic lease blocks aggregating close to one hundred twenty-five thousand acres altogether. Several deep tests were drilled to between three thousand and four thousand feet, but the hoped-for pay sought at these deep levels was never found. The succession of years saw Oil Springs figuratively obliterated from Texas' oil map.

The Oil Springs field escapes popular mention by writers and statisticians because it can not be regarded as a commercial field. Its only significance lies in the fact that its discovery marked the beginning of Texas oil history from which point search for additional fields spread down through the years to every points in the state.[7]

CORSICANA

[6] Ibid.
[7] *Henderson Daily News*, February 17, 1932, p. 14.

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Drilling for water at Corsicana, Navarro County, in 1895, the American Well and Prospecting Company encountered an oil showing at 1,033. Oil was treated in the light of an unwelcome intruder and promptly cased off, and drilling resumed to 2,580 feet where an artesian water flow was found. There the operation was completed as a water well. While the oil showing encountered by the drillers of this well held no more significance than a slight menace to their plans, its appearance suggested something more to Ralph Beaton and H. G. Damon, Corsicana citizens. They formed a partnership with John Davidson, a driller, and began drilling at once for oil two hundred feet south of the water well. This well was completed on October 15, 1895 as a small producer, and two additional wells were drilled in rapid succession, the third, a twenty-two barrel producer, being the best of the three.[8]

Additional wells were finished in 1896 and for the entire year a total of 1,450 barrels was credited to the Corsicana field. Increased drilling in 1897 swelled the field's production total to 65,000 barrels. Little importance was attached to the development as there was no ready market for this oil. There were no means of transporting it nor a refinery to handle the output.[9]

A partnership comprised of J. S. Cullinan, Calvin N. Payne and Henry G. Floger, known as the J. S. Cullinan Company, out of which in later years grew the Magnolia Petroleum Company, is one of the largest companies operating in Texas today.

Erection of a refinery began and progressed rapidly under the direction of E. R. Brown, who later became President of the Magnolia Petroleum Company. With erection of the refinery together with a one and one-half mile pipeline system and adequate storage, arrangements were made with the Waters-Pierce Oil Company to distribute their refined products.[10]

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[8] Ibid., p. 4.
[9] *Henderson Daily News*, February 17, 1932, p. 15.
[10] Ibid., p. 15.

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With a growing outlet for production, impetus carried the field's development ahead at an increasing pace. By May, 1901, a total of 595 producing oil wells and twenty-five gas wells had been completed, covering an area of six square miles. The excitement ran high during the field's early boom days, with yearly production totals mounting until, about 1921, its production peak was reached and thereafter declined.

Active wildcatting carried on in the surrounding territory resulted in minor producing areas being proved from time to time. However, only Powell, which was not proved in its deeper Woodbine horizon[11] until 1923, is considered noteworthy among these as a marker in Texas Oil chronology.

Corsicana's fame is not restricted to being the first commercial oil field developed in Texas. It was here the rotary method of drilling was born, here the first southwestern pipeline was laid, here the first refinery was built, and here oil was first utilized for paving streets and roads, as well as for locomotive fuel consumption. It was at Corsicana that natural gas was first used for commercial heating and lighting purposes, out of which has grown a separate industry, vast in scope and regency.[12]

The Texas Company, like the Magnolia, had its birth at Corsicana. Originally organized as the Texas Fuel Company by J. S. Cullinan, together with Governor Hogg and his associates in the Hogg-Swain Syndicate, it later evolved into the Texas Company. It was this company that was first to extend a pipeline from the Oklahoma fields to the Gulf Coast; and the first, too, in producing fuel oil for naval use.[13]

SPINDLETOP

[11] In East Texas the Woodbine sand is found at depth of 3,700 feet.
[12] *Henderson Daily News*, February 17, 1932, p. 14.
[13] Ibid.

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Today, the name Spindletop awakes recurrent memories and colorful images in the minds and hearts of all who remain of the group that thronged at Gladys City in the days of its mad reign. Succeeding years have brought a score of more new discoveries in Texas that surpassed Spindletop in area, number of wells drilled and total productivity but not one ever rivaled its boom and interest. It takes its place in history as the greatest oil boom ever known.[14]

Located in the northeast part of Jefferson County, Southeast Texas, about three miles south of Beaumont, Spindletop was first and one of the most prolific of Gulf Coast oil fields. Its name was derived from a knob of timber atop the elevated dome, the contour of which resembled an inverted spindletop when viewed from the surrounding prairie.

Geologic study describes it as composed of a steep-sided, flat-topped circular salt core of approximately one mile diameter, with the greater part of its early day production having come from the porous, cavernous limestone at the top of the cap, with its early flush production without equal anywhere in the United States. From its original productive area embracing only about two hundred and sixty-five acres, thirty million barrels of oil were produced in the first three years of the field's existence. Twenty million barrels additional were produced between the years of 1904 and 1926.[15]

Discovery of the field came only after years of diligent exploration work conducted by Patillo Higgins, a resident of the area. In 1890, he observed gas escaping from two points known as the copperas pond and mud springs areas. Borrowing one thousand dollars from George W. Carroll, a prominent lumberman of Beaumont, which sum he used in making a payment on 1,077 acres of land bought for a consideration of $6,452, he laid out a section which he named Gladys

[14] Donald C. Barton, *The Spindletop Salt Dome and Oil Field*, p. 594-600.
[15] Ibid., p. 602/

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City. In 1892, he formed the Gladys City Oil, Gas and Manufacturing Company, capitalized for $54,000.

During the ensuing four year period the company's attempts to find oil met with little encouragement. Their first drilling contract was made with M. B. Loonery, Dallas, February 17, 1893. A second contract was made with Savage and Company, a West Virginia drilling concern, May 26, 1895, and test wells drilled thereafter proved nothing to their eager eyes.

Later, in 1899, an advertisement which Higgins inserted in a trade journal was noticed by Captain Anthony F. Lucas, a mining engineer of Washington, D. C., who was at that time prospecting the salt domes of Louisiana. Correspondence followed between the two with the result that Captain Lucas went to Beaumont, viewed the prospects, and entered into a lease option sale contract with the Gladys City Oil, Gas and Manufacturing Company, June 30, 1899. Drilling operations followed and the first well drilled to five hundred and seventy-five feet encountered strong gas showings, and two demijohns of oil were secured.[16]

At this point Lucas had exhausted his funds, his wife having sold their furniture piece by piece to enable him to carry on operations as long as possible. They used packing boxes in improvising necessary household furniture to take its place, while Lucas sought outside financial assistance so vital to his purpose.

After he had succeeded in interesting Guffey and Galey, Pennsylvania operators, in his project, however, and had surrendered all but a small interest in his properties to them in effecting this agreement, location for another test well was made three hundred and ten yards southeast of his first drilling site. Drilling operations began October 27, 1900. The drilling

[16] Ibid., p. 603.

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contract was held by Hamilton Brothers, with Durt Hamill the driller, while Captain Lucas supervised operations.

Two months drilling rewarded them with periodic gas showings and occasional oil streaks sufficient to encourage continue drilling. Casing was slipped over the four inch drill stem and a six by six inch beam was used to hammer it down, designed to keep the casing moving downward with the bit. Damage to the threads at the top of the casing by this process, however, later proved a handicap to attempted efforts to cap the well. A single inch of grooved threads might have enabled them to subdue the maddened monster that for nine days and nights threatened disaster to residents and land before it finally was checked, after inundating more than one hundred acres under a one million barrel lake of oil.

Captain Lucas' log reveals the depth as being 1,160 feet. At 10:30 o'clock on the morning of January 10, 1901, while seven hundred feet of drill pipe was being lowered into the hole after making a change of bite, without warning a terrific roar rent the still morning air asunder. The seven hundred feet of drill pipe skyrocketed through the derrick top, a thing alive, and spiraled to earth amid an upheaval of water, mud, sand and rocks mixed with the deafening roar of gas that belched forth in volcanic like eruption. Then a column of inky oil shot skyward which attained a height of two hundred feet, spraying the countryside and gripping the hearts of bystanders with terror and fearful resignation.[17]

At once realizing the hazard of the situation, Lucas inaugurated immediate measures to cap the well before disaster swept by wings of fortune wrought havoc to his undertaking and the lives and property of surrounding residents. First he established a cordon of guards to hold the incoming throngs of sightseers at bay. Forty, four-horse teams and gang plows were secured and

[17] Ibid., p. 594-597.

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work begun at building levees to hold the oil. Like a raising tide, it swelled the hastily built storage at the rate of close to 100,000 barrels per day. It overflowed while frantic efforts to improvise an impregnable bulwark was pushed forward at a furious pace in an attempt to check the mounting tide.

In the meantime exhaustive efforts to bring the well under control proved futile. A split eight inch valve was needed, due to the damaged condition of the casing threads, and none could be procured in Beaumont. Telegrams sent to manufacturers throughout the United States brought only the disheartening report that none could be had, with six weeks time required to make one. Newspapers carried the erroneous report that Captain Lucas had offered $10,000 to any one able to close the well. Hundreds of telegrams and letters flowed in from every point of the Nation offering services and suggestions for proffered considerations ranging from $10,000 to $100,000.[18]

As an added threat, on Sunday, January 18, eight days after the well roared in, a prairie fire sprang from the oil soaked countryside. It was successfully quelled before it reached the reservoir of one million barrels of oil.

Then, with Mr. Galey's arrival from Pittsburgh, an iron cylinder was erected around the well which was filled with sand as a protective measure against fire. This proved a prudent step for on March 3 a spark discharged by a passing locomotive set the grass bordering the oil lake and sent sheets of flame leaping one hundred feet into the air. The rolling black billows of smoke in the sky, assuming the shape of a monster dragon, sent families in the neighborhood scurrying for safety, many believing doomsday was at hand.

[18] *Henderson Daily News*, February 17, 1932, p. 15.

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With the fire extinguished and the well under control, immediate development of the area began. This was accompanied by a frenzy of wild speculation that burned feverishly twenty-four hours a day and was permeated by a get-rich-quick madness never before nor since witnessed to delight the hearts of Wallingford's from San Diego to Maine, from Vancouver to Key West. The fame of Spindletop spread like wildfire beyond the farthest horizons—gripping the hearts of wildcatters everywhere with its enchanted lure—a lure that has never ceased.

Drilling and production totals reached their zenith during the year of 1902 with 17,240,949 barrels of oil gauged up to that time. At the end of 1902 drilling declined to the minimum.

It is of interest to note that such major companies as Gulf, Texas and Humble grew out of Gulf Coast Texas oil discovery and development. Gulf's birth was founded at Spindletop; Texas at Sour Lake; and the Humble Oil and Refining Company at Humble, Texas. All were salt domes discoveries of major productivity.[19]

[19] Ibid.

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NORTH TEXAS FIELD

Birth of North Texas' first major field had its beginning in the W. T. Waggoner well, Wilbarger County, November 15, 1909.[20] Oil operators and promoters throughout the United States hurried to the scene of the new strike. Wide exploratory development of Wilbarger and Wichita Counties followed. Electra marked the seat of Wichita County's first strike, which Mr. Waggoner named in the honor of his daughter, Electra Waggoner.

Today, production in this general area is estimated as covering more than one hundred separate pools. There are eleven producing horizons in the South Electra pool and as many in the shallow areas south of Burkburnett. The shallowest oil well is eight-eight feet deep. The deepest producer is 3,850 feet, which produces from the lime. Maximum production in the area was reached between the years of 1918 and 1922, with productivity in recent years decidedly declining from original flush levels.[21]

CADDO LAKE FIELD

Chronologically, at about the time of the Waggoner discovery in Wilbarger County, North Texas, exploration along the Texas-Louisiana border in the vicinity of Caddo Lake, resulted in discovery and development of the Caddo Lake, Marion County, Texas, in 1910. Ponds bubbling with unseen energy indicated the presence of gas which led to exploration of the area, and today some of the producers on the western side of the Caddo field are still yielding their daily oil quota extracted from beneath the waters of Caddo Lake.[22]

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[20] Ibid.
[21] *Oil Weekly*, October 8, 1933, p. 28
[22] Ibid., p. 30.

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Many new pools followed in later years. The Morgan and Strawn fields in Shackelford and Palo Pinto counties preceded Ranger which, like a bombshell, burst forth in 1917 in Eastland County.

Before the Ranger boom, at Thurber, Erath County, close to where the corners of Palo Pinto, Stephens, Eastland and Erath counties meet, the Texas and Pacific Railway Company owned extensive coal mines. Following their discovery of oil at Strawn the Texas and Pacific Coal and Oil Company was formed. They have since grown to be a major producing, refining and marketing company in the Mid-Continent field.

Out of this grew the Ranger discovery by W. K. Gordon, an engineer, engaged at surveying a railroad out of Strawn where he originally discovered coal. Becoming interested in the oil possibilities of the area he leased a block of 18,000 acres in and around Ranger and laid his plans for drilling a test well. Backed by a group of New York financiers, he made his location on the McClesky farm, a mile from Ranger, and proceeded to drill. He struck oil at 3,435.

Derricks sprang up as if by magic, and with no restrictions on well spacing or proration to curtail development of the field such as prevails today, an ugly spectacle marked the site of the new strike. With derricks jammed so close together in many instances transportation through the field was laborious and presented a serious problem. With the World War at its height, gasoline and oil were in greater demand than ever before. With foreign fields curtailed, the Rumanian fields seized or destroyed by the Germans and Russians, no curtailment regulations hampered drilling here and incoming wells were allowed to flow at full capacity. This resulted in quickly diminishing the gas pressure and making pumpers of wells that might have otherwise

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flowed for a long period of time. It was primarily an economic situation that pushed Ranger to the forefront among Texas discovery pools.[23]

BURKBURNETT AND MINOR DISCOVERIES

Before the reverberations of Ranger's tumultuous outburst had begun to ebb, Wichita County scored a major triumph with the birth of Burkburnett in 1918, and a year later was credited with 120,000 barrels daily oil production. Development of the new field doubled Texas' oil production in 1919 over the previous year's total, amounting to 79,366,000 barrels. With the addition of Desdemona, Comanche County, late in 1918, Texas' total oil production climbed to a grand peak in 1920, totaling 96,868,000 barrels.[24]

Following Ranger, Burkburnett and Desdemona extensive wildcatting was carried on throughout the entire west central and North Texas areas and scattered small pools located from time to time added their quota to Texas' increasing productivity through the succeeding years. Some of these areas proved more productive than others, such as Breckenridge and Cisco, but for the most part production came from shallow depths and the yield was small.

