

Water-Supply and Irrigation Paper No. 190

Series O, Underground Waters, 67

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
CHARLES D. WALCOTT, DIRECTOR

UNDERGROUND WATERS OF COASTAL PLAIN OF TEXAS

BY
THOMAS U. TAYLOR



WASHINGTON
GOVERNMENT PRINTING OFFICE
1907

PAID BY THE
GOVERNMENT

Water-Supply and Irrigation Paper No. 190

Series 0, Underground Waters, 67

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

CHARLES D. WALCOTT, DIRECTOR

UNDERGROUND WATERS
OF
COASTAL PLAIN OF TEXAS

BY

THOMAS U. TAYLOR



WASHINGTON
GOVERNMENT PRINTING OFFICE

1907

SEP 30 1907

CONTENTS.

	Page.
Introduction	1
Area covered	1
Sources of data	1
Geography of the region	1
General statement	1
Topography	2
Drainage	2
Geology	2
Underground waters, by counties	2
Cameron County	3
Hidalgo County	7
Starr County	8
Nueces County	9
San Patricio County	13
Refugio County	13
Aransas County	14
Calhoun County	14
Victoria County	15
Jackson County	16
Matagorda County	19
Wharton County	19
Brazoria County	21
Fort Bend County	24
Harris County	24
Galveston County	27
Chambers County	30
Jefferson County	31
Orange County	32
Zapata County	33
Duval County	33
Live Oak County	33
Bee County	34
Goliad County	34
Karnes County	34
Dewitt County	34
Gonzales County	35
Lavaca County	38
Fayette County	39
Colorado County	39
Austin County	41
Waller County	41
Washington County	41
Grimes County	42

Underground waters, by counties—Continued.

	Page.
Liberty County	43
Montgomery County	44
Walker County	46
San Jacinto County	46
Polk County	46
Hardin County	47
Tyler County	48
Jasper County	48
Newton County	50
Webb County	50
Maverick County	51
Dimmit County	51
Zavalla County	52
Lasalle County	53
McMullen County	53
Frio County	54
Atascosa County	55
Bexar County	55
Wilson County	57
Guadalupe County	57
Caldwell County	57
Bastrop County	58
Lee County	58
Robertson County	58
Milam County	59
Burleson County	60
Brazos County	61
Madison County	62
Leon County	62
Freestone County	63
Houston County	63
Anderson County	63
Limestone County	63
Cherokee, Trinity, Angelina, San Augustine, and Sabine counties	63
Nacogdoches County	64
Shelby, Panola, and Rusk counties	65
Van Zandt and Rains counties	65
Smith County	66
Wood and Gregg counties	66
Upshur County	67
Harrison County	67
Marion County	67

ILLUSTRATIONS.

	Page.
PLATE I. <i>A</i> , A typical artesian well in the Texas Coastal Plain; <i>B</i> , Artesian well 4 miles south of Pearsall, Tex	1
II. Map showing location of artesian wells in the Texas Coastal Plain	2
III. Artesian wells in Rio Grande embayment	6



4. A TYPICAL ARTESIAN WELL IN THE TEXAS COASTAL PLAIN.



B. ARTESIAN WELL 4 MILES SOUTH OF PEARSALL, TEX.

UNDERGROUND WATERS OF THE COASTAL PLAIN OF TEXAS.

By T. U. TAYLOR.

INTRODUCTION.

Area covered.—The region to which this report relates includes the greater part of the Coastal Plain of Texas. It comprises an area about 150 miles wide, bordering the coast and extending across the entire State. According to R. T. Hill's classification it includes the "eastern" and "southern" provinces, and it is bordered on the west, from Del Rio to Colorado River, by the "Edwards Plateau," and, from the Colorado River to the Arkansas State line, by the "Black Prairie." It includes the district lying between the coast and a line connecting Texarkana with Del Rio, through Cooper, Greenville, Corsicana, Cameron, Elgin, and San Antonio, an area of about 75,000 square miles.

Sources of data.—The information on which this report is based has been obtained partly by personal visits to the various localities and partly by correspondence. Information has been furnished by the following persons: B. M. Haberer, C. F. H. von Blucher, Randolph Robertson, F. W. Simonds, H. W. Harper, Ira H. Evans, Rudolph Kleberg, T. J. Lyne, G. Warnicke, R. D. Parker, O. M. Ball, Garland Miller, A. W. Seeligson, J. B. Armstrong, J. L. Ladd, Travis L. Smith, E. D. Dorchester, Geo. C. Herman, Geo. J. McManus, J. E. Broussard, and J. W. Sanders. The writer is also indebted to Mr. E. T. Dumble, former State geologist of Texas, for much valuable information.

GEOGRAPHY OF THE REGION.

General statement.—The Coastal Plain of Texas is a continuation of the Atlantic Coastal Plain to the east, although in many features it differs from that area. In general it consists of a gently sloping plain, extending from a high or mountainous background to the Gulf. In the eastern part of Texas the Coastal Plain has the general character seen in other Southern States, but in its southwestern extension it becomes more or less modified, widening to the southwest in the

vicinity of the Rio Grande where there is a great embayment similar to that of Mississippi River. South of Colorado River there is a well-defined interior border to the Coastal Plain, but to the north of that stream the transition between the level and hilly lands is gradual.

Topography.—The topography of the Texas Coastal Plain presents little variety. The surface rises gradually from the sea level at the coast to an elevation of 800 to 1,000 feet along the interior margin of the province. The portion of the plain bordering the coast is characterized by a very level surface which, throughout extensive areas, is scarcely broken, except by a few shallow drainage ways. The highest land along the coast is at Corpus Christi, where the bluffs rise to 40 to 60 feet above sea level. Toward the interior the surface of the plain becomes more diversified, developing into rolling hills which increase in number and prominence toward the western margin of the province.

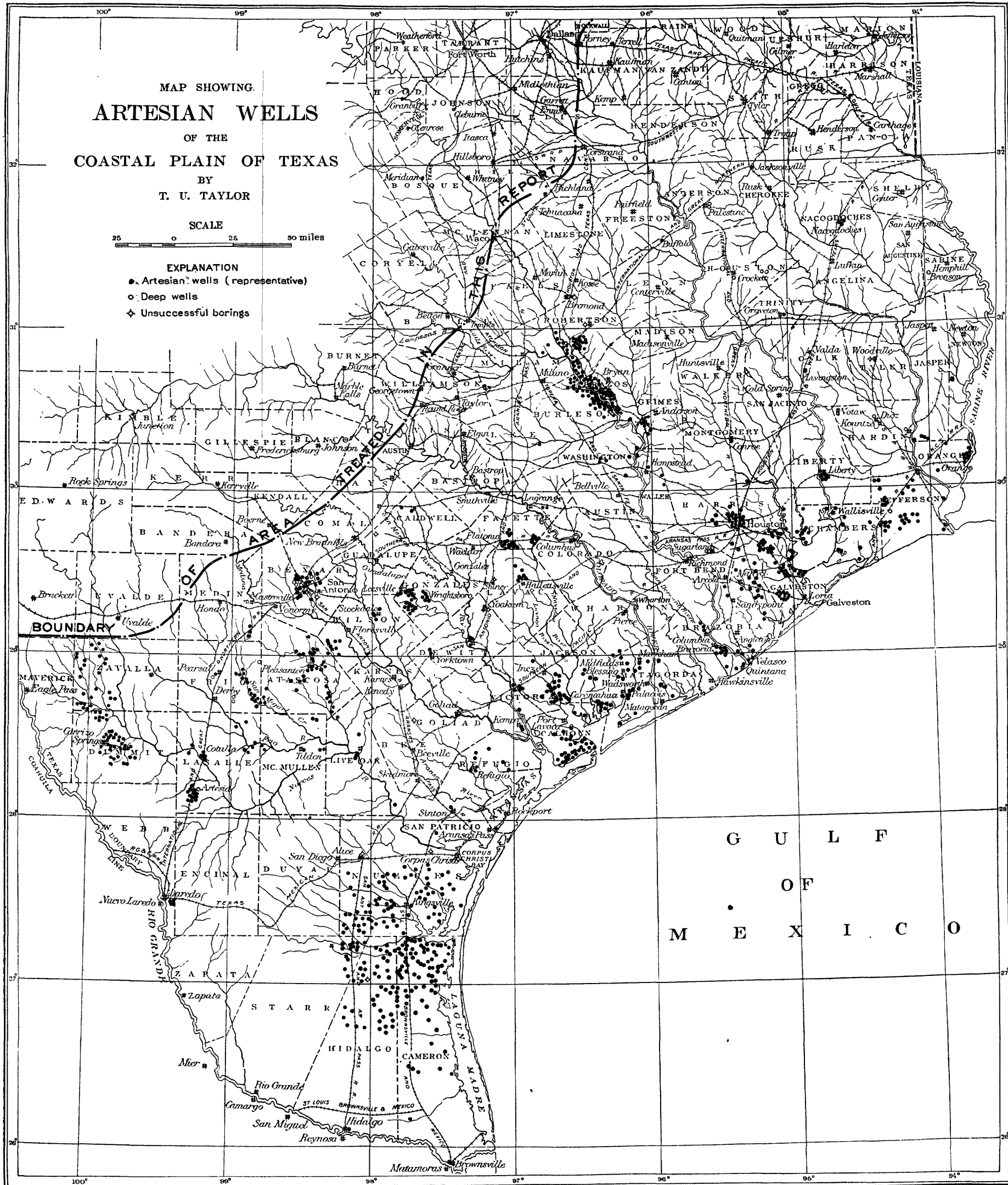
Drainage.—The Texas Coastal Plain is traversed by many streams. The largest of these are the Neches, Trinity, Brazos, Colorado, and Nueces rivers. Of all these streams only the Brazos enters the Gulf directly, the others emptying into lagoons or bays. South of the Nueces the drainage is not completely developed and the entire area between this stream and the Rio Grande contains only two small creeks, the San Fernando and Olmos, which unite to form Capano Bay. The larger streams of the area are generally narrow and deep, with feeble currents. Near the shore many of them expand into broad, shallow lakes entering the Gulf through shallow bays. While there are many streams in the Texas Coastal Plain, much of its surface is poorly drained, and in places water stands in lakes or ponds throughout the year.

GEOLOGY.

The Texas Coastal Plain is developed on a great thickness of soft rocks, sands, gravel, clays, and loams in general spread in thin but more or less extensive beds which dip very gently to the east. These sediments have a thickness of several thousand feet and are composed of alternating porous and impervious members, producing ideal artesian conditions. Over the greater part of the area the rocks are of Tertiary age, but along the interior border Upper Cretaceous sediments appear.

UNDERGROUND WATERS, BY COUNTIES.

General statement.—During recent years the underground-water resources of the Texas Coastal Plain have become of considerable economic importance. Ground water, which is usually abundant throughout the district, has been used for many years for general domestic purposes, and small irrigation plants in a few instances have derived their water supply from this source. Within recent years



artesian wells have been obtained in various parts of the region. Some of these furnish flows adequate for considerable irrigation. Three of the larger cities in the region, Houston, Galveston, and San Antonio, derive their entire city water supply from artesian sources. At Houston the city water is supplied by 60 flowing wells, while at Galveston and San Antonio 15 and 30 wells, respectively, furnish the required amounts. In the vicinity of El Campo, Chesterville, and East Bernard shallow artesian wells are employed to a considerable extent for rice irrigation, especially where small crops are raised. In the vicinity of Webster, in the southern part of Harris County, the flow of several ordinary surface wells has been increased, by pumping, to such an extent as to furnish water for the irrigation of 60 to 100 acres of rice. The depth at which artesian water may be obtained in the Coastal Plain of Texas varies according to the locality. It ranges from a few feet to over 2,000 feet, but the average is about 600 feet.

The amount of flow of these wells varies from 20 to 1,600 gallons a minute. A typical artesian well of this district is shown in Pl. I. The water is more or less mineralized, but with few exceptions the dissolved salts are neither objectionable for domestic purposes nor deleterious to plant growth. The general distribution of artesian wells of the Coastal Plain of Texas is shown in Pl. II.

In the following discussion the underground-water resources of the region will be described by counties.

CAMERON COUNTY.

Shallow wells.—The depths of the shallow wells of Cameron County vary from 20 to 100 feet, according to the locality. Along the coast water can usually be procured at depths of 20 to 30 feet, but, owing to the nearness of the sea, it is generally salty. To the north, along the bay, the wells are somewhat deeper, ranging from 20 to 60 feet, and in the western part of the county the deepest wells occur, some exceeding 100 feet. At Brownsville and in the immediate vicinity the average depth of shallow wells is about 30 feet.

Artesian wells.—Artesian water is now obtained in the northern two-thirds of this county, at depths which vary from 600 to 1,200 feet. There are about 150 flowing wells in the county. The flows of these wells vary from 50 to 1,000 gallons a minute, the average being about 400 gallons. A group of artesian wells in the Rio Grande embayment is shown in Pl. III (p. 6). The following is a list of artesian wells in Cameron County:

Artesian wells in Cameron County.

THE KENEDY PASTURE COMPANY'S WELLS.

Name.	Driller.	Depth.	Flow per minute.
		<i>Feet.</i>	<i>Gallons.</i>
La Parra.....	Wm. Turcotte.....	710	75
Do.....	do.....	825	150
Do.....	do.....	890	600
San Juan.....	do.....	1,000	250
Abujon.....	do.....	1,030	300
Moyote.....	do.....	610	80
Sacahuistal.....	do.....	998	125
Eurebia.....	do.....	920	350
Shipping pasture.....	do.....	689	150
Devisadero.....	do.....	724	550
Cobos.....	do.....	645	60
Paistle.....	do.....	710	1,000
Salada.....	do.....	700	600
Corte Sacate.....	do.....	751	400
Mota del Diablo.....	do.....	1,019	500
Atravesada.....	Guffey & Galey.....	720	500
Alto.....	do.....	1,120	350
Casa Mott.....	White Bros.....	1,175	500
Palmito.....	W. P. Gano.....	1,035	600
Ramirez.....	do.....	1,123	450
Edwin Mallory.....	do.....	1,170	500
Padre Alejos.....	N. G. Allen.....	865	450
Sarita.....	Railroad.....	604	300
Mifflin.....	Town site.....	740	450
Turcotte.....	do.....	787	800
Snipe.....	Wm. Turcotte.....	620	700
Esperanza.....	do.....	747	600
Barasas.....	do.....	700	500
El Suspiro.....	do.....	615	300
La Saragote.....	do.....	652	450
Mujeres.....	do.....	660	400
Mesquite de Final.....	do.....	750	300
Paradiso.....	do.....	917	200
Tio Coulas.....	do.....	892	250
Tecolite.....	N. G. Allen.....	890	300
Motto Negra.....	Wm. Turcotte.....	1,080	250
Perez.....	Tom Leary.....	1,360	600
Agua Negra.....	W. P. Gano.....	1,125	550
Mentidua.....	do.....	1,033	500
Mestana.....	do.....	1,232	125
El Toro.....	Wm. Turcotte.....	1,025	350
Repara.....	do.....	1,130	300
Mayote, No. 2.....	W. P. Gano.....	1,147	700
San Juan, No. 2.....	Wm. Turcotte.....	890	70
Tio Martin.....	do.....	860	350
Picacho, No. 2.....	do.....	1,155	110
Mesquite.....	do.....	750	400
La Serpa.....	do.....	617	315
Miralejos.....	do.....	862	115
Los Mojaras.....	do.....	760	450
Picacho, No. 1.....	Tom Leary.....	1,403	600
No name.....	do.....	1,314	350
La Piedra.....	Wm. Turcotte.....	950	350
La Tablome.....	do.....	1,000	350
Motta Palle.....	do.....	(a)	-----
Motta Romendonda.....	do.....	814	200
Townsite, No. 1.....	W. P. Gano.....	807	275
Townsite, No. 2.....	do.....	818	285
Medeneta.....	do.....	1,315	400
La Muerta.....	do.....	843	300
Bordos.....	Wm. Turcotte.....	862	100
Gansos, No. 1.....	W. P. Gano.....	1,234	350
Gansos, No. 2.....	do.....	(a)	-----
El Telephon.....	Wm. Turcotte.....	951	350
Railroad (new track).....	W. P. Gano.....	803	350
Loma Prieta.....	Wm. Turcotte.....	(a)	-----
Courta Sacate.....	do.....	757	250

a In progress.

Artesian wells in Cameron County—Continued.

LOWER KING RANCH.

Name.	Driller.	Depth.	Flow per minute.
		<i>Feet.</i>	<i>Gallons.</i>
Andrea.....	A. W. Ferguson.....	530	70
Bandera.....	do.....	682	12
Resaca.....	do.....	747	200
Gigante.....	do.....	382	75
Comanche.....	do.....	668	35
Morris City.....	do.....	1,364	60
Vieja.....	J. C. Curry.....	851	300
Loma Prieta.....	do.....	838	300
Tampico.....	do.....	719	50

MAJ. J. B. ARMSTRONG'S WELLS.

Marana.....	Sanders & Allen.....	490	20
San Tomas.....	do.....	500	20
Comal.....	Thos. Fowler.....	830	150
Rincon.....	Curry & Sons.....	770	75
El Ruco.....	J. B. Armstrong.....	568	.....
Katharine.....	R. Robertson.....	730	60
Rodeo.....	J. C. Curry.....	805	100
Horben.....	do.....	857	150
Tokio.....	do.....	830	108
Los Tollidos.....	do.....	780	160
Ranch House.....	J. B. Armstrong.....	893	150
El Alonozo.....	do.....	(a)	.....

a In progress.*Record of Atravesada well, on Kenedy ranch, Cameron County.*

	<i>Feet.</i>
Surface soil.....	0 - 1½
White sand, salty.....	1½ - 10
White sand.....	10 - 35
Fresh-water seep.....	35 - 45
Blue clay and bowlders.....	45 - 50
Sand and bowlders.....	50 - 80
Cemented shells.....	80 - 82
Sand.....	82 - 90
Sand and bowlders.....	90 - 100
Cemented shells.....	100 - 103
Clay bowlders.....	103 - 110
Blue and brown clay.....	110 - 140
Brown to buff clay.....	140 - 265
Cemented shells, scallop shaped.....	265 - 320
Brown to buff clay.....	320 - 330
Soft sand rock.....	330 - 335
Hard sand rock.....	335 - 360
Tough clay.....	360 - 380
Hard rock.....	380 - 380½
Clay.....	380½ - 400
Hard rock.....	400 - 400½
Clay.....	400½ - 420
Rock.....	420 - 422
Clay.....	422 - 440
Rock.....	440 - 440½
Fine-grained bluish rock.....	440½ - 460
Stiff brownish clay.....	460 - 470
Light-brown clay and sand.....	470 - 555
Sand.....	555 - 615

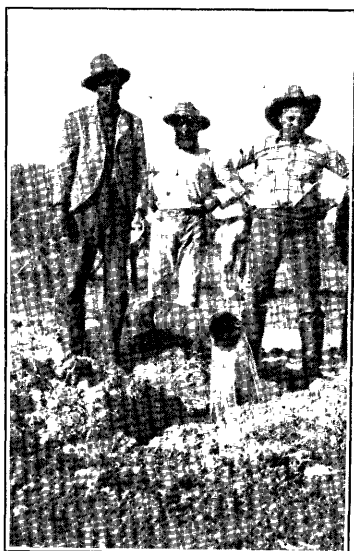
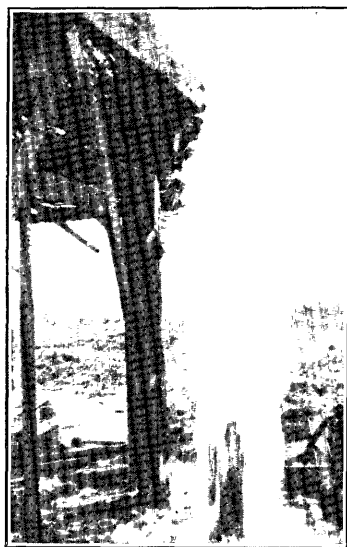
	Feet.
Very hard gumbo.....	615- 640
Reddish gumbo.....	640- 694
Rock.....	694- 696
Clay.....	696- 700
Water-bearing sand; strong flow.....	700- 720
Red clay.....	720- 765
Hard red clay.....	765- 860

Record of well at Sauz ranch, Cameron County.

	Feet.
Pale-red, sandy clay.....	0- 15
Sand.....	15- 30
Very pale-red clay, sandy.....	30- 50
Sand containing hard layers.....	50- 250
Sand with very soft blue clay.....	250- 315
Sand and bluish clay.....	315- 500
Sandstone.....	500- 512
Yellow sand.....	512- 517
Sandstone.....	517- 525
Sand.....	525- 529
Very hard bluish rock.....	529- 699
Rock and clay.....	699- 729
Red and blue clay with hard layers.....	729- 899
Bluish clay with red layers.....	899- 989
Reddish and greenish clay.....	989-1, 099
Sand.....	1, 099-1, 104

Record of Ovejas well, 8 miles east of Sauz ranch, Cameron County.

	Feet.
Soil and clay.....	0- 10
Sand and clay.....	10- 53
Clay and sand in hard and soft layers.....	53- 68
Sand.....	68- 81
White clay and gravels ("Equus beds").....	81- 115
Sandy clay and sand rock.....	115- 134
Sand and sandstone.....	134- 185
Clay and sandstone.....	185- 208
Sand.....	208- 225
Blue clay.....	225- 278
Sand.....	278- 290
Sand and sandstone.....	290- 378
Blue clay.....	378- 408
Coarse sand.....	408- 421
Clay containing hard layers.....	421- 442
Sandstone.....	442- 450
Sand.....	450- 470
White clay.....	470- 476
Sand.....	476- 490
Bluish clay.....	490- 520
Sand and sandstone.....	520- 532
Bluish clay.....	532- 551
Sand and sandstone.....	551- 560
Blue clay.....	560- 585
Sandy clay.....	585- 596
Very fine sand.....	596- 613
Sand and sandstone.....	613- 630



ARTESIAN WELLS IN RIO GRANDE EMBAYMENT.

HIDALGO COUNTY.

Shallow wells.—Water is procured from wells in Hidalgo County at depths varying from 25 feet on the lower ground to 150 feet on the highlands. An abundant supply is usually obtained.

Artesian wells.—During the last few years many successful artesian wells have been bored in the northern half of Hidalgo County. These are located mainly on the Lasater, Sullivan, Armstrong, Ward & Russell, and King ranches. In January, 1906, information had been obtained of about 60 of these wells, but there are others about which no data are available. The following is a partial list of the wells, giving their depth and approximate flow.

Artesian wells in northern Hidalgo County.

ED. C. LASATER RANCH.

Name.	Driller.	Depth.	Flow per minute.
		<i>Feet.</i>	<i>Gallons.</i>
No. 9.....	O. S. Caldwell.....	460	10
No. 4.....	do.....	438	35
Realitos.....	Perry Downs.....	478	75
White Sulphur.....	do.....	484	75
Patricio.....	do.....	460	25

D. SULLIVAN RANCH.

Jap Twins.....	S. A. Hamlin.....	742	400
Do.....	do.....	1,008	600
Three-fourths mile.....	do.....	820	800
Tula Twin.....	do.....	630	300
Do.....	do.....	630	400
Glmos Creek.....	do.....	350	500
South Twin.....	do.....	530	200
Do.....	do.....	530	150

WARD & RUSSELL RANCH.

No. 1.....	S. A. Hamlin.....	±500	Flows.
No. 2.....	do.....	±500	Do.
No. 3.....	do.....	±500	Do.
No. 4.....	do.....	1,008	Do.

KING RANCH.

Gigante.....	A. W. Ferguson.....	382	75
Andrea.....	do.....	530	70
Mesquite.....	do.....		
Tampico.....	do.....	719	50
Comanche.....	do.....	668	35
Resaca.....	do.....	747	200

A chemical analysis of the water of the White Sulphur well (Lasater ranch) is given below:

Analysis of water from White Sulphur well, Lasater ranch, Hidalgo County.^a

Parts per million.		Parts per million.	
Ammonium (NH ₄).....	0.04	Total solids at 105°.....	1,090.00
Sodium (Na).....	260.00	Total solids ignited, dull red-	
Magnesium (Mg).....	29.00	ness.....	1,000.00
Calcium (Ca).....	75.00	Loss on ignition.....	90.00
Iron (Fe).....	2.60	Albuminoid ammonia (NH ₃)..	.01
Chlorine (Cl).....	380.00	Free ammonia (NH ₃).....	.023
Nitrate radicle (NO ₃).....	.02	Nitrites.....	.007
Sulphate radicle (SO ₄).....	170.00	Oxygen required.....	4.500
Bicarbonate radicle (HCO ₃)...	120.00	Temporary hardness.....	140.00
Silica (SiO ₂).....	36.00	Permanent hardness.....	68.00
Organic matter.....	12.00		
	1,084.66		

STARR COUNTY.

