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THE MINERALS AND MINERAL LOCALITIES OF TEXAS

by Frederic W. Simonds

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THE UNIVERSITY OF TEXAS MINERAL SURVEY

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THE MINERALS AND MINERAL LOCALITIES OF TEXAS.

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PROFESSOR OF GEOLOGY IN THE UNIVERSITY OF TEXAS.

BULLETIN OF THE UNIVERSITY OF TEXAS, NO. 18.

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ENTERED IN THE POSTOFFICE AT AUSTIN AS MAIL MATTER OF THE SECOND CLASS.

LETTER OF TRANSMITTAL.

AUSTIN, TEXAS, December, 1902.

Hon. Wm. L. Prather, President, The University of Texas.

SIR: I beg to transmit, herewith, a report on "The Minerals and Mineral Localities of Texas," prepared by Dr. Frederic W. Simonds, Professor of Geology in the University. It will form Bullettin No. 5 of The University of Texas Mineral Survey.

In view of the deep interest now being shown in the mineral resources of the State, we have thought it advisable to issue a special publication dealing with the minerals and mineral localities. Dr. Simonds has been engaged upon this work for some time, and it is believed that the list he now presents covers the entire field as well as can be done at present.

Very respectfully,

WM. B. PHILLIPS.
Director.

INTRODUCTION.

There has been, so far as I am aware, no attempt to list, in a complete form, the mineral species occurring in Texas. In the "Mineral Resources of the United States" for 1882 (United States Geological Survey; Washington, 1883), Professor John C. Smock, of the Geological Survey of New Jersey, who was charged with the preparation of the material illustrative of the "Eastern Division," published two tables for the purpose of showing the mineral resources of Texas. The first included "Ores, minerals, and mineral substances, which are at present mined," and the second "Ores, minerals, and mineral substances of industrial importance and known occurrence, but which are not at present mined." Of the former, eight are mentioned, of the latter, thirty-two (pp. 733-736). In the "Mineral Resources" for 1887 (Washington: 1888), the same tables, with slight modification, mainly in the matter of additional localities, are repeated (pp. 792-794).

In the First Annual Report of the Geological Survey of Texas (Austin: 1890) Mr. W. H. von Streeruwitz published a list of minerals, sixty-three in number, observed in the Trans-Pecos Region, but the details of occurrence were not given (pp. 225-226).

In the same volume Dr. Theo. B. Comstock records one hundred and eleven minerals collected in the "Central Mineral Region"—the Llano Country. This "includes only those which occur as crystals or in special or rare situations," and is regarded by the author not as complete, but as affording a "preliminary list of localities" (pp. 379-391).

A "list of those minerals and rocks of Trans-Pecos Texas which up to this time could be classified by their appearance, blowpipe tests, and laboratory work," constitutes Chapter IV of a "Report of the Geology and Mineral Resources of Trans-Pecos Texas" by W. H. von Streeruwitz (Second Annual Report of the Geological Survey of Texas, 1890, pp. 710-713). It is, as the author states, "far from being complete, but it comprises a number of the more important and valuable minerals, building stones and ores of West Texas, giving the localities where they are found."

In his Second Annual Report as State Geologist, Mr. E. T. Dumble published a valuable statement of the "Mineral Resources of Texas," based, as he says, for the greater part upon the work of himself and his associates (Second Annual Report of the Geological Survey of Texas, p. 35, et seq.). This I have found very helpful in the preparation of the following list.

Unfortunately the State does not possess a collection of all the minerals enumerated herewith, consequently the information concerning them has been in large measure derived from many sources, viz., from a careful examination of the various reports relating to the geology of the State, keeping in mind at all times the value, so far as it could be estimated, of the observer as an authority. On the same basis the various

scientific journals have been examined and the transactions of the different learned societies. It is especially due that mention should be made of the *American Journal of Science,* the *Engineering and Mining Journal* (January, 1887-June, 1902), the *Transactions of the Texas Academy of Science* and the *Bulletins of the University of Texas Mineral Survey.* Nor should I omit the valuable publications of the United States Geological Survey, especially the volumes upon the "Mineral Resources of the United States," and of the *Engineering and Mining Journal,* entitled "The Mineral Industry." In some instances minerals or their localities have been inserted upon the statement of individuals, or as annnounced in the public press, but always with care.

In preparing the list I have, for convenience, arranged it alphabetically, my aim being to make it useful to the student, the prospector and the citizen. The name of the mineral species is first given, and, when possible, this is followed by the common name or synonym in general use, or both, together with the chemical name and formula. Following this list there is given a summary of the minerals of the State by counties.

As supplementing the necssarily brief mineral descriptions, those interested in the subject are referred to some standard work on mineralogy, such as "Dana's Manual of Mineralogy and Petrography" (elementary) or "Dana's Text Book of Mineralogy" (advanced), from which much of the descriptive matter in the following pages has been taken.

In compiling a work of this character one is, to a great degree, dependent upon the contributions of others, and so large has my indebtedness become that individual acknowledgments are well nigh impossible. As an exception, however, I would state that I have made free use of Dr. Comstock's "List of Minerals Collected by the Survey from the Central Mineral Region," before mentioned, as a base upon which to build this enlarged list of the "Minerals and Mineral Localities of Texas."

FREDERIC W. SIMONDS.

School of Geology, University of Texas, November 1, 1902.

Minerals from localities marked C are in the collection at the University.

Localities in Comstock's List are marked *.

Localities in von Streeruwitz's Lists are marked **.

U. T. M. S.—The University of Texas Mineral Survey.

H.—Hardness.

G.—Specific Gravity.

THE MINERALS AND MINERAL LOCALITIES OF TEXAS.

ACTINOLITE. *Calcium-magnesium-iron Amphibole.* Ca (Mg, Fe)$_3$ (Si O_4)$_3$.

A fibrous, bladed, columnar, or granular massive, light green mineral. Specific Gravity, 3-3.2. Hardness, 5-6.

BURNET COUNTY:
White Eagle Mine, five miles west of Burnet.

LLANO COUNTY:
King Mountains.*
Riley Mountains.*
Near Click, Glen and Sandy Gaps.*

ADULARIA. *A variety of Orthoclase. Potassium silicate.* pure or impure.

A white or "colorless subtransparent feldspar." Specific Gravity, 6.57. Hardness, 6.

LLANO COUNTY:
Barringer Hill.*
King Mountains.*
Cold Creek, near county line.*
Kothman's Water Gap.*

MASON COUNTY:
Martin Creek.*

AGATE. *Variegated Chalcedony. A variety of Quartz.* Si O_2.

Three forms: 1. Banded with different colors as white, brown and blue. 2. Clouded. 3. Moss Agate, with dendritic inclusions of manganese oxide. Specific Gravity, 2.65-2.66. Hardness, 7.

BREWSTER COUNTY:
Chisos Mountains. C.

BURNET COUNTY:
Spring Creek.*

MCCULLOCH COUNTY:*
Banded Chert and Flint.

PECOS COUNTY:
West of Glass Mountains.

PRESIDIO COUNTY:
Abundant between Marfa and Chinati Mountains.**C.
"Agates can be gathered by the wagon load between the Davis and Chinati Mountains. They are the milky, cloudy, and banded varieties, from the size of peas to six, eight and occasionally even more inches in diameter, and might be cut into marbles, ornamental work and mortars for chemical laboratories."—Von Streeruwitz.

SAN PATRICIO COUNTY:
Moss Agates in the vicinity of Mathis; not abundant.

SAN SABA COUNTY:*
Banded Chert and Flint.

ALABASTER. See Gypsum.

ALBITE. *Soda Feldspar. Aluminum-sodium Silicate.* $Na_2O.\ Al_2O_3.\ 6Si\ O_2$.

One of the triclinic Feldspars. Thick tabular crystalline, granular massive, or lamellar. White, often bluish or gray, opalescent, also tinted at times with green or red. Specific Gravity, 2.62-2.65. Hardness, 6-6.5.

BURNET COUNTY:
Clear Creek.*
Spring Creek.*

LLANO COUNTY:
Barringer Hill.*

"Albite is rare and occurs coating small cavities in the massive orthoclase. Crystals not above 1 inch in diameter were observed."—Hidden and Mackintosh, *Amer. Jour. of Science*, III, Vol. 38, p. 476.
King Mountains.*
Little Llano Creek below Lone Grove.*

ALLANITE. *Orthite. Composition complicated. A Silicate of Aluminum, Calcium, Iron and the rarer metals.*

A brittle brownish-black mineral with a resinous or submetallic lustre. Crystals, tabular or elongated, sometimes so elongated as to become acicular. Massive and in grains. Specific Gravity, 3-4.2. Hardness, 5.5-6.

LLANO COUNTY:
Mexican Diggings, Babyhead Creek.*
Barringer Hill, C.

"Allanite has not yet been found very abundantly at this locality, and all of the ten kilos obtained was massive-nodular in form. Its surface alteration is very slight compared with that of the other allied minerals. Its color is shining pitchy-black. Powder and streak dull greenish-brown. Upon ignition it first turns red-brown, and then becomes coal-black. It is opaque, except in the very thinnest splinters, when a greenish-brown translucence is evident. Specific gravity =3.488. We have made no complete analysis as yet, but the specimen tested showed the presence of considerable quantities of the cerium-yttrium earths and of thoria, and we learned that it was completely solubue in acids with the separation of gelatinous silica, either before or after igniting the mineral (like the associated gadolinite). The better masses have been found quite isolated from the other occurring minerals."—Hidden and Mackintosh, *Amer. Jour. of Science*, III, Vol. 38, p. 485.

Analyse des Allanits (von Llano County, in Texas).

$Si\ O_2$	29.21
$Fe_2\ O_3$	30.33
Gesammtceriterden	25.06*
$Al_2\ O_3$	12.20
$Ca\ O$	3.69
	100.49

*($Nd_2\ O_3$, 4.76; $Pr_2\ O_3$, 2.31; $La_2\ O_3$, $Ce_2\ O_3$.)

W. Muthmann und L. Stützel: Beiträge zur Spectralanalyse von Neodym und Praseodym.

[Mittheilung aus dem chemischen Laboratorium der kgl. Akademie der Wissenschaften zu München.] Berichte der Deutschen Chemischen Gesellschaft, 32, Bd. III, S. 2677. 1899. Berlin: 1900.

ALAMANDITE. *Iron-aluminum Garnet.* $3\ Fe\ O.\ Al_2O_3.\ 3Si\ O_2$.

This species includes in part that which has been termed "common garnet" and in part that termed "precious garnet." Its color ranges from brownish red to black. Precious garnet is transparent. Specific Gravity, 3.9-4.2. Hardness, 6.5-7.5.

BURNET COUNTY:
Clear Creek.*C.

"Near Shannon's Quarries in great variety of colors."*

LLANO COUNTY:
Mexican Diggings, Babyhead Creek.*

ALUM. *Hydrous Aluminum Sulphate.*

PRESIDIO COUNTY:
Fresno Cañon.

AMAZON STONE. *See Microcline.*

AMETHYST. *Amethystine Quartz. Silica.* $Si\ O_2$.

A violet or purple variety of Quartz. Specific Gravity, 2.65-2.66. Hardness, 7.

BURNET COUNTY:
In granite. C.

EL PASO COUNTY:
Sierra Blanca. C.

LLANO COUNTY:
In granite.

AMPHIBOLE. *Hornblende. Magnesium-calcium-iron-aluminum Silicate.*

The colors of this mineral range usually through various shades of green, especially dark green, to black. Specific Gravity, 2.9-3.4. Hardness, 5-6.

BURNET COUNTY:
White Eagle Mine, five miles west of Burnet.

EL PASO COUNTY:
"Hornblende is found in the northern part of the Quitman Mountains, in the Sierra Carrizo, at the Rattle Snake tank, in a spur of the Van Horn Mountains, and in the Sierra Blanca group and its northwestern extension."—Von Streeruwitz.**

LLANO COUNTY:
Headwaters of Cold Creek.*
Riley Mountain.*
Near Click, Glen and Sandy Gaps.*

ANDRADITE. *Common Garnet, Black Garnet. Calcium-iron Garnet.* $3Ca\ O.\ Fe_2\ O_3.\ 3Si\ O_2$.

Of various colors: yellow in different shades, green and greenish yellow, dark green, brown, brownish red or yellow, gray-black, black. Specific Gravity, 3.8-3.9. Hardness, 6.5-7.5.

LLANO COUNTY:
Babyhead Mountain.*
Babyhead Creek.*

MASON COUNTY:
Kothmann Tract, three miles southeast of Spiller Mine.

"Two specimens of this variety of garnet from the Kothmann tract, fifteen miles northeast of the town of Mason, Mason county, have been analyzed. Both specimens are impure, as is shown by their physical features and by their variation from the true garnet ratio, but they probably approach the latter closely enough to be classed as garnets. It has been suggested by Dr. S. L. Penfield, who has kindly examined these analyses, that the minerals represent manganese varieties of andradite, which is a calcium-iron-garnet having the formula $Ca_3 Fe_2 Si_3 O_{12}$, and that they bear a resemblance to the variety from Franklin, New Jersey, called Polyadelphite by Thompson. * * *

"The following analyses of the Texas specimens, made by R. N. Brackett, were not intended to be complete, but they show the important constituents of the minerals. They were made of material dried at 110°-115° Centigrade:

"(a) This is a massive or semi-crystalline mineral; color, chocolate-brown; streak, light brown; lustre, resinous; translucent; fracture, uneven; hardness, 7-7.5; specific gravity, 3.57. The mineral fuses readily into a black glass; is only slightly attacked by hydrochloric acid in the fresh state, but is readily decomposed with the separation of silica after fusion; with fluxes it gives manganese reactions.

Analysis of Andradite from Mason County, Texas.

	Per cent.	Ratio.		
Silica ($Si O_2$)	37.24	0.621		3.15
Ferric Oxide ($Fe_2 O_3$)	31.17	0.195		0.98
Alumina ($Al_2 O_3$)	trace			
Manganese Protoxide (Mn O)	20.11	0.283	0.497	2.49
Lime (Ca O)	10.16	0.181		
Difference (Magnesia?)	1.32	0.033		
	100.00			

* * * * * *

"(b) This is a crystalline mineral; color, deep yellow; lustre, resinous to vitreous; translucent; fracture, uneven; hardness, 6; specific gravity, 3.72. The mineral fuses readily into a black glass; is only slightly attacked by hydrochloric acid in the fresh state, but after fusion readily decomposes with the separation of silica; with fluxes gives manganese reactions.

Analysis of Andradite from Mason County.

	Per cent.	Ratio.		
Silica ($Si O_2$)	36.24	0.605		3.02
Ferric Oxide ($Fe_2 O_3$)	15.91	0.100	0.210	1.05
Alumina ($Al_2 O_3$)	11.23	0.110		
Manganese Protoxide (Mn O)	30.72	0.434	0.527	2.63
Lime (Ca O)	2.04	0.037		
Magnesia (Mg O)	2.22	0.056		
Difference. (Alkalies?)	1.64			
	100.00"			

—R. A. F. Penrose, Jr., Annual Report of the Geological Survey of Arkansas for 1890, Vol. I, pp. 435, 436.

ANKERITE. *Calsium-magnesium-ferrous Carbonate.* $2Ca CO_3 . Fe CO_3$.

Crystalline (rhombohedral), crystalline granular or compact. White to gray in color or reddish. Specific Gravity, 2.95-3.1.

BURNET COUNTY:
Spring Creek.*
High Point.*

LLANO COUNTY:
Northwest of Long Mountain, near Sutton's.*

ANTIMONY. *A Native Element.* *Sb.*

EL PASO COUNTY:**
"Antimony is contained in the ores of the Quitman Mountains and the Sierra Diablo."—Von Streeruwitz.

APATITE. *Calcium Phosphate.*

Crystalizes in hexagonal prisms; sometimes short and tabular. Occurs also in reniform masses having fibrous structure; massive, granular to compact. Color green, blue, white; sometimes yellow, gray, etc. Streak white. Specific Gravity, 3.17-3.23. Hardness, 5.

BURNET COUNTY:
High Point.*
Opposite Long Mountain (small green crystals in quartz).*

LLANO COUNTY:
Packsaddle Mountain (Cambrian).*

ARAGONITE. *Calcium Carbonate.* $Ca CO_3$.

Of various shapes—stalactitic, incrusting, globular, reniform, columnar, fibrous, etc.; crystals often acicular in radiating groups, also twinning. Color white, gray, yellow, green, etc. Streak uncolored. Specific Gravity, 2.93-2.95. Hardness, 3.5-4.

BREWSTER COUNTY:
Terlingua. C.

EL PASO COUNTY:
Franklin Mountains. C.

GILLESPIE COUNTY:
Southeast of Enchanted Rock.*

LLANO COUNTY:
South of Llano.*

MASON COUNTY:
Caylor's Diggings.*

SAN SABA COUNTY:
Quarter mile northeast of Barton's.*
Hinton Creek.*

WILLIAMSON COUNTY. C.

TRANS-PECOS REGION.**

ARGENTITE. *Silver Glance. Silver Sulphide.* $Ag_2 S$.

Metallic; of a blackish lead-gray color and streak. Octahedral crys-

tals often in reticulated or arborescent forms. Sometimes filiform; massive. Specific Gravity, 7.20-7.36. Hardness, 2-2.5.

TRANS-PECOS TEXAS.**

EL PASO COUNTY:
Hazel Mine, Sierra Diablo. C.

ASBESTUS. *A form of Amphibole.*

Fibrous. Of a white, green, or brown color.

GILLESPIE COUNTY:
Rare.*

LLANO COUNTY:
Near Sandys—not abundant..

ASPHALTUM. *Asphalt. Mineral Pitch. A Mixture of different Hydrocarbons.*

Color black, brownish black. Lustre pitch-like. Easily melted. Graduates by degrees to petroleum, from which, in many instances, it has been derived by the evaporation of the more volatile ingredients.

ANDERSON COUNTY:

"At a distance of from ten to twelve and a half miles northeast of Palestine there is a deposit of a partially consolidated sandstone which is in many places impregnated with an oily or asphaltic residuum. The material seems to be more abundant in the sandstone making up part of the ridge between Still's and Squirrel Creeks. The asphaltic sand outcrops in the creek banks, and has been encountered in practically all the wells dug in the neighborhood. It has been asserted that the deposits are in some instances more than forty feet thick, in which case the asphaltic material must impregnate more than one stratum. Nor is this at all unlikely, considering the nature of the beds making up the section."—Bull. of the Univ. of Texas Min. Surv., No. 3, p. 86.

Chapel Well. C.

Hassell Well. C.

Brule's Hole. C.

Analyses of Bituminous Sandstone by Messrs. O. H. Palm and S. H. Worrell, Assistant Chemists, University of Texas Mineral Survey.

	Before Heating.			After Heating to 300 degrees F. for 60 Minutes.		
	Chapel Well. Per Cent.	Hassell Well. Per Cent.	Brule's Hole. Per Cent.	Chapel Well. Per Cent.	Hassell Well. Per Cent.	Brule's Hole. Per Cent.
Asphaltene	11.25	0.92	.35	4.17	0.50	0.73
Petrolene	12.09	16.52	5.82	13.46	12.37	4.92
Lime Carbonate	None	0.96	Trace.	.....	.....	.....
Silica	76.71	81.60	91.83	.....	.....	.....
Sulphur	0.43	0.61	0.18	0.26	0.31	0.17
Total Bitumen	23.34	17.14	8.17	17.89	12.87	5.65

Bulletin of the University of Texas Mineral Survey, No. 3, pp. 86-87.

ANGELINA COUNTY:
Spring on Miller League, near Windom.

BREWSTER COUNTY:
Terlingua Creek.

BURNET COUNTY:
Post Mountain, near the town of Burnet. Asphaltic Limestone.

Analyses by Messrs. O. H. Palm and S. H. Worrell, Assistant Chemists, University of Texas Mineral Survey.

	No. 1. Per cent.	No. 2. Per Cent.
Asphaltene	7.76	1.90
Petrolene	6.75	8.40
Lime Carbonate	81.33	88.20
Silica	4.16	1.50
Sulphur	0.22	0.23
Total Bitumen	14.51	10.30

—Bull. Univ. of Texas Min. Surv., No. 3, p. 97.

COOKE COUNTY:
At various localities in the area between Muenster and St. Jo.
Asphaltic Sandstone. Abundant.
Hoover's Place. C.

HARDIN COUNTY:
Near Saratoga and Sour Lake.

HUNT COUNTY:
Reported.

JACK COUNTY:
Reported.

JASPER COUNTY:
The "Tar Well," four and a half miles northeast of Rockland.
Boykin Spring, three and a half miles northwest of the preceding.

MARTIN COUNTY:
Asphaltic Sands reported.

MONTAGUE COUNTY:
North and south of the town of St. Jo: Sampson Ridge, Gordon Mountain, etc.

"Composition of the bituminous sandstone at the north point of Sampson Ridge, three and one-half miles east of north of St. Jo, Montague county:

	First foot from bottom. Per cent.	Second foot. Per cent.	2 feet 8 inches. Per cent.
Asphaltene	1.35	1.46	1.58
Petrolene	9.00	9.50	9.10
Lime Carbonate	trace	trace	trace
Silica	89.65	89.04	89.32
Sulphur	0.20	0.24	0.22
Total Bitumen	10.35	10.96	10.68"

—Bull. Univ. of Texas Min. Surv., No. 3, p. 81.

NACOGDOCHES COUNTY:
Reported.

PANOLA COUNTY:
Near Tatum.

PECOS COUNTY:
Northeast of Fort Stockton fifteen miles. Asphaltic Limestone.

SAN AUGUSTINE COUNTY:
Reported.

STEPHENS COUNTY:
Near Crystal Falls. Asphaltic Sandstone.

TRAVIS COUNTY:
Near Watter's Station, north of Austin. (See Petroleum.)

UVALDE COUNTY:
Carbondale, six miles southeast of Cline. Bituminous Limestone. Turkey Creek. C.

"The statement has been made (Mineral Resources of the United States, 1893, p. 637) that the rock contains from 15 to 33 per cent. of bitumen, and that the average was about 20 per cent. Numerous samples of this rock have been examined in the laboratory of the Survey, but we have not been able to confirm this statement. In an excellent paper on 'The Asphalt Deposits of Western Texas,' by Mr. T. Wayland Vaughan (Mineral Resources of the United States, 1896-1897), there are two analyses of this rock, given on the authority of Mr. R. T. Rokeby, vice-president of the Litho-Carbon Rubber Company, in which the total bitumen is placed at 25.18 per cent. and 9.03 per cent., but Mr. Rokeby says that the average of the rock mined is from 15 to 16 per cent. of total bitumen.

"The average of many analyses of this rock shows that it contains from 14 to 17 per cent. of total bitumen, *i. e.*, asphaltene plus petrolene, with 80-85 per cent. of carbonate of lime, with some iron and alumina, a very small percentage of silica, and sulphur up to one per cent."—Bull. Univ. of Texas Min. Surv., No. 3, pp. 92-93.

Smyth-Nunn Ranch, twelve miles southeast of Cline. Bituminous limestone carrying some silica.

Mays's Ranch, Waxy Falls, thirteen miles southwest of Uvalde. Calciferous bituminous sandstone. C.

ATACAMITE. *Hydrous Copper Chloride.* $Cu\ Cl_2.\ 3Cu\ (OH)_2$.

Crystals slender and prismatic; striated vertically. Fibrous, granular, massive; sometimes as sand. Color: various shades of green. Streak, apple green. Lustre, adamantine; vitreous. Specific Gravity, 3.75-3.77. Hardness, 3-3.5.

TRANS-PECOS REGION.**

AVENTURINE. *A form of Quartz,* $Si\ O_2$, bespangled with scales of mica, hematite or other mineral. See Quartz.

EL PASO COUNTY:
Quitman Mountains.**

AZURITE. *Blue Copper Carbonate. Hydrous Copper Carbonate. Basic Cupric Carbonate.* $2Cu\ CO_3.\ Cu\ (OH)_2$, or $3CuO.\ 2CO_2.\ H_2O$.

In short, thick, oblique, rhombic prisms; columnar, massive, stalactitic. Color blue, azure blue, Berlin blue. Streak blue. Vitreous lustre. Brittle. Specific Gravity, 3.77-3.83. Hardness, 3.5-4.

BURNET COUNTY:
White Eagle Mine, five miles west of Burnet.

EL PASO COUNTY:
Sierra Diablo, Bromide Mine. C.
Sancho Panza Mine. C.
Carrizo Mountains. C.

LLANO COUNTY:
McGehee Place, head of Little Llano Creek.*
Parkhill Ranch, four miles north of Llano.
Mexican Diggings, Babyhead Creek.*
Miller's Mine.*
Babyhead Mountain. C.
Pecan Creek. C.
Near Yoakum Creek (granite with malachite and azurite).*

TRANS-PECOS REGION.**

BARITE. *Heavy Spar. Barytes. Barium Sulphate.* $Ba\ SO_4$.

Crystals tabular or prismatic. When massive often lamellar with convergent or curved plates. Also fibrous, columnar, granular, compact. Of a white color tinted with yellow, brown, red, blue. Lustre vitreous or pearly. Specific Gravity, 4.3-4.6. Hardness, 2.5-3.5. Brittle.

LLANO COUNTY. C.

BAT GUANO. Of economic importance but not strictly within the province of descriptive mineralogy. Found in caves. See article by Wm. B. Phillips in *Mines and Minerals,* Scanton, Pa., May, 1901.

BEXAR COUNTY.
BLANCO COUNTY.
BURNET COUNTY.
Headwaters of Beaver Creek.
COMAL COUNTY.
EDWARDS COUNTY.
GILLESPIE COUNTY.
HAYS COUNTY.
LAMPASAS COUNTY.
LLANO COUNTY.
SHELBY COUNTY.
TRAVIS COUNTY.
UVALDE COUNTY.
WILLIAMSON COUNTY.

BEAUXITE. *Bauxite. Hydrous Aluminum Oxide.* $Al_2O_3.\ 2H_2O$.

Resembling clay, massive, oolitic. In color whitish, gray, yellow, brown. Specific Gravity, 2.55.

Fe_2O_3 may be present, either replacing some of the Al_2O_3, or as an impurity. $Si\ O_2$ and other substances may also be present as impurities. See *Wocheinite.*

BURNET COUNTY:
Silver Mine Hollow, Beaver Creek.*

LLANO COUNTY:
King Mountains.*
Little Llano Creek, seven miles above Lone Grove.*
Near Smoothing Iron Mountain.*
Near Sutton's, northwest of Long Mountain, in quartz.*
Near head of Cold Creek.*
Near Field Creek.*

MASON COUNTY:
Little Bluff Creek.*
North of Mason Mountain.*

MCCULLOCH COUNTY:
East and west of Voca.*
San Saba River at crossing of Camp San Saba and Voca road.*

BERYL. *Aluminum-beryllium Silicate.* $3Be\ O.\ Al_2O_3.\ 6Si\ O_2$.

Long hexagonal prisms, usually striated vertically. Columnar, granular, massive. Various shades of green, from emerald green to blue-

green, blue, yellow, white. Brittle. Streak white. Specific Gravity, 2.63-2.80. Hardness, 7.5-8.

GILLESPIE COUNTY:*
Crab Apple Creek. C.
West of Mt. Nebo. C.

LLANO COUNTY:
Not common.

"Some very large beryls have been found in Gillespie county and occasionally in Llano county. They occur in Archæan situations similar to those in which garnets abound."—Comstock.

BIOTITE. *A Magnesium-iron Mica.* Composition varying. Typical Biotite $(H,K)_2(Mg,Fe)_2Al_2(Si\ O_4)_3$.

Crystals rhombic or hexagonal prisms, not common. Uusally found in scales or in masses composed of scales. Color green to black, brown, yellow, rarely white. Splendent lustre. Specific Gravity, 2.7-3.1. Hardness, 2.5-3.

BURNET COUNTY:
In granite, Granite Mountain.
Clear Creek.*
Near Spring Creek.*
Shannon's Quarries.*
White Eagle Copper Mine, five miles west of Burnet.

