University of Texas Bulletin

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With a Preliminary Contour Map

BY

E. H. SELLARDS

Bureau of Economic Geology and Technology

Division of Economic Geology

J. A. Udden, Director of the Bureau and Head of the Division

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The benefits of education and of useful knowledge, generally diffused through a community, are essential to the preservation of a free government.

Sam Houston

Cultivated mind is the guardian genius of democracy. . . . . It is the only dictator that freemen acknowledge and the only security that freemen desire.

Mirabeau B. Lamar

CONTENTS

ON THE UNDERGROUND POSITION OF THE ELLENBURGER FORMATION IN NORTH CENTRAL TEXAS

WITH A PRELIMINARY CONTOUR MAP

BY E. H. SELLARDS[1]

The Ellenburger limestone, approximating, when fully developed, a thousand feet in thickness, is exposed at the surface in the Central Mineral Region of Texas, and from this belt of surface exposures dips beneath later formations. To the north from the Central Mineral Region, the position of the formation is more or less well-known from drilling records as far as Young and Palo Pinto counties, beyond which it passes to depths not yet reached in drilling. However, approaching the north State line it is again brought sufficiently near to the surface to be reached by a few wells in the structurally high area adjacent to the Red River.

With the exception of the Vestal well in Callahan County, the formation itself is not known to be productive of either oil or gas in commercial quantities. However, its relation to the producing formations is such that the accurate or approximate determination of its position below the surface becomes a matter of much importance. As a rule, test wells for oil in north-central Texas are not drilled deeper than to the Ellenburger limestone. To have a knowledge of the approximate depth at which this formation will be encountered is, therefore, important in planning a test well. In addition, the structural conditions in the Ellenburger are, with little doubt, more or less reflected in the overlying petroleum-bearing formations. Hence the structures in the Ellenburger suggest the probability of similar structures in the later formations. This paper relates to the position of the Ellenburger limestone below the surface in north-central Texas as indicated by well records.

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[1]Paper read in abstract before the Dallas meeting of the American Association of Petroleum Geologists, March, 1920. Published by consent of the Association. Revised and submitted for publication April, 1920. Issued July, 1920.

ACKNOWLEDGMENTS

To the Director of the Bureau of Economic Geology of the University of Texas the writer is indebted not only for the opportunity of working on this problem, but also for access to the many data on this problem that have accumulated in the records and files of the Bureau. For data more recently obtained the writer is under obligation to all the large oil-producing companies operating in north-central Texas, and in particular, to the geological and scouting departments of these companies, and to drillers and others. The logs of wells have been obtained either directly or indirectly from the companies testing for oil. The surface elevations at the wells where known by instrumental surveys are to be credited entirely to the operating oil companies. Where elevations based on instrumental surveys are not available, the elevations of the wells have been estimated from the topographic maps of the United States Geological Survey. The samples of cuttings, like the logs, have accumulated in the Bureau collections at different times and from various sources. Many of them have come to the Bureau from geologists, scouts, drillers, and others interested in particular wells. A considerable number of samples recently received has been contributed from the geological departments of several of the operating companies.

In connection with the discussion of the well records, the writer has had occasion to refer to and utilize the data from cuttings from the numerous wells. These samples have been identified by Dr. J. A. Udden, to whom the writer is indebted for the opportunity of utilizing the data from them in this paper. Among those who have assisted from time to time in the identification of well samples in the Bureau of Economic Geology collections are V. V. Waite, E. B. Stiles, and A. H. Kemp. In the case of two of the wells used in this report, namely the Goss and Schoor wells of Comanche and Eastland counties, the samples contained in the Bureau collection have been supplemented by the description of samples from the same wells by S. G. Garrett under direction of Wallace E. Pratt of the Geological Department of the Humble Oil Company.

Previous Publications

The existence of a structurally high area extending slightly east of north from the Central Mineral Region has become well known in recent years. This arch was depicted in a general way in a map by M. G. Cheney, published in the May, 1918, issue of the Oil Trade Journal, page 75, and in a map by Dorsey Hager accompanying a paper published in Bulletin 138 of the American Institute of Mining Engineers, issued June, 1918. In these maps the Bend formations are used in contouring the regional structure, while the present paper relates entirely to regional structure as indicated by the Ellenburger formation. In a paper entitled "Recent Knowledge of Formations Below the Bend," Mr. William Kennedy has referred to a number of wells which enter the Ellenburger formation in north-central Texas and concludes that they indicate a ridge extending in a northeasterly direction from the Central Mineral Region.[1] A similar conclusion has been expressed by W. G. Matteson. The Oil and Gas Journal, issue of October 17, 1919, contains a paper by Lee Hager on regional structure on the Red River, while papers relating to structural conditions within the oil fields of north-central Texas have been published by a number of other geologists. Volume 3 of the Bulletin of the American Association of Petroleum Geologists, 1919, contains the following papers relating more or less directly to structural conditions in this area: Sub-surface Geology of the Oil Districts of North-Central Texas, by Jon A. Udden; Geologic Structures and Producing Areas in the North Texas Petroleum Fields, by Wallace E. Pratt; Observations on Two Deep Borings Near the Balcones Fault Zone, by J. A. Udden; A Review of the Development of the New Central Texas Oil Fields During 1918, by W. G. Matteson.

Limitation in the Data Now Available

The present map, as indicated by the title, is preliminary. It is based on the data now available in the Bureau of Eco-

[1]The Southwestern Oil Journal, Jan. 4, 1919, p. 1.

nomic Geology of the University and is expected to be revised as data accumulate. There are certain sources of possible error among which the following, in particular, should be mentioned: The elevation of the land surface at the wells is, in all instances, to be regarded as more or less of an approximation to actual levels. As already stated, in the absence of other data, some elevations, as noted in connection with the wells, have been estimated from topographic maps. These are reconnaissance maps with contours at 50-foot intervals. There is also difficulty in placing these wells accurately on the topographic map. There is thus introduced for these wells a possible error in elevation amounting to from a few feet to as much probably as 100 or 150 feet in the case of some wells. For the wells the elevation of which is based on instrumental levels, there is likewise a considerable possible limit of error in elevation. For many of these wells, two or more elevations have been recorded which seldom agree, and which vary among themselves from a few feet to as much in extreme cases as from 50 to 75 or 100 feet.

Not only in the matter of surface elevations, but in the records themselves, the data as to the Ellenburger formation are approximate rather than exact. A sample of cuttings which affords a positive identification of the Ellenburger may nevertheless be indeterminate as to whether it has been obtained from the top or from some distance down in that formation. In such instances, the data from the sample may be supplemented in an important way by the data from the log. In the case of wells represented by merely a log, the probability of error in determining the top of the Ellenburger is, of course, greater than when represented by both log and sample, and while most logs are so kept as to permit the determination of the dividing line between the Bend and Ellenburger formations, there are some that permit at best only of an approximate separation of these formations. Nevertheless, for regional structure, it is believed that the data now available are sufficiently exact to be of service in defining both the position and the structure of this formation in north-central Texas.