Shallow wells.—Water is generally obtained at shallow depths throughout Starr County, but along the Rio Grande a large portion of the inhabitants use river water.

Artesian wells.—Artesian water is found in the northeastern part of the county, near the town of Falfurrias. The wells range in depth from 540 to 1,020 feet. In the deeper borings five distinct water horizons are encountered, some of which have a capacity of 250 gallons a minute. The water is used extensively for irrigation; and during the last two years the progress in artesian irrigation has been very rapid. The following is a list of wells in Starr County:

Artesian wells in Starr County.

Name.	Depth.	Flow per minute.	Name.	Depth.	Flow per minute.
	<i>Feet.</i>	<i>Gallons.</i>		<i>Feet.</i>	<i>Gallons.</i>
Los Mosquitos.....	710	25	Colosa.....	609	100
Mesquite.....	540	100	Railroad.....	810	150
Alto Bonito.....	562	250	Tank.....	756	100
Barendo.....	526	30	Falfurrias No. 2.....	1,020	80
Copa.....	663	30	Falfurrias No. 3.....	700	110
Falfurrias No. 1.....	800	15	Copita.....	664	75
Novilla.....	760	75			

^a Analysis by H. W. Harper and B. L. Glascock, school of chemistry, University of Texas, Austin, April, 1903.

An analysis of the water from the Mesquite well is given below:

Analysis of water from Mesquite well, Lasater ranch, Starr County.^a

	Parts per million.		Parts per million.
Ammonium (NH ₄)	0.07	Total solids at 105°	680
Sodium (Na)	170.00	Total solids ignited, dull redness.	610
Magnesium (Mg)	.3	Loss on ignition	70
Calcium (Ca)	38.00	Albuminoid ammonia (NH ₃)	.062
Iron (Fe)	.1	Free ammonia (NH ₃)	.006
Chlorine (Cl)	.4	Oxygen required.	16
Nitrate radicle (NO ₃)	None.	Temporary hardness.	230
Sulphate radicle (SO ₄)	39.00	Permanent hardness.	19
Bicarbonate radicle (HCO ₃)	150.00		
Silica (SiO ₂)	18.00		
Organic matter	44.00		
	459.87		

NUECES COUNTY.

Shallow wells.—At most places throughout Nueces County water can be obtained at depths of 30 to 40 feet, but in the southern part of the county many of the shallow wells furnish brackish water. There are wells in the northern part of the county which range in depth from 50 to 180 feet. The deepest of these penetrated a water-bearing sand which furnishes 60 gallons of water a minute. Throughout the eastern part of the county water is obtained at a depth of 35 to 40 feet, but much of it is saline. Along the west side of the county the wells 80 feet deep supply only a small amount of water, while those which have been bored to a depth of 150 feet afford an abundance, and in many of them the water rises to within 70 feet of the surface.

Artesian wells.—Artesian water is secured throughout the southern two-thirds of this county at depths which vary from 490 to 1,240 feet. In the amount of flow these wells range from a few gallons to over 600 gallons a minute. So far no flowing wells have been obtained north of the Texas and Mexico Railroad, although borings have been made at Alice, Robstown, and Corpus Christi. The northernmost of the successful wells in this county are on the Driscoll ranch. A list of the artesian wells, giving their depth, flow, and other data, follows.

^a Analysis by H. W. Harper and C. Hartmann, school of chemistry, University of Texas, Austin, April, 1903.

Artesian wells in Nueces County.

KING'S WELLS.

Name.	Driller.	Depth.	Flow per minute.
		<i>Feet.</i>	<i>Gallons.</i>
Palo Alto No. 1.....	T. Herring.....	552	20
Palo Alto No. 2.....	do.....	704	20
Santa Gertrudis No. 1.....	do.....	535	125
Parrita.....	do.....	470	350
Ebanito No. 1.....	do.....	456	250
Ebanito No. 2.....	do.....	475	100
Fitch.....	do.....	396	100
Jenson.....	do.....	402	225
Baltimore.....	do.....	474	110
Canelo.....	do.....	495	250
Oaso Ancho.....	do.....	590	40
Lower Little Pasture.....	do.....	545	50
Santa Gertrudis No. 2.....	do.....	550	75
Coyote.....	do.....	795	30
Chiltipin.....	do.....	840	25
Burro.....	do.....	928	300
Telephone.....	do.....	874	75
Portales.....	do.....	1,085	100
Guayacan.....	do.....	905	100
Jaboncellos.....	do.....	948	60
Rincon de Los Cabellos.....	King Machinery Co.....	764	400
Bovida.....	do.....	720	300
Retamosa.....	do.....	447	30
Conchas.....	do.....	427	30
Vivoras.....	do.....	989	10
Visnaga.....	do.....	913	40
Santa Gertrudis No. 3.....	A. W. Ferguson.....	565	160
Santa Gertrudis No. 4.....	do.....	560	100
Alazan.....	do.....	423	40
Santa Clara.....	do.....	525	400
Valederas.....	Tom Leary.....	591	400
Rincon de Tio Pancho.....	do.....	615	400
Leoncitas.....	do.....	570	250
Tranquitas.....	do.....	655	50
Little Pasture.....	do.....	574	60
Rediche.....	do.....	680	200
Tranquecitos.....	do.....	640	150
Caldwell.....	do.....	540	150
Indios.....	do.....	490	100
Mota Negra.....	do.....	550	25
Palo Marcado.....	do.....	700	5
Comitas.....	do.....	578	300
Homer.....	A. B. Fuller.....	506	50
Alazan No. 2.....	King Machinery Co.....	465	90
Cobeza.....	do.....	410	60
Priesta.....	do.....	635	100
Ebenito.....	do.....	397	25
Leoncitas No. 2.....	do.....	1,050	75
Herring.....	T. Herring.....	805	20
Young.....	J. P. Morris.....	630	50
Taylor.....	T. Herring.....	620	40
Johnson.....	J. P. Morris.....	626	40
Reed.....	T. Herring.....	616	70
Harper.....	R. J. Mills.....	625	100
Kingsville.....	R. Robertson.....	609	75
Simms.....	W. J. House.....	600	34
McNeill.....	T. Herring.....	610	75
Warren.....	A. B. Fuller.....	628	110
Huffman.....	T. Herring.....	630	66
Jesse.....	J. P. Morris.....	640	.....
Weir.....	W. J. House.....	(a)	.....
Harvey.....	T. Herring.....	632	100
Hoffman.....	do.....	626	75
Alexander.....	do.....	.....	.....
Penn.....	W. J. House.....	650	150
Santa Gertrudis No. 5.....	King Machinery Co.....	580	40

a In progress.

NUECES COUNTY.

11

Artesian wells in Nueces County—Continued.

SEELIGSON'S WELLS.

Name.	Driller.	Depth.	Flow per minute.
		<i>Feet.</i>	<i>Gallons.</i>
Las Luchas.....	C. Premont.....	464	50
Balli.....	do.....	633	65
Galveston ranch.....	do.....	630	8
Lindero.....	do.....	475	75

ANNA COLLINS'S WELLS.

Creek.....	White Bros.....	625	50
Mota.....	do.....	825	9
Copita.....	do.....	918	150
Corner.....	do.....	790	50

ROBERT DRISCOLL'S WELLS.

Palito Blanco.....	Chas. P. Fox.....	612	150
Quates.....	do.....	653	100
Dunn ranch.....	Leary & Gano.....	525	25
Do.....	Thos. Fowler.....		60
Do.....	do.....		100

ANDRES CANALES'S WELLS.

La Cabra.....	F. Rosales.....	440	80
Ranchito.....	do.....	458	80

CHARLES WEIL'S WELL.

Flowing well.....	Leary & Gano.....	558	35
-------------------	-------------------	-----	----

RAGLAND & HERRING'S WELLS.

Flowing well.....	T. Herring.....	470	100
Do.....	W. C. Downing.....	499	60

TEXAS LAND AND CATTLE COMPANY'S LAURELES RANCH WELLS.

Shipping Pasture.....	O. S. Caldwell.....	1,130	40
San Vicente.....	do.....	926	30
Santa Cruz.....	do.....	1,068	160
Mujeres.....	J. McAlester.....	1,020	120
Rincon La Salle.....	do.....	1,240	240
Garcia.....	do.....	1,150	25
Rincon La Salle.....	do.....	1,185	60
Headquarters.....	do.....	998	80
Rincon La Salle.....	do.....	1,295	35

12 UNDERGROUND WATERS OF TEXAS COASTAL PLAIN.

Record of Galveston well, Seeligson ranch, about 30 miles south of Alice, Nueces County

	Feet.
Light-colored clay.....	0- 19
Soft sandstone.....	19- 39
Very hard, white flinty rock.....	39- 119
Pink to yellowish clay.....	119- 199
Reddish clay mixed with bowlders.....	199- 359
Coarse gray sand.....	359- 404
Sand and clay.....	404- 437
Sand and coarse gravel.....	437- 453
Sand and clay.....	453- 549
Sand and gravel.....	549- 569
Rock and sand in alternate layers.....	569- 589
Sand mixed with small pebbles.....	589- 610
Fine-grained gray sand (water bearing, 10 gallons per minute).....	610- 631
White calcareous clay.....	631- 686
Hard clay containing bowlders.....	686- 736
Gray sandstone.....	736- 756
Blue clay.....	756- 776
Blue clay with yellow spots.....	776- 816
Blue clay, fine grained.....	816- 856
White clay with yellow spots (not water bearing).....	856-1,001

Analysis of water from Santa Clara well, on King's ranch, Nueces County.^a

Parts per million.		Parts per million.	
Ammonium (NH ₃).....	.01	Total solids at 105°.....	680
Potassium (K).....	11.00	Total solids ignited, dull redness.....	600
Sodium (Na).....	130.00	Loss on ignition.....	80
Magnesium (Mg).....	16.00	Albuminoid ammonia (NH ₃).....	.014
Calcium (Ca).....	35.00	Free ammonia (NH ₃).....	None.
Iron (Fe).....	2.00	Nitrates.....	.05
Chlorine (Cl).....	140.00	Nitrites.....	None.
Nitrate radicle (NO ₃).....	.05	Oxygen required.....	13
Sulphate radicle (SO ₄).....	140.00	Temporary hardness.....	260
Bicarbonate radicle (HCO ₃).....	140.00	Permanent hardness.....	None.
Silica (SiO ₂).....	24.00		
Organic matter.....	40.00		
678.06			

^a Analysis by H. W. Harper and E. Anderson, school of chemistry, University of Texas, Austin, April, 1903.

Analysis of water from Balli well, Seeligson ranch, Nueces County.^a

Parts per million.		Parts per million.	
Ammonium (NH ₄).....	0.08	Total solids at 105°	1,080
Potassium (K).....	8.30	Total solids ignited, dull red-	
Sodium (Na).....	270.00	ness.....	930
Magnesium (Mg).....	.90	Loss on ignition	150
Calcium (Ca).....	69.00	Albuminoid ammonia (NH ₃)..	.06
Iron (Fe).....	2.00	Free ammonia (NH ₃).....	.014
Chlorine (Cl).....	250.00	Nitrates.....	.006
Nitrate radicle (NO ₃) .....	.01	Temporary hardness.....	210
Sulphate radicle (SO ₄)	250.00	Permanent hardness.....	63
Bicarbonate radicle (HCO ₃) ...	180.00		
Silica (SiO ₂).....	33.00		
Organic matter.....	78.00		
	1,141.29		

SAN PATRICIO COUNTY.

Shallow wells.—In San Patricio County the shallow wells vary in depth from 20 to 130 feet, and they usually furnish a large supply of water.

Artesian wells.—Only a few artesian wells have been bored in this county. A partial list of these is given below:

Artesian wells in San Patricio County.

Owner.	Depth.	Flow per minute.	Diameter.
	<i>Feet.</i>	<i>Gallons.</i>	<i>Inches.</i>
Coleman & Fulton.....	983	60	4½
Mrs. M. M. Murphy.....	365		
S. G. Miller.....	290	Flows.	

REFUGIO COUNTY.

Shallow wells.—The depth of shallow wells in Refugio County varies from 10 to 60 feet, and they generally furnish a sufficient amount of water for ordinary domestic purposes.

Artesian wells.—Information has been obtained of five artesian wells located on O'Connor's ranch. The depth, flow, and approximate location of these wells are given in the following table:

^a Analysis by H. W. Harper and Barney Brooks, school of chemistry, University of Texas, Austin, April, 1903.

Artesian wells in Refugio County.

Owner.	Depth.	Flow per minute.	Distance and direction from Anagua.
	<i>Feet.</i>	<i>Gallons.</i>	
O'Connor.....	946	60	7.5 miles south, 5 miles west.
Do.....	826	175	14 miles south, 15 miles west.
Do.....	1,204	175	11.5 miles south, 25 miles west.
Do.....	972	150	13 miles south, 5 miles east.
Do.....	1,000	40	19 miles south, 8 miles east.

ARANSAS COUNTY.

Shallow wells.—In Aransas County, which borders the coast, water is obtained at depths varying from 25 to 80 feet.

Artesian wells.—There are at present no artesian wells in this county, and as far as can be ascertained no prospecting has been done.

CALHOUN COUNTY.

Shallow wells.—The average depth of shallow wells throughout Calhoun County is 30 feet, and in most cases an abundant supply is obtained.

Artesian wells.—There are 21 artesian wells in Calhoun County, mainly on the ranch of T. M. O'Connor. Their approximate location, together with other data, is given in the following table:

Artesian wells in Calhoun County.

Owner.	Depth.	Flow per minute.	Distance and direction from Point Lavaca.
	<i>Feet.</i>	<i>Gallons.</i>	
C. A. Mitchell ^a	380	Weak.	4 miles northeast.
J. E. Shutt ^b	802	63	
H. C. Clark.....	496	12	8 miles southeast.
Do.....	330	8	8 miles south.
Do.....	360	.....	Do.
Thomas estate.....	441	4	4 miles south.
Do.....	442	6	5 miles south.
Do.....	500	9	7 miles southwest.
J. B. Watkins.....	366	.....	9 miles south.
T. M. O'Connor:			
Oil.....	780	.....	14 miles southeast.
Boggy.....	572	.....	16 miles southeast.
Old pens.....	570	.....	14 miles southeast.
Johnny Woods.....	600	.....	12 miles southeast.
Double dams.....	540	.....	Do.
Cein Pond.....	490	.....	14 miles southeast.
Eclipse No. 1.....	480	.....	Do.
Queen.....	482	.....	15 miles southeast.
Branding pen.....	460	.....	13 miles southeast.
Perry Bend.....	480	.....	11 miles southeast.
Eclipse No. 2.....	316	.....	12 miles southeast.
Tule Pond.....	315	.....	10 miles south.
Eclipse No. 3.....	320	.....	11 miles south.
Bayshore Dandy.....	390	.....	15 miles south.
Eagle Nest.....	460	.....	Do.
Alligator.....	1,484	.....	16 miles south.
Dugan dam.....	380	.....	17 miles south.
Salt flat.....	275	.....	18 miles south.
Middle Dandy.....	420	.....	15 miles south.
Fence line.....	480	.....	14 miles south.
25-foot Dandy.....	480	.....	Do.

^a Diameter 1½ inches

^b Diameter 2 inches,

Record of well at Alligator Head, Calhoun County.^a

	Feet.	
Surface soil.....	0-	3
Fine white quicksand.....	3-	21
White clay.....	21-	43
Greenish clay containing shells.....	43-	80
Gray sand.....	80-	83
Hard yellowish clay.....	83-	160
Coarse sand containing shells.....	160-	166
Hard clay containing shells.....	166-	210
Sand.....	210-	225
Hard clay containing oyster shells.....	225-	320
Sand containing oyster shells.....	320-	365
Blue clay containing a few shells.....	365-	452
Coarse gray sand.....	452-	476
Conglomerate.....	476-	551
Gray sand.....	551-	567
Conglomerate with layers of blue clay.....	567-	694
Gray sand, traces of oil.....	694-	704
Hard rock.....	704-	707
Light sand, traces of oil.....	707-	710
Blue clay.....	710-	713
Hard rock with soft layers.....	713-	725
Gray sand containing fragments of shells.....	725-	767
"Shell concrete".....	767-	887
Sand, water and oil bearing.....	887-	912
Conglomerate.....	912-	916
Gray sand.....	916-	942
Blue clay containing bowlders and shells.....	942-	1,008
Light-colored clay and fine gray sand in alternate layers.....	1,008-	1,022
Blue clay.....	1,022-	1,039
Rock.....	1,039-	1,042
Blue clay containing bowlders and shells.....	1,042-	1,051
White sand, traces of oil.....	1,051-	1,052
Blue clay with hard layers.....	1,052-	1,056
Light-colored clay with hard layers.....	1,056-	1,087
White sand, water bearing.....	1,087-	1,097
Red and blue clay.....	1,097-	1,230
Light-colored clay iron stained.....	1,230-	1,462
Variegated clay.....	1,462-	1,484

VICTORIA COUNTY.

Shallow wells.—Shallow wells are obtained in Victoria County at depths varying from 30 feet in the southern part to 80 feet in the northern and western parts.

Artesian wells.—Information has been received of 17 artesian wells in this county. The majority of these wells are on the Keeran ranch in the watershed of Garcitas and Aranosa creeks. The following is a list giving their depth, flow, diameter, and approximate location:

^a Furnished by J. D. Mitchell, Victoria, Tex.

Artesian wells in Victoria County.

Owner.	Depth.	Flow per minute.	Diameter.	Location.
	<i>Feet.</i>	<i>Gallons.</i>	<i>Inches.</i>	
Rathbone & Weeder.....	1,045	80	.....	City of Victoria.
J. N. Keeran.....	180	Flows.	.....	Southeast of Victoria.
Do.....	200	Flows.	.....	Do.
Do.....	148	Flows.	.....	Do.
Do.....	705	Flows.	.....	Do.
Do.....	130	Flows.	.....	Do.
Do.....	77	Flows.	.....	Do.
Do.....	50	Flows.	.....	Do.
Do.....	222	Flows.	.....	Do.
Do.....	110	Flows.	.....	Do.
Do.....	140	Flows.	.....	Do.
Do.....	425	Flows.	.....	Do.
Do.....	180	Flows.	.....	Do.
A. M. McFadden.....	716	10	2	Kemper, 1.5 miles south.
Do.....	592	10	3	Kemper, 1.7 miles south.
Ross Clark.....	152	50	2	Kemper, 7 miles north.
Jno. T. Rusk.....	226	00	.....	Inez, 7 miles north.

JACKSON COUNTY.

Shallow wells.—Water is obtained in the eastern part of Jackson County at depths varying from 25 to 40 feet; in the southern and western parts from 40 to 60 feet; and in the northern part from 25 to 45 feet.

Artesian wells.—Artesian water has been found in this county south of the New York, Texas, and Mexican Railway, and it is believed by local observers that artesian water can be obtained almost anywhere in the northern part of the county. The following table gives a list of the wells, with their depth, flow, and approximate location.

Artesian wells in Jackson County.

Owner.	Depth.	Flow per minute.	Location.
	<i>Feet.</i>	<i>Gallons.</i>	
C. Branch.....	223	7	Edna, 10 miles southeast.
Do.....	365	5	Do.
H. Bowers.....	360	42	Edna, 16 miles southeast.
S. Mitchell.....	402	4	Edna, 25 miles southeast.
R. Clement.....	398	2	Edna, 14 miles southeast.
W. Westhoff.....	785	6	
Buhler.....	325	.....
L. Ward.....	324	.....
A. W. Lewis.....	362	150	Carancohue, 2 miles east.
R. E. Ward.....	330	60	Carancohue, 3 miles east.
Do.....	338	100	Carancohue, 7 miles south.
Do.....	348	40	Carancohue, 10 miles southeast.
Do.....	366	100	Carancohue, 6 miles east.
Do.....	401	50	Carancohue, 5 miles southwest.
Thos. Dewees.....	893	.....
Do.....	777	.....
Do.....	540	.....
Bennett & West.....	360	.....
Do.....	152	.....
Do.....	560	.....
Do.....	240	.....
Do.....	480	.....
Do.....	355	.....
Do.....	450	.....

A well owned by S. H. Beasley, drilled in 1903 close to the west bank of Navidad River, about 1 mile north of the crossing of the New York, Texas and Mexican Railway, has the following record:

Record of Beasley well in central Jackson County.

	Feet.
Sandy soil.....	0 - $\frac{1}{2}$
Red clay.....	$\frac{1}{2}$ - 16
Red sand.....	16 - 30
Red clay.....	30 - 46
Rock.....	46 - 47
Sand.....	47 - 55
Rock.....	55 - 56
Sand and red clay in alternate layers.....	56 - 120
Sand.....	120 - 140
Rock.....	140 - 141
Sand.....	141 - 223
Red clay and sand.....	223 - 249
Rock.....	249 - 258 $\frac{1}{2}$
Clay and rock.....	258 $\frac{1}{2}$ - 268 $\frac{1}{2}$
Red clay.....	268 $\frac{1}{2}$ - 270 $\frac{1}{2}$
Sand.....	270 $\frac{1}{2}$ - 285 $\frac{1}{2}$
Rock.....	285 $\frac{1}{2}$ - 286
Red clay.....	286 - 287
Sand.....	287 - 289
Rock.....	289 - 290
Sand.....	290 - 311
Rock.....	311 - 335 $\frac{1}{2}$
White clay.....	335 $\frac{1}{2}$ - 339
Sand.....	339 - 361
Rock.....	361 - 387 $\frac{1}{2}$
Sand.....	387 $\frac{1}{2}$ - 408 $\frac{1}{2}$
Rock.....	408 $\frac{1}{2}$ - 411
Sand.....	411 - 414
Rock.....	414 - 424
Sand.....	424 - 465
Rock.....	465 - 469
Sand.....	469 - 479
Rock.....	479 - 481
Sand.....	481 - 498
Rock.....	498 - 510
Sand.....	510 - 521
Rock.....	521 - 525
Sand.....	525 - 545
Red clay.....	545 - 548
Sand.....	548 - 558
Red clay.....	558 - 566
Sand.....	566 - 586
Rock.....	586 - 596
Sand.....	596 - 640
Blue clay.....	640 - 650
Sand and clay in alternate layers.....	650 - 665
Rock.....	665 - 669
Sand.....	669 - 675

	Feet.
Rock.....	675- 676
Sand and clay in alternate layers.....	676- 695
Rock.....	695- 698
Sand.....	698- 771
Blue clay.....	771- 777
Red sand.....	777- 799
Red clay.....	799- 852
Red and blue clay.....	852- 910
Red clay.....	910- 950
White clay.....	950- 995
Blue clay.....	995-1,000
Sand.....	1,000-1,007
Red clay.....	1,007-1,009
Water-bearing sand.....	1,009-1,022
White clay.....	1,022-1,038
Sand.....	1,038-1,060
Clay.....	1,060-1,107
Soft mud.....	1,107-1,112
Red clay.....	1,112-1,140
Rock.....	1,140-1,144
Clay.....	1,144-1,155
Rock.....	1,155-1,156
Red clay.....	1,156-1,200
Soft mud.....	1,200-1,238
Rock.....	1,238-1,245
Soft mud.....	1,245-1,270
Clay.....	1,270-1,330
Sand, fine water bearer.....	1,330-1,370

An artesian well owned by Russell Ward, 25 miles from Edna, in the southeast corner of Jackson County, has the following record:

Record of Ward artesian well in southeastern Jackson County.

	Feet.
Surface soil.....	0- 10
Red clay.....	10- 20
"Oyster shells".....	20- 25
Red clay.....	25-110
Fine sand, water bearing.....	110-130
Blue clay.....	130-155
Thin layer of rock.....	
Blue clay.....	155-225
Soft black mud.....	225-230
"Water sand" and gravel.....	230-260
Red and white clay.....	260-290
Layer of thin rock.....	
Red and white clay.....	290-330
Sand and gravel, artesian water bearing.....	330-365

MATAGORDA COUNTY.

Shallow wells.—In Matagorda County shallow wells are from 15 to 30 feet deep.

Artesian wells.—Artesian water has been secured at many places, especially in the southern part of the county. Data respecting these wells are given in the following table:

Artesian wells in Matagorda County.