LLANO COUNTY:
Barringer Hill.*
Johnson Creek.*
King Mountain.*
Near Garner(?) Crossing of Llano River northwest of Gainsville (in graphic granite).*
Near Lone Grove.*
North of Lone Grove, Fisher and Miller Survey.*
North Sharp's Mountain (in granite).*
Miller's Mine.*
Rabb's Pasture.*
South of Field Creek, Panther Creek.*

MASON COUNTY:
Honey Creek, near Menardville road.*
North of Mason Mountain.*

MCCULLOCH COUNTY:
Southeast of Camp San Saba.*

BORNITE. *Purple Copper Ore. Variegated Copper Ore. Erubescite. Copper-iron Sulphide.* A sulphide of copper and iron in varying proportions. A typical form $3Cu_2S.\ Fe_2S_3$.

Usually massive, granular, compact. Crystalline faces, when present, often rough or curved. Color copper-red to brown. Iridescent from tarnish. Streak grayish black. Brittle. Lustre metallic. Specific Gravity, 4.9-5.4. Hardness, 3.

EL PASO COUNTY:
Hazel Mine, Diablo Mountains, ten miles north of Allamore. C.

LLANO COUNTY:
McGehee property, head of Little Llano Creek.*
Parkhill Ranch, four miles north of Llano.

BRAUNITE. $3Mn_2O_3.\ Mn\ Si\ O_3$.

Crystals octahedrons. Massive. Brown-black to steel-gray in color, and streak. Submetallic lustre. Brittle. Specific Gravity, 4.75-4.82. Hardness, 6-6.5.

LLANO COUNTY:
Chaney's Diggings, south of Packsaddle Mountain.*
Riley Mountain.*

BRICK CLAYS OR EARTHS.

Clays or earths that can be used in the manufacture of bricks are of common occurrence in the State. Excellent red brick are manufactured at many places. At Austin a light cream-colored brick, resembling the Milwaukee brick, is burned. The Quaternary clays of the Colorado Coal Field are said to be excellently adapted for brick-making. See also Pottery clays.

BASTROP COUNTY:
Elgin.

BEXAR COUNTY:
Twelve miles north of San Antonio.

BOWIE COUNTY:
Texarkana.

BRAZORIA COUNTY:
Velasco.

BRAZOS COUNTY:
Bryan.

CALDWELL COUNTY:
Between Lockhart and Luling.

CHEROKEE COUNTY:
Rusk.
New Birmingham.

DALLAS COUNTY:
Dallas.

EL PASO COUNTY:
Banks of the Rio Grande.

GRIMES COUNTY:
Anderson.
Navasota.

HOUSTON COUNTY:
Crockett.

MCLENNAN COUNTY:
Waco.

PALO PINTO COUNTY:
Gordon.

ROBERTSON COUNTY:
Calvert.
Hearne.

TRAVIS COUNTY:
Austin.

BROMYRITE. *Silver Bromide.* Ag Br.

In small concretions. Color bright yellow to amber-yellow, greenish. Specific Gravity, 5.8-6. Hardness, 2-3.

TRANS-PECOS REGION:**
Reported from Chisos Mountains.

BRONZITE. *Ferriferous Enstatite.* (Mg, Fe) Si O_3.

In color grayish, green, olive green, brown. Named from the bronze-like lustre of the cleavage surfaces, which are also at times pearly. Specific Gravity, 3.1-3.3. Hardness, 5-5.5.

BURNET COUNTY:
Head of Clear Creek.*

LLANO COUNTY:
Llano River, near Gainsville.*

CALAMINE. *Smithsonite. Hydrous Zinc Silicate.* 2Zn O. Si O_2, H_2O.

Crystals tabular or prismatic, implanted, often forming drusy surfaces. Fibrous, granular, massive, stalactitic, botryoidal, etc. Color white, bluish or greenish white, yellow, brown. Lustre vitreous. Brittle. Streak white. Specific Gravity, 3.4-3.5. Hardness, 4.5-5.

TRANS-PECOS REGION.**

CALCITE. *Calc Spar.* Many varieties. When clear and transparent, *Iceland Spar. Carbonate of Lime.* Ca CO_3.

Crystallization various, from tabular to elongated prismatic. Fibrous, granular, stalactitic, nodular, etc. Of many colors ranging from colorless to white, blue, red, yellow, brown and black. Lustre vitreous to earthy. Streak white to gray. Specific Gravity, 2.71, in pure crystals, varying according to the impurities present. Hardness, 3; earthy forms soft.

ANDERSON COUNTY:
In seams near the Saline, six miles west of Palestine.

BREWSTER COUNTY:
Terlingua District, associated with cinnabar.

BURNET COUNTY:
Burnet, from a well. C.
Hoover Valley. C.
Sherrard's Place. Rhombehedrons in Bat Cave.—Dana.

GILLESPIE COUNTY:
Willow Creek. C.
Mormon Creek. C.

LLANO COUNTY:
East Prong of Packsaddle Mountain.*

MASON COUNTY:
Caylor's Diggings.*
On San Saba River below Five Mile Creek.*

SAN SABA COUNTY:
Hinton Creek.*

TRAVIS COUNTY:
In fissures in limestone; calcified fossils, Barton Creek and Deep Eddy Bluff on the Colorado.

TRANS-PECOS REGION.**

CALOMEL. *Horn Quicksilver. Mercurous Chloride.* Hg_2Cl_2.

Crystals tabular, pyramidal, often complex. White, gray, yellowish,

brown. Lustre adamantine. Translucent—subtranslucent. Hardness, 1-2. Specific Gravity, 6.48.

BREWSTER COUNTY:
Terlingua District.

CARNELIAN. *Sard.* A variety of *Quartz.*

Defined as "a clear red chalcedony, pale to deep in shade; also brownish red to brown."—Dana.

EL PASO COUNTY:
Near Van Horn.

LLANO COUNTY:
Long Mountain.*
Pennington Creek.*
Sandy Creek.*

CARNOT. *See Kaolinite.*

CASSITERITE. *Tin Stone. Tin Ore. Tin Dioxide.* Sn O_2.

Crystals pyramidal; prismatic with acute terminations. Twins common. In grains, massive, reniform, fibrous. Color brown or black, sometimes reddish, grayish, yellow or even white. Lustre adamantine. Streak white to brown. Brittle. Specific Gravity, 6.8-7.1. Hardness, 6-7.

BURNET COUNTY:
Beaver Creek District. "Sparingly."—Dana.

EL PASO COUNTY:
Quitman Mountains.**
East Flank of Franklin Mountains, ten miles north of El Paso.

LLANO COUNTY.

MASON COUNTY.
"The most favorable points, judging from the knowledge thus far acquired, are in the region about Barringer Hill and westward in Llano county, and in the country about the headquarters of Herman and Willow Creeks, in Mason county."—Comstock.
Herman Creek. C.

CELESTITE. *Coelestine. Strontium Sulphate.* Sr SO_4.

When crystalline, tabular or prismatic; sometimes pyramidal; also fibrous, radiated, granular. In color white or bluish, hence its name. Lustre vitreous or pearly. Streak white. Specific Gravity, 3.95-3.97. Hardness, 3-3.5.

BURNET COUNTY:
Strickling. C.

LAMPASAS COUNTY:
"Celestite crystals, sometimes of gigantic size."—Dana.
Five miles north of Lampasas. C.

TRAVIS COUNTY:
At Mt. Bonnell, on the Colorado River above Austin.

CERARGYRITE. *Horn Silver. Silver Chloride.* Ag. Cl.

Crystals small, of the Isometric System, i. e., following the octahedron, cube, rhombic dodecahedron or some related form; sometimes columnar; generally massive and wax-like; incrusting. Color gray, white or green, yellowish, occasionally blue. Streak gray. Lustre adamantine, resinous. Specific Gravity, 5.55. Hardness, 1-1.5.

TRANS-PECOS REGION.**
BREWSTER COUNTY:
Reported from Chisos Mountains.

CEROLITE. *See Kerolite.*

CERUSSITE. *White Lead Ore. Lead Carbonate.* $Pb\ CO_3$.

Crystals, often in clusters, tabular, prismatic, pyramidal; twins common; six-rayed groups. Massive, compact; also "in long silky bundles." White, gray, grayish-black. Lustre adamantine to pearly. Brittle. Specific Gravity, 6.46-6.57. Hardness, 3-3.5. Brittle.

TRANS-PECOS REGION.**

CHALCEDONY. *A Cryptocrystalline variety of Quartz.* $Si\ O_2$.

Of various colors, of which white, gray, blue, brown and black are the most prominent. Waxy in lustre. In many forms, botryoidal, mamillary, etc.; often forming the lining of or filling cavities. Specific Gravity, 2.59-2.64. Hardness, 7.

PRESIDIO COUNTY:
Near Van Horn.
SAN SABA COUNTY:
Northeast of Barton's on Hinton Creek.*
Deep Creek Region.*
TRAVIS COUNTY:
"Some fine specimens of chalcedony have been found in Travis county in the neighborhood of the disturbances caused by the Pilot Knob eruption."—E. T. Dumble.

CHALCOCITE. *Copper Glance. Vitreous Copper. Redruthite. Copper Sulphide.* Cu_2S.

Occurs both in crystals and massive. In the latter form granular to compact. Color blackish to lead gray, dull; from tarnish sometimes blue or green. Streak like color. Brittle. Specific Gravity, 5.5-5.8. Hardness, 2.5-3.

"NORTHWESTERN PART OF THE STATE."
ARCHER COUNTY. C.
EL PASO COUNTY:
Carrizo, forty miles east of El Paso, with copper pyrites and copper carbonates carrying silver.
Hazel Mine.**
LLANO COUNTY:
Babyhead Mountain. C.
Parkhill Ranch, four miles north of Llano.
STONEWALL COUNTY.

CHALCOPYRITE. *Copper Pyrites. Yellow Copper Ore. Copper-iron Sulphide.* $Cu\ Fe\ S_2$.

In tetrahedral or octahedral crystals or massive. Of a yellow, especially a brass-yellow color; often iridescent. Streak greenish black. Lustre metallic. Specific Gravity, 4.1-4.3. Hardness, 3.5-4.

BURNET COUNTY. C.
EL PASO COUNTY:**
Near Carrizo.
Quitman Mountains. C.**
Carrizo Mountains.**
Between Sierra Blanca and Hueco Range.**
LLANO COUNTY:
Miller Mine, with malachite and azurite.*
Mexican Diggings, Babyhead Creek.*
"Elsewhere over the Central Mineral Region, but nowhere abundant."*

CHERT. *A Cryptocrystalline variety of Quartz. Hornstone.* $Si\ O_2$.

BURNET COUNTY:
In Silurian Beds.*
GILLESPIE COUNTY:
In Silurian Beds.*
KIMBLE COUNTY:
In Silurian Beds.*
LLANO COUNTY:
In Silurian Beds.*
MASON COUNTY:
"In the Cretaceous of Mason Mountain and other districts."
McCULLOCH COUNTY:
In Silurian Beds.*
SAN SABA COUNTY:
In Silurian Beds.*

CHLORITE GROUP.

Silicates of a green color in which ferrous iron is a prominent ingredient. Closely related to the micas.

"Chemically considered, the chlorites are silicates of aluminum with ferrous iron and magnesium chemically combined with water. Ferric iron may be present replacing the aluminum in small amount; chromium enters similarly in some forms, which are then usually of a pink instead of the more common green color. Manganese replaces the ferrous iron in a few cases. Calcium and the alkalies—characteristic of all true micas—are conspicuously absent, or present only in small amount."—Dana's Text-Book of Mineralogy, New Ed., p. 472.

CHLORITE. *Hydrous Magnesium-ferrous-aluminum-silicate* is recorded as occurring in

GILLESPIE COUNTY:
South of Enchanted Rock.*
LLANO COUNTY:
Little Llano Creek.*
Honey Creek.*

CHLOROPAL. *A Hydrous-ferric Silicate.* Aluminum may be present. Fe_2O_3. $3Si\ O_2$. $5H_2O$.

Massive and opal-like, with conchoidal fracture, or earthy. Of a greenish yellow color. Specific Gravity, 1.72-1.87. Hardness, 2.5-4.5.

LLANO COUNTY:
Johnson's Creek.*

CHRISTOPHITE. *A variety of Sphalerite. Black Sphalerite.*

TRANS-PECOS REGION.**
EL PASO COUNTY:
Quitman Mountains.

CHRYSOCOLLA. *Hydrous Copper Silicate.* $Cu\ Si\ O_3$. $2H_2O$.

Encrusting or botryoidal, in seams, opal or emanel-like in appearance. In color various shades of blue and green; dark when impure. Brittle. Fracture conchoidal. Lustre vitreous to earthy. Streak white. Specific Gravity, 2-2.23. Hardness, 2.4.

EL PASO COUNTY:
Foothills of the Sierra Diablo.**

CINNABAR. *Mercuric Sulphide.* Hg S.

Crystals six-sided prisms or thick tabular. At times acicular, incrusting, granular, massive. Often impure from the presence of clay, oxide of iron, bitumen, etc. Color bright red, brownish-red, gray. Hardness, 2-2.5. Specific Gravity, 8.9-8.2. Streak bright red. Liver ore or brown cinnabar has a brown streak.

BREWSTER COUNTY:
Terlingua and vicinity, in Blocks G12 and G4.

COAL.

As distinguished from the Lignites (Tertiary), the coals of Texas are of the Carboniferous (Bituminous) and Cretaceous (Semi-bituminous) Ages.

In the list of counties following this distinction will, as far as possible, be observed. First are given those in which Carboniferous coals are known to occur, or in which they are mined; second, those in which Cretaceous coals occur or are mined.

For analyses of Texas coals by Messrs. Palm and Worrell, see Bulletin of the University of Texas Mineral Survey, No. 3, p. 52-53.

I. Carboniferous Coals.

ARCHER COUNTY:
Southwest part.

BROWN COUNTY:
Northwest part.
Pecan Bayou, near Byrd's Store.

COLEMAN COUNTY:
Outcrops approximately on a line from Waldrip, in McCulloch county, to Jim Ned Creek, near the Brown county line.
Four miles east of Santa Anna.
On Home Creek, six miles west of Trickham. Twenty-eight inches thick.
On Bull Creek, Gibson Shaft, northeast of Waldrip. Twenty-four inches thick.

EASTLAND COUNTY:
Western part.
Near Cisco.
Smith-Lee Mine (upper bench, one foot one inch.
Smith-Lee Mine (lower bench), one foot three and three quarter inches.—U. T. M. S.

ERATH COUNTY:
Northwestern part.
Thurber—extensively mined. Twenty-eight to thirty inches, with shale partings.

Composition of Coal. Texas & Pacific Coal Company's Mine. (U. T. M. S.):

I.

Proximate Analysis—Natural Condition.

Moisture	5.36
Volatile and combustible matter	31.91
Fixed Carbon	43.03
Ash	19.70
Sulphur	2.04

Proximate Analysis—On Dry Basis.

Volatile and combustible matter	33.72
Fixed Carbon	45.47
Ash	20.81
Sulphur	2.16

II.

Proximate Analysis—Natural Condition.

Moisture	5.46
Volatile and combustible matter	35.66
Fixed Carbon	49.17
Ash	9.71
Sulphur	1.61

Proximate Analysis—On Dry Basis.

Volatile and combustible matter	37.72
Fixed Carbon	52.01
Ash	10.27
Sulphur	1.71

—Bull. Univ. of Texas Min. Surv., No. 3, p. 52.

Johnson Mine. C.

JACK COUNTY:
Northern and northwestern parts.
On West Fork of Trinity River.
Antelope, eight to eighteen inches.
Gertrude.
Eastern part of the county.

MCCULLOCH COUNTY:
Milburn. Few inches thick.
Near Waldrip. Finks Mine, twenty-eight inches.

MONTAGUE COUNTY:
Southwestern part.
Near Bowie. Max Elser Mine, four miles west.

PALO PINTO COUNTY:
Outcrop runs southwest from Keeler to Thurber.
Keeler, ten inches thick.—U. T. M. S.
Strawn, one foot eleven and a half inches.—U. T. M. S.
Palo Pinto Mine. C.
Gordon.

PARKER COUNTY:
Western part.
Near Millsap. Rock Creek Mines, one and a half to two feet and over.

STEPHENS COUNTY:
Northwestern part.
Crystal Falls. Wizeart Mine, two and a half feet with four-inch parting.
Albert Sidney Johnston Mine, six miles west of Crystal Falls—coal formerly used by the government troops at Fort Griffin.

WISE COUNTY:
Western part.
Near Bridgeport, on both sides of Trinity River, one and a half to two feet.

YOUNG COUNTY:
Outcrop runs diagonally from northeast to southwest.
Flat Top, eight miles northeast of Graham, twenty inches.
Coal Bank Branch, five miles west of Flat Top, twenty-four inches.
Salt Creek.
Near the mouth of Coal Creek, two feet.
At and near Belknap.
Near Wagon Timber Creek. Jones Mine, forty-two inches with four-inch parting.

II. Cretaceous Coals.

BREWSTER COUNTY:
East and south sides of Chisos Mountains.
"On the east and south side of the Chisos Mountains there are extensive areas of the Montana formation in which there are coal beds of unknown value."—R. T. Hill, Bull. U. S. Geol. Surv., No. 164, p. 86. See also Bull. No. 4, Univ. of Texas Min. Surv., p. 73.
Between Alpine and Paisano Pass.

EL PASO COUNTY:
Eagle Springs, Eagle Mountains. (Age doubtful.)
Between Sierra Barda and the Rio Grande. (Age doubtful.) See W. H. von Streeruwitz, Geol. Surv. of Texas, Vol. IV, Pt. I, p. 175, 1893.

MAVERICK COUNTY:
Eagle Pass Coal Field:
Old Hartz Mine, five miles northwest of Eagle Pass.
Coal four and a half to five feet thick, not counting the partings.
Maverick County Coal Company's Mine, four miles north of Eagle Pass. Thirty-eight inches of coal separated by two partings each two inches thick. A foot and a half below this, one foot four inches of coal.

Composition of Coal. (U. T. M. S.):

Proximate Analysis—Natural Condition.

Moisture	9.40
Volatile and combustible matter	33.08
Fixed Carbon	40.09
Ash	17.43
Sulphur	1.28

Proximate Analysis—On Dry Basis.

Volatile and combustible matter	36.52
Fixed Carbon	44.16
Ash	19.22
Sulphur	1.42

—Bull. Univ. of Texas Min. Surv, No. 3, p. 52.

Dolch and Company's (now the Rio Bravo Coal Company's) Mine, one mile south of the preceding. Coal cut by several partings.
Onion Creek. C.
Olmus Creek Bottom, seven miles north of Eagle Pass.
O. P. Hector's Place, two and a half miles below Eagle Pass.
"The [Eagle Pass] coal is dark, does not air slack, is lustrous or brownish black, has a brown streak and subcubical cleavage. Usually no woody structure is apparent."—T. Wayland Vaughan, "Reconnoissance of the Rio Grande Coal Fields of Texas," Bull. of the U. S. Geol. Surv., No. 164, p. 60.
The Maverick-Zavala Boundary, four miles north of the Dimmit county line.

PRESIDIO COUNTY:
San Carlos Coal Field.

ZAVALA COUNTY:
Two or three miles from the mouth of Mula Creek. Poor

CLAY IRON STONE. *Carbonate of Iron.* See Siderite.

CLAYS. *See Brick Clay, Fire Clay, Pottery Clay.*

COLUMBITE. *Iron-manganese-niobium-tantalate.* (Fe, Mn) (Nb, Ta)$_2$ O$_6$.

A black, brownish-black or grayish mineral. Often iridescent. Streak reddish to black. Lustre submetallic, subresinous, sometimes shining. Specific Gravity, 5-6. Hardness, 6-6.85.

LLANO COUNTY:
Barringer Hill. On the authority of Dr. Edgar Everhart.

COPPER, NATIVE. *An element.* Cu.

Often arborescent, filiform and wire-like. Also massive and in sheets. Crystals when present frequently distorted. Of a copper-red color. Hardness, 2.5-3. Specific Gravity, 8-8.9. Both ductile and malleable.

EL PASO COUNTY:
Hazel District, north of Van Horn.

COPPER ORES, PERMIAN.

"The existence of copper ores in the Permian measures of Texas has long been known, and these ores have been, from time to time, the object of geological researches and mining developments. * * *
"The ore appears principally in two zones of the Permian rocks, namely, the Red River zone in the counties of Archer, Wichita, Montague, Hardeman and Wilbarger, and the Brazos River zone in the counties of Haskell, Baylor, Stonewall and Knox. * * *

* * * * * *

"The Permian copper-ores appear in several horizons, and there exist two such horizons in each of the above mentioned zones. In the Red River district, the lower horizon is reported near Belcher, in Montague county. It belongs to the lowest Permian, and lies not much above the line of contact with the underlying Coal-Measures. The upper horizon of the Red River district is represented in Archer and Wichita counties, etc.
"The lower copper-horizon of the Brazos River zone appears in the

counties of Haskell and Baylor, and the upper horizon in Stonewall county, etc.

* * * * * *

"* * * The occurrences of copper-ores are scattered over a large area of Archer and Wichita counties, and the ore of Archer county appears principally in the marls and clay-slates as pseudomorph after wood (cuprified branches of trees, to a thickness of several inches in diameter), and as larger or smaller nodules (up to 4 or 6 inches in diameter), most or all of which are of fossiliferous origin.

"Copper-ore is found also in irregular amorphous masses, intermixed with and impregnating the marl and clay-slate. In a third form it occurs 'as numerous small pebbles in a hardened cupriferous conglomerate.' And, finally I found such nodules of copper-ore seated in hard clay-slate and even in sandstone.

"The copper-ore consists principally of green, blue and dark silicates and carbonates of highly varying percentage. The cuprified wood runs mostly high in copper, generally between 20 and 60 per cent., and the same is true of the nodules. When impregnating or intermixed with the clay and marl, the ore mostly contains less than 20 per cent. of copper; so does the conglomerate, etc."—E. J. Schmitz, Trans. American Institute of Mining Engineers, Vol. 26, p. 97, *et seq.*, 1897.

CREDNERITE. *Copper-manganese Oxide.* Foliated. $3Cu\ O.\ 2Mn_2O_3$.

Iron black to steel gray. Foliated. Metallic lustre. Streak black-brown. Specific Gravity, 4.9-5.1. Hardness, 4.5.

EL PASO COUNTY:
West of the Sierra Blanca.**
Hunter District, Quitman Mountains.**

CUPRITE. *Red Copper Ore.* Cu_2O.

Crystals in the form of octahedrons, cubes and dodecahedrons and their modifications. Massive, granular, earthy. Of a red color—sometimes dark. Streak brownish red of different shades. Specific Gravity, 5.85-6.15. Hardness, 3.5-4. Brittle; fracture conchoidal.

BURNET COUNTY:
White Eagle Mine, five miles west of Burnet.

TRANS-PECOS REGION.**

EL PASO COUNTY:
Boracho Mountains.**
Big Gulch District, Quitman Mountains.**

CUPRO-DESCLOISITE.

A massive variety of Descloisite in the form of crusts, reniform masses, etc., with 6.5-9 per cent of copper.

TRANS-PECOS REGION.**

CYANOTRICHITE. *Lettsomite.* $4Cu\ O.\ Al_2O_3;\ SO_3.\ 8H_2O$.—Genth.

"Occurs in velvet-like druses of short capillary crystals; sometimes in spherical globules."—Dana's System. Color bright blue.

TRANS-PECOS REGION.**

CYPRINE. *A blue variety of Vesuvianite or Idocrase,* which with salt of phosphorus gives a copper reaction.

LLANO COUNTY:
"Babyhead Region (with idocrase and copper ore)."**

CYRTOLITE. *Hydrous-zirconium Silicate,* often with uranium, yttrium, etc.

Crystals resembling rhombic dodecahedrons. Color brownish red. Lustre adamantine. Specific Gravity, 3.98-4.04. Hardness, 5.55.

LLANO COUNTY:
Barringer Hill.* C.
"Cyrtolite has been found abundantly in both massive form and in good crystallizations. One hundred kilos have thus far been collected while mining the yttria minerals. * * * This mineral here occurs in thick plates attached to the biotite and also constituting veins in the coarse pegmatite. It is often the matrix of the thoro-gummite and fergusonite. Specific gravity=3.652. It occurs in tetragonal forms with all the planes rounded, and polysynthetic groupings of crystals are very common. Its color ranges from dull gray, through various shades of brown to deep brown and almost black. Hardness about 5."—Hidden and Mackintosh, *Amer. Jour. of Science,* III, Vol. 38, pp. 485, 486.
At Hiram Castner's, 1 m. s.—Dana.

DIHYDRITE. *See Pseudomalachite.*

DOLOMITE. *Pearl Spar. Calcium Magnesium Carbonate.* $Ca\ Mg\ C_2O_6 = Ca\ CO_3.\ Mg\ CO_3$.

Crystallization rhombohedral. Curved faces common. Granular massive like marble. Of various colors from white to black, gray, reddish, brown, green. Lustre vitreous to pearly. Specific Gravity, 2.8-2.9. Hardness, 3.5-4.

CENTRAL MINERAL REGION:
"Very common as rock masses, occasionally crystalline, in the Silurian and Cambrian systems."—Comstock.

LLANO COUNTY:
Little Llano Creek.

TRANS-PECOS REGION.**

ENSTATITE. *Magnesium Silicate.* $Mg\ Si\ O_3 = Mg\ O.\ Si\ O_2$.

Crystals not common. Lamellar, also fibrous or massive. Color yellowish, greenish white, gray. Specific Gravity, 3.1-3.3. Hardness, 5.5. Brittle with an uneven fracture.

BURNET COUNTY:
Head of Clear Creek.*

LLANO COUNTY:
North Base of Long Mountain.*

EPIDOTE. *Pistacite. Hydrous Aluminum-ferric-calcium Silicate.* $H\ Ca_2\ (Al, Fe)_3\ Si_3\ O_{13} = H_2\ O.\ 4Ca\ O.\ 3\ (Al, Fe_3)_2\ O_3.\ 6Si\ O_2$.

Crystals prismatic, passing into acicular and fibrous forms. Granular

massive. Color pistachio green (a peculiar yellowish green) varying from light to dark, the latter becoming black. Red and yellow forms are known and sometimes grayish white and colorless. Lustre vitreous. Specific Gravity, 3.25-3.5. Hardness, 6-7.

BURNET COUNTY:
At "Capitol Rock."
At Dupre's.—Dana.

LLANO COUNTY:
On Cherokee Road, one-half mile from Babyhead Postoffice.* C. Johnson's Creek.*
Riley Mountains, near Click, Glen and Sandy Gaps.*
Miller's Mine.*
Oatman Creek, one and a half miles from Llano.*

MASON COUNTY:
Comanche Creek, three miles west of north from Mason.*
Flemming Postoffice.*
Near Fly Gap.*
One-half mile from Llano on branch of Oatman Creek.*

TRANS-PECOS REGION.**

EPSOMITE. *Epsom Salt. Hydrous Magnesium Sulphate.* $Mg SO_4 + 7H_2O$.

In masses and crusts and especially as efflorescences on rocks. With a bitter saline taste.

BROWN COUNTY:
Occurs in large quantities and of a purity sufficient to make it the source of an exceedingly cheap commercial product.

Analysis by Dr. H. W. Harper:

Water	40.07	40.00
Silica	21.075	21.43
Alumina and Iron Oxides	2.20	2.21
Magnesium Oxide	12.381	12.38
Calcium Oxide	trace	.....
Sulphur Trioxide	24.014	24.01
	99.74	100.03

Calculated to contain 76.13 per cent. $MgSO_4$, 7 H_2O.

"A series of experiments demonstrated that the material yields crystalized $MgSO_4$ within one or two per cent. of the analytical results."—Dr. Henry Winston Harper, Trans. Texas Academy of Science, Vol. II, Pt. 2, pp. 91-92, 1899.

ESSONITE. See Grossularite.

FASSAITE. A *variety of Augite.*

"Includes the pale to dark, sometimes deep green crystals, or pistachio green and thus resembling epidote."—Dana.

BURNET COUNTY:
From well on branch of Spring Creek.*

FELDSPAR. *See Orthoclase.*

FELDSPAR, LABRADOR. See Labradorite.

