

Early West Texas Drilling and Evaluation Technology

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West Texas

Petroleum Graveyard
of the World

Early Oil and Gas Shows

- 1889 80' Nasworthy well 4 mi S of San Angelo
- 1900 1200' Turney well 13 mi NE of Ft. Stockton had 13 shows
- 1901 282' well 6 mi SE of Toyah had 4 shows; two 60' wells 6 miles from Paint Rock found oil; one or more wells near El Paso had an oil show
- 1903 170' Leatherman well 15 mi NW of Toyah found low gravity oil (sold for windmill grease)
- 1904 Three more show wells near Toyah and a 21' bore found gas NE of Rustler Spring

Later Oil and Gas Shows

- 1910 400' DuPont Powder Company well near the Turney test had a show
- 1911 2000' show in two Producers Company wells near Toyah
- 1915 Calumet and Arizona Copper made a five barrel well at 550' and had shows in another well at 576' near Ft. Stockton. Two tanks of oil were sold from these in 1922
- 1921 96' Grant #10 drilled 40' from the Turney well came in at 1000 BOPD but soon declined to nothing

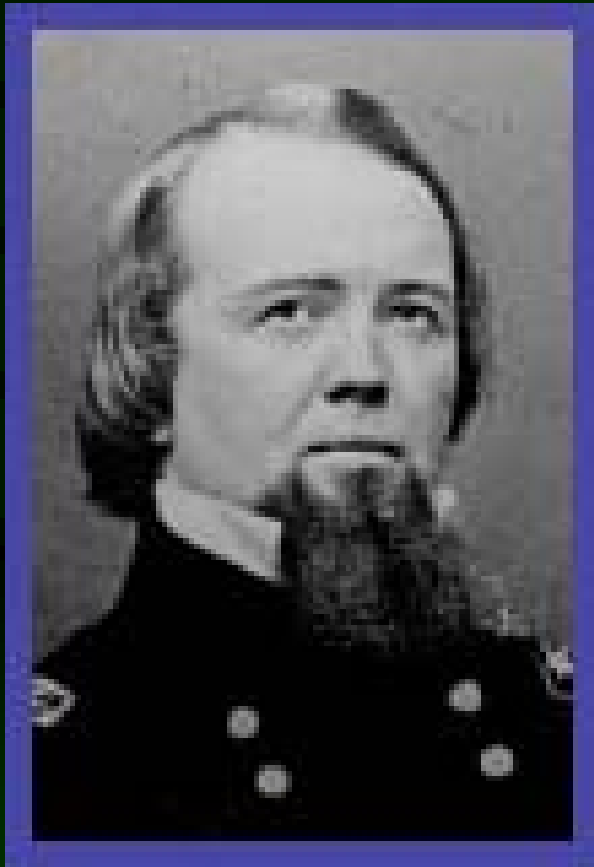
Texon Oil and Land Company

- Frank T. Pickrell and Haymon Krupp
- Leased 431,360 acres of University Lands
- Shipped to Best a water well machine which was damaged while being unloaded
- Sat up beside railroad tracks and spudded
- Christened the well Santa Rita 9/3/21
- Blew in from 3028' on 5/28/23
- In 1925 the #18 well came in for 9000 BOPD