Irregularities in the Top Surface of the Ellenburger Produced by Erosion

As has been stated, the purpose of a map contouring the Ellenburger is two-fold. First of all, the map and text combined afford the driller the data by which to make such an estimate as it is now possible to give of the depth to this formation at any place within this area. Secondly, the map indicates in a broad way the regional structure of the Ellenburger formation in north-central Texas. In applying the map to the interpretation of structure, however, it must not be forgotten that the top surface of the Ellenburger is an erosion surface and that some of the irregularities in the formation may be due in part to erosion and not entirely to structure. It is certain, however, that while the erosion feature may account for relatively minor irregularities in the Ellenburger, the major features observed and mapped in that formation are structural.

Explanation of the Map

The location of each well used in determining the position of the Ellenburger limestone is indicated to such degree of accuracy as is practicable on a map of this scale. In the case of those wells believed to have entered the Ellenburger formation, the approximate actual level of the top of the formation above or below sea level, as nearly as can be determined, is shown by the map entry for that well, levels below sea being indicated by a minus sign preceding the number. In addition to wells entering the Ellenburger a few have been used which, although not known to have entered the Ellenburger, are useful in mapping as showing that the formation lies below a given depth. In the map entry such wells are indicated by a plus sign following the entry. Dotted contours include those farther removed from known wells and hence less definitely placed than the contours shown in solid lines.

Regional Structure in North-Central Texas as Indicated by the Ellenburger Formation

Contours on the Ellenburger, as on the Bend, indicate a pronounced arch extending slightly east of north from the

Central Mineral Region. From near the western part of San Saba County the axis, or line of maximum elevations on this arch, passes somewhat east of the center of Brown County, crosses the northwestern part of Comanche County, and lies probably somewhat east of the center of Eastland County. North of Eastland County the available data are as yet too limited to locate the ill-defined axis of the fold in the Ellenburger, which probably lies near the Stephens-Palo Pinto county line.

This fold plunges to the north, the rate of plunge varying from place to place. In San Saba and McCulloch counties, the Ellenburger is found at the surface at elevations of from 1500 to 1700 feet or more above sea level. In Young County, 150 miles to the north, the formation lies 3500 feet or more below the sea level. The plunge is probably most rapid in Brown County where it may amount to as much as an average of 50 feet per mile. Farther to the north the plunge in the axis of the fold is less rapid, and over considerable distance may not exceed 25 or 30 feet per mile.

A conspicuous feature of this large fold is the lack of symmetry between the west and east sides of the arch. The west limb of the arch has an approximately uniform slope, decreasing in rate of dip perhaps with the increased distance from the Central Mineral Region. On the east limb of the fold, on the other hand, the rate of slope is notably irregular, and is in general more rapid than on the west limb. In contouring, this lack of symmetry in the fold is expressed by the abrupt turn of the contours to the south after crossing the axis of the fold. On the west side of the fold the contours, when drawn to express regional structure, and disregarding such local structures as may exist in this formation, maintain an approximately regular course, varying in direction from north-northeast, west of the mineral region, to east-northeast and in places almost east-west as they approach the axis of the fold. After crossing the axis, these contours turn shortly to the south and in some instances turn southwest, thus almost doubling back on themselves.

The arch, as developed in the Ellenburger, is not a simple fold. Masses or "noses" of this formation project to the

northeast. One of the best delineated of these noses is that at Desdemona. Here the contours on the Ellenburger, after making the turn at Desdemona, run west of south until again deflected to the east by another northeastward projecting mass of the Ellenburger. The 2000-foot contour below sea level, after turning south near Desdemona, runs west of south for as much as 15 miles to the Tate and Fisher wells where it turns at right angles to a direction slightly south of east. This contour again turns south after passing the Sturkie well northeast of Comanche. Its position at the Mills County line is defined in part by the Luckie well which indicates that its course from the Sturkie well may be about due south as drawn on the map, or very possibly when more fully known the course of the contour after making the turn northeast of Comanche may be found to be west of south into Mills County. Other contours, crossing the axis of the fold, follow a more or less similar course, at least to the extent of bending very shortly to the south.

Disturbed Area Between the Bend Arch and the Balcones Fault Zone

Not only is the east slope of the major arch one of rapid and irregular dip, but observation will show that the whole area from the Bend Arch to the Balcones Fault Zone, at least that part of it in which the Ellenburger formation can now be delineated, is an area of much greater disturbance than is a similar area to the west of the Bend Arch. The northeastward projecting masses of the Ellenburger at Desdemona and northeast of Comanche have been referred to, the syncline separating these being located by the Tate and Fisher wells and expressed on the map by the deep reentrant in the contours. A very deep reentrant in the contours, in the eastern part of Mills County, indicates the location of another structurally low area in the Ellenburger. This low area in Mills County contrasts strongly with the broad high Ellenburger mass extending into the northwestern part of Lampasas County. The broad high area of Lampasas County is interpreted in contouring as continuing to the northeast to the Clark well in Coryell County. However, as there are at

present no deep wells in northeastern Lampasas and northwestern Coryell counties, this mapping of the Ellenburger lacks confirmation and may ultimately require alteration. Another low is indicated, the writer believes, by the wells of eastern Lampasas and southwestern Coryell counties, including the Grove well of Lampasas County and the Tienert and Strickland wells of Coryell County. The Gotcher well near the Coryell-Bell county line with little doubt indicates the approach of the relatively high area of the Balcones fault zone lying next to the east of the low area referred to. The number of wells reaching the Ellenburger is as yet limited as compared to the large area to which this map relates, and more complications in the structure of the Ellenburger are to be expected than can now be indicated in contouring. The map should, therefore, be regarded as preliminary and drawn for the purpose of expressing the present available records of the formation. The data on which the map is based are more fully given in the pages which follow.

Conditions in North Texas

The arch in the Ellenburger formation may be followed more or less definitely, as already noted, as far to the north as Young County, where by reason of the north plunge of the structure it lies at a depth of from 3500 to 4000 feet below sea level. That the north plunge does not continue uninterruptedly to the north state line is indicated by well records available from Clay, Montague and Cooke counties. A well on the Byers farm, 12 miles north of Henrietta in Clay County, is reported to have entered granite at 4240 feet from the surface, or at an actual level of about 3311 feet below sea level. A well in the northern part of Montague County is known to have entered the schists at about 3000 feet from the surface. In Cooke County, a few miles north of Myra, the Ellenburger is reported by samples at a depth of 2105 feet from the surface,[1] or at an actual level of approximately 1000 feet below sea level. These records indicate that the Ellenburger formation, where present in these counties, lies at a level much higher than in the adjoining

[1]The University of Texas, Handbook Series No. 1. J. A. Udden, p. 55.

counties to the south. The conditions in the Red River area have been discussed by Mr. Lee Hager, in the paper to which reference has already been made.