FERGUSONITE. *Tyrite. Bragite.*

"Essentially a metaniobiate (and tantalate) of yttrium with erbium, cerium, uranium, etc., in varying amounts; also iron, calcium, etc."—Dana.

"Fergusonite, mono-hydrated.—Specific gravity=5.67. Hardness, 6—6.5, form tetragonal, with acute octahedral terminations, a zirconoid plane hemihedrally developed and, rarely, the basal pinacoid. The crystals are rough and dull gray exteriorly, but with a bronzy sub-metallic appearance on the surface of fracture, which is small conchoidal and brilliant. Thin splinters show a yellowish-brown translucence. Color, bronzy hair-brown. Streak and powder dull brown. It is infusible, but on ignition the powdered mineral changes to a pale olive-green color, and a momentary glow creeps over the mass at the point of redness. Fragments decrepitate violently when heated. With a microscope a peculiar light brown muddiness is noticed, and the mineral is filled with minute streaks and spots of a darker shade, all of which may indicate incipient alteration.

"Crystals often have a thin coating of, or are otherwise partly altered to, the tri-hydrated variety next described. It is decomposed when in fine powder by hydrochloric acid, with separation of columbic acid. The analytical results are as follows:

Analysis.

			Oxygen ratio.
Cb_2O_5	46.27%		86.30
UO_3	1.54		1.59
ThO_2	3.38		
Al_2O_3	0.09		
Fe_2O_3	0.98		
(A) Y_2O_3*	23.95	Atomic weights,	
(B) Y_2O_3*	18.38	110.55	
PbO	1.43	113.3	
ZnO	0.24		
CaO	0.10		
MgO	0.04		
Ignition H_2O	1.98		
110° C. H_2O	0.04		
F	0.91	Atomic ratio,	
	99.33		
Less O=F	0.38		
	98.95		

	2.56	
	0.27	
	1.83	
	26.70	
	20.07	52.65
	0.64	
	0.30	
	0.18	
	0.10	
	11.00	
		15.79
	4.79	

*Total Y_2O_3 etc., and Ce earths = 42.33'.

"Fergusonite, tri-hydrated.—Specific gravity=4.36—4.48, hardness about 5. Color deep brown, almost black, thin edges show a yellowish-brown translucence. Form and exterior appearance same as the species previously described. Streak and powder pale greenish-gray. On ignition turns light brown, but does not glow nor decrepitate like fergusonite. Is decomposed by hydrochloric with separation of columbic acid.

Analysis.

			Oxygen ratio.	
$Cb_2 O_5$	42.79			
$U O_3$	3.12		79.59	
$U O_2$	3.93		3.24	
$Th O_2$	0.83		2.90	
$Al_2 O_3$	0.85		0.62	
$Fe_2 O_3$	3.75		2.49	
$Y_2 O_3$ etc.	31.36	Atomic weight, = 121.77	7.03	51.08
Pb O	1.94		32.28	
Ca O	2.74		0.87	
Ignition $H_2 O$	7.57		4.89	
110° C. $H_2 O$	0.62		42.05	
F	0.502	Atomic ratio,	2.64	44.69
	100.002			
Less O = F	0.206			
	99.796			

—William Earle Hidden and J. B. Mackintosh.

American Journal of Science, III, Vol. 38, Dec., 1889, pp. 483 and 484. Also Trans. Texas Academy of Science. Vol. III, pp. 139-140.

LLANO COUNTY:
Barringer Hill.* C.

FERRO-CALCITE. A variety of *Calcite* containing Fe CO_3. *Calcium-iron Carbonate.*

BURNET COUNTY:
Silver Mine Hollow.*

LLANO COUNTY:
Little Llano Creek, near Lone Grove.*
Foot of Point Peak.*

FIBROLITE. *Sillimanite. Aluminum Silicate.* $Al_2 O_3$. $Si O_2$.

Crystals long and slender and often flattened rhombic prisms; also in fibrous masses. In color brown, grayish brown, or pale green. Lustre vitreous. Specific Gravity, 3.23-3.24. Hardness, 6-7.

BURNET COUNTY:
Garnet Diggings, Clear Creek.*

LLANO COUNTY:
Honey Creek.*

MASON COUNTY:
Head of Elm Creek.*

FIRE CLAY. *A product of rock decay capable of resisting high temperatures.*

FAYETTE COUNTY.

HARRISON COUNTY:
Marshall.

HENDERSON COUNTY:
Athens.

LIMESTONE COUNTY.
In general associated with coal. See Coal for localities.

FLINT. *A variety of Quartz.* SiO_2.

In color gray, brown, brownish black, opalescent, pink. Lustre subvitreous. Fracture conchoidal—easily chipped, leaving a sharp edge.

CENTRAL MINERAL REGION:*
"In Silurian and Cretaceous limestones; somewhat common."—Comstock.

COMANCHE COUNTY:
"Opalescent with fossil nuclei."—Hill.

TRAVIS COUNTY:
Barton's Creek.
Taylor's Quarries, west of Austin.
Deep Eddy Bluff, on the Colorado.
"Where these chalky limestones form the mesas of extensive plateaus, such as the remnants of the Grand Prairie west and southwest of Austin, the flints are left in great quantities as a residuum (the softer chalk being more readily decomposed into soils and washed away), and they cover large areas of country."—R. T. Hill.

TRANS-PECOS REGION.**

FLUORITE. *Fluorspar. Calcium Fluoride.* $Ca F_2$.

Crystals in the form of cubes, octahedrons, dodecahedrons, etc., with combinations. Cubes common. Also granular, coarse or fine, compact, massive. Of many colors—white, blue, green, yellow, red. The last not common. With a vitreous lustre and white streak.

BREWSTER COUNTY:
In association with cinnabar.

GILLESPIE COUNTY:
Near Enchanted Rock. C.

LLANO COUNTY:
Barringer Hill.*
"Fluorite occurs in some abundance. Masses of a pale greenish kind were found weighing fifty pounds tightly imbedded in the pegmatite. Purple and white shades have also been found. A very opaque dark purple kind has been found in small masses."—Hidden and Mackintosh, *Amer. Jour. of Science,* III, Vol. 38, p. 489.

FRANKLINITE. (Fe, Zn, Mn) O. $(Fe, Mn)_2 O_3$.

Crystals octahedrons or dodecahedrons, often modified so as to form grains. Granular massive, compact. Iron black. Reddish brown to black streak. Lustre metallic, at times dull. Specific Gravity, 5.07-5.22. Hardness, 6.5. Slightly affected by the magnet.

TRANS-PECOS REGION.**

GADOLINITE. $Be_2 Fe Y_2 Si_2 O_{10} = Be_2 Fe (Y O)_2 (Si O_4)_2$.

"Gadolinite. In the fall of the year 1888, Dr. A. E. Foote sent me for identification a shining black mineral from Burnet County, Texas*. A preliminary examination, which I made, proved it to be Gadolinite, which excepting that from Colorado, described and analyzed by Mr. L. G. Eakins of the U. S. Geological Survey, had never been observed in

*It is probable that Dr. Foote's specimens came from Llano county.

this country. Since it became known that the mineral brought from Texas by Dr. Foote was gadolinite, large quantities have been obtained, some in crystals, weighing from seven to eleven pounds. I am indebted to Mr. W. Earl Hidden for some from Llano County, Texas, and give in the following the results of my analyses of this, as well as that received from Dr. Foote.

"It has a black color; in thin splinters it is translucent with a dark bottle-green color; the fine powder is greenish-gray; fracture conchoidal to splintery. Specific gravity=4.201 (Burnet Co.) to 4.254 (Llano Co.)."

Analyses:

	I. BURNET COUNTY.		II. LLANO COUNTY.	
	a	*b*	*a*	*b*
$Si O_2$	22.87*)	23.40*)	22.80	22.92
$Al_2 O_3$	0.28	0.33	0.31	0.29
$Ce_2 O_3$†)	2.65	2.76	2.66	2.85
$(Di, La)_2 O_3$	5.22	5.17	5.01	5.33
$(Y, Er)_2 O_3$	44.35	44.65	44.45	44.30
Mn O	0.22	not det.	0.18	not det.
Fe O	13.69*)	13.58	12.93	13.03
Be O	9.24	9.32	9.19	9.34
Mg O	0.07	0.08	0.11	not det.
Ca O	0.64	0.54	0.71	0.78
$Na_2 O$	0.20	not det.	0.23	not det.
$K_2 O$	0.15	not det.	0.12	not det.
Ignition	0.72	not det.	0.79	not det.
Insoluble in dil. $H_2 S O_4$	not det.	not det.	0.93	0.92
	100.30		100.42	

"*Includes the Fe_2O_3 and SiO_2, insoluble in dilute sulphuric acid.

"†Mr. L. G. Eakins informed me that he had found Th O_2 in the Texas gadolinite. As I had not tested for it, I examined the ceric oxide, left from the four analyses, and found it to contain 3.22 per cent. of Th O_2.

"DECOMPOSED GADOLINITE FROM LLANO COUNTY.

Spec. grav.	3.592
Ignition	9.30
Quartz	1.03
Si O_2	22.11
$(Ce, Di, La, Y, Er)_2 O_3$	39.20
$Fe_2 O_3$	14.53
Be O	6.03
Mn O	0.22
Ca O	5.58"

F. A. Genth, "Contributions to Mineralogy, No. 44." *Amer. Jour. of Science,* III. Vol. 38, pp. 198-200. Sept., 1889.

GADOLONITE, LLANO COUNTY, TEXAS.

Sp. gr.=4.329.*

		Oxygen Ratio.	
"Si O_2	23.79		79.30
Th O_2	0.58		0.44
Mn O	trace		
Fe O	12.42	17.25	
Gl O	11.33	45.18	
Ca O	0.74	1.32	63.75
Mg O, $K_2 O$, $Na_2 O$	traces		121.13
$Al_2 O_3$			
$Fe_2 O_3$	0.96	1.80	
$Ce_2 O_3$	2.62	2.43	56.94
$(Di, La)_2 O_3$	5.22	4.77	†
$(Y, Er)_2 O_3$	41.55	47.94	‡ §
$H_2 O$	1.03		
$P_2 O_5$	0.05		
Insoluble			
	100.29"		

"*At 17° C.

†Didymium spectrum very strong.

‡Molecular weight=260.

§Erbium spectrum weak."

L. G. Eakins. (Analysis of Gadolinite from Llano County, Texas.) See Hidden, W. E., and Mackintosh, J. B. A Description of Several Yttria and Thoria Minerals from Llano County, Texas.

Amer. Jour. of Science, III, Vol. 38, pp. 474-486. December, 1889.

This analysis was privately communicated to the authors of the above paper by Professor E. W. Clarke.

"History.—In July, 1886, the first piece of gadolinite (a mass of about 1½ lbs.) was accidentally discovered, by Mr. J. J. Barringer, in Llano County, Texas. It was noticed projecting from an outcropping of granite and was detached therefrom and preserved merely because of its peculiar appearance. Later Mr. Barringer commenced digging at the locality, and in a short time unearthed a pocket of huge crystals and masses of this rare mineral aggregating not less than 500 kilos. This remarkable quantity was obtained by digging with a pick and shovel, in the partly decomposed surface rock and all came from a space not over 4 feet deep, 3 feet wide and 8 feet long.

Until August, 1888, the true nature of the mineral remained unknown and meanwhile it received such local names as 'tin ore,' 'black jack zinc,' 'volcanic glass,' etc. Later the name 'samarskite' was given to it and as such it was known until Mr. Barringer, upon sending it to New York in an endeavor to obtain a market for it, received the information that it was gadolinite."

W. E. Hidden and J. B. Mackintosh, "A Description of Several Yttria and Thoria Minerals from Llano County, Texas. *Amer. Jour. of Science.* III. Vol. 38 p. 474, Dec. 1889.

LLANO COUNTY:

Barringer Hill, five miles south of Bluffton, on the west bank of the Colorado River.* C.

GALENA. *Galenite. Lead Glance. Lead Sulphide.* Pb S.

Crystallizes in cubes and octahedrons and their combinations. Massive, granular and sometimes fibrous. Color lead gray. Metallic. Specific Gravity, 7.4-7.6. Hardness, 2.5-2.75. Galena often contains silver. It is then termed Argentiferous Galena.

BURNET COUNTY:
Silver Mine Hollow, Beaver Creek.*

EL PASO COUNTY:
Quitman Mountains:**
Bonanza Mine. C.
Alice Ray Mine. C.**
Barlow Mine. C.
Carrizo Mountains. C.
Mt. Ord Range. C.
Eagle Mountains.**

GILLESPIE COUNTY:
Iron Creek. C.

LLANO COUNTY:
Miller Mine, Babyhead Mountain. C.
Mexican Diggings, Babyhead Creek.*
Mexican House, Babyhead Creek.*
Cold Creek.*
Beaver Creek.* C.
Riley Mountains.—Dumble.

MASON COUNTY:
Caylor's Diggings.*

MONTAGUE COUNTY:
"Small amounts taken from wells in western part of county."—Cummins.

PRESIDIO COUNTY:
Presidio Mine. C.
Chinati Mountains.** C.
Shafter Mine.** C.

GARNET. *See Almandite, Andradite, and Grossularite.*

GAS, NATURAL.

ANGELINA COUNTY:
Burke.

ATASCOSA COUNTY:
Twenty miles southeast of Pleasanton.

BEXAR COUNTY:
Near San Antonio.
Twelve miles southwest of San Antonio.

BRAZORIA COUNTY:
Near Alvin.
Bryan Heights, near Velasco.
Near West Columbia.
Damon Mound.

BROWN COUNTY:
Brownwood, in connection with salt water.

COLEMAN COUNTY:
Trickham and vicinity.

COLORADO COUNTY:
Rock Island.
Near Columbus.

COOKE COUNTY:
Near St. Jo.

DUVAL COUNTY:
At Piedras Pintas, near Benavides.

EL PASO COUNTY:
South of Delaware Creek.

ERATH COUNTY:
Thurber.

FAYETTE COUNTY:
Five miles south of La Grange. The Cervanke Well.

GRIMES COUNTY:
Eighteen miles northeast of Navasota, near Lamb's Springs.

HARDIN COUNTY:
Sour Lake.

HARRIS COUNTY:
Taylor Place, seven miles from Houston.

JACKSON COUNTY:
Red Bluff.

JEFFERSON COUNTY:
Beaumont Oil Field.

LAVACA COUNTY:
Moulton.

LIBERTY COUNTY:
Six and a half miles north of Dayton.

LIMESTONE COUNTY:
Kosse.
Near Groesbeek.

LIVE OAK COUNTY:
Near Ramirena.

MATAGORDA COUNTY:
Big Hill.

MCCULLOCH COUNTY:
Three miles south of Waldrip, on the Kellett Place.

MCMULLEN COUNTY:
Crowther.

NACOGDOCHES COUNTY:
Bog Prairie.

NAVARRO COUNTY:
Corsicana Oil Field.

NUECES COUNTY:
Piedras Pintas.

PALO PINTO COUNTY:
Gordon.
Five miles north of Palo Pinto.

PECOS COUNTY:
Fourteen miles northeast of Fort Stockton.

RED RIVER COUNTY:
Clarksville.

TOM GREEN COUNTY:
Four miles south of San Angelo.

UVALDE COUNTY:
Near Uvalde.

WASHINGTON COUNTY:
Greenvine.

GIBBSITE. *Hydrargillite.* $Al_2 O_3. 3H_2 O.$

Tabular crystals. Also in incrusting, mamillary, stalactitic and concretionary forms. In color white, grayish, greenish, reddish. Lustre pearly-vitreous. Specific Gravity, 2.3-2.4. Hardness, 2.5-3.5.

SAN SABA COUNTY:
Hinton Creek.*

GLAUCONITE. *Hydrous iron potassium silicate of a green color.*

CENTRAL MINERAL REGION:
"Abundant as greensands of Cambrian period, and in grains in Cambrian green limestones."—Comstock.

EAST TEXAS:
Disseminated in the strata associated with Tertiary Iron Ores.

TRANS-PECOS REGION.**

GOETHITE. *Hydrous Ferric Oxide.* $Fe_2 O_3. H_2 O.$

Prisms showing vertical striation often flattened. At times fibrous, radiating, concentric. Also in reniform and stalactitic masses. Color yellowish to blackish brown. Streak yellowish brown. Specific Gravity, 4-4.4. Hardness, 5-5.5.

LLANO COUNTY:
Little Llano Region.**

TRANS-PECOS REGION.**

GOLD. *A Native Element.* Au.

Crystals often elongated and strung together in arborescent shapes; also occurs in nuggets, plates, scales and grains. Color golden yellow to silver white; sometimes red. Hardness, 2.5-3. Specific Gravity, 15.6-19.3. Malleable and ductile; not brittle as is Pyrite which is often mistaken for it. Streak the same as color; that of Pyrite is greenish-black.

EL PASO COUNTY:
Franklin Mountains.** C.
Quitman Mountains.** C.
Carrizo Mountains. C.
Sierra Blanca. C.
Sierra Diablo, Sancho Panza Mine. C.
In gravel hills near the Rio Grande between the Eagle and Quitman Mountains.**
In float north of Finlay.**

GILLESPIE COUNTY:*
In small amounts.

LLANO COUNTY:*
Headwaters of Little Llano Creek and Babyhead Creek associated with silver—or copper-bearing minerals.
Big Sandy Creek, in alluvial deposits.
Pecan Creek, placer sands. C.

UVALDE COUNTY:
Chatfield's Switch.

WILLIAMSON COUNTY:
Twenty miles north of Georgetown. See paper "On the Occurrence of Gold in Williamson County, Texas," by Professor Charles A. Schaeffer, Transactions of the American Institute of Mining Engineers, Vol. XI, p. 318 *et seq.*, 1882-83.
Some specimens of limestone are quite rich in gold, but the occurrence is apparently of no commercial importance.

GRAHAMITE.

Related to *Asphaltum*. Pitch black. Specific Gravity, 1-1.45. Hardness, 2.

FAYETTE COUNTY:
Buckner and O'Quinn Creeks. In very small quantities.—Dumble.

Analyses of Fayette County Grahamite, by L. E. Magnenat.

PROXIMATE ANALYSIS.		Sulphur.	ULTIMATE ANALYSIS.	
Moisture	None.	None.	Carbon	76.19
Volatile Matter	57.90	2.50	Hydrogen	6.61
Fixed Carbon	37.70	4.71	Nitrogen	0.39
Ash	4.40	0.24	Oxygen	5.15
	100.00		Sulphur	7.45
Total Sulphur		7.45	Ash	4.21
				100.00

WEBB COUNTY:
Webb Bluff on the Rio Grande. In small amounts associated with gypsum and sulphur.—Dumble.

Analyses of Fayette County Grahamite, by L. E. Magnenat.

PROXIMATE ANALYSIS.		ULTIMATE ANALYSIS.	
Moisture	0.30	Carbon	78.65
Volatile Matter	44.00	Hydrogen	7.50
Fixed Carbon	52.80	Nitrogen	0.15
Ash	2.90	Oxygen	5.08
	100.00	Sulphur	5.42
Total Sulphur	5.42	Ash	2.90
		Water	0.30
			100.00

See note on the "Occurrence of Grahamite in Texas," by E. T. Dumble, Trans. American Inst. Mining Engineers, Vol. XXI, pp. 601-605. Summary in Trans. Texas Acad. of Science, Vol. III, pp. 95-96.

GRAPHITE. *Plumbago. Black Lead. Carbon* (C).

Crystals tabular, six-sided. In foliated, scaly, granular, or compact masses. Sometimes columnar. In color gray to black. Greasy to the touch. Metallic lustre. Specific Gravity, 2.09-2.23. Hardness, 1-2.

BREWSTER COUNTY. C.

CENTRAL MINERAL REGION:
Impure.

LLANO COUNTY:
Near Graphite and Bessemer, flag stations on the Austin Division of the H. & T. C. R. R.
Base of Long Mountain.*
Public Pen Creek.*
Near Sandy Mountain.*
Cat Mountain.*
East of Packsaddle Mountain.*
Morley's Mine.*
North, south, east and west of Llano.*

MASON COUNTY:
Honey Creek Crossing of the Menardville Road.*
Headwaters of Honey Creek.*
Caylor's Diggings.*

GRAY COPPER ORE. *See Tetrahedrite.*

GROSSULARITE. *Hessonite. Calcium aluminum Garnet.* $Ca_3 Al_2 (Si O_4)_3$.

BURNET COUNTY:
"Near Clear Creek."—Dana.

EL PASO COUNTY:**
Quitman Mountains.**

MASON COUNTY:
Martin Creek, near Fleming.:*

GUMMITE.

"An alteration-product of uraninite of doubtful composition. In rounded or flattened pieces looking much like gum. Specific Gravity= 3.9-4.20. Lustre greasy. Color reddish yellow to orange-red, reddish brown."—Dana.

LLANO COUNTY:
Barringer Hill.*

GYPSUM. *Hydrous calcium Sulphate.* $Ca SO_4+2H_2 O$.

Crystals flattened, prismatic, or acicular. Massive and foliated lamellar-stellate; granular. Color white, gray, brown, brownish-red, yellow and other colors. Glistening to earthy. Specific Gravity, 2.314-2.328. Hardness, 1.5-2.

Varieties:
Selenite. Transparent and colorless. In crystals or foliated masses.
Radiated or Plumose Gypsum.
Fibrous or Satin Spar.
Compact massive Gypsum or Alabaster.
Snowy Gypsum.
Earthy or Rock Gypsum.
"Gypsite," the "overburden" of disintegrated gypsum.

ARMSTRONG COUNTY:
Palo Duro Cañon. C.

BASTROP COUNTY:
Crystals in clay. Colorado River below Bomb-Shell Bluff.

BRAZORIA COUNTY:
Damon Mound.

BREWSTER COUNTY:
Terlingua, and many other localities.

EL PASO COUNTY:
Quitman Mountains, granular. C.
Northeast part, associated with sulphur.

FAYETTE COUNTY:
"Chalk Bluff on the Colorado River, twelve miles above La Grange."—Penrose.

GRAYSON COUNTY:
Selenite crystals, Iron Ore Creek valley, near the west Sherman-Denison road.

HARDEMAN COUNTY:
"Selenite. Head of Canal Creek."—Cummins.
Commercial Deposits. At Acme Station, near Quanah.

KENT COUNTY:
"Satin Spar. Near Salt Fork of the Brazos."—Cummins.
Alabaster. Many places along the Salt Fork.
Massive Gypsum.

KING COUNTY:
"In crystals. West of Eight Ranch."—Cummins.

NOLAN COUNTY:
Rose Gypsum, Sweetwater.
Rosette Gypsum. C.

RUNNELS COUNTY:
Runnels. C.

STONEWALL COUNTY:
Fibrous Gypsum, Kiowa Peak. C.
Salt Fork of the Brazos River. C.
Double Mountain. C.

TRAVIS COUNTY:
Selenite in Del Rio Shales. Austin: Shoal Creek; also bluff near the mouth of Barton Creek.

VAN ZANDT COUNTY:
In Crystals 5-6 inches long. Burnet Creek, one mile east of Wills Point.

WEBB COUNTY:
"Bluff fifteen miles above Laredo."—Penrose.

TRANS-PECOS REGION:**
Alabaster.**

HEMATITE. *Red Hematite. Iron Sesquioxide.* $Fe_2 O_3$.

Crystals tabular. Common in a massive granular state; also botryoidal, stalactitic, lamellar, micaceous. In color steel-gray to iron-black giving a red streak or powder. Red earthy variety=*Red Ochre.* Lustre of crystals splendent. Specific Gravity, 4.9-5.3. Hardness, 5.5-6.5.

BURNET COUNTY:
Divide between Clear and Spring Creeks.*
Hooking Hollow.*
Hoover Valley.*

EL PASO COUNTY:
Sierra Blanca. C.
Quitman Mountains, siliceous.**
Sierra Diablo, siliceous.**
Sierra Carrizo, siliceous.**

GILLESPIE COUNTY:
Iron Creek.

LLANO COUNTY:
Iron Mountain.*
South of Pontotoc.*
Mexican Diggings.*
Nunnely's Mine.*
Long Mountain Region.*
King Mountains.*
Near Bauman's Ranch, fossiliferous. C.

Sandy Creek.*
Barringer Hill.*
Cold Creek.*
Babyhead Mountain, in sandstone.* C.
Brady Road, two miles east of Smoothing Iron Mountain.
Near Castell.
South of Tom Long's, above Gainsville near the Llano River.*
Packsaddle Mountain.*

Average of Six Analyses of Llano County Hematites, by J. H. Herndon and L. Magnenat.

Metallic Iron	56.43
Silica	5.59
Alumina	7.86
Lime	1.44
Magnesia	trace
Phosphorus	0.55
Sulphur	0.091

—"The Iron Resources of Texas," Wm. B. Phillips, Proceedings of Engineers' Society of Western Pennsylvania, March, 1902.

MASON COUNTY:
East of Fleming.*
Southeast of Camp San Saba.*
Caylor's Diggings.*
Near Head of Bluff Creek.*
James River Region.*
Two miles northwest of Katemcy.

MCCULLOCH COUTNY:
Three miles southeast of Camp San Saba.

TRANS-PECOS REGION.**

HESSONITE. *See Grossularite.*

HORNBLENDE. *See Amphibole.*

HYALITE. *Muller's Glass. (Opal.) A form of Silica.* $Si O_2$.

"Clear as glass and colorless, constituting globular concretions and crusts with a globular or botryoidal surface; also passing into translucent and whitish. Less readily dissolved in caustic alkalies than other varieties."—Dana.

GILLESPIE COUNTY:
Near Enchanted Rock.*

LLANO COUNTY:
Barringer Hill.*
Hyalite, in mammilary forms was observed coating the seams of feldspar and quartz, in very small patches."—Hidden and Mackintosh, *Amer. Jour. of Science*, III, Vol. 38, p. 476.

HYPERSTHENE, *Ferrous-magnesium Silicate.* (Fe Mg) $Si O_3$.

Crystals uncommon; prismatic or tabular. Massive foliated. In color various shades of green to black—brownish green, grayish or greenish black. Lustre pearly to metalloid. Specific Gravity, 3.40-3.50. Hardness, 5-6.

BURNET COUNTY:
Clear Creek.*

LLANO COUNTY:
Northern Base of Long Mountain.*

IDOCRASE. *See Vesuvianite.*

ILMENITE. *Menaccanite. Titanic Iron Ore.* $Fe O, Ti O_2$.

Crystals tabular, at times large. Usual occurence in thin plates. Also in grains, both embedded and loose, and massive. In color iron-black. Powder red to black (this mineral is closely related to hematite). Streak and lustre submetallic.

LLANO COUNTY:
Barringer Hill.*
East of Cold Creek, above Bauman's.*

MASON COUNTY:
Fly Gap.*
North of Pontotoc.*

JASPER. *A Variety of Quartz.* $Si O_2$.

Of various colors—red, yellow, brown, sometimes green or blue.

BREWSTER COUNTY:
Chisos Mountains. C.

JEFF DAVIS COUNTY:
Near Fort Davis.

LLANO COUNTY:
Pennington Creek.*
Sandy Creek.*

UVALDE COUNTY:
Montell—Yellow Jasper. C.

TRANS-PECOS REGION.**

JEFFERISITE=*A Hydrated Mica.*

In flat crystals or crystalline plates. Color brownish, yellowish brown, greenish yellow. Specific Gravity, 2.30. Hardness, 1.5.

LLANO COUNTY:
Johnson Creek.*
Mexican Diggings, Babyhead Creek.*

KAOLINITE. *Kaolin. Hydrous-aluminum Silicate.* $Al_2 O_3 . 2Si O_2 . 2H_2O$.

In clay-like masses. Of various colors—white, grayish, yellowish, brownish, etc. Greasy to the feel. Specific Gravity, 2.6-2.63. Hardness, 2-2.5.

BURNET COUNTY:
Clear Creek (encrustation on quartz).*
Silver Mine Hollow, Beaver Creek.*

EDWARDS COUNTY:
Near Leaky.

FAYETTE COUNTY:
Flatonia.
O'Quinn.

LLANO COUNTY:
Enchanted Rock.*
Iron Mountain (in binary granite).*
Johnson Creek (with tourmaline).*
King Mountains (with serpentine).*
Near Pontotoc (encrustation on quartz).*

ROBERTSON COUNTY:
Mexia.