Out of the 28,000 wells drilled in Texas in 1919, eighty-five percent were paying producers. In this year the Somerset Field was brought in near San Antonio, followed by the Westbrook field, Mitchell County in 1920. It was West Texas' first contribution to the state's ever increasing petroleum yield, and while never a large field, production here came from the Permian strata at 2,498 feet, proving this formation's productivity in the face of adverse geological theory and opinion.[25]

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[23] Ibid.
[24] Ibid., p. 31.
[25] *Oil Weekly*, September 27, 1937,. p. 74.

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MEXIA AND MINOR DISCOVERIES

At Mexia, 1920, Colonel Albert E. Humphreys opened the first of a series of prolific pools along the famed semi-circled line that spans the state of Texas from north to south and beyond through Mexico to the Pacific. Termed the "Golden Lane," production at Mexia held close to the east side of the fault in a long stretch that widened more than a half mile and served to bring the state's total production figure at the close of 1921 to 106,166,000 barrels.[26]

Powell, Wortham, Currie, Groesbeck, and Nigger Creek followed Mexia on the Balcones Fault, and of these Powell topped the list. Simultaneous with Balcones Fault line field development, Southwest Texas made its first bid for recognition among Texas' broadening oil producing areas in April, 1921, opening the Laredo District including Duval, Jim Hogg, Webb, Starr and Zapata counties, and later annexing Hidalgo County to the producing list.[27]

[26] *Oil and Gas Journal*, October 2, 1930, p.74.
[27] Ibid.

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BORGER FIELD

Oil was first discovered in the Borger section in 1921. Development spread like wildfire from this initial strike in Hutchinson County into Carson, Moore, Potter, Hartley and Wheeler counties.

May 28, 1923 a new oil empire was discovered by the Santa Rita bringing itself in at Big Lake. This well was the key well to Permian Basin development. Today production comes from between 2,400 and 3,000 feet as well as from the Ordovician pay at between 8,483 and 9,020 feet, the world's deepest wells. Big Lake has twenty-four deep wells producing from the Ordovician today and about six more have been drilled elsewhere in the Permian Basin in attempts to locate additional deep pay in this formation, but none outside of the Big Lake field has made a commercial producer. The deepest of these was the Gulf Production Company's Number 103 McElroy, at that time the world's deepest test, drilled to 12,786. It did not produce from that depth and was plugged back to the lime at 3,518 feet, from which it made a producer.[28]

VAN FIELD

One of the few salt dome producers outside the Gulf coast region is the Van pool, located in Van Zandt County. Discovered and developed by the Pure Oil Company in 1929, this field afforded outsiders little opportunity for joining in the lease play and development as the Pure Oil Company had the greater part of the present producing area under lease before starting their well. The Van field was developed to cover approximately 4,200 acres, having approximately five hundred wells, and became a singular example of efficiency of equipment and operation under the unitization plan of proration. The first in the state to operate on this basis, the field was

[28] *Henderson Daily News*, February 17, 1932, p. 16.

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weighed as a unit, irrespective of property lines or ownership's, and was thus designed to produce the oil in the most efficient manner possible.[29]

[29] *Oil and Gas Journal*, September 25, 1930, p.150.

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CHAPTER II

DISCOVERY AND EARLY DEVELOPMENT OF THE EAST TEXAS FIELD

DRILLING OF THE FIRST WELL IN RUSK COUNTY

In the preceding chapter a brief account was given of the opening of the Van pool in Van Zandt County. This field gave new life to a large area that had experienced a number of oil booms in the past. This chapter will deal with the chain of events that resulted in opening up the great East Texas Field in Rusk, Smith, Upshur and Gregg counties.

That the people in Rusk County and East Texas had wanted an oil field for many years is evidenced by a survey of what took place when the first well was started in the territory in 1911. O. P. Boynton, a veteran oil man, was of the opinion that this territory would develop into an oil field. His opinion was based upon his years of experience in the various fields of Louisiana and many of the old time fields of Texas including Spindletop, Corsicana, Humble and others.[30]

Boynton began by getting a few of the leaders of the community interested and organizing a company which included one hundred and eighty-nine shareholders. That his effort was appreciated and that people were really and truly interested is no mistake. They held picnics on the ground, they visited the well by hundreds from all over this section of the country, they told their friends to put money into the enterprise and they practiced what they preached by putting their own money into it. The address of the stockholders was not limited to Henderson but Tyler, Longview, Arp, Kilgore, Mount Enterprise, Jacksonville, Overton, Minden, Louisiana,

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Big Spring, Dallas, Laneville, Long Branch, Elderville, Palestine, Paris, Pine Hill, Houston, and Newark, New Jersey are among the other cities represented among those taking part in this venture. The first meeting of the directors of the company was held on March 13, 1911, and the board included John R. Arnold, E. B. Alford, Rade Kangerga, W. P. White, A. P. Adams, and D. R. Harris.[31]

Mr. Boynton had been a driller for the Gulf Production Company for a number of years and thought that he could see a likely territory in his home county. He felt this so strongly that he was able to convince the businessmen and property owners. He said that in all his experience he had never witnessed a more loyal citizenry. Mr. Boynton had been in the employ of Mr. Neil Espperson and was able to convince Mr. Espperson, who was a successful oil operator, that this section deserved development. He had the promise of Mr. Espperson for unlimited funds and credit to drill as many wells as necessary in the section. Mr. Boynton had assembled thousands of acres of leases and made all arrangements to begin active development work when Mr. Espperson died, terminating the activities of Mr. Boynton.[32]

With Espperson's aid and the loyal cooperation of the citizens Boynton had managed to drill three wells. Although they were dry they revealed evidences of oil and their loss encouraged others to continue the search. It was given to Dad Joiner and associates to discover the world's greatest oil field. Joiner's efforts now call for consideration.

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[30] Rusk County News, October 12, 1934, p. 16.
[31] Ibid., p. 18.
[32] *Henderson Daily News*, September 30, 1934, p. 5.

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VENTURE OF 1919

Several Oklahoma oil men began leasing operations in Rusk County early in 1919, acquiring about 20,000 acres from the farmers and landowners. The standard form of lease contract was employed, permitting them to hold the oil leases for ten years by paying a nominal rental each year after the first year from the date of the lease. Leases were not hard to obtain, as the majority of the landowners were anxious to have an oil well go down in their neighborhood.[33]

It is a common practice throughout the oil country for "wildcatters" to lease up large areas for the purpose of promotion. Almost any area will do, but if there is some geological formation that will lend color to the undertaking it is much easier to promote the sale of acreage. Prices on this type of acreage may range from one dollar to ten or twenty dollars depending on the distance of the acreage from the proposed well. Many drilling blocks are obtained only by the drilling of a well at some stated point within the block. In this event, the leases usually are placed in escrow. That is to any, some local bank is made a depository for the leases, which may not be delivered to the promoters until they have fulfilled their contract to drill the well. The wildcatter depends on the sale of a part of his acreage for his profit and for the expenses of drilling the well.

The 1919 venture was doubtless nothing but a promotion scheme, as most of the leases were taken back to Oklahoma City and sold for a profit. When the Rusk County leases were disposed of in Oklahoma City to a syndicate formed for the purpose of selling stock or shares in

[33] Ibid.

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the venture, there was a residue of a few hundred acres left over. It remained for a veteran wildcatter to take the remnant and find the world's largest and most prolific oil field.[34]

Columbus Marion Joiner, now known as "Dad" Joiner, of Ardmore, Oklahoma, credited with the discovery of the Duncan, Oklahoma oil field, bought these few leases in Rusk County and came down to see what he had acquired. The bulk of the leases lay in the southern part of the county, between the towns of Overton and Henderson. It was a likely looking country of gently rolling hills, about one-third wooded with pines, oaks, and gums and the balance given over to farm and pastures. For nearly a century the people had been living on the soil, raising cotton, sweet potatoes, operating gins and saw mills and dreaming that there might someday be oil.

Delighted with the appearance of the land, which struck some responsive chord in him, Dad Joiner decided to do some leasing on his own account. Purchasing two or three thousand acres more, he revived the talk of drilling a well at an early date and even went so far as to have the timbers out for foundations for a derrick. The timbers lay on the ground for a year and no well was commenced. In 1925, Dad Joiner reappeared in East Texas and acquired some additional acreage. The actual drilling of the first well was not commenced until the summer of 1927.

Even a wildcatter may sometimes turn to the geologist for advice in locating a well. The Joiner holdings of five or six thousand acres were looked over and marked with the approval of Dr. A. D. Lloyd, who shared with Dad Joiner the belief that the area would produce oil. The site selected by Dr. Lloyd was about two miles northwest of the site that was actually drilled. Dad

[34] *Tyler Courier Times*, December 21, 1937, p. 18.

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Joiner put the well on the land of Mrs. Daisy M. Bradford in order to secure the nine hundred and seventy-five and one-half acres lease for his block.[35]

[35] Harry Harter, *East Texas Oil Parade*, p. 147.

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JOINER'S FIRST WELL

Not far from the Bradford farmhouse preparations were made for "Bradford Number One." Heavy machinery began moving in from the highway south of the farm. Most of the equipment was second hand. The boilers, which were to furnish steam for the engine and pumps, were secondhand and mismated. One was an oil field boiler of seventy-five horsepower, the other a cotton gin boiler rated at ninety horsepower. The two together could not build up more than one hundred and twenty-five pounds of steam pressure. Yet with this equipment the miracle of bringing in a new oil field eventually was accomplished.[36]

The first well, for there were three drilled, encountered many difficulties and suffered numerous shut downs. The work progressed slowly and financial difficulties were encountered from the start. There had been so many wildcat promotions already, it was difficult to dispose of the acreage to advantage. Dad Joiner had the Bradford farm subdivided into lots of varying sizes, containing from thirty-five to fifty acres each, with an eighty acre block set out for the purpose of drilling the well.

The drill pipe employed in the drilling of the first well was old and unreliable. Frequently it stuck in the hole or twisted off and had to be recovered by costly fishing jobs. When once it stuck so defiantly that nothing at hand would cause it to loosen, dynamiting was resorted to and an expert was called down from Arkansas to attend to the job. The drill pipe in the hole of the first well was never loosened and the location was abandoned. The derrick was skidded over and drilling of the second Bradford well began.[37]

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[36] *Oil and Gas Journal*, October 9, 1930, p. 50.
[37] Harry Harter, *East Texas Oil Parade*, p. 54.

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HIS SECOND ATTEMPT

Despite the enthusiasm of the East Texans, elsewhere Joiner found it difficult to arouse much interest in his project. It was necessary to sell some of the leases in order to finance the work and Dad Joiner was called away from the well much of the time. The money came in very slowly and there were times when the well was shut down for days waiting for funds to buy much needed equipment. Sometimes there was no money for paying wages, or for settling with the grocer in Overton for foodstuff furnished in running a cook tent for the crew. Mr. Walter D. Tucker, an Overton banker, who had obtained a block of leases prior to Joiner's entry in East Texas, turned over his lease holdings to Joiner, enabling Joiner to acquire many valuable leases that he could not otherwise have had. Not only this, Mr. Tucker and his associates worked indefatigably in behalf of the Joiner drilling activity, straining their resources to the limit in order to keep the well going. During the drilling of the first two wells, in order to help Joiner in keeping expenses at a minimum, Mr. Tucker himself worked on the well with the drilling crew, while his wife superintended the cooking for them.[38]

[38] Ibid., p. 58-59.

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THE DISCOVERY WELL

Before the completion of the third well on the Bradford farm, it became apparent to Joiner that his lease would expire before the well could be drilled to a sufficient depth. After almost three years of effort, it would have been disconcerting to see the nine hundred seventy-five and one-half acre Bradford lease slip away from him. The landowner, Mrs. Daisy M. Bradford and her brothers, H. C. and K. C. Miller, anxious to see the well completed, twice granted thirty day extensions to the original lease.

While drilling was in progress on the third and last well, orders frequently were given to operate the well only on Sundays so that visitors might see the well actually in operation and be induced to lend their support by buying shares in the venture.

No little credit is due the public-spirited citizens of Overton, Texas, about ten miles northwest from the Joiner drilling operations, for their support and encouragement. It was here that Joiner established a temporary headquarters for his activities during the time he sought to obtain additional leases and royalties. An obliging grocer, the same who supplied the groceries for the drilling crews, allowed Joiner to use the back of the store as an office. Here, inside a screened off space where the grocer piled sacks of flower and corn meal to protect them from rodents, many of the early lease transactions were enacted.[39]

When the Joiner Well Number Two was junked and finally abandoned, his hope was at low ebb, but his friends and backers urged him to continue, promising to stay with him until the well was completed. Consequently, he moved the rig again to the third and final location. It was now in its third year on location on the Bradford farm. The drilling crew kept doggedly on. Most of them were East Texans, endowed with the rugged determination to see the job through. The

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head driller, E. C. Laster, kept the job going in the face of every obstacle. So firmly did he believe in the possibility of getting oil, Laster secured a number of leases for himself. Later he became owner of a number of wells of his own.[40]

Out of Joiner holdings of five thousand acres, about one-fourth of this amount was syndicated and offered for sale. The plan was to sell for twenty-five dollars a one acre interest in the syndicated holdings, with a pro rata share in the Joiner Number Three well, located on an eighty acre tract. For the purpose of fixing the potential value of the well, it was appraised at seventy-five thousand dollars. So, in the syndicate comprising five hundred acres, each twenty-five dollars invested entitled the owner to twenty-five seventy-five thousandths interest in the well itself, in addition to one five-hundredth undivided interest in the syndicate. There were three syndicates organized by Joiner, but all of them gave participation in the drilling well.[41]

The certificates in the various syndicates were sold to friends of Joiner and friends of the landowners whose leases he had taken. In the list of subscribers appear the names of policemen, postal clerks, railway employees, bankers, merchants, waitresses, farmers and even a reputed gambler or two. Many a widow's mite and the life savings of more than one believer in East Texas were responsible for Joiner's success. Indeed, it was the support of these friends that is almost entirely responsible for the success of the venture.[42]

As a precautionary measure, major oil companies employ "scouts" whose duty it is to report the progress of drilling in wildcat territory. In the event that indications become favorable for the discovery of oil, the companies begin buying "protection" acreage. Scouts had been visiting the scene of the Joiner drilling at intervals during the three years preceding the discovery

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[39] *Overton Press*, October 2, 1932, p. 3.
[40] Harry Harter, *East Texas Oil Parade*, p. 60.
[41] Ibid., p. 63.