Owner.	Depth.	Diam-eter.	Flow.		Location.
			Per min-ute.	Above surface.	
J. E. Pierce.....	<i>Feet.</i> 356	<i>Inches.</i> 4	<i>Gallons.</i> 50	<i>Feet.</i> 8	Bay City, 25 miles south-west.
Do.....	<i>a</i> 380	4	15	4	Bay City, 22 miles south-west.
Do.....	280	4	10	2	Do.
Do.....	280	4	10	2	Do.
Do.....	350	4	50	8	Do.
Do.....	336	4	15	3	Blessing.
Do.....	350	4	60	16	Blessing, 3 miles south.
A. B. Pierce.....	465	4	60	15	Palacios, 4 miles northeast.
J. E. Pierce.....	485	4	50	10	Palacios, 10 miles south.
A. B. Mayes Oil Co.....	<i>b</i> 870	4	20	10	Matagorda, 5 miles north-east.
C. C. Duson.....	326	6	30	.5	Midfield.
J. L. Jordan.....	530	4	75	8	Blessing, 1½ miles west.
Morre-Cortes.....	125	3	5	2	Markham, 1 mile south.
Tackett & Co.....	460	6	100	20	Palacios, 1 mile northwest.
Ward Cattle Co.....	350	4	75	20	Palacios, 5 miles northwest.
L. Ward.....	326	4	25	2	Midfield, 4 miles southwest.
Platner & Stoddard.....	440	2	10	4	Wadsworth, 1.5 miles south-east.
J. T. Sargent.....	<i>c</i> 81	4	7	2	Hawkinsville, 6 miles south-east.
Cane Belt Railroad.....	460	6	150	4	Bay City.
Southern Pacific Railroad.....	320	6	40	4	Palacios.
J. L. Ladd.....	444	2	15	1.2	Bay City.
Palacios (town).....	572	4	60	4	Palacios.
Palacios College.....	620	4	75	6	Do.
A. H. Pierce.....	1,500	.....	0	.....	Bay City, 9 miles north.
Palacios.....	800	.....	0	.....	Palacios.
Cobell & Hughes.....	1,100	.....	0	.....	Ashby.

a Sulphur water at 280 feet; bored 100 feet farther and good water obtained.

b Bored for oil; flows warm sulphur water, which is slightly saline.

c John T. Sargent has about 12 deep wells on his ranch. They average about 80 feet in depth and the water rises within 2 feet of the surface.

WHARTON COUNTY.

Shallow wells.—In Wharton County west of Colorado River water can be obtained from wells varying in depth from 15 to 30 feet. In the vicinity of El Campo many rice farms are supplied with water from shallow wells. Here the water-bearing sand lies about 15 feet below the surface. A pit 4 to 6 feet in diameter is dug to the water-bearing sand and in the bottom of this excavation three or four wells are drilled. These wells are all cased, and to the top of the casing centrifugal pumps, operated by engines on the surface, are attached. In this way a large supply of water is brought to the surface and used extensively in the irrigation of rice. The most successful shallow-well irrigation plants in Texas are in the vicinity of El Campo.

Artesian wells.—On account of the shallow depth at which ground water can be secured, few attempts have been made to obtain artesian water. The only artesian well in the county of which a record has been kept is known as the Borden well and was drilled in 1892. It

is located near Pierce and has a depth of 1,509 feet. A complete record of the beds penetrated is given below:

Record of A. P. Borden well, Pierce station, Wharton County.

	Feet.
Clay and sand.....	0- 30
Red sand.....	30- 35
Quicksand.....	35- 43
Blue clay.....	43- 53
Indurated sand.....	53- 70
Yellow clay and sand.....	70- 100
Coarse sand.....	100- 106
Red clay.....	106- 127
Clay and sand.....	127- 191
Coarse sand.....	191- 214
Fine sand.....	214- 250
Red clay.....	250- 254
Fine sand.....	254- 270
Yellow clay.....	270- 280
Sand and clay.....	280- 300
Fine white sand.....	300- 373
Indurated sand, very hard.....	373- 383
Yellow sand.....	383- 385
Indurated sand, very hard.....	385- 410
Yellow sand mixed with thin layers of clay.....	410- 460
Sand, clay, and gravel.....	460- 476
Indurated sand, very hard.....	476- 485
Indurated sand, soft and hard layers alternating.....	485- 529
Indurated sand, very hard.....	529- 549
Red and white clay.....	549- 582
Fine white sand.....	582- 590
Indurated sand with soft layers.....	590- 612
Hard clay.....	612- 650
Very hard sandstone.....	650- 687
Limestone, very hard.....	687- 693
Very coarse sand.....	693- 696
Limestone, very hard.....	696- 700
White clay.....	700- 730
Very hard white clay.....	730- 745
Soft mottled clay.....	745- 786
Red mottled clay.....	786- 818
Red sand.....	818- 838
Quicksand.....	838- 850
Red clay.....	850- 890
Gray sand.....	890- 920
Very hard white clay.....	920- 938
Gray sand.....	938- 970
Indurated sand.....	970- 976
Fine gray sand.....	976- 996
Hard clay.....	996-1,000
Hard gray sand.....	1,000-1,010
White clay.....	1,010-1,015
White sand.....	1,015-1,039
White clay.....	1,039-1,050
Very hard white clay.....	1,050-1,053

	Feet.
Rock.....	1,053-1,065
Very hard white clay.....	1,065-1,076
Sandstone and hard blue clay.....	1,076-1,128
Water-bearing sand, gray.....	1,128-1,150
White clay.....	1,150-1,205
Red clay.....	1,205-1,359
Fine red sand.....	1,359-1,366
Red clay.....	1,366-1,450
White clay.....	1,450-1,470
White clay with sand.....	1,470-1,509

In the southern part of Wharton County, near the Matagorda County line, there are two small artesian wells owned by the Texas Land and Cattle Company. These are 2-inch wells, 315 and 513 feet deep, respectively, the former having a flow of 1 gallon and the latter 8 gallons a minute.

BRAZORIA COUNTY.

Shallow wells.—Water is obtained from shallow wells throughout Brazoria County at depths which vary from 15 to 30 feet.

Artesian wells.—Flowing wells are widely distributed throughout the county, on both the east and west sides of Brazos River. They vary considerably in depth, some being over 1,000 feet, and in the amount of flow they range from a few gallons to over 700 gallons a minute. The water is generally of good quality, but from a few wells saline flows have been reported.

Artesian wells in Brazoria County.

Owner.	Depth.	Flow per minute.	Diameter.	Location.
	<i>Feet.</i>	<i>Gallons.</i>	<i>Inches.</i>	
E. D. Dorchester.....	1,060	720	8	Velasco.
Quintana.....	640	60	4	Quintana.
E. D. Dorchester.....	1,000	180	4	Surfside.
Oil-mill site.....	600	90	4	Velasco.
Guy M. Bryan.....	1,020	200	4½	Velasco, 6 miles west.
S. H. Hudgins.....	450	Slight.	2	Velasco, 6 miles east.
Do.....	do	do	2	Velasco, 3 miles east.
J. S. Hogg.....	250	100	10	Columbia, 3 miles north-west.
Do.....	500	100	10	Do.
Do.....	700	Slight.	10	Do.
State farm.....	504		10	West of Brazos.
Do.....	365			Do.
Do.....	950			Do.
Do.....	800			Do.
Do.....	1,030			Do.
Do.....	1,040			Do.
Do.....	1,050			Do.
County.....	1,100		4	Brazoria.
J. P. Bryan.....	600	90		Bryan Heights.
Oil well.....	1,000			Alvin.
Do.....	1,000			Do.
H. L. Skeets.....	911	Slight.	6	Alvin, 3 miles southeast.
R. Willis.....	785	do	3½	Do.
H. Masterson.....	603	Strong.	6	Alvin, 3 miles south.
E. B. Thomas.....	772		12	Alvin, 2½ miles southeast.
W. H. Bush.....	704			Alvin.
E. M. Miller.....	1,200			Manvell, 2 miles south.
W. J. Moore.....	650	Strong.		Alvin, 8 miles northwest.
Santa Fe R. R.....	700			Alvin.
Willis heirs.....	760			Sandy Point, 2 miles north-west.
J. S. Daugherty.....	300			Alvin, 6 miles north.
Do.....	300			Alvin, 10 miles north.
Guffey.....	600	Strong.		Damon mound.

Record of Arnold well No. 3, Columbia, Brazoria County.

	Feet.
Surface soil, clay, and sand.....	0 - 85
Rock.....	85 - 85½
Sand.....	85½ - 88
Rock.....	88 - 89½
Oil sand.....	89½-118
Clay.....	118 -150
Rock.....	150 -158
Blue clay.....	158 -192
Soft rock.....	192 -196
Sand.....	196 -210
Soft rock.....	210 -212
Blue clay.....	212 -218
Soft rock.....	218 -219
Blue clay.....	219 -260
Soft lime rock.....	260 -261
Blue clay, very tough.....	261 -275
Rock (hard layer at 294 feet contains some gas).....	275 -299
Hard rock.....	299 -315
Crystallized sand.....	315 -328
Blue clay.....	328 -333
Rock.....	333 -338
Sand.....	338 -343
Blue clay.....	343 -346
Compact sand.....	346 -354
Clay.....	354 -368
Rock.....	368 -370
Clay.....	370 -395
Soft rock.....	395 -397
Blue clay.....	397 -405
Rock.....	405 -406
Blue clay.....	406 -428
Crystallized sand.....	428 -462
Blue clay, very hard and oil saturated.....	462 -484
Soft rock.....	484 -486
Blue clay.....	486 -510
Sand, very compact.....	510 -532
Rock, full of pyrites and shell.....	532 -534
Sand, very compact.....	534 -574
Hard rock, conglomerate, pyrites, and lime; rock sulphur and shell.....	574 -582
Hard blue clay.....	582 -620
Rock, pyrites, sulphur, lime, volcanic crystals, and oil saturations.....	620 -628
Blue clay.....	628 -632
Rock with sand.....	632 -651
Sand.....	651 -657
Rock.....	657 -675
Hard rock.....	675 -676
Sand.....	676 -678
Very hard rock.....	678 -680
Sand, color of oil.....	680 -681
Rock, very hard.....	681 -682
Sand.....	682 -691

	Feet.
Blue clay.....	691 - 719
Sand.....	719 - 723
Blue clay.....	723 - 729
Oil sand.....	729 - 734
Blue clay.....	734 - 800
Sand.....	800 - 835
Shell with some little showing of oil.....	835 - 857
Blue clay, very thin strata full of shell.....	857 - 858
Sand.....	858 - 870
Blue clay.....	870 - 906
Crystallized sand.....	906 - 926
Rock.....	926 - 936
Blue clay.....	936 - 943
Sand.....	943 - 970
Soft sandstone.....	970 - 971
Hard sandstone.....	971 - 973
Clay.....	973 - 989
Sand.....	989 -1,002
Hard rock.....	1,002 -1,004
Sand, fairly firm, contains fossil wood.....	1,004 -1,012
Hard clay.....	1,012 -1,050
Sand with a little gas.....	1,050 -1,110
Blue clay.....	1,110 -1,115
Sand.....	1,115 -1,136
Soft rock, or compact sand.....	1,136 -1,214
Clay, blue with a greenish cast.	

Record of well on lot 234, Hoskins Mound (midway between Velasco and Alvin), Brazoria County.

	Feet.
Black surface clay.....	0 - 4
Pale blue clay.....	4 - 12
Red clay.....	12 - 25
Yellow loamy sand, rather fine.....	25 - 45
Blue gumbo.....	45 - 85
Blue quicksand.....	85 -130
Blue clay filled with small white shells.....	130 -152
Blue quicksand.....	152 -172
Blue gumbo, very tough.....	172 -233
Blue sand, fine grained, with black specks; first indication of oil.....	233 -239
Sand with some clay.....	239 -378
Blue sand, coarse, with black specks; some oil near bottom.....	378 -423
Blue clay with some small shells.....	423 -465
Coarse blue sand with black specks.....	465 -500
Blue sand with some brown layers, contains iron pyrite and some small shells.....	500 -530
Soft blue clay with small shells.....	530 -535
Blue clay with larger shells.....	535 -555
Blue clay with few shells.....	555 -580
Blue gumbo, very tough; shells.....	580 -595
Tough blue clay with few shells.....	595 -628
Blue sand with gravel and some shells.....	628 -632½
Blue sand with coarse black particles.....	632½ -642½
Blue clay with large shells.....	642½ -654
Blue clay with shell fragments.....	654 -674

	Feet.
Blue sand, gravel with black particles; considerable gas.....	674 -684
Blue sand with many black particles; good show of oil from 688 to 692 feet.....	684 -692
Bluish sand, coarse; shows oil saturation.....	692 -711
Tough blue clay containing shells.....	711 -720
Tough blue gumbo containing boulders.....	720 -722
Blue clay and sand; show of oil.....	722 -728
Blue clay with thin layers of sandstone.....	728 -735
Tough blue gumbo.....	735 -755
Blue gumbo with thin layers of sandstone and limestone.....	755 -778
Blue sand with iron pyrites; some show of oil at 778 feet.....	778 -783
Tough blue gumbo with thin layers of sandstone and limestone; considerable iron pyrites.....	783 -786
Blue gumbo with shells.....	786 -793
Sand with iron pyrites; "oil show".....	793 -794
Tough blue gumbo.....	794 -799
Very hard blue clay with rock 2 to 6 feet thick, mostly limestone.	799 -825

FORT BEND COUNTY.

Shallow wells.—Water in sufficient quantity for ordinary domestic purposes is obtained throughout Fort Bend County at depths of 15 to 40 feet.

Deep wells.—A few deep pump wells have been sunk. Two on the Cunningham farm near Sugar Land are 1,000 feet deep. The town of Richmond derives its water supply from a pump well 400 feet deep. The following is a list of some of the deeper wells in this region.

Deep wells in Fort Bend County.

Owner.	Depth.	Capacity.	Location.
	<i>Feet.</i>	<i>Gallons.</i>	
T. W. House.....	925	60	Arcola, 2 miles southwest.
Do.....	1,000	60	
City waterworks.....	400		Richmond.
Cunningham farm.....	1,000		Sugar Land.
Do.....	1,000		Do.

HARRIS COUNTY.

Shallow wells.—Good shallow wells have been bored in Harris County, at Clodine, Erin, Katy, and Deepwater, and it is believed that wells of this character may be obtained throughout the county. In the vicinity of Clodine, on the rice farms of the Meadow Brook Company, the wells are generally 150 feet deep and 10 inches in diameter, the water rising within 15 to 20 feet of the surface. Wells on the J. H. O'Donnell farm, at Erin, are less than 100 feet deep and penetrate 46 feet of water-bearing sand. At Katy the two wells of J. E. Cabaniss are 93 and 94 feet deep.

Artesian wells.—There are about 140 artesian wells in Harris County, 80 of these being at Houston, where the artesian water resources have been better developed than in any other part of the

State. The city water supply of Houston is derived from 60 artesian wells which have been drilled in an area of 14 acres lying on either side of Buffalo Bayou. The general distribution of these and other artesian wells in Harris County is shown in Pl. II (p. 2), and the following tables contain all available information concerning them:

Artesian wells in Harris County.

Owner.	Depth.	Flow per minute.	Diameter.	Location.
	<i>Feet.</i>	<i>Gallons.</i>	<i>Inches.</i>	
A. L. Smith.....	570	Flows.	.....	Webster, 1 mile south.
H. D. T. Wilson.....	520	Flows.	.....	Webster.
S. Seibara.....	670	Flows.	.....	Webster, $\frac{1}{4}$ mile east.
S. T. Nishimura.....	475	Flows.	.....	Webster, 3 miles northeast.
L. Onisha.....	615	Flows.	.....	Webster, 1 mile north.
R. Onisha.....	470	Flows.	.....	Do.
R. Bruce.....	500	Flows.	.....	Webster, 3 miles east.
J. A. Caplen.....	450	Flows.	.....	Webster, $\frac{1}{4}$ mile northeast.
Railroad Co.....	650	Flows.	.....	Genoa.
City.....	600	Flows.	.....	Do.
H. Bohlen.....	90	Flows.	.....	Genoa, 2 miles north.
Sam Allen.....	250	Flows.	.....	Genoa, 2 miles south.
Do.....	250	Flows.	.....	Genoa, 4 miles south.
Col. Burnett.....	700	Flows.	3	Genoa.
Van Meter.....	300	Flows.	.....	Genoa, 1 mile south.
H. D. Allen.....	660	Flows.	.....	Seabrook, 3 miles northeast.
J. G. Todd.....	640	Flows.	.....	Seabrook, $1\frac{1}{4}$ miles north-east.
Alf Palm.....	670	70	3	Seabrook, $\frac{1}{2}$ mile northeast
City.....	660	Flows.	.....	Seabrook.
Townsite Co. (4 wells).....	440-500	Flows.	3	La Porte.
Clark & Co.....	440	350	6	Do.
Tom Jennings.....	380	170	4	I. a Porte, Spillway Island.
Galveston, Houston and Northern R. R.....	450	Flows.	.....	Strange.
Do.....	450	Flows.	.....	Do.
Tud Allen.....	.....	Flows.	.....	Morgan Point.
N. A. Baker.....	440	Flows.	.....	Do.
Q. A. Wooster.....	217	Flows.	.....	Wooster, 1 mile west.
W. E. Jones.....	330	Flows.	.....	Deepwater.
Do.....	340	Flows.	.....	Deepwater, 1 mile north.
Do.....	340	Flows.	.....	Deepwater, $1\frac{1}{2}$ miles north.
Do.....	340	Flows.	.....	Deepwater, 2 miles north.
Do.....	330	Flows.	.....	Deepwater, 1 mile south-east.
Col. Hill.....	230	Flows.	.....	Deepwater, 1 mile north-east.
Wright.....	300	Flows.	.....	Deepwater, 2 miles north-west.
L. Zlemke.....	300	Flows.	.....	Do.
P. H. West.....	344	Flows.	.....	Deerspark.
A. G. Howell.....	324	Flows.	.....	Do.
Southern Pacific R. R.....	330	Flows.	.....	Do.
Public well.....	290	Flows.	.....	Pasadena.
H. E. Halladay.....	310	Flows.	.....	Do.
Dr. McNyder.....	180	Flows.	.....	Do.
I. L. Pitts.....	210	Flows.	.....	Do.
Chas. D. Allen.....	659	100	.....	Harrisburg, 1 mile east.
M. Davidson.....	500	Flows.	.....	Alameda, 1.5 miles north.
G. Dogg.....	450	Flows.	.....	Alameda, 3.5 miles east.
F. B. Markley.....	65	Flows.	.....	Aldine, $\frac{1}{2}$ mile northeast.
Kellogg.....	400	Flows.	.....	Aldine, 4 miles southeast.
C. W. Hahl.....	240	Flows.	.....	Aldine, 5 miles northwest.
Do.....	280	Flows.	.....	Aldine, 4 miles west.
B. F. Smith.....	88	Flows.	.....	Barker, 2 miles south
Fort Smith.....	180	Flows.	.....	Addicks, 3 miles southwest.
H. F. V. Blender.....	500	Flows.	.....	Humble.
Magnolia Brewery Co.....	150	35	.....	Houston.
Do.....	300	209	.....	Do.
Do.....	200	104	.....	Do.
Do.....	500	249	.....	Do.
Do.....	500	250	.....	Do.
Do.....	500	490	.....	Do.
Do.....	800	Flows.	.....	Do.
American Brewery Co.....	180	.....	.....	Do.
Do.....	242	125	.....	Do.
Do.....	339	75	.....	Do.
Do.....	800	95	.....	Do.
Do.....	570	45	.....	Do.
Do.....	830	175	.....	Do.

Artesian wells of waterworks at Houston, Harris County.

No.	Depth.	Diam- eter.	No.	Depth.	Diam- eter.	No.	Depth.	Diam- eter.
	<i>Feet.</i>	<i>Inches.</i>		<i>Feet.</i>	<i>Inches.</i>		<i>Feet.</i>	<i>Inches.</i>
1.	140	15	20.	183½	4	38.	325	10
2.	140	6	21.	314	8	39.	684	12
3.	80	6	22.	703	8	40.	211	8
4.	140	15	23.	692	8	41.	319	8
5.	140	15	24.	192	6	42.	720	7
6.	140	15	25.	204	6	43.	806	8
7.	140	15	26.	802	8	44.	496	8
8.	154	6	27.	1,170	8	45.	800	8
9.	312	8	28.	814	8	46.	1,185	12
10.	328	6	29.	502	10	47.	2,018	-
11.	130	6	30.	1,165	12	48.	1,214	8
12.	328	4	31.	317	8	49.	1,305	8
13.	292	8	32.	319	12	50.	1,280	8
14.	292	8	33.	823	10	51.	936	8
15.	460	8	34.	1,185	9	52.	936	8
16.	460	6	35.	1,171	12	53.	501	8
17.	564	8	36.	292	8	54.	828	8
18.	115	6	36.	314	12	55.	635	8
19.	493	8	37.	1,173	12			

Record of well No. 28, Houston, Harris County.

	<i>Feet.</i>
Surface soil	0- 30
Clay	30- 44
Sand and rock	44- 74
Clay	74- 89
Sand and gravel	89- 93
White clay	93-137
Sand	137-210
Clay and gravel	210-290
White sand and gravel, water bearing; hard to finish	290-316
Clay and gravel	316-356
Red sand	356-393
Clay and gravel	393-456
White clay and gravel	456-496
Sand, clay, and gravel	496-514
Sand	514-526
Gravel	526-532
Clay	532-570
Limestone	570-571
Sand and gravel	571-585
Clay	585-600
Hard rock	600-602
Clay	602-608
Sand	608-618
Clay	618-658
Clay and gravel	658-668
Sand	668-678
Clay and sand	678-687
Sand	687-705
Clay and gravel	705-745
Sand	745-756
White clay	756-772
Water-bearing sand	772-814

Record of deep well at Houston, Harris County.

	Feet.	
Clay and sand	0	154
Sand, water bearing	154	161
Clay	161	163
Sand	163	210
Clay	210	280
Sand	280	312
Clay	312	345
Rock	345	345½
Sand	345½	350
Clay	350	415
Sand	415	420
Clay	420	465
Sand	465	502
Clay	502	540
Sand	540	570
Clay	570	605
Sand and gravel	605	643
Clay	643	670
Sand and gravel	670	702
Clay	702	745
Sand	745	769
Clay	769	779
Sand	779	805
Clay	805	810
Sand	810	835
Clay	835	895
Sand	895	940
Clay	940	-1, 134
Rock	1, 134	-1, 137
Sand	1, 137	-1, 179
Clay	1, 179	-1, 236
Sand	1, 236	-1, 314
Rock	1, 314	-1, 315
Clay	1, 315	-1, 334
Sand	1, 334	-1, 368
Clay	1, 368	-1, 430
Sand and gravel	1, 430	-1, 470
Clay and rock	1, 470	-1, 600
Rock with gas	1, 600	-1, 605
Clay	1, 605	-1, 895
Sand	1, 895	-1, 907
Clay	1, 907	-2, 025

GALVESTON COUNTY.

Shallow wells.—In Galveston County the average depth of shallow wells is 25 feet.

Artesian wells.—The log of the deep well at Galveston, bored about 1892, clearly indicates that artesian water could be found in the coast region at much shallower depths than that reached by this boring. The record down to the water-bearing sand is given below. There are at present about 90 artesian wells in Galveston County. Their

approximate location is shown in Pl. II. The most important group of these wells is located 18 miles from Galveston, at Alta Loma, where 30 wells have been drilled on both sides of the Santa Fe Railway track. The original contract for these wells specified that 33 wells should be bored and a supply of 5,000,000 gallons every twenty-four hours guaranteed. When 30 wells had been sunk, the yield was 9,000,000 gallons every twenty-four hours, 4,000,000 gallons more than the contract amount. The wells are located in a line that trends nearly north and south, and there are about an equal number on each side of the railroad track. They are provided with pipes that connect with mains to a standpipe on the north side of the track. The wells are about 868 feet deep, and all receive their water from a bed of water-bearing sand 128 feet thick, which rests upon a layer of hard clay. This water horizon was encountered in all wells at a depth of 740 to 750 feet, but some were not bored through the water-bearing sand. The following table shows the depths of wells on the south side of the railroad:

Partial list of wells at Alta Loma, Galveston County.