UVALDE COUNTY.

KEILHAUITE. *"A titano-silicate of calcium, aluminum, ferric iron, and the yttrium metals."*

"Crystals near titanite in habit and angles. Hardness, 6.5. G.= 3.52-3.77. Color brownish black."—Dana.

MASON COUNTY:
Kothmann's Gap, near Fleming.*

KEROLITE. *Cerolite. Kerolith. Hydrous magnesium Silicate* related to serpentine.

"Massive, reniform, compact or lamellar. Fracture conchoidal. Feel greasy. H.=2-2.5. G.=2.3-2.4. Lustre vitreous or resinous. Color greenish or yellowish white, yellow, reddish. Streak uncolored. Transparent to translucent."—Dana.

LLANO COUNTY:
Iron Mountain.*

LABRADORITE. *Labrador Feldspar. Lime-soda Feldspar. Calcium-sodium aluminum Silicate.*

Crystals usually thin and tabular. This mineral also occurs in cleavable masses. Color gray, brown, greenish brown; it may be colorless. When cleavable it often shows a beautiful play of colors. Specific Gravity, 2.70-2.72. Hardness, 5-6.

BURNET COUNTY:
Hoover's Valley.*

LAMPADITE. *Cuprous Manganese.*

A variety of Wad containing copper.

EL PASO COUNTY:
In prospects west of the Sierra Blanca.**
Hunter District, Quitman Mountains.**

LIGNITE.

The Brown Coals of Texas have been grouped as follows (Brown Coal and Lignite, by E. T. Dumble, Austin, 1892, p. 48 *et seq.*):
Lignite, Earthy Brown Coal, Brown Coal, Pitch Coal, Glance Coal.
In the following list of localities no attempt has been made to classify

the carbonaceous product, which, as will be seen from the terms above employed, varies from that in which the more or less altered vegetable matter may be readily recognized to that which in physical appearance most closely resembles true coal—black, massive, glossy, and having a subconchoidal fracture.

All of these varieties are assumed to be of the Tertiary Age.

ANDERSON COUNTY:
Northeast and West Central parts.
Fosterville.
Douglas.

ANGELINA COUNTY:
North of Lufkin.

ATASCOSA COUNTY:
Northwest part, near Somerset.
Northeast part.
Kirkwood Mines. Seam five and a half feet thick.
Kinney Mine.
West of Pleasanton.

BASTROP COUNTY:
Along the Colorado River.
Bishop's Switch, M. K. & T. Ry., six miles north of Bastrop. Seam four feet thick.—U. T. M. S.
Cedar Creek, four miles west of Bastrop.
McDade Mine, east of Elgin.
Near Paige.

BEXAR COUNTY:
Southwest part.

BOWIE COUNTY:
Seven miles south of New Boston, Solomon Poor Headright. Seam twelve feet thick. C.
On Anderson's Creek; at other points.
Southern part, on Sulphur Fork.

BRAZOS COUNTY:
Brazos River, west of Bryan.
Eastern part, along Navasota River.

BURLESON COUNTY:
Along Brazos River.
Deanville.
Cedar Creek.
Spring Creek.

CALDWELL COUNTY:
Southeast of Lockhart.

CAMP COUNTY.

CASS COUNTY:
Northeast part, near Alamo.
Stone Coal Bluff.

CHEROKEE COUNTY:
Along railroad north and south of Rusk.
Three miles northwest of Rusk. C.
Six miles south of Alto.
Near Jacksonville.
McBee's School House.

DIMMIT COUNTY:
Southern part.
At the mouth of Espantosa Slough.
On the Nueces, northeast of Carrizo Springs, crossing of Batesville Road.

FAYETTE COUNTY:
Along Colorado River, above La Grange.
Southwest of La Grange.
Southwest of Flatonia.

FREESTONE COUNTY:
West of Fairfield.
Near Wortham. Borings show three seams. The second is said to have a thickness of five feet. See Dumble's Brown Coal and Lignite, p. 173.

FRIO COUNTY:
San Miguel Creek.

GONZALES COUNTY:
Near Guadalupe River, southeast and southwest of Gonzales.

GRAYSON COUNTY:
Near Gordonville.
One-half mile west of Martin's Springs. C.

GREGG COUNTY:
Near Centre, along Sabine River.

GRIMES COUNTY:
Northeast and west central parts; Bedias.

GUADALUPE COUNTY:
Northeast of Seguin.

HARRISON COUNTY:
Northeast part, near Caddo Lake.
Southern part, near Sabine River; Rocky Ford, seam four feet thick; near Carter's Ferry, six feet thick; Robertson's Ford, six feet thick.
West and northwestern parts.
Encountered in the Deep Well at Marshall. One hundred feet below the surface, seam one foot thick.

HENDERSON COUNTY:
West of Athens.
Northeast part.
Southern part.

HOPKINS COUNTY:
Como, ten miles east from Sulphur Springs. Seam seven feet one inch.—U. T. M. S.

HOUSTON COUNTY:
West of Crockett, near Trinity River.
East of Crockett, midway between Crockett and Lufkin.
Southwest part; Hyde's and Westmoreland's Bluff.
Wooter's Siding. Seam five feet six inches thick.—U. T. M. S.

JASPER COUNTY.

KARNES COUNTY:
Southwestern part.

LEE COUNTY:
Northwestern part; Blue Branch. C.
Giddings. Two seams, eighty feet below surface six feet thick; one hundred and twenty feet below surface four feet thick.
Rabb's Creek, below railroad Crossing.

LEON COUNTY:
Northern part; Bear Grass. Seam nine feet thick.
Northwestern part, near Jewett.
Southwestern part.
Southeast of Centreville.
On Trinity River, opposite Hyde's Bluff.

LIMESTONE COUNTY:
Southeast portion.
Head's Prairie.

MARION COUNTY:
East and west through central part: north of Caddo Lake.
Three seams were encountered in the Deep Well at Jefferson.

MCMULLEN COUNTY:
Northern part.

MEDINA COUNTY:
Southeast of Castroville; Lytle Mine (near Lytle on I. & G. N. R. R.).
Seam five feet six inches thick.—U. T. M. S.

MILAM COUNTY:
Rockdale Mines. C. Seams six and a half, five and seven and a half to eight feet thick.

Composition of Lignite (U. T. M. S.):

I.

BIG LUMP COAL COMPANY'S MINE.

Proximate Analysis—Natural Condition.

Moisture	31.52
Volatile and combustible matter	44.49
Fixed Carbon	17.48
Ash	6.51
Sulphur	0.93

Proximate Analysis—On Dry Basis.

Volatile and combustible matter	64.98
Fixed Carbon	25.57
Ash	9.45
Sulphur	1.36

II.

ARANSAS PASS LIGNITE COMPANY'S MINE.

Proximate Analysis—Natural Condition.

Moisture	29.07
Volatile and combustible matter	28.96
Fixed Carbon	24.47
Ash	17.60
Sulphur	3.29

Proximate Analysis—On Dry Basis.

Volatile and combustible matter	40.84
Fixed Carbon	34.49
Ash	24.67
Sulphur	4.63

—Bull. Univ. of Texas Min. Survey, No. 3, p. 51.

Along the Brazos.
Southeast of Cameron.
Northern part; Jones' Prairie.

MORRIS COUNTY:
Northern part, near Sulphur Fork.
Five or six miles south of Daingerfield.

NEWTON COUNTY.

PANOLA COUNTY:
Four miles south of Carthage.
North and northwest part; east of Tatum; northwest of Beckville.
Carter's Ferry.
Rocky Ford on the Sabine.
Mineral Springs. C.

RAINS COUNTY:
Southeast part.
Emery.
East of Emery seven miles.

ROBERTSON COUNTY:
Calvert Bluff Mines. Three seams, twelve, three and three feet thick.
Along the Brazos and Little Brazos Rivers.
North and northwest of Franklin.
East of Franklin on the Navasota River.
Northern part; Headville.
North of Hearne.
Southeast of Hearne, near the county line.

RUSK COUNTY:
Martin's Creek, north of Henderson.
Sulphur Spring.
Northeast of Henderson.
Millville.
Graham's Lake, twelve miles west of Henderson.
Southern part.

SABINE COUNTY:
Near county line, west of Hemphill.

SAN AUGUSTINE COUNTY.

SHELBY COUNTY:
Tandy Switch, one and one-half miles south of Timpson. Seam six feet six inches.—U. T. M. S.
South of Timpson seven miles. Five feet of Brown Coal.

SMITH COUNTY:
Southeast of Tyler.
Eight and a half miles west of Tyler. C.
Southwest of Tyler.
South of Tyler.
Near Lindale, northeast and west.
Of common occurrence in the county.

TITUS COUNTY.

TRINITY COUNTY:
Northern part.
Southwestern part.

UPSHUR COUNTY:
Western part.
Six miles northeast of Gilmer.

UVALDE COUNTY:
South of Uvalde fourteen miles; northern border of the San Tomas Field near Zavala county line.

VAN ZANDT COUNTY:
North half; near Grand Saline; north and northeast of Canton.
Southwest part.

WALKER COUNTY:
Northwest part.

WEBB COUNTY:
Western part.
San Tomas Mines. Seam two and a half feet thick.
Espada Creek, eight miles west of San Tomas.
Two and a half miles north of Palafox.
Northwest of San Tomas twenty-five miles.

"The coal of the San Tomas Field is hard, lustrous black, with a brown streak and a conchoidal fracture. No woody structure was apparent."—T. Wayland Vaughan, Bull, U. S. Geol. Surv, No. 164, p. 64.

WILSON COUNTY:
Southwest of Floresville.

WOOD COUNTY:
Southern part, along Sabine River; Mineola.
Alba Mines, near Alba. Seam eight feet six inches and nine feet.—U. T. M. S.

"In this region there are three distinct deposits of brown coal. First, the upper bed cropping out close to the Alba Coal Company's shaft, a second one near Alba, and a third a short distance north of that village."—E. T. Dumble, Rept. on Brown Coal and Lignite, p. 169. The upper seam is that above mentioned.
Near Hawkins Station.

ZAVALA COUNTY:
Near north line of county on east bank of Nueces River. Two feet of coal exposed.
Southern part, between Turkey Creek and Nueces River.

(COMPLETE ANALYSES OF TEXAS LIGNITES ARE GIVEN IN BULL. NO. 3, UNIV. OF TEXAS MIN. SURVEY, MAY, 1902.)

LIMNITE. $Fe_2O_3 . 3H_2O$.

"A hydrated iron oxide, for the most part bog ore, recent in origin and containing organic acids with quartz sand, phosphoric acid, etc."—Dana.

LLANO COUNTY:
Chaney's Diggings, Packsaddle Mountain (perhaps not correctly placed here).*
Long Mountain Region.*
Seven miles above Lone Grove, on Little Llano Creek.*

LIMONITE. *Brown Hematite. Hydrous Ferric Oxide.* $2Fe_2O_3 + 3H_2O$.

In various forms: botryoidal, stalactitic, mamillary, massive, concretionary, earthy. Often shows a fibrous structure in the first mentioned forms. In color brown to ochre yellow, the latter in the earthy forms. Sometimes this mineral shows a bright black lustrous surface. Streak brown or yellowish. Specific Gravity, 3.6-4. Hardness, 5-5.5.

The Limonite Ores of East Texas have been classed as follows:

(1) Brown Laminated Ores.
(2) Nodular or Geode Ores.
(3) Conglomerate Ores.

1. Brown Laminated. "This ore is a brown hematite of a rich chestnut color, and often of a highly resinous lustre. In structure it varies from a compact, massive variety showing no structure, to a highly laminated form, the laminae varying from one sixteenth inch to one-quarter inch thick, frequently separated by hollow spaces, and sometimes containing thin seams of gray clay. These often give it a buff color and a crumbly nature, and hence the name often applied to it of "Buff Crumbly Ore.' The laminae frequently show a black glossy surface."

2. Nodular or Geode. "The ore is a brown hematite and occurs in a great variety of forms. It very rarely shows the laminated structure of the brown laminated ores or their resinous lustre. It generally occurs as nodules or geodes, or as honey-combed, botryoidal, stalactitic, and mammilary masses. It is rusty brown, yellow, dull red, or even black

in color, and has a glossy, dull, or earthy lustre. The most characteristic feature of the ore is the nodular or geode form in which it occurs. Some of the beds are made up of these masses, either loose or in a sandy clay matrix or solidified in a bed by a ferruginous cement. The ore lies horizontally at or near the tops of the hills, in the same manner as the brown laminated ores to the south of the Sabine River. The beds vary in thickness from less than one foot to over ten feet, the thicker ones being often interbedded with thin seams of sand."

3. Conglomerate. "The variety of ore included under this head consist of a conglomerate of brown ferruginous pebbles one-quarter to two inches in diameter and cemented in a sandy matrix. Sometimes a few silicious pebbles are also found. The beds vary from one to twenty feet thick, and are generally local deposits along the banks and bluffs and sometimes in the beds of almost all the creeks and streams in the iron ore regions * * *. They are generally of low grade, but could be concentrated by crushing and washing out the sandy matrix. They usually contain more or less ferruginous sandstone in lenticular deposits, and are much cross-bedded. These ores are seen throughout East Texas from the Red River to the Brazos."—R. A. F. Penrose, Jr., "Preliminary Report on the Gulf Tertiary of Texas." See First Ann. Rept. Geol. Survey of Texas, 1889.

"Throughout northeastern Texas we have an extensive series of iron ore deposits, occupying portions of 19 counties and having approximately an actual ore covered area of 1,000 square miles. The existence of these ores has long been known. The great ore belt may be described as a triangular area, bounded on the north by an irregular line drawn from the Sulphur Fork, in Cass County, extending west and south through Daingerfield, in Morris County, to a little south of Quitman, in Wood County. The western limitation of the belt extends irregularly southward through the west side of Smith, east side of Van Zandt and Henderson, and the center of Anderson County, a short distance west of Palestine, and in a southwesterly direction to the Brazos River, near Hearne. The southern side is limited to a line crossing the Trinity River, near Crockett, the Neches at Augusta, and the Sabine River near the northeast corner of Sabine County. The total area is approximately 10,000 square miles, of which about 1,000 square miles are covered with iron ore."—W. Kennedy. See *Engineering and Mining Journal* Vol. 57, p. 222. March 10, 1894.

For a discussion of east Texas Iron Ores and numerous analyses, see also *"Iron Ores of East Texas,"* by W. Kennedy. Trans. Amer. Institute of Mining Engineers, Vol. 24, p. 258 et seq.

ANDERSON COUNTY:
- North of Palestine.
- Three miles south of Palestine.
- Eight miles southeast of Palestine.
- Fosterville.
- North of Nechesville.

BREWSTER COUNTY:
- Near McKinney Springs, east of Tornillo Creek.

BURNET COUNTY:
- Sparks Survey. C.
- Spring Creek.*

- High Point.*
- Hoover Valley.*
- Near Marble Falls. C.

CALDWELL COUNTY:
- Near Harwood. C.

CAMP COUNTY.

CASS COUNTY:
- Andes Survey. C.
- Nash Mine.
- Northwest of Queen City. C.
- Kecton Survey.
- Near Linden. C.
- Atlanta. C.
- Cuseta. C.
- Springdale. C.
- Hughes Spring.

CHEROKEE COUNTY:
- Alto. C.
- North of Jacksonville. C.
- West of Jacksonville. C.
- Mt. Selman.
- Rusk and vicinity.

"The following analyses show the composition of the ore near Alcalde furnace:

Composition of Limonite Near Rusk, Cherokee County, Texas.

	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Iron	46.55	45.65	45.17	40.63	48.31	48.11
Silica	17.53	17.67	20.36	23.84	16.62	10.43
Sulphur	.....	.....	0.038	0.01	0.027	.....
Phosphorus	0.153	0.069	0.062	0.315	0.234	2.12
Water	.....	13.09	15.25	15.76	13.71	14.64

"A sample personally collected in Cherokee county was analyzed by the St. Louis Sampling and Testing works with the following results:

Analysis of Limonite From Cherokee County, Texas.

	Per cent.
Moisture	1.63
Loss by ignition	11.65
Silica	10.81
Alumina	3.40
Metallic iron	48.24
Manganese	0.43
Lime	0.24
Magnesia	trace
Sulphur	1.176
Phosphorus	0.268"

—John Birkinbine, "Mineral Resources of the United States for 1887," p. 51.

EL PASO COUNTY:
- Sierra Carrizo. C.

GILLESPIE COUNTY:
- Nunnely's Diggings.*

GONZALES COUNTY:
- Near Harwood.

GRAYSON COUNTY:
- Near Whitesboro.

GREGG COUNTY:
Longview. C.

HARRISON COUNTY:
Near Marshall. C.
Johnson's Survey. C.
Dickson's Survey. C.
Hynson's Spring. C.
Rocky Branch. C.

HENDERSON COUNTY:
Gannett Survey. C.
Caldwell Survey. C.
Battle Creek. C.
Two miles west of Fincastle.
Brownsboro.
Pilot Hill.

HOUSTON COUNTY:
Near Davis Creek. C.

LLANO COUNTY:
North Base of Long Mountain.*
Long Mountain. C.
Riley Mountain. C.
Sandy Gap. C.
Seven miles above Lone Grove, Little Llano Creek.*
East of Cold Creek, above Bauman's.*
"Horse" Maxwell's Diggings. C.
Near Castell.*
Near head of Silver Creek.*
South of Garner Crossing, Llano River.*
Chaney Diggings, south of Packsaddle Mountain.*
South of Packsaddle. C.
Honey Creek.*

MARION COUNTY:
Near Lasater. C.
Leverett's Hill. C.
Berry's Hill. C.
Near Ware. C.
Gray Survey. C.
Lilly Headright. C.
Near Knight's Bluff. C.
Little Beach Creek. C.
Farrell's Hill. C.
Watkin's Survey. C.
Duncan's. C.
Two miles north of Jefferson.

MASON COUNTY:
Near Pontotoc.*
Near Spiller Mine, Fly Gap.*
South of Mason Mountain.*
Near Caylor's Diggings.*
Near head of Little Bluff Creek.*
Headwaters of Bluff Creek.*
James River Region.*
Junction City Road. C.
Ten Mile Creek.*

MCCULLOCH COUNTY:
Northwest of Voca.*
Near Camp San Saba.*
Heard's Diggings.*

MILAM COUNTY.

MORRIS COUNTY:
Pincheon Survey. C.
Near Daingerfield. C.
Edwards Survey. C.
Kidd Survey. C.
Duncan Survey. C.
Cluary Survey. C.

NACOGDOCHES COUNTY:
Near Nacogdoches. C.
Northwest of Nacogdoches. C.
West of Nacogdoches. C.
Near Looneyville. C.
Near Linn Flat. C.
Southern part of county.

PANOLA COUNTY:
Beckville. C.
Near Carthage. C.
Grand Bluff. C.
Gooden Survey. C.

ROBERTSON COUNTY:
Five miles east of Calvert.

RUSK COUNTY:
Iron Mountain. C.
Schoober Creek. C.
Sulphur Springs. C.

SABINE COUNTY!
South of Patroon. C.

SAN AUGUSTINE COUNTY:
Near San Augustine. C.

SAN SABA COUNTY:
Divide between the branches of Deep and Wallace Creeks.*
Deep Creek Gap. C.
Near Hinton Creek. C.
Three miles beyond the crossing of Brady Creek near road from San Saba to Voca.*

SHELBY COUNTY:
South of Timpson. C.

SMITH COUNTY:
Near Tyler. C.
Newberry Survey. C.
Lawrence Headright. C.
Garden Valley. C.
Near Lindale. C.
West of Troupe. C.
Half a mile west of Swann Switch.

UPSHUR COUNTY:
Butler Survey. C.
Coffeeville. C.

VAN ZANDT COUNTY:
Near Edom. C.
Near Grand Saline. C.
Johnson Survey. C.
Edgewood. C.

WOOD COUNTY:
Pine Mills. C.
Greer's, near Mineola. C.

TRANS-PECOS REGION.**

LITHOMARGE. *Compact Kaolinite, Indurated Kaolinite.*

BURNET COUNTY:
High Point.*

MACKINTOSHITE. *Silicate of Uranium, Thorium, Cerium, etc.*—Dana.

"The mineral is opaque and black, but not quite so dull in lustre as the associated black cyrtolite which it resembles to a very remarkable degree. A strong lens is necessary to distinguish the two. Its hardness is about 5.5. No trace of cleavage has been observed. Its fracture is minute sub-conchoidal to hackly. Density=5.438 at 21° C. Its form, as is often evidenced by the thoro-gummite, is tetragonal and closely resembles zircon and thorite in habit and angle. Square prisms, sometimes 1 cm. thick, with a simple pyramid are all the forms thus far observed. It also occurs massive, nodular and filling veins in cyrtolite and fergusonite embedded in a coarse pegmatite. Under the blowpipe, it is infusible but becomes fissured in all directions without intumescence or decrepitation.

"In powder the mineral is not entirely decomposed by any one acid. Sulphuric acid attacks it quite strongly but the gelatinous silica set free protects it from further action. Hillebrand has observed, however, that if nitric acid is added, speedy and complete solution results."

William Earle Hidden. *Amer. Jour. of Science,* III, Vol 46, p. 99, 1893.

LLANO COUNTY:
Barringer Hill.

Analyses of Mackintoshite by W. F. Hillebrand.

	a	*b* *
SiO_2	13.90	13.92
UO_3	22.40	21.86‡
ZrO_2 ?	.88	
ThO_2, Ce_2O_3 ?	45.30†	lost.
La_2O_3, Y_2O_3 groups	1.86	
PbO	3.74	3.92
FeO	1.15	§
CaO	0.59	0.44
MgO	0.10	0.13
K_2O	0.42	0.70
$(Na, Li)_2O$	0.68	
P_2O_5	0.67	0.46
H_2O above 100° C.	4.31	
H_2O below 100° C.	0.50	0.35
	96.50	

*Was made on a small sample selected grain by grain with the utmost care, but it was evidently not much purer than the first lot.

†The precipitate by potassium hydroxide was pure white after long action of chlorine. It may, however, have contained a trace of cerium.

‡Would be slightly increased by uranium which was not separated from the earths.

§The estimation of iron miscarried, but the amount was unquestionably less than in *a.*—*American Jour. of Science,* III, Vol. 46, p. 101, 1893.

MAGNESITE. *Magnesium Carbonate.* $MgCO_3$.

A white, gray or brownish mineral; massive, often earthy. Crystals uncommon; some varieties are fibrous. Hardness, 3.5-4.5. Specific Gravity, 3-3.12. Brittle.

Reported from the western part of the State.

MAGNETITE. *Magnetic Iron Ore. Ferric and Ferrous Oxides.* $FeO.Fe_2O_3$.

Crystallizes in octahedrons, dodecahedrons and their combinations. Color, iron black. Lustre metallic to submetallic and dull. Streak, black. Specific Gravity, 5.168-5.180. Hardness, 5.5-6.5. Also occurs as dendrites between sheets of mica.

BURNET COUNTY:
Spring Creek.*
Clear Creek.*

EL PASO COUNTY:
Quitman Mountains, siliceous.**
Sierra Carrizo, siliceous.**
Sierra Diablo, siliceous.**

GILLESPIE COUNTY.

LLANO COUNTY:
Little Llano Creek, near Lone Grove (Bessemer Iron Mine).
Little Llano Region.*
Near Yoakum Creek (small quantity).*
Babyhead Mountain.* C.
Iron Mountain.* C.
Bader Mine, south of Iron Mountain.
Cold Creek, above Smoothing Iron Mountain.*
Near Castell.*
Riley Mountain.*
Lost Hollow. C.
Near Sandy Mountain.*
Davis Gap, King Mountain, in quartz. C.
King Mountains.*
Barringer Hill.

"Magnetite is quite abundant, both massive and crystalized. It is always associated and intermixed with biotite. Octahedral crystals with planes of the cube, rhombic-dodecahedron and of the trapezohedron were found abundantly, though superficially they were coated with a thin micaceous layer and some uranium hydrate."—Hidden and Mackintosh, *Amer. Journal of Science,* III, Vol. 38, p. 476.

Analyses of Llano County Magnetite, Iron Mountain, by O. H. Palm and S. H. Worrell, Assistant Chemists, U. T. M. S.:

Metallic Iron	66.33	64.40	64.40
Silica	2.38	6.52	6.54
Alumina	2.69	trace	trace
Lime	none	none	none
Magnesia	none	none	none
Sulphur	0.44	trace	trace
Phosphorus	0.032	0.048	0.045

Analysis of Magnetic Iron Ore from Bader Mine, South of Iron Mountain, Llano County, by Andrew McCreath, Harrisburg, Pa.:

Metallic Iron	64.15
Silica	7.28
Titanic Acid	0.38
Phosphorus	0.014

Average of five Analyses of Llano County Magnetites by J. H. Herndon and L. Magnenat:

Metallic Iron	63.31
Silica	4.67
Alumina	5.74
Lime	0.57
Magnesia	trace
Sulphur	0.092
Phosphorus	0.064

—"The Iron Resources of Texas," by Wm. B. Phillips, Proceedings of Engineers' Society of Western Pennsylvania, March, 1902.

MASON COUNTY:
Near Pontotoc.*
West of Pontotoc.*
Bode Peak Region.*
North of Fly Gap.*
Kothmann Gap, near Fleming.*
Caylor's Diggings.*

For an account of the Magnetites in the Central Mineral Region, see the following reports by Dr. Theo. B. Comstock: "Preliminary Report on the Geology of the Central Mineral Region," First Ann. Rept. of the Geological Survey of Texas, 1889, p. 347 *et seq.;* "Report on the Geology and Mineral Resources of the Central Mineral Region of Texas," etc., Second Ann. Rept. of the Geological Survey of Texas, 1890, p. 611 *et seq.*

PANOLA COUNTY:
Magnetite Sands.

PRESIDIO COUNTY:
Chinati Mountains, siliceous.**

TRANS-PECOS REGION.**

MALACHITE. *Green Copper Carbonate. Hydrous Copper Carbonate.* $2Cu\ O.\ CO_2.\ H_2O$.

Crystals circular and grouped. Usually occurs massive or as encrustations. Surface stalactitic or botryoidal. Of a light green color and streak. Specific Gravity, 3.9-4.03. Hardness, 3.5-4.

ARCHER COUNTY. C.

BURNET COUNTY:
White Eagle Mine, five miles west of Burnet.

EL PASO COUNTY:
Quitman Mountains,** Hunter Mine. C.
Sierra Diablo,** Sancho Panza Mine, C; King Bee Mine, C; Schleicher Mine, C; Butler Mine, C.
Sierra Blanca Mountains. C.
Near Sierra Blanca.** C.
Franklin Mountains. C.
Carrizo Mountains.** C.
Van Horn Mountains.**

HARDEMAN COUNTY. C.

LLANO COUNTY:
About three and a half miles east of Valley Springs.*
Yoakum Creek.*
Babyhead Region.*
H. & T. C. R. R. lands, Little Llano Creek.*
Miller's Mine.* C.
Wolf and Pecan Creek waters.*

Pecan Creek. C.
McGehee Place, head of Little Llano Creek.*
Little Llano Creek. C.
Parkhill Ranch, four miles north of Llano.

MASON COUNTY:
On Comanche Creek, one mile west of Koochville.*
Bauer Mine. C.
Pontotoc. C.

MONTAGUE COUNTY:
In clay.

PRESIDIO COUNTY:
Chinati Mountains.**

STONEWALL COUNTY:
Paint Creek, in sandstone.
Kiowa Park.

TAYLOR COUNTY:
Near Abilene. C.

TRANS-PECOS REGION.**

MANGANESE MINERALS.

See Andradite; Psilomelane; Pyrolusite; Spessartite; Tephroite; Wad.

"The manganese ores of Texas occur in the central part of the State, mostly in Mason, Llano and San Saba counties. The different deposits are from forty to sixty miles from railway transportation, and no ore has yet been shipped from any of them. Several places, however, have been prospected, espcially the Spiller Mine and the Kothmann tract in Mason county, and, to a lesser degree, Horse Mountain, in Llano county.