Three Notable Wells

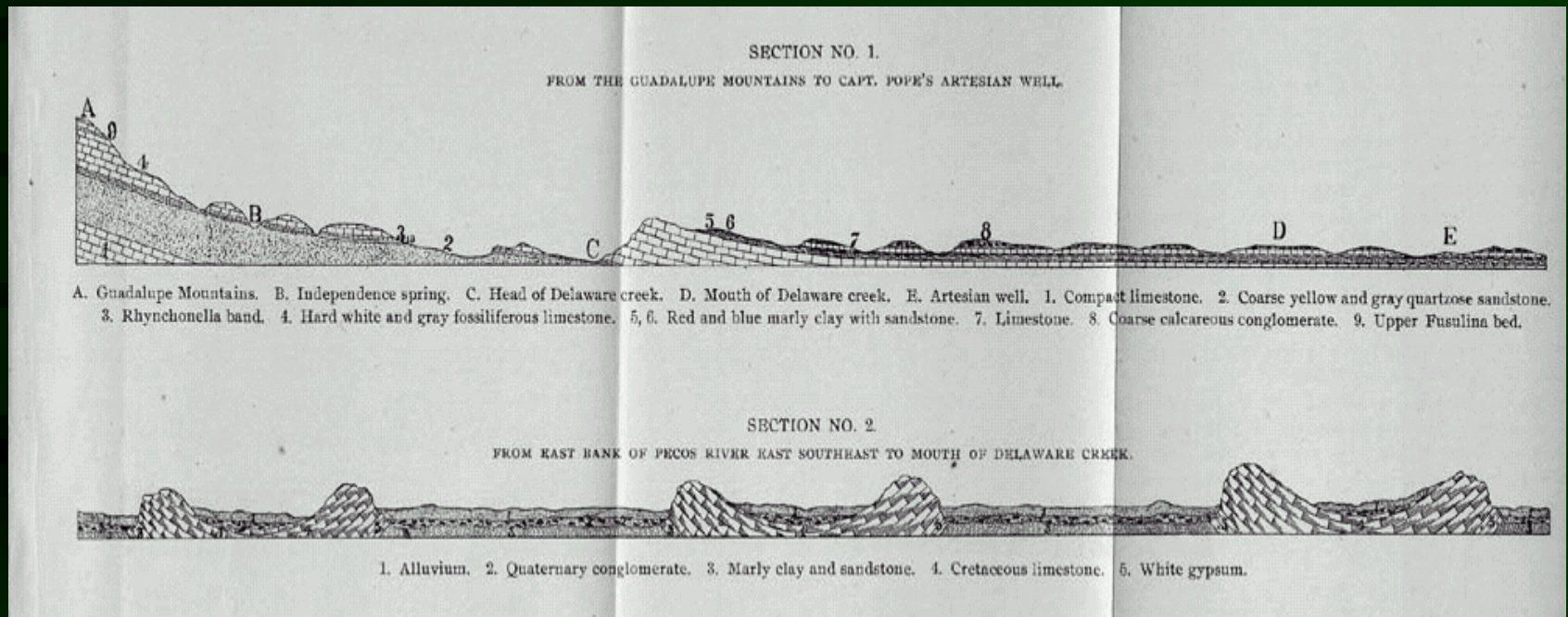
- Transcontinental Oil blew in at 997' for 135 BOPH on 10/28/26; deepening to 1150' gave a flow of 70,824 BOPD on 8/18/28
- Texon-University #1-B at 8525' became the world's deepest test and deepest producer on 11/30/28
- Gulf-McElroy #103 was spudded 3/21/33 and reached a T.D. of 12,786' on 5/5/35 making it the world's deepest test

John Pope and his Drilling Machine



- Captain John Pope
- Topographical Engineer
- West Point Class 1842
- Mexican War Veteran
- Surveyed a route for the transcontinental railroad
- AFE of \$28,532 for four water wells to be drilled to 600'

Map of Dr. G.G. Shumard



Bulletin #1 Geological Survey of Texas

Red Bluff Reservoir



Captain Pope's Artesian Tests

- #1 T.D. of 640' (1855)
- #2 T.D. of 293' (1855)
- #3 T.D. of 861' (1856)
- Deepened #3 to a T.D. of 1050' (1858)
- The #3 reentry was finished one year and five days before Drake's 69' test

Ruffner Drilling Method

- Spring beam percussion
- 55 spm reciprocation
- Tools connected to surface by oak rods
- Steam engine and boiler
- Bit, stem, jars, and sand pump
- Casing carried by under-reaming
- Fishing procedures well-developed

Standard Percussion Rigs

- Evolved by 1880's
- Major components front to back
 - Boiler
 - Steam Engine
 - Band Wheel
 - Sand Wheel
 - Walking-beam
 - Sampson post
 - Derrick
 - Bull Wheel
- Supplemented in the 1940's

Percussion Methods

- Steam Power
- Reciprocation by walking-beam
- Feed by temper-screw
- Power transfer by friction belt and rope
- Tool withdrawal by bull wheel
- Casing run by calf wheel
- Bailing and sand-pumping by sand line wheel
- Drilling line originally manila rope

Early Rotary Rigs

- Steam-driven with steam pumps
- Had to be torn down and rebuilt
 - First unitized rig deployed in 1934
- Grip ring made a compression fit to drill pipe
- Live catheads
- Chain tongs and rope-and-pole tongs
- Jaw clutches
- Brake bands instead of brake blocks

