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**BULLETIN 7**

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COLORADO STATE GEOLOGICAL SURVEY  
BOULDER

R. D. GEORGE, State Geologist

BULLETIN 7

# BIBLIOGRAPHY OF COLORADO GEOLOGY AND MINING

WITH SUBJECT INDEX

FROM THE EARLIEST EXPLORATIONS  
TO 1912

BY

OLIVE M. JONES



DENVER, COLORADO  
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LETTER OF TRANSMITTAL

STATE GEOLOGICAL SURVEY,  
UNIVERSITY OF COLORADO, August 1, 1914.

*Governor Elias M. Ammons, Chairman, and Members of the  
Advisory Board of the State Geological Survey.*

GENTLEMEN: I have the honor to transmit herewith Bulletin  
7 of the Colorado Geological Survey.

Very respectfully,

R. D. GEORGE,  
State Geologist.



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# Bibliography of Colorado Geology and Mining with Subject Index

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## INTRODUCTION

The geological literature of Colorado is very extensive and has appeared in a very large number of publications. No single library in the United States, much less any library in Colorado, contains copies of all the papers, reports, maps and illustrations bearing on the geology of the state. Much valuable information published in the newspapers of the state and of the country from the early days of western exploration to the present time has been lost beyond recovery.

The authentic geological and geographical literature of Colorado may be said to begin with the accounts and reports of the early explorations. The records of the discoveries of Coronado in 1540, and Escalante in 1776 are followed by the much more complete reports of the American explorers, beginning with Pike in 1805 and 1806; Long in 1820; Bonneville in 1832; Fremont in 1842 to 1853; Gunnison and Beckwith in 1853; and Macomb and Newberry in 1859 and 1860. These reports were published by the War Department, and form an important part of the early literature bearing on the region. Later surveys were made under the authority of the Department of the Interior, and extensive reports accompanied by excellent maps were published by the government. The principal organizations which carried on work in the territory now comprising the state of Colorado were as follows: The Geological Exploration of the Fortieth Parallel, under the direction of Mr. Clarence King, from 1867-1872; The Geological and Geographical Survey of the Territories under Dr. F. V. Hayden, from 1867-1879; The Geographical Survey West of the One Hundredth Meridian, under Capt. George M. Wheeler, and the Geographical and Geological Survey of the Rocky Mountain Region, under Maj. J. W. Powell. Many valuable contributions to the literature of this period are also to be found in the scientific journals and periodicals of the time.

To the present United States Geological Survey must be credited by far the greatest amount of recent literature bearing on the geology of Colorado. Many valuable contributions are also to be found in the reports of the departments of the state of Colorado devoted to geology and mining, together with the publications of the different institutions of learning within the state, the publications of the learned societies, and scientific and mining magazines.

In order that this extensive literature may be made more available to the public a bibliography of Colorado geology has been prepared. It covers the literature of general and economic geology, paleontology, petrology, mineralogy, and mining, from the earliest publications to the end of 1912, and follows, in general, the plan and arrangement of the bibliographies of North American geology published by the United States Geological Survey. Many of the entries and references in the present work are taken, with little or no change, from the bibliographies of the United States Geological Survey.

The papers, with full title and medium of publication and explanatory note, when the title is not fully self-explanatory, are listed under the authors, arranged in alphabetic order. The author index is followed by an index to the literature listed. In this index the entries will be found in straight alphabetic arrangement. Lists of chemical analyses, minerals described, rocks described, and geologic formations described follow immediately after the index.

Many of the publications listed in the bibliography are available to the public in the libraries of the following institutions: University of Colorado, State School of Mines, Colorado College, State Agricultural College, Denver University, and the Colorado Scientific Society. They may also be found in the public libraries of the larger cities, as Denver, Pueblo, and Colorado Springs. If the local library does not possess the publication desired, under the system of inter-library loans the Library of Congress, Newberry, John Crear and other libraries will lend books to libraries for the use of investigators engaged in serious research.

The author wishes to acknowledge the valuable assistance rendered by Professor Ralph D. Crawford, Professor Junius Henderson, and Professor W. E. McCourt, and to Professor R. D. George the author is especially grateful for criticisms and suggestions during the progress of the entire work. Thanks are also

due the Denver Public library, the State School of Mines library, and the Colorado Scientific Society library for the special privilege of consulting their files of periodicals not immediately accessible to the Geological Survey.

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## Cross, Whitman—Continued.

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Describes the topographic features, the granite and metamorphic rocks, the occurrence and distribution of the Algonkian, Cambrian, Silurian, Carboniferous, Jurassic, Cretaceous, and Eocene strata. Describes the occurrence and petrographic characters of diabase, syenite, andesite, rhyolite, trachyte, phonolite, the geographic distribution of the sedimentary and igneous formations, and the structural development of the region. Includes a topographic, colored areal geologic, economic geologic, and structure section maps.

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**Cross, C. Whitman, Eldridge, Geo. H., and Emmons, S. F.**

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**Cross, Whitman, and Hillebrand, W. F.**

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**Cross, Whitman, and Hole, Allen D.**

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**Cross, Whitman, Howe, Ernest, and Ransome, F. Leslie.**

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Gives an outline sketch of the physical history and general geology, describes the occurrence, character, and relations of Archean, Algonkian, Cambrian, Devonian,

**Cross, Whitman, Howe, Ernest, and Ransome, F. Leslie.**—Con.

Carboniferous, and Tertiary rocks, of Quaternary deposits, and of eruptive rocks, and the physiography and geologic history and structure, and discusses in detail the petrology of the quadrangle. Economic geology: Describes the system of fissures, the relations of the ores to the fissures, the minerals occurring in the lodes, and the character, distribution, origin and value of the ore deposits containing gold, silver and lead. By Fredrick L. Ransome.

**Cross, Whitman, and Howe, Ernest.**

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Discusses the occurrence, character, and relations of strata, collectively called Red Beds, in southwestern Colorado, their subdivisions and correlation with Red Beds elsewhere.

**Cross, Whitman, Howe, Ernest, and Irving, J. D.**

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Describes the topography, the character, occurrence, and relations of Algonkian, Devonian, Carboniferous, Triassic, Cretaceous, Tertiary, and Quaternary deposits, and of igneous surface and intrusive rocks, geologic structure and history, and the economic resources, chiefly gold, silver and coal.

**Cross, Whitman, Howe, Ernest, Irving, J. D., and Emmons, W. H.**

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Describes the physiographic features, the occurrence, character, and relations of metamorphic and igneous rocks, and of Algonkian, Cambrian, Devonian, Carboniferous, and Tertiary strata, and the geologic structure and history of the area. Describes the character, occurrence, and relations of the gold and silver ores.

**Cross, Whitman, and Iddings, J. P.**

1. On the wide spread occurrence of allanite as an accessory mineral constituent of many rocks. See Iddings, J. P., and Cross, Whitman.

**Cross, Whitman, and Penrose, R. A. F., Jr.**

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Chap. I. Describes the geographic position and geologic character of the district and its recent physiographic changes. Chap. II. Rock formations. Describes the petrographic character of the granite, schist, diabase, phonolite, nepheline syenite, augite syenite porphyry, andesite, tuff, breccia, rhyolite, and the High Park lake beds. Chap. III. The Cripple Creek volcano. Describes the constitution and distribution of the fragmental materials and the character of the volcanic phenomena. Chap. IV and V. Comprise a description of the distribution of the volcanic rocks in the central area and its outlying districts. Chap. V and VI. Give an historical account of mining at Cripple Creek. Describe the mineralogic character and superficial alteration of the gold ores. Discuss the mode of occurrence and deposition of the ores. Contain detailed descriptions of the mines. Contain a discussion of the chemical characters of calaverite by W. F. Hillebrand and of its crystallographic characters by S. L. Penfield.

**Cross, Whitman, and Purington, Chester Wells.**

1. **Description of the Telluride quadrangle.** U. S. Geol. Surv., Geol. Atlas of U. S., folio no. 57, 1899. Review: Am. Jour. Sci., 4th ser., vol. 9, p. 387, 1900.

Describes the general physiography and geology of the San Juan region, and the occurrence and character of the Algonkian, Jura-Trias, Cretaceous, Tertiary and igneous rocks of the quadrangle, and discusses the geologic history. Includes topographic and geologic maps, columnar sections, and special illustrations. Economic geology: Describes the fissures and veins of the region, and the occurrence, character, and origin of the gold and silver ores.

**Cross, Whitman, and Ransome, F. L.**

1. **Description of the Rico quadrangle.** U. S. Geol. Surv., Geol. Atlas of U. S., folio no. 130, 1905.

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**Cross, Whitman, Spencer, Arthur Coe, and Purington, Chester Wells.**

1. Description of La Plata quadrangle. U. S. Geol. Surv., Geol. Atlas of U. S., folio no. 60, 1899.

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**Cross, Whitman, and Spencer, Arthur Coe.**

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**Cross, R. T.**

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**Crow, Wade L.**

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**Crows, Thomas B.**

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**Cumenge, E., and Freidel, C.**

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**Cummings, G. W.**

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**Curle, J. H.**

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**Curran, Thomas F. V.**

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**Dall, W. H.**

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3. Record of North American geology for 1887 to 1889 inclusive. U. S. Geol. Surv., Bull. 75, 173 pp., 1891.
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**Darton, N. H.**—Continued.

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4. Types of orographic structure. Am. Jour. Sci., 3rd ser., vol. 12, pp. 414-428, 1876.

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Blackhawk,	Huerfano,	Pueblo,
Boulder,	Ignacio,	Rangely,
Canon City,	Kit Carson,	Rico,
Castle Rock,	Lake City,	Sanborn,
Catlin,	Lamar,	San Cristobal,
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Crested Butte,	Limon,	Telluride,
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- 26b. On the geology and physiography of a portion of north-western Colorado and adjacent points in Utah and Wyoming. *U. S. Geol. Surv.*, 9th Ann. Rept., pp. 677-712, Illust., 1889. Abstract: *Am. Geol.*, vol. 7, pp. 57-58, 1891.

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**White, C. A., Marvin, A. R., Endlich, F. M., and Peale, A. C.**

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ore deposits: Bancroft, G. J., 6; Emmons, 12; Lakes, 66, 83, 195, 248; Pearce, 15; Rickard, T. A., 28.

placers: Bradford and Curtis, 1; Brown, T. A., 1; Crow, 1; Janin, C., 1; Lakes, 121, 143, 191, 195, 197, 199, 206, 256, 257, 259; Lakes, A., jr., 1; Mg. Rept., 2, 4; Of, 1.

**Breckenridge.**—Continued.

Wellington mine: Henahan, 1; Lakes, 234.

zinc-lead ores, concentration of: Lawrence, D. H., 1.

**Breckenridge quadrangle**, map: U. S. G. S.

**Brick**, production, 1888: Day, 4. *See* annual volumes on Mineral Resources, U. S. Geol. Surv.

**Brick clay.**

*General*: Lakes, 165; Ries, 1.

Apishapa quadrangle: Stose, G. W., 1.

Boulder district: Fenneman, 5.

Denver Basin: Emmons, Cross and Eldridge, 2.

Golden: Hague, J. D., 1.

**Brick and tile**, production: 1902-1905: Day, 15, 16, 17, 18—1906-1907: Thom, 1, 2—1908: Middleton, 1, 2.

**Briquets**, from Colorado coal: Mills, J. E., 1.

**Browns Park**: Davis, W. M., 4; Powell, 1, 2, 3, 4; White, 26.

**Bruins Peak**, mica slate: Zirkel, F., 1.

**Brule clay**: Darton, 9; Osborn, 4.

**Brush Creek**, minerals from, analysis of: Clarke, F. W., 6.

**Bryozoa**, bibliography and catalogue, Paleozoic: Nickles and Bassler, 1.

Chazy: Nickles and Bassler, 1.

Cincinnati: Nickles and Bassler, 1.

Devonian: Nickles and Bassler, 1.

Mesozoic: Nickles and Bassler, 1.

Mississippian: Nickles and Bassler, 1.

Paleozoic, bibliography and catalogue: Nickles and Bassler, 1.

Silurian: Nickles and Bassler, 1.

**Buckhorn mine** described: Lakes, 102.

**Buena Vista**, bauxite from: Ohly, 7.

**Buffalo Peaks**, andesite, analysis of: Cross, 1.

geology of: Emmons, 5.

minerals from, analysis of: Clarke, F. W., 6; Clarke and Hillebrand, 1.

**Building material.** *See also* cement, granite, limestone, marble, sandstone.

**Building stone.**

*General:* Bailar, 3; Chauvenet, 1; Emmons, S. F., 7; Fenneman, 5; Foster, E. L., 1; Foster, Wm., 1; George, 5; Harris, C. H., 1; Hawes, G. W., 1; Henahan, 1; Lakes, 5, 51, 94, 203, 219, 235; Lee, H. A., 1; Smith, J. A.

Apishapa quadrangle: Stose, G. W., 1.

Boulder county: Fenneman, 5; Langridge, 1; Lee, H. A., 9.

Denver Basin: Emmons, Cross, and Eldridge, 2.

Elk Mountains: Emmons, Cross, and Eldridge, 1.

exhibit at World's Columbian Exposition: Day, 8.

Georgetown: Spurr, Garry, and Ball, 1.

granite: Lakes, 165.

Gunnison: Lakes, 20.

Larimer County: Lee, H. A., 9.

limestone, Niobrara: Lakes, 165.

northern Colorado: Henderson, 10.

ornamental stones, and: Merrill, 2.

production 1885, 1886, 1901: Day, 1, 2, 12, 14—1891: Trowbridge, 1—1894: Rothwell, 3—1905: Ores and Metals, 9—1908: Coons, 1—1910: Burchard, E. F., 6; Dalzell, 4; Warwick, 4—1911: Burchard, E. F., 8; Parker, E. W., 7; Tonge, 14—Denver Basin: Emmons, Cross and Eldridge, 2—by counties: Mg. Ind., 6; Tonge, 12.

Rico quadrangle: Cross and Ransome, 1.

rhyolite tuff: Lakes, 165.

sandstone: Lakes, 165.

sedimentary: Lakes, 95.

Silverton: Cross and Howe, 1.

Steamboat Springs: Fleck and Halldane, 1.

**Burroughs Park**, ore deposits: Rickard, 28.

**Cache la Poudre**, antiquities: Berthoud, E. L., 2.

hydrology: Emmons, Cross and Eldridge, 2; Newell, 7, 12.

paleontology: Henderson, J., 8; White, 6b.

soils: Means, T. H.

Upper South Platte valleys, and, map: Clason Map Co.

water analysis: Headden, 4.

Cadmium: Crawford, 4; Frenzel, A. B., 1; Siebenthal, 3, 6.

**Calcite**, Saguache County: Rogers, A. F., 1.

**Calciferous**: Endlich, 5.

**Calhan**, clay: Richardson, 3.

**Calumet**, epidote and quartz from: Smith, W. N., 2.

**Cambrian.**

*Stratigraphy.*

*General:* Darton, 9, 13; King, 1; Lakes, 10, 143; Schiel, 1; Walcott, 1, 2.

Alma district: Patton, 10.

Aspen, white quartzite: Henrich, 2.

Aspen: Newberry, 16; Spurr, 1.

Castle Rock: Lee, W. T., 5.

Deadman Creek: Lee, W. T., 5.

gold in: Austin, W. L., 3.

map showing: Willis, 2.

Monarch-Tomichi district: Crawford, 4.

North America: Walcott, 1.

ore in: Lakes, 135; Rickard, T. A., 28.

Paleozoic, and: Willis, 1.

Pike's Peak: Cross, 24.

quartzite: Henrich, 2; Lakes, 171. sandstones, Manitou: Finlay, G. I., 3.

Sangre de Cristo: van Diest, E. C. and P. H., 1.

Tomichi-Monarch district: Crawford, 4.

*Paleontology.*

*General:* Girty, 2.

Alma district: Patton, 10.

Brachiopoda: Cross, 33; Cross, Howe, Irving, and Emmons, 1; Darton, 13; Schuchert, 1; Walcott, 8, 14, 15.



**Cambrian.**—Continued.*Paleontology.*—Continued.

Canadian period: White, 22.

correlation papers: Walcott, 2.

Engineer Mountain: Cross, 41.

Ignacio: Cross, 33; Cross, Howe and Ransome, 1; Cross, Howe and Irving, 1.

Pikes Peak: Cross, 24.

Potsdam: Peale, 7; Walcott, 2.

**Camp Bird.** *See* Ouray.

Canadian Canyon, Morrison of: Lee, W. T., 6.

Canfield-Erie, coal deposits: Emmons, Cross and Eldridge, 2.

**Canon City.***General:* Williams, S. G., 1.

agates: Sterrett, 3, 4.

building stone: Merrill, 2.

coal: Clark, R. N., 1; Darton, 9; Drown, 1; Hawn, 1; Hills, R. C., 22; Lakes, 6, 69, 154; Lesqueux, 2; Potter, W. B., 1; Raymond, 7; Stevenson, 9, 11; Storrs, 1; Washburne, 5; White-side, 4.

coal, analysis of: Clark, R. N., 1; Drown, 1; Raymond, 7.

coal fields, map: Washburne, 5.

coke: Eilers, 4.

concretions from: Lakes, 39.

corundum near: Finlay, 2; Pratt, 1.

garnet: Sterrett, 7.

geology, economic and general: Endlich, 1; Hayden, 6.

geology, stratigraphic: Hayden, 19; Stanton, 3.

gypsum near: Lakes, 141.

hydrology: Endlich, 1; Newell, 6.

iron, analysis of: Drown, 1.

mica near: Sterrett, 1.

minerals from, described: Loew, 1.

soda spring: Wilson, Jas. S., 1.

mineral springs: Hayden, 6; Loew, 1; Lee, H. A., 9.

natramblygonite from: Schaller, W. T., 13.

Ordovician exposures: Darton, 14.

oil deposits: Williams, S. G., 1; Hayden, 12.

**Canon City.**—Continued.

paleontology, dinosaurian: Cope, 7; Hatcher, 1; Holland, W. J., 1.

paleontology, fish remains: Am. Geol., 1; Clarke, J. M., 1; Vailant, 1.

paleontology, Paleozoic fossils: Walcott, 3.

paleontology, Silurian fossils from: Emmons, 16; Walcott, 5.

paleontology, fossils from: Cope, 31, 32, 64; Darton, 14; Gilmore, 1; Hay, O. P., 5; Hayden, 13; Marsh, 8, 20; White, 20.

physiography: Darton, 13; Walcott, 3.

post-Laramie: Cross, 18.

precious stones from: Henahan, 1; Sterrett, 2.

sandstone quarries described: Foster, E. L., 1.

tantalum near: Hess, 1, 3.

water analysis: Lee, H. A., 9.

zinc-lead pigment smelter: Barber, P., 1; Mg. Rept., 9.

zinc-lead, treatment of ores: De-Cou, 1.

zinc plant: Barker, 1; Mines and Mining, 5.

**Canon City quadrangle,** map: U. S. G. S.**Canon Park:** White, 4.**Capers,** fire clay from: Bailar, 3.**Capital City,** Hanna mill: Richards and Locke, 1.**Carboniferous.***Stratigraphic.**General:* Endlich, 1, 3, 4, 5; Girty, 2, 4; Hayden, 6, 14, 19, 22; Hitchcock, 1; Hollister, 1; Holmes, 2; Lakes, 5, 10, 143; Marvine, 1; Newberry, 3; Peale, 5, 7; Stevenson, 3, 7; White, 26.

Alma district: Patton, 10.

Aspen, quartzite: Newberry, 16.

Aspen: Henrich, 2.

Castle Rock: Lee, W. T., 5.

chalcedony: Lakes, 171.

coal measures: Emmons, 9; Hills, R. C., 6.

Creede: MacMechen, 1.

**Carboniferous.—Continued.***Stratigraphic.—Continued.*

Devonian, and, correlation: Williams, H. S., 2.

eastern slope: Hayden, 24.

Elk Range: Holmes, 1.

Fremont County: Williams, S. G., 1.

iron ore: Snedaker, 2.

Leadville: Emmons, 2, 21.

limestone, Ouray, Camp Bird: Titcomb, 1.

limestone, magnetite in: Putnam, 1.

lower, chalcedony: Lakes, 171.

lower, Leadville: Emmons, 21.

lower, northwestern Colorado: White, 4.

lower, Red Mountains: Kedzie, 1.

lower, Rico: Rickard, T. A., 7.

lower: Peale, 8.

middle, northwestern Colorado: White, 4.

middle: Endlich, 5.

non-conformity: Emmons, 8.

northwestern Colorado: White, 4.

ore in: Lakes, 135; Rickard, T. A., 28.

Perry Park: Lee, W. T., 5.

Pitkin County: Lee, H. A., 9.

Red Beds: Henderson, J., 11.

Red Mountains: Kedzie, 1.

Rico: Farish, 3; Rickard, T. A., 7.

Sangre de Cristo: Lee, W. T., 8.

San Juan: Comstock, 7.

San Juan County: Comstock, 1, 7; Read, 4.

southwestern Colorado: Cross and Howe, 1.

Spanish Peaks: Stevenson, 8.

upper, Elk Range: Holmes, 1.

upper, northwestern Colorado: White, 4.

upper: Endlich, 5; Peale, 8, 12.

western Colorado: Cross, 35.

*Paleontology.*

*General:* Cross, 35; Cross and Howe, 1; Darton, 9; Emmons, 9; Endlich, 5; Girty, 2, 3, 4, 5; Hayden, 14, 19; Henderson, 10, 11; Jackson, R. T., 1; King, 1; Lee, W. T., 5, 8; Meek, 1; Peale, 5, 7,

**Carboniferous.—Continued.***Paleontology.—Continued.*

8; Stevenson, 3; White, 8, 10, 15, 16, 18, 22; Williams, H. S., 3.

Arkansas Valley: Darton, 13.

Badito: Hills, R. C., 15.

Brachiopoda: Schuchert, 1.

Castle Rock: Lee, W. T., 5.

coal measures: Emmons, 9; Hague and Emmons; Lakes, 6.

Crested Butte: Lesquereux, 18.

Cripple Creek district: Lindgren and Ransome, 3.

Echinoidea: Jackson, R. T., 1.

Engineer Mountain district: Cross, 41.

Fountain: Butters, 2; Finlay, G. I., 3.

Garfield, Monarch-Tomichi district: Crawford, 4.

Gleneyrie, Manitou district: Finlay, G. I., 3.

Grayback: Patton, 8.

Greenhorn limestone: Gilbert, 5, 7; Hills, R. C., 15, 24; Stose, 1.

Ingleside, Front Range: Butters, 2.

lower: Endlich, 5; Hayden, 26.

middle: Endlich, 5.

Millsap: Cannon, 9; Cross, 24; Finlay, G. I., 3; Girty, 2.

Mississippian, Bryozoa: Nickles and Bassler.

Mississippian, invertebrates: Cross, Howe, and Irving, 1.

Mississippian: Cross, 41; Girty, 2; Weller, 3.

Molas: Cross, Howe, and Ransome, 1; Cross, Howe, and Irving, 1.

Needle Mountains: Cross, Howe, Irving and Emmons, 1.

Ouray: Cross, Howe and Irving, 1.

Plants: Lesquereux, 18.

Red Beds: Butters, 2; Cross and Howe, 1; Henderson, J., 10, 11; Peale, 7.

Rico: Cross and Ransome, 1; Cross and Spencer, 1.

Sangre de Cristo district: Hawn, 1; Lee, 8.

San Juan district: Comstock, 7; Newberry, 4; Stevens, R. P., 1.

**Carboniferous.**—Continued.*Paleontology.*—Continued.

Silverton: Cross, Howe and Ransome, 1.

upper, Arkansas Valley: Darton, 13.

upper: Cross, Howe, and Irving, 1; Endlich, 5.

Weber grits: Emmons, 9.

Weber shales: Emmons, 9.

**Carboniferous-Devonian.***Paleontology.*

Blue limestone: Emmons, 9; Spurr, 1.

correlation: Williams, H. S., 2.

Leadville limestone: Emmons, Cross, and Eldridge, 1.

Ouray limestone: Cross, Howe, and Ransome, 1; Cross, Howe, and Irving, 1; Cross and Ransome, 1; Crawford, 4; Girty, 1, 2; Hay, O. P., 2.

Parting quartzite: Emmons, 9; Girty, 2.

**Carbon Mountain**, geology of: Cross, 23.

**Caribou.** *See* Boulder County.

iron ores: Putnam, 1.

**Carlisle Springs**, analysis of water:

Lee, H. A., 9.

**Carnotite.**

*General:* Fleck and Haldane, 1, 2; Henahen, 1; Henning, 2; Mg. World, 2; Phillips, 1.

Fall Creek: Fleck and Haldane, 2; Hess, 3.

Montrose County: Lee, H. A., 9.

northwestern Colorado: Henderson, J., 13.

Paradox Valley: Curran, 1.

radioactivity of: Mg. Sci., 8.

Rio Blanco County: Gale, 2, 6.

Routt County: Lindgren, 8.

vanadiferous minerals associated with: Hillebrand and Ransome, 1; W——, C. H., 3.

**Carrizo area**, eruptive rocks: Peale, 9.

**Carson**, ore deposits: Larsen, 1.

**Castle Arch**, geology, dynamic: Lee, W. T., 5.

**Castle conglomerate**: Lee, 5; (Richardson, 4).

**Castle Creek**, fault on: Lakes, 2.

rhyolite building stone: Foster, Wm., 1; Merrill, 2.

**Castle Rock conglomerate**: (Lee, 5); Richardson, 4.

**Castle Rock**, geology of: Lee, W. T., 5.  
gypsum deposits: Lee, W. T., 5.  
map: Lee, W. T., 5; U. S. G. S.  
physiography: Lee, W. T., 5.

**Catlin quadrangle**, map: U. S. G. S.

**Caves.**

*General:* LeCouppey de la Forest, 1.

underground channels, and, Monarch-Garfield area: Crawford, 3, 4.