No.	Depth.	Dia- meter.	No.	Depth.	Dia- meter.	No.	Depth.	Dia- meter.
	<i>Feet.</i>	<i>Inches.</i>		<i>Feet.</i>	<i>Inches.</i>		<i>Feet.</i>	<i>Inches.</i>
2.....	792	7	12.....	788	5	22.....	726	5
4.....	868	7	14.....	800	5	24.....	733	5
6.....	793	7	16.....	838	5	26.....	745	9
8.....	809	5	18.....	790	5			
10.....	792	5	20.....	775	5			

Record of well at Alta Loma, Galveston County.^a

	<i>Feet.</i>
Surface soil.....	0- 4
Clay.....	4- 12
Quicksand.....	12- 18
Very red clay.....	18- 25
Red quicksand.....	25- 35
Clay.....	35- 37
Quicksand.....	37- 40
Red and white clay.....	40-100
Sand, water bearing; no flow.....	100-123
White clay.....	123-150
Red clay.....	150-173
Very hard red clay.....	173-190
Hard and soft clay.....	190-208
Soft red clay.....	208-218
Hard clay.....	218-230
Quicksand.....	230-385
Hard and soft white clay.....	385-435
Soft white clay.....	435-478
White sand and clay.....	478-488
Very hard shell rock.....	488-489
White water-bearing sand; first flow.....	489-494

^a Information furnished by E. H. Stobard.

	Feet.
Hard white clay.....	494-500
Soft white clay.....	500-514
Hard and soft white clay.....	514-560
Hard white clay.....	560-590
Quicksand.....	590-611
Hard clay.....	611-620
Soft clay.....	620-631
Hard and soft clay.....	631-703
Sand and clay.....	703-735
Hard white clay.....	735-740
Sand, water bearing.....	740-868
Hard red clay.....	868-

Artesian wells in Galveston County.

Owner.	Depth.	Flow per minute.	Diameter.	Location.
	<i>Feet.</i>	<i>Gallons.</i>	<i>Inches.</i>	
D. Collogue.....	640	200		Dickinson.
W. H. Crawford.....	675	(a)	8	Dickinson, 1 mile east.
J. D. Ward.....	700		6	Dickinson, 2½ miles east.
C. C. Pellit.....	620	4	6	Dickinson, 2 miles east.
F. Font.....	600	10	6	Dickinson, 2 miles south.
John Williams.....	750	(b)	6	Dickinson, 2 miles north.
Sam Saloets.....	550	2		Dickinson, ½ mile northeast.
Charles Engelke.....	700	(a)		Dickinson, ½ miles east.
Mick Weeks.....	675	100		Dickinson, ¼ mile south west.
Joe Lohit.....	640	100		Dickinson.
Do.....	640	100		Do.
Do.....	640	100		Do.
Charles Nolan.....	600			Dickinson, 1 mile south.
Do.....	650			Dickinson, 2½ miles south.
C. H. Collier.....				Dickinson, ¼ mile south.
Nicolini.....	640			
R. A. Walker.....	750	40		League City.
A. W. Wilkerson.....	550	40		Do.
Do.....	530	40		Do.
J. C. League.....	526	40		Do.
C. R. Reffel.....	562	25		Do.
Do.....	410	25		Do.
Mrs. L. Cours.....	420	20		Do.
Mrs. R. T. Wheeler.....	690	57	2	Hitchcock, ¾ mile east.
Do.....	763	80	3	Hitchcock, ¼ mile north.
A. H. Tacquard.....	406	80	4½	Hitchcock, 8 miles west.
Do.....	300	25	3	Hitchcock, 7 miles west.
Do.....	306	30	2	Hitchcock, 6 miles west.
Do.....	60	10	2	Hitchcock, 7 miles west.
Do.....	88	12	2	Hitchcock, 8 miles west.
Do.....	88	12	2	Do.
Jacques Tacquard.....	763	25	3	Do.
Do.....	180	15	2	Do.
A. H. Tacquard (home).....	710	100	3	Hitchcock, 1½ miles west.
A. H. Tacquard (pasture).....	720	80	3	Hitchcock, 2 miles south-west.
Jules Perthuis.....	230	25	3	Hitchcock, 2 miles east.
Do.....	495	65	3	Do.
W. F. Reitmeyer.....	433	10	2	Hitchcock, 1½ miles west.
Do.....	420	80	3	Do.
J. Jinsen.....	500	48	3	Hitchcock, 1 mile east.
J. A. Minot.....	763	64	2	Hitchcock, ½ mile south.
David Tahy.....	576	68	3	Hitchcock, 1½ miles east.
B. F. Fast.....	702	120	3	Hitchcock, 2½ miles west.
Gulf, Colorado and Santa Fe R. R.....	720	78	3	Hitchcock, 100 yards east.
J. H. Kemper.....	600	60	3	Hitchcock, 1 mile east.
Alta Loma Co.....	914	40	3	Hitchcock, 4 miles north-west.
Galveston, Houston and Henderson R. R.....	867	700	10	Hitchcock, 4 miles east, at La Marque.
W. McClintoc.....	630	50	4	Bay View.
Galveston, Houston and Northern R. R.....	600	55	3	Edgewater.
J. R. Myers.....	725	70	4½	Texas City.
Inman Compress Co.....	912	70	4½	Do.
South Galveston Land Co.....	640	40	3	Middle of island.
Do.....	644	40	3	Do.
Galveston Brewing Co.....	872	Flows.	8	

^a Water rises 10 feet above surface.^b Water rises 8 feet above surface.

Record of deep well at Galveston.

Pleistocene:	Feet.
Gray to buff sand.....	0- 46
Reddish-brown clay containing lenses of sandstone, quartz pebbles, nodules of dark-gray clay, and shell fragments.....	46- 63
Mottled red and blue clay containing shell fragments and in lower part lignitic material.....	63-100
Gray sandy clay.....	100-110
Fine gray sand with fragments of lignite.....	110-167
Buff-colored sandy clay.....	167-279
Fine gray sand with fragments of lignite.....	279-305
Grayish-brown clay with fragments of lignite.....	305-315
Fine sand, gray to buff, with fragments of lignite throughout bed and lower 35 feet slightly micaceous.....	315-440
Grayish-brown clay with fragments of lignite, shells, corals, and claw of crustacean.....	440-458
Age doubtful:	
Gray sandy clay, slightly micaceous.....	458-468
Brownish-gray sandy clay.....	468-497
Fine light-gray clayey sand, micaceous.....	497-575
Brownish-gray sandy clay.....	575-592
Gray sand, micaceous.....	592-612
Brownish sandy clay with shell fragments.....	612-647
Light-gray sandy clay.....	647-674
Reddish-brown sandy clay with shell fragments.....	674-706
Buff-colored sand, slightly micaceous.....	706-720
Brownish-gray clayey sand.....	720-737
Light-gray clayey sand, the lower 11 feet containing a few shell fragments and large pieces of lignite.....	737-827
Coarse silver-gray sand, composed of angular fragments of translucent and smoky quartz not much water-worn (the water-bearing sand from which most of the city's water supply was derived previous to the utilization of the Alta Loma wells)...	827-882

This well was drilled to a depth of 3,070 feet, but practically no water-bearing sand of importance was found below 882 feet. The complete record is published in the Twenty-first Annual Report of the U. S. Geological Survey, part 7, pages 402-405.

CHAMBERS COUNTY.

Shallow wells.—Beneath the surface soil in Chambers County there is a bed of sand which extends to a depth of 30 feet or more. In its lower part this sand contains an abundance of excellent water which is the source of supply for all shallow wells in the region.

Artesian wells.—There are 17 artesian wells in Chambers County and their approximate location is indicated in Pl. II. At many places artesian water has been obtained, but it is salty in many cases, especially in wells near the bay.

Artesian wells in Chambers County.

Owner.	Depth.	Flow per minute.	Location.
	<i>Feet.</i>	<i>Gallons.</i>	
E. W. Barber.....	800	Flows.	Mount Belvieu.
Mat Fisher.....	550	Flows.	Mount Belvieu, 10 miles south.
J. C. Fisher (estimate) ^a	500	Flows.	Cedar Bayou.
Dr. N. Schilling.....	700	Flows.	Do.
Do.....	700	Flows.	Do.
Barney Donelly.....	375	Flows.	Mount Belvieu, 3 miles south.
Amos Lawrence.....	500	Flows.	Mount Belvieu, 5 miles south.
C. R. Cummings Co.....	400	Flows.	Anahuac, 4 miles north.
Do.....	400	Flows.	Do.
John Cook.....	380	Flows.	Wallisville.
W. D. Wilcox.....	850	35	Anahuac, Turtle Bayou.
J. T. White ^a	1,720	Flows.	
D. L. Broussard.....	850	100	Double Bayou.
Sol. Brown.....	800	100	Do.
Hugh Jackson.....	100	100	Double Bayou, 15 miles southeast.
James Jackson.....	1,000	100	Double Bayou, 15 miles northeast.
Davidson.....	600	100	Near Stowell.

^a Water salty.**JEFFERSON COUNTY.**

Shallow wells.—The wells of Jefferson County are very shallow, ranging from 6 to 15 feet in depth. Many of those 6 feet deep furnish an abundance of water.

Artesian wells.—Information has been obtained of about 31 artesian wells in this county, but such wells are not generally successful. Many of them have feeble flows, making it necessary to employ pumps to increase the discharge, while in other cases, where the flows are sufficiently large, the water is more or less salty. A large number of wells have been drilled for oil in the vicinity of Spindletop, south of Beaumont. The following is a list of artesian wells in Jefferson County, with other data concerning them. A record of the Stribling well is also given.

Artesian wells in Jefferson County.

Owner.	Depth.	Flow per minute.	Location.
	<i>Feet.</i>	<i>Gallons.</i>	
W. C. Tyrrell.....	180	Slight.	
H. De Mondrot.....	430	25	
Port Arthur.....	450	40	
McKinney.....	620	Slight.	
Jefferson Rice Co.....	530	Slight.	
Jes Garland.....	450	65	
J. W. Denny.....	260	Slight.	
H. C. Wheeler (5 wells).....	230	Slight.	Hampshire, 1½ miles south.
D. N. Coffol.....	306	25	
A. J. Snouffer.....	180	25	Hampshire, 1½ miles north.
Do.....	200	25	
C. T. Heisig.....	230	Slight.	
Do.....	180	No flow.	
Do.....	150	No flow.	
Doctor Price.....	190	Slight.	
H. Aldridge.....	135	Slight.	
Geo. J. McManis.....	180	20	Stowell, 2 miles east.
H. Aldridge.....	135	Slight.	
Geo. J. McManis.....	178	20	
Do.....	267	20	
Do.....	180	20	
Do.....	653	45	
R. P. Carroll.....	280	25	
Court-house ^a	745	30	
Natatorium ^b	796	150	Port Arthur.
Hotel ^b	1,065	100	Sabine Pass.
J. F. Keith ^c	534	10	Beaumont.

^a Diameter, 3 inches.^b Diameter, 4½ inches.^c Diameter, 6 inches.

Record of Stribling well, Sabine Pass, Jefferson County.

	Feet.	
Red clay.....	0-	16
Red sand.....	16-	20
Red clay.....	20-	60
White sand.....	60-	80
Red clay.....	80-	140
Coarse sand.....	140-	170
Blue clay.....	170-	185
White sand.....	185-	220
Soft blue clay.....	220-	236
Fine white sand.....	236-	250
Hard blue clay.....	250-	260
White sand.....	260-	270
Blue clay.....	270-	355
White sand.....	355-	426
Blue clay.....	426-	442
Interbedded sand and clay.....	442-	500
White sand.....	500-	600
White sand with gravel at bottom.....	600-	636
Blue clay with streaks of sand.....	636-	740
Sand.....	740-	764
Sand and coarse gravel, all colors.....	764-	795
Hard sandstone.....	795-	796
Blue shale.....	796-	854
Hard sandstone.....	854-	855½
Blue shale.....	855½-	892
Sandstone.....	892-	893
Fine white sand.....	893-	960
Soft blue clay.....	960-	1,000
Fine white sand.....	1,000-	1,260
Blue and white shale.....	1,260-	1,270
Fine white sand.....	1,270-	1,360
White and blue clays.....	1,360-	1,450
White sand.....	1,450-	1,490
Solid white and blue shale.....	1,490-	1,500

ORANGE COUNTY.

Shallow wells.—The deepest of the shallow wells of Orange County are about 22 feet in depth, and a large supply of water is usually obtained.

Artesian wells.—There are a few artesian wells at Orange, varying in depth from 400 to 800 feet. Their flows are moderate, but few exceeding 50 gallons a minute. A partial list of these wells is given below:

Artesian wells in Orange County.

Owner.	Depth.	Flow per minute.	Diameter.	Location.
	<i>Feet.</i>	<i>Gallons.</i>	<i>Inches.</i>	
J. W. Link.....	600	15		Orange.
Do.....	467	21	4	Do.
High school.....	467	22	3	Do.
Do.....	500	10		Do.
Electric-light plant.....	650			Do.
Ice plant.....	480	52	6	Do.
Sam Wilson.....	800	Slight.		Orange, 9 miles northwest.
W. A. Fletcher.....	740	60	6	8 miles from Beaumont.
Texas and New Orleans Railroad.....	396		8½	Echo.
Do.....	435	35	6	Echo, 1 mile from Sabine River.

ZAPATA COUNTY.

Shallow wells.—Shallow wells are difficult to obtain in the northern part of Zapata County. Near the Rio Grande and along the eastern part of the county water can be obtained at moderate depths, but in the lower lands the depths of the wells vary from 100 to 250 feet.

Artesian wells.—No information has been received concerning the artesian conditions of this county.

DUVAL COUNTY.

Shallow wells.—Wells in Duval County can be obtained at depths varying from 50 to 300 feet.

Artesian wells.—No artesian wells have been reported from Duval County. Artesian water is found, however, in the southern part of Nueces County, in the northeastern part of Starr County and at Bruniville, on the Texas and Mexican Railroad, in the eastern part of Webb County. The northern part of Duval County lies between two artesian districts; that at Kingsville, Nueces County, and that at Artesia, Lasalle County. Artesian water is also obtained in the region about 30 miles north of the northern boundary of Duval County.

LIVE OAK COUNTY.

Shallow wells.—Shallow-well water is obtained in the southern and eastern parts of Live Oak County, at depths of 100 to 120 feet; in the western part at about 200 feet, and in the northern part at 300 feet.

Artesian wells.—Artesian water is found in the northern part of this county. The following table gives a list of the artesian wells:

Artesian wells in Live Oak County.

Owner.	Depth.	Flow.	Location.
	<i>Feet.</i>		
Geo. W. West.....	155	Slight ..	Oakville, 13 miles northwest.
Do.....	226	Slight ..	
Thos. R. T. North.....	375	Small...	Oakville.
C. T. Tom.....	450	(a)	Oakville. 18 miles north-west.
Mrs. B. McGloin.....	150	Flows ..	Near Mikeska.

a Water at 6 feet below surface.

BEE COUNTY.

Shallow wells.—In the northern and southern parts of Bee County wells have an average depth of about 40 feet, in the eastern part about 70 feet, and in the western part about 100 feet.

Artesian wells.—No information has been obtained regarding the artesian condition of this county. There are at present no artesian wells in Bee County.

GOLIAD COUNTY.

Shallow wells.—In Goliad County water is found in shallow wells at depths varying from 50 to 125 feet.

Artesian wells.—There are no artesian wells in this county. On the ranch of T. M. O'Connor, 6 miles south and 20 miles east of Goliad, on the head of Little Carco Creek, a boring was made to a depth of 1,446 feet, but no artesian water was obtained.

KARNES COUNTY.

Shallow wells.—In Karnes County a good supply of water is obtained from shallow wells having the following average depths: In the northern part, 60 feet; in the eastern part, 80 feet; in the southern part, 90 feet; in the western part, 120 feet.

Artesian wells.—There are at present no artesian wells in Karnes County. At Karnes City a test well was sunk to a depth of 1,800 feet, but no artesian water was found. It is possible that more extensive prospecting in other parts of the county may result in the discovery of flows at shallower depths.

DEWITT COUNTY.

Shallow wells.—Throughout Dewitt County shallow wells are obtained at an average depth of about 55 feet. The principal water supply appears to lie in sheets, so that the depths of the wells vary according to the elevation of the surface.

Artesian wells.—The only artesian water thus far obtained in Dewitt County is at Yorktown and Yoakum. At Yorktown there were formerly 8 or 10 small artesian wells, flowing 5 gallons a minute and varying in depth from 50 to 60 feet, but at present only two of these flow, the others having been allowed to cave in or to become choked with sand at the bottom. The two wells which continue to flow are in the bed of Yorktown Creek. Many of the wells in the town show a strong artesian tendency, the water rising within 10 feet of the surface. At Yoakum several deep wells have been drilled and in nearly every case the water rises within a few feet of the surface, but no wells are recorded in which flows were obtained. In the deepest well, 1,300 feet deep, the water is soft, relatively pure, and admirably suited for general domestic uses. It is noncorrosive and well adapted to boiler purposes. According to some analyses it contains only 42 grains of solid matter per gallon and no organic matter.

Record of H. G. Brown's artesian well, 7½ miles southwest of Cuero, Dewitt County.

	Feet.
Red and yellow clay, with cobblestone.....	0 - 60
Hard rock, fine grained.....	60 - 120
Water-bearing sand.....	120 - 121
Gravel and clay, hardpan.....	121 - 181
Very hard gritty rock.....	181 - 202
Sandstone.....	202 - 365
Yellow clay and hard rock.....	365 - 490
Sand, water bearing.....	490 - 690½
Stratified rock.....	690½ - 710
Red, white, and blue clay.....	710 - 805
"Talc," with an occasional layer of red and blue clay.....	805 -1,050
Pale-blue "talc;" strong indications of water.....	1,050 -1,100
Clear glassy rock, soluble in acid; slacks if exposed to the air..	1,100 -1,130

GONZALES COUNTY.

Shallow wells.—The shallow wells of Gonzales County show considerable variation in depth, ranging from 20 to 80 feet.

Artesian wells.—In the western part of Gonzales County the artesian water resources have been extensively developed. There are 125 artesian wells in the vicinity of Leesville, Rancho, and Wrightsboro. They vary considerably in depth, ranging from 100 to 700 feet, and their maximum flow is 100 gallons a minute. The average flow, however, is much less than this, as shown in the following table, which contains a partial list of these wells, with their depth, flow, and approximate location.

Artesian wells in Gonzales County.

Post-office and owner.	Distance and direction from post-office.	Depth.	Flow per minute.
Wrightsboro:			
J. G. Barnett	2 miles southwest	Feet. 640	Gallons. 40
R. R. Hinton	1½ miles northwest	420	10
W. T. Mahon	2 miles west	363	25
Do.	2½ miles northwest	400±	0
W. B. Houston	3 miles southwest	316	10
Do.	do.	408	36
H. G. Barnett	3 miles northwest	347	0
J. D. Tankersley	¾ mile northeast	269	20+
Dewet:			
J. D. Tankersley	1 mile northeast	290±	10+
W. L. Caraway	100 yards south	313	5+
Do.	½ mile southeast	200±	3+
J. R. Keadings	do.	311	5
John Worthy	¾ mile west	528	7
F. M. Caraway	1½ miles northeast	500±	5
John Caraway	1½ miles northeast	260±	5
M. V. Caraway	1 mile southwest	300±	6
Albert Tankersley	¾ mile northeast	268±	15
E. O. Perkins	¾ mile south	231	6
Leesville:			
Jay Mahan ^a	3 miles southeast	222	6
Do.	do.	527	5
W. F. McGlasson ^b	do.	176	4
C. C. Littlefield	1½ miles south	600±	2
Do.	2 miles northwest	360±	50
Do.	3 miles west-northwest	350±	75
Do.	2 miles west	212	25
Do.	1½ miles northwest	284	5
Do.	2 miles west	216	30
John Bratton	¾ mile southwest	470±	0
Do.	1 mile south	250±	10
Jno. Glazier	¾ mile southwest	448	10-
F. C. Baker	1 mile northeast	500±	40
W. M. Carr	1½ miles north	439	20
Gus Scoffe	2½ miles north	400±	5
Otto McNemar	2 miles north	435	30
J. A. Williams	2½ miles north	480±	1
K. J. Hawkins	2 miles north-northeast	400±	5
J. E. Martin	1 mile southwest	290±	1
Davenport	4 miles west-northwest	250±	10
J. B. Wells	1½ miles north	185	5
Do.	3 miles northwest	200±	40
Do.	3+ miles northwest	180	5
Do. ^c	2 miles northwest	200±	50
Do. ^d	2½ miles northwest	200±	100
Do. ^e	2½ miles northwest	200	40
Do. ^f	1½ miles northwest	200	50
Do.	2½ miles north	250	5
Do. ^d	3½ miles north	350	100
Do.	3½ miles north	350	100
Do. ^e	3 miles north-northwest	200	50
Do.	do.	350	25
S. A. Brown	200 yards north	441	25
W. H. Brown	400 yards east	504	20
Do.	300 yards east	643	40
Do.	600 yards north	450	35
F. M. Caraway	50 yards west	460	40
J. G. McGuffin	250 yards southwest	143	5
S. A. Hubbard	150 yards southwest	160	10
Doctor Littlefield	75 yards south	166	15
Do.	50 yards west	160	15
Do.	750 yards south	490	30
J. P. Watkins	500 yards southwest	160±	7
I. A. Pruett	200 yards east	250±	6
Dr. J. M. Fly	100 yards northeast	170±	5
Do.	135 yards northeast	170±	5
A. B. Holmes	400 yards west	488	15
Geo. Brown	500 yards north	450±	8
Geo. Williams	350 yards west	200±	10
J. C. West	300 yards northeast	450	18
J. M. Caraway	200 yards northeast	170	5
Sol. Gordon	5 miles southwest	420	20
W. H. Brown	6 miles southwest	450	10
Gus Varner	6 miles west	350	7
Rancho:			
H. Wicke	¾ mile northeast	180	15
Do.	1 mile northeast	297	5
W. M. Mangum	¾ mile east	500	10
Do.	2 miles north	300	20

^a First water at 135 feet; second at 222.^b Four wells with 4-inch pipe casing.^c Casing, 3-inch pipe.^d First water.^e Casing, 6-inch pipe.^f Casing, 4-inch pipe.

Artesian wells in Gonzales County—Continued¹.

Post-office and owner.	Distance and direction from post-office.	Depth.	Flow per minute.
Rancho—Continued.		<i>Feet.</i>	<i>Gallons.</i>
W. M. Mangum	1 mile east-northeast	185	30
James Pace	3 miles east	360	5
Doctor Green	1½ miles northeast	420	20
Do.	do.	175	10
Do.	3 miles northeast	400	12
Do.	½ mile northeast	325	15
W. T. Davis	250 yards	509	10
W. J. New	200 yards east	450	6
I. W. Littleton	1 mile northwest	140	10
J. R. Murray	400 yards north	130	4
Paul Murray	1 mile north	180	10
Mrs. Murray	500 yards southeast	230	5
S. W. Magee	100 yards south	475	15
W. A. Williams	1½ miles north	300	5
G. P. McDonald	1½ miles north-northwest	280	5
J. T. Nixon	1 mile southwest	400	6
George McPeters	½ mile northwest	117	7
J. H. Patterson	1 mile east	270	10
Mrs. C. E. Hall	½ mile northeast	300	1
D. C. Hall	600 yards northeast	350	25
Do.	2½ miles northeast	450	10
Miller & Sayers	100 yards east	385	20
W. H. Magee	4½ miles east-northeast	430	15
F. Weinert	5 miles southwest	406	10
J. D. Houston	3½ miles south	420	15
J. L. Weber	4 miles southeast	537	3
Geo. Parks	3 miles southeast	531	40
Do.	4 miles southeast	505	30
Frank Clark	1½ miles east	400	7
W. B. Clark	1½ miles east	300	5
S. W. Fanning	2½ miles east-northeast	260	15
M. G. Fanning	3 miles east-northeast	225	13
Jeff Patterson	3½ miles east	337	6
Do.		450	25
		700	10

^a This well has two casings, one inside the other. The outer is 450 feet deep and furnishes salt water (25 gallons) and gas. The inner is 700 feet deep and furnishes good water.

The following is the record of a representative artesian well, situated on the Gentry ranch, on Sandy Fork of Peach Creek, 12 miles northeast of Gonzales.

Record of Charles Gentry's artesian well, Gonzales County.

	<i>Feet.</i>
Clay and flint boulders	0 - 45½
Rock	45½ - 46
Blue sand and clay	46 - 68
Blue clay, very little sand	68 - 157
Hard sandstone, fine grained (10 inches of water sand at this depth; trace of oil; lignite plentiful)	157 - 195
Sand, water and oil bearing	195 - 195½
White quartz	195½ - 196½
Sandstone, hard, fine grained (trace of oil)	196½ - 218
Blue clay	218 - 220
Sandstone (trace of oil)	220 - 222
Black clay, containing decayed wood	222 - 228
Sandstone (trace of oil)	228 - 263
Blue marl	263 - 285
Quartz	285 - 286
Blue marl, spongy	286 - 304
Shale with soft strata	304 - 321
Hard blue sandstone	321 - 339

	Feet.
Hard cement rock	339-378
Clay, sand, and shell	378-380
Rock	380-381
Clay, sand, and shell	381-383
Hard rock	383-384
Clay and sand (trace of oil)	384-405
Dark blue clay and sandstone	405-406
Clay and sand	406-410
Clay and shell	410-463
Clay, little shell; thin hard rock at intervals	463-501
Shells and clay	501-579
Clay and shell (water bearing)	579-708
Hard rock	708-709

LAVACA COUNTY.