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of oil. They entertained little, if any, expectation of having anything of importance to report. Only the Humble Oil and Refining Company and the Mid-Kansas Oil Company had any holdings in the vicinity of the Joiner well at the time of the discovery. The reason for this lack of protection is probably due to the fact the scouts, a few weeks before the completion of the well, had ceased to report it as a drilling well. Mr. Laster, the driller, has reported this oversight as being the result of his having shut down the well in order to obtain a new string of drill pipe. Negotiations for obtaining a new string of drill pipe occupied several days and the report was out that Joiner had abandoned his Bradford Number Three.[43]

When the pipe arrived and the drilling equipment had been given a final overhauling, drilling again went on. At a depth of some 3,700 feet shale was encountered, samples of which were sent to paleontologists for analysis. The reports from the paleontologists were not favorable and both Joiner and Laster had about reached the conclusion that further drilling would be useless. Laster thought that he had observed a slight oiliness in the drilling mud and decided to go into the hole and take an additional core. It was this decision that was to make visible the silver lining of the Joiner venture. The core bit brought up a section of oil sand, showing a considerable saturation of oil. This information, naturally, was of vast importance to all those interested in the well, and preparations were made for testing the importance of the discovery.[44]

Shutting down the well for a day, Laster removed the core to Henderson and telephoned the information to Joiner in Dallas. A major oil company scout, having heard that the well had been drilling again, came to the scene and looked around the deserted drilling rig for evidence of any kind that would indicate the formation in which drilling had just ceased. He chanced upon a

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[42] *Southwestern Oil Journal*, July 12, 1935, p. 6.
[43] *Oil and Gas Journal*, October 9, 1930, p. 50.
[44] Harry Harter, *East Texas Oil Parade*, p. 65-68.

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bucket under the derrick floor in which a few cuttings from the core bit had been caught by the driller. Finding there some oil bearing sand, he believed that the cuttings had been "salted" purposely for "bait" and that they had been obtained from a well drilling in the Woodbine sand in the Van pool.

After the discovery of the oil sand, in September, 1930, it was decided to make a test of the formation to determine, if possible, its potential producing qualities. A test pool was secured for the purpose and preparations got under way. First the hole had to be reamed down with a diamond bit, leaving a tapered collar in the hard shale above the sand on which to lower the test tool. The test tool was then lowered into the hole on the end of the drill pipe, with the intention of resting it on the tapered shoulder, effectively sealing off the mud in the hole above the test pool and leaving the pressure of the gas in the sand to force the mud and other fluid below the test tool up into the drill pipe as soon as the valve was opened. The valve was opened by dropping an iron weight into the inside of the drill pipe, but apparently the test tool had not properly sealed off the mud and the test was a failure. When the pipe was brought out of the hole and uncoupled it contained only a few joints of mud. In view of the fact that the presence of an oil sand was known from the samples that had been removed in the core bit, it was decided to put casing in the well and attempt to make an oil well of it.[45]

When it became known that the casing was set and cemented and the drilling of the plug of cement was about to commence, East Texans came from miles around to witness the operation. Hours before the preparations were completed, cars began arriving on the Bradford farm. The news of the impending experiment had traveled over telephones to remote corners of the county. Mail carriers on the rural routes found residents waiting at the mail boxes for

[45] *Oil and Gas Journal*, October 9, 1930, p. 50.

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conformation of the report. Upon receiving it, these people called their families together to prepare for the trip to the well.

A crowd of eight to ten thousand people flocked to the well and prepared to stay until something happened. This was the long looked for event in East Texas. Either success or defeat was to be the answer of their vigil. Somehow the general feeling was one of optimism, but no one could tell just why. Friends had telephoned Mr. Joiner in Dallas to hurry down and witness the test, but he was not quite convinced that there would be anything worthwhile in the well. Finally, after a third call he consented to attend the ceremony.[46]

The day passed without any sign of oil. After drilling out the concrete used in setting the string of casing, the boiler was run for hours. The bailing continued during the second day and eventually all the mud was removed from the hole. Still the oil failed to flow from the well. The indomitable spirit of the East Texans refused to give up hope. On the third day swabbing was resorted to. The swab was run to the bottom of the casing and it pulled up with it on each trip some of the mud colored by the black fluid everyone wanted so much to see. After countless trips had been made with the swab a change occurred.

At last there was an audible gurgling sound from the casing, coming nearer to the top all the time. A hush spread over the crowd. The fires in the boiler were extinguished to prevent a possible fire in case the well should begin to flow. At last a spurt of oil came from the casing. A tremendous shout rose from the throng who witnessed the long hoped for spectacle. The hilarious gathering gave vent to long stored up emotions. Dad Joiner, witnessing the first flow of oil from his well, turned pale and leaned against the derrick for support. Then the seventy year

[46] Harry Harter, *East Texas Oil Parade*, p. 70-72.

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old veteran wildcatter turned to the driller and remarked, “I always dreamed it, but I never believed it!”[47]

THE EFFECT OF THE DISCOVERY

Leases which might have been bought near the well for ten dollars an acre could be obtained only by paying five hundred to fifteen hundred dollars. Speculators and independent operators made deals for leases on the basis of the payment of one-fourth to one-half in cash and the balance out of oil, to be paid if oil were found. For this reason some of the leases brought as much as twenty-five hundred dollars an acre. The large oil companies failed to reach the conclusion that this discovery would lead to a prolific field. They argued that it could be only a small oil pocket. Their geological departments had already condemned it, so, for a while, choice leases were bought up by the speculators and smaller operators.

Oil field machinery from the adjacent Texas, Louisiana, Arkansas and Oklahoma fields began moving in. In the vicinity of the Bradford Number Three, derricks were going up and rigs began to hum.

The well lay about one mile north of the paved highway connecting Henderson and Tyler. At the point in the highway, six miles west from Henderson, where the road turned off toward the well, lots were staked off by industrious landowners and a building boom was on. Joinerville was the name given to the new “mushroom” town which was named after C. H. Joiner, the new discoverer.[48]

Henderson, the county seat of Rusk County, almost six miles northeast of the well, saw the largest boom in its history. Not only were the hotels and rooming houses filled, but private homes were opened to the enlarged population. Signs declared the opening of new subdivisions.

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[47] Ibid., p. 74.

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Lots were sold for ten times the value of the same space a month earlier. A new hotel was planned. The schools became so crowded that pupils attended classes only half a day. Banks profited from the effect of the oil activity as the frozen paper, cotton and farm mortgages were paid off by farmers who had sold their oil rights. Old established law firms began to feel the pressure of the boom. Titles had to be examined before the money for leases could be delivered. Abstract and title companies were overwhelmed with orders for new abstracts of titles. Long forgotten papers were dug out of their hiding places and rushed to the county clerk's office for recording.[49]

In the wake of the boom, came the inevitable influx of humanity. New legal talent, oil field supply agents, scouts, promoters, sharp-shooters, engineers, surveyors, secretaries, adventurers and gamblers poured into the new oil land.

At the newly completed court house in Henderson, the records department was struggling with the receipt of hundreds of instruments hourly. Stenographers and typists from Dallas, Shreveport, Houston and other cities quickly found places at the court house copying records, or at the abstractors' offices compiling abstracts. Fabulous wages were offered. Many a girl who had been satisfied in the city with a weekly wage of fifteen dollars found it possible to make as much, or more, in a day. Public notaries pinned badges on their hats and milled through the hotel lobbies, finding ready money on all sides. Fortunately for them the profession was not crowded.

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[48] *Oil and Gas Journal*, October 9, 1930, p. 50.
[49] Harry Harter, *East Texas Oil Parade*, p. 82.

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CHAPTER III

EXPANSION OF THE FIELD

The most remarkable feature of the development of the East Texas Field is the rapidity with which the field spread out. The discovery well was located in the Juan Ximinez survey of Rusk County in the south (Henderson) sector. Dad Joiner had actually started drilling on his Number One Bradford in August of 1927, but due to the inferior equipment was forced to abandon the first test at 1,098 feet in February of 1928. Number Two Bradford was started in April of 1928, but this hole was lost at 2,518 feet. In the preceding chapter the story of Bradford Number Three has been told. This well, which was brought in on September 5, 1930, was the discovery well of the great East Texas Oil Field. Thus it took Dad Joiner three years and two months to complete the discovery of the East Texas Field which was destined to become the pivot of the world's oil industry for many years. After operators learned the structure they were able to complete a well in six days.

The first completion to follow the discovery well was the Deep Rock Oil Company Number One Ashby, also in the Juan Ximinez Survey, about one mile due west of the discovery well. This well, showing greater pressure and volume than the Joiner discovery, was brought in December 4, 1930, for 3,000 barrels per day. It was all that was needed to send drilling activities to fever heat. By leaps and bounds the western limit of the field was extended two, three and even four miles within the first six months of the drilling campaign, a fact that astounded all observers. Nothing like it had ever been known in any field.

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All over Rusk County, and in Upshur and Gregg counties locations were made and wildcat wells started.[50]

Ten miles due north of the discovery well, E. W. Bateman's Lou Della Crim Number One, in the E. G. Sevier Survey in the central (Kilgore) sector, Rusk County, was brought in on December 28, 1930, for 10,000 barrels per day initially from 3,652 feet.

About one month later Moncrief-Farrell's, J. K. Lathrop Number One, in the William Robinson Survey in the north (Longview) sector, Gregg County, about fifteen miles due north of the E. W. Bateman's Lou Della Crim Number One, was completed for 12,000 barrels per day, initially from 3,587 feet.

Development spread throughout the basin from Rusk and Gregg counties into Smith County on the west and Upshur County on the north. First, the Guy Lewis Number One Cook well was drilled four and one-half miles west of the Joiner discovery and proved the west extension of the field into Smith County. Mudge Oil Company's Richardson Number One, four miles northwest of the Lathrop discovery, extended the field north into Upshur County.[51]

At this stage of development the oil operators were faced with an unprecedented and unique picture, an oil field with four completed oil wells. One was one mile west, one ten miles north and one twenty-five miles north from the discovery well. At first it was generally presumed that two or three fields were discovered along a north-south line of folding, but subsequent completions filled in the gaps, indicated the shore line type of Woodbine deposition and extended the width of the East Texas Field until today it is forty-two miles long and from four to eight miles wide, covering 127,000 acres or 198.2 square miles. But early in the life of the field there was not much buying of leases on the part of major concerns and that factor

[50] Brasil B. Zavoico, *Geology and Economic Significance of the East Texas Field,* p. 5.

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allowed hundreds of independent companies to purchase leases cheaply and without undue competition.[52]

By December 31, 1931, a total of 3,732 oil wells had been completed in the East Texas Field. In 1932 the giant field witnessed its most active development campaign and ended the year with 9,384 producers, a gain of 5,652 wells for the year or a daily average of 22.6 wells. The period of demoralized crude oil market during the first eight months of 1933 resulted in completion of only 934 wells, a daily average of 3.84 wells; but one dollar per barrel crude in the later part of the year brought the number of completions during the last four months to 1,342 or to 11.0 per day, ending the year with 11,891 oil wells. Maintenance of crude oil prices in the East Texas Field at one dollar per barrel in 1934 and 1935 kept the number of completions at a high level during these two years, 1934 registering 3,616 wells per day. At the end of 1935 and early in 1936 the rate of new completions dropped to around 7.0 wells per day, though the increased crude oil price of $1.15 per barrel made effective January 8, 1935, again stimulated new drilling.[53] By April 14, 1938, 25,000 wells had been completed.[54]

DRILLING PRACTICE AND COST

The East Texas Field has been developed by the most efficient methods and the use of the best equipment known to the industry. Hence, even though this is a historical study, it is necessary to give some consideration to business methods and drilling technique.

Though earlier in the life of the field many heavy rotary rigs were in use, all later drilling in the East Texas Field has been done with medium rotary rigs. In this field drilling has been facilitated by soft formations and amazing progress has been made in the speed of drilling and in

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[51] Ibid., p. 6.
[52] *Southwestern Oil Journal*, November 4, 1937, p. 6.
[53] Brasil B. Zavoico, *Geology and Economic Significance of the East Texas Field*, p. 7.

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coordination and saving of time in breaking-down, moving and rigging-up operations. The recent advances in design and the improvements in the quality of drilling equipment materials used are primary contributory factors in making possible continuous operations under high speeds. Contractors drilled the great majority of wells in East Texas, though companies with a large amount of acreage, such as Humble Oil and Refining Company, Gulf Production Company and others, maintained and still maintain rigs themselves in continuous operations.

Drilling for oil and gas may be classified into two main groups, known as "churn drilling" methods and rotary methods. There are several methods classified as "churn drilling" but the American cable tool "standard" rig and portable cable tool rig are the only ones used to any extent in this country at this time.

The cable tool method, whether in a standard rig or in a portable outfit, consists essentially of making a hole by raising a string of tools attached to the end of a long heavy beam, called a walking beam and then allowing them to fall free and in this way pounding and fracturing the rock. By the use of water and a bailer the dirt and powdered rock are removed periodically in the form of slush and mud. By the rotary method the hole is drilled by the bit boring into the formation, aided by the mud fluid which circulates under pressure and carries the cuttings out of the hole.