Available Data

The data available on wells reaching the Ellenburger formation in north-central Texas are summarized in the following lists in which, for convenience of reference, the wells are arranged by counties. The wells of each county are listed alphabetically under the name of the owner of the land on which the well is located. For each well there is given the name of the company or individual by whom the well was drilled; the location by survey; the location in miles from a town or other designated place; the total depth of the well, if known; the elevation of the land surface at the well; the depth from the surface to the Ellenburger limestone; the kind of data available, whether a log or sample or both. In the case of a number of wells, although samples are at hand showing the presence of the Ellenburger, the log must be relied upon to determine the top surface of that formation, the samples having come from below the top of the formation. In such instances the entry showing the top of the Ellenburger is taken from the log, and there is added an entry showing the depth at which the first Ellenburger sample is available. There is added a column in the lists giving a map entry for each well on which the data are sufficiently complete to permit of its use in mapping. Except when followed by a plus sign, the map entry indicates the depth of the Ellenburger formation below or above sea level, as nearly as can be determined. When followed by the plus sign, the map entry shows that although the well was drilled to the depth indicated, the Ellenburger was not reached, and lies at an undetermined distance below that depth. Those wells, the elevation of which is estimated from the topographic map, are indicated by the letter "T" following the entry. The elevations given for all other wells are elevations obtained from operating companies in this section and are based on instrumental levels. Following is the list of wells by counties:

Name of Well and Owner	Location by Survey	Location from town or other place	Total Depth	Surface Elevation	Depth Ellenburger	Kind of Record	Map Entry
Abney 1, Graham Ludlow and Thomas.	Kerr County School Lands Surv. 272	6 mi. S, 2 E Brownwood	2610	1504	1510	Log	—6
Alvis 1, Oil States Petroleum Co.	H. T. & B. Ry. Co. Surv. 37	12½ mi. N, 1 W Bangs	3160	1575	3035	Log	—1460
Andrews 1, Pippin Oil Co.	H. H. Hall Surv. 49	½ mi. S, ¾ E Brownwood	2401	1316	1675	Log Sample at 1921	—359
Baugh 1, Bartles and Dumenil and Texas Co.	Osborn Dalton Surv. 26	7½ mi. N, 1½ E Brownwood	3310	1395	2278	Samples	—883
Burns 1, Gilman Crabtree and Simcons	C. C. Baker Surv. 7	12 mi. N, 6 E Brownwood	3250	1721	3003	Log Sample at 3070	—1272
Capps 1, Texas Eastern Oil Co	Patrick Sullivan Surv. 7	2 mi. NE Brownwood	1900	1377	1874	Samples	—497
Cross 1, A. A. Peard.	E. D. Prewett Surv. 13	South county line	2803	1417	1270	Log	147
Davis 1, Carter et al.	Jas. Bird Surv. 102	5 mi. S, 1 W Bangs	2218	1553	2147	Log Sample at 2190	—594
Fuller 1, Empire Oil and Gas Co.	C. B. Jennings Surv. 353	2¼ mi. W, 1¼ N Bangs	3708	1563	2345	Log	—782
Gaines 1, Sinclair Gulf Oil Co.	Nancy Jordan Surv. 12	12 mi. N, 4 W Brownwood	2778	1520	2760	Log Sample at 2763	—1240
Gehrke 1, Perry-Bencini.	Kerr County School Lands	5 mi. S Brownwood	2105	1400	?	Sample at 2105	
Harris 1, Pennant Oil Co.	Jno. Saunders Surv. 162	4 mi. fr. N, ½ fr. W county line	3405	1625	3405	Log	—1780
Low 1, D. R. Bailey et al.	J. M. Baker Surv. N. part	8½ mi. N, 1 W Bangs	--------	1450T	2755	Samples	—1305
Lowe 1, J. W. Collins	Reuben Ross Surv. 44	3 mi. S, 1½ E Brownwood	1565	1375T	1487	Log	—112

Matlock 1, Pecan Bayou Oil Co.	Brown County School Land Surv. 360	3½ mi. E Brownwood	2757	1417	1850	Log Sample at 2380	—433
Nevermind, Producers Oil Co.		Southern part of county	1975	--------	1780	Log	--------
Sewell 1, E. J. McJunken et al.	T. & P. Ry. Co. Surv. 3	10½ mi. N, 5 W Brownwood	2505	1500T	2230	Log	—730
Sterns 1, Jewel Oil Co.	A. D. Neill Surv. 41	10 mi. S, 4 W Bangs	2084	1515T	?	--------	--------
Weeden 1, Partridge Oil and Gas Co.	H. T. & P. Ry. Co. Surv. 51	10½ mi. N, 5 W Brownwood	2760	1492	2657	Log	—1165
		CALLAHAN COUNTY					
Vestal 1, New South Oil Assn.	Jesse Dyson Surv.	1½ mi. E, 1½ N Cross Plains	3755	1785	3725	Samples	—1940
Childs 1, F. E. Henderson, et al.	John Sayers Surv.	10 mi. S, 3 E Putnam	4005	1846	?	Samples	--------
		COLEMAN COUNTY					
Guthrie 1, Producers Oil Co.	Bond & Saunders Surv. 78	1½ mi. S, ½ W Trickham	1975	1400T	?	Log	--------
Guthrie 1, Santa Anna Indus. Co.	Bond & Saunders Surv. 110	1 1-3 mi. W Trickham	1904	1400T	?	Log	--------
Guthrie 1, The Sun Company	H. E. & W. T. Surv. 117	7 mi. S, 3 W Trickham	2267	1400T	?	Log	--------
Harris 1, Slick Oil Company	H. Stearns Surv. 63	2½ mi. S, 1½ E Santa Anna	3264	1600T	2625	Log	—1025
Miller 1, Systems Oil Company	Fort Bend County School Lands Surv.	Near SW corner Coleman County	3175	1500T	2918	Log	—1418
Morris 4, Magnolia Pet. Co. and Elizabeth Oil Co.	David Breeding Surv.	9½ mi. N, 2 E Coleman	3978	1583	3417	Log	—1834
Morris 3, Magnolia Pet. Co. and Elizabeth Oil Co.	David Breeding Surv.	NE Morris 4 mi.	3438	1582	3432	Log	—1856
Morris 5, Magnolia Pet. Co. and Elizabeth Oil Co.	David Breeding Surv.	N Morris 4 mi.	3430	1578	3418	Log	—1840
Neff 1, Sinclair-Gulf Oil Co.	Geo. Eubanks Surv. 178	11 mi. N, 7 E Coleman	3425	1622	3402	Sample	—1780
Padgett 1, Sinclair-Gulf Oil Co.	Brazoria County School Lds. Surv. 226.	Near SW corner Coleman County	3580	1596	3445	Sample and log	—1849
Sealey-Hutchins 1, Sinclair-Gulf Oil Co.	G. M. & N. Surv. 231	9 mi. N, 2 W Coleman	3922	1882	3885	Log	—2003