Shallow wells.—An abundance of water is obtained in Lavaca County from wells which vary in depth from 30 to 40 feet.

Artesian wells.—A number of good artesian wells have been obtained in Hallettsville and the surrounding country. In the wells at Hallettsville two flows have been found, one at 300 feet and the other at 560 feet below the surface. The oil-mill well encountered the first flow at 320 feet, which furnished a supply of 45 gallons per minute, while the second flow at a depth of 560 feet furnished 88 gallons a minute. At Shiner a flowing well was obtained at a depth of 90 feet, which yielded 79 gallons a minute. The well was located on low ground and the water rose 6 feet above the surface. Several attempts to obtain water from this horizon on higher ground, in the vicinity of Shiner, have been unsuccessful, one boring being continued to a depth of 700 feet without striking a flow. The following is a list of the artesian wells in this county:

Artesian wells in Lavaca County.

Owner.	Depth.	Flow per minute.	Diameter.	Location.
	<i>Feet.</i>	<i>Gallons.</i>	<i>Inches.</i>	
City	600	30	4	Hallettsville.
Do.	560	89	4	Do.
Do.	325	45	4	Do.
Do.	980	140	4	Do.
Oil mill	560	30	4	Do.
Ice factory	340	30	.....
J. Keusler	768	.....	4	Breslau.
C. Pagelest	340	30	4	Hallettsville, 4 miles north.
Trautwine & Walters	90	25	4	Shiner.
Unknown	700	Failure.	.....	Do.
Oil Company	1,500	do.	.....	Hallettsville, 7 miles south-east.

FAYETTE COUNTY.

Shallow wells.—Water in sufficient quantity for general domestic purposes is found in the northern and western parts of Fayette County at average depths of 60 feet, in the southern part at depths of 75 to 100 feet, and in the eastern part at depths of 40 to 75 feet.

Artesian wells.—There are 20 artesian wells in this county, including a few deep ones; the area in which the greatest number has been drilled lies north of Engle. The average depth of these wells varies from 200 to 300 feet and the maximum flow is 100 gallons a minute. The following is a list of the wells, including their depth, flow, and other data:

Artesian wells in Fayette County.

Owner.	Depth.	Flow per minute.	Diameter.	Location.
	<i>Feet.</i>	<i>Gallons.</i>	<i>Inches.</i>	
John Sima.....	196	25	3	Praha.
Mrs. Vyvjala.....	216	15	3	Do.
Do.....	220	50	3	Do.
J. A. Drozd.....	210	10	3	Do.
J. Kalich.....	210	18	3	Engle, 2 miles northwest.
M. Schwenke.....	185	16	3	Do.
J. Sulak.....	165	10	3	Do.
J. Ladewig.....	200	10	2	Do.
Compress Co.....	260	a 40	6	Schulenburg.
C. Baumgartner.....	258	a 87	6	Do.
W. A. McKinsen.....	267	a 43	5	Do.
H. P. Schaeffer.....	300	a 79	3	Do.
G. Hoeffers.....	275	a 54	3	Do.
C. Blaschke.....	300	a 79	3	Do.
Southern Pacific R. R.....	762	(b)	10	Do.

^a No flow; water rises to number of feet stated below surface of ground.

^b Well caved in.

COLORADO COUNTY.

Shallow wells.—Shallow wells in Colorado County are about 40 feet deep in the northern and western parts, 35 feet in the southern part, and 30 feet in the eastern part. East of Eagle Lake there are a number of wells 30 to 35 feet deep, which furnish a large supply of good water. Two wells supply water for 100 acres of rice, each acre of which requires 9 gallons a minute, and it is generally believed that a good rice well can be obtained at moderate depths in this county at any point east of Eagle Lake.

Artesian wells.—So far as known the only artesian well in Colorado County is located on the west bank of Colorado River at Columbus. This well was bored by the city for water supply, and it has maintained a steady but small flow for years. The water contains a small amount of gas. The record of this well is given below:

Record of artesian well at Columbus, Colorado County.

	Feet.
Sand and gravel.....	0- 29
Soft rock.....	29- 37
Fine gravel.....	37- 41
Blue gravel.....	41- 54
Yellow clay.....	54- 99
Hard rock.....	99-101
Yellow clay.....	101-104
Conglomerate rock.....	104-110
Yellow clay.....	110-190
White sand, water bearing.....	190-198
Yellow clay.....	198-210
Hard boulders.....	210-212
Yellow clay.....	212-214
Red sandstone.....	214-220
Yellow clay.....	220-221
Soft rock.....	221-223
Yellow clay.....	223-226
Concrete rock.....	226-233
Light-red clay.....	233-280
Boulder bed.....	280-281
Yellow clay.....	281-283
Boulder rock.....	283-285
Yellow clay.....	285-289
Yellow sandstone.....	289-290
Yellow clay.....	290-302
Hard sandstone.....	302-304
White clay.....	304-309
Red sandstone.....	309-311
Light-yellow clay.....	311-319
Yellow sandstone.....	319-321
Yellow clay.....	321-412
Slate and clay.....	412-454
Red, white, and blue clay.....	454-583
Blue sand; flowing water, 8 gallons a minute.....	583-600
Hard blue clay.....	600-620
Fine blue sand; flowing gas.....	620-633
Shells and old logs.....	633-637
Blue clay.....	637-658
White pottery clay.....	658-675
Fine white sand; flowing water.....	675-683
Red and blue clay.....	683-730
Hard rock.....	730-739
Hard blue clay.....	739-793
Fine blue sand, hard.....	793-807
Fine rock (bored into 19 feet).	

AUSTIN COUNTY.

Shallow wells.—A good supply of water is obtained from shallow wells in the western part of Austin County at an average depth of 30 feet; in the southern part at 40 feet, in the eastern part at 60 feet, and in the northern part at about 50 feet.

Artesian wells.—No artesian wells have been reported from this county, although it is probable that they can be obtained along Brazos River.

WALLER COUNTY.

Shallow wells.—In Waller County shallow wells vary in depth from 35 to 50 feet.

Artesian wells.—Only a few artesian wells have been drilled in Waller County, the data of some of which are tabulated below. The most successful free-flowing wells are found near Brazos River.

Artesian wells in Waller County.

Owner.	Depth.	Flow per minute.	Diameter.	Location.
	<i>Feet.</i>	<i>Gallons.</i>	<i>Inches.</i>	
Waterworks	1,132	110	4½	Hempstead.
Heber Stone	485	40	1	Hempstead, 5 miles north-west.
Rufus Hardy	850	15	1	Hempstead, 6 miles south.
J. C. Ralston	1,700	.....	.....	Waller, 4 miles south.

WASHINGTON COUNTY.

Shallow wells.—A good supply of excellent water is obtained in Washington County, at various depths, ranging from 20 to 60 feet.

Artesian wells.—Only a few artesian wells have been drilled in this county, a list of which is given below. It is probable that artesian water can be found in the eastern part of the county, in the Brazos bottom lands, but owing to the excellent supply of water from non-flowing wells few attempts have been made to develop artesian water.

A few years ago Heber Stone had a well drilled in Brenham to a depth of 1,500 feet, but no flowing water was obtained. The water rose in the well within 40 feet of the surface, and it is believed that wells penetrating the same water horizon in the Brazos bottom lands would yield flows. The city of Brenham derives its water supply from wells between 300 and 400 feet deep. The following is a list of the artesian wells in this county.

Artesian wells in Washington County.

Owner.	Depth.	Flow.	Diameter.	Location.
	<i>Feet.</i>		<i>Inches.</i>	
J. Balbridge	640	Flows..	.....	Gaball, 300 yards northwest.
Robert Moore	340	Flows..	2	Old Washington.
Do.	700	Flows..	2	
J. P. Buchanan	500	Strong..	.....	Chapel Hill, 6 miles north-east.
John Carlisle	560	Flows..	.....	Chapel Hill, near.

GRIMES COUNTY.

Shallow wells.—Water from shallow wells is obtained in the eastern part of Grimes County at a depth of 30 feet; in the southern part, at 35 feet; in the western part, along the Navasota, at 30 feet, and in the northern part at depths of 50 to 60 feet.

Artesian wells.—Good artesian water is obtained in and around Navasota and between Navasota and Brazos River. The following table shows the artesian wells of Grimes County:

Artesian wells in Grimes County.

Owner.	Depth.	Flow per minute.	Diameter.	Location.
	<i>Feet.</i>	<i>Gallons.</i>	<i>Inches.</i>	
R. A. Sangster.....	300	60	2	Navasota.
A. J. Sangster.....	225	+15	.....	Navasota, $\frac{1}{4}$ mile south.
Ice factory.....	250	+20	6	Navasota.
Mrs. Lewis Wilson.....	224	.....	.....	Do.
August Horst.....	1,000	.....	.....	Do.
City waterworks.....	97	.....	.....	Do.
Shumaker.....	101	.....	.....	.....
J. M. McCord.....	850	Strong.	4	Courtney, $\frac{1}{4}$ mile southeast.
Do.....	900	Medium.	4	Courtney, $\frac{3}{8}$ mile east.

Record of Navasota well, Grimes County.

	<i>Feet.</i>
Soil.....	0- 2
Clay.....	2- 18
Sand.....	18- 29
Blue clay.....	29- 94
Slate.....	94-114
Blue clay.....	114-216
Rock.....	216-220
Water sand.....	220-237
Blue shale.....	237-277
Rock.....	277-280

Analysis of water from deep well at Navasota, Grimes County.^a

Parts per million.		Parts per million.	
Sodium (Na).....	140.0	Carbonate radicle (CO ₃).....	168.0
Magnesium (Mg).....	8.8	Sulphates of iron and aluminum...	15.0
Calcium (Ca).....	43.0	Organic matter.....	38.0
Chlorine (Cl).....	79.0		
Sulphate radicle (SO ₄).....	41.0		532.8

^a Expressed by analyst in grains per gallon and hypothetical combinations; recomputed to parts per million and ionic form at U. S. Geol. Survey.

LIBERTY COUNTY.

Shallow wells.—Water from shallow wells is secured throughout Liberty County at depths of 15 to 25 feet.

Artesian wells.—The Gulf, Colorado and Santa Fe Railroad has deep wells at Trinity River and Cleveland. Records of these wells and analyses of their waters are given below. The following table contains a list of flowing artesian wells drilled in Liberty County:

Flowing artesian wells in Liberty County.

Owner.	Depth.	Diameter.	Distance and direction from Liberty.
	<i>Feet.</i>	<i>Inches.</i>	
J. T. Russell.....	290	.....	$\frac{1}{2}$ mile south.
Do.....	300	.....	$\frac{1}{2}$ mile southeast.
Southern Pacific R. R.....	800	.....	300 yards southeast.
Fisher.....	150	.....	1 mile west.
Melon farm.....	240	.....	$\frac{1}{2}$ mile south.
Do.....	245	.....	Do.
Texas and New Orleans R. R.....	576	6	

Record of deep well at Trinity River, Liberty County.

	Feet. .
Red clay.....	0- 8
Sand.....	8- 38
Clay.....	38- 60
Rock and clay.....	60-104
Quicksand.....	104-117
Rock.....	117-119
Clay.....	119-121
Rock.....	121-133
Clay.....	133-145
Rock.....	145-151
Coarse sand.....	151-163
Soapstone.....	163-194
Rock.....	194-196
Sand.....	196-203
Rock.....	203-210
Clay.....	210-220
Rock.....	220-240
Water sand.....	240-290
Clay.....	290-300

Analysis of water from deep well at Trinity River, Liberty County.^a

Parts per million.		Parts per million.	
Sodium (Na).....	19.0	Carbonate radicle (CO ₃).....	7.0
Magnesium (Mg).....	4.4	Silica (SiO ₂).....	14.0
Calcium (Ca).....	38.0	Organic matter.....	50.0
Chlorine (Cl).....	16.0		
Sulphate radicle (SO ₄).....	20.0		305.4
Bicarbonate radicle (HCO ₃).....	137.0		

^a Expressed by analyst in grains per gallon and hypothetical combinations; recomputed to parts per million and ionic form at U. S. Geol. Survey.

Record of deep well at Cleveland, Liberty County.

	Feet.
Soil.....	0- 4
Yellow clay.....	4- 24
Yellow sand.....	24-100
Clay.....	100-108
Sand.....	108-131
Rock.....	131-132
Clay and coarse sand.....	132-140
White sand rock.....	140-142
Yellow clay.....	142-160
White sand rock.....	160-161
Yellow sand.....	161-165
White sand rock.....	165-166
Yellow clay.....	166-236
Sand.....	236-246
Clay.....	246-288
Open water sand.....	288-367
Rock.....	367-368

Analysis of water from deep well at Cleveland, Liberty County.^a

[Analyst, W. A. Powers.]

Parts per million.		Parts per million	
Silica (SiO ₂).....	27	Chlorine (Cl).....	9. 1
Calcium (Ca).....	43	Organic matter.....	32
Magnesium (Mg).....	30	Total solids.....	340
Sodium (Na).....	12		
Carbonate radicle (CO ₃).....	74	Free carbonic acid (CO ₂).....	17
Sulphate radicle (SO ₄).....	113	Carbonic acid combined as HCO ₃	63

MONTGOMERY COUNTY.

Shallow wells.—Shallow wells in Montgomery County vary in depth from 30 to 50 feet.

Artesian wells.—The Gulf, Colorado and Santa Fe Railroad has a deep well at Bobbin and an artesian well at Conroe. Records of these wells and analyses of their waters are given below.

Record of well at Bobbin, Montgomery County.

	Feet.
Soil.....	0- 2
Clay.....	2- 12
Sand.....	12- 28
Clay.....	28- 78
Quicksand.....	78- 90
Sandstone.....	90-101
Clay.....	101-114
Water sand.....	114-134
Clay.....	134-234
Sand.....	234-264
Rock.....	264-309
Clay.....	309-343

^a Expressed by analyst in grains per gallon and hypothetical combinations; recomputed to parts per million and ionic form at U. S. Geol. Survey.

	Feet.
Rock.....	343-347
Slate.....	347-383
Rock.....	383-390
Slate.....	390-454
Rock.....	454-457
Slate.....	457-480

Analysis of water from deep well at Bobbin, Montgomery County.^a

	Parts per million.		Parts per million.
Sodium (Na).....	90	Carbonate radicle (CO ₃).....	65
Magnesium (Mg).....	14	Silica (SiO ₂).....	27
Calcium (Ca).....	110	Sulphates of iron and aluminum ..	27
Chlorine (Cl).....	167	Organic matter.....	70
Sulphate radicle (SO ₄).....	11		
Bicarbonate radicle (HCO ₃).....	358		939

Record of well at Conroe, Montgomery County.

	Feet.
Red clay.....	0- 12
Rock.....	12- 13
Red clay.....	13- 69
Sand.....	69- 89
Red clay.....	89- 133
Hard yellow clay.....	133- 153
Joint clay.....	153- 182
Water sand.....	182- 193
Soft clay.....	193- 248
Hard clay.....	248- 265
Rock.....	265- 267
Hard clay.....	267- 280
Rock.....	280- 285
Dry sand bed.....	285- 297
Clay.....	297- 340
Rock.....	340- 343
Clay.....	343- 363
Rock.....	363- 365
Blue clay.....	365- 489
Light clay.....	489- 500
Soft clay.....	500- 575
Rock.....	575- 577
Water sand.....	577- 642
Blue clay.....	642- 680
Water sand.....	680- 740
Clay.....	740- 790
Soapstone.....	790- 831
Red clay.....	831- 888
Soapstone.....	888- 924
Clay.....	924- 976
Rock.....	976- 978
Clay.....	978-1, 003

^a Expressed by analyst in grains per gallon and hypothetical combinations; recomputed to parts per million and ionic form at U. S. Geol. Survey.

	Feet.
Rock.....	1, 003-1, 004
Sand.....	1, 004-1, 008
Red clay.....	1, 008-1, 033
Soapstone.....	1, 033-1, 073
Rock.....	1, 073-1, 075
Sand.....	1, 075-1, 125
Soapstone.....	1, 125-1, 169
Rock.....	1, 169-1, 170
Clay.....	1, 170-1, 190
Rock.....	1, 190-1, 192
Clay.....	1, 192-1, 212
Sand.....	1, 212-1, 234
Rock.....	1, 234-1, 236

Analysis of water from deep well at Conroe, Montgomery County. ^a

Parts per million.		Parts per million.	
Sodium (Na).....	41	Silica (SiO ₂).....	21
Magnesium (Mg).....	16	Organic matter.....	38
Calcium (Ca).....	73		
Chlorine (Cl).....	48		407
Carbonate radicle (CO ₃).....	170		

WALKER COUNTY.

Shallow wells.—Water is procured from shallow wells in Walker County at depths varying from 35 to 45 feet.

Artesian wells.—There are no artesian wells in Walker county, but it is believed that they could be obtained throughout its area. The numerous flowing streams in the county and the shallow depths at which nonflowing wells may be obtained have decreased the demand for artesian water.

SAN JACINTO COUNTY.

Shallow wells.—In San Jacinto County shallow wells vary in depth from 35 to 60 feet.

Artesian wells.—There are no artesian wells in this county. At Oakhurst, 7 miles east of Dodge, a well was drilled to a depth of 1,052 feet, penetrating hard rock the greater part of the distance, but no flowing water was obtained. It is generally believed that the prospects for artesian water in this region are very poor.

POLK COUNTY.

Shallow wells.—The average depth of shallow wells in Polk County is 30 feet.

Artesian wells.—There is little demand for artesian water in Polk County, owing to the numerous small flowing streams and the shallow depths at which nonflowing wells may be obtained.

^a Expressed by analyst in grains per gallon and hypothetical combinations; recomputed to parts per million and ionic form at U. S. Geol. Survey

HARDIN COUNTY.

Shallow wells.—The shallow wells of Hardin County vary in depth from 15 to 30 feet. The county is well drained by the small flowing streams that empty into Neches River or Pine Island Bayou.

Artesian wells.—In this county there is little need for artesian water and consequently no artesian wells have been drilled. Deep wells are owned by the Santa Fe Railroad at Silsbee, Dies (Kountze post-office), and Votaw. Records of these wells and analyses of their waters are given below.

Record of well at Silsbee, Hardin County.

	Feet.
Clay and sand.....	0- 88
Sand.....	88-288
Blue sand.....	288-374
Yellow clay.....	374-392
Water sand.....	392-466
Clay.....	466-468

Analysis of water from deep well at Silsbee, Hardin County.^a

Parts per million.		Parts per million.	
Sodium (Na).....	24.0	Carbonate radicle (CO ₃).....	9.5
Magnesium (Mg).....	5.9	Silica (SiO ₂).....	19.0
Calcium (Ca).....	36.0	Organic matter.....	44.0
Chlorine (Cl).....	26.0		
Sulphate radicle (SO ₄).....	15.0		315.4
Bicarbonate radicle (HCO ₃).....	136.0		

Record of deep well at Dies, Hardin County.^a

	Feet.
Soil.....	0- 3
Clay.....	3- 18
Dry sand.....	18- 66
Dark clay.....	66- 75
Water sand.....	75-268

Analysis of water from deep well at Dies, Hardin County.^a

Parts per million.		Parts per million.	
Sodium (Na).....	33.0	Silica (SiO ₂).....	45.0
Calcium (Ca).....	59.0	Sulphates of iron and aluminum... ..	7.2
Chlorine (Cl).....	62.0	Organic matter.....	37.0
Sulphate radicle (SO ₄).....	2.2		
Carbonate radicle (CO ₃).....	79.0		324.4

^a Expressed by analyst in grains per gallon and hypothetical combinations; recomputed to parts per million and ionic form at U. S. Geol. Survey.

Record of well at Votaw, Hardin County.

	Feet.
Clay	0-18
Sand	18-168
Coarse sand	168-203
Fine sand	203-226
Coarse sand	226-260
Clay	260 265
Open water sand	265-320
Clay	320-354
Rock	354-355

Analysis of water from deep well at Votaw, Hardin County.^a

Parts per million.		Parts per million.	
Sodium (Na)	2.7	Sulphates of iron and aluminum ..	10.0
Calcium (Ca)	13.0	Organic matter	39.0
Sulphate radicle (SO ₄)	5.8		
Carbonate radicle (CO ₃)	19.0		111.5
Silica (SiO ₂)	22.0		

TYLER COUNTY.

Shallow wells.—In the southern part of Tyler County the wells are about 20 feet deep, in the eastern part about 25 feet, in the northern part about 80 feet, and in the western part about 65 feet.

Artesian wells.—No attempts to obtain artesian water have been made in this county, but an oil well was drilled near Woodville to a depth of 933 feet without finding artesian water.

JASPER COUNTY.

Shallow wells.—Shallow wells in Jasper County vary in depth from 20 to 50 feet.

Artesian wells.—So far only three artesian wells have been reported from this county, and these are all located on the ranch of Wiess & Sanders, near Wiess Bluff, in the southern part of the county. Various data concerning these wells are given below. There is a deep well at Kirbyville, a record of which follows, also an analysis of its water.

Artesian wells in Jasper County.

Owner.	Depth.	Flow per minute.	Location.
	<i>Fect.</i>	<i>Gallons.</i>	
Wiess & Sanders	1,062	.....	Wiess Bluff, 2½ miles north 6° east.
Do.	1,054	45	3 miles north 8° east.
Do.	1,070	60	2½ miles north 7° east.

^a Expressed by analyst in grains per gallon and hypothetical combinations; recomputed to parts per million and ionic form at U. S. Geological Survey.

Record of Wiess & Sanders artesian well No. 1, Jasper County.^a

	Feet.
Fine sandy loam.....	0- 2
Red clay.....	2- 25
White sand.....	25- 75
Yellow clay.....	75- 96
Fine blue sand.....	96- 129
Yellow clay.....	129- 156
White sand.....	156- 173
Yellow clay.....	173- 225
Fine blue sand.....	225- 252
Hard yellow clay.....	252- 386
White sand.....	386- 476
Blue clay.....	476- 547
Blue sand.....	547- 569
Hard blue clay.....	569- 579
Coarse white sand.....	579- 628
Blue clay.....	628- 646
Fine blue clay.....	646- 676
Hard blue clay.....	676- 695
Coarse white sand.....	695- 750
Hard blue clay.....	750- 759
Soft blue clay.....	759- 784
White sand.....	784- 794
Hard blue clay.....	794- 814
Fragmentary sand.....	814- 818
Hard blue clay.....	818- 900
Rotten sandstone.....	900- 906
Blue clay.....	906- 913
White sand.....	913- 935
Hard blue clay.....	935-1, 002
Coarse white sand.....	1, 002-1, 021
Fine gravel.....	1, 021-1, 038
Coarse gravel.....	1, 038-1, 052
White sand.....	1, 052-1, 086
Blue clay.....	1, 086-1, 104
White sand.....	1, 104-1, 202

Record of Wiess & Sanders artesian well No. 2, Jasper County.

	Feet.
Fine sandy loam.....	0- 2
Yellow clay.....	2- 6
Yellow sand.....	6- 18
Gray clay.....	18- 27
White sand.....	27- 50
Yellow clay.....	50- 83
Fine blue sand.....	83- 117
Blue clay.....	117- 152
White sand.....	152- 173
Blue clay.....	173- 234
Fine blue sand.....	234- 264
Blue clay.....	264- 295
Fine blue sand.....	295- 356
Gray clay.....	356- 426

^a Capacity of this well is 165 gallons a minute, or 237,000 gallons every twenty-four hours.

	Feet.
White sand.....	426- 520
Blue clay.....	520- 583
Fine blue sand.....	583- 620
Blue hard clay.....	620- 631
Coarse white sand.....	631- 684
Blue clay.....	684- 697
Fine blue sand.....	697- 718
Soft stone.....	718- 756
Hard blue clay.....	756- 768
Coarse white sand, loses water rapidly.....	768- 799
Hard blue clay.....	799- 853
Unable to tell the strata, drills like oil strata.....	853- 868
Hard blue clay.....	868- 936
Fine blue clay.....	936- 949
Hard blue clay.....	949- 990
White sand.....	990-1, 012
Blue and green clay.....	1, 012-1, 039
Hard blue clay.....	