With the cable tool system it is customary to set successively smaller diameter strings of casing as the hole is drilled deeper and formations carrying gas or water are penetrated. This is done to prevent the gas or fluid from escaping into the drilled hole.

Fewer strings of casing are required with the rotary process of drilling than with the cable tool method as the mud fluid, circulating down through the hollow drill pipe and up in the

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[54] *Dallas Morning News,* April 15, 1938, p. 9.

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annular space between the outside of the drill pipe and the drilled hole, tends to enter the porous formations and seal the pores, preventing escape of gas, oil and water into the hole.[55]

Improvements in cable tool drilling in recent years have consisted primarily in building heavier equipment suitable for the deeper holes to be drilled. However, the rotary drilling method has been so improved that at this time cable tool operations in the East Texas Field are confined almost entirely to relatively shallow operations and for clean-out work. The ability to rig up on a cable tool well in less time than it takes to set up the larger, modern rotaries permits the use of either standard or portable cable tool outfits in drilling wells to about 4,000 feet. Below that depth however, the rotary is usually used in either proven or wildcat territory.

Crooked holes may occur in well drilling by any method, but it was not until the rotary method was used extensively that badly deflected holes were noted. The causes of crooked holes in rotary drilling may be summarized as the urge for speed in drilling; carrying too much weight on the bit, which causes the drill pipe to spring or to bear against one side of the hole; using drill pipe of too small a diameter; or carrying too great a pressure of mud fluid.

Drilling for oil demands adequate and proficient use of cement for derrick foundation and cellar construction, the cementing of surface pipe, water strings, oil strings, and other miscellaneous jobs, such as plugging wells before abandonment, plugging-back crooked holes, and shutting-off bottom water. Cement may be used in wells for the following reasons; to protect surface strings of casing from high gas pressure, and facilitate the controlling of wild wells and fires; to exclude water from producing oil or gas sands; to reinforce casing and strengthen it against abnormal earth pressures; to protect casing against corrosion caused by certain percolating waters and earth minerals; to seal-off and prevent migration of well fluids from one

[55] *Oil and Gas Journal*, August 23, 1934, p. 233.

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porous stratum to another; to provide a means of setting casing at any point in a well, without landing the string; to provide a certain amount of protection to casing in wells where shooting is necessary; to provide an effective means of excluding bottom or edge water; to reinforce old casing and to repair leaking casing; and to permit the salvaging of extra casing at wells drilled with cable tools.[56]

There are two cementing practices widely used in the East Texas Field. Full hole cementing process allows drilling a full sized hole into the oil or gas sand. The screen, of the same diameter as the oil string, is screwed to the casing string at its last joint with full hole cementer just above it. After the oil string is run, drilling fluid is circulated down the full hole cementer to wash the space outside of the screen thoroughly, and during that operation the screen is protected by special lining from becoming clogged. When actual cementing operations begin, the bottom plug forces the sleeve of the full hole cementer down, uncovering cement outlets and permitting cement to pass through the outlets up into the annular space behind the casing. After cement is set, the plugs, back pressure valve, and the screen lining are drilled out, in which operation it is possible to use a small diamond point bit on the bottom of the tubing which is rotated, thus saving the very considerable cost and time involved in hauling, making up and breaking down of a string of small drill stem. Some one hundred and twenty-five sacks of cement are used in full hole cementing a five inch oil string in East Texas and the cost of the work is around $435, or about $300 above the standard cementing practice.

Multiple stage cementing is not designed for East Texas conditions if new casing is run, its application in this field being limited to wells in which used and thereby somewhat weakened casing or line pipe is to be run. In such cases it becomes advisable to cement the whole string

[56] Wilbur F. Cloud, *Petroleum Production*, p. 173.

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from top to bottom. In the East Texas Field seven hundred and fifty sacks of cement are used in multiple stage cementing of the oil strings from top to bottom at a cost of about $300 in excess of standard practice. This does not include, however, the cost of additional cement, some forty-five dollars.[57]

To drill holes in formations with comparatively low pressures, a system of "pressure drilling" has been developed. It is the mechanical means of closing the annular space between casing and the drilling tools in order to enable drilling to be carried on with pressure applied to the hole at the surface. The drill pipe is lowered into the hole, as the bit penetrates the formation, by means of a hydraulic feed attached to the rotary turntable, with special packers and blow-out preventers engaging the drill stem at all times.

Whether the hole is drilled by rotary or cable tools, it is quite necessary that it be completed so that gas and oil have an easy escape into the bottom of the hole. With cable tools the penetration into the producing formation is made slowly and as the hole is deepened the formation pressure helps to "drill" the well in many instances.[58]

Where the gas pressure is not sufficient to force the oil out of the well it must be pumped. Beam pumping, while common since the first wells were opened, is still used at the majority of the wells in this field. The equipment has been greatly improved and the units are powered with gas or oil engines, driven from remote power plants by red lines and operated by electric motors. They are made with strokes varying from a few inches to ten feet and in some instances longer.

Corrosion of oil production equipment has given much trouble since the early days of the industry and in many fields the losses from this cause are appreciable. The manufacturers and engineers have done much to retard and in some instances practically to eliminate the corrosion

[57] P. W. McFarland, "The East Texas Oil Field," *American Association Petroleum Geologists, Vol. XV. p. 843.*

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of well and lease equipment. Special metals have been used with good results and in districts where corrosion of steel tanks has been rapid, wooden straight-sided tanks have been used successfully.

The problem of cleaning out shallow holes has always faced the producer and the use of a light clean out string of tools and bailer has been common practice. These units usually are mounted upon a truck bed. They are built so that the operators can back the truck up to the well and pull rods and tubing and even string up light tools and bailer.[59]

Representative medium size rigs now in use in the East Texas Field include: Standard combination derricks ninety-four feet high and twenty-four feet by twenty-four feet at the base; sixty-six inch or seventy-two inch traveling blocks; enclosed type rotary table with twenty inch roller bearing; and slush pumps of sixteen inch by seven and one-half inch by eighteen inch size. Natural gas derived from the field is generally used as fuel. The average time of drilling in and completing a producing well in East Texas is currently about nine to ten days, including moving-in and breaking-down time, though wells have been completed in a record overall time of six days.[60]

Casing is pipe through which the tubing is placed. Casing is used to start the hole straight and to exclude surfaces waters and prevent caving. It is used so that if there is a blowout before another string of pipe is set the hole will be protected. The depth of the well, the nature of the oil sand, and the formations penetrated determine the amount, size, and weight of casing to be used

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[58] *Oil Weekly*, July 15, 1935, p. 38.
[59] Ibid., February 26, 1934, p. 94-117.
[60] Ibid., p. 119.

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and the method of completion, which in turn affect the amount and character of the initial production of each well and influence its economic life and ultimate recovery.[61]

Casing programs vary considerably in the East Texas Field. One hundred feet to three hundred feet of eight and one-eighths inch, ten and one-half inch or twelve and one-half inch surface pipe is set and cemented with from thirty-five to seventy-five sacks of cement. The oil string is usually set a few feet above the base of the Austin chalk, which rests directly on the Woodbine sand in the field. The top of the Woodbine sand varies in the field from a depth of 3,540 feet. The casing used for the oil string, that is the casing through which the oil is produced is usually five inch to seven inch, though smaller diameters were used in the past quite extensively. This latter practice is not recommended because it is believed that the wells will be pumped for many years. Naturally flowing wells will be pumped for many years. Naturally flowing wells are produced through two inch or two and one-half inch tubing.

The total drilling development expense, inclusive of flowing equipment, for the 19,507 oil wells completed to January 1, 1936 was therefore some $293,000,000, while the total of 25,000 wells completed to April 15, 1938, was $365,000,000.[62]

PRODUCTION PRACTICE AND COST

Flowing wells in East Texas produce oil through pipe inserted in the casing. This pipe is called tubing and is two or two and one-half inches in diameter. Wells making salt water are choked down to cut water production to the least volume possible. Under proration regulations all wells must flow their allowed productions each day. Although the great majority of operators abide by these rulings, insuring even withdrawal of crude oil from the reservoir, a number of small operators flow one well on the lease to produce the allowable of the whole tract. This saves

[61] F. D. Davies and J. B. Graham, "The Care and Use of Pipe," *American Petroleum Institute*, 1932, p. 106-125.

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the operators the expense of installing pumping equipment and of pumping, while in the case of wells making only water, operators secure extra oil allowable. In the case of flowing wells in the areas of low and declining pressures it is advisable to use bottom hole valves which close when the wells are not producing. This prevents oil from accumulating in the flow string and thus creating a pressure head which can not be overcome when the well is opened for its allowable production. Production costs of flowing wells in the East Texas Field probably averages five and one-half cents per barrel. In the East Texas Field a great majority of wells will stop flowing naturally when reservoir pressures declines below eight hundred or nine hundred pounds.

After wells discontinue flowing naturally, gas or air-lift or pumping is resorted to. Opinions vary as to the relative merits of gas-lifting and pumping and also as to the best equipment for producing oil by these methods. In the middle of 1933 the very high rate of daily production from the field resulted in a precipitate drop of reservoir pressures. This caused operators to rush much pumping equipment into the field, and at that time a total of 4,500 wells were equipped for pumping.[63]

The cost of installation of small gas-lift plants in the East Texas Field is around $1,300 to $1,500 per well, while overall lifting costs do not exceed six to seven cents per barrel.[64]

An interesting pumping equipment development for the East Texas Field, beginning in 1936, was the introduction of Reda centrifugal electric pumps specially designed for the field in a small one-unit model with full automatic control. The automatic control will permit operation of wells with a minimum of manual supervision, inasmuch as the control mechanism performs all the functions of the pumper in starting and stopping the pump when the allowable has been

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[62] *Tyler Courier News*, April 15, 1938, p. 6.
[63] *Oil Weekly*, July 15, 1935, p. 13.

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produced. Actual supervision will be limited to running oil from farm tanks. The capacity of pumps recommended for the East Texas Field is three hundred barrels per day. This will permit the well to produce its allowable in one or two hours[65]

[64] L. L. Foley, "Gas Lift and Restricted Production," *American Association of Petroleum Geologists*, October, 1934, p. 233.
[65] *Oil Weekly*, July 15, 1935, p. 38.

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CHAPTER IV

PRORATION

THE PROBLEM OF CONSERVATION

One of the most significant developments in the oil industry in the last decade has been the stabilization of the industry through the control of production. In achieving this highly desired goal, the oil industry enlisted the aid of both the federal and state governments in the name of conservation. The success of the program as a stabilization measure speaks for itself in the stabilization of prices at a high level, and the maintenance of a close balance between production and demand. As a conservation measure, on the other hand, there is still a wide difference of opinion among authorities as to its efficacy.

While this study is confined to a single field, it has a broader significance. The East Texas Field was the proving ground on which experimental laws and experimental methods were tried and proved. As one law was cast aside a new one took its place; as one regulation was declared invalid, a new one was invented; and as one loophole was plugged against violators, a new one was soon discovered. The evolution of the program was a slow and trying one but the final result has been the development of a proration program legally airtight in every respect.

In Texas the problem of conservation of oil and gas lies within the jurisdiction of the Railroad Commission, a body composed of three commissioners whose office is elective. Control of the state's oil and gas fields is effected by means of a department known as the Oil and Gas Division. This arm of the Commission is represented in each of the main producing

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areas of the state by an umpire and supervisors whose duties are to see that all regulatory measures are enforced.[66]

The State proration regulations of the East Texas Field are based upon the Oil and Gas Conservation Act enacted in 1919 by the State Legislature under authority of a constitutional amendment voted August 31, 1917, which required the Legislature to pass laws for conservation and development of the natural resources of the state. The Oil and Gas Conservation Act of 1919 prohibited production of crude oil "in such manner and under such conditions as to constitute waste" and the Texas Railroad Commission was charged with doing "all things necessary for the conservation of oil" and with establishment of "such rules and regulations as will be necessary to conserve the oil and gas resources in the state."[67] The Railroad Commission, acting under the above mentioned statutes, and after open hearings promulgated various regulations which were altered and changed from time to time as new developments and various court rulings demanded. The state legislature also added periodically new statutes to correct defects indicated by court decisions. The hearing rooms of the Commission are similar to court rooms, with the commissioners presiding as judges. The rulings of the Commission become valid and binding upon signature by two of the three commissioners. Each commissioner is elected for a term of six years, and the chairmanship of the body is reposed in one member for a period of two years, whereupon it is passed to one of the other members.[68]

At the time of the Joiner discovery in East Texas, the Railroad Commission was composed of Pat Neff, Chairman, C. V. Terrell and Lon A. Smith. This group naturally was watching closely the rising tide of production from the new field. Notwithstanding their

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[66] General Laws, *Thirty-Sixth Legislature, Regular Session*, p. 2855; Railroad Commission of Texas, Oil and Gas Circular 17, *Oil and Gas Conservation Law*, Mary 1, 1934, p. 18.
[67] Ibid., June 18, 1919, p. 23.

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attention, the daily output continued to rise until, in April, 1931, East Texas alone was producing 160,000 barrels of oil.[69]

Prior to the dumping of this oil onto an already harassed market, the state had been receiving a gross production tax amounting to two percent of the value of the seven hundred thousand barrels coming from its other fields.[70] With an average of one dollar per barrel as the going price of oil throughout the state prior to the East Texas discovery, the state's revenue had amounted to about fourteen thousand dollars daily. Oil produced from lands owned by the state university was bringing in enormous revenues. In spite of the 160,000 barrels coming from East Texas in April, 1931, the gross production tax diminished to about three thousand six hundred dollars daily. This was due to the fact that the flooded market had lowered the average price throughout the state to twenty cents per barrel.[71]

FIRST PRORATION PLAN

In April, 1931, the Railroad Commission, after due hearing, adopted its first proration plan. It was decided that effective May 1, 1931, a limit of 160,000 barrels daily should be produced from East Texas wells. The order provided that 15,000 barrels daily increase would be added each fifteen days for a ninety day period.[72]

Already a similar plan had been applied in certain fields in the Panhandle of Texas and had been upheld by the lower courts.[73]

Soon after the proration orders had been declared the Commission was faced with forty injunction suits brought against it by producers who declared that they had contracts for much

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[68] Brasil B. Zavoico, *Geology and Economic Significance of the East Texas Oil Field*, p. 6.
[69] H. L. Williford, *History of the East Texas Oil Field*, Vol. 1, p. 8.
[70] Ibid., p. 10.
[71] L. G. Bignell, "East Texas Must Not Pass 160,000 Barrels of Oil," *Oil and Gas Journal*, August 20, 1931, p. 23.
[72] Ibid., p. 25.