COLEMAN COUNTY (Continued)

Name of Well and Owner	Location by Survey	Location from town or other place	Total Depth	Surface Elevation	Depth Ellenburger	Kind of Record	Map Entry
Sealey & Smith 1, Magnolia Pet. Co. and Elizabeth Oil Co.	H. H. H. Ry. Co. Blk 2, Surv. 9	7 mi. N, 1½ E Coleman	3610	1632	3530	Log	—1898
Slate 1, Magnolia Pet. Co. and Elizabeth Oil Co.	J. Kaufman Surv. 237	23 mi. S, 2 W Coleman	3114	1400T	2227	Log	—827
Wallace 2, Robertson and Son.	Wm. Ferris Surv. 279	7 mi. S Santa Anna	------	1500T	2533	Log	—1033
		COMANCHE COUNTY					
Armstrong 1, P. L. Tippit	H. T. & B. Ry. Co. Surv. 13	3 mi. N, 2 E Comanche	------	1250T	2885	Samples	—1635
Bender 1, Henderson et al.	J. P. Stevenson Surv. 3, SE part	2½ mi. E, 1½ N De Leon	3500	1247	--------	--------	--------
Davis 1, Sam Davis Oil Co.	Jas. Walker Surv.	Comyn Station	3500	1250	--------	--------	--------
Fine 1, Lone Star Gas Co.	E. T. Ry. Co. Surv. 35, NW part	16 mi. E, 2½ N Comanche	4150	1350T	--------	Log	—2800+
Fisher 1, Copperas Creek Oil Co.	D. H. McFadden Surv. 190	11 mi. N, 2 W Comanche	--------	1271	3204	Log	—1933
Fritz 1, Maxwell and Ertel	Geo. L. Addison Surv., SE corner	5 mi. N, 5 E Comanche	3276	1150T	3145	Log	—1995
Galloway 1, Lone Star Gas Co.	H. & T. C. Ry. Co. Surv. 15, SW corner	9 mi. S, 4½ W Comanche	3525	1700T	3883	Log	—1683
Goss 1, Humble Oil and Rfg. Co.	D. & D. Asylum Lands Surv. 59, NE corner	4 mi. W Sipe Springs	3275	1532	3272	Samples	—1740
Gregory 1, Texas Penn.	W. R. Gregory Surv., N corner	½ mi. from E, 1-3 from N county line	3410	1400T	--------	--------	--------
Hamlin 1, Manhattan Oil Co.	D. & D. Asylum Surv. 23	1½ mi. N Duster	3176	1402	3150	Samples	—1748
Hilly 1, Gates Oil Co.	L. Birdsall Surv. 54, NW corner	2 mi. from N, 1¼ from E county line	--------	1343	3340	Log	—1997
Kee 1, Henderson et al.	J. P. Stevenson Surv. 10 NW corner	5¾ mi. S, ½ W Desdemona	--------	1258	3325	Samples	—2057

Huckabee 1, Home Boys' Oil Co.	E. Moore Surv.	3 mi. W, ½ S De Leon	3500	1238	--------	--------	--------
Lucky 1, Thomas and Ludlow	E. T. Ry. Co. Surv. 6	1¼ mi. from S, ½ from W county line	3456	1484	--------	Samples and log	—1972+
Montgomery 1, Maxwell and Ertel	Robt. Page Surv., SE corner	5 mi. E Mercer's Gap	3500	1420	3245	Log	—1825
Moore 1, Gulf Production Co.	E. Whitesides Surv. 71	12 mi. E, 2½ S Comanche	3824	1193	3776	Log	—2583
Pittman 1, National Refining Co.	H. & T. C. Ry. Co. Surv. 42	4 mi. N, 4 W De Leon	3410	1325T	?	--------	--------
Rudd 1, Roxana-Wallace Oil Co.	D. and D. Asylum Lands Surv. 17	North county line, 10½ mi. from NE corner	3076	1300	3075	Log	—1775
Small 1, Humble Oil and Refining Co.	D. and D. Asylum Lands Surv.	2 mi. N, ¼ E Sipe Springs	--------	1500T	3313	Log and Sample at 3345	—1813
Shearer 1, Texas Penn.	G. Fay Surv. 53, N corner	½ mi. from N, 1½ from E county line	3450	1400T	?	--------	--------
Studeville 1, Miller, Knight and Chass.	E. Whitesides Surv. 71	12 mi. E, 2½ S Comanche	3850	1150T	?	--------	--------
Sturkie 1, Comanche Oil Assn.	Asa Hoxey Surv.	2 mi. E Hasse, 7¾ E, 3½ N Comanche	3350	1200T	3335	Samples	—2135
Tate 1, Crawford and Flynn	H. & T. C. Ry. Blk. 2, Surv. 7	6½ mi. W De Leon	3323	1369	3301	Log	—1932
		CORYELL COUNTY					
Clark 1, Benedum & Trees, Francis Keystone Texas Oil Co.	G. W. Carlisle Surv.	9 mi. W, 1 N Gatesville	3630	870	3465	Samples	—2595
Gotcher 1, N. Y. Syndicate.	W. T. Whitley Surv.	2¼ mi. W, ½ S Copperas Cove	3035	1132	3025	Log and Sample at 3035	—1893
Strickland 1, Buckeye Mid-Kansas	John Winn Surv.	1½ mi. S, ¾ W Pitcock	3628	946	3615	Samples	—2669
Tienert 1, N. Y. Syndicate	Elizabeth Jones Surv.	1½ mi. W, 2 N Copperas Cove	3384	1094	3384	Samples	—2290
		EASTLAND COUNTY					
Allen 1, Gulf Production Co.	Wm. Fields Surv.	4¾ mi. S, 3¾ E Ranger	4010	1446	3765	Log	—2319
Alsobrook 1, Havermeyer & Seamans.	H. T. & C. Ry. Surv. 14	1½ mi. SW Gorman	3525	1400	3190	Log	—1790
Barnes 1, Prairie Oil and Gas Co.	F. P. Barnall, Blk. 40, Surv. 657, SE corner	2 mi. N, 2 W Ranger	4300	1584	4080	Log	—2496