**Cebolla Creek.**

*General:* Peale, 8.

manganese and iron deposits, with analysis: Lakes, 26.

manganese and titanium: Chauvenet, 8.

**Cebolla Hot Springs**, geology, dynamic:

Rickard, T. A., 23.

**Cedar Creek beds**: Osborn, 4.

**Cedar**, vanadium: Mg. World, 8.

**Cement.**

*General:* Bailar, 3; Dalzell, 3; Lakes, 204, 205, 219.

limestone, Elmore quadrangle: Hills, R. C., 24.

materials: Bancroft, 3; Eckel, 1; Lakes, 165; Ohly, 2.

materials, plains area: Darton, 9.

**Nepesta quadrangle**: Fisher, 1.

plant, Florence: Remmell, 1.

production 1883-1885: Williams, A., 1—1885, 1889-1890, 1891: Day, 1, 5, 6—1892, 1894, 1895: Rothwell, 1, 3, 4—1895 Day, 9—1900: Day, 13—Ores and Metals, 3—1901: Day, 14—1902: Day, 15, Struthers, 3—1903-1905: Day, 16, 17, 18—1905: Ores and Metals, 9—1906: Thom, 1—1907: Ingalls, 6; Thom, 2—1908: Eckel, 3—1909: Burchard, E. F., 4—1910: Burchard, E. F., 6; Warwick, 4—1911, Burchard, E. F., 8; Henahen, 1; Parker, E. W., 7; Tonge, 14.

rock, Walsenburg: Hills, R. C., 15.

**Cement Creek**, fossil from described:  
Walcott, 8.

**Cenozoic.**

*Stratigraphic.*

*General:* Endlich, 5; King, 1;  
Peale, 7; Powell, 3.  
northwestern Colorado: White, 24.

*Paleontology.*

*General:* Endlich, 5; Miller, S. A.,  
1; Scudder, 33; White, 2, 3.  
bibliography: Scudder, 31.  
Brachiopoda: Schuchert, 1.  
Green River region: White, 3.  
mammals: Osborn, 4.

**Cenozoic geology**, Fortieth Parallel  
area of Colorado.

Bear River: Hague and Emmons,  
1; King, 1.

Browns Park: Hague and Emmons,  
1; King, 1.

Chalk Bluffs: Hague and Emmons,  
1; King, 1.

Colorado Range: Hague and Em-  
mons, 1; King, 1.

Eocene—Bridger group, Green  
River group, Uinta group, Ver-  
million Creek group, paleontol-  
ogy: Hague and Emmons, 1;  
King, 1.

erosion and canyon cutting: King,  
1.

Escalante Hills: Hague and Em-  
mons, 1; King, 1.

glacial geology—canyons, drift,  
lakes: King, 1.

Godiva Ridge: King, 1.

Great Plains: King, 1.

lakes—Tertiary and Quaternary:  
King, 1.

Miocene—White River group, pale-  
ontology: Hague and Emmons,  
1; King, 1.

North Park: Hague and Emmons,  
1; King, 1.

Owi-yu-kuts Plateau: King, 1.

paleontology: Hague and Emmons,  
1; King, 1.

**Cenozoic geology.**—Continued.

Pliocene—Niobrara group, North  
Park group, Wyoming conglom-  
erate, paleontology: Hague and  
Emmons, 1; King, 1.

Quaternary — canyons, glaciers,  
lakes; King, 1.

Tertiary lakes: King, 1.

Uinta Mountains: Hague and Em-  
mons, 1; King, 1.

Vermilion Bluffs: King, 1.

**Central City.**

*General:* Endlich, 1; Hayden, 6, 12;  
Mg. Rept., 15.

geology, economic: Hague, 1;  
Wheeler, G. M., 2.

enargite: Spencer, L. J., 1.

granite: Underhill, 4.

map: Endlich, 1; U. S. G. S.

minerals described: Loew, 1.

mines and mills: Rogers, A. N., 1.

ore deposits: Rickard, T. A., 28.

pitchblende and tellurium: Hill, N.  
P., 1.

Topeka gold mine: Lakes, 71.

uraninite: Pearce, R., 10.

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**Chadron formation:** Darton, 9; Osborn,  
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**Chaffee County**, beryl: Sterrett, 2.

bismutite: Genth, 2; Ingalls, 8.

building stone: Merrill, 2, 4.

Calumet iron mine: Snedaker, 2.

cinnabar: E. and M. J., 15.

copper: Crawford, 3; Mg. Rept.,  
40; Lindgren, 8; Struthers, 3.

corundum: Pratt, 1.

Cree Camp, ore deposits and mines:  
Crawford, 4.

cyrtolite: Genth, 1.

garnet: Smith, W. B., 2.

gems: Henahen, 1; Smith, W. B.,  
2; Sterrett, 2.

geology, dynamic: Crawford, 3.

geology, economic: Crawford, 3;  
Emmons, 7.

glaciation: Crawford, 4.

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**Chaffee County.**—Continued.

- granite: Crawford, 3, 4; Hoenes, 1; Mg. Sci., 3.
  - iron ore, analysis of: Chauvenet, 5, 8; Crawford, 3.
  - iron deposits: Rolker, 1; Snedaker, 2.
  - latite and latite porphyry: Crawford, 3.
  - lead: Crawford, 3.
  - limestone: Burchard, E. F., 8; Crawford, 3, 4; E. and M. J., 15.
  - manganese: Crawford, 3.
  - marble: Crawford, 3, 4.
  - mines described: Lee, H. A., 9.
  - Monarch-Garfield area, geology, mines, minerals, ore deposits, paleontology: Crawford, 3, 4; Mg. Sci., 3.
  - Monarch-Tomichi: Crawford, 4.
  - Mount Antero. *See* Mount Antero.
  - onyx marble: Crawford, 4.
  - ore deposits: E. and M. J., 15.
  - phenacite: Penfield, 1.
  - placer mining: Crawford, 4; Mg. Rept., 2.
  - platinum and allied metals: Lindgren, 10.
  - porphyries: Crawford, 3, 4.
  - precious stones: Henahan, 1; Smith, W. B., 2; Sterrett, 2.
  - production of mines: Burchard, H. C., 1, 2, 3, 4; Henderson, C. W., 3; Hodges, 1; Lee, H. A., 9; Mg. Rept., 18.
  - quartzite: Crawford, 4.
  - sapphire and garnets: Smith, W. B., 2.
  - silver, Monarch-Garfield area: Crawford, 3.
  - silver: E. and M. J., 15.
  - Taylor Gulch, ore deposits and mines: Crawford, 4.
  - tungsten: Hess, 3.
  - Winfield, mines described: Mg. Rept., 20.
  - water, analysis of: Lee, H. A., 9.
  - zinc: Crawford, 3.
- Chalk, Smoky Hill:** Conrad, 1.

- Chalk Bluffs**, formation described: Collier, D. C., 1.
- Neocene: Dall and Harris, 1.
- paleontology, fossil described: Scott, W. B., 1.
- Chalk Creek**, map: Chapman, J. A. J., 1.
- Chalk Mountain**, sanidine in rhyolite: Cross, 6.
- sanidine and topaz: Cross, 4.
- Charcoal**, at depth in Silver Cliff mine: Charlton, T., 1.
- in Bassick mine: Mg. and Sci. Press, 12.
- Chemical analyses.** *See* list, page 458.
- Chemical products**, production of 1905: Ores and Metals, 9.
- Cherry Creek**, gold placers: Wilson, J. S.
- Cheyenne Canyon**, West, rutile and danalite from: Genth, 1.
- Cheyenne County**, map: Clason Map Co.
- water supply: Hay, Robert, 2.
- Cheyenne Mountain**, fayalite: Hidden and Mackintosh, 1.
- tysonite and bastnäsite: Hillebrand, 8.
- xenotime: Penfield, 6.
- Cheyenne Wells quadrangle**, map: U. S. G. S.
- Chonoliths**, Monarch-Tomichi: Crawford, 4.
- Cimarron**, landslide: Cross, 9.
- Cimarron Canyon**, Morrison of: Lee, W. T., 4.
- Cimarron Creek**: Peale, 8.
- Cinnabar**, Chaffee County: E. and M. J., 15.
- Clarks Peak**, granite: King, 1; Zirkel, 1.
- Clay.**
  - General:* Bailar, 3; Lakes, 51, 235; Lee, H. A., 1; Lesquereux, Leo, 2.
  - bibliography: Branner, 1.
  - Boulder district: Fenneman, 5; Langridge, 1.
  - brick. *See* brick clay.
  - brick and fire: Lakes, 219.
  - fire. *See* fire clay.
  - china: Lakes, 51.

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- Durango-Gallup district: Shaler and Gardner, 1.  
 Elk Mountains: Emmons, Cross, and Eldridge, 1.  
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 northern Colorado: Henderson, J., 10.  
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 production, 1883-1884, 1891-1894, 1897-1911: Day, 6, 8, 10, 12, 13, 14, 15, 16, 18; Emmons, Cross and Eldridge, 2; Middleton, 3; Ores and Metals, 3, 9; Parker, E. W., 7; Rothwell, 2, 6, 7, 8; Struthers, 1, 2, 3; Thom, 1, 2; Tonge, 12; Warwick, 4; Williams, A., 1.  
 Pueblo quadrangle, Gilbert, 7.  
**Clear Creek**, hydrology: Newell, 16.  
 geology, areal: Underhill, 4.  
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**Clear Creek County.** *General:* Endlich, 1, 5; Henning, 4; Lindgren, 2.  
 antiquities: Cannon, 1.  
 geology, economic: Emmons, 7; Fossett, 1; Hague, 1.  
 granite quarries: Merrill, 4.  
 granite, gray, analysis: Lakes, 165.  
 gold deposits: Lawrence, B. B., 2; Sharwood, W. J., 1.  
 gold and silver, production 1859-1887: Munson, 1.  
 lead deposits: Lawrence, B. B., 2.  
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 minerals: Emmons, 7; Loew, 1.  
 mines described, 1867; Holister—1869-1874: Raymond, 1, 4, 5, 7, 9, 10—1880-1883; Burchard, H. C., 1, 2, 3, 4; Callbreath, 1; Collins, G. E., 3, 5, 6, 9; Henderson, C. W., 3, 4; Hodges, 1; Lakes, 5; Lee, H. A., 9; Miner, 1; Mg. Rept., 15, 24; Rickard, T. A., 6; Rothwell, 6.

**Clear Creek County.**—Continued.

- mines, leasing system: Lawrence, B. B., 1.  
 mining, timbering of mines: McClelland, 1.  
 ore deposits: Bancroft, G. J., 6; Lakes, 233, 243; Lee, H. A., 9; Spurr and Garrey, 2; Spurr, Garrey, and Ball, 1.  
 paleontology, fossil described: Berthand, E. L., 1.  
 Pelican mine: Lawrence, B. B., 2.  
 physiography: Underhill, 4.  
 placer mining: Callbreath, 1; Lakes, 19, 22; Mg. Rept., 2; Spurr and Garrey, 2.  
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- anthracite, production 1898: Day, 11—1889-1890, 1901-1905: Day, 5, 14, 15, 18—1907: Thom, 2.
- anthracite, production, Ragged Mountains, Chair Mountain: Hewitt, 1.
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- Berwind-Aguilar group: Hills, R. C., 25.
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- Boulder County: Am. Jour. Mg., 4; Emmons, Cross, and Eldridge, 2; Fenneman, 5; Hayden, 2, 4; Headden, 8; Langridge, 1; Walters, 1.
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- Canon City: Hills, 22; Washburn, 5, Raymond, 6.
- Coal Creek: Lee, 13.
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- Crested Butte field: Lee, 13.
- Crested Butte and Floresta fields: Lee, 13. *See also* Anthracite-Crested Butte and Gunnison.
- Dakota coal measures: Hills, 22.
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- Grand Mesa and W. Elk Mountains: Lee, 13.
- Grand River: Hills, 22.
- Gunnison county: Lord, 2; Pope, 1; Potter, 1.
- Gunnison district: Lee, 13.
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- Huerfano county: Hills, 15, 25; Lord, 2; Potter, 1.
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- La Plata county: Hills, 22; Lord, 2.
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- South Park: Hills, 22; Potter, 1.
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- Walsenburg-Trinidad: Hills, 15, 22, 24, 25; Richardson, 2.
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- Yampa field: Fenneman and Gale, 2; Gale, 7, 8; Hills, 22; Pope, 1.
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- Canon City region: Darton, 9; Drown, 1; Hanes, 1; Hills, R. C., 22; Lakes, 6, 154; Potter, W. B., 1; Stevenson, 9, 11; Storrs, 1; Washburn, 5; Whiteside, 4.
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geological formations, names: Gale, 3, 5; Gilbert, 7; Hills, R. C., 24.

geological formations, names, used for strata in western Colorado: Gale, 8.

geological formations: Cross, 35; Peale, 7; White, C. A., 4.

**Correlations and Comparisons.—Continued.**

- Georgetown, dikes: Spurr, Garrey, and Ball, 1.
- Gilpin County and California milling: Rogers, A. N., 1.
- gravel covered terraces: Howe and Cross, 1.
- greenstones, of Needle Mountains with Menominee and Marquette regions: Cross, Howe, and Irving, 1.
- Hermosa and coal measures: Cross and Spencer, 1.
- Hermosa and Weber and lower Maroon: Cross, Howe, and Irving, 1.
- Idaho Springs, dikes: Spurr, Garrey, and Ball, 1.
- Jurassic beds: Emmons, 17.
- La Plata and Gunnison: Cross and Ransome, 1; Cross, Spencer and Purington, 1; Cross and Spencer, 1.
- Laramie and Cretaceous: Fennemans and Gale, 1.
- Laramie, definition, origin of term: Veatch, 1.
- Laramie, Mesaverde: Lee, W. T., 11.
- Laramie and Poison Canyon: Hills, R. C., 28.
- Laramie, western Wyoming and adjacent parts of Colorado: Peale, 13.
- Leadville and Aspen formations: Henrich, 2; Lakes, 2.
- Lewis shale and Montana formation: Cross, Spencer and Purington, 1.
- Mancos and Benton and Pierre: Cross and Spencer, 1.
- Manitou embayment and other regions: Crosby, 3.
- Maroon and Weber: Cross and Spencer, 1.
- McElmo and Morrison: Cross and Ransome, 1; Cross and Spencer, 1; Cross, Spencer and Purington, 1.

**Correlations and Comparisons.—Continued.**

- Menominee and Marquette with Irving greenstones: Howe, 1.
- Mesaverde, Montana, Fox Hills: Cross, Spencer and Purington, 1.
- Mesaverde, Laramie: Lee, W. T., 11.
- Middle Park and Denver formation: Eldridge, 5.
- Milling, Colorado and California: Rickard, T. A., 1; Rogers, A. N., 1.
- Monument Creek: Darton, 12.
- Morrison, *Atlantosaurus* beds, Como, Beulah, Gunnison: Stanton, 3.
- Morrison, Como, non-Marine Jura: Lee, W. T., 6.
- Neocene: Dall and Harris, 1.
- Ore deposits of state: Lakes, 200.
- Ouray and Elk Mountains: Cross, Howe, and Irving, 1.
- Ouray and San Juan, Devonian and Carboniferous: Cross, Howe, and Ransome, 1.
- Paleogeography and correlation: Osborn, H. F., 6.
- Paleozoic strata: Emmons, 17; Hayden, 19.
- Poison Canyon and Laramie: Hills, R. C., 28.
- Red Beds, Fountain, Ten Sleep: Henderson, 11.
- Red Beds: Cross and Howe, 1.
- Rico, Permo-Pennsylvanian: Cross and Ransome, 1.
- Salida schists and other formations: Cross, 20.
- San Miguel and Arapahoe: Cross and Purington, 1.
- Southern Colorado, geological formations: Stevenson, 8.
- Spring waters: Spurr, Garrey, and Ball, 1.
- stratigraphic names: Gale, 3, 5, 8; Gilbert, 7; Hills, R. C., 24.
- stratigraphy: Endlich, 5.

**Correlations and Comparisons.—Continued.**

Telluride and Arapahoe: Cross, Howe, and Ransome, 1; Cross, Howe, and Irving, 1.

Telluride, igneous names, Hayden survey: Cross and Purington, 1.  
Tepee Buttes and buttes of other origin: Gilbert and Gulliver, 1.

Tepee Buttes and allied phenomena in Canada: Gilbert and Gulliver, 1.

terraces: Howe and Cross, 1.

Tertiary: Dall, 1; Hayden, 19; King, 1; Scott, W. B., 3.

Weber and Maroon: Cross and Spencer, 1.

West Peaks and Huerfano: Hills, R. C., 25.

Wyoming formation: Emmons, Cross, and Eldridge, 2.

**Corundum.**

*General:* Pratt, 1.

in pegmatite: Finlay, 2.

production, 1893-1894: Rothwell, 2, 3—1903: Day, 16.

**Costilla County, artesian water: Head-**  
**den, 13.**

gold dredging: Julian, 1.

Grayback area, geology: Patton, 8.

Grayback area, map: Patton, 8.

Grayback placer: Julian, 1.

magnetite: Rolker, 1.

map: Clason Map Co.

mines, and ore deposits: Lee, H. A., 9; Henderson, C. W., 4; Patton, 8; Rickard, T. A., 28.

Sangre de Cristo Mountains, ore deposits: Gunther, 1; van Diest, E. C., and P. H., 1.

**Cottonwood, map: Chapman, J. A. J., 1.****Coyote Basin: White, 4.****Creede.**

*General:* Lakes, 10.

amethyst: Lakes, 43.

mines described: Day, 6; Johnson, L. H., 5; Lakes, 125; Rickard, T. A., 6.

mills described: Mg. Ind. and Rept., 8; Mg. Rept., 28, 42.

**Creede.—Continued.**

ore deposits described: Emmons and Larsen, 1; Lakes, 21, 233; Lee, H. A., 9; MacMechen, 1; Spurr, Garrey, and Ball, 1; Rickard, T. A., 28.

production, 1897-1901: Lee, H. A., 9.

silver deposits: Lakes, 16.

**Crested Butte. See also Anthracite—Crested Butte.**

anthracite coal: Hosea, 3; Lakes, 6.

basalt: Emmons, Cross, and Eldridge, 1.

coal, analysis of: Eakins, 6; Emmons, Cross, and Eldridge, 1; Frazer, 2; Lakes, 4, 6; McNeil, 1; Rickard, T. A., 23; Williams, C. P., 1.

coal: Frazer, 2; Lakes, 4, 172; McNeil, 1; Rickard, T. A., 23; Warren, E. R., 1; Williams, C. P., 1.

coke, analysis of: Weeks, J. D., 3.

coke: Lakes, 4; Weeks, 3.

copper: Lakes, 6; Warren, 2.

diorite: Emmons, Cross, and Eldridge, 1.

geology, dynamic: Emmons, Cross, and Eldridge, 1; Lakes, 6.

geology and map: Cross, 23.

granite: Emmons, Cross, and Eldridge, 1.

iron ore, analysis of: Chauvenet, 5.

iron ore, bog: Lakes, 4, 6; Warren, E. R., 2.

lead: Lakes, 6; Warren, E. R., 2.

map: U. S. G. S.

ore deposits: Warren, E. R., 2.

paleontology, fossil described: Walcott, 8.

porphyrite: Emmons, Cross, and Eldridge, 1.

rhyolite: Emmons, Cross, and Eldridge, 1.

silver: Warren, E. R., 2; Lakes, 6.

vein-walls, Keystone mine: Warren, E. R., 1.

**Crestone, ore deposits: Rickard, T. A., 28.**

**Cretaceous.***Stratigraphic.*

*General:* Cope, 23; Cross, 22; Emmons, 4; Endlich, 1, 3, 5; Gale, 7; Hayden, 5, 6, 12, 14, 18, 22; King, 1; Lakes, 5, 6, 10, 143; Lee, W. T., 10; Lesquereux, 2, 12; Marvin, 1; Newberry, 3; Peale, 5, 7, 8; St. John, 1; Stevenson, 3, 6; Ward, F., 1; White, 26; Woolsey, 1.

Apishapa quadrangle: Stose, 1.

Archuleta County: Lee, H. A., 9.

Arkansas Valley: Gilbert, 5.

Boulder: Henderson, J., 3.

Castle Rock: Lee, W. T., 5.

Chalk Creek, Middle Park: Hollister, 1.

coal, Dakota: Lakes, 69.

coal, Elk Range: Holmes, 1.

coal, Gunnison County: Hills, R. C., 8.

coal: Hewett, 1; Lakes, 73, 128;

Loew, 1; Newberry, 1.

Denver Basin: Eldridge, 2.

eastern Colorado: Collier, D. C., 1;

Hay, R., 2; Hayden, 20, 24.

Elk Range: Holmes, 1.

Fremont County: Williams, S. G., 1.

Grand River district: Peale, 12.

Huerfano Basin: Hills, R. C., 28.

Laramie, age of: White, 25.

lignites, age of: Cope, 12.

lower, Elk Range: Holmes, 1.

lower: Hayden, 19; Holmes, 2;

Peale, 7, 8.

map: Willis, 2.

Marshall: Hayden, 4.

middle: Eldridge, 1; Holmes, 2, 6;

Peale, 7, 8.

Middle Park, Chalk Creek: Hollister, 1.

Morrison, and, Golden: Cross, 22.

northwestern Colorado: Gale, 3;

Hewett, 1; White, 4.

ore deposits in: Rickard, T. A., 28.

Ouray, Camp Bird: Titcomb, 1.

Palmer Lake: Cannon, 9.

Perry Park: Cannon, 7.

**Cretaceous.—Continued.***Stratigraphic.—Continued.*

Rabbit Ears district: Grout, Worcester, and Henderson, 1.

Red River: Hill, R. T., 1.

San Juan, Dakota to Laramie: Read, 4.

San Miguel formation: Cross, 30; Spaulding, 1.

shale, Camp Bird: Titcomb, 1.

southeastern division: Endlich, 4.

South Park: Stevenson, 1.

southwestern Colorado: Spencer, A. C., 1.

time: Gilbert, 4.

Trinidad: Conkling, 3.

upper, Breckenridge: Ransome, 5.

upper, Elk Range: Holmes, 1.

upper, Huerfano Basin: Hills, R. C., 28.

upper, Red River: Hill, R. T., 1.

upper, South Park: Stevenson, 1.

upper Cretaceous: Cragin, 3; Hayden, 19; Holmes, 2; Peale, 7, 8;

Spencer, A. C., 1.

western Colorado stratigraphy: Cross, 35.

*Paleontology.*

*General:* Darton, 9, 13; Hayden, 14,

16, 20, 23; Henderson, J., 8, 10,

12, 14; Hollister, 1; Holmes, 2;

Lesquereux, 1, 2, 3, 4, 6, 7, 8, 9,

10, 12, 13, 14, 17, 18, 19; Marcou,

J. B., 1; Marsh, 4, 26, 29, 30, 37;

Meade, 1; Meek, 1, 1a, 2, 3, 4, 4a,

5; Newberry, 3; Peale, 5; Stan-

ton, 2; Stevenson, 3, 6; St. John,

1; White, 3, 4, 5, 6b, 6c, 8, 10, 11,

12, 13, 15, 16, 18, 21, 22, 26b, 27;

Williams, S. G., 1.

Ammonoidea: Hyatt, 1; Stanton, 2a.

Apishapa: Darton, 13; Hills, 15, 25; Stose, 1.

Arkansas and Colorado: White, 13.

Benton, Boulder area: Henderson, J., 3.

Benton, Florence area: Eldridge, 5.



**Cretaceous.—Continued.***Paleontology.—Continued.*

- Benton, invertebrates: Lee, W. T., 5.  
 Benton, Rio Blanco County: Gale, 5.  
 Benton: Cope, 15; Emmons, Cross, and Eldridge, 2; Fenneman, 2; Logan, 1.  
 Bitter Creek series: Cope, 15, 19.  
 Book Cliffs: Richardson, 1.  
 Boulder area: Fenneman, 5; Henderson, 3.  
 Breckenridge: Ransome, 5.  
 Carlile: Darton, 13; Gilbert, 5; Hills, R. C., 15, 25.  
 Castle Rock: Lee, W. T., 5.  
 Clypeastridae: Cragin, 2.  
 Colorado group: Endlich, 4, 5; Girty, 3; Hague and Emmons, 1; King, 1; Stanton, 2; Stevenson, 13.  
 Comanche: Darton, 11; Stanton, 3.  
 Dakota, Denver Basin: Emmons, Cross, and Eldridge, 2.  
 Dakota carnivorous dinosaurian: Cope, 27.  
 Dakota, dinosauria: Lucas, 1; Marsh, 3.  
 Dakota, saurians: Cope, 32.  
 Dakota, Rabbit Ears region: Grout, Worcester, and Henderson, 1.  
 Dakota: Cope, 41; Cross, 24; Cross and Purington, 1; Endlich, 5; Holmes, 1; Lesquereux, 7, 8, 10, 11, 13; Peale, 7, 8; White, 5, 27.  
 Danforth Hills: Gale, 3.  
 Denver Basin: Emmons, Cross, and Eldridge, 2.  
 dinosaur: Lucas, 1; Marsh, 3.  
 eastern Colorado: Collier, D. C., 1.  
 Echinoidea: Clark, W. B., 1a.  
 Elmoro: Hills, 24.  
 Fort Collins district: White, 10.  
 Fortieth Parallel area: Meek, 5, 6.  
 Fossil Ridge: Henderson, 9.  
 Fox Hills: Cockerell, 9; Cope, 19; Darton, 13; Emmons, Cross, and Eldridge, 2; Endlich, 5; Hayden, 20; King, 1; Lee, W. T., 5; Stevenson, 5; White, 1.