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larger quantities of oil than the new proration order would permit them to produce and deliver. The federal courts granted temporary injunctions to these applicants, restraining the Commission from enforcing its proration orders in each case.[74]

To the many smaller independent producers the enforcement of proration, together with the distressing low prices that prevailed during the first six months of 1931, appeared to threaten early ruin. With approximately ten thousand dollars invested in each well they drilled, these operators were dependent on their oil production and sales for the money to pay the supply houses for materials furnished for drilling and equipping their leases, as well as to pay the contractors who drilled their wells for them. Their only salvation lay in higher priced oil or in recourse to injunction suits against the Railroad Commission. Many of these operators, viewing the small supervisory forces of the Railroad Commission, chose the comparatively easy plan of surreptitious violation.[75]

From the very first, the Commission was beset with numerous difficulties which rendered the task of enforcing the proration laws almost impossible. There is little wonder that the Commission failed to cope with the flagrant violation of its orders when it is remembered that new wells were being brought in at the rate of five hundred a month and that the enforcement body consisted of a mere half dozen umpires and a small number of field assistants.[76]

By June 1, 1931, there were one thousand completed wells in the field, producing and marketing 500,000 barrels of oil daily. This production was greatly in excess of the allowable production set by the Commission. The pressure of this avalanche of oil rapidly undermined the price structure of the entire industry from coast to coast and from the Great Lakes to the Gulf of

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[73] Dancigar *et al* va The Railroad Commission of Texas, 122, *Texas,* p. 243.
[74] L. E. Bredberg, "Texas Proration Seems Step Nearer," *Oil and Gas Journal,* May 10, 1934, p. 34.
[75] Ibid., p. 25.

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Mexico. By August the price of oil throughout the Mid-Continent Field had fallen from one dollar and seven cents for high gravity oil, similar to that produced in East Texas, to an average of twenty-two cents a barrel.[77]

Injunction suits against the Railroad Commission continued to pile daily; the dockets of the federal courts became congested to such an extent that judges instructed petitioners to pool their complaints and eliminate the necessity of separate hearings. In the interval between the date of petitioning and the date for trial, the appellants might naturally produce their wells wide open under the terms of the injunction. The law seemed to favor those who wished to cloak their unfair practices with a vestige of legality. This turn of events naturally proved discouraging to others who were striving to comply with the proration orders.

During the first eight months of 1931, numerous organizations were perfected among the right-thinking independent operators, joined by many of the land and royalty owners, who sought to combat the growing menace of over-production, violation and thievery. These operators and their friends endeavored to assist the Railroad Commission in its task of enforcing proration; but the assistance was volunteered not so much from an altruistic feeling for the Railroad Commission as from the desire to restore normal prices through rigid proration and thus save their own investments in East Texas from utter destruction.[78]

At first, nearly all land and royalty owners were opposed to any kind of proration but that was before they were educated to understand that a flooded market invariably means a cheapened market. They might readily have understood the circumstances had they been dealing in cotton, corn, wheat and the commodities of the farms. Established oil companies with millions

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[76] Harry Harter, *East Texas Oil Parade*, p. 103.
[77] H. L. Williford, *History of the East Texas Oil Field*, Vol. 1, p. 12.
[78] *Oil and Gas Journal*, June 8, 1933, p. 44.

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on hand, joined by many of the independents, carried on a vigorous program of missionary work with the landowners in order to convert them to the idea that proration and conservation were vital factors in securing greater returns from the oil in the common reservoir underlying their lands.[79]

It was evident that the oil and gas conservation laws would have to be strengthened. Governor Sterling was in sympathy with the conservation idea and on June 14, 1931 he called a special session of the Legislature for that purpose. The Legislature passed a comprehensive oil and gas conservation act on August 12, 1931.[80] Under the act the Railroad Commission was given liberal powers to regulate oil production provided it did so in order to prevent waste. The law plainly stated that the power was withheld from the Commission to limit the production of oil in order to affect market conditions. Meanwhile sentiment for proration was developing rapidly in East Texas. The people were urging drastic action.

MARTIAL LAW

Guy A. Blount of Nacogdoches, Texas, then President of the East Texas Chamber of Commerce, in a speech at the annual convention at Marlin, Texas, April 20, 1931, declared openly for proration. The convention adopted resolutions favoring regulation and conservation of oil. About this time sentiment began to change strongly in favor of proration.[81]

Wide divergence of opinion developed among oil men, and royalty owners, most of whom were unfamiliar with the problem of conservation. On August 14, 1931, a mass meeting of producers and royalty owners of the East Texas Field was held at Tyler, Texas. This mass meeting was attended by approximately 1,500 citizens. On the following day, the committee

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[79] "East Texas Proration Hearing," *Oil and Gas Journal*, January 22, 1934, p. 21.
[80] *General and Special Laws of the State of Texas*, Forty-Second Legislature, First Called Session, p. 46-66.
[81] Henderson *Daily News*, February 17, 1932, p. 16.

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appointed by this mass meeting called upon the Governor and orally presented the situation insisting that a state of insurrection existed in Gregg, Smith, Rusk and Upshur counties and that riot and destruction of property and probably bloodshed was imminent. The Governor on that day ordered Brigadier-General Jacob F. Wolters to mobilize the 56th Cavalry Brigade, together with such medical units and trains from the 36th Division as might be required. This order was promptly complied with and a report was made by the National Guard units concerned in mobilizing their respective armories. On August 15, the Governor issued a proclamation declaring Martial Law in the counties of Upshur, Gregg, Rusk and Smith and putting some into effect at 6:00 a.m., August 16. By daylight August 17, the troops were in the area and immediately the Governor's proclamation was published and broadcast, and the various essential orders of the Commanding General were issued and published, including General Order Number 4, completely shutting down all crude petroleum oil and natural gas wells. The order was promptly complied with.[82]

In the meantime, the Railroad Commission called a meeting to consider the matter of putting into effect the conservation law that had been passed by the Legislature and made effective August 12, 1931. On September 2, the Railroad Commission issued an order, effective September 5, the effect of which was to hold that the production of 400,000 barrels or more of oil would physically injure the great field. The Commission provided that the production of oil in the field should be restricted to two hundred and twenty-five barrels per well per day until further orders. Immediately the Commanding General of the Military District issued General Order Number 10, adopting the Railroad Commission's order and putting it into effect. The practical effect of this was that the military authorities became agents of the Railroad

[82] Ibid.

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Commission in enforcing its decrees. Civil authority had broken down and government was left to the military.

Subsequently the Railroad Commission reduced the allowable per well per day first to one hundred and eighty-five barrels, and then to one hundred and sixty-five barrels.[83]

Governor Sterling's martial law policy was defended by some persons and attacked by others in spirited and even bitter fashion.

So far as the Governor was concerned, the facts indicate that he did not enter upon the proration of the East Texas Field solely because of any economic condition, nor did the Railroad Commission issue its order because of that. The Governor took charge of the field and its proration in order to prevent not only the physical waste of natural gas and oil but the absolute destruction of the property of the people in East Texas who owned these lands, and to prevent rioting that appeared to be imminent in the event the rape of the East Texas Oil Field of August was repeated.[84]

Evidently the overwhelming majority of the people of East Texas were in sympathy with Sterling. Evidence of the actual danger of physical violence, rioting, and the taking of the law into their own hands by owners of oil leases and royalties was submitted to the Governor and was substantiated by the statements, letters, telegrams, petitions and resolutions of numerous responsible citizens and organizations in close touch with situation.

Some of them read as follows:

> "Upon motion of Director Low, seconded by Director Taylor, the directors voted to extend the commendation of the board to Governor Sterling for his action in establishing martial law in the East Texas oil fields of Smith, Rusk, Gregg and Upshur Counties,

[83] Ibid.
[84] East Texas Chamber of Commerce, *Martial Law in East Texas,* p. 6.

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supporting the former action of our Executive Committee on this date wired the Governor as follows: `In our opinion your action in establishing martial law to preserve order, prevent disturbances and conserve natural resources was necessary and the removal of the soldiers now would threaten the peace and dignity of the four counties so affected'."[85]

"The declaration of Martial Law by you, and the shutting in of the field was very welcome to our people, and we are very grateful to you as our Chief Executive for having so acted. That Martial Law is and has been acceptable to the good citizens of this East Texas is beyond question, and we feel that disaster was averted by your heroic act."[86]

"We the undersigned citizens of Overton within the military district of East Texas having read in the press reports a suggestion that Martial Law be abandoned respectfully repeat that in said district there is yet existing a strong tendency toward lawlessness among a large and apparently organized element. We believe this lawless element has been suppressed only by the presence of the troops. We believe that the abandonment of Martial Law and withdrawing of troops would result in disastrous consequence and crime in all its phases would probably strangle the district. We therefore respectfully petition that you continue martial law in the military district until such time as will be safe for life and property to withdraw troops."[87]

"That we hereby commend the Governor in declaring Martial Law in East Texas because we believe same was done to conserve the great resources of this State and to prevent

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[85] "Extracts from Minutes of Directors Meeting, East Texas Chamber of Commerce, Houston, November 23, 1931," found in East Texas Chamber of Commerce, *Martial Law in East Texas*, p. 23-25.
[86] Excerpts of letter from Mayor J. M. Crim of Kilgore, Texas, to Governor Sterling, December 9, 1931, *ibid*., p. 32.
[87] Telegram from Overton citizens to Governor Sterling, December 11, 1931, found in East Texas Chamber of Commerce, *Martial Law in East Texas*, p. 34.

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violence and that same has resulted in stabilizing the oil industry throughout the State and has saved a great number of marginal or stripper wells from abandonment and will no doubt save many small producers and refiners from bankruptcy, thereby preventing widespread unemployment and general unrest."[88]

"I would state that in my opinion the sentiment in East Texas is changing very rapidly from one of censure on the way you have handled the situation to one of approval. To take care of the real need of the people here, I am sure, and to protect all interested parties, the lower allowable should be enforced, and one hundred barrels per well per day at this time would not be far out of line. I believe any action you may take along this line will be sustained with firmness by the oil fraternity in East Texas."[89]

"Longview oil men and business leaders today dispatched fifty congratulatory Christmas telegrams to Governor Ross Sterling thanking him for his handling of East Texas oil field."[90]

"Under present conditions we have harmony and team work, and I believe, fairly complete proration, and I believe from observation here, that to change the existing condition would surely invite grave danger, and strife. I believe, in making your decision to let the present condition remain, you have rendered our section, its great industry and the people and order of the State, a great service."[91]

"Anyone who feel inclined to criticize Governor Sterling's declaration of Martial Law in the East Texas oil fields should reflect that this extraordinary action was evoked by an

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[88] Resolution passed at a meeting of the Independent Refiners of Texas held at Wichita Falls, August 25, 1931, *ibid*., p. 38.
[89] Letter from C. M. Joiner to Governor Sterling, December 3, 1931, found in East Texas Chamber of Commerce, *Martial Law in East Texas*, p. 40.
[90] United Press Dispatch carried in Houston Press, December 23, 1931, *ibid*., p. 43.

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> extraordinary occasion. Regardless of who is to blame, the fact remains that one of the finest oil pools in the world is being ruined by ruthless exploitation. The people of Texas have a vital vested interest in the vast reservoirs of petroleum which lie under the surface of Texas. Not this generation alone, but future generations are directly and vitally concerned with what goes on in East Texas. Thousands of people are dependent upon an industry that is being drowned in a sea of oil. The welfare of all Texans is affected."[92]

> "As Christmas approaches, with its years reminiscences, I am writing this to let you know how much I appreciate your action in dealing with, and solving the many difficult conditions growing out of the development in the `East Texas Oil Field'. Had you not intervened when you did, the land owners would have been deprived of their oil, without consideration and the other interested parties, too, would have suffered the loss of their all."[93]

It was to be expected that the drastic regulations suppressing production would be challenged by certain oil interests. On October 13, 1931, Constantin and others brought suit against the Railroad Commission, the Attorney General, and Brigadier-General Wolters to restrain the enforcement of the orders limiting the production of oil. A United States district judge issued a temporary restraining order but Governor Sterling refused to recognize its authority, continued to control the field by martial law, and from time to time reduced well allowables. The Supreme Court of the United States, on December 12, 1932, sustained the federal district court on the ground that a governor can declare martial law only in case of actual insurrection or menacing threats of insurrection and that such conditions did not prevail in the

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[91] Letter from W. R. Hughes, County Judge, Gregg County, to Governor Sterling, November 6, 1931, *ibid*., p. 48.
[92] *Abilene Reporter News*, August 8, 1931.
[93] "Letter from Gus F. Taylor, President of the Citizens National Bank, Tyler, Texas, to Governor Sterling, December 23, 1931," found in East Texas Chamber of Commerce, *Martial Law in East Texas*, p. 23.

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East Texas Oil Field in 1931.[94] Long before this decision by the Supreme Court Governor Sterling had, however, given up the program of enforcing proration by martial law.