Name of Well and Owner	Location by Survey	Location from town or other place	Total Depth	Surface Elevation	Depth Ellenburger	Kind of Record	Map Entry
Brashear 1, Leon Oil Co	Wm. Van Norman Surv.	5 mi. S, 2-3 W Ranger	4000	1477	3628	Log	—2151
Brashear 2, Leon Oil Co.	Wm. Van Norman Surv.	5 mi. S Ranger	----------	1471	3618	Log	----------
Brashear 1, Westheimer et al.	Wm. Van Norman Surv.	5½ mi. S, 2-3 W Ranger	----------	1460	3615	Log	----------
Branford 1, Prairie Oil and Gas Co.	Rosseau Surv. 25	5 mi. S, 2¾ E Eastland	3955	1479	3717	Log	—2238
Brown 1, Central Oil Development Co.	G. E. Moore Surv.	1 mi. E, ½ N Desdemona	----------	1450T	3545	Samples	—2095
Cooke 1, Texas & Pacific.	N. Cooper Surv.	3 mi. N Ranger	4200	1546	4187	Samples	—2514
Connellee 1, Benedum & Trees.	N. Ussury Surv.	3 mi. S, ¾ E Eastland	3800	1541	3737	Log	—2196
Duffer 1, Prairie Oil and Gas Co.	S. N. Mathias Surv.	1 mi. E, 3½ S Ranger	3770	1446	3680	Log	—2234
Eppler 1, Connollee and Aguire.	Wm. De Moss Surv.	3½ mi. NE Gorman	----------	1356	3238	----------	—1902
Falls 1, Prairie Oil and Gas Co.	E. Finley Surv., NW part	3½ mi. S, 1½ W Ranger	3700	1441	3685	Log	—2244
Fee 1, Sun Company.	H. T. & C. Ry. Blk. 4, NE corner	6½ mi. W, 1 N Ranger	4012	1538	4000	Log	—2462
Fee 1, Texas Pacific Coal and Oil Co.	Robertson County School Lands, SE part	8 mi. E, 1½ S Ranger	3710	1250T	3520	Log	—2270
Hagaman 1, Lone Star Gas Co.	W. C. & C. Boswell Surv.	1½ mi. NE Ranger	3745	1426	3699	Log	—2273
Holcomb 1, Cosden Oil Co.	J. House Surv.	1 mi. NE Eastland	3777	1485	3777	Sample	—2292
Mann 1, Atlas Oil Co.	Thos. Mallryne Surv. (Center)	8 1-3 mi. E, 2 1-3 N Carbon	3500	1371	3428	Log	—2057
Parrock 1, States Oil Corporation.	H. & T. C. Ry. Co. Blk. 4, Surv. 7	6¼ mi. N, 7½ E Eastland	4083	1619	4078	Log	—2478
Pitcock 1, Texas and Pacific Coal and Oil Co.	Wm. Frells Surv.	2 mi. S Ranger	4020	1454	3575	Log	—2121
Rush 1, Mid-Kansas Oil and Gas Co.	E. Finley Surv.	3 mi. S Ranger	3945	1420	3720	Log	—2300
Shoor 1, Humble Oil Co.	H. T. & C. Ry. Co. Blk. 3, Surv. 50	6 mi. S, 2 E Cisco	3790	1608	3769	Samples	—2171
Stewart 1, Leon Oil Co.	Wm. Van Norman Surv.	6 mi. S, 1 W Ranger	----------	1413	3658	Log	—2245
Underwood 1, Systems Tidal Oil Co.	D. S. Richardson Surv.	4 mi. W, ¾ N Desdemona	----------	1379	3510	Log	—2131

Ward 1, New Domain Oil Co.	J. D. Roxie, N part	4½ mi. N, 1 E Cisco	3976	1415	3825	Log Sample	—2410
Vaught 5, Atlantic Production Co.	Wm. DeMoss	3 mi. W, 1½ S Desdemona	3245	1250T	3165	Samples	—1915
Stockton 1, Cosden Oil Co.	Wm. DeMoss	South of county line	3250	1322	3180	Samples	—1878
		ERATH COUNTY					
Perkins 1, Baltimore-Texas Syndicate.	Q. Tarbox Surv., SW corner	7 mi. from W, 8 from N county line	4018	1250T	?	Samples	—2768+
Randolph 1, Burt and Griffith	S. Blythe Surv.	6 mi. S Dublin; 14 mi S, 7 W Stephenville	4510	1400T	?	Log	—3110+
Thompson 1, Gulf Production Co.	F. R. Lubbock Surv., E side	9 mi. S, 2 W Thurber	3860	1383	3755	Sample	—2505
Stacey, Sinclair Oil Co.	K. K. Koontz	3 mi. S, 14 E Stephenville	4355	1050T	?	Log	—3305+
		HOOD COUNTY					
Followell 1, Sinclair Gulf Oil Co.	Isaac Eaves Surv., NE corner	2 mi. from N, 2 from W county line	4820	980	?	Log	—3840+
		LAMPASAS COUNTY					
Abney Well, City of Lampasas		Near Santa Fe Depot, Lampasas	2000	1000T	470	Log	530
Conradt 1, Robarts et al.	E. T. Ry. Co. Surv. 1, SE one-fourth	5 mi. N, 2 W Lometa	2001	1500T	1880	Log and Samples	—380
Grove 1, Price et al.	R. W. Brown Surv.	6 mi. N, 1 E Lampasas	2005?	1100T	?	Sample	—1005+
Hill 1, Hill River Oil Co. (Champion).	David Evans	8 mi. S Lometa	1602	1450T	417	Log	1033
McCree 1, Nelms-Marvin Oil Co.	Wm. F. Nicholson Surv. 3, NW corner	10 mi. W, 2 S Lampasas	1120	1400T	20	Sample	1380
Smith 1, C. H. White	T. R. Stiff Surv. 16, S side	13 mi. W 1 S Lampasas	?	1400T	29	Sample	1371
White 1, Howell et al.	Wm. Todd Surv. 42, NW part	3 mi. S, 7 W Lometa	1021?	1250T	136	Log and Samples at 1021	1114
White 1, Texoleum Petroleum Co.	Hill Surv.	18½ W, 1½ N Lampasas	?	1250T	At surface	--------	1250
Whittenburg 1, Western Lampasas	John Boyd Surv. 612, NE corner	8 mi. W Lometa	?	1450T	998	Sample	452