Record of deep well at Kirbyville, Jasper County.

	Feet.
Yellow clay.....	0- 17
Yellow sand.....	17- 34
Coarse white sand.....	34- 54
Sand and gravel.....	54- 82
Water sand.....	82-212
Blue clay.....	212-227

Analysis of water from deep well at Kirbyville, Jasper County.^a

	Parts per million.
Magnesium (Mg).....	9. 2
Chlorine (Cl).....	2. 5
Carbonate radicle (CO ₃).....	21. 0
Sulphates of iron and aluminum.....	15. 0
	47. 7

NEWTON COUNTY.

Shallow wells.—The average depth of wells in Newton County is 35 feet, the deepest one being in the northern part.

Artesian wells.—The only artesian well in this county is located near Call and is owned by the Kirby Lumber Company. This well is 796 feet deep, 4 inches in diameter, and has a flow of 38 gallons a minute. Several oil wells have been drilled near this place, but no artesian flows have been obtained.

WEBB COUNTY.

Shallow wells.—The shallow wells of Webb County vary considerably in depth. In the western part they have an average depth of 60 feet; in the northern part, 425 feet; and in the eastern part, 375 feet. It is very difficult to obtain water in the southern part of the county.

^a Expressed by analyst in grains per gallon and hypothetical combinations; recomputed to parts per million and ionic form at U. S. Geological Survey.

Artesian wells.—At Bruniville, a station on the Texas Mexican Railway, four artesian wells were drilled for A. M. Bruni. They are each 325 feet deep and flow only about 3 gallons a minute. They are located on 1 acre of land, just south of Bruniville, within 100 feet of the railroad track.

MAVERICK COUNTY.

Shallow wells.—It is difficult to find water in Maverick County. In the northern part one well was drilled to a depth of 918 feet without getting water, while wells in other localities 500 feet deep yielded salty water.

Artesian wells.—So far as can be ascertained there are no artesian wells in Maverick County.

DIMITT COUNTY.

Shallow wells.—In the Nueces Valley good wells are obtained at moderate depths, but on the higher lands they vary from 100 to 150 feet in depth.

Artesian wells.—There are over 60 artesian wells in Dimmit County, ranging in depth from 300 to 700 feet. The water is used for both stock and irrigation purposes. The following is a list of the artesian wells of this county, with depth, flow, and other data concerning them:

Artesian wells in Dimmit County.

Owner.	Depth.	Flow.	Diameter.	Distance and direction from Carrizo Springs.
	<i>Feet.</i>	<i>Gallons.</i>	<i>Inches.</i>	
F. M. Shaw.....	350-400	150	3 $\frac{3}{8}$	2 $\frac{1}{2}$ miles north.
Do.....		150	3 $\frac{3}{8}$	Do.
Do.....		Weak.	3 $\frac{3}{8}$	5 miles northwest.
Do.....		Weak.	3 $\frac{3}{8}$	5 miles east.
J. J. Webb.....	500	150	4	Do.
Thos. Paterson.....	600	200	5 $\frac{1}{8}$	4 miles east.
Do.....	650	200	8	Do.
A. Eardley.....	590-690	1,400	10	5 $\frac{1}{2}$ miles east.
Do.....		1,400	10	Do.
Do.....		1,400	10	Do.
W. A. Mance.....	600	100	6 $\frac{1}{2}$	4 miles east.
Do.....	600	No flow.	6 $\frac{1}{2}$	Do.
J. L. Hudson.....	500	150	6	2 miles northeast.
M. J. Dermann (5 wells).....	350	125	4	3 miles north.
Do.....	400	150	5 $\frac{3}{8}$	Do.
J. C. Owen.....	350	150	6 $\frac{1}{2}$	2 $\frac{1}{2}$ miles north.
Burton.....	315	125	5 $\frac{3}{8}$	2 miles north.
Do.....	375	125	5 $\frac{3}{8}$	Do.
W. L. Kendall.....	350	150	5 $\frac{3}{8}$	3 miles north.
Do.....	350	Weak.	5 $\frac{3}{8}$	Do.
J. K. Rector.....	600	200	5 $\frac{3}{8}$	5 miles east.
M. L. Oppenheimer.....	350	125	5 $\frac{3}{8}$	1 mile northeast.
George & Wilkerson.....	600	100	5 $\frac{3}{8}$	1 mile north.
F. Moehrig (3 wells).....	350-600	a 150	5 $\frac{3}{8}$	2 $\frac{1}{2}$ miles north.
W. B. Rector.....	382	200	8	Do.
Couran & Jeffrey.....	350	100	5 $\frac{3}{8}$	Do.
Craig.....	325	50	4 $\frac{1}{2}$	$\frac{1}{2}$ mile east.
Hugh Knight.....	600	350	8	5 miles southeast.
Chas. Pollard.....	600	350	10	Do.
A. Richardson (8 wells).....	600-650	100-600	4-12	6-10 miles southeast.
Ed. Schimmelpfening & Bro. (2 wells).....	600	150, 200	5 $\frac{3}{8}$	6 miles southeast.
McCaleb & McDaniel (3 wells).....	400	125-150	5 $\frac{3}{8}$	5 miles southeast.
Shipp (2 wells).....	325, 418	100	5 $\frac{3}{8}$	4 $\frac{1}{2}$ miles southeast.
T. A. Coleman (2 wells).....	300	50, 75	5 $\frac{3}{8}$	5 miles south.
C. White.....	350	125	5 $\frac{3}{8}$	10 miles northwest.
Tom Riggs.....	350	125	5 $\frac{3}{8}$	Do.
T. A. Coleman.....	350	125	5 $\frac{3}{8}$	Do.
F. J. Arnold.....	500	150	8 $\frac{1}{2}$	5 miles southeast.
Wm. George.....	350	20	4 $\frac{1}{2}$	5 $\frac{1}{2}$ miles southeast.
Bob Lemons (2 wells).....	350, 700	No flow.	6 $\frac{1}{2}$	6 miles southwest.

a Each.

Record of Eardley Barosa Creek well, Dimmit County (near Carrizo Springs).

	Feet.
Light red soil and clay.....	0- 3
Pale blue clay.....	3- 9
Sand and yellow clay.....	9- 34
Yellow clay.....	34- 64
Pale to dark-blue clay.....	64- 99
Sandstone, a little salt water, no flow.....	99-102
Sticky pale-blue clay.....	102-152
Blue clay containing small seams of coal.....	152-252
Sand and clay.....	252-297
Fine-grained sandstone.....	297-312
Sand and clay.....	312-332
Blue clay.....	332-377
Darker blue clay.....	377-417
Sand and clay.....	417-462
Fine sand rock. Small flow.....	462-522
Sandstone; flow gradually increased.....	522-682
Fine sand and clay.....	682-720

ZAVALLA COUNTY.

Shallow wells.—Water from shallow wells is obtained in the western part of Zavalla County at an average depth of 50 feet, in the southern part at a depth of 75 feet, and in the eastern and northern parts at a depth of 100 feet.

Artesian wells.—Artesian wells have been drilled in the western and southwestern parts of the county along some of the tributaries of Nueces River. The following list of wells and data concerning them were furnished by George C. Hermann, of Batesville.

Artesian wells in Zavalla County.

Owner.	Depth.	Flow.	Diam-eter.	Distance and direction from Batesville.
	<i>Feet.</i>		<i>Inches.</i>	
R. R. Ware.....	211		5	31 miles south 56° west.
Ed. English.....	450		5	28½ miles south 46° west.
Do.....	450		5	28½ miles south 46° west.
Jas. Oden.....	400		5	29 miles south 49° west.
B. H. Erskine.....	250		5	30 miles south 50° west.
N. Y. and T. L. Co.....	400		5	25 miles south 58° west.
Do.....	450		5	25 miles south 66° west.
J. C. Turman.....	450	Slight.	5	28 miles south 71° west.
Ed. English.....	390	Strong.	6	28 miles south 47° west.
Do.....	410	Strong.	6	28 miles south 46° west.
James Oden.....	500	Strong.	6	28½ miles south 48° west.
B. H. Erskine.....	420	Strong.	6	30 miles south 50° west.
Clift.....	450	Strong.	6	27½ miles south 47° west.
C. Vancleve.....	310	Strong.	6	28 miles south 53° west.
Brown & Williams.....	560	Strong.	6	26 miles south 51° west.
T. A. Coleman (4 wells).....	450-460	Strong.	6	31 miles south 49° west.
A. Boynton.....	460	Strong.	6	29 miles south 46° west.
Pratt & Hays.....	900	Slight.	10	25 miles south 40° west.
I. T. Pryor.....	1,029	(a)	10	16 miles south 70° west.
T. Riggs.....	420	Flows.	6	28 miles south 45° west.
A. Boynton.....	460	Flows.	6	29 miles south 46° west.
T. A. Coleman.....	460	Strong.	6	31 miles south 49° west.
R. R. Ware.....	260	Strong.	6	32 miles south 56° west.

a Water rises within 10 feet of surface.

LASALLE COUNTY.

Shallow wells.—In Lasalle County the pump wells are considerably deeper than those in adjoining localities. They vary from 150 to 200 feet in depth.

Artesian wells.—There are 27 artesian wells in this county. The area of greatest development in well boring is around Artesia, where a number of wells are utilized for irrigation purposes. They vary in depth from 200 to 500 feet and usually furnish a strong flow of good water. At Cotulla the International and Great Northern Railroad has drilled a well 1,008 feet deep, but the water is slightly impregnated with salts of magnesia. In the vicinity of Dull's ranch, in the north-eastern portion of the county, along Frio River, there is a well-developed artesian district. The following is a list of the artesian wells of the county:

Artesian wells in Lasalle County.

Owner.	Depth.	Flow per minute.	Diameter.	Location.
	<i>Feet.</i>	<i>Gallons.</i>	<i>Meters.</i>	
International and Great Northern R. R.....	900	6	.....	Cotulla.
Do.....	1,008	.....	.....	Do.
J. W. McInnis.....	486	15	.....	Do.
Joe Cotulla.....	400	4	.....	Cotulla, 1½ miles north.
A. Armstrong.....	764	2	.....	Cotulla, 8 miles west.
J. M. Ramsey.....	550	24	6	Artesia, 2 miles northeast.
Do.....	550	24	6	Do.
Do.....	350	15	6	Do.
Do.....	350	8	6	Artesia, 1 mile northeast.
Do.....	186	5	6	Artesia, ½ mile northeast.
J. W. Bucow.....	400	20	6	Artesia, 4 miles east.
W. H. McWhorter.....	450	10	6	Artesia, 1 mile south.
Kuhn.....	600	10	6	Artesia, 6 miles east.
Anderson & Sinclair.....	670	10	8	Artesia, 1 mile northwest.
Do.....	670	10	8	Artesia, ½ mile northeast.
Crossley.....	400	10	6	Artesia, 1 mile southeast.
C. H. DeRyle.....	450	10	6	Artesia, 1½ mile southeast.
T. J. Alderman.....	180	0	.....	Artesia, 3 miles northeast.
Do.....	650	0	.....	Do.
Naylor & Jones.....	295	4	6	Dull's ranch, 2 miles east.
Do.....	366	4	6	Dull's ranch, 7 miles east.
Do.....	720	30	6	Dull's ranch, 14 miles north-east.
Do.....	310	12	6	Dull's ranch, 3 miles east.
Do.....	300	4	6	Dull's ranch, 7 miles north-east.
W. C. Irwin.....	797	100	.....	Dull's ranch, 7 miles north-west.
Uhl & Gaith.....	767	4	1	Cotulla, northwest.
International and Great Northern R. R.....	800	0	.....	Encinal.

McMULLEN COUNTY.

Shallow wells.—The nonflowing wells of McMullen County are generally deep. In the eastern part they have an average depth of 130 feet, in the northern part 250 feet, and in the southern part 350 feet. No information has been received concerning the depth of wells in the western part of the county.

Artesian wells.—Data have been obtained of seven artesian wells in McMullen County. A list of these wells, with their depth, flow, size, and approximate location is given below:

Artesian wells in McMullen County.

Owner.	Depth.	Flow per minute.	Diameter.	Location.
	<i>Feet.</i>	<i>Gallons.</i>	<i>Inches.</i>	
County.....	485	.....	4	Public square, Tilden.
Ortho Askey.....	300	.....	.....	Tilden, 12 miles east.
Do.....	147	5	.....	Tilden, 13 miles east.
Sam Crowther.....	1,728	250	.....	Tilden, 14 miles northeast.
Do.....	1,325	200	.....	Do.
Naylor & Jones.....	700	15	6	Tilden, 20 miles west.
Do.....	512	15	6	Do.

FRIO COUNTY.

Shallow wells.—Water is obtained from shallow wells in Frio County at depths of 60 to 125 feet.

Artesian wells.—There are flowing wells along San Miguel Creek, also at Derby, and northwest of Derby along Frio River. A typical artesian well of Frio County is shown on Pl. I, *B* (p. 1). Many of the wells along San Miguel Creek are located along the creek bed, on very low ground; most of them are about 400 feet in depth, 8 inches in diameter, and flow about 10 gallons a minute. The general distribution of these wells is shown in Pl. II (p. 2), and their depth, size, flow, and approximate location are given in the following table:

Artesian wells in Frio County.

Owner.	Depth.	Flow per minute.	Diameter.	Location.
	<i>Feet.</i>	<i>Gallons.</i>	<i>Inches.</i>	
G. F. Hinds.....	420	25	.....	San Miguel Creek, 1½ miles from Atascosa County line.
Do.....	410	15	.....	Do.
Do.....	400	20	.....	Atascosa County, 4 miles north of No. 2.
F. M. O'Connor.....	405	50	5	San Miguel Creek, 1 mile above No. 1.
Do.....	200	17	4	San Miguel Creek, 1 mile above No. 4.
Do.....	115	12	2	San Miguel Creek, 2 miles above No. 5.
Do.....	60	7	1	San Miguel Creek, 2 miles above No. 6.
Do.....	300	20	4	1 mile south of No. 4.
S. Speed.....	.....	.....	.....	Derby, 4 miles east.
Do.....	.....	.....	.....	Do.
P. E. Authar.....	600	.....	6	Pearsall, 4 miles north.
Half & Schremer.....	800	.....	5	Pearsall, 6 miles southwest.
Do.....	1,473	400	5	Pearsall, 4 miles south.
Keystone Land and Cattle Co.....	.....	10	8	San Miguel Creek, 4 miles above No. 7.
Do.....	.....	10	8	San Miguel Creek, 3 miles above No. 14.
Do.....	398	10	8	San Miguel Creek, 3 miles above No. 15.
Do.....	.....	10	8	San Miguel Creek, 4 miles above No. 16.
Do.....	.....	2	8	San Miguel Creek, 1 mile west of No. 17.
Do.....	.....	10	8	San Miguel Creek, 4 miles above No. 17.
.....	.....	5	8	San Miguel Creek, 1 mile below No. 6.
.....	380	12	6	Miguel, 5 miles west of post-office.
.....	648	.....	8	2 miles south of No. 18.
J. W. De Villbis.....	125	19	2	San Miguel Creek, ½ mile above No. 6.

ATASCOSA COUNTY.

Shallow wells.—A good supply of excellent water is obtained from wells 40 to 60 feet deep throughout the greater part of Atascosa County.

Artesian wells.—Artesian water is found in all parts of this county, at depths varying from 200 to 700 feet. The county is well drained by the tributaries of San Miguel Creek, and wells for the most part are located along these tributaries. The approximate location of artesian wells, also their depth, flow, and diameter are given in the following table:

Artesian wells in Atascosa County.

Owner.	Depth.	Flow per minute.	Diameter.	Distance and Direction from Pleasanton.
	<i>Feet.</i>	<i>Gallons.</i>	<i>Inches.</i>	
J. B. Williams.....	120	20	.....	1 mile east.
Do.....	520	10	.....	Do.
Theo. Oden.....	447	30	.....	8 miles south.
Do.....	376	7	.....	Do.
Do.....	620	32	.....	Do.
J. W. Murphy.....	625	.....	.....	11 miles southwest.
International and Great Northern R. R.....	740	20	.....	20 miles southwest.
Beever & Hindes.....	400	5	.....	19 miles southwest.
Bar Fuller.....	314	60	.....	4 miles northeast.
James Draper.....	230	4	.....	4 miles north.
Dr. E. L. Sharpe.....	500	40	.....	In town.
Do.....	340	15	.....	Do.
John Dossey.....	320	6	.....	7 miles southeast.
James Gilliland.....	510	.....	.....	6 miles northeast.
Coughran Bros.....	397	.....	.....	5 miles east.
Mrs. E. Johnson.....	337	30	.....	Do.
Do.....	227	50	.....	3 miles east.
Henry Martin.....	430	10	.....	4 miles southeast.
Geo. M. Martin.....	319	15	.....	3 miles northwest.
J. M. Solis.....	300	2	.....	6 miles northwest.
José Estrada.....	240	12	.....	5 miles northwest.
Anton Ploch.....	228	4	.....	4 miles northeast.
Do.....	208	8	.....	Do.
Coughran Bros.....	308	55	4	6 miles northeast.
Do.....	540	60	3½	5 miles east.
J. J. Stevens.....	915	.....	.....	8 miles northeast.
Do.....	700	.....	.....	12 miles northeast.
Do.....	1,011	.....	.....	11 miles east.
Manuel Leal.....	207	.....	.....	8 miles southeast.
C. T. Tom.....	441	35	2	19 miles southeast.
Alice Peeler.....	139	4	.....	16 miles southeast.
Do.....	165	6	.....	Do.
J. N. McAda.....	340	4.5	.....	12 miles southeast.
Do.....	202	4.5	.....	13 miles southeast.
D. C. McAda.....	200	4.5	.....	12 miles southeast.
A. Oppenheimer.....	729	40	.....	6 miles south.
Do.....	700	35	.....	4 miles south.
Do.....	525	75	.....	14 miles south.
John Campbell.....	280	12	.....	18 miles southeast.
Court-house.....	378	.....	.....	In town.
Mrs. N. R. Wallace.....	377	30	.....	Do.
Allen & Wilson.....	357	18	.....	Do.
L. A. Franks.....	368	.....	.....	Do.
F. M. Mansfield.....	406	4	.....	Do.
V. Richter.....	301	5	.....	2½ miles northeast.
J. A. Walton.....	497	40	2	In town.
J. S. Thornton.....	700	100	4	Do.

BEXAR COUNTY.

Shallow wells.—In the southern part of Bexar County water can be procured at depths varying from 30 to 60 feet; near Vanraub, at a depth of 325 feet, and at Leon Springs, at depths of 40 to 200 feet.

Artesian wells.—There are nearly 100 artesian wells in Bexar County. Some of them are among the strongest wells in the State. The water

is of excellent quality and is used largely for irrigation. The following is a list of the artesian wells, giving location and other data:

Artesian wells in Bexar County.

Owner.	Depth.	Flow per minute.	Location with respect to San Antonio.
	<i>Feet.</i>	<i>Gallons.</i>	
West End Town Co.....	260	150	West End Lake.
Russ.....	250	60	In town.
Brendle.....	533	.....	3 miles north.
Yantis.....	540	400	2.5 miles northwest.
Waterworks No. 1.....	630	1,042	$\frac{1}{2}$ mile below head of river.
Waterworks No. 2-4.....	780	<i>a</i> 1,042	$\frac{1}{2}$ miles below head of river.
Waterworks Nos. 5-8 ^b	880	<i>a</i> 4,166	Market street.
Waterworks Nos. 9-12 ^c	880	<i>a</i> 1,740	Do.
Schulz Sanitarium.....	712	555	Alamo Plaza.
Crystal Ice Co.....	657	417	Eighth street.
Do.....	657	417	Do.
Do.....	715	278	Do.
Do.....	850	36	Do.
Street railway.....	980	156	Tenth street.
Do.....	1,140	17	Do.
Court-house ^d	760	861	Center of city.
State asylum ^e	1,900	Flows.	3 miles southeast.
Col. Terrell ^e	1,900	555	5 miles southeast.
C. Kampman.....	650	200	3 miles east.
Do.....	464	20	Do.
Geo. Dulnig ^f	2,215	1,007	6 miles southeast.
Santa Rosa Hospital.....	1,000	104	400 yards northwest court-house.
Do.....	1,250	.....	Do.
Schulz.....	822	200	2 $\frac{1}{2}$ miles northwest.
Union Meat Co.....	1,202	300	1 $\frac{1}{2}$ miles southwest.
Menger Hotel.....	1,160	170	.....
Koelbeen.....	1,100	140	Southern Pacific round-house.
Dignowitty.....	465	55	1 $\frac{1}{2}$ miles west.
Kampman.....	850	200	Velita street.
Epps.....	884	70	2 $\frac{1}{2}$ miles southwest.
Van Dale.....	835	55	2 miles west.
F. F. Collins.....	700	1,200	$\frac{1}{2}$ mile southwest.
Do.....	850	300	$\frac{1}{2}$ mile northeast.
T. F. Brady.....	1,500	400	2 $\frac{1}{2}$ miles southwest.
Walters.....	900	200	Do.
Barnes.....	950	1,200	Do.
Meerscheidt-Stieren Irrigation Co. ^g	950	800	3 miles west.
A. Herff.....	1,200	Slight.	3 $\frac{1}{2}$ miles west.
Elmendorf.....	750	377	3 miles west.
Hofheinz.....	.....	.....	5 miles southwest.
Tommins.....	1,500	Slight.	2 $\frac{1}{2}$ miles south.
Acme Irrigation Co.....	1,200	No flow.	5 miles southwest.
J. D. Guinn.....	610	50	3 miles northeast.
H. J. Ackerman.....	1,400	50	6 miles east.
Watters.....	1,400	50	2 $\frac{1}{2}$ miles southwest.
D. Sullivan.....	800	No flow.	3 miles northwest.
J. C. Chaney.....	1,500	100	2 $\frac{1}{2}$ miles southeast.
City brewery.....	728	2,083	James street.
Do.....	728	2,083	Do.
Lone Star Brewery.....	805	650	Jones street.
United States Ice Plant.....	710	650	Grayson street.
Do.....	710	650	Do.
D. Meyer.....	.....	.....	3 miles west.
Tappans polo ranch.....	.....	.....	5 miles northwest.
J. D. Guinn.....	1,000	No flow.	5 $\frac{1}{2}$ miles northeast.
T. B. Dashiell.....	635	Slight.	7 miles northeast.
W. Eisenhauer.....	700	do.	5 miles east.
Urbahn.....	1,200	No flow.	4 miles east.
Kampman ^h	1,000	Occasional.	3 miles north.
St. Louis College.....	720	No flow.	5 miles west.
Do.....	720	do.	Do.
International and Great Northern R. R. ⁱ	808	Good.	At Davenport.

^a Each.

^b Four 12-inch wells.

^c Four 8-inch wells.

^d Gas and water at 460 and 620 feet below surface.

^e Hot sulphur water.

^f 6-inch well yielding hot sulphur water.

^g Two wells: One 6-inch, with 800-gallon flow; one 10-inch, with 3,000-gallon flow..

^h Water at 630 feet.

ⁱ Water rises within 110 feet of surface.

WILSON COUNTY.

Shallow wells.—The shallow wells of Wilson County are from 30 to 150 feet deep.

Artesian wells.—There are two principal artesian-well districts in the county—one in the southwestern part, where a group of wells is owned by J. S. Thornton and J. J. Stevens, and one in the vicinity of Stockdale and Sutherland Springs. A list of these wells, including available data, is given below.

Artesian wells in Wilson County.

Owner.	Depth.	Flow per minute.	Diameter.	Location.
	<i>Feet.</i>	<i>Gallons.</i>	<i>Inches.</i>	
W. W. Beaty.....	565	20	2½	Union, ¼ mile northeast.
J. S. Thornton.....	700	15	2½	Floresville, 8 miles south-west.
Do.....	840	90	4	Floresville, 11 miles south, 4 west.
Do.....	460	30	3	Floresville, 8 miles south, 7 west.
J. J. Stevens.....	365	40	-----	Floresville, 10 miles west, on Borego Creek.
Do.....	650	50	-----	Floresville, 11 miles south-west, on Borego Creek.
Do.....	650	50	-----	Floresville, 10½ miles north-west, on Borego Creek.
Do.....	1,036	50	-----	Floresville, 13 miles south-west, on Prietas Creek.
Do.....	960	50	-----	Floresville, 16 miles south-west, on Lucas Creek.
W. A. Coughran.....	700	15	3½	Floresville, 4 miles west.
T. B. Coughran.....	480	12	2½	Floresville, 5 miles west.
H. M. Aubrey.....	1,200	-----	-----	Sutherland Springs, ½ mile northeast.
Hobbs.....	400	00	-----	Sutherland Springs, 3 miles southeast.