"The ores are associated with quartzites and gneisses, though micaceous and garnetiferous schists are frequently found in the neighborhood. The rocks are much disturbed and dip at various angles, sometimes standing vertically. They are supposed to be of pre-Cambrian age.

"The manganese minerals of the Central Texas region occur in the forms of oxides and silicates. The latter, so far as yet determined, generally represent manganiferous varieties of garnet, though the protoxide silicate of manganese known as tephroite has also been found.

"The oxides of manganese occur in either a massive form or as a granular crystalline aggregate, the two being more or less intimately associated. The massive variety has a black color, a smooth conchoidal fracture, and a hardness of 6 to 7. The crystalline variety is black and often very soft, in which condition it represents pyrolusite. The oxides are generally associated with more or less silica, which sometimes amounts to from 15 to 25 per cent., and makes the true mineralogical nature of the ores doubtful. Dr. T. B. Comstock notes the existence of psilomelane, pyrolusite, and wad in the Central Texas region."—R. A. F. Penrose, Jr., Geol. Surv. of Arkansas, Rept. for 1890, Vol. 1, pp. 432-433.

"MODE OF OCCURRENCE OF MANGANESE ORES.

Both the oxides and the silicates of manganese occur, so far as observed, as lenticular layers in the quartzites and gneisses. They have not been seen anywhere to cut across the enclosing beds, but, on the contrary, appear to follow the strike of the country rocks throughout their folds. They are not confined to one kind of rock, but have been observed in at least two different associations: at the Spiller Mine they are in quartzite, while at the Kothmann property and on Horse Mountain they are in gneiss. Though the manganese deposits are probably lenticular, alternately thinning out and appearing

again beyond, they are often traceable for considerable distances, in some places for half a mile or more. They vary from a few inches to several feet in thickness and crop out along the summits and slopes of the mountains. They frequently contain lenticular strata of a similar nature to the enclosing rocks."—R. A. F. Penrose, Jr., *loc. cit.*, p. 441.

MARCASITE. *White Iron Pyrites. Iron Disulphide.* $Fe S_2$.

See Pyrite.

MARGARITE. *Hydrous—aluminum—calcium Silicate.* $H_2 Ca Al_4 Si_2 O_{12}$.

Foliated; with mica-like cleavage but brittle laminae. Color grayish, white, pink, reddish, yellow. Lustre pearly to vitreous. Specific Gravity, 2.99-3.08. Hardness, 3.5-4.5.

LLANO COUNTY:
Waters Creek, east of Riley Mountain.*
Honey Creek (in white quartz).*

MASON COUNTY:
West of Fly Gap, on road to Pontotoc.*

MARGARODITE *A Form of Hydro-Mica. A Variety of Muscovite.*

In scales, talc-like.

"Margarodite, as originally named, was the talc-like mica of Mount Greiner in Zillerthal; granular to scaly in structure, lustre pearly, color grayish white."—Dana.

GILLESPIE AND LLANO COUNTIES.*

MARMATITE. *Ferriferous Blende. See Sphalerite (Zinc Blende).*

MARTITE. *An Isometric Form of Hematite. Ferric Oxide.* $Fe_2 O_3$.

Crystals in cubes or octahedrons, probably pseudomorphous after magnetite or pyrites. Of an iron black color having a bronze tarnish, but with a reddish or purplish brown streak. Specific Gravity, 4.8-5.3. Hardness, 6-7.

LLANO COUNTY:
Barringer Hill.*

"Martite was very common, being an alteration from the magnetite. Crystals having a black color interiorly and preserving the cleavages of magnetite, but having no magnetite properties were very commonly observed."—Hidden and Mackintosh, *Amer. Journal of Science*, III, Vol. 38, p. 476, 1889.

MASSICOT. *Lead Monoxide.* Pb O.

"Massive, scaly, earthy. Color yellowish, reddish."—Dana. Specific Gravity, 7.83-9.36. Hardness, 2.

TRANS-PECOS REGION.**

MELACONITE. *A Variety of Tenorite. Black Copper. Cupric Oxide.* Cu O.

Black; massive.

TRANS-PECOS REGION.**
EL PASO COUNTY:
Foothills of Sierra Diablo.**

MELANITE. *A Variety of Andradite, the Calcium and Iron Garnet, which includes in part the Black Garnet.*

LLANO COUNTY:
Little Llano Creek, near Lone Grove, in float.*

MELANTERITE. *Copperas. Green Vitriol. Iron Vitriol. Hydrous Ferrous Sulphate.* $Fe SO_4 + 7H_2 O$.

"Usually capillary, fibrous, stalactitic, and concretionary; also massive, pulverulent."

Green of different shades to white in color; yellowish, especially on exposure. Lustre vitreous. Translucent. Hardness, 2. Specific Gravity, 1.89-1.90. Brittle.

BASTROP COUNTY:
Elgin.
CORYELL COUNTY:
Copperas Cove.
UVALDE COUNTY.

MENACCANITE. *See Ilmenite.*

MERCURY. *Quicksilver. A Native Element.* Hg.

In bright metallic globules. Of a tin-white color. Specific Gravity, 13.596.

BREWSTER COUNTY:
Near Terlingua.

"Found in its native state filling cavities in the limestone and as globules in crevices of rocks impregnated with cinnabar,"—E. P. Spalding, *Engineering and Mining Journal*, Vol. 71, June 15, 1901, p. 750.

See also Bull. No. 4, Univ. Tex. Min. Surv., October, 1902.

METACINNABARITE. *Mercuric Sulphide.* Hg S. (See Cinnabar, which is of the same composition.)

"Occurs in black tetrahedral crystals; also massive." Specific Gravity, 7.8.

BREWSTER COUNTY:
Terlingua District in small amounts; amorphous.

METAGADOLINITE.

A mineral substance covering Gadolinite.

Original description:

"The material enveloping the Gadolinite seems to be amorphous; dull,

with an uneven fracture and brittle; its color is grayish brown; streak red, when powdered bright red.

"It was found necessary to float off the suspended part in water from another portion which was not decomposable by hydrochloric acid, and this was repeated until a sample was wholly decomposable by that acid. The silica did not gelantinize.

"Hardness=3. Sp. gr.=3.494.

"Not fusible before the blow-pipe. The fluxes indicated iron; heated in a tube it gave water. Heated with carb. soda upon charcoal it afforded a dark brown slag.

"The analysis indicated great complexity of mixture:

$Si\ O_2$	18.145 per cent.	O= 9.676
$Ce_3\ O_4$	20.662 per cent.	O=16.773
$Fe_2\ O_3$	26.026 per cent.	O= 7.807
$Y\ O$	21.854 per cent.	O= 4.500
$Ca\ O$	3.642 per cent.	O= 1.040
$Mg\ O$	0.214 per cent.	O= 0.085
$H_2\ O$	9.761 per cent.	O= 8.676

* * * * * *

"I am not aware that this material over the Gadolinite has been named. I propose for it the name *Metagadolinite.*"

E. Goldsmith, Proc. Acad. of Nat. Sciences, Phila., May-Sept. 1889, p. 165.

LLANO COUNTY:
Barringer Hill.*

METEORIC IRON. *Native Iron found in Iron Meteorites and as grains or scales in Siderolites and Meteoric Stones.*

It is difficult to establish with precision the localities of the early discoveries of Meteoric Iron in Texas.

BOSQUE COUNTY:
Five or six miles southwest of Iredell.

"IREDELL METEORITE."

Analysis by J. Edward Whitfield.

Iron	93.75
Nickel	5.51
Cobalt	.52
Phosphorus	.20
Sulphur	.06
	100.04

—*Amer. Jour. of Science*, IV, Vol. 8, p. 416, 1899.

DENTON COUNTY:

Analysis by Professor W. P. Riddell.

Residue insoluble in NO_3 [H NO_3]	0.32814
Iron (mean of three determinations)	94.02466
Nickel	5.42982
Cobalt	a trace
	99.78262
Specific gravity	7.6698

—Transactions of the Academy of Science of St. Louis, Vol. 1, No. 4, p. 624, 1860.

FAYETTE COUNTY:
Bluff.

"FAYETTE COUNTY METEORITE."

Analysis by Chemical Laboratory U. S. Geological Survey.

Silica (SiO_2)	37.70
Metallic Iron (Fe)	3.47
Protoxide of Iron (FeO)	23.82
Alumina (Al_2O_3)	2.17
Phosphoric Acid (P_2O_5)	.25
Lime (CaO)	2.20
Protoxide of Manganese (MnO)	.45
Magnesia (MgO)	25.94
Oxide of Nickel (NiO)	1.59
Metallic Nickel (Ni)	.65
Oxide of Cobalt (CoO)	.16
Metallic Cobalt (Co)	.09
Sulphur (S)	1.30
	99.79
Less O for S,=	.65
	99.14
Specific gravity	3.510

—*Amer. Jour. of Science*, III, Vol. 36, p. 115, 1888.

HAMILTON COUNTY:
Northern part.

"HAMILTON COUNTY METEORITE."

Analysis by L. G. Eakins.

Iron (Fe)	86.54
Nickel (Ni)	12.77
Cobalt (Co)	0.63
Copper (Cu)	0.02
Phosphorus (P)	0.16
Sulphur (S)	0.03
Carbon (C)	0.11
	100.26

—*Amer. Jour. of Science*, III, Vol. 40, p. 224, 1890.

JOHNSON COUNTY:

"THE RED RIVER METEORITE," 1836.

Nickel (Ni)	8.46

MCLENNAN COUNTY:
Mart.

MONTAGUE COUNTY.

MAVERICK COUNTY:
Near Fort Duncan. Found June 10, 1882.

"THE MAVERICK COUNTY METEORITE."

Analysis by J. B. Mackintosh.

Iron (Fe)	94.90
Phosphorus (P)	0.23
Nickel and Cobalt (Ni and Co)	4.87
Sulphur (S)	trace
Carbon (C)	trace
	100.00
Specific gravity	7.522

—*Amer. Jour. of Science*, III, Vol. 32, p. 306, 1886.

TOM GREEN COUNTY:
Seven miles south of San Angelo.

"SAN ANGELO METEORITE."

Analysis by Mariner and Hoskins, Chicago, Ill.

Iron (Fe)	91.958
Nickel (Ni)	7.860
Cobalt (Co)	trace
Copper (Cu)	0.040
Phosphorus (P)	0.099
Sulphur (S)	0.032
Manganese (Mn)	trace?
Silicon (Si)	0.011
Carbon (C)	trace
	100.000
Specific gravity	7.7

—*Amer. Jour. of Science*, IV, Vol. 5, p. 272, 1898.

Specimen of this fall is in the collection of the University of Texas.

WICHITA COUNTY:

"WICHITA COUNTY METEORITE."

"Long held by the Comanches as an object of worship. Removed to Fort Belknap in 1858 ('59?) by Maj. Neighbors."

Analysis by Dr. J. W. Mallet.

Iron (Fe)	90.769
Nickel (Ni)	8.342
Cobalt (Co)	.265
Manganese (Mn)	trace
Copper (Cu)	.018
Tin (Sn)	.004
*Phosphorus (P)	.141
*Sulphur (S)	.016
Graphitic Carbon	.190
Silica (SiO_2) / Iron Oxide (Fe_3O_4)	.132
	91.877
Specific gravity	7.841

*Both variable with the distribution of schreibersite and troilite.

—*Amer. Jour. of Science*, III, Vol. 28, p. 287, 1884.

The larger part of this fall is in the collection of the University of Texas.

MICA. *See Biotite and Muscovite.*

MICROCLINE. *Potash Feldspar. Green Variety=Amazon Stone.*

Resembles Orthoclase but the cleavage angle falls a few minutes short of 90°. Cleavage surface may be finely striated. Color white, red or green. Lustre vitreous to pearly. Specific Gravity, 2.54-2.57. Hardness, 6-6.5.

LLANO COUNTY:
Upper Ford of Llano River.*

MASON COUNTY:
Hermann Creek. C.

TRANS-PECOS REGION:
As float south of Pena Colorado."—Von Streeruwitz.

MOLYBDENITE. *Molybdenum Disulphide.* $Mo S_2$.

Crystals hexagonal; tabular or prismatic. Usually in foliated masses resembling Graphite. Also in scales or granules. Color lead gray. Greasy. Specific Gravity, 4.7-4.8. Hardness, 1-1.5.

BURNET COUNTY:
In granite, Granite Mountain.

LLANO COUNTY:
Barringer Hill.*
"Molybdenite occurs sparingly in quite large folia, and in hexagonal tables, with cyrtolite and fergusonite."—Hidden and Mackintosh, *Amer. Jour. of Science*, III, Vol. 38, p. 485.

MOLYBDITE. *Molybdenum Trioxide.* $Mo O_3$.

"In capillary tufted forms and earthy. Color straw-yellow."—Dana.

EL PASO COUNTY:
Sparingly north of Van Horn in Sierra Diablo."—Phillips.

LLANO COUNTY:
Barringer Hill.*
"Molybdite was noticed in the cavities once occupied by molybdenite and it often yet retained the plate-like form of the mineral from which it was derived by alteration. Its color was from white to greenish-white. Specific gravity=4.004. On two specimens indistinct crystals have been found, having a light apple-green color and almost perfect transparency. Qualitative tests have shown the absence of any large amounts of anything but molybdic acid."—Hidden and Mackintosh, *Amer. Jour. of Science*, III, Vol. 38, p. 485.

MUSCOVITE. *Potash Mica. Common Mica. Aluminum Potassium Silicate.* $H_2 K Al_3 (Si O_4)_3$.

Crystals tabular, usually six-sided. Commonly occurs in plates and scales. Laminae elastic. Color various: white (or colorless), gray, yellow, brown, and less frequently reddish, violet, greenish. Lustre vitreous (micaceous). Specific Gravity, 2.76-3. Hardness, 2.2-5. Transparent; translucent.

LLANO COUNTY:
Head of Rocky Creek, east of Riley Mountain.*
Johnson Creek.*
Mexican Diggings, Babyhead Mountain.*
Near Sandy Mountain Postoffice.*
Near Smoothing Iron Mountain.*
Little Llano Creek, below Lone Grove.*
North of Lone Grove.*

MASON COUNTY:
North of Fly Gap, on the road to Pontotoc.*
King Mountain. C.

MANY OTHER LOCALITIES.*

NICKEL.

EL PASO COUNTY:
"Nickel exists in the ores of the Hunter and Quitman Mountains. Bona prospects, and probably with the material of most of the Quitman Mountain prospects."—Von Streeruwitz.

NITRE. *Saltpetre. Potassium Nitrate.* $KN O_3$.

In tufts, masses or incrustations. Cave deposits. White, gray, yellow. Specific Gravity, 2. Hardness, 2.

EL PASO COUNTY:
North of Van Horn.—E. M. Skeats.
SAN SABA COUNTY.

NIVENITE. *A Variety of Uraninite. A Hydrated Thorium-Yttrium-Lead Uranate.*

"This mineral we found intimately associated with fergusonite and thorogummite. It is as yet a rare mineral at the locality. Its specific gravity is 8.01, H.=5.5. It is velvet-black in color, and when powdered becomes brown-black. After ignition it turns blue-black. As yet only massive pieces have been found, but some of these suggest that the species may be isometric in crystallization. It is easily soluble in nitric and sulphuric acid, and some slight effervescence was noticed upon dissolving the mineral. The analysis gave the following results:

			Oxygen Ratio.
UO_3	46.75		48.69=12.
UO_2	19.89	14.62	
ThO_2	7.57	5.74	
Y_2O_3 etc.	11.22 Atomic weight 124.2	11.34	37.33= 9.20
Fe_2O_3	0.58	1.08	
PbO	10.16	4.55	
(Ignition) loss H_2O	2.54		14.11= 3.48
Insoluble	1.22		
	99.93		

Hidden and Mackintosh, *Amer. Jour. of Science,* III, Vol. 38, p. 481.

LLANO COUNTY:
Barringer Hill.*

OCHRE, RED. *An earthy variety of Hematite.*

CHEROKEE COUNTY.
MILAM COUNTY. C.
PANOLA COUNTY:
"Nuclei in limonite on the Wesley Gooden Headright."—J. B. Walker, Second Ann. Rept. Geol. Surv. of Texas, p. 231.

OCHRE, YELLOW. *An earthy variety of Limonite.*

BASTROP COUNTY:
Two miles south of Elgin.
PANOLA COUNTY:
"In geodes of limonite in northwestern part of county."—Walker, Sec. Ann. Rept. Geol. Surv. of Texas, p. 231.

OIL. *See Petroleum.*

OLIGOCLASE. *Soda-Lime Feldspar.*

Crystals rare. Usually in cleavable masses. White, gray, green, reddish. Specific Gravity, 2.65-2.67. Hardness, 6-6.5.

BURNET COUNTY:
Granite Mountain.*
LLANO COUNTY:
Little Llano Region.*

ONYX. *A variety of Quartz.* SiO_2.

Banded like Agate. Layers white, black, red, etc.

PRESIDIO COUNTY:
"Between Davis and Chinati Mountains."—Von Streeruwitz.
TRANS-PECOS REGION.**

OPAL. *Amorphous Silica.* SiO_2+water.

Massive, reniform, stalactitic, etc. White, gray, yellow, red, brown, blue, etc. The precious variety shows a beautiful play of color. Specific Gravity, 1.9-2.3. Hardness, 5.5-6.5. Lustre vitreous to pearly.

EL PASO COUNTY:
Van Horn Wells.
LLANO COUNTY:
Long Mountain (grains in felsite porphyry).*
Float, Little Llano Creek Rgion.

OPAL, WOOD. *Opalized Petrified Wood.* SiO_2.

WASHINGTON COUNTY. C.

ORTHOCLASE. *Common Feldspar. Potash Feldspar. Aluminum—Potassium Silicate.* $KAlSi_3O_8$.

The members of the Feldspar Group crystallize after two systems, the monoclinic and the triclinic. Orthoclase is monoclinic.

Crystals usually prismatic. This mineral often well exemplifies twinning as for example in the "Carlsbad Twins." Also massive and cleavable; cleavage angle 90°. Color white, gray, yellow, flesh-red, greenish. Specific Gravity, 2.57. Hardness, 6.

BURNET COUNTY:
Headwaters of Clear Creek.*
Clear Creek, near High Point.*
Granite Mountain, large crystals.
Headwaters of Clear Creek.*
Hoover Valley.*
Near Niggerhead Mountain.*
Shannon's Quarry, in quartz.*
Spring Creek Region, in granite.*
LLANO COUNTY:
Barringer Hill.
"Orthoclase occurs massive and finely crystallized and in great variety of form. Twin crystals, of curious complexity, and simple forms are very common. Crystals of huge dimensions, a foot or more in length, more or less perfect, and smaller sizes abound, especially are they abundant on the contact of the vein with the granite walling."—Hidden and Mackintosh, *Amer. Jour. of Science,* III, Vol. 38, p. 476.
Cold Creek Region.*
East of Dancer Peak.*

Hickory Creek, Little Llano Region.*
Johnson Creek.*
Long Mountain.*
Little Llano Creek.*
Lockhart Mountain.*
Mexican Diggings, Babyhead Mountain.*
Parker Place, west of Llano.*
On Brady Road, west of Bauman's, Cold Creek Region.*
Near Castell, on Chr. Sneider's place.*
Nunneley's Mine.*
Streeruwitz Mine.*
Twin Mountains.*
Upper Ford of Llano River.*

MASON COUNTY:
Kothmann's Water Gap, near Fleming.*
North of Fly Gap.*
West of Enchanted Rock.*
West of King Mountain three miles. C.

PEARLS. Of economic interest but not strictly within the province of descriptive mineralogy.

Found in Unios, or Fresh Water Mussels in many of the streams of Texas.

"Of single pearls, one from Montpelier, Vt., valued at $300; one from Waynesville, Ohio, valued at $200; one from Boston, Texas, valued at $250; one pink pearl, 19½ grains, from Murfreesborough, Tenn., valued at $80; and another at $150; one from Llano, Texas, valued at $95, have been sold in New York. G. F. Kunz, Gems and Precious Stones, 2nd Edition, p. 231. New York, 1892.

PENNINITE. *Pennine. Chlorite in part. Hydrous—magnesium—aluminum—ferric Silicate.*

Cleavage mica-like. Crystals tabular, steep rhombohedral or tapering six-sided pyramids. Occurs also in scaly masses or compact. Green in various shades, greenish red, pink, violet, yellow, white. Laminae flexible; inelastic. Specific Gravity, 2.6-2.85. Hardness, 2-2.5.

LLANO COUNTY:
Mexican Diggings, Babyhead Mountain,*

PETROLEUM. *Rock Oil. Mineral Oil.*

A complex native hydrocarbon compound, having a disagreeable odor, of colors varying from black to brown, brownish-yellow and greenish-brown. Some varieties are thin and flow readily, others thick and more or less viscid.

ANDERSON COUNTY:
New Palestine. Sand impregnation.

BASTROP COUNTY:
Near Elgin.

BELL COUNTY:
Western part.
Small quantities near Belton.

BEXAR COUNTY:
Dulnig Place, seven miles south of San Antonio.
J. Linn Survey, ten miles south of San Antonio.

BRAZORIA COUNTY:
Kaiser Mound, near Columbia.

BREWSTER COUNTY:
Six miles east of Terlingua, in bituminous shale.

BROWN COUNTY:
Brownwood.

BURLESON COUNTY:
Near Rita.

CALDWELL COUNTY:
Near Lockhart.

CLAY COUNTY:
Two miles from Hurnville, north of Henrietta.

COLEMAN COUNTY:
Near Trickham.

COOKE COUNTY:
Muenster, west.

CORYELL COUNTY:
Gatesville.

DENTON COUNTY:
Reported six miles from Denton.

DUVAL COUNTY:
Piedras Pintas, near Benavides.

EDWARDS COUNTY:
Reported near Rock Springs.

EL PASO COUNTY:
Twenty miles north of Van Horn, in small amounts.

GONZALES COUNTY:
Near Ottine.

GRIMES COUNTY:
Near Keith.
Lamb Springs neighborhood.

HARDIN COUNTY:
Saratoga.
Sour Lake.

JACK COUNTY:
Ten miles north of Jacksboro.

JEFFERSON COUNTY:
The Beaumont Field.

Analysis of Upper Oil (875-899 feet), Lucas Well, by Dr. E. P. Schoch, of the School of Chemistry, University of Texas.

Specific gravity at 60° F., 0.9218 (22° B.).

Fractions, ordinary distillation.
Scarcely any distillate up to 212° F.

Degrees F.	Per cent. of yield by Vol.	Color.
212-320	1.96	Clear white.
320-410	5.07	Light straw yellow.
410-464	14.60	Deeper straw yellow.
464-500	8.02	Deep yellow.
500-680	26.08	Light red brown.
Above 680	37.08	Dark brown; fluorescent.
Residue	3.33	
Loss	3.86	
	100.00	

Analysis of Lower Oil (Commercial Crude Petroleum, 1120-1139 feet), Lucas Well, by Dr. E. P. Schoch.

Specific gravity at 60° F., 0.916 (23° B.).

Degrees F.	Per cent. of yield by Vol.	Color.
212-230	1.78	Clear white.
230-410	6.41	Light straw yellow.
410-464	6.88	Deeper straw yellow.
464-500	12.14	Deep yellow.
500-680	18.65	Light red brown.
Above 680	44.64	Dark brown; fluorescent.
Residue	4.24	
Loss	5.26	
	100.00	

NOTE.—At 311° F., a white sublimate appeared in the condenser, probably sulphur. At 338° F., sulphuretted hydrogen fumes were quite strong. From 572°-662° F., scarcely any distillate.—Bulletin of the University of Texas Mineral Survey, No. 1, pp. 71-72.

LIVE OAK COUNTY:
Atascosa Creek, twelve miles north of Oakville.

MCCULLOCH COUNTY:
Near Milburn.

MCLENNAN COUNTY:
Near Waco.

MCMULLEN COUNTY:
Crowther.

MEDINA COUNTY:
Near Dulnay.

MONTAGUE COUNTY:
St. Jo, east.

NACOGDOCHES COUNTY:
Oil Spring, six miles south of Melrose.
Chireno.

NAVARRO COUNTY:
The Corsicana Field.

Analysis of Corsicana Oil by Dr. Henry Winston Harper, Professor of Chemistry in the University of Texas.

Color, very dark brown, almost black; opaque except in thin layers; greenish fluorescence.
Viscosity, not determined; but the oil is very mobile at 32° F.
Sediment, none.
Water, none.
Flash point, 73° F.
Specific gravity, 63.5° F., 0.8586, equivalent to 33° Beaumé.

Fractions.	Per centage. By Vol.	Per centage. By weight.	Specific gravity.	Color.
77°-203° F.	1.6	1.28	0.6912	Colorless.
203°-230°	9.9	8.37	0.7265	Colorless.
230°-248°	6.14	5.48	0.7650	Colorless.
248°-302°	7.14	6.65	0.8003	Colorless.
302°-347°	9.32	8.8	0.8107	Pale yellow.
347°-392°	5.56	5.29	0.8211	Pale yellow.
392°-428°	15.36	14.51	0.8115	Straw; blue fluorescence.
428°-437°	8.0	7.54	0.8095	Light brown; blue fluorescence.
437°-482°	13.0	12.36	0.8012	Light brown; blue fluorescence.
482°-536°	8.7	8.45	0.8341	Brown; blue fluorescence.
536°-592°	2.0	2.18	0.9393	Brown; solid at ordinary temperature.
Residue	.....	9.2	.....	
Total	86.72	90.11		

NOTE.—The yield of the fraction 77°-203° was greater than 1.6 per cent., but a portion of it was unfortunately lost before the entire amount was measured.—Bulletin of the University of Texas Mineral Survey, No. 1, pp. 48-49.

The Powell Field.
Frost.

NUECES COUNTY:
Puerto-Richard King's Ranch.

PALO PINTO COUNTY:
Near Strawn.
One mile north of Mineral Wells.

PECOS COUNTY:
Fifteen miles northeast of Fort Stockton.
Twenty-two miles north of Fort Stockton.

REEVES COUNTY:
Pecos Valley, above and below Pecos City.
Nine miles north of Toyah.

SAN AUGUSTINE COUNTY:
San Augustine.

SHELBY COUNTY:
Near Timpson.

TARRANT COUNTY:
Near Fort Worth.

TRAVIS COUNTY:
Walnut Creek, nine miles north of Austin.

WILSON COUNTY:
Sutherland Springs.

PHLOGOPITE. *A magnesium Mica.* $(K_2\ Mg\ Al)_2\ Si\ O_4$.

Crystals often large, coarse and prismatic, usually 6-sided. Occurs also in plates and scales which are elastic. In color yellowish brown or reddish brown, with a copper-like reflection, or it may be colorless, white and sometimes green. Specific Gravity, 2.78-2.85. Hardness, 2.5-3. Resembles Biotite.

LLANO COUNTY:
Barringer Hill.*
(Of doubtful occurrence, but announced on the authority of Dr. Edgar Everhart.)

PLATINUM. *A Native Element.* Pt.

In grains and scales, crystals unusual. White to steel gray in color and streak. Lustre metallic. Malleable and ductile. Specific Gravity, 14-19 native; 21-22 when chemically pure. Hardness, 4-4.5.

EL PASO COUNTY:
Traces on the west side of the Quitman Mountains.**

POTTERY CLAY. A product of rock decay suitable for the manufacture of vessels, tiling, etc.

ANDERSON COUNTY:
Palestine.

AUSTIN COUNTY:
New Ulm.

BASTROP COUNTY:
Bastrop.
Elgin.
McDade.
Smithville.

BELL COUNTY:
Belton.
Little River.

BEXAR COUNTY:
Atascosa.
Elmendorf.
San Antonio.

BOWIE COUNTY:
Texarkana.

BRAZORIA COUNTY:
Brazoria.

BURLESON COUNTY:
Caldwell.

CAMERON COUNTY:
Brownsville.

CAMP COUNTY:
Pittsburg.

CASS COUNTY:
Atlanta.

COLLIN COUNTY:
Clear Lake.

COLORADO COUNTY:
Eagle Lake.

COOKE COUNTY:
Gainesville.

DALLAS COUNTY:
Dallas.

DELTA COUNTY:
Cooper.

DENTON COUNTY:
Denton.
Lewisville.
Lloyd.