THE COLLAPSE OF LAW ENFORCEMENT

The failure of Sterling's martial law plan left the state at the mercy of the oil thieves. The Railroad Commission continued to issue proration decrees and set allowables but its measures could not be enforced. In June, 1932, it was allowing East Texas 325,000 barrels of oil daily, this figure being taken to represent the limit of production that might be allowed without physical waste. Amounts variously estimated to run from 100,000 to 350,000 barrels daily in excess of this figure were finding their way into the market with devastating effect.[95]

While there were a half dozen modern efficiently constructed refineries in operation in East Texas, the number of topping and skimming plants had increased to nearly fifty. These plants continued to receive all the oil they required at prices far below the posted market price for oil. At the low prices they paid for crude, these refineries could only be receiving supplies from operators who would sell them amounts greatly in excess of the allowable set by the Railroad Commission. Methods of checking these plants were difficult, as most of the oil was run to them in a secretive, underhand manner, through hidden lines and from sources unknown to the Railroad Commission employees.[96]

Stolen oil was hauled from the wells at night. Tank trucks delivered it to topping plants; the converted oil, in the form of low grade gasoline, was, in turn, distributed by fleets of trucks which virtually commanded the principal highways leaving the oil field for cities and towns within a radius of several hundred miles. Practically none of this product had paid the state

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[94] Sterling vs. Constantin, 287, *United States*, p. 378.
[95] Harry Harter, *East Texas Oil Parade*, p. 116-117.
[96] *Oil Weekly*, February 26, 1933, p. 67.

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gasoline tax; the plants manufacturing it kept no visible records of their crude purchases. Any attempt to trace the source of the oil going to these plants ended in failure.[97]

Employees of the Railroad Commission were repeatedly turned away from the small refining plants in the field with shotguns and threats of violence. At one of the plants, employees of the Commission had demanded to be allowed to gauge the oil in a 55,000 barrel tank, but were sent off the premises. The investigators promised to return, armed with warrants form the county authorities that would make it incumbent on the owners to give them access to the tank. Upon returning on the following day, the investigators found themselves blocked again. The owners had cut down the steel stairway to the top of the tank and there was no way to scale the tank without considerable delay. Of course, in the time required for authorities to find a way to take the gauges, the owners had ample time to run out the thousands of barrels of illegally produced oil that had been in storage.[98]

Shady practices have doubtless been resorted to in almost every other field in this country, but none of the old tricks will compare with the ingenuity of the East Texas oil racketeer.

In one instance, investigators for the Railroad Commission found that one well was being made to serve in the place of three. Naturally this would mean a large saving in drilling expense to the operator who succeeded in adopting the plan. First, a well would be completed in the usual manner. Then the drilling machinery would be moved onto a new location and the drilling of the next well commenced. Instead of actually drilling, the machinery would be kept in motion, the usual noises would take place, steam was maintained in the boilers and other indications of

[97] N. A. Dupuy, "Hot Oil, the Test of Proration," *New Outlook*, June, 1934, p. 22-25.
[98] Harry Harter, *East Texas Oil Parade*, p. 117.

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drilling carried out. After setting the surface casing, a hundred feet or so of ten or twelve inch pipe, drilling stopped—the rest was merely a pretense.[99]

When sufficient time had elapsed actually to have completed the well, the controls, valves and other finishing details were added to the well and it was reported to the Commission as a complete well. In order to get the production into the faked hole, a line connected into the first well was laid underground into the second well and additional oil run through it as though it were the regular allowable production from the second well. The operator could thus save from fifteen to twenty thousand dollars.[100]

Governor Sterling kept up the fight with dogged determination. A called session of the legislature in November, 1932, passed at his request a law authorizing proration to limit oil production to meet the market demand. Meanwhile opponents of conservation kept hammering away, and generally succeeded in having the courts nullify those decrees of the Railroad Commission that did not please them. In January, 1933, Rowan and Nichols attacked the order of the Commission giving each and every well in a field the same allowable.[101] In March, 1933, a federal district judge restrained the Commission from opening wide all wells in the field for the purpose of learning potential production.[102]

AID OF THE FEDERAL GOVERNMENT

In 1933 oil and gas Conservationists in Texas were greatly encouraged by the coming of federal forces to their aid.

In July, 1933, before the adoption of the federal Petroleum Code, President Roosevelt issued an executive order prohibiting the interstate or foreign transportation of illegally produced

[99] H. L. Williford, *History of the East Texas Oil Field*, Vol. 1, p. 16.
[100] Ibid., p. 20.
[101] Ibid., p. 47.

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oil. The President issued the order as the result of a petition presented to him by counsel for the Independent Petroleum Association of America. The petition was supported by the Railroad Commission of Texas, all three of whose commissioners attended a meeting in Washington to state their position. It was felt that this action had to be taken to prevent the breakdown of proration in East Texas prior to the adoption of the Petroleum Code, then in course of preparation. This order may have served its purpose in preventing the shipment of illegally produced oil out of the state, but it is no way prevented the traffic in such oil within the state.[103]

In September, 1933, a large force of federal investigators opened their headquarters in Tyler and began to take steps to eliminate excess oil. The force entering upon this new work suffered from inexperience in meeting the problems confronting it, and for some months there was no apparent change in the situation. Federal employees scoured the field at night, searching for bypasses and other signs of illegitimate activity, but violations continued in practically the same way as before.[104]

The oil fraternity looked with great expectancy to the federal investigators of the Department of the Interior to put an end to the large interstate shipments of illegal oil. This end might have been accomplished but for the efforts of a small group of chronic violators in East Texas, who obtained an injunction in the Federal Court for the East Texas district from Judge Randolph Bryant. By the terms of the injunction, the federal investigators were prevented from having access to the complainants' refineries or their records. The case, known as the "Panama Case," was filed on the grounds that these operators never had signed the Petroleum Code and should not be subjected to any of the provisions of the code. The plaintiffs, in their pleading,

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[102] Ibid., p. 48.
[103] Ibid., p. 12.
[104] Ibid., p. 10.

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further stated that their business was entirely intrastate commerce and, therefore, would not come under the President's executive order covering interstate shipments of illegal oil.

The oil industry at large was shocked to learn that the Panama Case injunction had been granted. Attorneys for the Department of the Interior at once appealed the case to the United States Supreme Court. In a lengthy opinion that court held (J. Cardoza dissenting) that the President did not have constitutional authority to prohibit interstate or foreign shipment of illegally produced oil. The Supreme Court did not pass on the Panama Case until January 7, 1935. Its decision had been anticipated, however, and the findings of the lower court had given fresh impetus to the operations of producers and refiners who had been persistent in their defiance of both federal and state legislation.[105]

Later, as an additional aid to clearing up the situation, an amendment to the General Deficiency Act was passed by the United States Congress, imposing a tax on all oil produced in the country. The intent of this provision was not so much to secure revenue as to give the federal authorities the right to inspect the books of producers and refiners and thus ascertain whether the crude they handled was legally produced. This legislation has resulted in a noticeable reduction in the amount of illegally produced oil in East Texas, Conroe and Oklahoma City fields, strengthening considerably the crude oil and refined products markets.

THE STATE RENEWS THE FIGHT

Coincident to the granting of the injunction by the federal court in the Panama Case, it became apparent to the state officials in Texas that additional legislation was urgently needed to

[105] Ibid., p. 19.

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increase the powers of the Railroad Commission. Accordingly in February, 1934, a special session of the legislature was called in an effort to obtain the enactment of such laws.[106]

House Bill 99, known as the Refinery Control Bill, was designed to compel all the refineries operating in the state to report the source of oil which they handle. In the investigations carried on during this special session, ample proof of the culpability of a large percentage of the East Texas refineries in dealing in illegal oil was furnished. Of the sixty plants in operation in the field at that time, only four were rendering the required reports to the Railroad Commission. The total receiving capacity of the sixty plants was approximately 140,000 barrels of crude daily. Shipments of refined products, which could be checked through tank car movements, indicated that about sixty thousand barrels of crude was being refined. Scrutiny of the pipeline connections of all sixty plants revealed that the allowable production from the wells selling their output to the refineries was but 18,000 barrels daily.[107]

House Bill 99 passed both houses after facing one of the most powerful oil lobbies ever witnessed in Austin. The independent refiners made a desperate fight to defeat the bill, but the lobbying efforts of the major companies were even more determined. Representatives of almost every major company operating in Texas were present in Austin pending the outcome of this legislation, and they remained active until victory was apparent.

After passing both houses, only the signature of the governor was required to make the bill effective at once. Governor Miriam A. Ferguson, after some deliberation, announced that she would withhold signing the bill until a hearing might be held before her from both the proponents and the opponents of the bill. Two days were set aside for the hearing.[108]

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[106] Ibid., p. 22.
[107] Ibid., p. 23.
[108] Ibid., P. 24.

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Having viewed one side of the matter, the Governor awaited the delegation of opponents to the measure. With the intent of carrying their arguments by dramatic appeal, a special train brought the opposition forces into the capitol. The independent refiners, most of them owners of small topping and skimming plants, were anxious to carry their side of the matter by picturing to the Governor and her staff the distressing conditions that would prevail in East Texas if the plants in the field should be forced to close and throw the men out of work.[109]

After both sides had been heard, the Governor signed the bill and it became at once a law, March 9, 1934.[110] Victory at Austin did not necessarily mean that the Conservationists had won. There was a court battle ahead. In this, however, the Commission was also successful.

On May 26, 1935, the orders of the Railroad Commission then in effect, which gave the East Texas Oil Field an allowable of 827,000 barrels of oil per day, based upon the potential flowing capacity of a number of key wells distributed over the field, was attacked in the Federal Court at Fort Worth, Texas, by the Hunt Production Company, Rowan and Nichols Oil Company and a large number of major companies among which were the Sun Oil Company, Shell Petroleum Company, Humble Oil and Refining Company, Atlantic Oil Company and the Tidewater Oil Company. The court was composed of Circuit Judge Hutcheson, Judge Bryant, and Judge Wilson.[111]

In this suit, the plaintiffs contended that the orders of the Railroad Commission caused physical waste by allowing the wells to produce 827,000 barrels per day and that the method of allocation was illegal because it permitted the owner of a well on a small tract to drain the oil from the larger tract and the more densely drilled areas to take the oil from the lesser drilled

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[109] Ibid., p. 26.
[110] *General and Special Laws of the State of Texas*, Forty-Third Legislature, Second Called Session, p. 104.
[111] Williford, as cited, p. 50.

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areas. The court handed down the decision from the bench after the hearing and denied the plaintiffs their relief prayed for. Thus, the orders of the Railroad Commission were upheld and the potential method of allocation was sustained. No appeal was ever made from this bench decision.

With the aid of these state and federal laws the Texas Railroad Commission has made proration a reality. Its procedure may be described as follows; when a new well is brought in, a potential test is made and on the result of this test, an allowable for the well is calculated. There has never been a uniform statewide method for setting allowables for wells. Some of the methods employed in setting allowables are: A per well basis, marginal plus potential allowance, straight potential allowance, acreage plus potential, per lease allowance, and percent of the potential, and using key wells as indicators. Based on this data, an order by the Commission is made monthly, setting the allowable for each particular well in the State. New wells completed during the month are given their allowables as soon as possible after the receipt of completion data.[112]

In order that the Commission may know whether each individual lease is over or under producing the allowable, the Commission requires of all producers a monthly report which shows the storage on hand at the beginning of the month, the amount of oil produced, the disposition made of this oil, and the amount remaining in storage at the end of the month. This report is sworn to as to correctness by the operator who makes it. After the reports are carefully checked, the information is accumulated by leases, fields, Commission Districts, and for the

[112] *Forty-Fourth Annual Report of the Railroad Commission, Oil and Gas Division,* 1935, p. 5-6.

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State as a whole, to show comparisons between allowables and production and pipeline runs from the leases as reported by the operators and as reported by the pipeline companies.[113]

In addition to the monthly reports mentioned above, the Railroad Commission has an accounting system which gives positive control over the movement of oil. This is known as the Tender System.[114]

Approved tenders are required for the movement of any crude oil from leases, and successive tenders are required for each subsequent movement of the oil or its products. The original tenders are based upon the allowable schedules and are not approved for more than the authorized allowable. All subsequent tenders show the immediately preceding tender numbers as support. In this way the movements are controlled from the well to the ultimate destination. The Railroad Commission's oil control activities are so designed that there is an interrelation and interdependence of every phase of the work. All reports received by the Commission and all tenders are compared, and all conflicting figures are thoroughly investigated. All reports rendered by producers, transporters, and refiners, are supported by affidavit.[115]

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[113] Ibid., p. 6.
[114] Ibid., p. 7.
[115] *Forty-Fifth Annual Report of the Railroad Commission, Oil and Gas Division*, 1936, p. 8-11.

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RECENT DEVELOPMENTS

FLOOD AIDS PRORATION

Curtailed not only by state regulation of the flow from their wells, many operators in the East Texas Field also face occasional proration by a force which admits of no evasions or hot oil flowing—the Sabine River. It winds a thirty mile channel through the center of the field, and has twice this year, 1938, inundated many leases and restricted or entirely out off production.

In the earlier flood the rise and subsidence of the river was comparatively rapid. Some of the drowned wells were off flow only two or three days, but with the second flood of the year, coming in the wake of the first, the rise was rapid, and the high stage protracted. Estimates of lost time in the second flood only, which reached a stage two feet higher than its predecessor, shows a total of 1,156 wells which could be flowed regularly. The shutdown time ranged from two days at flood crest to as many weeks in other sections. Estimates based on figures assembled from representative producers place the enforced river shutdown as 10,404 well-days, or on the basis of minimum allowable, a loss of 208,000 barrels of oil due solely to flooded wells.[116]

To the figure of production loss due to inability to reach wells there must be added the additional time required to service the power units, reduction gears and other well equipment flooded or otherwise put out of use by the high waters. Estimated that it will be months before all the figures can be assembled and placed before the Railroad Commission in an attempt to secure back allowables, there will be a further shutdown of 3,251 well-days, or an additional loss of production, totaling 65,020.[117]

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[116] *World Petroleum*, 1938, p. 56.
[117] Ibid., p. 57.

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On the basis of loss of production, which falls alike on lease holder and property owner, there is a stupendous repair bill facing many producers before they can again resume normal flowing. Of the 493 pumping wells reported submerged, both prime mover and reduction gear must be dismantled, thoroughly cleaned of silt and water, reassembled and refilled with new lubricant. At a minimum figure of $25 per unit, this reaches $12,000, for labor and oil alone. To this must be added the cost of resetting many batteries of lease tanks, the resetting of seven derricks toppled or sagging so seriously as to require rebuilding, the regrading of more than fifteen miles of field and lease roads washed out by the stream as it spread from a normal width of a few yards to as much as one and a quarter miles, rebuilding of fire-walls and earthen storage pits and the removal of debris from around wells and lease equipment.