Rotary Procedure

- Until 1934 all drill pipe in the Permian Basin was run in compression
- In 1934 a California contractor moved to the region and began drilling with 8 or 10 drill collars, area contractors followed his example immediately
- Before this date, suspect all formation tops and bottom-hole locations drilled in the Permian Basin by rotary rigs

Well Control Equipment

- 10,000 patents issued from 1882 to 1937
- Decker preventer of 1900
 - 2 screw operated compression rams, 1 relief outlet
- Savoie preventer of 1922
 - Hinged lead-seal tool forced into the bell nipple
- Hosmer preventer replaced the Savoie tool
 - Similar to a modern stripping bowl
- Rotating head used by 1929
- Remote control used by 1929
- Steam-operated turbine closing by 1934

Drill-stem Testing

- First commercial test tools invented by E.C. and M.O. Johnston in 1926
- Consisted of a retaining valve only and used a cone-shaped packer made of friction belting
- A pilot hole was drilled to provide a seat
- Trip valve came in 1928; equalizing valve in 1931; pressure recorders in 1933
- Better rubber lead to straight-wall packers
- Testing only became accepted as safe in the 1940's

Percussion Samples

- Temper screws were from 5' to 6', but the stretch of the drilling line allowed 5' to 8' to be made before running the bailer or sand pump
- Cuttings were free from contamination, and in dry holes oil or gas could enter freely
- With “chip-coring” the driller would cut 1' and bail; the largest cuttings were then examined
- The record of cuttings and rig activity was called a “log” as early as 1913

Rotary Samples

- Sample quality was poor
- Sample lag was not understood until 1940
 - Hayward discounts lower rock from arriving at the surface before upper rock by an experiment which dropped oats, aquarium gravel, and gasoline at the same time
 - Hayward still allowed the existence of “slow” and “fast” holes
- Coring was necessary in order to obtain reliable information about the pay

Drilling Mud

- Early mud properties were extremely poor
- 1889 B. Andrew had drilled with mud
- 1921 Stroud weighted with iron oxide
- 1926 Stroud patent covering barite
- 1936 Filter press and sand content tests
- 1941 Starch used as an additive
- 1944 Lime used as an additive
- A gallon bucket was weighed with a spring scale, thence “pounds per gallon”

Coring Practices

- Serrated bottom-hole joint was “burned in” by applying extra weight to separate and retain the core
- Angled slots in another method used chilled shot to abrade the rock; dropping shot down the drill pipe wedged the core
- By 1930 more than 20 devices were in use, including those of the modern type
- Side-wall samplers were used by 1936
- A percussion coring system was developed after the double barrel rotary core device

Surface Analysis Equipment

- Fluorescence was recognized as an oil indicator between 1933 and 1936
- Geograph was invented in 1937 and manufactured commercially in 1943
- Geograph replaced the 5-foot stick
 - 1' time was not reliable since there was no way to apply continuous WOB
- Hot-wire gas detection came into use during 1937-1932

Electrical Logging

- 1927-1931 point by point resistivity survey
- 1932 SP and continuous logging of SP and one resistivity curve
- 1935 Only thirty electrical surveys in PB
- 1941 Archie expounds water saturation
- 1930's caliper logging available
- 1935 Continuous temperature survey used to set casing shoe below oil-gas contact
- 1937 Kermit Field had first two continuous gamma-ray surveys (Walton B8 & Colby C22)

Electrical Logging II

- 1941 Qualitative neutron-neutron logging
- 1945 Limestone Device (use limited to PB)
 - Measured a short lateral R_i to R_m ratio as an indication of porosity
- 1946 Commercial induction logging
- 1948 Microlog
- 1950 Focused Electrical Survey, Saltwater Electrical Surveys and Micrologs
- 1954 Commercial sonic velocity log



We the People

We are an enormously diverse people, of every race, color, creed and kind. We have gathered folks here from all the four corners of the globe. We cannot claim a common ethnic stock, a common racial heritage; even, these days, it is unclear that common language will bind us. But one thing is clear - that we stand on common ground of our moral aspiration, that we stand on common ground of our claim to human rights and dignity, which we have offered to all those people, from every corner of the globe. Not because it is our choice, but because it was understood by our Founders to be God's will.

Alan Keyes for President

President **KEYES**
ALAN 2000 

Pro-God
Pro-Gun
Pro-Life
Pro-Liberty



Delenda
Est
Clintonus