**Cretaceous.—Continued.***Paleontology.—Continued.*

- Fox Hills, Boulder district: Henderson, J., 3.  
 Fox Hills, Denver Basin: Eldridge, 2.  
 Front Range: Lesquereux, 13.  
 Grand Hogback: Gale, 3.  
 Graneros shale: Stose, 1.  
 invertebrates: Cross, Howe, and Irving, 1; Gabb, 1.  
 Judith River beds: White, 1.  
 La Plata: Cross, Spencer and Purington, 1.  
 Laramie, Boulder district: Henderson, J., 3.  
 Laramie, Grand River district: Lakes, 160.  
 Laramie, mammals and horned dinosaurs: Hatcher, 3.  
 Laramie, molluscan: White, 6, 17.  
 Laramie, nelumbo: Hollick, 1.  
 Laramie plant: Hollick, 2.  
 Laramie, Shoshone: Cross, 38.  
 Laramie: Clark, W. B., 1; Cockerell, 45; Darton, 13; Emmons, Cross, and Eldridge, 1, 2; Endlich, 5; Henderson, J., 7, 8; Hills, R. C., 24, 25; King, 1; Lee, W. T., 5; Marsh, 38; Newberry, 18; Peale, 13; Stanton and Knowlton, 1; Ward, L. F., 3; White, 1, 3, 5, 6b, 7, 14, 15, 16, 25, 27.  
 Lewis shale: Cross, Spencer, and Purington, 1.  
 Lignitic formation, age of: Lesquereux, 6; Meek, 2; Stevenson, 2.  
 Lignitic, lower: Berthand, 2; Cope, 15, 19; Cross, 19; Dana, 2; Hayden, 14, 15, 16, 18, 20, 23; Lesquereux, 9, 12, 14; Marvine, 1; Newberry, 1; Peale, 5, 12; Stevenson, 3.  
 Lucina profunda: White, 12.  
 Mancos, Grand Mesa district: Lee, W. T., 13.  
 Mancos, Hahns Peak district: George and Crawford, 1.  
 Mancos, Rio Blanco district: Gale, 5.

**Cretaceous.—Continued.**

*Paleontology.—Continued.*

- Mancos: Cross, Howe, and Irving, 1; Cross and Purington, 1; Cross and Ransome, 1; Cross, Spencer, and Purington, 1.
- McElmo, *Atlantosaurus*: Cross, Spencer, and Purington, 1.
- Mesaverde, Grand Mesa: Lee, W. T., 13.
- Mesaverde, invertebrates: Cross, Spencer, and Purington, 1.
- Mesaverde, plants: Cockerell, 57; Lee, W. T., 14.
- Mesaverde, Rio Blanco County: Gale, 5.
- Mesaverde: Cross, Howe, and Irving, 1.
- middle Cretaceous: Eldridge, 1.
- Montana, Aspen district: Spurr, 1.
- Montana: Emmons, Cross, and Eldridge, 1; White, 27.
- Nepesta: Fisher, 1.
- Niobrara, Boulder district: Henderson, J., 3.
- Niobrara, Florence district: Eldridge, 4.
- Niobrara: Cannon, 8, 10; Cope, 15, 19; Emmons, Cross, and Eldridge, 2; Gilbert, 7; Lee, W. T., 5; Logan, 1.
- northwestern Colorado: Gale, 3, 8.
- Ostreidae: White, 18.
- Palmer Lake district: Cannon, 9.
- Pawnee Creek beds: Matthew, 5.
- Pierre, Boulder district: Henderson, J., 3.
- Pierre, Florence: Eldridge, 5.
- Pierre, Tepee zone: Gilbert, 5.
- Pierre: Cannon, 10; Cope, 15, 19; Darton, 13; Emmons, Cross, and Eldridge, 2; Fisher, 1; Gilbert, 5; Henderson, J., 8; Lee, W. T., 5.
- plants: Cockerell, 9, 57; Hollick, 1, 2; Knowlton, 1a, 2, 4; Lesquereux, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 16, 17, 18, 19; Peale, 17; Ward, 1, 1a, 2, 3, 5, 6.
- Pueblo: Gilbert, 7.

**Cretaceous.—Continued.**

*Paleontology.—Continued.*

- Purgatoire: Stose, 1.
- Rabbit Ears district: Grout, Worcester, and Henderson, 1.
- Rangely: Gale, 5.
- Rico: Cross and Ransome, 1.
- San Juan district: Meek, 4.
- Spanish Peaks: Hills, 25.
- Telluride: Cross and Purington, 1.
- Timpas, Spanish Peaks: Hills, R. C., 25.
- Timpas: Darton, 13; Fisher, 1; Gilbert, 5; Hills, 15, 24; Stose, 1.
- Trinidad district: Conkling, 3; Hills, R. C., 15, 25.
- vertebrata: Cockerell, 57; Conrad, 2; Cope, 1, 3, 15, 19, 22, 23, 40; Emmons, Cross, and Eldridge, 2; Endlich, 1, 3, 4, 5.
- Walsenburg: Hills, 15.
- White River district: Adams, G. I., 1; Cope, 54, 60; Dall and Harris, 1; Marsh, 1; Osborn and Wortman, 1; Scudder, 8; White, 1.
- Yampa coal field: Fenneman and Gale, 2.
- Cripple Creek.**
- General*: Blake, 1b; Cross and Penrose, 1; Draper, 2; E. and M. J., 23; Hills, V. C., 1; Lakes, 10, 17, 35; Lindgren, 1, 2; Miller, G. W., 1; Moore, C. J., 2; Pearce, R., 11; Skewes, 1; Van Wagenen, H. R., 2; Wolcott, G. E., 5; Worcester, S. A., 3.
- aegirite and aegirite-augite in phonolite: Graton, 1.
- alunogen: Hobbs, 2.
- amethyst: Lakes, 43.
- amphibole, blue: Graton, 1.
- analcite in phonolite: Graton, 1.
- analcite basalt, analysis of: Cross, 28; Clarke, F. W., 9.
- antimony: Cross and Penrose, 1.
- auriferous iron pyrite: Cross and Penrose, 1.
- bonanzas: Rickard, T. A., 17.
- breccia: Lindgren and Ransome, 3; Graton, 1.

**Cripple Creek.—Continued.**

breccia and associated ore deposits: Lakes, 245.

calcite: Cross and Penrose, 1.

calaverite: Clarke, F. W., 9; Hillebrand, 7, 10; Penfield and Ford, 1; Lindgren and Ransome, 3.

copper: Cross and Penrose, 1; Lindgren and Ransome, 3; Rickard, J. A., 14.

diabase: Graton, 1.

dikes described: Skees, 2.

dividends: E. and M. J., 33.

drainage tunnels: Alderson, 1; Bain, 6; Countryman, 1, 2; Lakes, 225.

emmonsite (?): Hillebrand, 12; Lindgren and Ransome, 3.

epsomite and alunogen: Hobbs, 2.

feldspar in phonolite: Graton, 1.

Fluorine mine: Lakes, 59.

fluorite: Cross and Penrose, 1.

gas, subterranean, analysis of: Lindgren, 3.

geology, dynamic: Argall, 11; Bancroft, 1, 4; Cross, 29; Cross and Penrose, 1; Lakes, 18, 21; Lee, H. A., 9; Lindgren, 3; Lindgren and Ransome, 2, 3; Miler, G. W., 1; Pearce, R., 9; Rickard, T. A., 15, 22, 26; Spurr, Garrey, and Ball, 1; Stevens, 1; Stone, 6; Van Hise, 4; Weed, 2.

geology: Cross, 29; Winslow, 1; Lindgren and Ransome, 1; Rickard, T. A., 1.

gold: Cross and Penrose, 1; Curle, 1; Ingalls, 1; Kemp, 1a; Knight, F. C., 1; Lakes, 30, 35, 41, 47, 56, 59; Liebenan, 1; Lindgren, 4; Lindgren and Ransome, 1, 2, 3; McCarn, 1 Möllmann, 1; Pearce, R., 6, 8, 9; Rickard, T. A., 11, 22; Ritter, 2; Sharwood, W. J., 1; Winslow, 1.

Gold Hill ore shoots described: Skewes, 3.

goldschmidtite: Hobbs, 1.

gneiss: Graton, 1.

granitic breccias: Stone, 7.

**Cripple Creek.—Continued.**

granite, analysis of: Clarke, F. W., 8.

granites: Clarke, F. W., 8; Graton, 1; Mathews, 1, 2; Rickard, T. A., 1.

granite gneiss: Clarke, F. W., 8.

hydrology: Cross and Penrose, 1; Lindgren and Ransome, 1, 3.

Independence mine: Mg. World, 6; Rickard, T. A., 29.

kaolin, analysis of: Cross and Penrose, 1; Rickard, T. A., 15.

krennerite: Chester, 2; Lindgren and Ransome, 3.

latite porphyry: Graton, 1.

latite phonolite: Clarke, F. W., 8.

lead: Rickard, T. A., 14; Cross and Penrose, 1.

lavenite: Graton, 1.

leasing: Burgess, 1.

limburgite: Stevens, E. A., 1.

manganese minerals: Cross and Penrose, 1; Lindgren and Ransome, 1, 2, 3; U. S. G. S.

mills and milling: Argall, P., 16, 17, 18, 19; Clancy, 1; Dodge, 1; Henahan, 1; Koch, 1; Magenau, 1; Min. Ind. and Rept., 8; Miller, G. W.; Of, 1; Taylor, G. M., 1; Warwick, 5; Wolcott, 6.

minerals, analysis of: Clarke, F. W., 8, 9; Knight, F. C., 1; Ritter, 2; Schaller, 1.

minerals, characteristic: Graton, 1.

minerals, new: Knight, F. C., 1.

mines, Ajax: Colburn, E. A., 1.

mines, El Paso: Zulch, 1.

mining, cost of: Bain, 4; Finlay, J. R., 1, 3; Ingalls, 3.

mining, early: Rickard, T. A., 6.

mining, Independence mine: Lakes, 13.

mining, labor troubles: Finch, 2.

mining, leasing system: Finch, 2; Finlay, J. R., 2.

mining, Portland mine: Fulton, 1.

mining, underground workings, extent of: Lindgren and Ransome, 3.

**Cripple Creek.—Continued.**

- mining, Victor mine: Elder, 1.
- mining: Arthur, 1; Bancroft, 1; Collins, G. E., 3, 4, 5, 6; E. and M. J., 20, 23, 28, 33; Finch, 2; Forsyth, 1; Hazelhurst, 1; Herrick, 1; Hills, F., 1; Johnson, 1; Judson, 1; Lakes, 88, 142; Lindgren and Ransome, 3; Miller, G. W., 1; Mg. Inv., 2; Moore, 2; Rickard, T. A., 8, 22; Van Wagenen, H. R., 2; Winslow, 1; Wolcott, G. E., 4.
- monchiquite, description and analysis of: Clarke, F. W., 8; Graton, 1.
- nepheline syenite: Clarke, F. W., 9; Graton, 1.
- Ophelia tunnel: Dinsmoor, 1.
- ores, alteration of: Cross and Penrose, 1.
- ores, analysis of: Baker, 1; Cross and Penrose, 1; Graton, 1; Smith, F. C., 1.
- ore deposits, basaltic zones as guide to: Stevens, E. A., 2.
- ore deposits, character and value of: Miller, G. W., 1.
- ore deposits, compared with Custer County: Emmons, 23.
- ore deposits, formation: Bancroft, 4.
- ore deposits, lodes: Rickard, T. A., 22.
- ore deposits, occurrence: Cross and Penrose, 1.
- ore deposits, shoots: Lakes, 47; Skewes, 3.
- ore deposits: Argall, P., 6; Bancroft, 1, 7; Cross and Penrose, 1; Lakes, 11, 16, 18, 21, 30, 74, 214, 233, 243, 254; Lee, H. A., 9; Lindgren, 7; Lindgren and Ransome, 1, 2; McCarn, 1; Pearce, R., 9; Penrose, 2; Rickard, T. A., 8, 26, 28; Schwarz, 3; Spurr, Garrey, and Ball, 1; Stevens, E. A., 2; Warwick, 2.
- ore treatment, cyaniding: Baker, 1; Fulton, 2; Lakes, 70.

**Cripple Creek.—Continued.**

- ore treatment: Argall, P., 9, 14, 15; Crows, 1; Croll, 1; Fulton, 1, 2; Greenawalt, 1; Headden, 10; Hoover, 2.
- petzite: Lindgren and Ransome, 3; Rickard, T. A., 16.
- phonolite, analysis of: Clarke, F. W., 9; Cross and Penrose, 1; Graton, 1.
- physiography: Cross and Penrose, 1; Lindgren and Ransome, 1, 3.
- placer deposits: Cross and Penrose, 1; Lakes, 259; Lindgren and Ransome, 3.
- Portland mine: Scates, 1.
- Poverty Gulch mine: Henderson, C. W., 3.
- production: Collins, G. E., 9; Cross and Penrose, 1; Day, 13; E. and M. J., 28, 33; Finch, 2; Hazelhurst, 1; Hodges, 1; Lakes, 18; Lee, H. A., 9; Lindgren and Ransome, 1, 3; Mg. Rept., 15, 21, 24; Mg. Sci. Press, 8; Rothwell, 5, 6; Tonge, 4.
- pseudomorphs after sylvanite and krennerite: Rickard, T. A., 16.
- quartz: Cross and Penrose, 1.
- rhyolite: Graton, 1.
- rocks, analyses of: Clarke, F. W., 8; Clarke and Hillebrand, 1; Daly, 1; Hillebrand, 11; Graton, 1; Miller, G. W., 1.
- sampling: Wolcott, 3.
- schist: Graton, 1.
- secondary enrichment: Bancroft, 1; Weed, 3.
- silver deposits: Cross and Penrose, 1; Rickard, T. A., 14.
- sodalite and nosean: Graton, 1.
- subterranean gases: Lindgren, 3.
- syenite, analysis of: Clarke, F. W., 8; Graton, 1.
- sylvanite: Lindgren and Ransome, 3; Palache, 1; Rickard, T. A., 16.
- tellurides, analysis of: Bailar, 1; Rickard, T. A., 16.

**Cripple Creek.—Continued.**

tellurides: Cross and Penrose, 1; Crows, 1; Hess, 1; Hillebrand and Allen, 1; Lindgren, 7; Lindgren and Ransome, 3; Portland Metallurgical Society, 1.

titanite: Graton, 1.

trachydolerites, analysis: Clarke, F. W., 8; Graton, 1.

tunnel: Warwick, 3.

underground water: Lindgren and Ransome, 2, 3.

vein intersections: Ritter, 2; Underhill, 1.

vogesite, analysis of: Clarke, F. W., 8; Graton, 1.

volcano: Rickard, T. A., 15.

water problem: Lakes, 101.

zinc ores: Cross and Penrose, 1.

**Crow Creek**, Laramie beds: Stanton and Knowlton, 1.

Little, Neocene: Dall and Harris, 1.  
paleontology, fossils described: Henderson, 8; White, 5, 6b.

**Crustacea**, Paleozoic: Vogdes, 1.

**Cryolite**, occurrence and metallurgy: Ohly, 2.

production, 1893, 1894, 1898, 1901: Day, 8, 11, 14; Rothwell, 2, 3, 1911: Burchard, E. F., 8.

**Crystal Park**, amazonstone: Henahen, 1; Lakes, 75.

minerals from: Cross and Hillebrand, 4; Kunz, 2.

**Culebra axis**: Stevenson, 8.

**Cunningham Gulch**: Cross, Howe and Ransome, 1.

**Current Creek**, iron, meteoric: Headen, 12.

**Custer County**, Bassick and Bull Domingo mines: Lakes, 142; Mg. and Sci. Press, 12.

charcoal at depth in mine: Charlton, 1.

cerussite: Brinsmade, 1.

geology, dynamic: Cross, 12; Emmons, 23; Van Hise, 4.

geology, economic: Emmons, 7.

Geyser mine, analysis of water from: Clarke, F. W., 9.

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eruptive rocks: Cross, 12.

fluorspar: Burchard, E. F., 1.

gold: Emmons, 23.

iron: Emmons, 21.

Marion mine, zinc: Babbit, 1.

minerals, analyses: Clarke, F. W., 6; Eakins and Chatard, 1.

minerals: Cross, 14.

mines, Rosita and Silver Cliff: Emmons, 24; Lakes, 55.

mines: Emmons, 23, 24; Lakes, 5; Lee, H. A., 9.

mineral production, mines described: Burchard, H. C., 1, 2, 3, 4; Munson, 1; Emmons, 23; Lee, H. A., 9; Mg. Rept., 18.

ores, analysis of: Emmons, 23, 24.

physiography: Lee, H. A., 9.

reduction plants: Emmons, 23.

Rosita Hills, geology: Cross, 17.

Rosita-Silver Cliff. *See* Rosita-Silver Cliff.

silver: Emmons, 23.

zinc, Marion mine: Babbit, 1.

**Cut nails**, production, 1899: Day, 12.

**Danforth Hills**. *General*: White, 4.

Grand Hogback, and, coal deposits: Gale, 3, 8.

geology, dynamic: White, 24.

map: Gale, 3; U. S. G. S.

paleontology, fossils described: White, 5, 6b.

**Davidson district**, coal deposits: Emmons, Cross, and Eldridge, 2.

geology, dynamic: Emmons, Cross, and Eldridge, 2.

**Dawson arkose**: Richardson, 4.

**Deformation**. *See also* faulting and folding.

*General*: Bechler, 2; Blow, 1; Davis, W. M., 4; Emmons, 15, 20, 26; Endlich, F., 1, 2, 4, 7; King, 1; Gannett, 9; Hayden, 6, 14, 19, 22; Hills, R. C., 14, 17; Holmes, 2, 6; Marvine, 1; Peale, 5, 7, 8, 13; Pirsson, 2; Powell, 1, 2, 3, 6; Ransome, 4; Stevenson, 3, 7; Stone, 7; White, 4; Williams, S. G., 1.

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Alma district: Patton, 10.  
 Anthracite - Crested Butte quadrangle: Emmons, Cross, and Eldridge, 1.  
 Aguilar district: Lakes, 117.  
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 Archean disturbances: Emmons, 17; Hills, R. C., 17.  
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 Arkansas Valley: Darton, 13; Gilbert, 5.  
 Aspen district, as related to mining: Lakes, 150.  
 Aspen district: Brunton, 2; Henrich, 2; Lakes, 2, 103; Newberry, 16; Spurr, 1.  
 Bear Creek area: Emmons, W. H., 2; Emmons, Cross, and Eldridge, 2.  
 Book Cliffs coal field: Lakes, 130.  
 Boulder, coal field: Lakes, 159.  
 Boulder, mineral belt in Boulder and Gilpin counties: Spurr, Garrey, and Ball, 1.  
 Boulder, mining, as related to: Lakes, 150.  
 Boulder, oil field: Fenneman, 2, 3.  
 Boulder Valley region: Emmons, Cross, and Eldridge, 2.  
 Boulder district: Fenneman, 5; Lakes, 124; Lindgren, 6.  
 Breckenridge district: Lakes, 66.  
 Cambrian, crustal movements: Walcott, 1.  
 Canyons: Bross, 1.  
 Carboniferous movement, Denver Basin: Emmons, Cross, and Eldridge, 2.  
 Castle arch: Lee, W. T., 5.  
 Cenozoic disturbances: Hills, R. C., 17.  
 Clear Creek, veins: Lakes, 49.  
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 coal, spontaneous combustion, effect on surrounding strata: Lakes, 180.  
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Colorado Range: King, 1.  
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 Cretaceous, early, movement, Denver Basin: Emmons, Cross, and Eldridge, 2; Hills, R. C., 17.  
 Cretaceous-Tertiary unconformity, Aspen: Spurr, 1.  
 Cripple Creek, fissures: Weed, 2.  
 Cripple Creek: Cross and Penrose, 1; Lindgren and Ransome, 3; Miller, G. W., 1; Stevens, 2; Stone, 6; Van Hise, 4.  
 Culebra axis: Stevenson, 8.  
 Dakota at Golden: Patton, 6.  
 Danforth Hills uplift: White, 24.  
 Davidson section: Emmons, Cross, and Eldridge, 2.  
 Denver Basin, Green Mountain section: Emmons, Cross, and Eldridge, 2.  
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 Dike, to trace an invisible: Stone, 5.  
 Durango coal field: Taff, 1.  
 Durango quadrangle: Emmons, W. H., 1.  
 Durango-Gallup coal field: Shaler and Gardner, 1.  
 Elk Mountains, mining, as related to: Lakes, 150.  
 Elk Mountains: Emmons, Cross, and Eldridge, 1; Holmes, 1.  
 Elmore coal fields: Hills, R. C., 24.  
 Engineer Mountain: Cross, 41.  
 Florence oil field: Eldridge, 5; Fenneman, 4.  
 foothills, near Denver: Eldridge, 4.  
 geological history: Hollister, 1.  
 Georgetown quadrangle: Ball, S. H., Crosby, 4; Spurr and Garrey, 1; Spurr, Garrey, and Ball, 1.  
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Gunnison and Ouray districts:  
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Hahns Peak district: Draper, 1;  
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Henry Mountains: Hills, R. C., 20.

Idaho Springs: Spurr and Garrey,  
2.

Jurassic movement: Emmons, 17;  
Emmons, Cross, and Eldridge,  
2; Hills, R. C., 17.

La Plata dome, origin of: Cross  
and Spencer, 1.

La Plata mountains: Cross and  
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H. A., 9; Petre, 1.

Laramie, alterations, causes effect-  
ing: Hills, R. C., 22.

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Las Animas and Huerfano coal  
field: Hanes and Parsons 1.

Leadville, downtown district: Em-  
mons and Irving, 1.

Leadville, mining, as related to:  
Lakes, 150.

Leadville, ore deposits: Weunsch,  
2.

Leadville, Yankee Hill: Shedd, 1.

Leadville: Barker, 1; Freeland, 1;  
Lakes, 196; Miller, G. W., 1;  
Spurr, Garrey, and Ball, 1.

London fault: Patton, 10.

Louisville coal field: Lakes, 6.

Manitou embayment: Crosby, 3.

Mesozoic disturbances: Emmons,  
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mid-Cretaceous movement: Em-  
mons, Cross, and Eldridge, 2.

Monarch-Tomichi mining district:  
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Mosquito Range, London fault:  
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overturns, Denver Basin: Hender-  
son, J., 1.

Paleozoic disturbances: Emmons,  
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Paleozoic movement, late: Em-  
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Park County: Lee, H. A., 9; Sadt-  
ler, 1.

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5; Kruger, Hamilton, and En-  
riquez, 1.

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Plum Creek, Denver Basin: Em-  
mons, Cross, and Eldridge, 2.

post-Arapahoe movement: Em-  
mons, Cross, and Eldridge, 2.

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C., 17.

post-Carboniferous movement:  
Hills, R. C., 17.

post-Cretaceous movement: Em-  
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post-Denver movement: Emmons,  
Cross, and Eldridge, 2.

post-Eocene movement: Hills, R.  
C., 17.

post-Laramie movement: Emmons,  
Cross, and Eldridge, 2.

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- post-Pliocene movement: Hills, R. C., 17.
- pre-Cambrian: Walcott, 1.
- pre-Cretaceous, Aspen: Spurr, 1.
- Quaternary movement: Hills, R. C., 17.
- Ralston section, Denver Basin: Emmons, Cross, and Eldridge, 2.
- Raton Mountains: Hills, R. C., 20, 22.
- Rico dome: Cross and Ransome, 1.
- Rico, fissure system, Enterprise mine: Van Hise, 4.
- Rico, laccolithic centers of eruptions, compared with: Cross and Spencer, 2.
- Rico, mining, related to: Lakes, 150.
- Rico: Cross and Ransome, 1; Cross and Spencer, 1; Farish, 3; Ransome, 2; Rickard, T. A., 7.
- Rio Blanco oil field: Gale, 5.
- Rock Creek district: Lakes, 6.
- Rocky Mountains, age of: Peale, 10; Stevenson, 4.
- Rocky mountains, movements in: Am. Geol., 2; Emmons, 17; Hills, 17; King, 1.
- Rocky mountains: Lakes, 175.
- Rosita district: Wulsten, 1.
- Routt County: Parsons and Liddell, 1.
- Sangre de Cristo Mountains: Hills, R. C., 20.
- San Juan, fissure system: Ransome, 1.
- San Juan, sedimentary series: Read, 4.
- San Juan, Treasure Mountain: Purington, 8.
- San Juan, zones of weakness: Spurr, Garrey, and Ball, 1.
- San Juan: Comstock, T. B., 7; Hills, R. C., 20; Howe, 1; Lee, H. A., 9; Rickard, T. A., 23; Snedaker, 1.
- San Miguel County: Lee, H. A., 9.
- Silver Plume mining district: Spurr, Garrey, and Ball, 1.

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- Silverton: Cross, 32; Cross, Howe, and Ransome, 1.
- southeastern Colorado: Gilbert, 6.
- South Park: Lakes, 115.
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- Spanish Peaks: Hills, R. C., 9, 20, 25; Lakes, 156; Savage, 1.
- Summit County: Mg. Ind., 5.
- Teller County, mining district: Rickard, T. A., 22.
- Telluride quadrangle: Cross and Purington, 1; Purington, 2.
- Tomichi-Monarch mining district: Crawford, 4.
- Two Butte uplift: Stanton, 3.
- Uinta fold: White, 24.
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- uplift, eastern: Emmons, 9.
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- Walsenburg: Hills, R. C., 15.
- White River Plateau: Hills, 20.
- Yampa coal field: Fenneman and Gale, 2.
- Delagua, coal mine explosion: Duck, 1.
- Del Norte:**
- General:* Endlich, 4.
- hydrology: Newell, 6.
- rhyolitic vitrophyre: Clarke, F. W., 8.
- Delta County, coal:** Headden, 8; Woodruff, E. G., 1.
- gypsum: Siebenthal, 1.
- map: Clason Map Co.
- minerals described: Headden, 6.
- mines described: Henderson, C. W., 4.
- radium bearing springs: Headden, 5.
- Denver, altitude of:** Howe, H. A., 1.
- artesian wells: Cannon, 10; Chauvenet, 2; Chisholm, 1; Cross, 3, 22; Darton, 9; Hills, R. C., 18; Strong, 1; van Diest, 3, 11.
- Cretaceous section: Stanton, 2.
- geology: Cannon, 2, 10; Hayden, 6.
- infusorial earth: Headden, 2.
- irrigation district, map: Clason Map Co.