With many of the lower roads still blanketed by the muddy waters, complete material damage is still problematical, but figures now total around $1,000,000 needed to restore the river bottom section to its former well kept condition.

Tank farms such as the Atlantic and Magnolia, located adjacent to the river bed, were closed down during the peak of the flood. Water reached as high as the second ring of many fifty-five feet tanks and made access to control valves impossible. Field gathering stations located in the bottoms were drowned out. One company, Tidewater Associated, is planning to remove its low-lying stations to higher ground as a result of lost pumping. Another field pump station, normally three-quarters of a mile from the river channel, saw the crest halt only a few inches below hastily sandbagged fire walls, with an auxiliary station just below it stripped of motors and controls to escape the flood.

The flood threatened earthen storage pits impounding over 100,000 barrels of illegally produced crude, confiscated by the state and held for auction. One such reservoir, containing an

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estimated 20,000 barrels was overflowed despite frantic sandbagging of weak spots, but the oil failed to float away. The original forty gravity crude had so weathered that it was in effect but a vast mass of paraffin and would have floated only in much warmer water.

One well, long on the pump, was converted, during flood duration, into a flowing well. The derrick shifted, taking with it a wooden floor which cracked the "Christmas tree" and released a steady stream of oil.

As yet the Railroad Commission has made no move looking toward the making up of allowables lost by flood conditions. The question came up in connection with the earlier inundation, and was intensified by the second, deeper and more enduring flood. In the absence of any definite decision, the Commission's attitude seems to favor classing such a flood enforced proration of the affected wells as it does shutdowns occasioned by failure of the human or mechanical element at the individual well.

With many of the wells at the upstream end of the inundated area already pumpers, and producing in some instances up to eighty percent salt water, it is regarded as doubtful if all former production is ever reestablished after the enforced shutdown. Where these wells which go dead lie on leases having other wells more fortunately situated with regard to water encroachment, it is natural to conclude that somehow the discrepancy will be made up as opportunity permits. For the small producer the flood and its results may spell failure and bankruptcy.[118]

[118] Henderson *Daily News*, May 1, 1938, p. 8.

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PRODUCTION HOLIDAYS

Sunday production holidays were first adopted November 21, 1937, for four consecutive Sundays. This method of bolstering the crude market locally was resumed January 23, 1938, and continues in effect at this time, with Saturdays added since May 14, 1938.

Enforcement of production holidays in the East Texas Field has curtailed the normal expansion of salt water production and pumping equipment needs. A survey conducted April 1, 1938, by the Texas Railroad Commission's engineering staff reveals that 22.56 percent of the completed oil wells require artificial lifting equipment to make their oil allowable and also that accounted for water production is estimated at 91,831 barrels daily, or an average of 24.29 barrels of water daily from 3,780 listed water wells.[119]

A demand for Federal oil control drew sharp denunciation at the Railroad Commission's statewide proration hearing as operators generally appeared to accept Saturday closing as a necessary emergency action, and welcomed further efforts to maintain the crude price structure by keeping production in balance with demand.

Underlying numerous commendations of the commission's action in closing production on the final three Saturdays in May as a curtailment measure when a crisis appeared imminent, however, was a firm request for readjustment of allocations among the various fields in the State. Representatives from several sections urged such action.

The Commission gave no indication whether it believed a continuation of Saturday shutdowns in addition to Sunday would be needed during June but assured operators it would be alert to maintain a favorable condition in the industry through restriction of production to demand. The June order was issued.

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[119] Interview, Lon A. Smith, Member of the Texas Railroad Commission, June 7, 1938.

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Data prepared for the Commissioner showed that grave conditions are resulting from a diminishing demand and mounting stocks. Despite successive curtailments which have been made in production in an effort to cope with a decline of 88,700 barrels of crude oil daily in the estimated demand, stocks have continued to rise. Since the first of the year crude stocks have increased 3,679,000 barrels, gasoline stocks have increased 12,173,000 barrels and gas and fuel stocks have increased 11,188,000 barrels.

Despite efforts to reduce the production, the commission reported completion of 422 new wells in the first seventeen days of May and a consequent rise in the basic allowable. Bureau of Mines Division of the Railroad Commission calculated that the monthly production would be decreased by 12,049,240 barrels, due to the five Sunday and three Saturday closing, and that with underproduction subtracted the total outlet would be 36,719,939 barrels or 1,184,482 daily average.[120]

John Schroder of Longview, President of East Texas Independent Petroleum Association, at the Railroad Commission's statewide proration hearing, May 18, 1938, provoked a lively controversy with a demand for federal control after alleging that the Commission was unable to solve the problems of threatened chaos in the oil industry. He protested against the granting of special allowables, but withheld criticism of the two days a week closing order, "if East Texas is given fair treatment." "East Texas is willing to go the limit toward stabilization if it is on a statewide basis," asserted Schroder. He demanded the cancellation of special allowables, the placing of all wells on a marginal basis and the allocation of the remainder of the allowable necessary to meet the market demand on a potential basis in a formula considering also the cost

[120] Ibid.

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of wells. “We are facing a problem that will crush every independent operator in Texas,” he said, “but now realize the helplessness of the Texas commission to solve this problem.”[121]

C. V. Terrell said he believed that “regulatory efforts to control production of crude had kept Texas the largest white spot on the Nation’s business map despite a general index showing business had dropped almost to the depression level of 1933. “Saturday shutdowns were necessary as an emergency,” he related, and as chairman of the interstate compact he contacted the regulatory agencies of other states. “In the difficult task of balancing supply with demand, we are getting along fine,” he said.[122]

When the Railroad Commission took over its duties, September 5, 1931, the schedule of allowable was a per well basis. This schedule was in effect up to and including December 9, 1932, but was used two more times, from January 1, 1933, to January 9, 1933, inclusive, and from March 10, 1933, to March 20, 1933, inclusive. This is the last per well allowable in the field, to date, June 12, 1938.[123]

Another order went into effect and stayed in effect from March 21, 1933, to April 5, 1933, combining a per well allowable based on bottom-hole pressure and sand thickness. From April 6, 1933, to April 23, 1933, inclusive, the field was shutdown in order to take open flow potential tests of all wells.

The allowables based upon these tests were on percentage application. Beginning at fifteen percent of the hourly average open flow, these applications decreased, as the field

[121] Taken from report of Railroad Commission’s Statewide Proration Hearing, May 17, 1938.
[122] Ibid.
[123] Interview with V. E. Cottingham, Chief Engineer of Commission, June 7, 1938.

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potentials and number of wells increased to two and thirty-two hundredths percent, August 1, 1937.[124]

[124] Ibid.

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PER WELL ALLOWABLES OF THE EAST TEXAS FIELD AS SET BY THE RAILROAD COMMISSION ON THE BASIS OF HOURLY POTENTIAL FROM APRIL 24, 1933 TO AUGUST 1, 1937[125]

Dates Inclusive			Days	Percentage Of Hourly Potential
04-24-33	to	06-13-33	5	15.00
06-14-33	to	09-07-33	86	10.00
09-08-33	to	09-30-33	23	7.50
10-01-33	to	10-17-33	17	7.40
10-18-33	to	10-29-33	12	7.00
10-30-33	to	11-14-33	16	5.75
11-15-33	to	11-30-33	16	5.55
12-01-33	to	12-30-33	30	5.40
12-31-33	to	06-30-34	182	5.00
07-01-34	to	07-31-34	31	4.50
08-01-34	to	09-30-34	61	4.00
10-01-34	to	11-30-34	61	3.60
12-01-34	to	12-17-34	17	3.45
12-18-34	to	03-31-35	104	3.60

[125] Compiled by the Engineering Department, Railroad Commission of Texas, Kilgore, Texas.

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04-01-35	to	04-30-35	30	3.45
05-01-35	to	06-30-35	61	3.40
07-01-35	to	07-21-35	21	3.30
07-22-35	to	09-22-35	63	3.00
09-23-35	to	10-31-35	100	2.80
01-01-36	to	01-31-36	31	2.70
02-01-36	to	01-31-36	90	2.85
05-01-36	to	04-30-36	19	2.78
05-20-36	to	05-19-36	30	2.60
06-30-36	to	08-01-37	406	2.32

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CHAPTER V

GEOLOGY

HOW OIL FIELDS COME TO BE

Oil is formed from the remains of plants and animals, most probably minute plants and animals. Sand and clay are brought down by the rivers to the sea and settle out on the sea bottom, and in lagoons and marshes along the shore. The ocean water along the shore and the waters of lagoons and bays in many areas are rich in low forms of life. When the minute plants and animals die, their remains drop to the bottom and are buried in those sands and mud. The deposition of sand and clay goes on for millions and tens of millions of years; and with the passage of those millions of years, the older beds of sand, clay and limestone, and the plant and animal material in them come to be buried under great thickness of similar deposits. Under the effects of the temperature and pressures which prevail at those depths and possibly under the effect of other factors, part of that plant and animal material slowly is changed into small drops of petroleum.

These small drops of petroleum are widely scattered through the sands and clays, but during succeeding millions of years, they collect together and coalesce into large pools of oil in definite reservoirs underground.

For an oil pool to form in any particular place, there must be some sort of reservoir rock to hold the oil, some sort of trap to catch and confine the oil within particular space underground.

The porous space in which the oil is held in the reservoir rock may be either the small pore spaces between the individual grains of sand in an oil sand or in various types of cracks, fissures, and solution channels which are common in limestone and dolomite. An oil sand is

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composed of more or less rounded grains of sand. No matter how much they are pressed together, they never fit tightly; and there is always space left between grains. It is in this space between the individual grains of an oil sand which holds the oil. In a water sand, this pore space holds the water; and in a gas sand, the gas. The only difference between an "oil sand," a "gas sand," and a "water sand," is that in the first, the pore spaces hold oil, in the second, gas, and in the third, water. At different times in its history, a sand may have been a water sand, an oil sand, or a gas sand. Limestone and dolomite, which is a rock very much like limestone, rarely have pore space between their constituent granules but may have small and large cracks and fissures, and may also be permeated by small and large solution channels. These solution channels may be microscopic, or they may even be feet in diameter. Shale or any rock which will shatter also may have cracks and fissures. If such rocks are oil-bearing, the oil is held in these cracks, fissures, and solution channels.[126]

Many rocks are relatively impervious to the movement of water, oil and gas. Such rocks are the clayey rocks; clays, gumbos, shales, marls; and some other kinds of rocks, such as well cemented sandstone, chalk, anhydrite, and rock salt. These rocks are too tight for much movement of liquid or gas through them, and confine the movement of water, oil and gas, and the collection of oil and gas to the beds or masses of porous rock.

Underground, the open spaces in the porous reservoir rocks nearly everywhere are full of water. The oil collects above the water in the uppermost part of the porous reservoir rock; and any free gas collects above the oil. The water nearly everywhere is under pressure and forces the oil and gas as far up in the porous reservoir rock as they can go. In arched or domed beds, it forces them to the crest of the arch; in inclined beds, to the upper end of the porous bed; and in a

[126] Bulletin of the Humble Oil and Refining Company, entitled, *250,000,000 Years With Texas*, p. 21.

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porous mass of rock projecting up into impervious beds, to the highest point or points of the porous mass.

This pressure of the water upward against the oil is coming to be recognized by petroleum engineers as most important in the production of oil. It is the force which makes the wells flow in many fields. If properly handled, it will lead to the maximum recovery of oil in those fields; but if it is mishandled, its energy may be dissipated and the wells will cease to flow. Also, if it is mishandled, large quantities of oil may be blocked off and become unrecoverable. Under slow extraction of the oil from the oil reservoir, the water rises as a level surface and pushes the oil ahead of itself, but under rapid extraction the water pushes rapidly ahead along the streaks and zones of easiest movement and may bypass and block off oil in the less porous parts of reservoir. The recovery of bypassed and blocked-off oil is difficult and may be impossible.

The facts set forth above show how important it is that an oil field be properly developed. Both the producers and the general public are vitally concerned. A few reckless operators may by their blunders destroy their own property and that of others.

FOUR FAMOUS TEXAS OIL FIELDS

By way of comparison the geology of three other oil fields will be considered in connection with the East Texas Field.

The Powell Oil Field is an example of the breaking off of an inclined porous reservoir bed by faulting. As Powell lies on the west side of the East Texas structural basin the regional dip of the beds is easterly. A break in the earth's crust took place at Powell many millions of years ago. The block on the west was dropped down, or, as the geologists would say, was faulted down. Such breaks in the earth's crust are termed "faults." The Woodbine sand was broken off; and the upper edge of the segment of the Woodbine sand in the block on the east was jammed

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against the tight impenetrable Taylor shale of the down-dropped block on the west and was sealed against loss of oil, gas, or water. The oil sand at Powell is part of the Woodbine sand; and, in the same way as in the oil sand of the East Texas Oil Field, the oil is held in the very small spaces between the individual sand grains in the area above the water table. Below the water table the space between the sand grains is filled with salt water.[127]

The Spindletop Oil Field is on the special and interesting type of geologic structure which is known as a salt dome. The Spindletop salt dome has a column-like, more or less cylindrical core of rock salt, which is approximately a mile in diameter. The salt originally must have been part of a thick bed of salt which was deposited when an ancient sea dried up a hundred and fifty to two hundred million years ago. Salt is lighter than almost all of the surrounding material, and flows if it is buried at a moderate or great depth below the surface. Under the weight of the overlying beds, the salt has flowed plastically toward the places of least upward resistance. Being lighter, the salt has risen; the surrounding beds have sunk; and through the geologic ages, the salt core has continued to rise relatively to the sinking surrounding sediments, and salt from the mother salt bed has continued to flow inward into the base of the salt core. This process has been going on at Spindletop for more than a hundred million years.[128] The original production of the early days was obtained from the line cap. Most of the salt domes of the Gulf Coast carry a thimble-like or plate-like disc of rock which is called the cap.[129]

The Big Lake Oil Field of West Texas is another famous and interesting Texas Oil Field. Its 8,300—8,900 foot production belongs among the deepest in the world and comes from one of

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[127] E. H. Sellards, "Pre-Cretaceous Rocks in Balcones Fault Zone of Central Texas," *American Association of Petroleum Geologist*, July, 1931, p. 819.
[128] Bulletin of the Humble Oil and Refining Company, entitled, *250,000,000 Years With Texas*, p. 23.
[129] Hugh D. Miser and E. H. Sellards, "Pre-Cretaceous Rocks Found In Wells In Gulf Coastal Plain South Of Quachita Mountains," *American Association of Petroleum Geologists*, July, 1931, p. 801.