DE WITT COUNTY:
Yoakum.

ELLIS COUNTY:
Ferris.

EL PASO COUNTY:
El Paso.
Vinton.
White Spur.

ERATH COUNTY:
Thurber.

FALLS COUNTY:
Denny.
Lott.
Marlin.
Reagan.
Viesca.

FANNIN COUNTY:
Bonham.
Ector.
Ladonia.
Lamasco.
Randolph.

FORT BEND COUNTY:
Duke.

FREESTONE COUNTY:
Wortham.

GONZALES COUNTY:
Gonzales.

GRAYSON COUNTY:
Collinsville.
Denison.
Sherman.
Whitesboro.

GREGG COUNTY:
Longview.

GRIMES COUNTY.

GUADALUPE COUNTY:
Seguin.

HALE COUNTY:
Progress.

HARRIS COUNTY:
Buffalo Bayou.
Cedar Bayou.
Harrisburg.
Houston.

HARRISON COUNTY:
Marshall.

HENDERSON COUNTY:
Athens.

HIDALGO COUNTY:
Hidalgo.

HOPKINS COUNTY:
Cumby.
Pine Forest.
Sulphur Springs.

HOUSTON COUNTY:
Crockett.
Percilla.

HUNT COUNTY:
Caddo Mills.
Campbell.
Greenville.
Lone Oak.
Wolfe City.

JACKSON COUNTY:
Edna.

JEFFERSON COUNTY:
Beaumont.
Port Arthur.

JOHNSON COUNTY:
Cleburne.
Grandview.

KARNES COUNTY:
Hobson.

KAUFMAN COUNTY:
Terrell.

LAMAR COUNTY:
Blossom.
Paris.

LAVACA COUNTY:
Hallettsville.

LEE COUNTY:
Giddings.
Lexington.

LEON COUNTY:
Buffalo.
Centerville.
Jewett.

LIMESTONE COUNTY:
Groesbeck.
Kosse.
Thornton.

LLANO COUNTY:
Llano.

MARION COUNTY:
Amicus.
Jefferson.

MASON COUNTY:
Mason.

MCLENNAN COUNTY:
Waco.
West.

MEDINA COUNTY:
D'Hannis.

MONTAGUE COUNTY:
Bowie.

NACOGDOCHES COUNTY:
Chireno.
Garrison.

NAVARRO COUNTY:
Corsicana.

PARKER COUNTY:
Lakota.
Weatherford.

RAINS COUNTY:
Point.

ROBERTSON COUNTY:
Calvert.
Franklin.
Hearne.

RUSK COUNTY:
Henderson.
Wherry.

SHELBY COUNTY:
Center.
Tenaha.

SMITH COUNTY:
Arp.
Lindale.
Troup.
Tyler.

STARR COUNTY:
Roma.

TARRANT COUNTY:
Arlington.
Kennedale.

TAYLOR COUNTY:
Abilene.

TITUS COUNTY:
Winfield.

TRAVIS COUNTY:
Austin.

TRINITY COUNTY:
Trinity.

TYLER COUNTY:
Colmesneil.

UPSHUR COUNTY:
Asbury.
Big Sandy.
Gilmer.

VAN ZANDT COUNTY:
Canton.
Edgewood.
Grand Saline.
Myrtle Springs.
Stone Point.
Wills Point.

VICTORIA COUNTY:
Victoria.

WASHINGTON COUNTY:
Burton.

WEBB COUNTY:
Laredo.

WHARTON COUNTY:
Wharton.

WICHITA COUNTY:
Wichita Falls.

WILLIAMSON COUNTY:
Taylor.

WILSON COUNTY:
Calaveras.
Fairview.
Saspamco.
Sutherland Springs.

WOOD COUNTY:
Alba.
Golden.
Mineola.
Winnsboro.

PITCH BLENDE. *Uranpecherz. A massive variety of Uraninite.*

Black or dark brown. The rare earths are not present. Specific Gravity, 6.4-8. Hardness, 5.5.

EL PASO COUNTY:
Hunter District, Quitman Mountains.**

PRIBRAMITE. *A Cadmiferous Zinc Blende or Sphalerite.*

TRANS-PECOS REGION.**

PSEUDOMALACHITE. *A Phosphate of Copper.* In part $Cu_3 P_2 O_8 \cdot 3Cu(OH)_2$.

"Usually massive, reniform, and botyoidal, with a radiating fibrous structure. H.=4.5-5. G.=3.4-4.4. Lustre vitreous. Color dark emerald-green, verdigris-green, blackish green, often darker on the surface. Streak paler green." When the composition is $Cu_3 P_2 O_8 \cdot 2Cu(OH)_2$ and the mineral occurs in dark emerald-green crystals it is termed *Dihydrite.* When the composition is $Cu_3 P_2 O_8 \cdot 2Cu(OH)_2 \cdot H_2O$ the name *Ehlite* is applied. The relation of these forms is somewhat uncertain. See Dana's System of Mineralogy, pp. 793-794.

EL PASO COUNTY:
Hills west of Sierra Blanca Junction.**
Ehlite and Dihydrite.**

PSILOMELANE. *Magnesium Dioxide with Water.* MnO_2+water.

Amorphous, botryoidal, stalactitic, reniform. Iron black to blue black, gray. Streak brownish-black. Lustre submetallic. Specific Gravity, 3.7-4.7. Hardness, 5-6.

EL PASO COUNTY:
In prospects west of the Sierra Blanca.**
In the Hunter District, Quitman Mountains.**

MASON COUNTY:
Head of Martin Creek, above Fleming.*
Spiller Mine, fifteen miles northeast of Mason.*

PYRITE. *Iron Pyrites. Mundic. Fool's Gold. Iron Disulphide.* FeS_2.

Crystals of forms and combinations of the Isometric System, such as the cube, octahedron, pentagonal dodecahedron, and their modifications. It also occurs massive, granular and in many other forms: globular, fibrous, stalactitic, etc. Color brass yellow, sometimes very bright. Streak greenish black. When gold bearing this mineral is termed Auriferous Pyrite. Specific Gravity, 4.95-5.10. Hardness, 6-6.5.

Marcasite is of the same composition as Pyrite but crystallizes after a different system (Orthorhombic). It occurs also massive and often in reniform, stalactitic, globular and other shapes. Its color is lighter than that of ordinary pyrite, hence the name White Iron Pyrites.

ANDERSON COUNTY:
In clays near Elkhart.

BASTROP COUNTY:
Bombshell Bluff.

BREWSTER COUNTY:
In association with cinnabar.

BURLESON COUNTY:
On Brazos River below Burleson Shell Bluff, in cross-bedded sands.

BURNET COUNTY:
Occasionally at Granite Mountain.

DICKENS COUNTY.

EL PASO COUNTY:
With Cassiterite, ten miles north of El Paso.

GILLESPIE COUNTY:
Hickory Creek.
Head of Crabapple Creek.
Nonley Shaft.
Sandy Shaft.
Southeast of Enchanted Rock.
Silver Mine Creek.

GRAYSON COUNTY:
Four miles north of Whitesboro.

LLANO COUNTY:
Hoover Valley (brassy).*
Little Llano Creek (yellow).*
Miller Mine (brassy).*
Nunnely's Mine (brassy).*
Six miles from Llano, on the road to Click Gap.*
South of Chaney's Diggings, Packsaddle Mountain.*

MASON COUNTY:
North of Pontotoc.*

ROBERTSON COUNTY:
Brazos River, above Calvert Bluff.

SAN SABA COUNTY:
Half mile below the mouth of Brady Creek.

TRAVIS COUNTY:
Austin. In Del Rio Shale, encrusting fossils, near Camp Mabry.
Radiating nodules in Austin Chalk.

WASHINGTON COUNTY:
Two miles below Yegua Creek. "Rusty crystals of iron pyrites."

WEBB COUNTY:
One mile south of Laredo.

WILSON COUNTY. C.

TRANS-PECOS REGION.**

PYROAURITE. *Hydrous Ferric Magnesium Oxide.* Fe_2O_3. 6Mg O. $15H_2O$?

"Hexagonal. In six-sided tables. Also with obscure fibrous structure. Lustre pearly. Color gold-like or silver white. Subtranslucent."—Dana.

MCCULLOCH COUNTY:
East of Camp San Saba, on San Saba Road, small amount.*

MASON COUNTY:
North of Pontotoc.*

PYROLUSITE. *Black Oxide of Manganese. Manganese Dioxide.* MnO_2.

Columnar, divergent, massive granular, reniform. Iron-black or bluish, with streak of the same color. Metallic lustre. Specific Gravity, 4.73-4.86. Hardness, 2-2.5.

BREWSTER COUNTY:
Block G12.

BURNET COUNTY:
Hocking Hollow, Clear Creek Region.*

EL PASO COUNTY:
In prospects of the Hunter District, Quitman Mountains.**

MASON COUNTY:
Spiller Mine, fifteen miles northeast of Mason.*

PROXENE. *Iron-calcium-magnesium Silicate.*

Crystals "usually in thick stout prisms, of 4, 6, or 8 sides, terminating in two faces meeting in an edge." When massive it is lamellar, fibrous, granular or compact. Green of various shades from light to dark (brown or black). The blue tints are included but not the yellow. Lustre vitreous. Specific Gravity, 3.2-3.6. Hardness, 5-6.

BURNET COUNTY:
Spring Creek Region.*

LLANO COUNTY:
Miller Mine.*

QUARTZ. *Silica.* SiO_2.

See also Agate; Amethyst; Aventurine; Chalcedony; Jasper; Onyx; Sagenitic Quartz; Sardonyx.

Crystals of various shapes and sizes: double 6-sided pyramids or prisms, rhombohedrons, etc., and many combinations; acicular, and in the form of druses. In the massive state this mineral is very common. It may be coarsely granular or fine. Of various colors from that which is limpid and colorless (Rock Crystal) to that which brown or black (Smoky Quartz), the many shades of red (Rose Quartz), yellow (Citrine or False Topaz), blue (Amethyst), etc., being due to impurities. The opaque white variety is termed Milky Quartz.

Fracture conchoidal or perhaps oftener sub-conchoidal. Lustre vitreous, splendent or dull. Specific Gravity, 2.65-2.66. Hardness, 7.

ABUNDANT IN THE CENTRAL MINERAL REGION.

BURNET COUNTY:
Granite Mountain.
Colorado River, five miles below Bluffton, smoky quartz. C.

EL PASO COUNTY:
East Flank of the Franklin Mountains, north of El Paso.
"Quitman** and Carrizo Mountains** and the foothills of the Sierra Diablo.** Common, milky, and granular quartz."—Von Streeruwitz.
Quitman Mountains.** Sagenitic quartz, aventurine.
Quitman Mountains, green quartz. C.

GILLESPIE COUNTY: Amethystine quartz; "Thetis Hairstone, near Enchanted Rock."—Dumble.

JEFF DAVIS COUNTY:
Davis Mountains. Flinty, smoky, and granular quartz. Agate.**

LLANO COUNTY:
Barringer Hill. Milky, smoky, crystalline quartz.*
In different parts of the county, white and rose quartz.*
Two miles northwest of Llano. Rose quartz. C.
Four miles south of Llano.
Near Packsaddle Mountain.

MASON COUNTY:
King Mountain. C.
Three miles west of King's Mountain. C.
Caylor's Diggings.
Near Pontotoc.

PRESIDIO COUNTY:
Between Marfa and the Chinati Mountains. Agates.

RUNNELS COUNTY:
Moro Hill. C.

QUICKSILVER. *See Mercury.*

ROWLANDITE. *An Yttrium Silicate.*

"The mineral is isotropic, its hardness is 6, its fracture glassy conchoidal, its lustre vitreous-resinous and the powdered mineral is a light greenish gray. It is easily soluble in acids with gelatinization."

"Its color varies from bottle- to pale drab-green when pure and its lustre on a fractured surface is decidedly more vitreous than that of gadolinite. It is also more transparent, being perfectly so in thin splinters."—W. E. Hidden. *Amer. Jour. of Science,* III. Vol. 46, p. 209. Specific Gravity, 4.515.

"The specimen of Rowlandite, furnished by Mr. Hidden for analysis, was a portion of a mass resembling somewhat amorphous gadolinite. It had a glassy interior surrounded by an uneven thickness of reddish alteration substance, chiefly a carbonate, or carbonates, of the rare earths and lime. The glassy 'rowlandite' showed, when broken up, reddish and dark stains in places, the latter being produced by minute black inclusions, perhaps of a titanium mineral. Numerous scarcely visible fissures, filled with foreign matter, traversed the glass. This rendered the selection of pure material an arduous task; the result of several days of

labor, however, was a sample possessing a high degree of purity as shown by the microscope. A small amount of impurity was still present, but much less, apparently than the analysis seems to indicate. A slight cloudiness in some grains points to incipient change. Its density is the same as that found by Mr. Hidden, 4.513, at 15.5° C. The analysis is as follows:

			Mean.	
Silica ($Si O_2$)	25.77	26.04	26.04*	
X†	.39	.....	.39	
Thorium oxide ($Th O_2$)	.59	.....	.59	
Cerium oxide ($Ce_2 O_3$)‡	5.06	.....	5.06	
Lanthanum group (La group)	9.34	.....	9.34	Mol. Wt. 336.8
Yttrium group (Yt group)	47.70	.....	47.70	Mol. Wt. 266.2
Iron peroxide ($Fe_2 O_3$)	.09	.....	.09	
Iron protoxide (Fe O)	4.39§	.....	4.39	
Manganese protoxide (Mn O)	.70	.64	.67	
Lime (Ca O)	.60	.40	.50	
Magnesia (Mg O)	1.58	1.66	1.62	
Alkalies (Akl)	.32	.24	.28	
Water ($H_2 O$)	.24	.....	.24	
Carbonic acid ($C O_2$)	.34	.....	.34	
Fluorine (Fl)	3.87	.....	3.87	
Phosphoric acid ($P_2 O_5$)	trace	.....	trace	
			101.12	
Less O for Fl			1.63	
			99.49	

*Certainly more nearly correct than 25.77, since fluorine must have caused loss of silica on evaporation with hydrochloric acid.

†A mixture of undefinable earths with some uranium and a trace of titanium.

‡Cerium dioxide cannot be present, if at all, in more than trivial amount, for otherwise much less ferrous oxide would have been found. For the same reason the manganese cannot be present as Mn_2O_3.

§If the small and undetermined amount of uranium exists as dioxide, the ferrous oxide here given is correspondingly high, but the possible error can have no influence on the formula deduced."—W. F. Hillebrand, *Amer. Jour. of Science*, III, Vol. 46, p. 210.

LLANO COUNTY:
Barringer Hill.

SALT, ROCK. *Halite. Sodium Chloride.* Na Cl.

Crystallizes in cubes, which may be cavernous. Occurs also compact, granular. White, gray, yellow, red and blue. Easily soluble, with a saline taste. Specific Gravity, 2.1-2.6. Hardness, 2.5.

ANDERSON COUNTY:
East of Palestine seven and a half miles. Penetrated for 104 feet.

BRAZORIA COUNTY:
Damon Mound.

CRANE COUNTY:
Salt Lakes.

EL PASO COUNTY:
Northern part, west of Guadalupe Mountains—Salt Basin.

LIBERTY COUNTY:
Dayton. Penetrated four hundred feet.

MITCHELL COUNTY:
Colorado City. Encountered at the depth of eight hundred and fifty feet; one hundred and forty feet of salt within the next two hundred and fifty feet.

VAN ZANDT COUNTY:
Grand Saline. Encountered at two hundred and fifty feet; penetrated one hundred and twenty-five feet.
Wills Point.

TRANS-PECOS REGION.**

SAGENITIC QUARTZ. *A form of Quartz enclosing acicular crystals of rutile and other minerals. See Quartz.*

EL PASO COUNTY:
Quitman Mountains.**

SAMARSKITE.

Crystallizes in rectangular prisms with rough faces. It usually occurs massive and in grains. Velvet black in color. Lustre vitreous to resinous. Streak dark reddish brown. Specific Gravity, 5.6-5.8. Hardness, 5-6.

LLANO COUNTY:
Barringer Hill (on the authority of Dr. Edgar Everhart).* Of doubtful occurrence in Texas. C.

SARDONYX. *A cryptocrystalline variety of Quartz.* $Si O_2$.

"Like onyx in structure, but includes layers of carnelian (sard) alongwith others of white, whitish, and brown, and sometimes black colors."—Dana.

TRANS-PECOS REGION:
El Paso or Jeff Davis counties.

SELENITE. See Gypsum.

SERPENTINE. *Hydrous Magnesium Silicate.*

Massive; under the microscope finely fibrous. At times foliated. Of various shades of green, also brownish yellow, brown, red, or grayish white. Fracture conchoidal — splintery. Specific Gravity, 2.2-2.65. Hardness, 2.5-4. Rarely harder.

GILLESPIE COUNTY.

EL PASO COUNTY:
Foothills of Sierra Diablo.**

LLANO COUNTY:
King Mountains.*
Near Long Mountain.*

TRANS-PECOS REGION.**

SIDERITE. *Spathic Iron. Chalybite. Iron Carbonate.* $Fe CO_3$.

Crystallizes in rhombohedrons which not infrequently show curved faces. Also massive, cleavable or granular; at times botryoidal or con-

cretionary, compact, earthy. Color white, gray, yellowish, brown, brownish red. Lustre vitreous. Specific Gravity, 3.83-3.88. Hardness, 3.5-4.

EL PASO COUNTY:
Second Range of Quitman Mountains.**

SILLIMANITE. *See Fibrolite.*

SILVER, NATIVE. *An Element.* Ag.

In distorted crystals, arborescent and reticulated forms. Also in plates and scales, or massive. Of a silver-white color but often gray or black from tarnish. Metallic. Ductile and malleable. Specific Gravity, 10.1-11.1. When pure, 10.5.

TRANS-PECOS REGION.**

EL PASO COUNTY:
Hazel Mine, ten miles north of Allamore, Sierra Diablo.

SOAPSTONE. *See Talc.*

SPHALERITE. *Blende. Zinc Blende. Black Jack.* Zn S.

Crystallizes often in tetrahedrons and their modifications. Usually massive; granular, compact, cleavable, foliated, fibrous; botryoidal. Yellow, bronze, black, and other colors, as red, white, green. Streak brownish, yellowish, white. Specific Gravity, 3.9-4.1. Hardness, 3.5-4.
See Pribramite.

EL PASO COUNTY:
Quitman Mountains. C.
Bonanza Prospect.**
Alice Ray Mine.**
Alta Prospect.**

LLANO COUNTY: C.
Northeast of Lone Grove.

TRANS-PECOS REGION.**

SPESSARTITE. *Spessartine. Manganese-Aluminum Garnet.*

"Specimen from Horse Mountain [five miles north of Llano], Llano County, Texas. This mineral is massive to crystalline; color pale lemon-yellow; streak light yellow; lustre resinous (dull in weathered specimens); translucent; fracture conchoidal to uneven; hardness 7. Its specific gravity as determined by R. N. Brackett is 3.79. It contains disseminated particles of magnetite and pockets and veins of transparent or smoky quartz. The mineral fuses to a black glass; is insoluble in hydrochloric acid in the fresh state, but after fusion rapidly decomposes with the separation of silica; with fluxes it gives manganese reactions.

"The survey is indebted to the kindness of Professor F. W. Clark, Chief Chemist of the United States Geological Survey, for the following analysis by Dr. W. H. Melville, whose examination has shown the mineral to be spessartite:

Analysis of Spessartite from Llano County, Texas.

	Per cent.	Ratio.		
Silica ($Si O_2$)	35.93	.600		3.00
Ferric oxide ($Fe_2 O_3$)	4.60	.029	.206	1.03
Alumina ($Al_2 O_3$)	18.08	.177		
Manganese protoxide (Mn O)	31.77	.449	.618	3.09
Lime (Ca O)	8.48	.152		
Baryta (Ba O)	trace			
Magnesia (Mg O)	0.69	.017		
Potash ($K_2 O$) } Soda ($Na_2 O$) }	0.17			
Phosphoric acid ($P_2 O_5$)	none			
Titanic acid ($Ti O_2$)	trace			
Loss at 105° C.	0.03			
Loss on ignition	0.36			
	100.11			

"In the sample taken for analysis the quartz was separated from the spessartite and the small amount of magnetite was removed by a magnet. 'A black oxide of manganese remained in the material analyzed, so that the quantity of ferrous oxide could not be determined. The iron was weighed as ferric oxide.'" R. A. F. Penrose, Jr., Ann. Rept. Geological Survey of Arkansas for 1890, pp. 433, 434.

STEATITE. *See Talc.*

STROMEYERITE. $(Ag, Cu)_2 S$.

Ordinarily massive. Dark steel gray. Specific Gravity, 6.15-6.3. Hardness, 2.5-3.

EL PASO COUNTY:
Hazel Mine. C.

TRANS-PECOS REGION.**

STRONTIANITE. *Strontium Carbonate.* Sr. CO_3.

Crystals acicular. Also fibrous, columnar, granular, globular (geodes). Color pale green, white, yellow, brownish. Lustre vitreous. Specific Gravity, 3.68-3.71. Hardness, 3.5-4.

LAMPASAS COUNTY:
Little Lucy Creek, six miles north of the town of Lampasas.
Head of Lynch Creek, ten miles northwest of Lampasas.

TRAVIS COUNTY:
Mount Bonnell, on the Colorado above Austin.

SULPHUR, NATIVE. *An Element.* S.

Crystals pyramidal, acute, occasionally tabular. Massive in many shapes, encrusting, stalactitic, etc. Also in powder. Of various shades of yellow, brownish, greenish, reddish, gray. Lustre resinous. Specific Gravity, 2.05-2.09. Hardness, 1.5-2.5. Occurs in many places where iron pyrite is undergoing decomposition.

BRAZORIA COUNTY:
Damon Mound.

BURLESON COUNTY:
Sulphur Bluff, nine miles below Moseley's Ferry.

EDWARDS COUNTY.

EL PASO COUNTY:
Northeast part, the Delaware Creek Region, twenty to thirty miles southwest of Guadalupe Station.

FAYETTE COUNTY:
Chalk Bluff, twelve miles below La Grange. Efflorescence.

HOUSTON COUNTY:
Eastern part.

JEFFERSON COUNTY:
Beaumont.

NUECES COUNTY.

PECOS COUNTY:
Fourteen miles northeast of Fort Stockton.

REEVES COUNTY:
East of Guadalupe Station.

STARR COUNTY.

TOM GREEN COUNTY.

WEBB COUNTY:
One mile below Laredo. Efflorescence from pyrites.

TRANS-PECOS REGION.**

TALC. *Steatite. Soapstone.* $3Mg\ O.\ 4Si\ O_2.\ H_2\ O.$

Usually massive, foliated, granular, compact. Laminae not elastic. Greasy to the touch. Greenish gray, pearly to white, light green, dark green, reddish. Specific Gravity, 2.7-2.8. Hardness, 1-1.5.

GILLESPIE COUNTY:
South and southeast of Enchanted Rock.

LLANO COUNTY:
On the Hondo.
On the Sandys.
Mexican Diggings. Babyhead Mountain.*
Pecan Creek.*
Nunnely's Mine.
Three and a half miles east of Enchanted Rock, close to the junction of two branches of Crabapple Creek.*
Southwest of Smoothing Iron Mountain.

MASON COUNTY:
Near Double Knobs.*

TRANS-PECOS REGION.**

TENGERITE. *Yttrium Carbonate?*

White coatings associated with gadolinite.

LLANO COUNTY:
Barringer Hill.*

"Tengerite(?)—In the cracks and fissures of the gadolinite and yttrialite a white mineral rich in CO_2 is often noticed. We have seen it in globular-radiated incrustations and in one instance in distinct transparent isolated crystals. Dr. Genth has already noted its occurrence, and, as he observes, there is not enough now obtainable to show its composition except by qualitative tests."—Hidden and Mackintosh, *Amer. Jour. of Science*, III, Vol. 38, p. 486.

TEPHROITE. *A Protoxide Silicate of Manganese.* $2Mn\ O.\ Si\ O_2.$

"Specimen from the Kothmann tract [three miles southeast of the Spiller mine], Mason County, Texas. This mineral is massive; color gray or greenish-gray; streak white; lustre resinous; translucent; hardness, 6; very tough; specific gravity, 3.94. It is fusible, gelatinizes in hydrochloric acid, and with fluxes gives manganese reactions. It effervesces in hydrochloric acid, probably from the presence of a carbonate, as is shown in the analysis.

* * * it is much jointed and breaks into angular blocks. It is decomposed on the surface and along the joint cracks, giving rise to a black incrustation of oxide of manganese, enclosing an interior of unaltered mineral. The following analysis, made by W. A. Noyes, shows its composition:

Analysis of Tephroite from Mason County Texas.

Silica ($Si\ O_2$)	28.57
Ferric oxide ($Fe_2\ O_3$)	5.52
Alumina ($Al_2\ O_3$)	2.46
Manganese protoxide ($Mn\ O$)	58.86
Lime ($Ca\ O$)	0.30
Magnesia ($Mg\ O$)	0.80
Alkalies (as $Na_2\ O$)	0.27
Carbonic acid ($C\ O_2$)	2.92
	99.70

"It is evident from the analysis that the specimen is an impure material, but the composition approaches that of Tephroite, which is a protoxide of manganese having the formula $2Mn\ O.\ Si\ O_2$, and containing theoretically manganese protoxide 70.2 and silica 29.8. The sesquioxide of iron and the alumina do not normally belong in a protoxide silicate and are probably admixtures, due to the specimen being a massive material. The carbonic acid possibly exists as carbonate of manganese, which may have been formed by the alteration of the silicate."—R. A. F. Penrose Jr., Annual Report of the Geological Survey of Arkansas for 1890, Vol. I, pp. 436, 437.

TERLINGUAITE. *An Oxychloride of Mercury.*

Description not available.

BREWSTER COUNTY:
Terlingua District.

TETRAHEDRITE. *Gray Copper Ore. Fahlerz.* $4Cu_2\ S.\ Sb_2\ S_3.$

Crystallizes in tetrahedrons and their modifications. Massive granular, compact. Color steel gray to black. Streak various—gray, black, brown, red. Specific Gravity, 4.4-5.1. Hardness, 3-4.

EL PASO COUNTY:
Diablo Mountains.
Hazel Mine.**
Carrizo Mountains. C.

LLANO COUNTY:
Packsaddle Mountain.*
Yoakum Hollow.*

TRANS-PECOS REGION.**

THOROGUMMITE. *A Hydrated Uranium Thoro-Silicate.*

"This mineral, of which we have been able to gather about one kilo, occurs intimately associated with fergusonite and cyrtolite, and masses up to three ounces have been found, though for the most part it is in very small pieces. It is of a dull yellowish-brown color, has hardness above that of gummite, or 4-4.5, and occurs commonly massive, though several well defined groups of zircon-shaped crystals have been discovered with angles near to those of zircon. It has a characteristic color, after ignition, becoming of a dull greenish hue. Thus it is distinguished from freyalite, eucrasite and thorite, which species it otherwise resembles in some respects. Its specific gravity varies from 4.43 to 4.54. It is easily soluble in nitric acid. The analytical results are:

				Oxygen ratio.
SiO_2	13.085			43.62 = 2.000
UO_3	22.43			23.37 = 1.071
ThO_2	41.44		31.22	
Al_2O_3	0.965		2.83	
Fe_2O_3	0.845		1.59	
$(Ce\ Y)_2O_3$, etc.	6.69	Atomic weight = 135.	6.30	43.64 = 2.001
PbO	2.16		0.97	
CaO	0.41		0.73	
H_2O	7.88			43.78 = 2.008
P_2O_5	1.19			
Moisture	1.23			
	98.325			

* * * * * * *

"We name this mineral *thoro-gummite* because it is a gummite in which the water has been replaced by the thorite molecule."

W. E. Hidden and J. B. Mackintosh, *Amer. Jour. of Science,* III, Vol. 38, p. 480.

LLANO COUNTY:
Barringer Hill.* C.

TIN. See Cassiterite.

TITANIFEROUS ORES.