McCULLOCH COUNTY

Name of Well and Owner	Location by Survey	Location from town or other place	Total Depth	Surface Elevation	Depth Ellenburger	Kind of Record	Map Entry
Baumgartner 1, Texas Hurst Synd.	P. H. Schaff Surv. 402	1½ mi. SSE Brady	1253	1650T	61	Log	1589
Beasley 1, Dallas Milburn Valley Oil Co.	F. Winkle	2½ mi. N, 2½ E Mercury	2526	1280	945	Log and Samples at 1012	335
Cawyer 1, Burford & Brimm.	D. Mechels Surv. 968, NW corner	3 mi. SE Mercury	1422	1422	725	Log	697
Crews 1, Southwestern Pet. Co.	U. Heinrich	1 mi. SW Rochelle	1960	1675T	605	Log	1070
Craig 1, Thomas et al.	C. Usner Surv.	4½ mi. N, 1 W Melvin	2565	1850T	2065	Log	—215
Morgan 1, J. E. Morgan	State School Lands, Surv. 2	2 mi. NNW Brady	?	1700T	420	Log and Samples at 680	1280
Sellman 1, Texas Eastern Oil Co.	C. Beag Surv. 904, NW corner	3½ mi. ENE Rochelle	2005	1650T	610	Log and Samples at 1470	1040
White 1, Henderson et al.	B. S. & F. Ry. Co. Surv. 1, SW corner	10 mi. S, 4 W Whiteland	1401	2050T	1285	Log	765
White 1, Thomas et al.	Fisher and Miller Surv. 2586	1 mi. E Whitehead	3280	1750T	1008	Log	742
Zella 1, Prairie Oil and Gas Co.	H. & T. C. Ry. Co. Surv. 59, SW corner	4 mi. NW Lohn	3466	1500T	1870	Log and Samples at 2050	—370

MILLS COUNTY

Cryer 1, Mills County Oil Co.	J. M. Clark Surv. 14	12 mi. W, 5 N Goldthwaite	---------	1317	1885	Log and Samples at 1885	—468
Harrison & Slayden 1, Venture Oil Co.	T. Carroll Surv. 401	14 mi. W, 8 N Goldthwaite	3065	1271	1540	Log	—269
Howell 1, Atlantic Production Co.	M. Kenedy Surv. 647	4½ S, 3 W Goldthwaite	2440	1228	2007	Log	—779

Locklear 1, Texas Co.	Sam Cates	8 mi. W, 1 N Goldthwaite	2715	1248	2035	Log	—787
Tyson 1, A. R. Forstner et al.	T. & N. O. Ry. Co. Surv. 2	10 mi. W, 10 N Goldthwaite	2520	1372	2320	Log and Samples at 2410	—948
Ware 1, Ware Haywood Oil Co.	H. Thurmester	6 mi. S, 1 E Goldthwaite	2510	1248	2473	Log and Samples at 2505	—1225
Weston 1, Clarion Oil Co.	Caldwell County School Lds. Surv. 112	4¾ mi. W, 1½ N Goldthwaite	2400	1338	2118	Samples	—780
Whittenburg 1, Stirling Oil Co.	A. Thompson Surv. 2	2 mi. E Ebony	1285	1435	1175	Log	260
Young 1, Fidelity Oil Co.							
		PALO PINTO COUNTY					
Abrams 1, Sinclair Gulf Oil Co.	Texas and Pacific Surv. 43	3½ mi. S Mineral Wells	3998	1305	?	Log	—2693+
Chestnut 1, Empire Gas and Fuel Co.	Geo. Green Surv. A-207, center W one-half	8¼ mi. S, 1½ W Mineral Wells	4210	1122	?	Log	—3088+
Dye 1, Roxana Pet. Co.	Texas Emi. Lds. Co. Surv. 879	3¾ mi. from N, 9½ from E county line	3933	940	?	Log	—2993+
Edmondson 4, Empire Gas and Fuel Co.	Daniel Boarn Surv. 46	7 mi. S, 1¼ W Mineral Wells	4710	1120	?	Samples	—3590+
McDonald 1, Texas Co.	T. & P. Blk. 1, Surv. 31	2 mi. W, 1 S Palo Pinto	4665	1033	4635	Samples	—3602
Rogers & Rhea 1, Prairie Oil and Gas Co.	Surv. 166, SW corner	6¼ mi. E Gorman	4052	950T	?	Log and Samples	—3102+
Seaman, Roxana Pet. Co.	T. & P. Blk. 3, Surv. 6	9½ mi. from N and 1 from W county line	4535	1248	4519	Log	—3271
Smith 1.	Johnson Bros.	2½ mi. E Mineral Wells	4392	847	?	Log	—3545+
Watson 1, Empire Gas and Fuel Co.	Surv. 48	5 mi. W, 5 N Palo Pinto	4053	979	?	Log	—3074+
		RUNNELS COUNTY					
Russel 1, Gulf Prod. Co.	James Hughes	SE part of county	3505	1677	3448	Sample	—1771

SAN SABA COUNTY

Name of Well and Owner	Location by Survey	Location from town or other place	Total Depth	Surface Elevation	Depth Ellenburger	Kind of Record	Map Entry
Cummings 1, Coline Oil Co.	C. Herberg	3 mi. NNE Lockyer	1380	1362	805	Log and Sample at 1250	557
Heatherly 1, Duke & Knowles.	Burchell Surv. 255	6 mi. N, ¾ E Richland Spring	----------	1425T	605	Drilling Report	820
SHACKELFORD COUNTY							
Nail 1, Benedum and Trees.	E. T. Ry. Co. Surv. 50	10 mi. N, 2 W Albany	4465	1525T	?	Sample	—2930+
STEPHENS COUNTY							
Bobo 1, Texas Pac. Coal and Oil Co.	T. P. Blk 6, Surv. 67	2 mi. S, 1 E. Frankell	4311	1453	?	Log	—2658+
Gaston 1, Texas Pac. Coal and Oil Co.	A. S. Johnston	South side Brazos, 7 mi. from W county line	4650	1131	4650?	Samples	—3519?
Veale 1, Texas Pac. Coal and Oil Co.	T. P. Blk. 6, Surv. 74	6 mi. S, 2 E Frankell	4018	1502	?	Log	—2516+
YOUNG COUNTY							
Arnold 1, Texas Co.	Johanna and Lee Surv. S W corner	10 mi. WNW Graham	4711	1270	?	Samples	—3438+

SUMMARY BY COUNTIES

In the following pages the data on the Ellenburger formation are summarized, the discussion being arranged by counties.