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map: Clason Map Co.  
 mineral water, analysis: Clarke, F. W., 9.  
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 soda near: Wilson, J. S., 1.  
 South Platte Valley, and, map: Clason Map Co.  
 stratigraphic and structural features: Eldridge, 2.  
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 coal, production 1864-1894: Emmons, Cross, and Eldridge, 2.  
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 fire clay, analysis: Emmons, Cross, and Eldridge, 2.  
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 geology, dynamic: Eldridge, 2; Emmons, Cross, and Eldridge, 2; Henderson, J., 1; Lakes, 6.  
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 Niobrara dolomite, analysis of: Clarke, F. W., 9.  
 oil deposits: More, Wm., 1; Ohly, 6.  
 overturns in: Henderson, J., 1.  
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paleontology: Cannon, 11; Lee, W. T., 5; Marsh, 30; Emmons, Cross, and Eldridge, 2.  
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 placer gold: Emmons, Cross, and Eldridge, 2.  
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 rocks, analysis of: Clarke, F. W., 9; Clarke and Hillebrand, 1.  
 soil, loess: Clarke, F. W., 9; Emmons, Cross, and Eldridge, 2.  
 wells, analysis of water: Eakins, 5; Emmons, Cross, and Eldridge, 2; Foster, E. L., 1.  
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**Denver County**, map: Clason Map Co.  
**Denver-Greeley district**, map: Clason Map Co.  
**Devil's Head Mountain**, allanite and gadolinite: Eakins, 1.  
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*Stratigraphic.* See list of formations, page 479.  
*General*: Cross, 33; Endlich, 1, 3, 5; Hay, O. P., 2; Hollister, 1; Lakes, 5; Peale, 7; Spencer, A. C., 2.  
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 Rico Mountains, quartzite: Cross and Spencer, 2.  
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*General:* Clarke, J. M., 2; Crawford, 3, 4; Cross, 33; Endlich, 1, 3, 5; Girty, 1, 2; Hay, O. P., 2; Spencer, A. C., 2; Spencer and Girty, 1; White, 16.

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Needle Mountains: Cross, Howe, Irving and Emmons, 1.

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Ouray: Cross, Howe, and Irving, 1.

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**Devonian-Carboniferous.** *See* Carboniferous-Devonian.

**Devonian-Mississippian, Monarch-Tomichi district:** Crawford, 4.

**Diamond field:** Mg. and Sci. Press, 2, 3.

**Dillon, placer mining:** Lakes, 249.

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**Disappointment, ore deposits:** Hillebrand and Ransome, 1.

**Dolomite:** Merrill, 4.

**Dolores, Engineer Mountain:** Cross, 41.

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uranium in: Lee, H. A., 7.

**Dolores Peak:** Endlich, 7.

**Dolores River, hydrology:** Newell, 7, 14; Peale, 8.

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**Dotsero, volcano near:** Lakes, 7.

**Doughty Springs, radium-bearing springs:** Headden, 5.

**Douglas County, allanite and gadolinite:** Eakins, 1.

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minerals, analysis of: Clarke, F. W., 6; Hillebrand, 4.

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**Douglas Creek, erosion:** Endlich, 8.

**Drainage system, Georgetown district:** Crosby, 4.

La Plata Mountains: Cross and Spencer, 1.

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Mineral Creek: Cross and Howe, 1.

Nepesta quadrangle: Fisher, 1.

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Rico Mountains: Cross and Spencer, 2.

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**Durango, coal, analyses:** Gardner, 1; Lakes, 6; 223; Taff, 1.

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geology, dynamic: Emmons, W. H., 1; Taff, 1.

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mine described: Emmons, W. H., 1.

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**Durango-Gallup district, clay deposits, analysis:** Shaler and Gardner, 1.

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- Durango-Mesa Verde field**, coal, analysis: Shaler, 2.
- Durango-Monero coal field**: Gardner, 1.
- Dynamic and structural geology**. *See* anticlinal structure, batholiths, caves, chonoliths, cone-in-cone, deformation, earthquakes, erosion, faulting, folding, glaciation, igneous intrusions, jointing, landslides, magmatic differentiation, metamorphism, ore formation, orogeny, sedimentation, vulcanism, weathering.
- Eagle County**. *See also* Red Cliff.  
 Battle Mountain, mines: E. and M. J., 19; Nicholson, H. H., 1; Olcutt, 1.  
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 hen, 1.  
 iron ore, Red Cliff: Snedaker, 2.  
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- Eagle River Mountains**: Bechler, 1.
- Eagle River Valley**, geology: Peale, 7.
- Earthquakes**: recent earth movements: Lakes, 120.  
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- East Beaver**, copper production: Mg. Rept., 40.
- Eastern Colorado**, artesian wells: Darton, 9, 10, 13; Emmons, Cross, and Eldridge, 2; Gilbert, 5; Hay, R., 2.  
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- Eastern slope**: Marvine, 1.
- Echinodermata**, Cretaceous: Cragin, 2.  
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- Economic (general)**.  
*General*: Emmons, 15; Emmons and Hayes, 1; Endlich, 1, 3, 6; Fossett, 1; Hayden, 25, 26; Lesquereux, 2; Loew, 2; Marshall, W. L., 3; Newberry, 3; Peale, 8; Stevenson, 3.  
 briquetting, bibliography: Mills, J. E., 1.  
 Colorado Fuel and Iron Company, Elmore: Stutz, 1.  
 Colorado Fuel and Iron Company, equipment and work: Bancroft, 5; Lewis, 1.  
 economic products, bibliography of: Emmons and Eckel, 1, 2; Emmons and Hayes, 3; Hayes and Lindgren, 1.  
 ferric sulphate in mine waters, action on metals: Jones, L. J. W., 1.  
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 fuel testing, bibliography: Burrows, 1.  
 geological work, 1901: Walcott, 9.  
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- mineralogical mistake: van Diest, 13.
- sulphide belt: Ores and Metals, 1; Ritter, 8.
- veins and minerals: Mg. and Sci. Press, 1.
- veins of southwestern Colorado: Comstock, T. B., 6.
- vein phenomena, Boulder County: Farish, 1.
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**Elbert County,** map: Clason Map Co.**Eldora.** *See also* Boulder County.

- mines described: Mg. Rept., 7.
- ore deposits: Rickard, T. A., 28.

**Elk Creek,** ore deposits, head of North Fork: Cross, Howe, and Irving, 1.**Elk Mountains:**

- General:* Emmons, 7; Hayden, 14; Peale, 5.
- building stones: Emmons, Cross, and Eldridge, 1.
- clay: Emmons, Cross, and Eldridge, 1.
- coal, contact metamorphism: Stevenson, 14.
- coal: Emmons, Cross, and Eldridge, 1.
- eruptive rocks: Peale, 9.
- geology, dynamic: Emmons, Cross, and Eldridge, 1; Holmes, 1; Lakes, 143, 150.
- geology, northwestern portion: Holmes, 1.
- geology: Cross, 23; Hayden, 19.
- hydrology: Holmes, 1.
- iron, bog ore: Emmons, Cross, and Eldridge, 1.
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- limestones: Emmons, Cross, and Eldridge, 1.
- map: Hayden, 19; Peale, 7.
- minerals, analysis of: Clarke, F. W., 6.
- mines, production, 1880: Burchard, H. C., 1.
- ore deposits: Emmons, Cross, and Eldridge, 1; Lakes, 2.

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- physiography: Emmons, Cross, and Eldridge, 1.
- rare minerals from: Emmons, Cross, and Eldridge, 1.
- rocks, analysis of: Clarke and Hillebrand, 1.
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**Elk Range,** map: Holmes, 1.**Elkhead Mountains.**

- General:* Draper, 2; Hague and Emmons, 1.
- basalt and trachyte: Zirkel, 1; Hague and Emmons, 1.
- basaltic hills: Hague and Emmons, 1.
- Cretaceous formations: Hague and Emmons, 1.
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- Hahns (Hantz) Peak: Hague and Emmons, 1.
- Rampart: Hague and Emmons, 1.
- rocks, analyses: Clarke, F. W., 8; Hague and Emmons, 1.
- trachyte region: Hague and Emmons, 1.

**Elkton mine:** Mg. Rept., 19.**El Late Mountain,** geology of: Cross, 23.

- Elmoro,** artesian wells: Hills, R. C., 24.
- basalt: Hills, R. C., 24.
- cement limestone: Hills, R. C., 24.
- coal: Hills, R. C., 24, 26.
- coke, analysis of: Hills, R. C., 24; Weeks, J. D., 3.
- fire clay: Hills, R. C., 24.
- geology, dynamic: Hills, R. C., 24.
- iron ore: Hills, R. C., 24.
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- map: Hills, R. C., 24; U. S. G. S.
- petroleum: Hills, R. C., 24.
- physiography: Hills, R. C., 24.
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- arfvedsonite, analysis of: Endlich, 6.
- astrophyllite, with analysis: Eakins, 8; Endlich, 6.

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- Calhan, clay from: Richardson, 3.  
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 minerals: Emmons, 7.  
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 oil: Ores and Metals, 5.  
 rocks, analysis of: Hillebrand, 11.  
 rutile and danalite: Genth, 1; Schaller, W. T., 3.  
 sandstone: Foster, E. L., 1.  
 Turkey Creek, geology of: Stone, 4.  
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**Empire mining district:** Spurr, Garrey, and Ball, 1.

**Engineer Mountain,** geology and ore deposits: Cross, 41.

- map: Cross, 41; Cross, Howe, Irving, and Emmons, 1.  
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 rocks, analysis of: Clarke, F. W., 8.  
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*Stratigraphic.*

- General:* Endlich, 5; Hayden, 19; Marvin, 1; Peale, 7.  
 Book Cliffs: Richardson, 1.  
 Huerfano Lake basin: Hills, R. C., 19, 28; Weller, 1.  
 lake beds, San Juan: Comstock, 7.  
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 lower: Hayden, 19.  
 North America, west of 100th meridian: Smith, J. H., 1.  
 Oligocene, map: Willis, 2.  
 Silver Cliff: Cross, 27.  
 Tertiary: King, 1.

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- General:* Clarke, W. B., 1; Cockerell, 20d; Cope, 6, 15, 17; King, 1; Lesquereux, 4; Peale, 7.  
 Amyzon beds: Clark, W. B., 1.  
 Bear River group: Cope, 15, 19.  
 Bridger group: Clark, W. B., 1; Cope, 54, 60; White, 1, 3.  
 Fort Union: Cope, 15, 19; Knowlton, 1; White, 1.  
 Green River group: Clark, W. B., 1; Peale, 12; White, 1, 3, 17.  
 Huerfano beds: Clark, W. B., 1; Cragin, 1; Hills, 13; Osborn, 1, 2, 4.  
 lake basins: Marsh, 2.  
 lower: Osborn, 4; Peale, 12.  
 Monument Creek: Dall and Harris, 1; Darton, 12, 13; Lee, W. T., 5.  
 Puerco beds: Clark, W. B., 1; Cope, 54.  
 Uinta fauna: Cope, 60; King, 1.  
 Wasatch: Cope, 54, 60; Endlich, 5; Peale, 12; White, 1, 3.  
 Wind River: White, 1.

**Eozoic rocks:** Hunt, 3.

**Epidote:** Sterrett, 2.

**Erie, coal:** Potter, W. B., 1.

Puritan mine: Watson, J., 1.

**Erosion.**

- General:* Bechler, 2; Davis, W. M., 4; Endlich, F. M., 1, 4, 5; Hayden, 6, 12, 14, 18, 19, 22; Holmes, 6; Marvin, 1; Newberry, 3; Peale, 7; Powell, 1, 3; Russell, 1; Stevenson, 3; White, 26.  
 Arkansas Valley: Darton, 13; Emmons, 9; Gilbert, 5.  
 Aspen district: Spurr, 1.  
 Base leveling of the Cretaceous during Tertiary age: Upham, 1.  
 Chalk Bluffs and Pawnee Buttes: Henderson, J., 7.  
 cliff erosion, Front Range: Fenneman, 6.  
 Cripple Creek district: Lindgren and Ransome, 3.

**Erosion.—Continued.**

Denver district, erosional epoch:  
 Cannon, 2, 10; Emmons, Cross,  
 and Eldridge, 2.  
 Elk Range: Holmes, 1.  
 eruptive rocks, late: Peale, 9.  
 fluvial, Georgetown: Crosby, 4.  
 forms, eastern Colorado: Hayden,  
 17.  
 Front Range, cliff erosion: Fenne-  
 man, 6.  
 Garden of the Gods: Minerals, 1.  
 Georgetown, fluvial: Crosby, 4.  
 glacial, Leadville: Capps and  
 Leffingwell, 1.  
 glacial, Mosquito Range: Emmons,  
 9.  
 Glacial Twin Lakes: Westgate, 1.  
 Lake basins, by wind: Gilbert, 3.  
 La Plata Mountains: Cross and  
 Spencer, 1.  
 mesas of Boulder: Lee, W. T., 2.  
 monuments, peculiar formations,  
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 Needle Mountains: Cross, Howe,  
 Irving, and Emmons, 1.  
 ore deposits, Summit County:  
 Merrick, 1.  
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 Pikes Peak district: Cross, 24;  
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 Pitkin County: Lee, H. A., 9.  
 Plateau province: Gilbert, 2.  
 polished pebbles: George, 1.  
 products of erosion: Endlich, 8.  
 Pueblo: Gilbert, 7.  
 Red Mountain: Kedzie, 1.  
 Rico quadrangle: Cross and Ran-  
 some, 1; Cross and Spencer, 2.  
 Rio Grande, headwaters of: Pat-  
 ton, 2.  
 Rocky Mountains: Emmons, 17.  
 Rosita Hills: Cross, 17.  
 Rosita and Silver Cliff: Emmons,  
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 dell, 1.  
 sand: Gilbert, 1.  
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San Juan Mountains, interglacial:  
 Howe and Cross, 1.  
 San Miguel County: Lee, H. A., 9.  
 stream, Mosquito Range: Emmons,  
 9.  
 subaerial versus marine: Crosby,  
 3.  
 Telluride quadrangle: Cross and  
 Purington, 1.  
 Tertiary, base leveling: Upham, 1.  
 Unaweep Canyon: Gannett, H., 9.  
**Escalante Hills:** Hague and Emmons,  
 1; King, 1; Powell, 1.  
**Estes Park.**  
*General:* Bechler, 1; Hague and  
 Emmons, 1.  
 glaciation: Mills, Enos, 1, 2, 3.  
 water, analysis of: Lee, H. A., 9.  
**Eureka, zinc treatment mill:** Prosser,  
 5.  
**Evergreen, copper:** Mg. Rept., 40;  
 Ritter, 4, 5.  
**Fair Glacier:** Henderson, J., 15.  
**Fairplay.**  
*General:* Endlich, 1; Peale, 6.  
 geology, economic: Endlich, 1;  
 Peale, 6.  
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 Scudder, 19.  
 placers: Lakes, 21, 81.  
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 Clarke and Hillebrand, 1.  
**Fairview, micaceous granite:** Clarke,  
 F. W., 8.  
**Fall Creek, carnotite:** Fleck and Hal-  
 dane, 2; Hess, 3.  
**Fall River district, Alice mine:** Her-  
 rick, 3.  
**Faulting.**  
*General:* Lakes, 136, 155; Wash-  
 burne, 3.  
 Alma, Mosquito Gulch fault: Pat-  
 ton, 10.  
 Alma, London fault: Patton, 10.  
 Apishapa quadrangle: Stose, 1.  
 Creede: Emmons and Larsen, 1.  
 Dakota fire clay beds, fault planes:  
 Patton, 6.  
 Denver Basin: Eldridge, 2.

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- Durango-Monero coal field, dip and faults: Gardner, J. H., 1.  
 Georgetown, nature of fault movements: Spurr, Garrey, and Ball, 1.  
 Gunnison: Hill, J. M., 1.  
 Leadville: Argall, 1; Emmons, 9.  
 London fault: Patton, 10.  
 Monarch-Garfield: Crawford, 3.  
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 Mosquito Range, London fault: Lakes, 85; Patton, 10.  
 northern Colorado: Henderson, J., 10.  
 northwestern coal fields: Gale, 7, 8.  
 Ouray quadrangle: Cross, Howe, and Irving, 1.  
 San Juan: Howe, 2.  
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 Ute Pass, great fault, accompanying sandstone dikes: Crosby, 2.
- Ferromanganese:** Harder, 1.  
 production, 1903-1904: Day, 16,  
 17—1907: Thom, 2.
- Fire brick,** production 1888: Day, 4—  
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- Fire clay.**  
*General:* Bailar, 3; Hague, 1;  
 Lakes, 51, 165, 205; Ries, 1.  
 Apishapa quadrangle: Stose, G. W., 1.  
 Boulder County: Mg. Rept., 33.  
 Denver Basin: Emmons, Cross, and Eldridge, 2.  
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- Fishes,** Canon City: Clarke, J. M., 1;  
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- Devonian: Eastman, 1; Hay, 2.  
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- Flint, chalcedony:** Lakes, 171.  
 pebbles, production 1905: Day, 18.
- Florence.** *See also* Fremont County.  
 cement plant: Rennell, 1.  
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 geology, dynamic: Eldridge, 5;  
 Fenneman, 4; Washburne, 2.  
 mills described: Min. Ind. and Rept., 8.  
 oil deposits: Day, 19, 22; Eldridge, 5; Emmons, 20; Fenneman, 4; Hall, C. L., 1; Lakes, 6, 8, 86, 124, 195a, 241; Mg. Investor, 3; Newberry, 11, 15; Ohly, 9; Washburne, 2; Weeks, J. D., 2, 4; Youmans, 1.  
 oil production, 1909: Day, 20.  
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- Floresta (Ruby), coal:** Emmons, Cross, and Eldridge, 1; Hosea, 6; Lee, W. T., 13.
- Florida River,** hydrography: Newell, 14.
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- paleobotany, fossil flora: Britton and Hollick, 1; Cockerell, 1, 6, 8, 25, 32, 33, 34, 44, 46, 56, 58, 59, 61, 62; Hollick, 3, 4; Kirchner, 1; Warder, 1.
- paleobotany, fossil forest: Heilprin, A., 1; Lakes, 75.
- paleobotany, fossil grass: Brues, C. T., 2.
- paleontology, insects: Scudder, 9.
- paleontology, fossil insects: Brues, C. T., 1, 3, 4, 5, 6; Cockerell, 2, 4, 5, 6, 7, 10, 11, 14, 15, 16, 18, 19, 19a, 20a, 20b, 20c, 20d, 21, 22, 24, 26, 27, 28, 29, 30, 31, 33, 36, 37, 38, 39, 40, 41, 42, 43, 47, 48, 49, 51, 52, 53, 54, 55, 60; Rohwer, 1, 2, 3, 4, 5, 6, 7; Scudder, 9, 10, 20, 24, 26, 27, 28, 30, 31, 34, 35, 36; Sutton, 1; Wheeler, W. M., 1, 2.
- paleontology, fossil mollusca: Cockerell, 3, 12, 35.
- paleontology: Allen, J. A., 2; Cockerell, 6, 17; Cope, 40; Lesquereux, 16; Scudder, 5, 7, 11, 12, 13, 14, 15, 20, 27, 28, 29, 34, 35, 37, 38, 39, 41; Wickham, 1, 2, 3.
- phenacite: Hidden, 2; Penfield, 1.
- physiography: Henderson, J., 6.
- Tertiary lake basin: Henderson, J., 6; Scudder, 10, 15, 18, 27.
- tufa: Wadsworth, 1.
- Fluorspar**, production 1893-1894: Rothwell, 2, 3—1899, 1905: Day, 12, 18—1906: Ingalls, 5; Thom, 1—1907: Thom, 2—1909: Burchard, E. F., 4—1910: Fay, 1—1911: Burchard, E. F., 8; Of, 1; Parker, E. W., 7.
- Folding**, coal measures, southeastern Colorado: van Diest, 10.
- Elk range: Holmes, 1.
- Leadville: Bulkley, 1; Emmons, 2; Shedd, 1.
- Monarch-Garfield: Crawford, 3.
- Monarch-Tomichi: Crawford, 4.
- northwestern coal fields: Gale, 7, 8.
- Rabbit Ears: Grout, Worcester, and Henderson, 1.
- Tomichi-Monarch: Crawford, 4.
- Uinta fold: White, 24.
- Forest reserves**, reports: Gannett, H., 17.
- Forestry**, timber consumption: Gannett, H., 16.
- timber line: Gannett, H., 18.
- wooded area: Gannett, H., 16.
- Fort Collins**, building stone: Merrill, 2.
- calcites, phosphorescent: Headden, 7.
- concretions: Lakes, 39.
- Cretaceous: White, 10.
- sandstone quarries: Merrill, 4.
- Fort Collins quadrangle**, map: U. S. G. S.
- Fort Garland**: Wheeler, 6.
- geology: Hawn, 1.
- Fortieth Parallel area**, Colorado.
- General*: Hague and Emmons, 1; King, 1.
- See also*: Archean, Cenozoic geology, Fortieth Parallel area, Elkhead Mountains, Green River Basin, Medicine Bow Range, Mesozoic (of) Fortieth Parallel area, North Park, Orography (of) Fortieth Parallel area, Paleozoic (of) Fortieth Parallel area, Pre-Cambrian Topography, Volcanic rocks Fortieth Parallel area, Yampa River Valley.
- Fortification Peak**, basalt: Zirkel, 1.
- Fossil Canyon**, paleontology: Scudder, 1.
- Fossil Creek**, paleontology: Henderson, J., 9.
- Fossil Ridge**, geology: Henderson, J., 8, 9.
- paleontology: Henderson, J., 8, 9.
- Fourmile**, placer gold: Hoover, 3.
- Fowler**, water, analysis of: Fisher, 1.
- Franceville**, meteorite: Preston, 1.
- Fremont County**. *See also* Canon City and Florence.
- General*: Williams, S. G., 1.
- bismuth: Ingalls, 8.
- building stone: Lakes, 95; Merrill, 2.
- coal: Raymond, 9; Williams, S. G., 1.
- copper, map: Lindgren, 8, 9.



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- Gem mine, nickel deposits: Charlton, 2.
- geology, economic: Emmons, 7.
- iron, magnetite: Rolker, 1.
- iron ores, analysis of: Clark, R. N., 1; Raymond, 7.
- limestone: Burchard, E. F., 8.
- marble, Twin Mountain: Lakes, 221.
- mines described, 1873: Raymond, 9.
- mines, production, 1881-3: Burchard, H. C., 2, 3, 4—1910: Henderson, C. W., 4.
- nickel, Gem mine: Charlton, 2.
- oil fields: Ihlseng, 2; Lee, H. A., 9.  
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- physiography: Lindgren, 8.
- precious stones: Sterrett, 2.
- Red Gulch, copper deposits: Lindgren, 9.
- resources of: Lee, H. A., 9.
- sandstone quarries: Merrill, 4.

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- General*: Bechler, 1; Emmons, 20; Hague and Emmons, 1; Hills, R. C., 17; Marvine, 1; Suess, 1; Youmans, 2.
- gas: Lakes, 185.
- geology, dynamic: Fenneman, 6; Lakes, 185.
- geology, relation to topography: Davis, W. M., 10, 11.
- geology, surface features: Hayden, 18.
- hydrology: Lakes, 185.
- Jura-Trias: Hallowell, 1.
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- Morrison: Lee, W. T., 6.
- oil: Lakes, 185.
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**Frying Pan**, map: Boehmer, 1c.

- Fuller's earth**, production, 1897, 1899, 1901, 1904: Day, 10, 12, 14, 17—1907: Thom, 2; Middleton, 3—1911: Parker, E. W., 7.

**Gadolinite**, production, 1904: Day, 17.**Garden Park**, Ordovician exposures in: Darton, 14.

- paleontology, fossil described: Gilmore, 1.

**Garfield County**, coal deposits, Newcastle: Ashley and Fisher, 1.

- coal deposits: Campbell, M. R., 5; Gale, 3; Hosea, 2; Lord, 2.
- copper: Mg. Rept., 40.

**Carboniferous rocks**, analysis: Clarke and Hillebrand, 1.

- mineral production, 1910: Henderson, C. W., 4.

**Garnet**, *General*: Henahen, 1; Sterrett, 2, 7.

- production: Day, 7; Thom, 1.

**Gas**, *General*: Bailar, 3; George, 5; Henahen, 1; Lakes, 8, 106, 209;

- Nat. Conservation Commission, 1.
- Boulder field: Curtis, H. H., 1; Day, 22; Fenneman, 5; George, 5; Hill, B., 1; van Diest, 7.

- coke, production, 1902, 1903, 1905: Day, 15, 16, 18—1906, 1907: Thom, 1, 2.

**Florence**: Day, 22; Weeks, J. D., 6.**Front Range**: Lakes, 185.**Manitou**: Strieby, Wm., 1.**Pitkin County**: Hills, R. C., 7.**producer plants**, list of: Fernald, 2.

- production, 1887, 1895, 1896, 1898, 1899, 1900: Day, 3, 9, 10, 11, 12, 13—1901-1902: Day, 14, 15; Struthers, 2, 3—1903, 1904, 1905: Day, 16, 17, 18—1906, 1907: Thom, 1, 2—1911: Parker, E. W., 7.

**San Luis Valley**: Siebenthal, 4.**tests for**: Clark, R. N., 1.

- water, tar, production, 1905: Day, 18.