"The principal exposures [in the Central Mineral Region] are in Mason County east and west to Fly Gap Postoffice, in the Kothmann Hills, and on Shaft Mountain. The ore in the north 25° east trend occurs in patches or flakes in white quartz, and is usually a titaniferous magnetite or hematite. That which lies in the north-south (Texian) trend is more frequently contaminated with traces or notable proportions of the rare metals of Burnetian ilk. Ordinarily this class of ore may be readily

distinguished from the hematite by the glistening surfaces and the brittleness of the material, as well as by the black streak and powder. As a rule only a small portion of the whole is attracted by an ordinary hand magnet." T. B. Comstock. Second Ann. Rept. Geol. Surv. of Texas, p. 630.

EL PASO COUNTY:
Carrizo Mountains. C.

LLANO COUNTY:
Near Field Creek. C.

MASON COUNTY:
Near Fleming. C.
Shaft Mountain. C.

TITANITE. *Sphene.* Ca O. Ti O_2. Si O_2.

Crystals wedge shaped and flattened; prismatic. Contact and cruciform penetration twins not uncommon. Massive, compact. Brown, gray, yellow, black—in some forms red or green. Lustre adamantine-resinous. Specific Gravity, 3.4-3.56. Hardness, 5-5.5.

LLANO COUNTY. (Min. Res. U. S., 1887, p. 793.)

TOPAZ. $[Al\ (F.\ OH)]_2\ Si\ O_4$.

Prismatic crystals. Columnar, granular. Yellow of different shades, white, gray, blue, greenish, reddish. Brittle. Fracture subconchoidal. Vitreous lustre. Specific Gravity, 3.4-3.6. Hardness, 8.

ANDERSON COUNTY:
Transported crystals have been found near Palestine. See *American Journal of Science,* III, Vol. 47, May, 1894, p. 403.

TORBERNITE. *A Hydrous Phosphate of Uranium and Copper.* Cu $(U\ O_2)_2\ P_2\ O_8 + 8H_2\ O$.

Crystals square tabular either thick or thin; rarely pyramidal. Micaceous, foliated. Green of various shades. Laminae brittle. Specific Gravity, 3.4-3.6. Hardness, 2-2.5.

EL PASO COUNTY:
Hunter Mine. C.
"Uranium in the shape of torbernite, uranochre, uranpecherz, etc., is found in the material of all prospects of the Hunter District (first range of the Quitman Mountains."—von Streeruwitz.

TOURMALINE. *A Complex Silicate of Boron and Aluminum with Magnesium or Iron, etc.*

Crystals prismatic, three, six or nine-sided. Sometimes slender and even acicular. Faces striated vertically. Occasionally massive, compact; also columnar.

Common variety black, brownish black. Other varieties of various colors—blue, green, red.

Lustre vitreous. Specific Gravity, 2.98-3.20. Hardness, 7-7.5.

BURNET COUNTY:
Hoover Valley.*
Spring Creek.*

LLANO COUNTY:
Johnson Creek.*
Near Sharp Mountain.*
Public Pen Creek.*
Riley Mountain.*
Upper Crossing of Llano River.*

MASON COUNTY:
Martin Creek, near Fleming.*

TRANS-PECOS REGION.**

TURQUOIS. *Turquoise. A Hydrous Phosphate of aluminum containing a compound of copper.*

In seams and grains, encrusting, stalactitic, etc. Color blue, green, gray. Luster waxy, dim. Specific Gravity, 2.6-2.86. Hardness 6.

EL PASO COUNTY:
Quitman Mountains. C.
LLANO COUNTY.

TRAVERTINE. *Calc-sinter. Calc Tufa. Calcium Carbonate.* $Ca\ C\ O_3$.

A deposit of calcium carbonate from springs and rivers closely related to stalagmite.

BURNET COUNTY:
Spring Creek.*
White Bluff, Morgan Creek.

LLANO COUNTY:
Two miles east of Smoothing Iron Mountain on Brady Road.*

MCCULLOCH COUNTY:
At the crossing of the river west of Voca.*

SAN SABA COUNTY:
North of Sloan's house on San Saba River.*

TREMOLITE. *A variety of Amphibole. Calcium-magnesium Amphibole.* $Ca\ Mg_2\ (Si\ O_4)_3$.

Crystals long-bladed or short and stout; also columnar, fibrous. Massive granular compact. White to gray; sometimes transparent. Specific Gravity, 2.9-3.1. Hardness, 5-6.

LLANO COUNTY:
One mile west of crossing of Pecan Creek, Lone Grove and Valley Springs Road.*
East base of Packsaddle Mountain.*

TUFA. *See Travertine.*

TURGITE. *Hydrohematite. Hydrous Ferric Oxide.* $2Fe_2\ O_3 . H_2\ O$.

Like Limonite; streak red. Specific Gravity, 4.14-4.6.

LLANO COUNTY:
Chaney's Diggings, Packsaddle Mountain.*
Seven miles above Lone Grove, Little Llano Creek.*
Near Sutton's, Hensley Survey. C.

MASON COUNTY:
Caylor's Diggings.*
James River.*
Seven miles from Mason on Junction City Road.*
Hinton Creek Gap. C.

MCCULLOCH COUNTY:
Camp San Saba. C.

SAN SABA COUNTY:
Hinton Creek.*
Deep Creek. C.

URACONITE. *See Uranochre.*

URALITE?

"Pyroxene altered to amphibole. The crystals, when distinct, retain the form of the original mineral ,but have the cleavage of amphibole. The change usually commences on the surface, transforming the outer layer into an aggregation of slender amphibole prisms, parallel in position to each other and to the parent pyroxene. When the change is completed the entire crystal is made up a bundle of amphibole needles or fibres. The color varies from white (Tremolite) to pale or deep green, the latter the more common."—Dana.

LLANO COUNTY:
Houston & Texas Central Railroad lands (stained with malachite).*

URALORTHITE. *See Allanite.*

A variety of allanite with large crystals. Black; gray powder.

LLANO COUNTY:
Babyhead Mountain.*

URANINITE. *See Nivenite.*

Crystals not common. Massive, botryoidal, or in grains. Gray, green, brown, black. Lustre submetallic, greasy, pitch-like, dull. Brittle. Specific Gravity, 9-9.7. Hardness, 5.5.

URANIUM.

EL PASO COUNTY:
"Uranium in the shape of torbernite, uranochre, uranpecherz, etc., is contained in all the materials of all prospects of the Hunter District (first range of the Quitman Mountains)."** — von Streeruwitz, Geol. Surv. of Texas, Second Ann. Rept., 1890, p. 712. C.

URANOCHRE. *See Uranium above. A Uranium Sulphate.*

Amorphous or earthy. Of a lemon or orange-yellow color.

EL PASO COUNTY:
Hunter District, Quitman Mountains.**

URANPECHERZ. *See Pitchblende.*

VERMICULITE. *Hydrous-magnesium-aluminum-ferrous-silicate.*

A member of the so-called "Vermiculite Group," which includes a number of mica-like minerals, hydro-silicates, said to be alteration products of the micas.

According to Crossley (Dana, Min. 3rd Ed., p. 291, 1850), Vermiculite occurs in small foliated scales, distributed through a steatitic base, hence scaly-massive. H. 1-2 G.=2.756; lustre somewhat talc-like; color grayish, somewhat brownish.—Dana. Syst. Min., 6th Ed., p. 665.

LLANO COUNTY:
Mexican Diggings, Babyhead Mountain.*

VESUVIANITE. *Idocrase. Aluminum-calcium-magnesium-iron silicate. Formula uncertain.*

Crystals prismatic or pyramidal. Columnar, massive, granular. In color brown, green, yellow. Streak white. Lustre vitreous—resinous. Specific Gravity, 3.35-3.45. Hardness, 6.5.

BURNET COUNTY:
Garnet Diggings.*
"Clear Creek."—Dana.

LLANO COUNTY:
Barringer Hill.*
Babyhead Region.*
Ten miles west of Llano. C.

VOIGTITE.

A hydrated Biotite?

CENTRAL MINERAL REGION.
LLANO COUNTY.(?)

WAD. *Bog Manganese. Manganese Dioxide+Water mixed with oxide of Iron, etc.*

Massive or reniform, compact, earthy, encrusting. Black or brownish black. Specific Gravity, 3-4.26. Soft usually; sometimes 6 in Hardness.

EL PASO COUNTY:
In prospects west of the Sierra Blanca.**
Hunter District, Quitman Mountains.**

LLANO COUNTY:
Cold Creek.*
Babyhead Region.*

MASON COUNTY:
Spiller Mine, fifteen miles northeast of Mason.

SHELBY COUNTY:
"One mile south of Tenaha, in nodules, on line of H. E. & W. T. R. R."—J. B. Walker.

TRANS-PECOS REGION.**

WOCHEINITE. *A clay-like variety of Beauxite.*

Color gray, or if oxide of iron be present red.

LLANO COUNTY:
Yoakum Hollow, Little Llano Creek Region.*

WOLFRAMITE. *Wolfram. Tungstate of Iron and Manganese.* (Fe, Mn) W O_4.

Crystals tabular or prismatic; prismatic faces vertically striated. Laminated, bladed, columnar, granular. Color grayish or brownish black. Specific Gravity, 7.2-7.5. Hardness, 5-5.5. Lustre submetallic. Brittle. May be slightly magnetic.

CENTRAL MINERAL REGION.*

EL PASO COUNTY:
With cassiterite (tin ore), ten miles north of El Paso.
North of Van Horn.

TRANS-PECOS REGION.**

WOLLASTONITE. *Tabular Spar.* Ca O. Si O_2.

Crystals tabular or prismatic. Massive and cleavable, reticulated fibrous, compact. Color white or gray tinged with brown, yellow, red. Lustre vitreous to pearly. Hardness, 4.5-5. Specific Gravity, 2.8-2.9. Streak white. Brittle.

GILLESPIE COUNTY. C.

WOOD OPAL. *See Opal.*

WULFENITE. *Lead Molybdate.* Pb Mo O.

Crystals square tabular; may be very thin; also octahedral and prismatic. Occurs also in granular massive form, either coarse or fine. In color yellow, greenish, grayish, white, orange, red. Streak white. Specific Gravity, 6.7-7. Hardness, 2.75-3.

EL PASO COUNTY:
Quitman Mountains. C.
Garlin Mine. C.

TRANS-PECOS REGION.**

YTTRIALITE. *Yttrium-Thorium Silicate.*

"The mineral which we have named *Yttrialite* was discovered associated with, and often upon, the gadolinite, and but for its characteristic orange-yellow surface alteration (that of gadolinite immediately alongside of it being invariably of a dull brick-red color) it might have continued to pass for 'green-gadolinite,' which was the local name given to it. Of these yellowish masses one weighed over ten pounds, and twenty kilos were found in all. Upon being broken open they are of an olive-green color, tending in places to a drab shade. Peculiar minute ragged lines permeate the mineral in all directions, causing an apparent muddiness or semi-opacity. No crystals have as yet been observed, but a seem-

ingly ortho-rhombic symmetry was apparent in some of these masses. The mineral breaks easily in two directions with a shell-like fracture, but separates into small flakes very readily. (Gadolinite is broken only with difficulty.) Nothing like a cleavage has been noticed. A thin white crust of a mineral related to tengerite occupies the cracks in the mineral, and this is equally true concerning the gadolinite of the locality, as Genth has already noted. We have named the mineral *yttrialite,* in allusion to the prominent part played by the yttria earths in its composition.

"The specific gravity is 4.575; hardness=5-5.5. It is readily soluble in hydrochloric acid. When heated over the Bunsen flame it decrepitates violently, and falls to powder upon being ignited over a blast, becoming snuff-brown, infusible and insoluble. These characteristics serve to at once distinguish it from gadolinite, which has specific gravity from 4.2 to 4.3 (Texas varieties), and which, when heated, glows vividly and swells into ragged fragments. The analysis shows several fractions of the yttria earths (A, B, C, D), which were separated by successive precipitations with sodium sulphate. The atomic weight of each fraction was determined, showing successive increase with each separation. The fractionation was discontinued after the fourth separation, as the amount of material was getting very small, but the atomic weight shows that the lanthanum and didymium are still mixed with an earth of higher atomic weight.

"The results obtained are as follows:

			Oxygen ratio.	
SiO_2	29.17%			97.234=4
Pb O	0.854		0.383	
$Tb O_2$	12.00		9.108	
Mn O	0.77		1.084	
Fe O	2.89		4.014	
Ca O	0.60		1.071	
$Al_2 O_3$	0.55		1.617	
$Ce_2 O_3$	1.86		1.722	
		Atomic weight.		72.918=3
(A) $Y_2 O_3$	22.67	= 110.3	25.320	
(B) $Y_2 O_3$	5.30	= 110.53	5.910	
(C) $Y_2 O_3$	4.50	= 114.9	4.860	
(D) $Y_2 O_3$	14.03	= 120.	14.616	
$(La, Di)_2 O_3$ etc	2.94	= 162.	2.370	
$U O_3$	0.83		0.843	
Ignition loss	0.79			
	99.754			

Total yttria earths = 46.50%.....erbia spectrum distinct."

Hidden and Mackintosh, *Amer. Jour. of Science,* III, Vol. 38, pp. 477-478. December, 1889.

LLANO COUNTY:
Barringer Hill.*

ZINC BLENDE. *See Sphalerite.*

ZOISITE. *Calcium Aluminum Silicate, or Calcium-aluminum-iron Silicate.* $4Ca O. 3Al_2 O_3. 6Si O_2. H_2 O.$

Prismatic crystals striated vertically. Massive, columnar, compact. Gray, yellowish brown, greenish, red. Lustre vitreous. Transparent to subtransparent. Specific Gravity, 3.25-3.37. Hardness, 6-6.5.

LLANO COUNTY:
Near Babyhead.*

A SUMMARY OF THE MINERALS OF TEXAS BY COUNTIES.

ANDERSON COUNTY:
Asphaltum; Calcite; Chalcocite; Lignite; Limonite; Petroleum; Pottery Clay; Pyrite; Rock Salt; Topaz (transported).

ANGELINA COUNTY:
Natural Gas; Lignite.

ARCHER COUNTY:
Chalcocite; Coal; Malachite.

ARMSTRONG COUNTY:
Gypsum.

ATASCOSA COUNTY:
Natural Gas; Lignite.

AUSTIN COUNTY:
Pottery Clay.

BASTROP COUNTY:
Brick Clay; Gypsum; Lignite; Melanterite; Yellow Ochre; Petroleum; Pottery Clay; Pyrite.

BAYLOR COUNTY:
Permian Copper Ore.

BELL COUNTY:
Petroleum; Pottery Clay.

BEXAR COUNTY:
Bat Guano; Brick Clay or Earth; Natural Gas; Lignite; Petroleum; Pottery Clay.

BLANCO COUNTY:
Bat Guano.

BOSQUE COUNTY:
Meteoric Iron.

BOWIE COUNTY:
Brick Clay or Earth; Lignite; Pearls; Pottery Clay.

BRAZORIA COUNTY:
Brick Clay; Natural Gas; Gypsum; Petroleum; Pottery Clay; Rock Salt; Sulphur.

BRAZOS COUNTY:
Brick Clay or Earth; Lignite.

BREWSTER COUNTY:
Agate; Aragonite; Asphaltum; Calcite; Calomel; Cerargyrite; Cinnabar; Coal; Fluorite; Graphite; Gypsum; Jasper; Mercury; Metacinnabarite; Petroleum; Pyrolusite; Terlinguaite.

BROWN COUNTY:
Coal; Epsomite; Natural Gas; Petroleum.

BURLESON COUNTY:
Lignite; Petroleum; Pottery Clay; Pyrite; Sulphur.

BURNET COUNTY:
Actionolite; Agate, Albite; Almandite; Amethyst; Amphibole; Ankerite; Apatite; Asphaltum; Azurite; Bat Guano; Beauxite; Biotite; Bronzite; Calcite; Cassiterite; Celestite; Chalcopyrite; Chert; Cuprite; Enstatite; Epidote; Fassaite; Ferrocalcite; Fibrolite; Galena; Grossularite; Hematite; Hypersthene; Kaolite; Labradorite; Limonite; Lithomarge; Magnetite; Malachite; Molybdenite; Oligoclase; Orthoclase; Pyrite; Pyrolusite; Pyroxene; Quartz; Tourmaline; Travertine; Vesuvianite.

CALDWELL COUNTY:
Brick Clay or Earth; Lignite; Limonite; Petroleum.

CAMERON COUNTY:
Pottery Clay.

CAMP COUNTY:
Lignite; Limonite; Pottery Clay.

CASS COUNTY:
Lignite; Limonite; Pottery Clay.

CHEROKEE COUNTY:
Brick Clay or Earth; Lignite; Limonite; Red Ochre.

CLAY COUNTY:
Petroleum.

COLEMAN COUNTY:
Coal; Natural Gas; Petroleum.

COLLIN COUNTY:
Pottery Clay.

COLORADO COUNTY:
Natural Gas; Pottery Clay.

COMAL COUNTY:
Bat Guano.

COMANCHE COUNTY:
Flint.

COOKE COUNTY:
Asphaltum; Natural Gas; Petroleum; Pottery Clay.

CORYELL COUNTY:
Melanterite; Petroleum.

DALLAS COUNTY:
Brick Clay or Earth; Pottery Clay.

DELTA COUNTY:
Pottery Clay.

DENTON COUNTY:
Meteoric Iron; Petroleum reported; Pottery Clay.

DEWITT COUNTY:
Pottery Clay.

DIMMIT COUNTY:
Lignite.

DUVAL COUNTY:
Natural Gas; Petroleum.

EASTLAND COUNTY:
Coal.

EDWARDS COUNTY:
Bat Guano; Kaolinite; Petroleum; Sulphur.

ELLIS COUNTY:
Pottery Clay.

EL PASO COUNTY:
Amethyst; Antimony; Aragonite; Argentite; Aventurine; Azurite; Bornite; Brick Clay or Earth; Carnelian; Cassiterite; Chalcocite; Chalcopyrite; Christophite; Chyrsocolla; Coal; Copper, Native; Crednerite; Cuprite; Dihydrite; Ehlite; Galena; Gold, Grossularite; Gypsum; Hematite; Hornblende; Lampadite; Limonite; Magnetite; Malachite; Melaconite; Nickel; Nitre; Opal; Petroleum; Platinum (traces); Pitchblende (Uranpecherz); Pottery Clay; Pseudomalachite; Psilomelane; Pyrolusite; Quartz; Salt; Serpentine; Silver (Native); Siderite; Sphalerite; Stromeyerite; Sulphur; Tetrahedrite; Titaniferous Iron Ores; Tobernite; Turquoise; Uranochre; Wad; Wolframite; Wulfenite.

ERATH COUNTY:
Coal; Natural Gas; Pottery Clay.

FALLS COUNTY:
Pottery Clay.

FANNIN COUNTY:
Pottery Clay.

FAYETTE COUNTY:
Fire Clay; Natural Gas; Grahamite; Gypsum; Kaolinite; Lignite; Meteoric Iron; Sulphur.

FORT BEND COUNTY:
Pottery Clay.

FREESTONE COUNTY:
Lignite; Pottery Clay.

FRIO COUNTY:
Lignite.

GILLESPIE COUNTY:
Aragonite; Asbestus; Bat Guano; Beryl; Calcite; Chert; Chlorite; Fluorite; Galena; Gold; Hematite; Hyalite; Limonite; Magnetite; Margarodite; Pyrite; Quartz; Serpentine; Talc; Thetis Hairstone; Wollastonite.

GONZALES COUNTY:
Lignite; Limonite; Petroleum; Pottery Clay.

GRAYSON COUNTY:
Lignite; Limonite; Pottery Clay; Pyrite; Selenite.

GREGG COUNTY:
Lignite; Limonite; Pottery Clay.

GRIMES COUNTY:
Brick Clay or Earth; Natural Gas; Lignite; Petroleum; Pottery Clay.

GUADALUPE COUNTY:
Lignite; Pottery Clay.

HALE COUNTY:
Pottery Clay.

HAMILTON COUNTY:
Meteoric Iron.

HARDEMAN COUNTY:
Gypsum; Malachite.

HARDIN COUNTY:
Asphaltum; Natural Gas; Petroleum.

HARRIS COUNTY:
Natural Gas; Pottery Clay.

HARRISON COUNTY:
Fire Clay; Lignite; Limonite; Pottery Clay.

HASKELL COUNTY:
Permian Copper Ore.

HAYS COUNTY:
Bat Guano.

HENDERSON COUNTY:
Fire Clay; Lignite; Limonite; Pottery Clay.

HIDALGO COUNTY:
Pottery Clay.

HOPKINS COUNTY:
Lignite; Pottery Clay.

HOUSTON COUNTY:
Brick Clay or Earth; Lignite; Limonite; Pottery Clay; Sulphur.

HUNT COUNTY:
Asphaltum reported; Pottery Clay.

JACK COUNTY:
Asphaltum reported; Coal; Petroleum.

JACKSON COUNTY:
Natural Gas; Pottery Clay.

JASPER COUNTY:
Asphaltum; Lignite.

JEFF DAVIS COUNTY:
Jasper; Quartz.

JEFFERSON COUNTY:
Natural Gas; Petroleum; Pottery Clay; Sulphur.

KARNES COUNTY:
Lignite; Pottery Clay.

KAUFMAN COUNTY:
Pottery Clay.

KENT COUNTY:
Gypsum.

KIMBLE COUNTY:
Chert.

KING COUNTY:
Gypsum.

KNOX COUNTY:
Permian Copper Ore.

LAMAR COUNTY:
Pottery Clay.

LAMPASAS COUNTY:
Bat Guano; Celestite; Strontianite.

LAVACA COUNTY:
Natural Gas; Pottery Clay.

LEE COUNTY:
Lignite; Pottery Clay.

LEON COUNTY:
Lignite; Pottery Clay.

LIBERTY COUNTY:
Natural Gas; Rock Salt.

LIMESTONE COUNTY:
Fire Clay; Natural Gas; Lignite; Pottery Clay.

LIVE OAK COUNTY:
Natural Gas; Petroleum.

LLANO COUNTY:
Actinolite; Adularia; Albite; Allanite; Almandite; Amethyst; Amphibole; Andradite; Ankerite; Apatite; Aragonite; Asbestus; Azurite; Barite; Bat Guano; Beauxite; Beryl; Biotite; Bornite; Braunite; Bronzite; Calcite; Carnelian; Cassiterite; Chalcocite; Chalcopyrite; Chert; Chlorite; Chloropal; Columbite?; Cyprine; Cyrtolite; Dolomite; Enstatite; Epidote; Fergusonite; Ferro-calcite; Fibrolite; Fluorite; Gadolinite; Galena; Goethite; Gold; Graphite; Gummite; Hematite; Hyalite; Hypersthene; Ilmenite; Jasper; Jefferisite; Kaolinite; Kerolite; Limnite?; Limonite; Mackintoshite; Magnetite; Malachite; Margarite; Margarodite; Martite; Melanite; Metagadolinite; Microcline; Molybdenite; Molybdite; Muscovite; Nivenite; Opal; Oligoclase; Orthoclase; Pearls; Penninite; Phlogopite?; Pottery Clay; Pyrite; Pyroxene; Quartz; Rowlandite; Samarskite?; Serpentine; Sphalerite; Spessartite; Talc; Tengerite; Tetrahedrite; Thorogummite; Titaniferous Iron Ores; Titanite; Tourmaline; Travertine; Tremolite; Turgite; Turquoise; Uralite?; Uralorthite; Vermiculite; Vesuvianite; Viogtite?; Wad; Wocheinite; Yttrialite; Zoisite.

MARION COUNTY:
Clay Iron Stone; Lignite; Limonite; Pottery Clay.

MARTIN COUNTY:
Asphaltic Sands reported.

MASON COUNTY:
Adularia; Andradite; Aragonite; Beauxite; Biotite; Calcite; Cassiterite; Chert; Epidote; Fibrolite; Fluorite; Galena?; Graphite; Grossularite; Hematite; Ilmenite; Keilhauite; Limonite; Magnetite; Malachite; Margarite; Microcline; Muscovite; Orthoclase; Pottery Clay; Psilomelane; Pyrite; Pyroaurite; Pyrolusite; Pyroxene; Quartz; Talc; Tephroite; Titaniferous Iron Ores; Tourmaline; Turgite; Wad.

MATAGORDA COUNTY:
Natural Gas.

MAVERICK COUNTY:
Coal.

MCCULLOCH COUNTY:
Agate; Beauxite; Biotite; Chert; Coal; Natural Gas; Hematite; Limonite; Petroleum; Pyroaurite; Travertine; Turgite.

MCLENNAN COUNTY:
Brick Clay or Earth; Meteoric Iron; Petroleum; Pottery Clay.

McMULLEN COUNTY:
Natural Gas; Lignite; Petroleum.

MEDINA COUNTY:
Lignite; Petroleum; Pottery Clay.

MILAM COUNTY:
Lignite; Limonite; Red Ochre.

MITCHELL COUNTY:
Rock Salt.

MONTAGUE COUNTY:
Asphaltum; Coal; Galena; Malachite; Meteoric Iron; Petroleum; Pottery Clay.

MORRIS COUNTY:
Lignite; Limonite.

NACOGDOCHES COUNTY:
Asphaltum reported; Natural Gas; Limonite; Petroleum; Pottery Clay.

NAVARRO COUNTY:
Natural Gas; Petroleum; Pottery Clay.

NEWTON COUNTY:
Lignite.

NOLAN COUNTY:
Gypsum.

NUECES COUNTY:
Natural Gas; Petroleum.

PALO PINTO COUNTY:
Brick Clay; Coal; Natural Gas; Petroleum.

PANOLA COUNTY:
Asphaltum; Lignite; Limonite; Magnetite Sands; Red Ochre; Yellow Ochre.

PARKER COUNTY:
Coal; Pottery Clay.

PECOS COUNTY:
Agate; Asphaltum; Natural Gas; Petroleum; Sulphur.

PRESIDIO COUNTY:
Agate; Alum; Chalcedony; Coal; Galena; Hematite; Magnetite; Malachite; Onyx; Quartz; Sphalerite.

RAINS COUNTY:
Lignite; Pottery Clay.

RED RIVER COUNTY:
Natural Gas.

REEVES COUNTY:
Petroleum; Sulphur.

ROBERTSON COUNTY:
Brick Clay or Earth; Kaolinite; Lignite; Limonite; Pottery Clay; Pyrite.

RUNNELS COUNTY:
Gypsum; Quartz.

RUSK COUNTY:
Lignite; Limonite; Pottery Clay.

SABINE COUNTY:
Lignite; Limonite.

SAN AUGUSTINE COUNTY:
Asphaltum reported; Lignite; Limonite; Petroleum.

SAN PATRICIO COUNTY:
Moss Agate.

SAN SABA COUNTY:
Agate (Banded Chert); Aragonite; Calcite; Chalcedony; Chert; Gibbsite; Limonite; Nitre; Pyrite; Travertine; Turgite.

SHELBY COUNTY:
Bat Guano; Lignite; Limonite; Petroleum; Pottery Clay; Wad.

SMITH COUNTY:
Lignite; Limonite; Pottery Clay.

STARR COUNTY:
Pottery Clay; Sulphur.

STEPHENS COUNTY:
Asphaltic Sandstone; Coal.

STONEWALL COUNTY:
Chalcocite; Gypsum; Malachite.

TARRANT COUNTY:
Petroleum; Pottery Clay.

TAYLOR COUNTY:
Malachite; Pottery Clay.

TITUS COUNTY:
Lignite; Pottery Clay.

TOM GREEN COUNTY:
Natural Gas; Meteoric Iron; Sulphur.

TRAVIS COUNTY:
Asphaltum; Bat Guano; Brick Clay or Earth; Calcite; Celestite; Chalcedony; Flint; Gypsum (Selenite); Petroleum; Pottery Clay; Pyrite; Strontianite.

TRINITY COUNTY:
Lignite; Pottery Clay.

TYLER COUNTY:
Pottery Clay.

UPSHUR COUNTY:
Lignite; Limonite; Pottery Clay.

UVALDE COUNTY:
Asphaltum; Bat Guano; Natural Gas; Gold; Jasper; Kaolinite; Lignite; Melanterite.

VAN ZANDT COUNTY:
Gypsum; Lignite; Limonite; Pottery Clay; Rock Salt.