Brown County

At the south line of Brown County the Ellenburger, as indicated by the Riley Cross well, lies at a depth of 1270 feet from the surface. Near the west line of the county four miles from the north boundary, the same formation as determined from the record of the Harris well lies 3405 feet from the surface. Using the data available on elevations for these wells it appears that the formation at the south line of the county, somewhat east of the north-south central line, lies as much as 147 feet above sea level (Cross well). In the northwestern part of the county, as indicated by the Harris well, the formation is to be expected at a depth approximating 1780 feet below sea level. The other wells recorded show for the formation positions intermediate between those mentioned. The axis of the large Ellenburger fold lies somewhat east of the center of the county, and plunges to the north at a rate of between 40 and 50 feet per mile. On the west slope of the arch, the dip in the Ellenburger to the northwest appears to be between 90 and 100 feet per mile. On the east limb, the dip, although less definitely determined, is much more abrupt. The dip in the Ellenburger in this and other counties is interrupted and in places reversed by local structures not indicated on this small map.

Callahan County

Records have been obtained of two wells entering the Ellenburger formation in Callahan County. These are the Vestal well of the New South Oil Association, and the Child well of F. E. Henderson, both of which are located in the southeastern corner of the county. The Ellenburger was

entered in the Vestal well, as is shown by samples, one of which is said to come from 3725 feet from the surface, or 1950 feet below sea level. Oil in commercial quantities, was obtained from this well at a depth reported as about 3755 feet from the surface, and hence within the Ellenburger formation. The Childs well, located a few miles northwest of the Vestal, also entered the Ellenburger formation. The record at hand, however, is not sufficiently exact to determine the level of the top surface of the formation in this well.

Coleman County

In the southern part of Coleman County near the north-south center line, the Ellenburger as indicated by the Slate well of the Magnolia Petroleum Company, lies at a depth of 2227 feet. Near the southwest corner of the county, the Padgett well of the Sinclair-Gulf Company reached the Ellenburger at a depth of 3445. The well nearest to the northeast corner of the county reaching this formation is that of the Sinclair-Gulf Oil Company on the Neff property where the Ellenburger appears to have been reached at or near a depth of 3402 feet. The maximum recorded depth to the Ellenburger in this county is that of the Sealey-Hutchins well, nine miles north and two miles west of Coleman, where it lies at 3885 feet. In the southeast corner of the county the Ellenburger may be expected at or near sea level, while in the northwest corner of the county it passes to a depth of between 2000 and 2500 feet below sea level. The dip in the formation in this county is thus to the northwest.

Comanche County

The axis of the Ellenburger arch passes through the northwestern part of Comanche County, and the dip in the formation in this county accordingly is in general towards the east. In the Goss well near the northwest corner of the county the Ellenburger lies at a depth of 3272 feet from the surface, while in the Fine well of the Lone Star Gas

Company in the southeastern part of the county this formation lies more than 4150 feet below the surface. In the western part of the county the Ellenburger probably lies, over a small area, as high as 1500 feet below sea level, while at the southeast corner of the county the level is with little doubt fully 3000 feet below sea level. The course of the contours in crossing this county has already been referred to. While the dip in the Ellenburger formation on the west side of the arch in Coleman County is, as already noted, in general to the northwest, the dip in Comanche County on the east side of the arch, although varying, is to the east than to the northeast.

Coryell County

Of wells drilled in Coryell County up to the present time, four are known to have penetrated the Ellenburger formation. The Gotcher well in the southeast corner entered the Ellenburger at 3025 feet from the surface, or 1893 below sea level. From this well north to the Tienert well the dip in the Ellenburger is rapid, amounting to 397 feet in two and one-half miles. Continuing north to the Strickland well, the dip is much less rapid, amounting to 379 feet in seven miles. The Clark well, about thirteen miles north of the Strickland, entered the Ellenburger at 3465 feet from the surface, or at 2595 feet below sea level, the formation being actually at a higher level than in the Strickland well. In contouring in this county the relatively high Ellenburger is interpreted as a northeast extension from the Mineral Region. The Strickland and Tienert wells are regarded as probably associated with a structurally low area, making a sharp reentrant in the countours similar to that indicated by the Ware well in Mills County, and by the Tate well in Comanche County.

Eastland County

The axis of the Ellenburger arch passes, as nearly as can be judged, somewhat east of the center of Eastland County. On the south border of the county the Ellenburger as indi-

cated by wells near and west of Desdemona, lies at a depth approximating 3000 feet from the surface. At the north line of the county north of Ranger this formation is found, as indicated by the Cooke and other wells, at a depth of more than 4000 feet from the surface. In the northwestern part of the county the depth to this formation is with little doubt considerably in excess of 4000 feet. When reduced to sea level datum the Ellenburger in this county is found to vary from less than 1800 feet below sea at the south line of the county to more than 2500 feet below sea in the north and northwest parts of the county. Of the considerable number of wells that have entered this formation in Eastland County twenty-five are entered on this map. Of the Eastland County wells not shown on the map a few have been omitted to avoid crowding on a map of this small scale, while others have necessarily been omitted owing to lack of sufficiently exact data regarding either location of the well or depth to the Ellenburger formation.

Erath County

Record has been obtained of only one well entering the Ellenburger in Erath County. This is the Thompson well of the Gulf Production Company located near the Eastland county line. In this well the Ellenburger was entered at about 3755 feet from the surface, or at the level of about 2505 feet below sea. Other deep wells of this county noted on the map are the Perkins well in which the Ellenburger lies more than 4018 feet below the surface, and the Randolph well in which, as nearly as can be judged from the log, this formation had not been reached at 4510 feet from the surface.

Hood County

The Ellenburger formation has not been reached by any well in Hood County of which the writer has record. The Followell well of the Sinclair-Gulf Oil Company indicates that the formation in the northwest corner of the county

lies more than 4820 feet from the surface. The actual level of the Ellenburger at the west side of this county probably approximates 4000 feet below sea level.

Lampasas County

In Lampasas County the Ellenburger lies at the surface over a limited area in the extreme southwestern corner. From these surface exposures it is observed to dip to the north, and to the east. In the northwest part of the county it is entered in the Robarts well on the Conrad Ranch at about 1880 feet below the surface, indicating a dip of not less than 1600 feet between this well and the south line of the county. To the east along the south line of the county the formation likewise dips rapidly, and at the Whitis well near Kemper lies at an undetermined depth, but evidently more than 1000 feet below the surface. To the northeast the dip is more rapid, and in the Grove well, six miles north of Lampasas, the formation is reported to lie more than 2000 feet below the surface, which indicates, if the record is correct, a dip of more than 3000 feet in a distance of about fifteen miles.

With regard to sea level datum, the formation varies from 1300 or 1400 feet above sea in the southwestern part of the county to more than 1000 feet below in the eastern part of the county.