**White River**, wells and springs: Lakes, 165, 188, 236.**Gems.** *See* precious stones.

- General**, *General*: Agassiz, 1; Davis, W. M., 1; Dutton, 1; Emmons, 18; Geikie, 1; Hunt, 2, 3; Kneeland, 2; Marcou, J., 2; Newberry, 6.

**Collins**, Arthur L., work of in state: Lawrence, B. B., 3.

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- Geological Survey: Hayes, 1.  
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 illustrations, pictures: Hayden, 8, 11.  
 Long, expedition, 1819-1820: Long, 1.  
 mining law, summary: E. and M. J., 2; Brownlee, 1.  
 State Geological Survey: Finch, 3.  
 State School of Mines, graduates, 1882-1892: Christy, 1.  
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 taxation of mining property: Brownlee, 1; Mg. Sci., 7.

**Geological formations described.** See list, page 479.

**Georgetown, General:** Endlich, 1; Hayden, 6; Spurr, Garrey, and Ball, 1.

- adamellite gneiss: Spurr, Garrey, and Ball, 1.  
 alaskite porphyry: Spurr, Garrey, and Ball, 1.  
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 auriferous-pyritic deposits: Spurr, Garrey, and Ball, 1.  
 biotite latite: Mg. Sci., 2; Spurr, Garrey, and Ball, 1.  
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- geology: Mg. Sci., 2; Ball, S. H., 1; Crosby, 4; Spurr and Garrey, 1.  
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 gold deposits: Pearce, R., 12; Spurr and Garrey, 1; Spurr, Garrey and Ball, 1.  
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 ore deposits, lodes and fissures: Crosby, 4.  
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- quartz monzonite gneiss: Mg. Sci., 2; Spurr, Garrey, and Ball, 1.
- rocks described: Daly, 1.
- silver: Pearce, R., 12; Spurr and Garrey, 1; Spurr, Garrey, and Ball, 1.
- silver-lead deposits: Spurr, Garrey, and Ball, 1.
- underground waters, action of: Spurr, Garrey, and Ball, 1.
- zinc, metallurgy of: Siebenthal, 6.

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geology, economic: Emmons, 7; Fossett, F., 1.

gold deposits: Collins, A. L., 1; Collins, G. E., 1; Curle, 1; Hague, 1; Mathez, 1; McCarn, 2; Pearce, 15; Rickard, F., 1; Rogers, A. N., 1.

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mineral production, description of mines: Buchard, 2, 3, 4; Callbreath, 2; Collins, A. L., 1; Collins, G. E., 3, 9, 10; E. and M. J., 25, 34; Egleston, 1; Henderson, C. W., 3, 4; Hollister, 1; Hodges, 1; Lee, W. T., 9; Lakes, 5; Mg. Ind., 4; Mg. Rept., 22, 24, 27; Mg. and Sci. Press, 5; Raymond, 1, 4, 7, 10; Rickard, F., 1; Rickard, T. A., 6; Rogers, A. N., 1; Rothwell, 6; Tonge, 9, 10.

mines, Bob Tail Hill: Mg. Rept., 6.  
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Aspen mining district: Brunton, 2; Spurr, 1.  
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Boulder County: George, 3.  
Breckenridge: Ransome, 5.  
Clear Creek: Underhill, 4.  
Creede, glacial deposits: Emmons and Larsen, 1.  
Cripple Creek, moraines: Cross and Penrose, 1.  
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Denver basin: Emmons, Cross, and Eldridge, 2.  
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drift of the Rocky Mountains: Comstock, 3.  
drift, Colorado Plateau: Gilbert, 2.  
Engineer Mountain: Cross, 41; Hole, 1, 2.  
Estes Park: Mills, Enos, 1, 2, 3; Orton, 2.  
extinct glaciers: Henderson, J., 4.  
Georgetown district: Crosby, 4; Spurr, Garrey, and Ball, 1; Lakes, 247.  
Hagues Peak: Stone, 1.  
Hahns Peak: George and Crawford, 1.  
Hallett: Chapin, 1; Mills, 1.  
Lake County: Lakes, 5.  
La Plata quadrangle: Cross, Spencer, and Ransome, 1; Davis, W. M., 8.  
Las Animas glacier: Stone, 3.  
Leadville downtown district: Emmons and Irving, 1.

## Glaciation.—Continued.

Leadville: Capps, 1; Capps and Leffingwell, 1; Emmons, 2, 9.  
Longs Peak: Orton, 2.  
Monarch-Garfield district: Crawford, 3.  
Monarch-Tomichi district: Crawford, 4.  
Montezuma mining district, Summit County: Patton, 7.  
Mosquito Range: Emmons, 9; Lakes, 110.  
Needle Mountains: Cross, Howe, Irving, and Emmons, 1.  
North America in ice age: Newberry, 9.  
northwestern Colorado: Henderson, 14; White, 4.  
Ouray quadrangle: Cross, Howe, and Irving, 1.  
Pikes Peak: Cross, 24; Lakes, 29.  
Pitkin County: Lee, H. A., 9.  
Pleistocene, Sawatch Range: Capps and Leffingwell, 1.  
Rabbit Ears: Grout, Worcester, and Henderson, 1.  
Rico Mountains: Cross and Spencer, 1, 2; Cross and Ransome, 1.  
Rocky Mountains: Bliss, 1; Cannon, 2; Comstock, 3; Emmons, 14; Stone, 9.  
Sangre de Cristo Range: Siebenenthal, 2.  
San Juan County: Comstock, 1, 7; Hills, R. C., 4; Cross and Howe, 1, 2; Spencer, 3.  
San Juan River: Cross and Howe, 1.  
San Juan: Atwood and Mather, 1.  
San Luis district: Endlich, 1; Siebenenthal, 4, 5.  
Sawatch Range, near Leadville: Capps and Leffingwell, 1.  
Sawatch Range: Davis, W. M., 7; Lakes, 2.  
Silverton: Cross and Howe, 1.  
southeastern division: Endlich, 4.  
southern Colorado: Endlich, 4.

**Glaciation.**—Continued.

- Telluride quadrangle: Cross and Purington, 1; Hole, A. D., 2; Lay, 1.
- Ten Mile district: Emmons, 27.
- Twin Lakes: Hayden, 30; Westgate, 1.
- White River district: Endlich, 5.
- Gladstone, hübnerite from, Natalie mine: George, 3.
- zinc ores: Richards and Locke, 2.
- Glass sand, production, 1905: Day, 18—1906, 1907; Thom, 1, 2—1909: Burchard, E. F., 4; Of, 1.
- Glen Eyrie formation: Finlay, 3.
- Glen Eyrie, paleontology: Cragin, 5; Finlay, 3.
- Glenwood Springs, coal: Hills, R. C., 6.
- gas and oil: Newberry, 15.
- geology, dynamic: Lakes, 6.
- rocks, carbonaceous, analysis of: Clarke and Hillebrand, 1; Spurr, 1.
- Yampa spring, water analysis: Spurr, 1.
- Gold, General:** Chisholm, 4; Collins, G. E., 9; Eilers, 3; Emmons, 7, 20; Endlich, 1, 2, 4, 5; Fossett, 1; Frazer, 1; Hayden, 5, 6; Lakes, 5, 22, 56, 143, 205, 219; Lindgren, 1; Loew, 2; Marshall, 3; Marvin, 1; Mg. Rev., 3; Rickard, T. A., 8, 17; Stevens, 2; Stevenson, 3; Taylor, 1, 2; Wheeler, G. M., 2, 5; Wilson, J. S., 1. *See also* Reports of U. S. Mint.
- age of, geological: Lakes, 15.
- Animas Fork: Scholl and Herrick, 1.
- association with other metals: Lincoln, F. C., 1; Pearce, R., 15.
- auriferous pyrite, Georgetown: Spurr, Garrey, and Ball, 1.
- Battle Mountain quartzite formation: Guiterman, F., 1.
- bonanzas in: Rickard, T. A., 17.
- Boulder County: Curle, 1; Farish, 2; Jennings, 1; Lakes, 131; Marvin, 2; Rickard, T. A., 21; Silliman, 1.

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- Boulder County, near Jamestown: Farish, 1.
- Breckenridge district: Lakes, 66, 232; Lakes, A., Jr., 1; Min. Ind. and Tradesman, 7; Ransome, 5.
- calaverite: Hillebrand, 10.
- Cambrian formation: Austin, W. L., 3.
- Central City, Topeka mine: Lakes, 71.
- Clear Creek: Lawrence, B. B., 2.
- Colorado City, Golden Cycle mill, 1907: Fulton, 1.
- Costilla County, placer: Julian, 1.
- Cripple Creek: Cross and Penrose, 1; Curle, 1; Kemp, 1a; Knight, F. C., 1; Lakes, 30, 35, 47, 59; Liebenan, 1; Lindgren, 4; Lindgren and Ransome, 1, 2, 3; McCarn, 1; Mollmann, 1; Pearce, R., 6, 8, 9; Rickard, T. A., 9, 11, 14, 22; Ritter, 2; Winslow, 1.
- Custer County: Emmons, 23.
- discoveries: Weston, 8.
- distribution of: Rickard, T. A., 25.
- Durango quadrangle: Emmons, W. H., 1.
- Eagle River: Peale, 7.
- free: Lakes, 174.
- Georgetown: Spurr and Garrey, 1; Spurr, Garrey, and Ball, 1.
- Gilpin County: Collins, A. L., 1; Collins, G. E., 1; Curle, 1; Mathez, 1; McCarn, 2; Rickard, F., 1; Rogers, A. N., 1.
- Gold coin mine: Lakes, 89.
- Gold Hill: Eilers, 3; Marvin, 2; Silliman, 1.
- gravel deposits: Cummings, 1.
- Grayback, placer and lode deposits: Patton, 8.
- Grayback district, history of: Wulsten, 4.
- Gunnison County: E. and M. J., 14; Frazer, 2; Hill, J. M., 1; Lakes, 20, 27, 32, 63, 179.
- Hahns Peak: Draper, 1; Gale, 1; George and Crawford, 1; Parsons and Liddell, 1.

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Howardsville: Mines and Minerals, 4.  
 Idaho Springs: Lakes, 12; Spurr and Garrey, 2; Underhill, 2.  
 John Jay mine: van Diest, 12.  
 lacustrine sands, from: Hastings, 1.  
 Lake City: Irving, 3; Irving and Bancroft, 1.  
 Lake Fork: Woolsey, 2.  
 La Plata Mountains: Austin, W. L., 2; Cross, Spencer, and Purington, 1; Freeland, H. C., 1; Petre, 1; Rickard, T. A., 9.  
 La Sal Mountains: Lakes, 67.  
 Leadville: Blow, 1, 2; Boehmer, 1; Emmons, S. F., 2; Lakes, 16, 82; Tonge, 8; Warwick, 1.  
 metallurgy, Cripple Creek, 1897: Ingalls, 1.  
 mills, 1869: Munroe, 1.  
 milling, Gilpin County, 1895: Rickard, T. A., 10.  
 milling, cost of, 1898; Ingalls, 2.  
 milling, San Juan: E. and M. J., 36.  
 milling: Hubbard, G. D., 1; Collins, G. E., 4, 7.  
 mining: Hague, 1; Hubbard, G. D., 1; VanWagenen, T., 2.  
 Monarch-Garfield district: Crawford, 3, 4.  
 Monarch-Tomichi district: Crawford, 4.  
 Needle Mountains: Lakes, 48.  
 ores, extraction from: Argall, P., 5.  
 ores, minerals accompanying: Irving and Bancroft, 1; Lincoln, F. C., 1; Pearce, R., 15; Rickard, T. A., 13.  
 Ouray, American Nettie mine: Lakes, 181.  
 Ouray, Camp Bird mine: Purington, 3, 4; Titcomb, 1.  
 Ouray: Cross, Howe, and Irving, 1; Endlich, 9; Irving, 2; Kedzie, 1.  
 Paradox Valley: Lakes, 67.  
 paragenesis of: Pearce, 14.

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Park County, 1895: Rickard, T. A., 9; Sadtler, 1.  
 placer mining, Banner: Richards, 9.  
 placer mining, Breckenridge: Brown, T. A., 1; Crow, 1; Janin, C.; Lakes, 197; Lakes, A., jr., 1.  
 placer mining, Costilla County: Julian, C., 1.  
 placer mining, Denver Basin: Emmons, Cross, and Eldridge, 2.  
 placer mining, Fourmile: Hoover, 3.  
 placer mining, Grand River, upper valley: Hartley, C., 2.  
 placer mining, Hahns Peak: George and Crawford, 1; Janin, C., 1.  
 placer mining, Lay, Routt County: Gale, 4.  
 placer mining, Monarch-Tomichi district: Crawford, 4.  
 placer mining, Newlins Gulch: Butler, G. M., 3.  
 placer mining, Routt County, 1895: Rickard, 9.  
 placer mining, San Miguel: Mg. Ind., 2.  
 placer mining, Summit County: Mg. Rept., 5.  
 placer mining, Twin Lakes: Guentherodt, 1.  
 placer mining, Willow Creek: Hartley, C., 2.  
 placer mining: Hayden, 14; Hena-hen, 1; Lakes, 5, 21, 22, 50; Thomas, K., 1; Thorn, 1.  
 Placerville: Hess, 4.  
 plains area: Darton, 9.  
 Platoro: Barnes, 1; Hills, 3; Raymond, 10.  
 Plomo: Gunther, 1.  
 production 1860-1866: Hollister, 1—1869-1874: Raymond, 1, 4, 5, 7, 9, 10—1872: E. and M. J., 1—of Black Hawk smelters, 1874: Egleston, 1—by counties 1876: E. and M. J., 3—1872-1877: Fossett, 2—1880-1883: Burchard, H.

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C., 1, 2, 3, 4—1885-1905: Day, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18—1885: E. and M. J., 10—by counties 1885-1886: Kimball, 1, 2—1887: Mg. Ind., 1—1887-1888: Munson, 1, 2—1889: Smith, M. E., 1; 1880-1890: Emmons, 19—1891: Smith, M. E., 3—1892-1899: Rothwell, 1, 2, 3, 4, 5, 6, 7—1892: Williams, A., 2—1870-1896: Mg. Ind., 9—1896: Rickard, T. A., 6—1898: Tonge, 6—1899: Hodgson, 1—1877-1900: Lindgren, 2—1900: Smith, M. E., 2; Hodges, 1; Ores and Metals, 3; Struthers, 1—1901: Hodges, J. L., 2; Lee, H. A., 9; Struthers, 2—1902: Downer, F. M., 1, 2; Mines and Mining, 2; Ores and Metals, 6; Struthers, 3—1903: Eckel, 2; E. and M. J., 38; Mg. Rept., 34—1904: Judd, 1; Mines and Mining, 3; Ores and Metals, 8—1905: Ores and Metals, 9—1906: Ingalls, 5; Thom, 1—1907: Dalzell, 2; Ingalls, 6; Thom, 2—1908: Collins, G. E., 8; Henderson, C. W., 1; Ingalls, 7—1909: Ingalls, 8—1910: Dalzell, 3; Fay, 1; Henderson, C. W., 4; McCaskey, 1; Van Wagner, 4; Warwick, 4—1911: Breen, L. A., 1; Collins, 11; Henderson, C. W., 5; Of, 1; Parker, E. W., 7—1912: Henahan—general: Emmons, 1; Lee, H. A., 1; Lindgren, 2; Lindgren and McCaskey, 1; National Conservation Commission, 1; Raymond, 8; Tonge, 14; Wyncoop, 1. *See also* Reports of U. S. Mint.

quartz-bearing: Argall, P., 1.

Red Mountain: Kedzie, 1.

Rico quadrangle: Cross and Ransome, 1; Farish, 3; Lakes, 44; Ransome, 2; Rickard, T. A., 7.

rocks in which it occurs: Lakes, 13.

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Rosita: Clark, R. N., 2; Cross, 27; Mg. Rept., 32.

Sangre de Cristo Creek: Rhoda, 3; van Diest, E. C. and P. H., 1.

San Juan County: Comstock, 1, 7; Curle, 1; Endlich, 3; Ihlseng, 1; Prosser, 2; Rickard, T. A., 9.

San Miguel: Spaulding, 1.

Sawatch Range: Peale, 7.

Sawpit: Hess, 4.

Silverton: Cross and Howe, 1; Ransome, 3; Rickard, T. A., 9.

southern Colorado, 1895: Rickard, T. A., 9.

South Park: Lakes, 115.

Summit County: Hausmann, 1; Hills, R. C., 3; Lakes, 37, 53; Patton, 7.

tellurides of Bear Creek: Emmons, 2.

tellurides of Boulder County: Lakes, 25.

tellurides of Cripple Creek: Hillebrand and Allen, 1.

tellurides, Gold Hill: Eilers, 3; Silliman, 1.

tellurides, La Plata Mountains: Austin, W. L., 1.

tellurides and pyrite, La Plata mountains: Lakes, 119.

tellurides, Needle Mountains: Cross, Howe, Irving, and Emmons, 1.

tellurides, Sierra Blanca: Pearce, R., 13; Sharwood, W. J., 1.

telluride ores: Kemp, 2; Lakes, 56, 61.

Telluride district: Cross and Purington, 1; Porter, 1; Purington, 2.

Telluride district, Liberty Bell mine: Winslow, 2.

Telluride district, production 1894: Rothwell, 3.

Victor and Cripple Creek districts: Lakes, 41. *See* Cripple Creek.

Vulcan and Mammoth Chimney mines: Lakes, 20.

Gold Coin mine: Lakes, 89.

**Golden, General:** Cross, 22; Hague, 1.  
 andesite tuff, Table Mountain, analysis of: Lakes, 118.  
 analcite from: Clarke and Steiger, 1.  
 apophyllite, analysis of: Cross and Hillebrand, 2.  
 basalt, Table Mountain, analysis of: Emmons, Cross, and Eldridge, 2.  
 brick: Hague, 1.  
 clay, analysis of: Clarke and Hillebrand, 1.  
 clay, white ware: Geijsbeek, 1.  
 coal: Emmons, Cross, and Eldridge, 2; Hayden, 4; Hodge, 1; Lakes, 6; Potter, W. B., 1.  
 Cretaceous: Cross, 22.  
 feldspar, analysis: Geijsbeek, 1.  
 fire clay: Am. Jour. Mg., Bailar, 3; Darton, 9; Patton, 6; Ward, W. S., 1.  
 fire clay, analysis: Furman, 1; Ward, W. S., 1.  
 geology, dynamic: Emmons, Cross, and Eldridge, 2; Patton, 6.  
 geology: Hayden, 6; Marvine, 1; Peale, 1.  
 mesolite, analysis of: Cross and Hillebrand, 2.  
 minerals, analysis of: Clarke, F. W., 6; Steiger, 1.  
 Table Mountain, basalt from: Lakes, 165; Emmons, Cross, and Eldridge, 2.  
 Table Mountain, ptilolite: Dana, E. S., 7.  
 Table Mountain, minerals from: Cross and Hillebrand, 2; Patton, 4.  
 non-conformities: Eldridge, 2.  
 paleobotany: Lesquereux, 19.  
 paleontology, fossil described: Berthand, 1; Lesquereux, 16.  
 ptilolite, Table Mountain: Dana, E. S., 7.  
 soil, analysis of: Emmons, 7.  
 thomsonite: Clarke and Steiger, 2; Patton, 4.  
 tin deposits near: Rolker, 3.

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tuff, Table mountain, analysis: Emmons, Cross, and Eldridge, 2.  
 zeolite crystals: Emmons, Cross, and Eldridge, 2; Cross and Hillebrand, 2; Lakes, 218; Marvine, 1.

## **Gold Hill.**

*General:* Endlich, 5.  
 altaite: Endlich, 6.  
 calaverite: Endlich, 6.  
 geology, economic: Emmons, 7; Endlich, 1.  
 geology, mining: Marvine, 2.  
 hessite: Endlich, 6.  
 minerals: Endlich, 1, 6; Loew, 1.  
 petzite: Endlich, 6.  
 schirmerite: Endlich, 6.  
 silver: Eilers, 3.  
 sylvanite: Endlich, 6.  
 tellurides: Eilers, 3; Marvine, 1; Silliman, 1.

**Gore Canyon:** Draper, 2; Henning, 1.

**Gothic, ore deposits:** Rickard, T. A., 28.

**Gothic Mountain, geology:** Cross, 23.

**Grahamite, Middle Park:** Taff, 2.

production 1898: Rothwell, 8.

**Granada quadrangle:** map: U. S. G. S.

**Grand Cavern:** Le Couppey de la Forest, 1.

**Grand County, asphaltum:** Lee, H. A., 2.

geology, economic: Emmons, 7.

gilsonite: Taff, 2.

map: Clason Map Co.

mines, production: Burchard, H. C., 2; Henderson, C. W., 4.

Rabbit Ears region, geology: Grout, Worcester and Henderson, 1.

**Grand Hogback, General:** Belcher, 2; White, 4.

coal fields: Gale, 3, 8.

Danforth, Hills, and, coal field, map: Gale, 3.

map: U. S. G. S.

**Grand Junction, General:** Emmons, 20.

coal: Stone, 8.

hydrography: Newell, 6.

soil survey: Holmes and Rice, 1.



- Grand Mesa, General:** Endlich, 7.  
 coal field, analysis and map: Lee, W. T., 10, 13.  
 geology: Lee, W. T., 9.
- Grand River, General:** Beckwith, 1; Endlich, 5; Gannett, H., 4; Marvin, 1; Peale, 7, 8, 12; Powell, 1.  
 coal, analysis: Lakes, 72, 160.  
 coal fields: Hills, R. C., 22; Lakes, 8, 72, 160, 169, 172; Storrs, 1; Thiele, 1.  
 geology, dynamic: Lakes, 72, 160; Hills, R. C., 22.  
 hydrography: Newell, 6, 7, 12, 14, 16; Walcott, 13.  
 map: Peale, 8.  
 paleontology, dinosaurian beds: Riggs, 1; Riggs and Farrington, 1.  
 physiography: Riggs and Farrington, 1.  
 placer mining: Hartly, C., 2.  
 pre-Cambrian: Van Hise, 1.  
 reclamation work: Quinton, J. H., 1.
- Grand Valley, map:** Clason Map Co.  
 reclamation work: Newell, 21.
- Granite, General:** Day, 1; Merrill, 4; Peale, 6.  
 Chaffee County: Crawford, 4; Henahen, 1; Hoenes, 1; Mg. Sci., 3.  
 production: 1889-1893, 1895-1905; Day, 2, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 17, 18—1899: Rothwell, 7—1906-1907: Thom, 1, 2—1909: Burchard, E. F., 4.  
 Rabbit Ears region: Grout, Worcester, and Henderson, 1.  
 Salida: Henahen, 1.
- Granite (Chaffee County), bismuth:** Ingalls, 8.  
 geology, mining: Hayden, 14.
- Graphite, General:** Lakes, 151.  
 Chaffee County: Ihne, 1.  
 production 1893: Rothwell, 2—1904-1905: Day, 17, 18—1906: Ingalls, 5—1906-1907: Thom, 1, 2—1910: Bastin, 1—1911: Of, 1; Parker, E. W., 7—1912: Henahen, 1.  
 Trinidad: Lakes, 3.
- Gravel, Nepesta quadrangle:** Fisher, 1.  
 sand, and, production: Burchard, E. F., 4, 8; Parker, E. W., 7.
- Grayback. See also Costilla County.**  
 amphibole and hornblende schist: Patton, 8.  
 andesite: Patton, 8.  
 biotite gneiss: Patton, 8.  
 breccias, igneous: Patton, 8.  
 diorite: Patton, 8.  
 felsites: Patton, 8.  
 geology, mining: Hayden, 14.  
 geology, ore deposits: Patton, 8.  
 gold: Patton, 8; Wulsten, 4.  
 granite gneiss: Patton, 8.  
 hornblende schist and amphibolite: Patton, 8.  
 iron: Patton, 8.  
 mines, lode and placer: Patton, 8.  
 monzonite porphyry: Patton, 8.  
 paleontology: Patton, 8.  
 pegmatites: Patton, 8.  
 placer mining: Julian, 1; Patton, 8.  
 porphyries: Patton, 8.
- Great Basin, Tertiary strata:** Cope, 16.
- Great Plains, map:** Hay, Robert, 2.
- Greeley, coal:** Hayden, 19.  
 hydrology: Boyd, D., 1.  
 map: U. S. G. S.  
 physiography: Boyd, D., 1.  
 soil survey: Holmes and Neil, 1.
- Green Mountain, coal, analysis:** Eakins, 6.  
 physiography: Darton, 13.
- Greenhorn Mountains, tin mine:** Hills, 15; van Diest, 13.  
 vanadium: E. and M. J., 44.
- Green River, General:** Powell, 1, 2; Scudder, 1, 2.  
 antecedent to Uinta Mountains: Davis, W. M., 4; Suess, 1.  
 erosion: White, 26.  
 origin: Emmons, 26; Hills, R. C., 17.  
 paleobotany: Lesquereux, 16.  
 paleontology, Cenozoic and Mesozoic: White, 3.  
 physiography: Emmons, 26.  
 Tertiary: Scudder, 1, 2.  
 volcanic dust: Montgomery, 1.