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the oldest formations which produce oil. The production at Big Lake is found at three different depths, 2,400 feet, 3,000 feet, and 8,300—8,900 feet. Many other porous horizons are present but do not carry oil or gas, probably because no organic matter was deposited in them under the right conditions or in the immediate overlying or underlying beds. The shallowest production comes from a thin sand bed which lies six hundred feet above the top of the thick Permian limestone. The oil in this is found in the small spaces between the individual grains of sand.

The next deeper production comes from a horizon approximately one hundred feet below the top of the thick Permian limestone. The oil and gas are not held in small pore spaces between individual grains but in fissures and solution channels, many of which are large enough readily to be seen with the naked eye. The gas which is found with the oil contains ten percent of hydrogen sulfide and therefore is extremely poisonous. The term "sour gas" is applied to this gas on account of its content of hydrogen sulfide. Two-thirds of the production at Big Lake has come from this horizon.

The deepest production comes from a depth of from 8,300 to 8,900 feet. The porous zones in which the oil is held seem to be distributed irregularly, and therefore different wells find there production at different depths below the top of the limestone.[130]

The Woodbine oil sand, from which oil is produced in the East Texas Oil Field, includes sand of Eagleford Age and of Austin Age as well as the Woodbine Age. The strata on the east side of the East Texas basin dip to the west. The Woodbine sand on the contrary wedges out and dips upward to the east, and stops at the east edge of the East Texas Oil Field. Back in Gretaceous time, one hundred and twenty-five million years ago more or less, plant and animal material suitable for the generation of petroleum must have been deposited in the Woodbine

[130] Bulletin of the Humble Oil and Refining Company, entitled, *250,000,000 Years With Texas*, p. 27-30.

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sand, or in the sedimentary beds immediately below it, for the Woodbine and carries accumulations of oil and gas at many places: Van, Powell, Richland, Currie, Wortham, Mexia, Long Lake, and Cayuga. According to the belief of one school of geologists, the eastern shore of the East Texas sea of Woodbine time lay along what is now the eastern edge of the Woodbine sand, and that sand was deposited in a lens extending from the shore westward. According to the belief of perhaps more geologists, the Woodbine sand originally extended farther east than it does now; but at the end of the Woodbine time, the area to the east was raised above the sea, and the Woodbine sand was planed off to this wedge which we see today. Slightly later, the area sank beneath the sea again; and the Austin chalk was deposited on top of the wedge of Woodbine sand, sealing it against upward leakage of oil, gas, and water. Millions of years later than Woodbine or Austin times, oil migrating up-dip in the Woodbine sand on the east side of the East Texas structural basin moved as far up in the Woodbine sand as it could get and, therefore, collected in the upper end of this inclined wedge of Woodbine sand. The oil in the East Texas Field is held between the individual grains of sand in the oil sand. Below the water table, the Woodbine sand, of course, is a water sand, and the small spaces between the individual grains are filled with salt water. The salt water being under pressure tends to press into the oil sand to push the oil on ahead and out through the oil wells to the surface and is the force which makes the oil wells flow. The East Texas Oil Field, therefore, is one of the fields in which the petroleum engineers are most concerned about the conservation of the water pressure and the proper handling of the water in the Woodbine sand.[131]

The producing sand ranges in thickness from a few feet in the eastern part of the field to as much as one hundred feet near the western edge. The Woodbine formation thickens within a

[131] H. L. Williford, *History of the East Texas Oil Field*, Vol. I, p. 3.

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short distance westward into the East Texas Salt Dome basin. The top of the producing sand in the extreme eastern part of the field is encountered at approximately 3,150 feet below the sea level and the salt water on the western edge of the field is encountered at approximately 3,317 feet below the sea level. The oil is of paraffin base and has an average gravity of 39 degrees.[132]

[132] Ibid.

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CHAPTER VI

THE FUTURE OF THE EAST TEXAS FIELD

The amount of oil ultimately produced by the East Texas Field will depend largely upon the manner of operation and the rate at which production is obtained. It is estimated that if the field is sensibly produced throughout its flowing life, and ultimate recovery of 4,000,000,000 barrels is possible. The time element must be considered, however, and from a short range standpoint 3,000,000,000 barrels ultimately may be used.[133]

At the end of more than three years of intensive development, during which activity was largely confined to drilling inside leases, the area of the field was placed at 117,000 acres. Between June 1, 1934, and January 1, 1936, the productive acreage added to the East Texas Field almost equaled that proved in the remainder of the United States. It should be stated however, that the oil reserve added by those extensions to the field actually fell far short of those represented by all other discoveries in the United States, since the edge acreage does not measure up to the standard of inside leases. These extensions have included large additions on the east and southeast sides, and the north and south ends of the field.[134]

The extreme edge leases along the east side and north end were neglected after the original outposts indicated severe thinning of the producing zone. In 1935 the eastern frontier was pushed out rapidly, when it was found that the extreme thinning of the producing zone was followed in many places by a thickening tendency that permitted completion of good pumping and few flowing wells. The feathering out was irregular because of the apparent influence of an old shore line, and only extensive edge drilling established the true eastern limits. The sand

[133] *Oil Weekly*, May 17, 1937, p. 51.
[134] *Independent Petroleum Association of America*, 1936, p. 72.

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thickness along the east side of the field is only a fraction of that under inside leases, but absence of water added to the importance of extensions in the thin but stable producing zone. The bottom hole pressure[135] along the east and southeast flanks shows a much lower average than in other parts of the field. Although this area may normally be depleted ahead of inside leases, freedom from water will give the average well a long pumping life.

The north end of the field was extended an even greater distance, and good pumping wells were completed more than three miles beyond the original recognized limits. Several of these extensions added acreage that should not be classed with inside tracts, but the new producing area ultimately may produce from twenty to fifty percent of the ultimate recovery of inside tracts of the same size.

The extensions were important, since they were entitled immediately to twenty barrel allowables. The 20,000 acres of new leases also added a tremendous total to the ultimate field recovery. Many edge wells never will return a profit to their owners, but they will produce a good percentage of the field total so long as they are given a twenty barrel allowable.

The area of the East Texas Field, shown by the Texas Railroad Commission is 141,000 acres, but a more conservative total is 127,000 acres. The drawing of a very narrow line around the outside of the field can increase the acreage by ten percent, while a sharp delineation that recognizes only actual proved acreage can bring the total to a smaller figure than should be used. A good total for average purposes is 130,000 acres, but when all extreme edge leases are recognized the 141,000 acre total might be called technically correct.[136]

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[135] Bottom hole pressure, or depth pressure, is the pressure at or near the bottom of the well. It is usually determined at the face of a porous reservoir of sandstone or limestone, penetrated by the well. If the bottom hole pressure is determined while the well is producing, it may be called the bottom hole flowing pressure or bottom hole producing pressure.

[136] *Oil Weekly*, May 17, 1937, p. 54-57.

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The importance of the field as an oil reserve stands out when the cubic content of the producing zone is considered. With an area of about 130,000 acres and an average sand thickness of almost forty feet, the field has about 5,200,000 acre feet from which to produce. A conservative estimate of the oil recovery per acre foot is six hundred barrels, but other estimates run much higher. By multiplying the recovery per acre foot by the number of acre feet in the field, it is a simple matter to arrive at an ultimate recoverable of 3,120,000,000 barrels.

Production comes from the Woodbine sand, a porous formation that gives up its oil readily. Other fields producing from the Woodbine sand have yielded from 800 to 1,200 barrels per acre foot, and it is reasonable to suppose that the East Texas Field may do as well. Only a slight increase in the estimate on the yield per acre foot will be required to give the field an ultimate yield of 4,000,000,000 barrels.[137]

The recovery of oil in a field is effected by so many conditions that any calculation of the ultimate recovery is open to attack from any one who wishes to present another picture. Experience in other Woodbine fields may be taken as a rough yardstick, but it appears wise to place the ultimate oil yield from the East Texas Field at a lower total than is now indicated by a calculation of the oil in place, and the multiplying of this total by a percentage that represents a recovery factor.

The first fifty percent of the oil recovered from the field will be produced at a much lower cost than the second fifty percent. For this reason when considering the field from a strict economic standpoint, an adjustment on the true ultimate yield should be made on a dollars and cents basis. By giving the field an ultimate yield of 4,000,000,000 barrels, the last billion may be produced in a manner that will not disturb the oil market in the United States.

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[137] Ibid., August 31, 1936, p. 12.

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Several interpretations have been placed on the very gradual bottom hole pressure decline in the East Texas Field. This average pressure, which was in 1937 just under 1,200 pounds, was almost as high as it was in 1934. The bottom hole pressure is an important variable factor in any field, but it is not always a true index of formation condition. The original bottom hole pressure averaged about 1,600 pounds and the decline to 1,300 pounds was rapid, due to a rate of production that grew heavily from a fraction of the number of wells now producing.

Formation pressures along the east and southeast flanks of the field have declined to seven hundred or eight hundred pounds, but this low average is due to a thin producing zone. The formation or bottom hole pressure along the middle of the field is above 1,200 pounds, while along the east side of the field it approaches 1,300 pounds. It does not follow that the most desirable acreage includes that showing the highest bottom hole pressure, since the direct influence of water is felt along the west side. A clean well with a bottom hole pressure of one thousand pounds may not flow at the same pressure when water becomes a serious consideration. Many edge wells have stopped flowing when water became a factor, although the decline in bottom hole pressure was negligible. A clean well will stop flowing when the formation pressure falls below the critical level, and it may be said that bottom hole pressure is a fairly accurate yardstick of performance until water becomes a factor.[138]

[138] American Institute Mining Metallurgy Engineering, Vol. 117, 1937, p. 164-177.

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SAND THICKNESS

Sand thickness is a much more important factor than has been generally recognized. The thickness of the producing zones ranges from a very few feet to more than one hundred feet. Thinning out along the east side and water encroachment on the west side account for the very thin producing zone on either edge of the field. Wells are producing their allowables from less that twenty feet of sand all around the field, but these outside producers normally will be the first to give trouble. The producing sand gradually thickens toward the long center strip, and a full eighty foot section is not uncommon along the fairway. In the north central part of the field, the maximum thickness is about one hundred and twenty feet, but the area overlying such a thickness is small. The average sand thickness is about forty feet.[139]

In the final stages of development, leases producing from the greatest sand thickness will return the greatest profit, and will normally be the last to stop producing oil. Under the present curtailment plan, edge wells are drawing almost as much oil from each acre as the inside wells. In a way, this penalizes the stronger inside wells, but in the final stages of development they will produce profitably long after the extreme edge wells have been abandoned. At the present rate of production, each operator is obtaining somewhere near the correct percentage of the oil in place under his lease. A small daily production from each well tends to draw oil from inside leases for a time, but it would also draw water from the west edge of the field and sharply lower the pressure along the east side. The present rate of production seems fair and equitable to all concerned.

In April, 1938, the allowable of the East Texas Field was 500,000 barrels daily, for the first time since its all-time high output under proration in 1933. On April 14, 1938, the field had

[139] *Oil Weekly*, August 31, 1936, p. 43-48.

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25,000 wells on regular production with total potential of 15,031,597 barrels. There were one hundred and fourteen wells listed as dead and four hundred and forty-eight wells lacked 3,938 barrels producing their daily marginal allowable of twenty barrels. The field since September 8, 1930, has produced 1,225,008,303 barrels of legal oil. The average density is one well to every five and a half acres.[140]

The importance of the field as a future market factor can be understood best when it is considered that almost all the wells will be able to make more oil on artificial lift than they are now making naturally and otherwise. It will be a very poor well that can not make twenty-five barrels daily on the pump. Such an average for the field will give a greater daily production than is now allowed. There is little reason to believe that the field will not be able to make 432,000 barrels daily during any one of several future years. This statement is based on the ease with which edge wells on the pump are now making twenty barrels per day.[141]

The field produces with a very low gas/oil ratio, apparently all gas being in solution in the oil. Gas production is less than four hundred cubic feet per barrel, but even this low ratio yields a large quantity of gas at the surface. Recent completion of several new natural gasoline plants has almost eliminated the waste of rich gas. The gasoline plants are taking the wet gas and returning a similar amount of dry gas to the leases for use as fuel.[142]

The average field will flow from thirty to fifty percent of its recoverable oil, and it is not unusual for fields producing from very porous sands to flow more than fifty percent of the ultimate yield is fifty percent of indicated recoverable oil, the field will flow almost as much oil in the future as it has flowed in the past. Such a production by natural flow seem high, however.

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[140] Henderson *Daily News,* April 14, 1938, p. 8.
[141] *Oil and Gas Journal*, November 27, 1937, p. 20.
[142] Ibid., p. 21-23.

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It is impossible to predict a flowing life for the average inside well, but it must be projected for into the future.

A careful check of wells nearing the border line between the pumping and flowing stages shows that a bottom hole pressure of from nine hundred to one thousand pounds is required to flow wells satisfactorily, where the usual short production period each twenty-four hours is practiced. Clean wells will flow satisfactorily at lower pressures after the flow is started. There is no reason to believe that the several thousand inside wells having an average bottom hole pressure of 1,200 pounds will stop flowing in the immediate future. A large number of weak wells that are now flowing their allowables will go on the pump in the next year.

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