McCulloch County

The Ellenburger formation lies at the surface in the southeastern part of McCulloch County. It dips to the north and more rapidly to the northwest. Near the west line of the county it is found in the Craig well at a depth of 2065 feet from the surface. In the southeastern part of the county the formation lies at a level approximating 1500 feet above sea, while in the Zella well to the northwest it is found at a level approximating 370 feet below sea, the dip to the northwest amounting to as much as about 100 feet per mile.

Mills County

In the northwestern part of Mills County, the Ellenburger formation, as indicated by the Whittenberg well, lies at a depth of about 1175 feet from the surface. In the northern part of the county near the Comanche-Brown county line, this formation is found in the Tyson well at a depth of 2320 feet.

From the northwestern part of the county the Ellenburger evidently dips rapidly east as well as north. The data on these wells are not sufficiently exact to permit a very close estimate on the rate of dip, although the maximum dip may be as much as between 100 and 120 feet per mile. These approximate data are derived from a consideration of the Howell, Tyson, and Whittenburg wells, all of which are located in the west one-half of the county. No wells in this county are known to reach the Ellenburger east of Goldthwaite.

Palo Pinto County

Near the west line of Palo Pinto County, the Ellenburger formation, as indicated by the Seaman well, lies at a depth of 4519 feet from the surface. Three miles southwest of Palo Pinto this formation is found in the McDonald well 4635 feet from the surface, while in the eastern part of the county, as indicated by the Edmondson well, it lies more than 4710 feet from the surface. From somewhat less than 3000 feet below sea level in the southwestern part of the county this formation dips to probably more than 4000 beet below sea level in the northeastern part of this county.

Runnels County

The Ellenburger is known from one well in the southeastern part of the county, where it lies at a depth of 3448 feet from the surface.

San Saba County

The southern part of San Saba County lies within the belt of surface exposures of the Cambrian formations, including the Ellenburger formation. To the north these formations pass beneath later formations, and near the north county line the Ellenburger, as indicated by the Cummings well, lies about 805 feet below the surface.

Stephens County

The Gaston well near the Brazos River in the northwestern part of Stephens County is regarded as possibly having entered the Ellenburger formation at 4650 feet from the surface, or at the actual level of about 3519 feet below sea level. A number of other wells drilled in this county exceed 4000 feet in depth. Of these, however, no record has been obtained by the writer indicating the presence of the Ellenburger formation.

Young County

The Arnold well of the Texas Company, northwest of Graham in Young County, is reported to have entered the Ellenburger formation at 4711 feet from the surface. Samples obtained by the writer at 4708 feet indicate, according to determinations made by Dr. J. A. Udden, the Bend at that depth.

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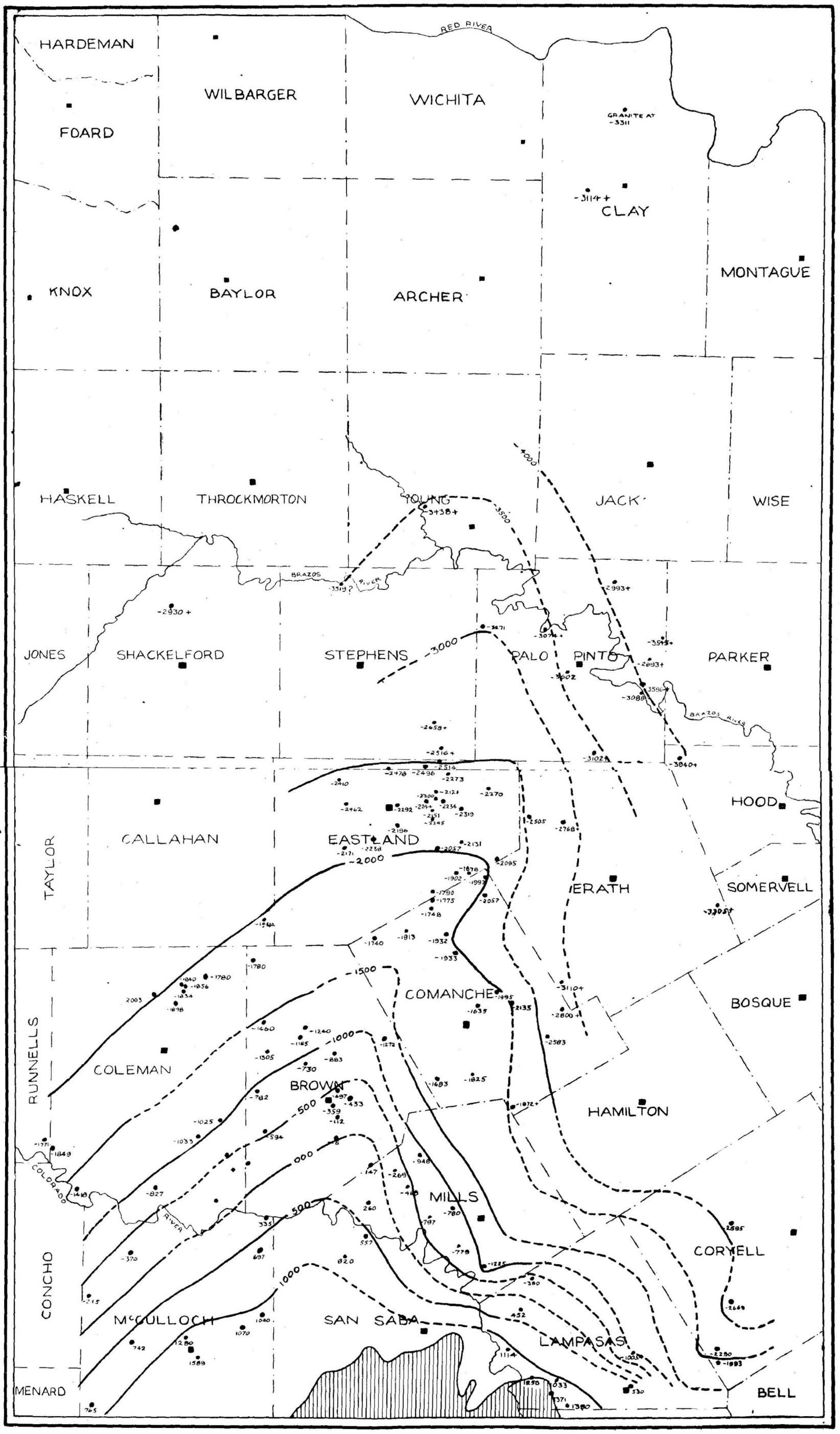

SCALE

0 5 10 15 20 25 30 35 40 45 50 MILES

Preliminary map to show the underground position of the Ellenbùrger formation in a part of north central Texas. By E. H. Sellards. Sea level datum. Contours on the top surface of the Ellenburger. The minus sign indicates elevations below sea level.