VICTORIA COUNTY:
Pottery Clay.

WALKER COUNTY:
Lignite.

WASHINGTON COUNTY:
Natural Gas; Wood Opal; Pottery Clay; Pyrite.

WEBB COUNTY:
Grahamite; Gypsum; Lignite; Pottery Clay; Pyrite; Sulphur.

WHARTON COUNTY:
Pottery Clay.

WICHITA COUNTY:
Meteoric Iron; Permian Copper Ore; Pottery Clay.

WILBARGER COUNTY:
Permian Copper Ore.

WILLIAMSON COUNTY:
Aragonite; Bat Guano; Gold; Pottery Clay.

WILSON COUNTY:
Lignite; Pottery Clay.

WISE COUNTY:
Coal.

WOOD COUNTY:
Lignite; Limonite; Pottery Clay.

YOUNG COUNTY:
Coal.

ZAVALA COUNTY:
Coal; Lignite.

TRANS. PECOS REGION:
Agate, Banded; Agate, Cloudy; Agate, Moss; Alabaster; Alum; Amethyst; Antimony; Aragonite; Argentite; Asphaltum; Atacamite; Aventurine; Azurite; Bornite; Brick Clay or Earth; Bromyrite; Calamine; Calcite; Calomel; Cassiterite; Cerargyrite; Cerussite; Chalcedony; Chalcocite; Chalcopyrite; Christophyte; Chrysocolla; Cinnabar; Copper, Native; Crednerite; Cuprite; Cupro-Descloisite; Cyanotrichite; Dihydrite; Dolomite; Ehlite; Epidote; Flint; Fluorite; Franklinite; Galena; Gas, Natural; Glauconite; Goethite; Gold; Graphite; Grossularite; Gypsum; Hematite; Jasper; Lampadite; Limonite; Magnetite; Malachite; Massicot; Melaconite; Mercury; Metacinnabarite; Microcline; Nickel; Nitre; Onyx; Opal; Petroleum; Platinum, traces; Pitchblende (Uranpecherz); Pribramite; Pseudomalachite; Psilomelane; Pyrite; Pyrolusite; Quartz (Agate, Amethyst, Flinty, Granular, Milky, Smoky); Salt; Sagenitic Quartz; Sardonyx; Serpentine; Siderite; Silver, Native; Sphalerite; Stromeyerite; Sulphur; Talc; Terlinguaite; Tetrahedrite; Titaniferous Ores; Torbernite; Tourmaline; Turquoise; Uranium; Uranochre; Wad; Wolframite; Wulfenite.

THE SCALE OF HARDNESS.

The scale of hardness in common use covers ten pounds, as represented by the hardness of the following minerals:

1. Talc.
2. Gypsum.
3. Calcite.
4. Fluorite.
5. Apatite.
6. Orthoclase.

7. Quartz.
8. Topaz.
9. Corundum.
10. Diamond.

As a substitute for this use may be often made of the following scale taken from Crosby although the degree of accuracy is much diminished:

"1. Very soft (below 2.5); can be scratched with the nail, or very easily with the knife.

"2. Soft (2.5-4); cannot be scratched with the nail, but easily scratched with the knife.

"3. Hard (4-6); can be scratched with the knife, but not easily.

"4. Very hard (6-7); cannot be scratched distinctly with the knife, but is scratched by quartz.

"5. Adamantine (above 7); cannot be scratched by quartz.

"The figures in the parentheses give the corresponding degrees of the regular scale."

SPECIFIC GRAVITY.

The specific gravity of a mineral is a comparison of its weight with that of an equal bulk of water.

Weigh the specimen as accurately as possible on a balance; then suspend it by means of a thread from one pan of the balance, completely immerse it in water, and weigh again. Subtract the weight while immersed in water from its weight in air and the difference is the weight of an equal bulk of water. Divide the weight in air by this difference and the result is the specific gravity sought.

NOTE.—The result obtained by the above method is approximate; the professional mineralogist and chemist while employing the same plan will perform the operation with a greater degree of refinement with reference to the weighing, and the purity and temperature of the water.

STREAK.

The streak of a mineral is the color of its powder. It may be seen (if the specimen is not too hard) by scratching its surface with a knife or rubbing it on a piece of unglazed porcelain or ground glass.

LUSTRE.

1. *Metallic* as seen on metallic surfaces.
2. *Adamantine* like that of the diamond.
3. *Vitreous* as in the case of broken glass.
4. *Resinous* as the surface of yellow resins.
5. *Greasy* as oily glass.
6. *Pearly.*
7. *Silky.*

FRACTURE.

1. *Conchoidal;* breaking with curved concavities, shell-like.
2. *Even;* the broken surface, while not necessarily smooth, that of a plane.
3. *Uneven;* surface irregular.
4. *Hackly;* surface rough and jagged.

THE COMMERCIAL ASPECTS OF CERTAIN ORES IN TRANS-PECOS, TEXAS.

WM. B. PHILLIPS, DIRECTOR OF THE SURVEY.

In the preceding pages Dr. Simonds has given as complete a list of the Minerals and Mineral Localities of Texas as can now be prepared. He has been engaged upon this work for some time and has drawn upon all possible sources of information, with the result that this Survey can now offer to the citizens of this State, and others interested in the subject, an authoritative statement.

Supplementary to the report there can be given some analyses and assays of useful minerals made by Messrs. O. H. Palm and S. H. Worrell in the laboratory of the Survey during the last eighteen months. In part these relate to material collected by the former Geological Survey and deposited in the museum. A great many specimens of ores from the Trans-Pecos region were secured by W. H. von Streeruwitz ten or eleven years ago, but they do not seem to have been examined with reference to their commercial value. In re-arranging this material it was decided to assay the specimens representing the ores of gold, silver, copper, lead and zinc. This task was undertaken in such a manner as not to interfere with the regular chemical work and it is believed that the results are of sufficient importance to warrant some discussion. From El Paso county there were examined 51 specimens for gold and silver alone; 33 for gold, silver and lead, 83 for gold, silver and copper; 5 for gold, silver, copper and lead, and 9 for gold, silver, copper, lead and zinc; total number examined, 181. From Presidio county there were examined 3 for gold and silver alone; 6 for gold, silver and lead; 5 for gold, silver, copper and lead, and one for gold, silver, copper, lead and zinc; total number examined, 15. From the counties of El Paso and Presidio there were thus examined 196 specimens, of which 54 were for gold and silver alone; 39 for gold, silver and lead; 10 for gold, silver, copper and lead; 10 for gold, silver, copper, lead and zinc, and 83 for gold, silver and copper.

In every case an assay for gold and silver was made, with the result that in 143 samples gold was not found at all, in 35 samples there was a tract, and in 18 samples it varied from 0.05 oz. ($1.00 per ton) as in a gold-silver-lead ore from the Carrizo Mountains, El Paso County, to 2.0 ozs. ($41.34 per ton) as in a sample from the Presidio mine, Presidio County. In 106 samples no silver was found; in 5 samples there was a trace; in 85 samples it varied from 0.2 oz. to 4,089 ozs., as in a sample from the Presidio mine, Presidio county. It does not appear to be necessary to make any further mention of the specimens that contained neither gold nor silver, nor those that contained less than ¼ oz. gold and 6 ozs. silver, but it would be well to consider each county separately and to give tables setting forth the results of the assays of specimens that contained both gold and silver and those that contained silver.

Such tables for El Paso county now follow:

EL PASO COUNTY.

Gold and Silver Ores.

Containing as much as ⅓ oz. gold and 6 ozs. of silver per ton, or ⅛ oz. gold with less than 6 ozs. of silver; values taken at $20.67 per oz. for gold and 50 cts. for silver.

Locality.	Assay No.	Ounces per ton.		Value per ton.		
		Gold.	Silver.	Gold.	Silver.	Total.
Quitman Mountains	1669	0.50	6.00	$ 10.33	$ 3.00	$ 13.33
Quitman Mountains	1670	0.25	19.00	5.16	9.50	14.66
Quitman Mountains	1672	0.70	19.30	14.46	9.65	24.11
Quitman Mountains	1681	0.20	trace	4.13	.....	4.13
Hunter Mine, Quitman Mountains	1797	1.40	8.60	29.43	4.30	33.73
Carrizo Mountains	1800	0.50	48.00	10.33	24.00	34.33
Sierra Blanca Mountains	1673	0.20	none	4.13	.....	4.13
Franklin Mountains	1678	0.25	none	5.16	.....	5.16

There were also silver ores from El Paso county that contained as much as 19 ozs. of silver per ton with no gold or copper.

These were, in ounces per ton:

Silver Ores.

Locality.	Assay No.	Silver. Ozs. per ton.	Value per ton.
Sancho Panza Mine, Sierra Diablo	1651	37.0	$ 18.50
Carrizo Mountains	1696	54.0	27.00
Chinati Mountains	1701	19.55	9.77
Emma Clark, Quitman Mountains	1333	21.80	10.90

The analyses of the more complex ores from El Paso county are given in the following tables.

ASSAYS OF ORES FROM EL PASO COUNTY.

Silver—Lead Ores.

Locality	Assay No.	Gold. Ozs. per ton.	Silver. Ozs. per ton.	Lead. Per cent.
Bonanza Mine, Quitman Mountains	1709	none	60.0	77.0
Bonanza Mine, Quitman Mountains	1718	none	28.05	61.8
Belle, Quitman Mountains	1723	none	39.15	43.7
Gray Mule, Quitman Mountains	1729	none	11.25	27.0
Quitman Mountains	1711	none	25.80	37.0
Quitman Mountains	1712	none	31.20	68.7
Quitman Mountains	1716	none	9.00	47.4
Quitman Mountains	1720	none	57.75	49.5
Quitman Mountains	1722	none	9.15	27.3
Quitman Mountains	1725	none	16.8	16.5
Quitman Mountains	1727	none	6.0	8.9
Near Etholen, Quitman Mountains	1751	none	24.6	48.0
Quitman Mountains	1186	none	8.16	12.0
Chief Mine, Quitman Mountains	1189	none	24.00	43.0
Mt. Ord Range	1183[1]	none	75.00	60.0
Don Quixote Mine, Sierra Diablo	1710	trace	27.45	52.0
Parlin Mine, Sierra Diablo	1717	trace	43.35	51.7
Chinati Mountains	1713	none	16.50	74.0
Chinati Mountains	1730	0.45	49.50	26.2
Carrizo Mountains	1742	0.05	7.00	24.95

NOTE: [1]Assay No. 1183, of sample from Mt. Ord Range, El Paso county, should, perhaps, be from Mt. Ord Range, Brewster county, but it was marked from El Paso county and so recorded.

ASSAYS OF ORES FROM EL PASO COUNTY.

Silver-Copper Ores, some of them carrying Lead or Zinc, or both.

Locality.	Assay No.	Silver. Ozs. per ton.	Copper. Per cent.	Lead. Per cent.
Crow's Nest, Carrizo Mountains	1121	7.80	5.60	9.00
Crow's Nest, Carrizo Mountains	1188	12.00	5.50	25.20
Crow's Nest, Carrizo Mountains	1777	2.00	21.80	.....
Carrizo Mountains	1800[1]	48.00	23.90	.....
Carrizo Mountains	1802	none	38.8	.....
Carrizo Mountains	1818	none	17.1	.....
Carrizo Mountains	1859	none	14.0	.....
Hazel Mine, Sierra Diablo	1122	198.71	4.4	.....
Hazel Mine, Sierra Diablo	1781	77.0	43.0	.....
Hazel Mine, Sierra Diablo	1804	29.0	19.9	.....
Hazel Mine, Sierra Diablo	1810	60.0	44.2	.....
Hazel Mine, Sierra Diablo	1844	371.6	24.3	.....
Big Springs Gulch, Quitman Mountains	1182[2]	60.0	none	none
Barlow Mine, Quitman Mountains	1184	3.7	1.2	5.30
Thimbles Mine, Quitman Mountains	1186	8.16	trace	12.00
Alice Ray Mine, Quitman Mountains	1187	1.30	none	11.00
Hunter Mine, Quitman Mountains	1797[3]	8.60	5.40	.....
Hunter Mine, Quitman Mountains	1846	29.80	23.30	.....
Hunter Mine, Quitman Mountains	1863	4.20	6.00	.....
Sierra Blanca Mountains	1845	71.50	24.70	.....

[1]Contains also 0.5 oz. gold. [2]Contains also 15 per cent. zinc. [3]Contains also 1.4 ozs. gold.

A sample from the Don Quixote mine, Sierra Diablo, El Paso county, gave 24.2 per cent of copper, but no gold or silver, assay No. 1812; a sample from the Black Shaft, Sierra Diablo, gave 45 ozs. of silver per ton and 5.5 per cent of copper, with no lead or zinc, assay No. 1192; a sample from the Nameless Shaft, Sierra Diablo, gave 311 ozs. of silver per ton and 4.1 per cent of copper. The Hazel mine, in the foothills of the Sierra Diablo, north of Van Horn, El Paso county, has yielded beautiful specimens of native silver, besides silver chlorides, copper sulphides and native copper. W. H. von Streeruwitz (Geol. Survey of Texas, Third Annual Report for 1891, pp. 387-389) gave the following description of the Hazel mine.

"This mine is owned by Messrs. Shriver and Andrews, San Antonio, and is located about ten miles north of Allamore Station on the Texas & Pacific Railway. The gangue is nearly perpendicular. Its width to a depth of about five hundred feet averages thirty-four feet, below this depth it widens to over forty feet. Its longitudinal extension may be traced for several miles, and its nearly uniform thickness is ascertained for 1800 feet by the present workings. The gangue is in a fissure between a fine grained sandstone of probable Devonian age, which also forms the walls, and which, in the vicinity of the gangue, is more or less metalliferous. The gangue has a whitish gray colored calcareous silicate, more or less impregnated through nearly its whole width with copper and silver sulphide and other metal combinations, and numerous richer veinlets fill the space between the two principal veins known as the north and south veins.

"The north vein runs from the outcrop to the whole depth reached at the time of the examination (June, 1891), down to 575 feet, practically perpendicular. The south vein runs also perpendicular to about 150 feet, when it changes its dip slightly to the north and joins the north vein at about 455 feet from the surface. At about 350 feet from the surface another vein was struck on the south side, which joins the north vein at about 500 feet. A vein running in at 360 feet through the south wall dips nearly parallel with the north vein to the full depth of the shaft, thus forming the south vein in the deeper parts of the vein. The strike of the gangue and the veins is nearly true east and west.

"The east shaft, on which most of the work has been done, is sunk on the south vein, reaching (June, 1891) the depth of 575 feet. From this shaft every 50 feet cross-cuts are made to the north vein, determining the average width of the gangue from wall to wall to be about 35 feet. From these cross-cuts, as well as directly from the shaft, more or less extensive drifts are run in the north and south veins, and the quantity and quality of ore struck by shafting and drifting in the veins and pockets is highly promising to actual mining by stoping. The west shaft is sunk on the north vein 1800 feet west of the east shaft to a depth of 375 feet and about 350 feet of cross-cuts and drifts have been worked from this shaft. The middle shaft is 300 feet west from the east shaft, on the north vein. It is 42 feet deep, and there was a drift of about 40 feet in a material of the same character as the east shaft. The walls, as well as the gangue material in all the shafts and drifts, are sound and solid, and very little timbering is required. * * *

"The principal ores of the main veins, as well as the veinlets and pockets, are silver-bearing copper glance, gray copper, silver copper

glance, silver glance, native silver, and chlorides with more or less copper. Lead, antimony and arsenic compounds are found in traces, and traces of gold are not infrequent. Certain strongly ferruginous specimens assayed 0.95 oz. of gold and 13 ozs. of silver per ton. The gray copper yields very high assays, up to 2000 ozs, of silver, and assays of some of the copper glance exceed 600 ozs. of silver per ton. These, as well as the other combinations mentioned above, are deposited through the vein material (lime silicates, frequently with heavy spar), widening out occasionally to pockets of considerable size. The whole gangue between the east and west shaft may be regarded as filled in with low grade ore through which the richer veins, pockets and veinlets are dispersed.

* * *

"The red sandstone, in which the gangue runs to the depth of 575 feet, will probably change into a crystalline schist or granitic rock at greater depth, and this change will in all probability favorably influence the ore-bearing."

The Hazel mine is thought to have yielded about $60,000 worth of ore before it was closed down. It is one of the most promising silver-copper properties in the State, in spite of the fact that no work has been carried on there for several years.

Mr. von Streeruwitz says that some samples of the gray copper carried up to 2000 ozs. of silver and the copper glance above 600 ozs. While we have made no assays of ore of this character we did assay 7 samples from the old collections.

Hazel Mine Ore.

Assay No.	Silver. Ozs per ton.	Copper. Per cent.
1122	198.71	4.4
1653	3.60	none
1781	77.00	43.0
1804	29.00	19.9
1810	60.00	44.2
1844	371.60	24.3
1862	9.20	12.0

Last winter Mr. Thomas Owen, Van Horn, El Paso county, sent in some excellent copper ores from the district immediately adjoining the Hazel mine. The analyses of the samples sent were as follows:

Assay No.	Sample No.	Gold. Ozs. per ton.	Silver. Ozs. per ton.	Copper. Per cent.	Lead Per cent.
1442	1	none	2.3	12.7	.....
1443	2	none	2.5	5.0	13.0
1444	3	none	none	76.1	8.8
1445	4	none	none	55.6	6.8
1446	5	none	none	60.9	11.5

NOTE: **In assay No. 1442, sample No. 1, nearly all the copper was metallic, the remainder being red and black oxide.**

Mr. B. F. Hill, Assistant Geologist on this Survey, made a special

trip into the district in February, of this year, and his report is as follows:

"In the spring of the present year some rich samples of copper ore were received at the laboratory of the Survey from Mr. T. R. Owen, Van Horn. These samples were from prospects being worked by him at the time, on Block 54, public school lands, El Paso county. In February a visit was made to the locality. The prospects are located about about 18 miles north of Van Horn, a station on the Texas & Pacific Railroad. The wagon road leading to the locality is fairly good, passing through the gap between the main Diablo range and the Baylor Mountains, at the mouth of Sulphur Canyon. The prospects themselves are located in the foothills of the Diablos about one-half mile from the eastern scarp, which at this point is an almost vertical bluff about 1800 feet in height. The bluffs are of heavily bedded upper Carboniferous limestones, which lie almost horizontally upon the dark red sandstone that contains the ore deposits. The sandstone has been extensively altered and shows little evidence of bedding at the present time. Instead a species of slaty structure is visible in a great many places. There are a few fault displacements visible in the thickly bedded limestone, one overthrust fault with about 100 feet of displacement being conspicuous. The limestones are apparently unconformable upon the sandstone, whose thickness at this locality cannot be estimated, although as much as 1000 feet is exposed in bluffs on the south side of Sulphur Canyon.

The Pecos Mining Company of Pecos, Texas, composed of Messrs. Owen, Briggs and Kranskoff, has located seven claims along an altered belt in the sandstone. These claims, the Zada May, Merl, Congress, Sovereign, Silver Bean No. 1, Silver Bean No. 2, and Shorty, extend about one mile north and south and one-half mile east and west. They are located upon a "vein" in the sandstone which is indicated by a streak of yellow discoloration ranging in width from two to twenty feet. There are no distinct walls to the vein, the yellow colored sandstone passing gradually into the normal red colored variety. Within this belt there appear at intervals stringers and streaks of the ores of copper, silver and lead.

Shallow excavations have been made along the vein at intervals and at one locality a shaft was being sunk, which at that time had reached a depth of 45 feet. It was from the shaft that the samples sent to the laboratory of the Mineral Survey were obtained. At the depth of 45 feet the pay ore is found in a very narrow veinlet and consists of black oxide of copper with some sulphide.

On the dump are samples which show good values in native copper, malachite and azurite. I was informed that a considerable body of rich oxidized ore was found near the surface. A shipment of ore had been made to the El Paso smelter, but the returns were not available. Samples selected by Mr. Owen and represented as being fair samples of the pay streaks assayed as above.

Toward the southern end of the claim the surface workings show seams of the carbonates of copper and in one locality considerable lead carbonate.

West of Van Horn the cuts along the railroad show an extensive series of schists, crystalline limestones, slates and quartzites. These rocks have been badly broken and faulted and are cut in various directions by igneous intrusions and quartz veins, some of the latter being of great

width. Many minor veins with quartz and iron gangue carry small amounts of lead, copper and silver, and in some instances gold. There are numerous abandoned prospects whose name or history could not be learned, nearly all of which show some ore on the dumps. In this generald district one mine yielded considerable lead, silver and copper. Reference is made to the Hazel mine, which lies 12 miles north of Allamore. At present the mine is not being worked, but it is reported that work will be resumed shortly. The veins carrying the values cut the red sandstone in identically the same way as do the veins spoken of on Owen's prospects. On the dump are considerable quantities of low grade material that may in the future prove valuable.

As far as could be learned from the examination the sandstone rests unconformably on the series of slates, limestones, and quartzites. Only a detailed study can clear up the true structure of the county which on the whole seems to be of some promise as a mineral belt."

The Sierra Diablo, the Quitman Mts., the Carrizo Mts. and the Franklin Mts., all in El Paso county, are certainly worthy of a more detailed study than has yet been given to them, and it is proposed to send a special party there next season. From an economic standpoint the investigations of W. H. von Streeruwitz, in 1891, are about the only sources of information respecting these areas. What is now needed is a more detailed study of the geology of the region with special reference to ore deposits, together with a study of water supply. The country is arid, but it would appear to be entirely feasible to construct storage reservoirs for impounding and holding the rain water during the dry season. The underground waters of the region should also be a subject of special study, and this could be undertaken in co-operation with the Hydrographic Bureau of the United States Geological Survey. The topographic maps of the United States Geological Survey cover the following areas in El Paso county, viz.: N. W. Angle of Velentine sheet. N. E. Part Chispa sheet. Eagle Mountain sheet. Sierra Blanca sheet. Salt Basin sheet and the sheet west of Salt Basin; Fort Hancock sheet. Rio Grande sheet and El Paso sheet. Four other sheets should be added, viz.,the four north of the Chispa and the Valentine sheets and east of the Sierra Blanca and Salt Basin sheets. With the completion of these four sheets the entire mineral area of El Paso county would be covered by these excellent maps. The detailed examination of such a region with respect to its economic geology becomes much more satisfactory if undertaken *after* the topographic maps have been prepared, and it is hoped that we may be able to undertake this important work in co-operation with the Federal Government next year. The area still to be mapped in El Paso county embraces the deposits of sulphur in the northeastern part of the county, which were particularly described in Bulletin No. 2 of this Survey, issued in February, 1902. A more extended examination of these deposits is among the plans of the Survey for next year.

With respect to tin: It has been known for several years that tin ore was found in the Franklin Mountains, about 10 miles north of the city of El Paso. The deposits have been described by W. H. Weed, in Bulletin No. 178, United States Geological Survey, and what is now given concerning them is taken from this report, January, 1901.

The deposits of El Paso county lie on the east flank of the Franklin

Mountains, which are composed of Cambrian and other Paleozoic limestones. These limestones have been upturned and now rest upon an intrusive mass of coarse-grained granite which is the central core of the range. This granite appears to have been intruded between the base of the Cambrian and the underlying Archean complex, for basal quartzites occur in the drift along the arroyos. Mr. Lindgren examined the granite (sheeted near the tin veins) and reported that it was a coarse-grained normal granite, showing much anhedral quartz with anhedral feldspar, largely microperthite, with some few grains of microcline. A few small flakes of brownish-green hornblende and some small grains of magnetite were also observed. The rock is a soda-granite. White aplite-granite occurs in veinlets and irregular masses intrusive in the granite, but none was observed near the tin veins.

The tin ore is cassiterite (oxide of tin), with wolframite (a compound of tungstic acid, iron and manganese) in a quartz gangue, and occurs as a granular mixture of tin ore and quartz and resembles the greisen of the European tin deposits. This greisen is a quartz-cassiterite rock. It is coarsely granular and consists of anhedral quartz (quartz without visible crystal-planes) with which there are mixed slightly brownish grains of cassiterite. The quartz contains fluid inclusions. Mr. Weed took no samples, so that no assays are given in his report. Some shallow shafts had been sunk and a few cross-cuts run, but the development work was not of an extensive character. Assays of selected samples of the rich ore gave, in the laboratory of this Survey, as much as 42 per cent. of tin, but the average will be much below this. If, on the average, the ore should be found to carry 3 per cent. of tin and if it exists in sufficient quantity this property would be extremely valuable. It belongs to Mr. C. R. Moorhead, El Paso. It is our purpose to make a detailed examination of the locality next season. The United States does not produce any tin, the supply coming from Cornwall, the Straits Settlements (Banca), Borneo, etc.

ORES FROM PRESIDIO COUNTY.

From Presidio county there were examined three samples for gold and silver alone. Two of these were marked "Cibolo Mine," and one "Presidio Mine." Of the two from the Cibolo mine one contained neither gold nor silver, the other contained a trace of gold and 435.3 ozs. of silver per ton, assay No. 1654. The sample from the Presidio mine gave no gold but vielded 131.45 ozs. of silver per ton, assay No. 1655.

Six samples were assayed for gold, silver and lead. The results were as follows:

Ores from Presidio County.

Locality.	Assay No.	Gold. Ozs. per ton.	Silver. Ozs. per ton.	Lead. Per cent.
Shafter Mine	1185	none	60.00	5.5
Presidio Mine	1737	0.3	4.5	trace
Presidio Mine	1738	none	24.6	74.0
Presidio Mine	1739	none	2.8	14.0
Presidio Mine	1740	none	120.9	trace
Mexican House	1741	trace	8.25	37.5
Chinati Mountains				

Five samples were examined for gold, silver, copper and lead with the following results:

Ores from Presidio County.

Locality.	Assay No.	Gold. Ozs. per ton.	Silver. Ozs. per ton.	Copper. Per cent.	Lead. Per cent.
Cibolo Mine	1127	none	56.21	trace	trace
Presidio Mine	1130	none	177.8	none	none
Presidio Mine	1131	2.0	4,089.0	3.0	none
Presidio Mine	1132	trace	2,892.0	trace	trace
Spanish Mine	1134	none	20.7	none	trace

The sample represented by assay No. 1131 carrying 2 ozs. of gold and 4,089 ozs. of silver with 3 per cent of copper, is the richest specimen of ore from Texas that we have examined. Assay No. 1132 also represents an excellent silver ore, although it carried no gold or copper.

One sample of zinc blende, marked "Shafter Mine," contained a trace of gold and lead, no copper, 1.4 ozs. of silver per ton and 44 per cent of zinc.

The only continuously successful silver mine in Texas is at Shafter, Presidio county, 47 miles west of south from Marfa. It has been in active operation for 15 or 16 years and is credited with nearly $7,000,000 worth of silver. Its affairs have been conducted quietly and no stock is offered for sale. The Cibolo and the Presidio mines are included in the property. The assays given represent picked specimens and the average content of silver is by no means so high. The ore is held in limestone and is a free-milling quartz. The mill has 15 stamps and wet crushing and amalgamation is the process used for the extraction of the silver. There is but little galena and when found it is in pockets.

The silver mines at Shafter are the only mines now in operation in Presidio county or that have been so for several years. We can not enter upon a discussion of the question why the other properties in that county are not worked. Some of them are certainly of as good promise as the Shafter mines were when they were opened, and of one or two it may be said that they are of better promise than these were. The same is true of some properties in El Paso county.

Ten years ago W. H. von Streeruwitz called attention to the lack of systematic and competent prospecting, but there has been little or no development since. In the whole of the Trans-Pecos region the only mining operations that need be considered are at the silver mines near Shafter, Presidio county, and at the quicksilver mines, near Terlingua, Brewster county. These latter have been so fully described by B. F. Hill, in Bulletin No. 4 of the University of Texas Mineral Survey, October, 1902, that nothing further can now be said.

There are no mines of copper, or lead, or zinc, in operation in the Trans-Pecos.

ANNOUNCEMENT.

The Chemical Laboratory of the University of Texas Mineral Survey is fully equipped for all kinds of analytical work, assaying, etc. Prompt attention will be given to all such business.

Address

DR. WM. B. PHILLIPS,
Director.