GUADALUPE COUNTY.

Shallow wells.—Water is obtained in Guadalupe County in the eastern part at an average depth of 40 feet, in the southern part at 60 feet, in the western part at 70 feet, and in the northern part at 80 feet.

Artesian wells.—The only attempt to develop the artesian-water resources of this county was made by Adolph Ziegenhols, on his farm 12 miles north of Seguin, where a flow of strong sulphur water was found at a depth of 800 feet.

CALDWELL COUNTY.

Shallow wells.—Good wells are obtained throughout the greater part of Caldwell County at depths varying from 18 to 50 feet. Near Lockhart wells are from 18 to 20 feet deep, but on the prairie west of Lockhart they are somewhat deeper. South of Maxwell and east of Martindale it is difficult to get water, and it is generally not obtained at depths less than 100 feet.

Artesian wells.—Only two artesian wells have been reported from this county. T. F. Hudson, near Lockhart, has a 6-inch flowing well 260 feet deep, and V. Leshikar has one 5 miles west of Lockhart which has a depth of 180 feet, a diameter of 8 inches, and a flow of only a few gallons a minute.

BASTROP COUNTY.

Shallow wells.—Throughout Bastrop County the shallow wells are from 35 to 70 feet deep and generally furnish a good supply of water.

Artesian wells.—Very little prospecting has been done for artesian water in this county. In 1893 a well was drilled to a depth of 1,010 feet near Bastrop by the Bastrop Building and Loan Association without striking water.

LEE COUNTY.

Shallow wells.—In Lee County the average shallow well is 40 to 50 feet deep, and a good supply is usually obtained.

Artesian wells.—Owing to the ease with which shallow wells may be obtained in this county, few attempts have been made to develop artesian water. The only flowing well in the county is owned by M. G. York, near Leobau. It is a 6-inch well, 800 feet deep, but the exact flow has not been ascertained.

ROBERTSON COUNTY.

Shallow wells.—A good supply of water is found in Robertson County about 40 feet below the surface.

Artesian wells.—There are a large number of flowing wells between Big and Little Brazos rivers, from a point opposite Calvert to the mouth of the Little Brazos, a distance of about 25 miles. Water is obtained throughout this valley at four artesian horizons at depths of 160, 450, 650, and 920 feet. Attempts to get water east of Hearne, on the highland extending from Bremond to Franklin, have resulted in failure. At Hearne there are 23 flowing wells, nearly all of which obtain water from an artesian horizon 700 feet below the surface. The following is a list:

Artesian wells at Hearne.

Owner.	Depth.	Owner.	Depth.
	<i>Feet.</i>		<i>Feet.</i>
W. Creanan.....	740	L. W. Carr.....	700
Do.....	680	C. J. Hostrasses.....	680
Houston and Texas Central R. R.....	720	R. C. Allen.....	666
Do.....	720	Mrs. H. K. Davis.....	710
Compress.....	700+	Chas. Wood.....	460
Gin and Light Co.....	700+	W. P. Ferguson.....	720
Do.....	700	J. H. Hartzog.....	720
National Oil Co.....	715	C. L. Glass ^b	680
Planters' Oil Co.....	660	Do.....	700
Stock Yards ^a	1,020	Do.....	710
Do.....	750	City.....	720
W. Kenicks.....	700		

^a One mile northwest of Hearne.^b Three miles southwest of Hearne.**MILAM COUNTY.**

Shallow wells.—The average depth of shallow wells throughout Milam County is 50 feet. An abundant supply is usually obtained. In the western part of the county considerable difficulty is sometimes experienced in getting a successful well.

Artesian wells.—The International and Great Northern Railroad drilled a 6-inch well at Thorndale to a depth of 2,000 feet, passing through several beds of lignite coal, without obtaining artesian water. Other similar deep borings have been made for artesian water in the western part of the county without success. The following is a list of deep borings in Milam County:

Deep borings in Milam County.

Owner.	Depth.	Location.
	<i>Feet.</i>	
W. S. Caruthers.....	1,790	Thorndale.
A. E. Brady.....	1,356	Maysfield.
T. J. Estes.....	821	Baileyville, 3½ miles west.
A. J. Raymond.....	700	Branchville.
J. A. Peele.....	530	Branchville, 4 miles east.

BURLESON COUNTY.

Shallow wells.—In Burleson County wells 50 to 75 feet deep furnish a good supply of water.

Artesian wells.—Flowing wells are obtained in the Brazos bottom lands at depths varying from 355 to 1,250 feet, the average being about 700 feet. A list of these wells, with other data, the record of a 688-foot well at Clay, and analyses of the water from this well and from one of M. Parker's wells are given below:

Artesian wells in Burleson County.

Owner.	Depth.	Flow per minute.	Diameter.	Location.
	<i>Feet.</i>	<i>Gallons.</i>	<i>Inches.</i>	
J. W. Coulter.....	750	10	1½	Clay, 6 miles northeast.
Do.....		Small.	1	Clay, 7½ miles northeast.
Carson & Smith.....	355	5	1	Clay, 8 miles northeast.
Do.....	750	Strong.	1	Do.
T. R. Battea.....	850	50	1½	Whittaker, 3½ miles southeast.
J. O. Chance.....	900	1½	2	Whittaker, 1½ miles northeast.
Do. ^b	1,009	3	1½	Whittaker.
Do. ^c	650	7	3	Whittaker, 3½ miles northwest.
Do.....	700	1	1	Whittaker, 4½ miles northwest.
Do.....	550	2	2	Whittaker.
Fountain Bros.....	1,250	20	2	Whittaker, 1½ miles northwest.
Do.....	900	1	1	Do.
Do.....	900	1	1½	Do.
Do.....	900	1	1½	Myers, 1 mile southeast.
A. L. Ewing.....	740	2	2	Myers, 1 mile south.
J. B. Rosprim.....	910	5	2	Myers.
G. G. Foster.....	900	20	2	Myers, 400 yards west.
Do.....	900	25	1½	Myers, 800 yards west.
Adline Jones.....	850	20	2	Myers, 2 miles southwest.
Jas. Butler.....	840	25	2	Myers, 3 miles southwest.
Do.....	900	25	2	Myers, 3 miles north.
Do.....	850	20	2	Grant, 1 mile south.
Mit. Parker.....	630	12	1	Cooks Point, 3 miles east.
Do.....	555	12	1	Do.
Do.....	535	15	1	Pittbridge.
Do.....	535	15	1	Pittbridge, 1 mile west.
Do.....	630	15	1	Pittbridge, 4 miles south.
Do.....	835	35	1	Tunis, 1½ miles east.
Do. ^d	750	30	2	Tunis, 3 miles southeast.
Do.....	760	15	2	Pittbridge, 1½ miles east.
T. M. Ewing ^e	511	2	2	Pittbridge, 1½ miles northeast.
Robt. Dennis.....	400	7	1	Stone City, 300 yards south.
R. A. Rogers.....	420	2½	1	Rita, 7½ miles south.
Frank Aldridge ^f	760	2	1	Rita, 2 miles east.
Joe Collier.....	800	5	1	Caldwell, ¼ mile northeast.
T. F. Hudson.....	260	160	6	Caldwell, 5 miles southwest.
V. Leshikar.....	180	Small.	8	Somerville, 7 miles southeast.
J. D. Rogers ^g	703	45	3	

^a Temperature of water 77° F.; gas escapes from pipe.

^b Continuous flow of gas; water salty.

^c Gas associated with water.

^d At 350 feet a flow of salt water associated with gas was obtained.

^e Well flowed 60 gallons a minute at first, but is now becoming choked with sand.

^f Oil well.

^g Good flow obtained at 400 feet.

Analysis of water from deep well owned by Mit. Parker, 3 miles southeast of Tunis, Burleson County.^a

Parts per million.		Parts per million.	
Potassium (K).....	7	Sulphate radicle (SO ₄).....	630
Sodium (Na).....	520	Carbonate radicle (CO ₃).....	520
Magnesium (Mg).....	4		
Calcium (Ca).....	11		1,756
Chlorine (Cl).....	64		

^a Expressed by analyst in grains per gallon and hypothetical combinations; recomputed to parts per million and ionic form at U. S. Geol. Survey.

Record of well at Clay, Burleson County.

	Feet.
Soil.....	0- 15
Clay.....	15- 28
Rock.....	28- 41
Sand.....	41- 67
Lignite.....	67- 74
Blue granite.....	74- 88
Blue sand.....	88-124
Gray sand rock.....	124-161
Lignite.....	161-169
Blue limestone rock.....	169-185
Sand.....	185-188
Gray sand rock.....	188-197
Soapstone.....	197-217
Rock.....	217-220
Soapstone.....	220-249
Fine blue sand.....	249-254
Blue limestone.....	254-261
Soapstone.....	261-271
Rock.....	271-282
Soapstone.....	282-420
Fine water sand.....	420-480
Soapstone.....	480-525
Close blue sand with lignite and soapstone.....	525-608
Water sand.....	608-613
Lignite and soapstone.....	613-632
Water sand.....	632-636
Soapstone and sand.....	636-647
Water sand.....	647-687
Rock.....	687-688

Analysis of water from deep well at Clay, Burleson County. ^a

Parts per million.		Parts per million.	
Sodium (Na).....	490.0	Carbonate radicle (CO ₃).....	30.0
Magnesium (Mg).....	8.0	Silica (SiO ₂).....	38.0
Calcium (Ca).....	21.0	Organic matter.....	79.0
Chlorine (Cl).....	490.0		
Sulphate radicle (SO ₄).....	4.6		1,480.6
Bicarbonate radicle (HCO ₃).....	320.0		

BRAZOS COUNTY.

Shallow wells.—Water in sufficient quantity to supply an ordinary well is found in Brazos County from 35 to 60 feet below the surface.

Artesian wells.—The best developed artesian area in Brazos County is located near Steeles Store and Stone City, between Little and Big Brazos rivers, where about 50 flowing wells are located. About 15 miles southwest of Bryan there are a number of smaller artesian wells, varying in depth from 200 to 1,000 feet, but averaging about 300 feet, with diameters of 1 to 3 inches. The smaller wells yield about

^a Expressed by analyst in grains per gallon and hypothetical combinations; recomputed to parts per million and ionic form at U. S. Geol. Survey.

47 gallons a minute; the larger and deeper ones furnish considerably more. In sinking the deep wells in this district several small flows are encountered before the main water horizon is reached. These are generally cased off and only the water from the lowest horizon allowed to flow. In addition to the above-described wells there are a few in the southern part of the county. A partial list of the artesian and deep wells of Brazos County is given below, also a record of the materials penetrated in the Hearne and Brazos Valley Railroad well at Stone City.

Partial list of artesian and deep wells in Brazos County.

Owner.	Depth.	Flow.	Location.
	<i>Feet.</i>		
Hearne and Brazos Valley R. R.....	1,005		Stone City.
Templeton & Foster.....		Flows..	Navasota, 6 miles west.
John D. Rogers.....	900	Flows..	Allenfarm.
Do.....	1,300	Flows..	Allenfarm, 1 mile west.

Record of Hearne and Brazos Valley Railroad well at Stone City, Brazos County.

	<i>Feet.</i>	
Surface blue clay.....	0-	25
Rock.....	25-	28
Blue clay.....	28-	60
Rock.....	60-	61
Blue marl.....	61-	105
Lignite.....	105-	106
Blue marl.....	106-	145
Rock.....	145-	147
Blue marl with an occasional layer of rock.....	147-	1,005

MADISON COUNTY.

Shallow wells.—Throughout Madison County good water is obtained from wells at depths of 50 to 80 feet, depending on the elevation of the surface.

Artesian wells.—Owing to the ease with which good shallow wells are obtained and the numerous small flowing streams traversing the county, there is little need for flowing wells, and so far as can be ascertained no attempts have been made to develop this resource.

LEON COUNTY.

Shallow wells.—In Leon County shallow wells vary in depth from 30 to 45 feet, and a good supply of water is generally struck.

Artesian wells.—The only artesian well in Leon County is that owned by J. H. Oliver. It is located one-half mile northwest of Buffalo and has a depth of 1,200 feet.

FREESTONE COUNTY.

Shallow wells.—The shallow wells of Freestone County are from 35 to 45 feet deep and generally contain from 6 to 20 feet of water.

Artesian wells.—Owing mainly to the abundant supply of shallow-well water throughout the county, no attempts have been made to get artesian flows.

HOUSTON COUNTY.

Shallow wells.—Most of the shallow wells throughout Houston County are less than 40 feet deep, and a large supply of water is generally obtained.

Artesian wells.—At Crockett a well was sunk by Prof. J. B. Smith to a depth of 700 feet, and the water rose within 40 feet of the surface. There are several wells at Kenard 1,100 to 1,200 feet deep, from which a large supply of water is obtained by pumping.

ANDERSON COUNTY.

Shallow wells.—A good water supply is found in Anderson County at a depth of 30 to 40 feet below the surface.

Artesian wells.—There are no artesian wells in this county, but several deep borings have been made at Palestine and other places which furnish a good supply of water by pumping.

LIMESTONE COUNTY.

Shallow wells.—Water is secured in the southern part of Limestone County at a depth of about 35 feet. In the northwestern part the wells are somewhat deeper, averaging 60 feet.

Artesian wells.—There are no artesian wells in Limestone County, although it is believed that flows might be obtained if wells were sunk to a sufficient depth.

CHEROKEE, TRINITY, ANGELINA, SAN AUGUSTINE, AND SABINE COUNTIES.

Shallow wells.—Throughout Cherokee, Trinity, Angelina, San Augustine, and Sabine counties shallow wells find water at depths varying from 30 to 50 feet, and the supply is generally large.

Artesian wells.—The only artesian well in these counties is at Groveton, the county seat of Trinity County, where a 6-inch well 495 feet deep yields 27 gallons a minute. There is a deep well at Bronson, Sabine County, a record of which is given below, also an analysis of the water.

Record of deep well at Bronson, Sabine County.

	Feet.
Yellow clay.....	0- 30
Blue clay.....	30- 60
Brown shale.....	60- 103
Sand.....	103- 115
Brown shale.....	115- 145
Sand.....	145- 155
Blue clay.....	155- 163
Limestone rock.....	163- 164
Blue clay.....	164- 258
Sand.....	258- 272
Blue clay.....	272- 322
Brown shale.....	322- 352
Blue clay.....	352- 374
Blue clay and "shell".....	374- 380
Blue clay.....	380- 486
Sand rock.....	486- 489
Blue clay.....	489- 578
Blue clay and boulders.....	578- 586
Blue clay.....	586- 674
Water sand.....	674- 729
Blue clay.....	729- 810
Dark sand.....	810- 818
Blue clay.....	818- 892
Blue shale and "shell".....	892- 928
Dark shale.....	928-1,018
Water sand.....	1,018-1,068
Dark clay.....	1,068-1,070

Analysis of water from deep well at Bronson, Sabine County. ^a

	Parts per million.		Parts per million.
Sodium (Na).....	330.0	Silica (SiO ₂).....	17.0
Chlorine (Cl).....	30.0	Organic matter.....	34.0
Sulphate radicle (SO ₄).....	8 1		
Carbonate radicle (CO ₃).....	395		814.1

NACOGDOCHES COUNTY.

Shallow wells.—Wells of moderate yield are obtained in Nacogdoches County at a depth of 25 feet.

Artesian wells.—Two wells have been sunk in this county and data concerning them are given below.

Artesian wells in Nacogdoches County.

Owner.	Depth.	Flow per minute.	Diameter.	Distance from Nacogdoches.
	<i>Feet.</i>	<i>Gallons.</i>	<i>Inches.</i>	
Nacogdoches Ice Co.....	285	40	4	½ mile southwest.
Haywood Lumber Co.....	820		6	1 mile southeast.

^a Expressed by analyst in grains per gallon and hypothetical combinations; recomputed to parts per million and ionic form at U. S. Geol. Survey.

SHELBY, PANOLA, AND RUSK COUNTIES.

Shallow wells.—Water in Shelby, Panola, and Rusk counties is obtained in abundance in wells ranging from 20 to 35 feet in depth.

Artesian wells.—There is little demand for artesian water in these counties, owing mainly to the shallow depth at which ground water may be obtained. At Center, Shelby County, there is a deep well, a record of which is given below; also an analysis of the water.

Record log of deep well at Center, Shelby County.

	Feet.
Yellow clay.....	0- 10
Brown shale.....	10-106
Lignite.....	106-108
Brown shale.....	108-240
Sand.....	240-250
Brown shale.....	250-320
White sandstone.....	320-330
Brown shale.....	330-356
Lignite.....	356-358
Brown shale.....	358-372
White sandstone.....	372-374
Brown shale.....	374-416
"Stone coal".....	416-417
Brown shale.....	417-443
Sandstone.....	443-445
Brown shale.....	445-517
"Gray granite".....	517-520
Brown shale.....	520-556
Sandstone.....	556-557
Brown shale.....	557-562
"Gray granite".....	562-564
White sand, water bearing.....	564-614
Brown shale.....	614-623

Analysis of water from deep well at Center, Shelby County.^a

Parts per million.		Parts per million.	
Sodium (Na).....	370.0	Silica (SiO ₂).....	24.0
Calcium (Ca).....	4.1	Organic matter.....	31.0
Chlorine (Cl).....	57.0		
Sulphate radicle (SO ₄).....	14.0		930.1
Carbonate radicle (CO ₃).....	430.0		

VAN ZANDT AND RAINS COUNTIES.

Shallow wells.—Throughout Van Zandt and Rains counties an adequate supply of water is obtained from wells ranging in depth from 20 to 45 feet.

Artesian wells.—There are at present no flowing wells in either of these counties; and, so far as can be ascertained, no prospecting for artesian water has been done.

^a Expressed by analyst in grains per gallon and hypothetical combinations; recomputed to parts per million and ionic form at U. S. Geol. Survey.

SMITH COUNTY.

Shallow wells.—In Smith County water occurs at shallow depths, rarely exceeding 35 feet, and the supply is usually large.

Artesian wells.—A few years ago an oil well was drilled on the county poor farm to a depth of 460 feet and a strong flow of water obtained. No other deep borings have been reported from this county, but it is believed that artesian water could be obtained at other localities if wells were sunk to a sufficient depth.

WOOD AND GREGG COUNTIES.

Shallow wells.—Water is found in Wood and Gregg counties at depths ranging from 25 to 80 feet. The supply is large and the quality generally good, but a few wells near Quitman and Winnsboro furnish water containing a large percentage of mineral salts.

Artesian wells.—No flowing wells have been reported from either of these counties. About 6 miles south of Longview, Gregg County, an oil well was sunk to a depth of 1,424 feet without obtaining artesian water. It is possible that flows might be found at shallower depths in Wood County or in other parts of Gregg County, but thus far no tests have been made in these localities. A record of the deep oil well near Longview is given below:

Partial record of well 6 miles south of Longview, Gregg County.

	Feet.	
No record	0-	285
Soapstone	285-	305
Flint	305-	307
Soapstone	307-	322
Shaly clay	322-	329
Sandy shale	329-	353
Clay	353-	356
Sandy shale	356-	437
Clay	437-	452
Sandy shale	452-	487
Flint	487-	489
Sandstone	489-	543
Lignite	543-	545
Clay	545-	551
Sand	551-	571
Flint	571-	574
Sandy shale	574-	710
Clay	710-	745
Sandstone	745-	756
Water-bearing sand	756-	780
Sandstone	780-	880
Clay	880-	892
Sandy shale	892-	1, 027
Clay	1, 027-	1, 034
Sandy shale	1, 034-	1, 199
Flint	1, 199-	1, 200
Sandstone	1, 200-	1, 246
Sandy shale	1, 246-	1, 424
Gumbo.		

UPSHUR COUNTY.

Shallow wells.—In Upshur County the water table appears to be about 35 to 40 feet below the surface, and at this depth a good supply of relatively pure water is obtained.

Artesian wells.—The only artesian well which has been reported from this county is on the John Gillis ranch, $1\frac{1}{2}$ miles southwest of Hawkins. It is 250 feet deep and yields a flow of $2\frac{1}{2}$ gallons a minute.

HARRISON COUNTY.

Shallow wells.—In Harrison County sufficient water for ordinary domestic purposes is struck at depths rarely exceeding 40 feet, and the quality is usually good.

Artesian wells.—The only artesian well in Harrison County is owned by the Marshall waterworks. This well was bored in January, 1900, and the first flows were obtained at shallow depths. It is 208 feet deep, 6 inches in diameter, and has a flow of 200,000 gallons every twenty-four hours. The following is a record of the material penetrated:

Record of artesian well at Marshall, Harrison County.

	Feet.
Soil and clay.....	0- 80
Sand with rock at base, water bearing.....	80-100
Clay with layers of lignite.....	100-160
Sand with rock at base, water bearing.....	160-180
Sand, water bearing.....	180-208

This test well was made without a strainer, and considerable sand was brought up with the water. The test was continued for about twelve hours with no apparent change of flow.

MARION COUNTY.

Shallow wells.—Water in Marion County is found at 25 to 50 feet below the surface, and the supply is both abundant and pure.

Artesian wells.—The only artesian well reported from this county is owned by J. M. De Ware, at Jefferson. It is 2 inches in diameter, 801 feet deep, and yields a small flow, but the exact amount has not been ascertained.

INDEX.