- Green River Basin** (largely outside Colorado).
- Bitter Creek uplift:** Hague and Emmons, 1.
- Bridger group:** Hague and Emmons, 1.
- Browns Park Tertiary:** Hague and Emmons, 1.
- Cretaceous:** Hague and Emmons, 1.
- Colorado group:** Hague and Emmons, 1.
- Dakota:** Hague and Emmons, 1.
- Escalante Hills:** Hague and Emmons, 1.
- Fox Hills:** Hague and Emmons, 1.
- geology, descriptive:** Hague and Emmons, 1.
- geology, general:** Hague and Emmons, 1.
- Green River beds:** Hague and Emmons, 1.
- Junction Peak:** Hague and Emmons, 1.
- Jurassic:** Hague and Emmons, 1.
- Owi-yu-kuts plateau:** Hague and Emmons, 1.
- Permo-Carboniferous group:** Hague and Emmons, 1.
- Tertiary formations:** Hague and Emmons, 1.
- Triassic:** Hague and Emmons, 1.
- Uinta Eocene:** Hague and Emmons, 1.
- Uinta Range:** Hague and Emmons, 1.
- Uinta uplift:** Hague and Emmons, 1.
- Upper Coal Measures:** Hague and Emmons, 1.
- Vermillion Creek series:** Hague and Emmons, 1.
- Weber Quartzite group:** Hague and Emmons, 1.
- Wyoming Conglomerate:** Hague and Emmons, 1.
- Yampa Peak:** Hague and Emmons, 1.
- Yampa Plateau:** Hague and Emmons, 1.
- Green River group:** King, 1; Peale, 12.
- Green River Valley:** White, 4.
- Grey Creek, iron, analysis of:** Chauvenet, 5.
- Griffith lode, silver and gold:** Pearce, R., 12.
- Grindstone:** Lakes, 51; Parker, E. W., 7; Phalen, 1.
- quarries, Gunnison:** Mg. Sci., 4.
- Grizzly Peak, granite breccias:** Stone, 7.
- Gunnison:** von Rath, 1.
- to Grand River, map:** Peale, 7.
- Gunnison County, building stone:** Lakes, 20, 27, 94; Merrill, 2.
- Cebolla district, iron ores:** Lakes, 26; Singewald, 1; Snedaker, 2.
- Cliff Creek, efflorescence on sandstone, analysis of:** Eakins, 4.
- coal, analysis of:** Eakins, 6; Lakes, 6; McNeil, 1.
- coal, Book Cliffs:** Lakes, 192.
- coal:** Ashley and Fisher, 1; Chauvenet, 6; Hallowell, 2; Lakes, 6; Lee, H. A., 9; Lee, W. T., 10, 13; McNeil, 1; Potter, W. B., 1.
- geology, dynamic:** Hill, J. M., 1; Lakes, 6, 20.
- geology, economic:** Emmons, 7; Lee, H. A., 9.
- geology, Tomichi district:** Crawford, 4.
- gold, Sylvanite mine:** E. and M. J., 14.
- gold:** Frazer, 2; Hill, J. M., 1; Lakes, 20, 27, 32, 63, 179.
- grindstone quarries:** Mg. Sci., 4.
- iron, analysis of:** Chauvenet, 4, 6.
- iron ore, Cebolla district:** Lakes, 26; Singewald, 1, 2; Snedaker, 2.
- iron ore, Taylor Peak and Whitepine:** Harder, 2.
- iron ore, Whitepine:** Snedaker, 2.
- iron ore:** Chauvenet, 4, 6, 8; Leith, 1.
- kaolin, Waterfall mine:** Eakins, 3.
- Laramie and post-Laramie:** Cross, 18.
- limestone, analysis of:** Burchard, E. F., 8; Chauvenet, 6.
- löllingite:** Hillebrand, 1.

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Mammoth and Vulcan mines:  
 Lakes, 20, 27, 31.  
 manganese deposits, analysis of:  
 Harder, 4; Lakes, 26; Penrose, 1.  
 map: Clason Map Co., 33; Hill, J. M., 1.  
 Maple Leaf mine: Lakes, 177, 187.  
 marble: Hall, C. L., 2; Lakes, 22, 226; Merrill, 4; Newberry, 13; Stone Trades Journal, 1; Weston, 9.  
 minerals analyzed: Clarke, F. W., 6; Eakins, 10.  
 minerals from: Headden, 3.  
 mineral production: Burchard, 1, 2, 3, 4; Henderson, C. W., 4; Hodges, 1; Lakes, 5, 208; Lee, H. A., 9; Mg. Rept., 18; Munson, 1; Tonge, 1.  
 molybdenum: Sebben, 1.  
 ore deposits: Lakes, 143, 214; Rickard, T. A., 28; Warren, E. R., 2.  
 paleontology, fossils from: Spencer, 2.  
 physiography: McConnell, 1.  
 Pitkin, mines described: Holibaugh, 1; Mg. Rept., 11.  
 products: Hallowell, J. K., 3.  
 Sheep Mountain, mines: E. and M. J., 11.  
 silver: Frazer, 2; Holibaugh, 1; Lakes, 32; Mg. Rept., 11.  
 slate, stone: Coons, 1.  
 smaltite: Iles, 2.  
 Sulphantimonites, analysis of: Eakins, 2.  
 Sylvanite mine: E. and M. J., 1, 14.  
 Tomichi district: Crawford, 4.  
 triangulation: Gannett, H., 12; Gannett, S. S., 2.  
 Vulcan mine: Lakes, 20, 27, 63, 214.  
 Yule Creek. *See* marble.  
 Whopper lode: Frazer, 2.

**Gunnison River, General:** Peale, 7, 8.  
 Cretaceous section: Stanton, 2.  
 Eagle River, and, map: Newton, 1.  
 erosion: Endlich, 8.  
 hydrology: Newell, 6, 7, 12, 14.

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Lake Fork, landslides: Cross, 40.  
 Lake Fork: Peale, 8.  
 map: Peale, 8.  
 pre-Cambrian: Van Hise, 1.

**Gunnison tunnel:** Bain, 6.

**Gunnison Valley, coal:** Woodruff, E. G., 1.

map: Clason Map Co.

**Gunsight:** Draper, 2.

**Gypsum, General:** Eldridge, 5; Emmons, 7; Hague, 1; Hayden, 5, 6, 14; Lakes, 141, 235; Peale, 5, 12; Stevenson, 3.

Breckenridge: Ransome, 5.

Castle Rock district: Lee, W. T., 5.

Eagle County: Burchard, E. F., 5; Peale, 7.

Larimer County: Lee, H. A., 5, 9.

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- volcanic ash: Woolsey, 1.

**La Plata Mountains, General:** Endlich, 7; Freeman, 1; Holmes, 2.

- amalgam: Freeman, 1.
- augite monzonite, analysis: Clarke, F. W., 8.
- augite syenite: Clarke, F. W., 8; Cross, Spencer, and Purington, 1.
- auriferous bog iron ore: Cross, Spencer, and Purington, 1.
- basic dike rock: Clarke, F. W., 8; Cross and Spencer, 1.
- bismuth: Hess, 3, 5.
- camptonite, analysis of: Clarke, F. W., 9.
- diorite and diorite porphyry: Clarke, F. W., 8, 9; Cross, Spencer, and Purington, 1.
- geology: Cross, 23; Cross, Spencer, and Purington, 1; Freeman, 1; Hills, R. C., 20; Lakes, 34, 84, 119, 127, 143; Petre, 1; Toll, R. H., 1.
- glaciation: Atwood and Mather, 1; Davis, W. M., 8.
- gold: Austin, W. L., 1, 2; Cross, Spencer, and Purington, 1; Freeman, 1; Lakes, 119.
- hydrology: Cross, Spencer, and Purington, 1.
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- iron, bog, auriferous: Cross, Spencer, and Purington, 1.
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- monzonite: Clarke, F. W., 8, 9; Cross, Spencer, and Purington, 1.
  - ore deposits: Lakes, 34, 84, 233, 243; Sweetser, 2.
  - physiography: Cross, Spencer, and Purington, 1; Freeman, 1; Lee, H. A., 9; Walcott, 7.
  - placer deposits: Cross, Spencer, and Purington, 1.
  - porphyritic lamprophyre: Clarke, F. W., 8.
  - Parrott, telluride ore: Austin, W. L., 1.
  - quicksilver: Freeman, 1.
  - rocks described: Cross, 42.
  - silver: Cross, Spencer, and Purington, 1; Freeman, 1.
  - structure: Hills, 20.
  - syenite, analysis of: Clarke, F. W., 9.
  - syenite porphyry: Cross, Spencer, and Purington, 1.
- La Plata quadrangle, map:** Cross, Spencer, and Purington, 1; U. S. G. S.
- Laporte, fossils from, described:** Meek, F. B., 5.
- Laramie Hills:** Hague and Emmons, 1.
- Larimer County, building stone:** Lee, H. A., 9.
- cement material: Martin, 1.
  - geology, economic: Emmons, 7; Lee, H. A., 9.
  - gypsum: Lee, H. A., 5.
  - map: Clason Map Co., 22.
  - marble, Fort Collins: Merrill, 4.
  - mineral production: Henderson, C. W., 4.
  - triangulation: Gannett, S. S., 1.
- La Sal Creek, carnotite from:** Hillebrand and Ransome, 1.
- vanadium: Hess, 1; Mg. World, 2; Lindgren, 9.
- La Sal, carnotite, analysis of:** Ohly, 12.
- La Sal Mountains, copper:** Lakes, 67.
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- Las Animas, Arkansas River:** Freeman and Bolster, 2.  
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- Las Animas County, building stone:**  
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 Gray Creek mine: Whiteside, 1.  
 map: U. S. G. S.  
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- La Veta district, coal:** Hills, 25; Lakes, 231; Richardson, 2.
- La Veta Pass, geology:** Conkling, 1.
- Lay, gold:** Fleck and Haldane, 1; Gale, 4.  
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- Lead, General:** Dalzell, 2; Endlich, 2, 5; Frazer, 1; Hague, 1; Jerne-gan, 1; Lakes, 143, 219; Mg. Rev., 3; Nat. Conservation Com., 1; Stevenson, 3.  
 Aspen district: Henrich, 2; Newberry, 16.  
 Clear Creek County: Lawrence, B. B., 2.  
 Crested Butte: Warren, E. R., 2.  
 Cripple Creek: Rickard, 14.  
 Georgetown: Spurr, Garrey, and Ball, 1.  
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 Idaho Springs: Spurr and Garrey, 2; Spurr, Garrey, and Ball, 1.  
 Lake City: Irving and Bancroft, 1.  
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 Rico quadrangle: Cross and Ran-some, 1; Ransome, 2.  
 Rosita-Silver Cliff district: Lakes, 55.  
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 Keeler, 1; Lee, H. A., 9.

geology, Pleistocene: Capps and  
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- mining, downtown: Lakes, 82; McLeod, R. F., 1.
- mining, leasing system: Lawrence, B. B., 1.
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- mining, section from shafts: Van Wagenen, 1.
- mining, South Park: Lakes, 5.
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- ore deposits, Iron Hill: Blow, 1.
- ore deposits, Iron Hill, sulphides: Freeland, 1.
- ore deposits, origin of: Ameling, 1; Blow, 1, 2; Boehmer, 2; Emmons, 2, 9, 11; Emmons and Irving, 1; Smith, J. A., 1; Rolker, 2.
- ore deposits, Sawatch Range: Spurr, Garrey, and Ball, 1.
- ore deposits, secondary enrichment: Boehmer, 2.
- ore deposits, sulphide, Iron Hill: Freeland, 1.
- ore deposits: Argall, G. O., 2; Bancroft, George J., 6; Butler, G. M., 2; Butler, H. C., 2; Emmons, 9, 12, 22; Emmons, W. H., 4; E. and M. J., 18; Henrich, 1; Irving, 4; Keck, 1; Lakes, 5, 21, 143, 214, 233, 243; Lee, H. A., 9; Mg. and Sci. Press, 6; Matteson, W. G., 2, 3; Pearce, 15; Posepny, F., 1; Ralston, O. C., 1; Rickard, T. A., 28; Robbins, 1; Rolker, 2; Spurr, Garrey, and Ball, 1; Tonge, 8; Warwick, 2; Weed, 1; Weunsch, 1, 2, 5.
- ores, analysis of: Freeland, 1; Iles, 3; Penrose, 1; Rolker, 2.

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- petrography: Cross, 6a; Emmons, 9.
- physiography: Emmons, 9; Freeland, 1; Lee, H. A., 9; Weunsch, 6.
- placer mining, California gulch: Emmons, 9; Lakes, 21.
- placer mining: Warwick, 1a.
- porphyry, white: Clarke and Hillebrand, 1; Emmons, 3, 9; Julien, 1; Lakes, 5, 21.
- Prospect Mountain, quartz porphyry: Clarke, F. W., 9.
- rhodochrosite: Kunz, 1.
- silver: Blow, 1; Emmons, 2, 9, 11; Emmons and Irving, 1; Freeland, 1; Matteson, W. G., 1; Rolker, 2; Shedd, 1; Tonge, 8; Warwick, 1a; Weunsch, 4.
- silver-lead ores: Emmons, 19.
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- Twin Lakes, glaciated area: Capps, 1; Capps and Leffingwell, 1; Westgate, 1.
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- Lilys Park:** White, 4.
- Lime, Boulder district:** Fenneman, 5.
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- Limestone, General:** Eckel, 1; Emmons, 2; Lakes, 51, 205, 235.
- Apishapa quadrangle: Stose, G. W., 1.
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- Elk Mountains: Emmons, Cross, and Eldridge, 1.

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- Elmoro quadrangle: Hills, R. C., 24.
- Engineer Mountain: Cross, 41.
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- Nepesta quadrangle: Fisher, 1.
- northern Colorado: Henderson, J., 10.
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- production 1889-1905: Day, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18—1906-1907: Thom, 1, 2—1909: Burchard, E. F., 4.
- Pueblo quadrangle: Gilbert, 7.
- Rico, ore bearing: Cross and Spencer, 1.
- Rico quadrangle: Cross and Ransome, 1.
- Silverton: Cross, Howe, and Ransome, 1.
- Spanish Peaks: Hills, R. C., 25.
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- Lincoln County, map: Clason Map Co.
- Lithographic stone: Lakes, 51.
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- Little Snake River, trachyte: Zirkel, 1.
- Little Snake Valley: Hague and Emmons, 1.
- Little Thompson River, pre-Cambrian: Van Hise, 1.
- paleontology: White, 6b.
- Lizards Head, erosion: Endlich, 8.
- Lobatos, Rio Grande River: Freeman and Bolster, 3.
- Lodore Canyon: King, 1; Powell, 1.
- Loess: Emmons, Cross, and Eldridge, 2; Fenneman, 2.
- Logan County, map: Clason Map Co.
- London Mountain, ore deposits: Patton, 10.
- Lone Cone, San Juan: Darton, 8.
- Longs Peak, *General*: Hague and Emmons, 1; Marvine, 1.
- glaciation: Orton, 2.
- granite, analysis of: Hague and Emmons, 1.
- granite: Zirkle, 1.
- Lost Canyon, hydrology: Schuyler, 1.
- Louisville, coal: Emmons, Cross, and Eldridge, 2; Lakes, 6.
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- Loveland, gypsum: Lakes, 141.
- quadrangle, map: U. S. G. S.
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- Cripple Creek ores: Lindgren and Ransome, 3.
- Georgetown, origin of metals: Spurr, Garrey, and Ball, 1.
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- Rosita Hills, Silver Cliff: Cross, 27.
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- Magnolia**, geology, economic: Emmons, 7; Lindgren, 6.
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Adams County: Clason Map Co.

Albany quadrangle: U. S. G. S.

Algonkian and Archean: Van Hise, 1.

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Anthracite quadrangle: U. S. G. S.

Anthracite and Crested Butte: Cross, 23; Emmons, Cross, and Eldridge, 1.

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Arapahoe County: Clason Map Co.

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- Archean and Algonkian: Van Hise, 1.
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- Arroyo quadrangle: U. S. G. S.
- Aspen: Spurr, 1; U. S. G. S.
- Bakers Park: Endlich, 2.
- Bent County: Clason Map Co.
- Bibliography: Marcou, J., and Marcou, J. B., 1.
- Big Springs: U. S. G. S.
- Black Hawk: U. S. G. S.
- Book Cliffs coal field: Richardson, 1.
- Book Cliffs and Grand River Valley: Peale, 8.
- Boulder County oil field: Fenneman, 2.
- Boulder County oil and clay districts: Langridge, 1.
- Boulder County, Sugarloaf district: Crawford, 1.
- Boulder County tungsten field: George, 3.
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- Boulder district: Fenneman, 5.
- Boulder quadrangle: U. S. G. S.
- Boulder and Larimer counties: Martin, 1.
- Breckenridge quadrangle: Ransome, 5; U. S. G. S.
- British Provinces and United States, geological: Blake, W. P., 1b.
- Cache la Poudre and Upper Platte valleys: Clason Map Co.
- Camp Bird: Purington, 2.
- Canon City coal field: Washburne, 5.
- Canon City quadrangle: U. S. G. S.
- Castle Rock: Lee, W. T., 5; U. S. G. S.
- Catlin quadrangle: U. S. G. S.
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- Chaffee, Fremont, Jefferson counties, copper deposits: Lindgren, 8.
- Chalk Creek: Chapman, 1.
- Cheyenne County: Clason Map Co.
- Cheyenne Wells quadrangle: U. S. G. S.
- Clear Creek County: Clason Map Co.; Couzens, 1.
- coal field, northern area, near Denver: Marvin, 1.
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Costilla County: Clason Map Co.

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Crested Butte quadrangle: U. S. G. S.

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Delta County: Clason Map Co.

Denver Basin: Emmons, Cross, and Eldridge, 2.

Denver County: Clason Map Co.

Denver-Greeley district: Clason Map Co.

Denver irrigation district: Clason Map Co.

Denver and northern Colorado: Clason Map Co.

Denver and South Platte valley: Clason Map Co.

Denver: Clason Map Co.; U. S. G. S.; Williamson-Haffner Co., 3, 4.

Dolores: Fischer, 1.

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Durango coal field: Taff, 1.

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geographical work of the United States Geological and Geographical Survey of the Territories: Wilson, A. D., 4.

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Gilpin County: Clason Map Co.; Couzens, 1.

Granada quadrangle: U. S. G. S.

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 Mesa County: Clason Map Co.  
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Colorado Range: Hague and Emmons, 1; King, 1.

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Medicine Bow Range: Hague and Emmons, 1; King, 1.

North Park: Hague and Emmons, 1; King, 1.

paleontology: Hague and Emmons, 1; King, 1.

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- ore deposits of Custer County: Emmons, 23.
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- ore deposits of Lake City: Irving, 3; Irving and Bancroft, 1.
- ore deposits of Monarch-Tomichi district: Crawford, 4.
- ore deposits of Ouray district: Irving, 2.
- ore deposits of Rico district: Farish, 3.
- ore deposits of Silverton: Ransome, 3.
- ore deposits of Telluride district: Cross and Purington, 1.
- ore deposits of Tomichi-Monarch districts: Crawford, 4.
- paramorphic origin of certain minerals: Cross, 11.
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- pseudomorphs after garnet, Saliña: Penfield and Sperry, 1.
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- pseudomorphs after sylvanite and krennerite, Cripple Creek: Rickard, T. A., 16.
- rare minerals, Elk Mountains: Emmons, Cross, and Eldridge, 1.
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- rock constituents, table of, Pikes Peak quadrangle: Mathews, 2.
- silver minerals: Matteson, W. G., 2.
- silver ores, Cripple Creek: Cross and Penrose, 1.
- silver ores: Hollister, 1.
- spherulites containing chalcedony and opal: Patton, 1.
- zinc ores, Cripple Creek: Cross and Penrose, 1.
- zinc ores: Hollister, 1.

**Mineral production.** It was found impossible to include statistics of mineral production. These will be found in—

1. Mineral Resources, annual volumes published by the U. S. Geol. Surv.
2. Mineral Industry, annual volumes since 1892. Published at present by the McGraw-Hill Book Co., New York.
3. Annual report of the Director of the Mint, published by the Director of the Mint.
4. Special numbers issued in January of each year by the various mining journals.

**General:** Bailar, 3; Sterrett, 1—1872: Mg. Rev., 1; by counties, 1874: U. S. Com. Mines, 1; 1879: Fossett, 3—1881: Burchard, H. C., 2—1898-1902: Mg. Rept., 3, 15, 18, 31—1899-1900: Lee, H. A., 3—1901: Ores and Metals, 4—1902: State Bureau of Mines, 1—by counties, 1903: Lakes, 143; Tonge, 11—1904: State Com. of

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Mines, 1; White, E. L., 1—1860-1904, Leadville: Warwick, 1a—1905: Day, 18—1906-1907: Thom, 1, 2—1906: Tonge, 12; White, E. L., 2—1907: Dalzel, 1—1909: Hall, F. H., 2—1910: Henderson, C. W., 4.

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analysis of waters. *See* list of chemical analyses.

Boulder district: Lakes, 64; Lee, H. A., 9.

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Idaho Springs: Spurr, Garrey, and Ball, 1.

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Pagosa Springs: Lee, H. A., 9; McCauley, 2; Wheeler, G. M., 6.

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**Minerals described.** *See* list, page 464.

**Mines and Mining, General:** Am. Jour.

Mg., 3; Frazer, 1; Mg. and Sci. Press, 15; Raymond, 2; Rickard, T. A., 6.

aerial tramways, San Juan Mountains: Seymore, 1.

bibliography of mining districts: Hill and Lindgren, 1.

deep mines: Emmons and Becker, 1.

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drilling contest: Bain, 3; E. and M. J., 13.

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haulage, Idaho Springs: Burnes, H. B., 1.

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labor troubles: Mg. Mag., 1.

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progress in mining: Collins, G. E., 3, 5, 6; Hall, F. H., 1; Lee, H. A., 1; MacMechen, 2; Rickard, F., 2, 3; Rickard, T. A., 5; Rothwell, 5; Schwarz, 2.

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- lake beds, Creede: Emmons and Larsen, 1.
- map: Willis, 2.
- Tertiary: King, 1.
- Paleontology.** *See also* under formation names.
- General:* Brues, 3; Cockerell, 2b, 2c, 10, 17, 29, 30; Cope, 15; Endlich, 5; Hayden, 19; King, 1; Kirkaldy, 1; Lesquereux, 4; Lockwood, 1; Marsh, 41; Matthew, 3, 4; Osborn, 4; Osborn and Wortman, 3; Rohwer, 4, 5, 6; Scott, 1; Wickham, 1, 2, 3.
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- White River beds: Osborn and Wortman, 2.
- Mississippi drainage,** map of: James, 2.
- **Mitchell,** coal: Emmons, Cross, and Eldridge, 2.
- Moffat County,** coal, analysis: Campbell, M. R., 5.
- Mogote,** Conejos River: Freeman and Bolster, 3.
- Mollie Gibson mine,** polybasite and tennantite: Penfield and Pearce, 1.
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- Mesozoic: White, 2, 12.
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- non-marine: White, 16.
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- Molybdenum, General:** Frenzel, A. B., 1; Hess, 5; Lakes, 143; Ohly, 1.
- Gunnison and Teller counties: Sebben, 1.
- Monarch-Tomichi district: Crawford, 4.
- production 1893: Rothwell, 2—1901-1902: Day, 14, 16—1905: Ingalls, 4—1906: Thom, 1.
- Monarch and Gunnison area,** map: Chapman, J. A. J.
- Monarch-Garfield area.** *See* Chaffee County.
- Monarch-Tomichi district.** *See* Chaffee County.
- Monazite,** production 1906-1907: Thom, 1, 2.
- Montezuma,** argentite: Van Horn, 2.
- Montezuma County,** coal, analysis: Campbell, M. R., 5.
- geology, economic: Lee, H. A., 9.
- granite: Patton, 7.
- lead: Ritter, 8.
- lead-silver-zinc deposits: Ritter, 7.
- minerals: Loew, 1.
- minerals, California mine: Van Horn, 2.
- mining: Hague, 1; Henderson, C. W., 2; Hollister, 1; Ritter, 7, 8; Widmar and Dill, 1.
- ore deposits: Lee, H. A., 9; Rickard, T. A., 28.
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carnotite, analysis of: Clarke, F. W., 9; Ohly, 1.

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La Sal mine, carnotite: Clarke, F. W., 9; Hall, R. G., 1.

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Roc Creek, carnotite from, with analysis: Clarke, F. W., 9.

silver: Emmons, W. H., 3.

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vanadium: Clarke, F. W., 9; Fleck, 4; Hess, 5; Mines and Mining, 1; Mining World, 8; Ohly, 1.

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Neocene: Dall and Harris, 1.

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- Mount Antero**, aquamarine from: Cross, R. T., 1.  
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- Mount Brass**, mines: Mg. Rev., 5; Patton, 10.
- Mount Cameron**, geology: Patton, 10.
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- Mount Carbon** (Jefferson county), coal: Emmons, Cross, and Eldridge, 2; Potter, W. B., 1.
- Mount Carrizo** quadrangle, map: U. S. G. S.
- Mount Diablo**, coal: Mg. and Sci. Press, 4.
- Mount Lincoln**, clastic beds: Russell, 2.  
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- Mount Massive**, ore deposits: Rickard, T. A., 28.
- Mount Olympus** quadrangle, map: U. S. G. S.
- Mount Richard Owen**, eruptives: Endlich, 7.
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- Mount Wilson**, geology, vein system: Nason, F. L., 1; Rickard, T. A., 28.
- Mount Zirkel**, gneiss: Zirkel, 1.
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- Neeleton**, ore deposits: Rickard, T. A., 28.
- Nederland**. *See* Boulder County.
- Neglected mine**, description: Emmons, W. H., 1.
- Neocene**, correlation papers: Dall and Harris, 1.
- Nepesta** quadrangle, barite: Fisher, 1.  
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- Nevadaville, ore deposits:** Rickard, T. A., 28.
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- North Platte River:** Thomas, C., 2.
- Northwestern Colorado, coal, analysis:** Gale, 3, 7; Lord, 2.  
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- Aspen, ferration of ores: Spurr, 1.
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- Aspen, source of metals: Spurr, 1.
- Aspen, silicification of ores: Spurr, 1.
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- bismuth, associated with ore deposits: Pearce, 15.
- blankets, origin of, formation: Ransome, 2.
- Boulder County, genesis of ore deposits: Baggs, 1.
- Boulder County, John Jay mine, origin of veins and ore: van Diest, 12.
- Boulder County, mineral belt, to Leadville: Spurr, Garrey, and Ball, 1.
- Boulder County, vein phenomena: Farish, 1.
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- Beckenridge, origin of placers: Lakes, 195.
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- Cripple Creek, genesis of ores: Lindgren and Ransome, 3.