A.		Page.		Page.
Acknowledgments to those aiding	1		Brazos, wells near	21
Alameda, wells near	25		Brazos County, artesian wells in	61-62
Alice, well near, record of	12		artesian wells in, record of	62
Alligator Head, well at, record of	15		shallow wells in	61
Alta Loma, wells at	28		Brenham, water supply of	41
wells at, record of	28-29		Breslau, well at	38
Alvin, wells near	21		Bronson, well at, record of	63-64
Anahuac, wells at and near	31		well at, water of, analysis of	64
Anaqua, wells near	14		Brown (H. G.) well, record of	35
Anderson County, artesian wells in	63		Brownsville, wells at	3
shallow wells in	63		Brunville, wells at	51
Angelina County, artesian wells in	63		Bryan, wells near	61
shallow wells in	63		Bryan Heights, well near	21
Arcola, well near	24		Buffalo, well near	62
Area of region	1		Burleson County, artesian wells in	60-61
Aranas County, artesian wells in	14		artesian well in, record of	61
shallow wells in	14		water of, analyses of	60, 61
Arnold well, record of	22-23		shallow wells in	60
Artesia, wells near	53			
Artesian wells, flow of	3		C.	
location of, map showing	2		Caldwell, wells near	60
occurrence of	2-3		Caldwell County, artesian wells in	58
views of	1, 6		shallow wells in	57
Atacosa County, artesian wells in	54, 55		Calhoun County, artesian wells in	14-15
shallow wells in	55		artesian wells in, record of	15
Atravesada well, record of	5-6		shallow wells in	14
Ashby, well near	19		Call, well near	50
Austin County, artesian wells in	41		Calvert, wells near	58
shallow wells in	41		Cameron County, artesian wells in	3-6
			artesian wells in, records of	5-6
B.			shallow wells in	3
Barker, well near	25		Carancohue, wells near	16
Barosa Creek, well on, record of	52		Carrizo Springs, wells near	51-52
Bastrop, well near	58		Cedar Bayou, wells at	31
Bastrop County, artesian wells in	58		Center, well at, record of	65
shallow wells in	58		well at, water of, analysis of	65
Batesville, wells near	52		Chambers County, artesian wells in	30-31
Bay City, wells near	19		shallow wells in	30
Bay View, well near	29		Chapel Hill, wells near	41
Beasley (S. H.) well, record of	17-18		Cherokee County, artesian wells in	63
Beaumont, well at	31		shallow wells in	63
Bee County, artesian wells in	34		Chesterville, artesian wells near	3
shallow wells in	34		irrigation near	3
Bexar County, artesian wells in	55-56		Clay, wells at	60
shallow wells in	55		wells at, record of	61
Blessing, wells near	19		water of, analysis of	61
Bobbin, well at, record of	44-45		Cleveland, well at, record of	44
well at, water of, analysis of	45		well at, water of, analysis of	44
Branchville, wells at and near	59		Clodine, wells at	24
Brazoria, well near	21		Colorado County, artesian wells in	40
Brazoria County, artesian wells in	21-24		artesian wells in, record of	40
artesian wells in, records of	22-24		shallow wells in	39
shallow wells in	21		Columbia, wells near	21
			Columbus, well at, record of	40

	Page.	G.	Page.
Conroe, well at, record of-----	45-46	Galveston, water supply of-----	3
well at, water of, analysis of-----	46	well at-----	27
Cooks Point, wells near-----	60	record of-----	30
Corpus Christi, elevation at-----	2	Galveston County, artesian wells in-----	27-30
Cotulla, wells near-----	53	artesian wells in, records of-----	28-30
Counties, underground water in, de-		shallow wells in-----	27
scription of-----	3-67	Galveston well, record of-----	12
Courtney, wells near-----	42	Genoa, wells at and near-----	25
Cretaceous rocks, occurrence of-----	2	Gentry (Charles) well, record of-----	37-38
Crockett, well at-----	63	Geography, sketch of-----	1-2
Cuero, well near, record of-----	35	Geology, sketch of-----	2
Cunningham farm, wells on-----	24	Gillis (John) ranch, well on-----	67
		Goball, well at-----	41
D.		Goliad, well near-----	34
Damon mound, well at-----	21	Goliad County, artesian wells in-----	34
Davenport, well at-----	56	shallow wells in-----	34
Deepwater, wells at-----	24, 25	Gonzales, well near, record of-----	37
Deerpark, wells at-----	25	Gonzales County, artesian wells in-----	35-38
Derby, wells at and near-----	54	artesian wells in, record of-----	37-38
Dewet, wells at and near-----	36	shallow wells in-----	35
Dewitt County, artesian wells in-----	35	Grant, well near-----	60
artesian wells in, record of-----	35	Gregg County, artesian wells in-----	66
shallow wells in-----	34	artesian wells in, record of-----	66
Dickinson, wells at and near-----	29	shallow wells in-----	66
Dies, well at-----	47	Grimes County, artesian wells in-----	42
well at, record of-----	47	artesian wells in, record of-----	42
water of, analysis of-----	47	water of, analysis of-----	42
Dimmit County, artesian wells in-----	51	shallow wells in-----	42
artesian wells in, record of-----	52	Groveton, well at-----	63
shallow wells in-----	51	Guadalupe County, artesian wells in-----	57
Double Bayou, wells at and near-----	31	shallow wells in-----	57
Drainage, sketch of-----	2		
Duval County, artesian wells in-----	33	H.	
shallow wells in-----	33	Hallettsville, wells at and near-----	38
E.		Hampshire, wells near-----	31
Eagle Lake, wells near-----	39	Hardin County, artesian wells in-----	47-48
East Bernard, artesian wells near-----	3	artesian wells in, records of-----	47, 48
irrigation near-----	3	water of, analyses of-----	47, 48
Echo, wells at and near-----	33	shallow wells in-----	47
Edgewater, well at-----	29	Harris County, artesian wells in-----	24-27
Edna, wells near-----	16	artesian wells in, record of-----	26-27
El Campo, artesian wells near-----	3	shallow wells in-----	24
irrigation near-----	3	Harrisburg, well near-----	25
Elevations, range of-----	2	Harrison County, artesian wells in-----	67
Encinal, well at-----	53	artesian wells in, record of-----	67
Engle, wells near-----	39	shallow wells in-----	67
Erin, wells at-----	24	Hawkins, well near-----	67
F.		Hawkinsville, well near-----	19
Falfurrias, wells near-----	8	Hidalgo County, artesian wells in-----	7-8
Fayette County, artesian wells in-----	39	artesian wells in, records of-----	7
shallow wells in-----	39	water of, analysis of-----	8
Floresville, wells near-----	57	shallow wells in-----	7
Fort Bend County, deep wells in-----	24	Hearne, wells near-----	58
shallow wells in-----	24	Hempstead, wells at and near-----	41
Freestone County, artesian wells in-----	63	Hilchcock, wells near-----	29
shallow wells in-----	63	Hoskins Mound, well at, record of-----	23-24
Frio County, artesian wells in-----	54	Houston, water supply of-----	3, 25
shallow wells in-----	54	wells at-----	24, 25
view of-----	1	record of-----	26-27
Frio River, wells on-----	53	Houston County, artesian wells in-----	63
		shallow wells in-----	63
		Humble, well at-----	25

I.

	Page.
Inez, well near-----	16
Irrigation, use of-----	3

J.

Jackson County, artesian wells in--	16-18
artesian wells in, records of--	17-18
shallow wells in-----	16
Jasper County, artesian wells in--	48-50
artesian wells in, records of--	49-50
water of, analysis of-----	50
shallow wells in-----	48
Jefferson, well at-----	67
Jefferson County, artesian wells in--	31-32
artesian well in, record of--	32
shallow wells in-----	31

K.

Karnes City, well at-----	34
Karnes County, artesian wells in--	34
shallow wells in-----	34
Katy, wells at-----	24
Kenard, wells near-----	63
Kenedy Pasture Company's wells, list of-----	4
Kemper, wells near-----	16
King ranch, wells on-----	5, 7, 10
wells on, water of, analysis of--	12
Kirbyville, well at-----	48
well at, record of-----	50
water of, analysis of-----	50

L.

La Porte, wells at and near-----	25
Lasalle County, artesian wells in--	53
shallow wells in-----	53
Lasater (E. C.) ranch, wells on-----	7
wells on, waters of, analyses of--	8, 9
Laureles ranch, wells on-----	11
Lavaca County, artesian wells in--	38
shallow wells in-----	38
League City, wells at-----	29
Lee County, artesian wells in--	58
shallow wells in-----	58
Leesville, wells near-----	35-36
Leobau, well near-----	58
Leon County, artesian wells in--	62
shallow wells in-----	62
Leon Springs, wells at-----	55
Liberty, wells at and near-----	43
Liberty County, artesian wells in--	43-44
artesian wells in, records of--	43, 44
water of, analyses of-----	43, 44
shallow wells in-----	43
Limestone County, artesian wells in--	63
shallow wells in-----	63
Live Oak County, artesian wells in--	34
shallow wells in-----	33
Location of region-----	1
Lockhart, wells near-----	57, 58
Longview, well at, record of-----	66

M.

McMullen County, artesian wells in--	54
shallow wells in-----	53

Page.

Madison County, artesian wells in--	62
shallow wells in-----	62
Manvel, well near-----	21
Marion County, artesian wells in--	67
shallow wells in-----	67
Markham, well near-----	19
Marshall, well at-----	67
Martindale, wells near-----	57
Matagorda, well near-----	19
Matagorda County, artesian wells in--	19
shallow wells in-----	19
Maverick County, artesian wells in--	51
shallow wells in-----	51
Maxwell, wells near-----	57
Maysfield, well at-----	59
Meadow Brook County farms, wells on-----	24
Mesquite well, water of, analysis of--	9
Midfield, well near-----	19
Miguel, wells near-----	54
Mikesha, well near-----	34
Milam County, artesian wells in--	59
shallow wells in-----	59
Montgomery County, artesian wells in-----	44-46
artesian wells in, records of--	44-46
water of, analyses of-----	45-46
shallow wells in-----	44
Morgan Point, wells at-----	25
Mount Belvieu, wells at and near--	31
Myers, wells at and near-----	60

N.

Nacogdoches, wells near-----	64
Nacogdoches County, artesian wells in-----	64
shallow wells in-----	64
Navasota well, record of-----	42
water of, analysis of-----	42
Newton County, artesian wells in--	50
shallow wells in-----	50
Nueces County, artesian wells in--	9-13
artesian wells in, records of--	10-12
waters of, analyses of-----	12-13
shallow wells in-----	9

O.

Oakhurst, well at-----	46
Oakville, wells at and near-----	34
O'Donnell (J. H.) farm, wells at--	24
Orange, wells at and near-----	32-33
Orange County, artesian wells in--	32-33
shallow wells in-----	32
Ovejas well, record of-----	6

P.

Palacios, wells at-----	19
Palestine, wells at-----	63
Panola County, artesian wells in--	65
shallow wells in-----	65
Parker (Mit.) well, water of, analysis of-----	60
Pasadena, wells at-----	25
Pearsall, well near, view of-----	1
wells near-----	54

	Page.		Page.
Pierce Station, well at, record of-----	20	Silsbee, well at-----	47
Pittsbridge, wells at and near-----	60	well at, record of-----	47
Pleasanton, wells near-----	55	water of, analysis of-----	47
Point Lavaca, wells near-----	14	Smith County, artesian wells in-----	66
Polk County, artesian wells in-----	46	shallow wells in-----	66
shallow wells in-----	46	Somerville, well near-----	60
Port Arthur, well at-----	31	Starr County, artesian wells in-----	8-9
Praha, wells at-----	39	artesian wells in, water of, anal- ysis of-----	9
		shallow wells in-----	8
Q.		Steeles store, well near-----	61
Quintana, well near-----	21	Stockdale, well near-----	57
		Stone City, well at and near-----	60, 61, 62
R.		Stowell, well near-----	31
Rains County, artesian wells in-----	65	Strange, wells at-----	25
shallow wells in-----	65	Streams, character of-----	2
Rancho, wells near-----	35-37	Stribling well, record of-----	32
Refugio County, artesian wells in-----	13-14	Sugar Land, wells near-----	24
shallow wells in-----	13	Sullivan (D.) ranch, wells on-----	7
Rice, irrigation for-----	3	Surfside, wells near-----	21
Richmond, water supply of-----	24	Sutherland Springs, well near-----	57
well at-----	24		
Rio Grande embayment, wells in-----	3	T.	
wells in, plate showing-----	6	Tertiary rocks, occurrence of-----	2
Rita, wells near-----	60	Texas City, wells at-----	29
Robertson County, artesian wells in-----	58-59	Texas Land and Cattle Company's ranch, wells on-----	11
shallow wells in-----	58	Thorndale, well at-----	59
Rusk County, artesian wells in-----	65	Tilden, wells at and near-----	54
shallow wells in-----	65	Topography, sketch of-----	2
		Trinity River, well at, record of-----	43
S.		well at, water of, analysis of-----	43
Sabine County, artesian wells in-----	63-64	Tunis, well near, water of, analysis of-----	60
artesian wells in, record of-----	64	Tyler County, artesian wells in-----	48
water of, analysis of-----	64	shallow wells in-----	48
shallow wells in-----	63		
Sabine pass, well at-----	31	U.	
well at, record of-----	32	Underground water, description of, by counties-----	3-67
San Antonio, water supply of-----	3	Union, well near-----	57
wells at and near-----	56	Upshur County, artesian wells in-----	67
San Augustine County, artesian wells in-----	63	shallow wells in-----	67
shallow wells in-----	63		
San Jacinto County, artesian wells in-----	46	V.	
shallow wells in-----	46	Van Zandt County, artesian wells in-----	65
San Miguel Creek, wells on-----	54	shallow wells in-----	65
San Patricio County, artesian wells in-----	13	Vanraub, wells near-----	55
shallow wells in-----	13	Velasco, wells near-----	21
Sandy Point, well near-----	21	Victoria, well at and near-----	16
Santa Clara well, record of-----	12	Victoria County, artesian wells in-----	15-16
Sauz ranch, wells at and near, rec- ords of-----	5	shallow wells in-----	15
Schulenburg, wells at-----	39	Votaw, well at-----	47
Seabrook, wells at and near-----	25	well at, record of-----	48
Seeligson ranch, wells on-----	11	water of, analysis of-----	48
wells on, record of-----	12		
water of, analysis of-----	13	W.	
Seguin, well near-----	57	Wadsworth, well near-----	19
Shelby County, artesian wells in-----	65	Walker County, artesian wells in-----	46
artesian wells in, record of-----	65	shallow wells in-----	46
water of, analysis of-----	65	Waller County, artesian wells in-----	41
shallow wells in-----	65		
Shiner, wells at and near-----	38		

	Page.		Page.
Waller County, shallow wells in----	41	White Sulphur well, water of, anal-	
Waller, well near-----	41	ysis of-----	8
Wallisville, well at-----	31	Whittaker, wells at and near-----	60
Ward and Russell ranch, wells on--	7	Wiess and Sanders ranch, wells on--	48
Washington, well at-----	41	wells on, records of-----	49-50
Washington County, artesian wells		Wiess Bluff, well near-----	48
in-----	41	Wilson County, artesian wells in---	57
shallow wells in-----	41	shallow wells in-----	57
Water, underground, description of,		Wood County, artesian wells in----	66
by counties-----	3-67	shallow wells in-----	66
importance of-----	2-3	Woodville, well near-----	48
Webb County, artesian wells in----	51	Wooster, well near-----	25
shallow wells in-----	50	Wrightsboro, wells near-----	35-36
Webster, artesian wells near-----	3		
irrigation near-----	3	Y.	
wells at and near-----	25	Yoakum, well at-----	35
Wells, artesian, flow of-----	3	Yorktown, wells at-----	35
location of, map showing-----	2		
occurrence of-----	2-3	Z.	
views of-----	4, 54	Zapata County, artesian wells in---	33
Wharton County, artesian wells in--	19-21	shallow wells in-----	33
artesian wells in, record of----	20-21	Zavalla County, artesian wells in--	52
shallow wells in-----	19	shallow wells in-----	52

CLASSIFICATION OF THE PUBLICATIONS OF THE UNITED STATES GEOLOGICAL SURVEY.

[Water-Supply Paper No. 190.]

The publications of the United States Geological Survey consist of (1) Annual Reports, (2) Monographs, (3) Professional Papers, (4) Bulletins, (5) Mineral Resources, (6) Water-Supply and Irrigation Papers, (7) Topographic Atlas of United States—folios and separate sheets thereof, (8) Geologic Atlas of United States—folios thereof. The classes numbered 2, 7, and 8 are sold at cost of publication; the others are distributed free. A circular giving complete lists can be had on application.

Most of the above publications can be obtained or consulted in the following ways:

1. A limited number are delivered to the Director of the Survey, from whom they can be obtained, free of charge (except classes 2, 7, and 8), on application.

2. A certain number are delivered to Senators and Representatives in Congress for distribution.

3. Other copies are deposited with the Superintendent of Documents, Washington, D. C., from whom they can be had at prices slightly above cost.

4. Copies of all Government publications are furnished to the principal public libraries in the large cities throughout the United States, where they can be consulted by those interested.

The Professional Papers, Bulletins, and Water-Supply Papers treat of a variety of subjects, and the total number issued is large. They have therefore been classified into the following series: A, Economic geology; B, Descriptive geology; C, Systematic geology and paleontology; D, Petrography and mineralogy; E, Chemistry and physics; F, Geography; G, Miscellaneous; H, Forestry; I, Irrigation; J, Water storage; K, Pumping water; L, Quality of water; M, General hydrographic investigations; N, Water power; O, Underground waters; P, Hydrographic progress reports. This paper is the sixty-seventh in Series O, the complete list of which follows: (PP= Professional Paper; B=Bulletin; WS=Water-Supply Paper):

SERIES O, UNDERGROUND WATERS.

WS 4. A reconnaissance in southeastern Washington, by I. C. Russell. 1897. 96 pp., 7 pls. (Out of stock.)

WS 6. Underground waters of southwestern Kansas, by Erasmus Haworth. 1897. 65 pp., 12 pls. (Out of stock.)

WS 7. Seepage waters of northern Utah, by Samuel Fortier. 1897. 50 pp., 3 pls. (Out of stock.)

WS 12. Underground waters of southeastern Nebraska, by N. H. Darton. 1898. 56 pp., 21 pls. (Out of stock.)

WS 21. Wells of northern Indiana, by Frank Leverett. 1899. 82 pp., 2 pls. (Out of stock.)

WS 26. Wells of southern Indiana (continuation of No. 21), by Frank Leverett. 1899. 64 pp. (Out of stock.)

WS 30. Water resources of the Lower Peninsula of Michigan, by A. C. Lane. 1899. 97 pp., 7 pls. (Out of stock.)

WS 31. Lower Michigan mineral waters, by A. C. Lane. 1899. 97 pp., 4 pls. (Out of stock.)

WS 34. Geology and water resources of a portion of southeastern South Dakota, by J. E. Todd. 1900. 34 pp., 19 pls.

WS 53. Geology and water resources of Nez Perces County, Idaho, Pt. I, by I. C. Russell. 1901. 86 pp., 10 pls. (Out of stock.)

WS 54. Geology and water resources of Nez Perces County, Idaho, Pt. II, by I. C. Russell. 1901. 87-141 pp. (Out of stock.)

- WS 55. Geology and water resources of a portion of Yakima County, Wash., by G. O. Smith. 1901. 68 pp., 7 pls. (Out of stock.)
- WS 57. Preliminary list of deep borings in the United States, Pt. I, by N. H. Darton. 1902. 60 pp. (Out of stock.)
- WS 59. Development and application of water in southern California, Pt. I, by J. B. Lippincott. 1902. 95 pp., 11 pls. (Out of stock.)
- WS 60. Development and application of water in southern California, Pt. II, by J. B. Lippincott. 1902. 96-140 pp. (Out of stock.)
- WS 61. Preliminary list of deep borings in the United States, Pt. II, by N. H. Darton. 1902. 67 pp. (Out of stock.)
- WS 67. The motions of underground waters, by C. S. Slichter. 1902. 106 pp., 8 pls. (Out of stock.)
- B 199. Geology and water resources of the Snake River Plains of Idaho, by I. C. Russell. 1902. 192 pp., 25 pls.
- WS 77. Water resources of Molokai, Hawaiian Islands, by Waldemar Lindgren. 1903. 62 pp., 4 pls.
- WS 78. Preliminary report on artesian basins in southwestern Idaho and southeastern Oregon, by I. C. Russell. 1903. 58 pp., 2 pls.
- PP 17. Preliminary report on the geology and water resources of Nebraska west of the one hundred and third meridian by N. H. Darton. 1903. 69 pp., 43 pls.
- WS 90. Geology and water resources of a part of the lower James River Valley, South Dakota, by J. E. Todd and C. M. Hall. 1904. 47 pp., 23 pls.
- WS 101. Underground waters of southern Louisiana, by G. D. Harris, with discussions of their uses for water supplies and for rice irrigation, by M. L. Fuller. 1904. 98 pp., 11 pls.
- WS 102. Contributions to the hydrology of eastern United States, 1903, by M. L. Fuller. 1904. 522 pp.
- WS 104. Underground waters of Gila Valley, Arizona, by W. T. Lee. 1904. 71 pp., 5 pls.
- WS 106. Water resources of the Philadelphia district, by Florence Bascom. 1904. 75 pp., 4 pls.
- WS 110. Contributions to the hydrology of eastern United States, 1904; M. L. Fuller, geologist in charge. 1904. 211 pp., 5 pls.
- PP 32. Geology and underground water resources of the central Great Plains, by N. H. Darton. 1904. 433 pp., 72 pls. (Out of stock.)
- WS 111. Preliminary report on underground waters of Washington, by Henry Landes. 1904. 85 pp., 1 pl.
- WS 112. Underflow tests in the drainage basin of Los Angeles River, by Homer Hamlin. 1904. 55 pp., 7 pls.
- WS 114. Underground waters of eastern United States, by M. L. Fuller, geologist in charge. 1904. 285 pp., 18 pls.
- WS 118. Geology and water resources of east-central Washington, by F. C. Calkins. 1905. 96 pp., 4 pls.
- B 252. Preliminary report on the geology and water resources of central Oregon, by I. C. Russell. 1905. 138 pp., 24 pls.
- WS 120. Bibliographic review and index of papers relating to underground waters published by the United States Geological Survey, 1879-1904, by M. L. Fuller. 1905. 128 pp.
- WS 122. Relation of the law to underground waters, by D. W. Johnson. 1905. 55 pp.
- WS 123. Geology and underground water conditions of the Jornada del Muerto, New Mexico, by C. R. Keyes. 1905. 42 pp., 9 pls.
- WS 136. Underground waters of the Salt River Valley, by W. T. Lee. 1905. 194 pp., 24 pls.
- B 264. Record of deep-well drilling for 1904, by M. L. Fuller, E. F. Lines, and A. C. Veatch. 1905. 106 pp.
- PP 44. Underground water resources of Long Island, New York, by A. C. Veatch and others. 1905. 394 pp., 34 pls.
- WS 137. Development of underground waters in the eastern coastal plain region of southern California, by W. C. Mendenhall. 1905. 140 pp., 7 pls.
- WS 138. Development of underground waters in the central coastal plain region of southern California, by W. C. Mendenhall. 1905. 162 pp., 5 pls.
- WS 139. Development of underground waters in the western coastal plain region of southern California, by W. C. Mendenhall. 1905. 105 pp., 7 pls.
- WS 140. Field measurements of the rate of movement of underground waters, by C. S. Slichter. 1905. 122 pp., 15 pls.
- WS 141. Observations on the ground waters of Rio Grande Valley, by C. S. Slichter. 1905. 83 pp., 5 pls.
- WS 142. Hydrology of San Bernardino Valley, California, by W. C. Mendenhall. 1905. 124 pp., 13 pls.
- W 145. Contributions to the hydrology of eastern United States; M. L. Fuller, geologist in charge. 1905. 220 pp., 6 pls.
- WS 148. Geology and water resources of Oklahoma, by C. N. Gould. 1905. 178 pp., 22 pls.
- WS 149. Preliminary list of deep borings in the United States, second edition, with additions, by N. H. Darton. 1905. 175 pp.
- PP 46. Geology and underground water resources of northern Louisiana and southern Arkansas, by A. C. Veatch. 1906. 422 pp., 51 pls.
- WS 153. The underflow in Arkansas Valley in western Kansas, by C. S. Slichter. 1906. 90 pp., 3 pls.

- WS 154. The geology and water resources of the eastern portion of the Panhandle of Texas, by C. N. Gould. 1906. 64 pp., 15 pls.
- WS 155. Fluctuations of the water level in wells, with special reference to Long Island, New York, by A. C. Veatch. 1906. 83 pp., 9 pls.
- WS 157. Underground water in the valleys of Utah Lake and Jordan River, Utah, by G. B. Richardson. 1906. 81 pp., 9 pls.
- WS 158. Preliminary report on the geology and underground waters of the Roswell artesian area, New Mexico, by C. A. Fisher. 1906. 29 pp., 9 pls.
- PP 52. Geology and underground waters of the Arkansas Valley in eastern Colorado, by N. H. Darton. 1906. 90 pp., 28 pls.
- WS 159. Summary of underground-water resources of Mississippi, by A. F. Crider and L. C. Johnson. 1906. 86 pp., 6 pls.
- PP 53. Geology and water resources of the Bighorn basin, Wyoming, by C. A. Fisher. 1906. 72 pp., 16 pls.
- WS 160. Underground-water papers, 1906, by M. L. Fuller. 1906. 104 pp., 1 pl. (Out of stock.)
- WS 163. Bibliographic review and index of underground-water literature published in the United States in 1905, by M. L. Fuller, F. G. Clapp, and B. L. Johnson. 1906. 130 pp.
- WS 164. Underground waters of Tennessee and Kentucky west of Tennessee River and of an adjacent area in Illinois, by L. C. Glenn. 1906. 173 pp., 7 pls.
- WS 181. Geology and water resources of Owens Valley, California, by W. T. Lee. 1906. 28 pp., 6 pls. (Out of stock.)
- WS 182. Flowing wells and municipal water supplies in the southern portion of the Southern Peninsula of Michigan, by Frank Leverett and others. 1906. 292 pp., 5 pls.
- WS 183. Flowing wells and municipal water supplies in the middle and northern portions of the Southern Peninsula of Michigan, by Frank Leverett and others. 1906. 393 pp., 5 pls.
- B 298. Record of deep-well drilling for 1905, by M. L. Fuller and Samuel Sanford. 1906. 299 pp.
- WS 184. The underflow of the South Platte Valley, by C. S. Slichter and H. C. Wolff. 1906. 42 pp.
- WS 188. Water resources of the Rio Grande Valley in New Mexico and their development, by W. T. Lee. 1906. 59 pp., 10 pls.
- WS 190. Underground waters of Coastal Plain of Texas, by T. U. Taylor. 1907. 73 pp., 3 pls.

The following papers also relate to this subject: Underground waters of Arkansas Valley in eastern Colorado, by G. K. Gilbert, in Seventeenth Annual, Pt. II; Preliminary report on artesian waters of a portion of the Dakotas, by N. H. Darton, in Seventeenth Annual, Pt. II; Water resources of Illinois, by Frank Leverett, in Seventeenth Annual, Pt. II; Water resources of Indiana and Ohio, by Frank Leverett, in Eighteenth Annual, Pt. IV; New developments in well boring and irrigation in eastern South Dakota, by N. H. Darton, in Eighteenth Annual, Pt. IV; Rock waters of Ohio, by Edward Orton, in Nineteenth Annual, Pt. IV; Artesian-well prospects in the Atlantic coastal plain region, by N. H. Darton, Bulletin No. 138.

Correspondence should be addressed to

THE DIRECTOR,

UNITED STATES GEOLOGICAL SURVEY,

WASHINGTON, D. C.

APRIL, 1907.