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- Cripple Creek, secondary enrichment: Bancroft, G. J., 1.
- Cripple Creek, source and mode of deposition: Cross and Penrose, 1.
- Cripple Creek: Bancroft, G. J., 4; Lakes, 18; Pearce, 9; Stevens, E. A., 2; Van Hise, 4.
- Custer County, genesis of ores: Emmons, 23.
- Custer County, Geyser mine: Van Hise, 4.
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- enargite, formation of: Pirsson, 1.
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- Four Mile placers, origin of: Hoover, 3.
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- geological formations, distribution of ore deposits in: Rickard, T. A., 28.
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 Replacement deposits: Cross, Howe, and Ransome, 1; Cross, Howe, and Irving, 1; Emmons, 6.  
 Rico, Enterprise mine, veins structure: Rickard, T. A., 12; Jenney, 1.  
 Rico, genesis of ore deposits: Cross and Ransome, 1; Ransome, 2; Rickard, 7.  
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- Camp Bird mine, map: Purington, 2.
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- Camp Bird ores, treatment: Headen, 10.
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- ore deposits, bedded, Red Mountain: Kedzie, 1; Schwarz, 5.
- ore deposits: Bancroft, G. J., 6, 7; Cross, Howe, and Irving, 1; Downer and DeCou, 1; Ihlseng, 1; Irving, 2, 4; Kedzie, 1; Pearce, 15.
- paleontology: Kindle, 1; Spencer, A. C., 2.
- physiography: Kedzie, 1; Koenig, 3; Purington, 3; Titcomb, 1.
- polybasite: Penfield, 8.
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- Red Mountain, alunite: Hurlburt, 1.
- Red Mountain, andesite: Kedzie, 1.
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**Pagosa Springs, General:** Endlich, 4; Lowe, 1; McCauley, 2; Newberry, 3; Peale, 14; Stevenson, 3; Wheeler, G. M., 6.

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mineral waters: Lee, H. A., 9; McCauley, 2; Newberry, 3; Peale, 14; Wheeler, G. M., 6.

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*See also* under age names, formation names, locality names, etc.

**Paleontology, General:** Am. Nat. 1; Dawson, 1; Emmons, 7, 20; Hayden, 4, 6, 12, 16, 26; Hills, 11, 17; Lakes, 5, 10; Lesley, 1; Lesquereux, 2, 11; Lucas, 1; Meek, 1, 5; Newberry, 5; Osborn, H. F., 6; Parker, 1; Schiel, 1; Scudder, 9, 10; Stanton, 1, 3; Walcott, 8; White, 17.

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*See also* under: Paleozoic, Mesozoic, Cenozoic, Cambrian, Ordovician, Silurian, Devonian, Carboniferous, Permian, Triassic, Jurassic, Comanchean, Cretaceous, Tertiary, Shoshone, Eocene, Oligocene, Miocene, Pliocene, Pleistocene, formation names, Invertebrata, Vertebrata, Insecta, Paleobotany, locality names, etc.

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*General:* Holmes, 6; Hunt, 5; King, 1; Peale, 8; Stevenson, 3; Walcott, 4.

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Cordilleran sea, sediments: Walcott, 4.

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*General:* Darton, 9, 13; Girty, 2; Scudder, 33; White, 15.

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Bryozoa, bibliography and catalogue of genera and species: Nickles and Bassler, 1.

Canyon City: Am. Geol., 1; Walcott, 3, 3a, 5.

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Palmer Lake: Cannon, 9.

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Cambrian: Hague and Emmons, 1; King, 1.

Colorado Range: Hague and Emmons, 1; King, 1.

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Little Snake River: Hague and Emmons, 1; King, 1.

Lodore Canyon: Hague and Emmons, 1; King, 1.

Medicine Bow Range: Hague and Emmons, 1; King, 1.

North Park: Hague and Emmons, 1; King, 1.

Ogden Quartzite: Hague and Emmons, 1; King, 1.

Owi-yu-kuts: Hague and Emmons, 1; King, 1.

paleontology: Hague and Emmons, 1; King, 1.

Rocky Mountain province: Hague and Emmons, 1; King, 1.

Silurian: Hague and Emmons, 1; King, 1.

Uinta Range: Hague and Emmons, 1; King, 1.

Upper Coal-Measures: Hague and Emmons, 1; King, 1.

Weber Quartzite: Hague and Emmons, 1; King, 1.

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geology, economic: Emmons, 7; Fossett, 1.

geology: Lee, H. A., 9.

gold, Antelope springs: Hastings, 1.

gold: Rickard, T. A., 9; Sadtler, 1.

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placer deposits: Emmons, 7; Hartley, 1; Lakes, 5; Lee, H. A., 9.

physiography: Sadtler, 1.

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water analysis: Lee, H. A., 9.

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**Parnassus springs:** Lee, H. A., 9; Loew, 1.

**Pawnee Buttes, geology, dynamic:** Henderson, J., 7; Lakes, 112.

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**Pennsylvania.***Paleontology.*

*General:* Cross, 41; Girty, 2.

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*General:* Endlich, 5; Girty, 2, 5; Lesquereux, 11; Marvine, 1; Peale, 5, 7.

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*General:* Crawford, 4; King, 1; Peale, 7, 8.

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Front Range: Butters, 2; Girty, 5.

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catalogue of U. S. National Museum type specimens: Merrill, 7.

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- ore deposits, Evergreen, copper: Ritter, 5.
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- paramorphic origin of certain minerals: Cross, 11.
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- Tepee rock: Gilbert and Gulliver, 1.
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- Sauropoda: Marsh, 13.
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- Antero: Schuyler, 1.
- area and capacity: Newell, 16.
- Arkansas Basin: Thompson, 2.
- Kremmling: Quinton, J. H., 1.
- Lost Canyon: Schuyler, 1.
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- alunite rocks, analysis: Cross and Spencer, 1.
- basic dike rocks: Cross and Ransome, 1; Cross and Spencer, 1.
- building stone: Cross and Ransome, 1.
- Calico Peak, porphyry: Cross and Spencer, 1.
- Coal, Dakota formation: Cross and Ransome, 1.
- geology, dynamic: Cross and Ransome, 1; Cross, Spencer, and Purington, 1; Farish, 3; Jenney, 1; Lakes, 120, 150; Ransome, 2; Rickard, T. A., 7, 12; Van Hise, 4, 6; Weed, 2.
- Enterprise mine: Chester, 1; Rickard, T. A., 4, 7, 12.
- gold: Cross and Ransome, 1; Farish, 3; Lakes, 44; Ransome, 2; Rickard, T. A., 7.
- granite gneiss: Clarke, F. W., 8.
- gypsum: Ransome, 2.
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- jarosite: Ransome, 2.
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- lead: Cross and Ransome, 1; Ransome, 2.
- limestone, alteration product, analysis: Ransome, 2.
- limestone, magnesian: Farish, 3.
- limestone, ore-bearing: Cross and Spencer, 1.
- limestone: Cross and Ransome, 1.
- map: Cross and Ransome, 1; Cross and Spencer, 1; Ransome, 2; U. S. G. S.; Wittle, 1.
- minerals, analysis: Clarke, F. W., 6.
- mines, production: Cross and Ransome, 1; Ransome, 2; Rickard, T. A., 7.
- monzonite, quartz-bearing: Cross and Spencer, 1.
- Newman Hill: Farish, 3; Lakes, 214.
- ores, analysis: Ransome, 2; Rickard, T. A., 7.
- ore deposits, blanket deposits: Cross and Ransome, 1.
- ore deposits, lodes: Cross and Ransome, 1.
- ore deposits, Newman Hill: Farish, 3.
- ore deposits: Comstock, 7; Lakes, 143; Ransome, 2; Rickard, T. A., 28; Spurr, Garrey, and Ball, 1.
- physiography: Cross, 31; Cross and Ransome, 1; Cross and Spencer, 1; Ransome, 2; Rickard, T. A., 7.
- quartzite: Cross and Spencer, 2.
- sandstone, alteration product, analysis: Ransome, 2.
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- vein structure, Enterprise mine: Rickard, T. A., 12.
- Wellington mine: Salt Lake Mg. Rev., 2.
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- Rio Blanco County**, carnotite, map: Gale, 2; Mg. World, 2, 8.
- Coal Creek**, vanadium from: Mg. World, 8.
- coal**, analysis: Campbell, M. R., 5; Fleck and Haldane, 1; Gale, 5.
- coal**: Fleck and Haldane, 1; Gale, 3.
- geology**, dynamic: Gale, 5.
- map**: Gale, 2.
- mineral production**: Henderson, C. W., 4.
- minerals**: Mg. World, 3.
- oil**, analysis: Lakes, 97.
- oil**, map: Gale, 5; Lakes, 86, 97, 99; Mg. World, 4; Ores and Metals, 5.
- physiography**: Gale, 5.
- uranium**: Blanc, 1; Lee, H. A., 7.
- uranium-vanadium**: Fleck and Haldane, 1; Mg. World, 8.
- vanadium**: Hess, 1.
- Rio Cimarron**, Morrison: Lee, W. T., 6.
- section**: Stanton, 3.
- Rio Dolores**: Holmes, 2; Peale, 12.
- Rio Grande County**, enargite: Spencer, L. J., 1.
- geology**, dynamic: Patton, 2.
- geology**, economic: Emmons, 7.
- map**: Clason Map Co., 24.
- mines**, production: Burchard, H. C., 2, 3; Henderson, C. W., 2; Lee, H. A., 9; Mg. Rept., 18.
- ore deposits**: Lakes, 37; Lee, H. A., 9.
- rhyolite**, analysis: Clarke, F. W., 8.
- rocks**, analysis: Clarke, F. W., 8.
- Summit**, gold: Hills, R. C., 3; Lakes, 37.
- Summit**, Little Anne mine: E. and M. J., 7; Robins, 1.
- Summit**, ore deposits: Hills, R. C., 3.
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- volcanic craters**: van Diest, 9.
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- erosion forms**: Patton, 2.
- hydrography**: Cross, Howe, and Ransome, 1; Freeman and Mathers, 2; Newell, 2, 4, 6, 7, 12, 14, 16; Taylor and Hoyt, 1, 2; Taylor and Lamb, 1.
- valley**: Newberry, 3.
- Rio San Miguel**: Peale, 12.
- Roan** (Book Cliffs): Peale, 12.
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- Roaring Fork**: Emmons, 20; Holmes, 1.
- Rob Roy**, coal mine: E. and M. J., 3.
- Roc Creek**, carnotite: Hillebrand and Ransome, 1.
- vanadium**: Hess, 1; Lindgren, 9.
- Rock Creek**, coal field: Hewett, 1; Lakes, 6.
- marble**: Lakes, 6.
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- Rock gas**, Pueblo quadrangle: Gilbert, 7.
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- Rocky Mountains**, *General*: Emmons, 20; Newberry, 3; Suess, 1; Youmans, 2.
- age**: Peale, 10, 11; Stevenson, 3, 4.
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- Rosemount**, riebeckite granite: Clarke, F. W., 8.
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- copper**: Clark, R. N., 2.
- geology**, economic: Emmons, 7; Wheeler, G. M., 2.
- geology**: Lakes, 57.
- gold**: Clark, R. N., 2; Mg. Rept., 32.
- Humboldt-Pocahontas vein**: Clark, R. N., 2; Lakes, 220.
- minerals**, analysis: Eakins and Chatard, 1.

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- mines: Burchard, H. C., 2.
- ore deposits: Wulsten, 1; Lakes, 243.
- physiography: Carpenter, 1.
- rocks, analysis of: Clarke and Hillebrand, 1.
- rocks: Cross, 12.
- silver: Clark, R. N., 2.

- Rosita Hills**, alunite and diaspore, analysis of: Cross, 16.
- diaspore, analysis of: Cross, 16; Melville, 1.
- geology of: Cross, 16, 17, 27; Wulsten, 1.
- physiography: Cross, 27.
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- geology, dynamic: Emmons, 24; Lee, H. A., 9; Spurr, 1; Welles and Lakes, 1.
- geology: Cross, 27.
- map: Cross, 27.
- mines: Emmons, 23, 24; Lakes, 142; Tolman, 1.
- ore deposits: Clark, R. N., 2; Lakes, 21, 214; Rickard, T. A., 28; Spurr, Garrey, and Ball, 1.
- rocks, analysis of: Cross, 27.
- silver: Emmons, 24; Lee, H. A., 9; Lakes, 55.
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**Routt County**, carnotite deposits: Gale, 6; Lindgren, 9.

- coal, analysis of: Campbell, M. R., 5; E. and M. J., 37; Gale, 3; Headden, 9; Parsons and Liddell, 1; Weston, 5.
- coal: Chisolm, 3; Craise, 1; E. and M. J., 37; Gale, 3; Headden, 8, 9; Herrick, 2; Lakes, 167, 168, 172, 190; Lee, H. A., 9; Parsons and Liddell, 1; Weston, 5.
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- gold placers, Lay: Gale, 4; Rickard, T. A., 9.
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- map: Clason Map Co., 3, 29.
- minerals: Gale, 6.
- mineral waters. *See* **Mineral Springs**, in general index.
- mines, production: Burchard, H. C., 2; Henderson, C. W., 4.
- oil: Lakes, 86; Ores and Metals, 5; Parsons and Liddell, 1.
- olivine basalt, analysis of: Clarke, F. W., 8.
- onyx beds: Parsons and Liddell, 8.
- ore deposits: Lakes, 243.
- placer mines: Gale, 4; Hoover, 3; Lakes, 210; Lee, H. A., 9; Rickard, T. A., 9; Snow, 1.
- Rabbit Ears Range: Grout, Worcester, and Henderson, 1.
- rocks, analysis of: Clarke, F. W., 7.
- springs: Lee, H. A., 9.
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- uranium: Blanc, 1; Lee, H. A., 7.
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- Yampa coal, analyses: Campbell, M. R., 2; Fenneman and Gale, 1; Headden, 8; Herrick, 2; Lakes, 161; Weston, 6.
- Yampa coal field, map: Fenneman and Gale, 1, 2; Gale, 7.
- Yampa coal field, physiography: Fenneman and Gale, 2.
- Yampa coal field: Campbell, M. R., 2; Fenneman and Gale, 1, 2; Gale, 7; Herrick, 2; Hills, R. C., 22; Jones, J. D., 3; Lakes, 69, 129, 153, 161, 129; Mg. Rept., 36; Storrs, 1; Thomas, K., 1; Weston, 5, 6, 7; White and Perry, 1.

- Ruby** (Floresta), coal: Hosea, 6.  
mines, production, 1880: Burchard, H. C., 1.
- Ruby Range**, dike rocks: Emmons, Cross, and Eldridge, 1.  
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- Running Lode** mine, water analysis: Headden, 4.
- Russell**, placer deposits: Patton, 8.
- Russell Gulch**, enargite: Spencer, L. J., 1.  
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- Saguache County**, calcite: Rogers, A. F., 1.  
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- St. Charles River**, fossils from described: Hawn, L., 1.
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- St. Peters Dome**, aplitic granite: Clarke, F. W., 8.  
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- San Cristobal**, alunite: Larsen, E. S., 1.
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- Sand**, production: Burchard, E. F., 4, 6, 8; Day, 17, 18; Parker, E. W., 7; Thom, 1, 2.
- Sand-lime brick**. *General*: Middleton, 3.  
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- Sandstone**. *General*: Merrill, 4.  
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- physiography: Chittenden, 1; Comstock, 1, 7; Cross and Purington, 1.
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- San Juan Mountains:** Hills, 20; Rhoda, 1, 2.
- San Juan River,** ancient pueblos: Barber, E. A., 5.
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- hydrography: Newell, 4, 14; Siebenthal, 4.
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- eruptive rocks: Peale, 9.
- geology: Lee, H. A., 9; Spaulding, 1.
- gold: Mg. Ind., 2; Spaulding, 1.
- hydrology: E. and M. J., 32; Newell, 12, 14.
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- mines and mineral production: Ameling, 4; Burchard, H. C., 4; Curry, 1; Henderson, C. W., 2, 4; Hodges, 1; Lee, H. A., 9; Rothwell, 6; Spaulding, 1.
- ores: Hillebrand and Ransome, 2; Ihlseng, 1; Spaulding, 1; Rickard, T. A., 28.
- paleontology: Hills, R. C., 1.
- physiography: Lee, H. A., 9; Spaulding, 1.
- placer mining: E. and M. J., 32; Ihlseng, 1; Mg. Ind., 2.

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**Sapphire, production:** Rothwell, 5; Thom, 2.  
**Saucer Valley:** Peale, 12.  
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**Sawatch Range, General:** Endlich, 4; Hayden, 14.  
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**Scranton, coal field:** Emmons, Cross, and Eldridge, 2.  
**Seaton Mountain, Franklin mines:** Bain, 1.

**Sedalia, coal district:** Emmons, Cross, and Eldridge, 2.

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**Boulder district:** Lakes, 124.

**Cambrian sediments:** Walcott, 1.

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**Denver formation, source of sediments:** Emmons, Cross, and Eldridge, 2.

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**Sierra Blanca, General:** Beckwith, 1; Wheeler, G. M., 6.

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**Silurian.** (This should all be referred to Ordovician and Cambrian.)

*Stratigraphic.*

*General:* Cope, 23; Endlich, 1, 3, 4, 5; Hayden, 14, 19; Hollister, 1; Lakes, 5, 10, 143; Peale, 5, 7, 8; Schiel, 1; Stevenson, 3.

Aspen: Henrich, 2; Newberry, 16; Spurr, 1.

Canon City: Am. Geol., 1; Cope, 71, 72; Walcott, 3, 5.

eastern slope: Hayden, 24.

Elk Range: Holmes, 1.

iron ore: Snedaker, 2.

Leadville: Emmons, 2, 21.

lower or Ordovician, Alma district: Patton, 10.

lower: Hayden, 19.

northwestern Colorado: White, 4.  
ore in: Lakes, 135; Rickard, T. A., 28.

Sangre de Cristo Range: van Diest, E. C. and P. H., 1.

upper, San Juan County: Comstock, 1, 7; Endlich, 3.

**Silurian.—Continued.***Paleontology.*

*General:* Clarke, J. M., 1; Endlich, 1, 5; Girty, 2; Hayden, 14; Marsh, 35; Stevenson, 3.

Brachiopoda: Schuchert, 1.

Bryozoa: Nickles and Bassler, 1.

Canon City: Am. Geol., 1; Emmons, 16, 20; Walcott, 3, 3a, 5.

Front Range: Emmons, 9.

lower: Hayden, 19; Am. Geol., 1.

vertebrate life: Clark, W. B., 1b; Walcott, 3a, 5.

**Silver, General:** Berthoud, 4; Collins, G. E., 9; Comstock, 7; Emmons, 7, 20; Endlich, 1, 2, 5; Farish, 3; Fossett, 1; Frazer, 1; Hayden, 6; Lakes, 5, 22, 143, 205, 219; Lindgren, 1; Marshall, 3; Mg. Rev., 3; Nat. Conservation Com., 1; Pearce, R., 15; Stevens, R. P., 1; Stevenson, 3; Wheeler, G. M., 1; Wilson, J. S., 1.

Aspen district: Henrich, 2; Matteson, 1; Morse, 1; Newberry, 16.

Blackhawk smelters: Egleston, 1.

Boulder County: E. and M. J., 5; Jennings, 1.

Boulder County, Caribou mine: Mg. and Sci. Press, 5.

Breckenridge: Ransome, 5.

calaverite: Hillebrand, 10.

Cashin mine: Emmons, W. H., 3.

Chaffée County: E. and M. J., 15.

Clear Creek County: Lawrence, B. B., 2; Vinton, 2.

Creede: Lakes, 16.

Crested Butte: Warren, E. R., 2.

Cripple Creek: Cross and Penrose, 1; Rickard, T. A., 14.

Custer County: Emmons, 23.

Durango quadrangle: Emmons, W. H., 1.

Georgetown: Spurr and Garrey, 1; Spurr, Garrey, and Ball, 1.

Gilpin County: Collins, G. E., 1; Rickard, F., 1.

gold minerals, and: Pearce, R., 12.

Goldhill: Eilers, 3.



## Silver.—Continued.

Gunnison County: Frazer, 2; Lakes, 32.  
 Hahns Peak: Draper, 1; George and Crawford, 1.  
 Hall Valley: Jernegan, 2.  
 history of industry: Williams, A., 2.  
 Idaho Springs: Spurr and Garrey, 2; Underhill, 2.  
 Jamestown: Farish, 1.  
 Lake City: Irving, 3; Irving and Bancroft, 1.  
 Lake Fork: Woolsey, 2.  
 La Plata Mountains: Cross, Spencer, and Purington, 1; Freeland, H. C., 1.  
 La Sal Mountains: Lakes, 67.  
 Leadville: Blow, 1; Emmons, 2, 9, 11; Emmons and Irving, 1; Freeland, F. T., 1; Matteson, 1; Rolker, 2; Shedd, 1; Tonge, 8; Warwick, 1a.  
 mining: Am. Jour. Mg., 2; Hague, 1; Van Wagener, 2.  
 mining and milling: Hubbard, G. D., 1.  
 minerals: Penfield, 8.  
 Montezuma: Ritter, 8.  
 Monarch-Garfield: Crawford, 3.  
 Monarch-Tomichi district: Crawford, 4.  
 Ophir: Sweetser, 3.  
 ores, genesis of: Matteson, W. G., 2, 3.  
 Ouray, Camp Bird mine: Purington, 3, 4.  
 Ouray: Cross, Howe and Irving, 1; Endlich, 9; Irving, 2; Koenig, 3; Ransome, 3.  
 Paradox Valley: Lakes, 67.  
 Park Range: Hayden, 14.  
 Pitkin: Mg. Rept., 11.  
 production 1869-1874: Raymond, 1, 4, 5, 7, 9, 10—1872-1876: E. and M. J., 1, 2—1874: Egleston, 1—1872-1877: Fossett, 2—1881-1883: Burchard, H. G., 2, 3, 4—1885, 1887, 1889-1893, 1897-1905: Day, 1, 3, 5, 6, 7, 8, 10, 11, 12, 13, 14,

## Silver.—Continued.

15, 16, 18—1885: E. and M. J., 10; Kimball, 1, 2—1887: Mg. Ind., 1; Munson, 1—1888: Munson, 2—1889: Smith, M. E., 1—1889-1890: Emmons, 19; Smith, M. E., 2—1892: Rothwell, 1; Williams, A., 2—1892-1899: Rothwell, 1, 2, 3, 4, 5, 6, 7, 8—1870-1896: Mg. Ind. and Rev., 9—1896: Rickard, T. A., 5—1899: Hodgson, 1—1900: Hodges, 1; Ores and Metals, 3; Struthers, 1—1901: Hodges, 2; Lee, H. A., 8; Smith, M. E., 3; Struthers, 1—1902: Downer, F. M., 1, 2; Mines and Mining, 2; Ores and Metals, 6; Struthers, 3—1903: Eckel, 2; E. and M. J., 38; Mg. Rept., 34—1904: Judd, 1; Mines and Mining, 3; Ores and Metals, 8; Puckett, 1—1905: Day, 18; Ores and Metals, 9—1906: Ingalls, 5; Thom, 1—1907: Dalzell, 2; Ingalls, 6; Thom, 2—1908: Henderson, C. W., 1; Ingalls, 7; Lindgren and McCaskey, 1—1909: Ingalls, 8—1910: Dalzell, 3; Fay, 1; Henderson, C. W., 4; Van Wagener, T., 4; McCaskey, 1; Warwick, 4—1911: Breen, L. A., 1; Collins, 11; Henderson, C. W., 5; Of, 1; Parker, E. W., 7—1912: Henahen, 1; Tonge, 14.  
 Red Mountain: Kedzie, 1; Lakes, 60, 91; Schwarz, 1; Weston, 3.  
 Rico quadrangle: Cross and Ransome, 1; Lakes, 44; Ransome, 2; Rickard, T. A., 7.  
 Rosita: Clark, R. N., 2.  
 Rosita and Silver Cliff: Emmons, 24; Lakes, 55; Lee, H. A., 9.  
 Sangre de Cristo Range: van Diest, E. C. and P. H., 1.  
 San Juan County: Comstock, 1; Endlich, 3; Hartman, 2; Ihlseng, 1; Lakes, 40; Weston, 1.  
 San Miguel: Spaulding, 1.  
 Silver Cliff, gold, and: Lakes, 53.

**Silver.**—Continued.

- Silverton: Cross, Howe, and Ransome, 1.  
 South Park: Lakes, 115.  
 Summit County: Patton, 7.  
 Telluride district: Cross and Purington, 1; Porter, 1; Purington, 2; Winslow, 2.  
 telluride ore, Silverton, Bear Creek: Emmons, W. H., 2; Needle Mountains: Cross, Howe, Irving, and Emmons, 1.  
 Tenmile district: Cross, Howe, Irving, and Emmons, 1; Emmons, 27.

**Silver Cliff, General:** Lakes, 53; Lindgren, 1; Rath, 1.

- andesite, analysis: Clarke, F. W., 9.  
 Bassick mine: Grabill, 1.  
 charcoal at depth in mine: Charlton, 1.  
 geology, dynamic: Emmons, 29; Grabill, 1; Jenney, 1; Mg. and Sci. Press, 12.  
 geology: Cross, 27; Vinton, 1; Wallace, 1.  
 gold: Lakes, 53.  
 minerals, analysis: Clarke, F. W., 6; Eakins and Chatard, 1.  
 mines: Burchard, H. C., 2; Emmons, 24; Tolman, 1.  
 ore deposits: Emmons, 12; Keck, 1.  
 peridotite: Clarke, F. W., 9.  
 ptilolite: Cross, 1.  
 psilomelane, analysis: Clarke, F. W., 9.  
 rocks, analysis: Clarke and Hillebrand, 1.  
 rocks: Cross, 12; Bayley, 1.  
 Rosita, and. *See* Rosita and Silver Cliff.  
 silver: Lakes, 53.

- Silver Plume, geology, dynamic:**  
 Posepny, 1; Spurr, Garrey, and Ball, 1; Van Hise, 4.  
 granite: Bailar, 3.  
 map: U. S. G. S.  
 mills: Mg. Rept., 39.

**Silver Plume.**—Continued.

- mines, timbering: McClelland, 1.  
 mines: Callbreath, 1; Spurr, Garrey, and Ball, 1.  
 ore deposits: Rickard, T. A., 28.  
 Seven Thirty mine: Rickard, F., 3.  
**Silverton, General:** Endlich, 3.  
 andesite breccia, analysis of: Clarke, F. W., 8.  
 andesitic rocks: Van Horn, 3; Cross, Howe, and Ransome, 1.  
 building stone: Cross, Howe, and Ransome, 1.  
 Burns latite complex: Cross, Howe, and Ransome, 1.  
 crystalline schists: Berg, 1.  
 diabase: Cross, Howe, and Ransome, 1.  
 enargite: Spencer, L. J., 1.  
 geology, dynamic: Cross, 32; Cross, Howe, and Ransome, 1; Ransome, 3.  
 geology, economic: Ransome, 3.  
 geology and mineralogy: Comstock, 1.  
 gold: Cross, Howe, and Ransome, 1.  
 granites: Cross, Howe, and Ransome, 1.  
 ground water: Cross, Howe, and Ransome, 1; Ransome, 3.  
 guitermanite and zunyite: Dana, E. S., 4; Hillebrand, 3.  
 iron ore: Cross, Howe, and Ransome, 1.  
 kaolinite: Milch, 1.  
 latite: Clarke, F. W., 8.  
 limestone: Cross, Howe, and Ransome, 1.  
 map: Clason Map Co., 1; Cross, Howe, and Ransome, 1; Ransome, 3; U. S. G. S.  
 milling: Baron, 2; Pasco, J. M., 1.  
 minerals, analyses: Clarke, F. W., 6.  
 mining, 1905: Collins, G. E., 3; Lakes, 223; Prosser, 4.  
 monzonite porphyry: Clarke, F. W., 8.

**Silverton.**—Continued.

- ore deposits: Cross, Howe, and Ransome, 1; Irving, 4; Spurr, Garrey, and Ball, 1; Ransome, 3; Rickard, T. A., 28.
- ore dressing: Kinney and McNaughton, 1.
- physiography: Cross, Howe, and Ransome, 1; Ransome, 3.
- porphyries: Cross, Howe, and Ransome, 1.
- pyroxene andesite: Clarke, F. W., 8; Cross, Howe, and Ransome, 1.
- quartz latite: Clarke, F. W., 8; Cross, Howe, and Ransome, 1.
- quartz syenite porphyry: Cross, Howe, and Ransome, 1.
- rhyolite: Cross, Howe, and Ransome, 1.
- rocks, analysis of: Clarke, F. W., 8.
- schists: Cross, Howe, and Ransome, 1.
- silver: Cross, Howe, and Ransome, 1.
- Silver Lake mine: Lakes, 123.
- tuff: Cross, Howe, and Ransome, 1.
- tungsten, hübnerite ore, analysis: George, 3.
- tungsten, hübnerite: Cross, Howe, and Ransome, 1.
- tungsten, wolframite, analysis of: George, 3.
- tungsten: Ekeley, 1.
- zinc: Cross, Howe, and Ransome, 1.
- zunyte and guitermanite: Dana, E. S., 4; Hillebrand, 3.
- Sinbad Valley, General:** Peale, 8.
- salt: Gannett, H., 4.
- vanadium: Lindgren, 9.
- Slate, General:** Coons, 1; Lakes, 51; Merrill, 4.
- production: Burchard, E. F., 4; Day, 16.
- Slate Creek, coal, analysis:** Eakins, 6.
- Smaltite:** Iles, 2.
- Smelter Creek, stream measurement:** Lamb and party, 1.

- Smelting, General:** Austin, L. S., 1; Guiterman, 1, 2; Ores and Metals, 2; Johnson, 3.
- Argo: Lakes, 132; Pearce, H. V., 1.
- Blackhawk: Egleston, 1; Rickard, T. A., 6.
- Colorado-American Zinc-Lead Co.: Rothwell, 1.
- Dudley: Peters, 1.
- gold and silver ores: Tonge, 5.
- Green: Rickard, T. A., 6.
- in 1871: Raymond, 5—1874, Blackhawk: Egleston, 1—1882-1883: Burchard, H. C., 3, 4—1887: E. and M. J., 12—1892: Rothwell, 1—1905: Day, 18—1909: Argall, P., 14.
- history of, in state: Bain, 7; Pearce, R., 4.
- Leadville and Robinson: Doolittle, 1; Tonge, 8.
- matte and ore, Leadville and Robinson: Doolittle and Jarvis, 1; Struthers, 3.
- Ohio-Colorado, Salida: Mg. Rept., 29.
- pyrite: Argall, P., 4; Carpenter, F. R., 1.
- rates: Mg. Mag., 2.
- Salida: Mg. Rept., 29; Ritter, 1.
- San Juan, Durango: Rickard, T. A., 6.
- sinter roasting: Weeks and Laws, 1.
- slag treatment, Argo: Pearce, H. V., 1.
- sulpho-tellurides: Argall, 18.
- zinc ore dressing: Parmelee, 6; Prosser, 5.
- Smoky Hill, chalk:** Conrad, 1.
- Snake River district, mines:** Ellers, 1; Hague, 1.
- mining, 1867: Hollister, 1.
- Soda, General:** Bailar, 3.
- Denver, near: Wilson, 1.
- San Luis Valley: Siebenthal, 4.
- sulphate of: Smith, J. A., 1.
- Soda Creek, hot springs:** Spurr and Garrey, 2.

- Soda Lake, soda:** Hayden, 12.
- Soda Springs, hot:** Spurr and Garrey, 2.
- Sodium carbonate, San Luis Valley:**  
Fleck, 1.  
*General:* Elliott, R. S., 1; Thomas, C., 2.
- Soils.** It was found possible to include only a few references to soils of the state. For information regarding soils consult—
1. Reports of the Field Operations of the Division of Soils by the U. S. Dept. of Agric., Nos. 4, 5, 6, 7, and 12.
  2. Reports of the Experiment Station, State Agricultural College, Ft. Collins.
- Soils, General:** Elliott, R. S., 1; Thomas, C., 2.
- Arid lands:** White, 7.
- Arkansas Valley, lower:** Lapham and party, 1.
- Cache la Poudre Valley:** Means, T. H., 1.
- cultivable and cultivated area:** Newell, 14.
- Denver Basin, loess:** Emmons, Cross, and Eldridge, 2.
- Grand Junction district:** Holmes and Rice, 1.
- Greeley:** Holmes and Neill, 1.
- Nepesta quadrangle:** Fisher, 1.
- nitrates in:** Headden, 15.
- San Luis Valley:** Holmes, J. G., 1.
- Somerset coal field:** Lee, W. T., 10.
- Sopris, coal mines:** Hills, R. C., 25; White and Perry, 1.
- coal washing plant:** E. and M. J., 22; Hosea, 1.
- Sopris Peak, geology:** Holmes, 1.
- South Boulder Creek, Bear Canyon, paleontology:** Fenneman, 5; White, 6b.
- hydrology:** Lamb and party, 1; Newell, 7, 12, 16.
- ore deposits:** Rickard, T. A., 28.
- placer mining:** Mg. Rept., 2.
- pre-Cambrian:** Van Hise, 1.
- South-central Colorado, physiography:**  
Bergland, 1.
- Southeastern Colorado, canyons:** Lee, W. T., 7.
- geology, dynamic:** Endlich, 4; Gilbert, 6; Stevenson, 8.
- geology, economic:** Endlich, 4.
- geology, topographic:** Rhoda, 3.
- iron ore:** Endlich, 4.
- laccolites:** Gilbert, 6.
- map:** Hills, R. T., 1.
- physiography:** Lee, W. T., 7; Wilson, A. D., 3.
- Southern Colorado, andesite:** Conkling, 2.
- basalt:** Conkling, 2.
- coal mines:** Day, 4; Stevenson, 6.
- diorite:** Conkling, 2.
- dolerite:** Conkling, 2.
- geology:** Stevenson, 9.
- gold deposits:** Rickard, 9.
- granite:** Conkling, 2.
- Laramie group:** Stevenson, 6.
- map:** Newberry, 3.
- Mesozoic rocks:** Stevenson, 12.
- prehistoric ruins:** Gannett, 8.
- trachyte:** Conkling, 2.
- South Fork, hydrography:** Schuyler, 1.
- South Park, General:** Bechler, 1; Cope, 21; Hayden, 6; Lakes, 10; Peale, 5, 6.
- Alma, placer deposits:** Lakes, 22.
- ancient lake:** Stevenson, 3.
- coal:** Hills, R. C., 22; Lakes, 115, 163, 165; Mallett, 1; Stevenson, 1; Washburne, 4.
- coal field, map:** Washburne, 4.
- geology:** Hayden, 14; Lakes, 115.
- gold:** Lakes, 115.
- Laramie:** Cross, 18.
- lead:** Lakes, 115.
- map:** Bechler, 1; Peale, 6.
- mines:** Peale, 6.
- oil:** Lakes, 115.
- ore deposits:** Lakes, 243.
- placer beds:** Lakes, 22, 110.
- paleontology:** Cope, 21, 40.
- silver:** Lakes, 115.
- sulphur springs:** Stevenson, 3.

- South Platte River, *General*:** Bechler, 1; Thomas, C., 2.  
 coal field: Hayden, 14, 19; Hills, R. C., 22; Lakes, 69; Storrs, 1.  
 Fox Hills: Stevenson, 5.  
 hydrography: Lamb, Freeman, and Henshaw, 1; Lamb and party, 1; Newell, 7, 12, 16.  
 paleontology, fossils described: White, 17.
- South Platte Valley, and Cache la Poudre,** map: Clason Map Co., 10.  
 and Denver, map: Clason Map Co., 30.
- South River, erosion:** Endlich, 8.
- Southwestern Colorado, ancient ruins:**  
 Jackson, 1, 2.  
 coal: Lakes, 8.  
 geology, dynamic: Comstock, 5, 6, 7.  
 maps: Comstock, 7; Hayden, 31; St. John, 1.  
 oil: Lakes, 107.  
 physiography: Wilson et al., 1.  
 Red Beds: S—, C., 1.  
 veins: Comstock, 6.
- Spanish Peaks, *General*:** Beckwith, 1; Endlich, 4, 7; Hayden, 6; Jewett, 1.  
 augite granite porphyry: Daly, 1; Hills, R. C., 25.  
 basalt: Hills, R. C., 25.  
 coal: Hills, R. C., 9, 25; Lakes, 108, 156.  
 coke making: Hills, R. C., 25.  
 erosion: Endlich, 8.  
 eruptions: Hills, R. C., 9, 14.  
 eruptive rocks: Peale, 9.  
 fulgurite: Hills, R. C., 16.  
 geology, dynamic: Hills, R. C., 9, 10, 14, 16, 20, 25; Lakes, 108, 143, 156; Savage, 1.  
 geology: Savage, 1.  
 granite felsophyre: Hills, R. C., 25.  
 granite porphyry: Hills, R. C., 25.  
 intrusive rocks: Hills, 20.  
 lamprophyre: Hills, R. C., 25.  
 limestone: Hills, R. C., 25.
- Spanish Peaks.—Continued.**  
 map: Endlich, 4; Hills, R. C., 25; U. S. G. S.  
 minerals: Schaller, 1.  
 petroleum: Hills, R. C., 9.  
 physiography: Hills, R. C., 25.  
 sandstone: Hills, R. C., 25.
- Spiders:** McCook, 1.
- Spiegeleisen, production 1903-1904:**  
 Day, 16, 17—1907: Thom, 2.
- Split Mountain Canyon:** White, 4.
- Sprague Glacier:** Henderson, J., 15.
- Springfield quadrangle,** map: U. S. G. S.
- Starkville, coal mine explosion:** Mines and Minerals, 9.
- Steamboat Springs, *General*:** Draper, 2; Lakes, 23.  
 building stone: Fleck and Haldane, 1.  
 geology, dynamic: Lee, H. A., 9.  
 geology: Witter, 1.  
 mineral springs: Lakes, 23, 125; Lee, H. A., 9; Lowther and Knowles, 1.  
 onyx: Bailar, 3; Lee, H. A., 9.  
 water analysis: Lakes, 23; Lee, H. A., 9.
- Sterling, underground water:** Slichter and Wolff, 1.  
 water, analysis of: Slichter and Wolff, 1.
- Stonewall district, coal:** Richardson, 2.
- Stormridge, geology:** Cross, 23.
- Stream measurements, *General*:** Hoyt, 1; Newell, 2, 4, 8, 9, 11, 13, 15, 17, 18.  
 Animas: Newell, 12, 14.  
 Arkansas: Emmons, Cross, and Eldridge, 2; Freeman and Bolster, 2; Freeman and Mathers, 1; Hinderlider and Hoyt, 1; Newell, 2, 4, 7, 12, 14, 16.  
 Bear Creek: Newell, 12, 16.  
 Big Sandy: Freeman and Mathers, 1.  
 Big Springs Creek: Freeman and Mathers, 1.

**Stream measurements.—Continued.**

- Big Thompson: Lamb, Freeman, and Henshaw, 1; Lamb and party, 1; Newell, 12, 16.
- Blue: Freeman and Bolster, 1, 4.
- Boulder: Lamb, Freeman, and Henshaw, 1; Newell, 12, 16.
- Cache la Poudre: Emmons, Cross, and Eldridge, 2; Lamb, Freeman, and Henshaw, 1; Lamb and party, 1; Newell, 2, 7, 12.
- Chalk Creek: Freeman and Mathers, 1.
- Clear Creek: Freeman and Mathers, 1, 2; Lamb and party, 1; Newell, 16.
- Colorado River, above Yuma: Hinderlider, Swendson, and Chandler, 1; Hinderlider and Swendson, 1; Meeker and Reed, 1.
- Conejos Creek: Freeman and Mathers, 2.
- Cottonwood Creek: Freeman and Mathers, 2.
- Crystal Creek: Freeman and Bolster, 1, 4.
- Culebra Creek: Freeman and Mathers, 2.
- Dolores: Newell, 14.
- Duck Lake Creek: Lamb and party, 1.
- Eagle: Freeman and Bolster, 1, 4.
- Florida: Newell, 14.
- Fourmile Creek: Freeman and Mathers, 1.
- Frazer: Freeman and Bolster, 1, 4.
- Geneva Creek: Lamb and party, 1.
- Grand: Freeman and Bolster, 1; Newell, 12, 14, 16.
- Gunnison: Freeman and Bolster, 1, 4; Newell, 12, 14.
- Laramie River: Lamb and party, 1.
- Mancos: Newell, 14.
- Mississippi drainage: Hinderlider, Giles, and Hoyt, 1; Meeker and Giles, 1.
- Missouri River drainage: Babb, Hinderlider, and Hoyt, 1; Follansbee, Meeker, and Stewart, 1.

**Stream measurements.—Continued.**

- northwestern Colorado, low water: Newell, 16.
- Oil Creek: Freeman and Mathers, 1.
- Piedra: Newell, 12.
- Purgatory: Freeman and Mathers, 1; Newell, 12.
- resources, and: Fellows, 1.
- Rio Grande: Freeman and Mathers, 2; Newell, 12, 14; Taylor and Hoyt, 1, 2; Taylor and Lamb, 1; Newell, 16.
- Roaring Fork: Freeman and Bolster, 1, 4.
- San Juan: Newell, 12, 14.
- San Luis Creek: Freeman and Mathers, 2.
- San Miguel: Newell, 12, 14.
- Scott Gomer Creek: Lamb and party, 1.
- Smelter Creek: Lamb and party, 1.
- South Boulder: Lamb and party, 1; Newell, 12, 16.
- South Platte: Lamb and party, 1; Newell, 12, 16.
- St. Vrain: Lamb, Freeman, and Henshaw, 1; Lamb and party, 1; Newell, 12, 16.
- Tarryall Creek: Lamb and party, 1.
- Uncompahgre: Newell, 12; Freeman and Bolster, 1, 4.
- White River: Gale, 5.
- Strontium, production 1901: Day, 14.
- Sub-Carboniferous, *Paleontology*: Hay, O. P., 1a; Peale, 8; White, 22.
- Sugarloaf district, geology: Emmons, 7.
- Lake Fork, hydrology: Hosea, 7.
- Sugarloaf Mountain, eruptive rocks: Emmons, 7.
- Sulphur. *General*: Baldacci, 1.
- Mineral County: Larsen and Hunter, 1; Phalen, 3.
- production 1905: Day, 18—1906, 1907: Ingalls, 5, 6; Thom, 1, 2.
- Sulphuric acid, production: Parker, E. W., 7; Phalen, 3.
- Sulphur Springs, fossils from described: Cross, 18, 19.

- Summit County**, alabandite and pyrite:  
     Smith, W. B., 2.  
     Bell mine, Glacier Mountain, minerals: Van Horn, 1.  
     bismuth, Montezuma district: Ingalls, 8.  
     Breckenridge. *See* Breckenridge.  
     enargite: Pirsson, 1.  
     Farncomb Hill, gold: Hausmann, 1.  
     geology: Emmons, 7; Fosset, 1; Hills, R. C., 3; Lee, H. A., 9; Merrick, 1; Mg. Ind., 5; Patton, 7.  
     Glacier Mountain, Bell mine, minerals: Van Horn, 1.  
     gold: Hausmann, 1; Mg. Rept., 5; Patton, 7; Sharwood, W. J., 1.  
     iron ore: Patton, 7.  
     minerals, analyses: Clarke, F. W., 6.  
     mining and mineral production: Burchard, H. C., 1, 2, 3, 4; Callbreath, 3; Hollister, 1; Henderson, C. W., 2, 4; Lakes, 5; Lee, H. A., 9; Mg. Rept., 18, 24; Mg. Rev., 1; Munson, 1, 2; Patton, 7; Raymond, 1, 4, 5, 7, 9, 10; Rothwell, 6.  
     Montezuma district, geology, map: Patton, 7.  
     ore deposits, Bancroft, G. J., 6; Hills, R. C., 3; Lakes, 143, 195; Lee, H. A., 9; Merrick, 1; Mg. Ind., 5; Patton, 7.  
     physiography: Lakes, 195; Patton, 7.  
     placer mining: Brown, T. A., 1; Lakes, 121, 133; Mg. Rept., 5.  
     pyrite and alabandite: Smith, W. B., 2.  
     silver: Patton, 7.
- Summitville**, ore deposits: Hills, 3; Raymond, 10; Rickard, T. A., 28.
- Sunlight**, coal: Shubart, B., 1.
- Sunshine**, geology: Emmons, 7; Endlich, 5.
- Superior**, coal: Emmons, Cross, and Eldridge, 2.
- Swan River**, placer mines: E. and M. J., 6.
- Tantalum**, Canon City: Hess, 1, 3.  
     production 1906: Thom, 1.
- Tar**, production 1908: Parker, E. W., 3.
- Tarryall** reservoir site: Schuyler, 1.
- Taylor Peak**, iron deposits, map: Harder, 2; Hills, 20.
- Teller County**, amazonstone and moonstone from: Sterrett, 2.  
     Cripple Creek. *See* Cripple Creek.  
     geology, dynamic: Rickard, T. A., 22.  
     mineral production: Henderson, C. W., 4.  
     molybdenum: Sebben, 1.  
     moonstone and amazonstone: Sterrett, 2.  
     uranium: Lee, H. A., 7.
- Telluride**. *General*: van Diest, 5.  
     andesite: Cross and Purington, 1.  
     coal, Dakota formation: Purington, 2.  
     coal: Cross and Purington, 1; Purington, 2.  
     copper, native: Purington, 2.  
     gabbro, gabbro porphyry, analysis: Clarke, F. W., 8.  
     geology, dynamic: Cross, 26; Cross and Purington, 1; Lay, 1; Pearce, 5; Purington, 2.  
     geology, fissure and vein system: Cross and Purington, 1.  
     glaciation: Hole, A. D., 2.  
     gold: Cross and Purington, 1; Porter, 1; Purington, 2; Winslow, 2.  
     hydrology: Purington, 2.  
     igneous rocks: Cross, 26.  
     lamprophyre: Clarke, F. W., 8.  
     Liberty Bell mine, analysis of ore: Winslow, 2.  
     Liberty Bell mine, gold: Winslow, 2; Mg. and Sci. Press, 14.  
     Liberty Bell mine, milling: Bosqui, 1, 2; Of, 1.  
     Liberty Bell mine, minerals: Winslow, 2.

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- Liberty Bell Mine: Bosqui, 2;  
Henahen, 1; Mines and Mining,  
1; Winslow, 2.  
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Purington, 1; Purington, 2; U. S.  
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mica: Purington, 2.  
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minerals: Cross and Purington, 1.  
mining: Collins, G. E., 3; Cross  
and Purington, 1; Ingalls, 3; Mg.  
Rept., 10; Purington, 2.  
ore deposits: Cross and Purington,  
1; Lakes, 143; Pearce, 5; Pur-  
ington, 1, 2, 7; Spurr, Garrey,  
and Ball, 1.  
orthoclase: Purington, 2.  
placer mining: Cross and Puring-  
ton, 1.  
platinum and allied metals: Lind-  
gren, 10.  
quartz: Purington, 2.  
quartz monzonite: Clarke, F. W.,  
8, 9.  
rhyolite: Cross and Purington, 1.  
rocks, analysis: Clarke, F. W., 8;  
Cross, 26; Cross and Purington,  
1.  
San Miguel formation: Cross, 30.  
silver: Cross and Purington, 1;  
Porter, 1; Purington, 2; Wins-  
low, 2.  
Smuggler-Union mine, analysis of  
ore: Porter, 1.  
Smuggler-Union mine, milling:  
Adams, W. E., 1.  
Smuggler-Union mine: Nye and  
Clifford, 1; Met. and Chem. Eng.,  
1; Porter, 1.  
Tom Boy mine: Rothwell, 5.  
vitrophyre, black, analysis: Clarke,  
F. W., 8; Cross and Purington, 1.  
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man, B., 1.  
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- La Plata Mountains: Austin, 2;  
Freeland, H. C., 1.  
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physiography: Emmons, 27.  
rhyolite: Emmons, 27.  
silver: Emmons, 27.  
zinc: Emmons 27.  
**Teocalli Mountain**: Hayden, 30.  
**Tepee Buttes**, geology, dynamic: Gil-  
bert and Gulliver, 1.  
map: Gilbert and Gulliver, 1.  
physiography: Gilbert and Gulli-  
ver, 1.  
**Tercio**, coal mines: Hosea, 5; Merriam,  
1; Plumb, 1; Richardson, 2.  
**Tertiary.**  
*Stratigraphic.*  
*General*: Cope, 18, 55, 60; Elliott,  
E. T., 1; Emmons, 20; Endlich,  
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den, 5, 6, 12, 14, 16, 18, 22;  
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- correlation: Dall, 1.
- Creede: Emmons and Larsen, 1.
- Denver Basin: Eldridge, 2.
- Denver formation: Cross, 13; Davis, W. M., 5.
- eastern Colorado: Hay, R., 1, 2; Hayden, 20, 24.
- eruptives, Creede: Emmons and Larsen, 1.
- eruptives, San Juan: Read, 4.
- eruptives, southeastern Colorado: Stevenson, 8.
- Florissant: Henderson, J., 6; Scudder, 10, 15, 18, 27.
- fresh water formations: Chamberlin, 1; Marsh, 47.
- Grand Canyon: Dutton, 3.
- Grand River district: Peale, 12.
- Green River: Scudder, 1, 2.
- Huerfano River basin: Hills, R. C., 10, 13.
- iron ore: Berthoud, 4.
- lake basin, Florissant: Henderson, J., 6; Scudder, 10, 15.
- Lake Beds. *See* Lake Beds.
- lakes: King, 1.
- Laramie, age of: Bannister, 1; White, 25.
- lignite deposits: Hayden, 4; Lesquereux, 2.
- lower: Hayden, 19.
- map: King, 1; Willis, 2.
- northeastern Colorado: Matthew, 2.
- North Park: Hague and Emmons, 1.
- northwestern Colorado: Gale, 3; White, 4.
- ore in: Lakes, 135; Rickard, T. A., 28.
- Palmer Lake: Cannon, 9.
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- Rabbitt Ears district: Grout, Worcester, and Henderson, 1.
- Rocky Mountain region: Davis, W. M., 5a.
- San Juan County: Comstock, 1; Lakes, 181.

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- shales, San Miguel: Spaulding, 1.
- silver, uranium in: Berthoud, 4.
- southeastern division: Endlich, 5.
- Trinidad: Richardson, 2.
- White River: Hollister, 1.
- Yampa: Fenneman and Gale, 2.

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- General*: Adams, 2; Allen, 2, 5, 7; Cockerell, 3, 7b, 12, 23, 35, 50, 60; Cope, 15, 21, 40; Cross, 13, 18, 19, 24, 38; Hayden, 19, 23, 25; Hills, 10, 13, 15, 21, 25, 28; Hollister, 1; Lesquereux, 4, 13, 14; Marsh, 21, 35; Matthew, 1, 3; Peale, 5, 7; Scudder, 7, 8, 9, 15, 18, 20; White, 3, 8, 9, 15, 16, 18, 21, 22.

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bibliography and catalogue of genera and species: Nickles and Bassler, 1.

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**Texas Creek**, rose quartz: Sterrett, 7.**Thermal springs.** *See* hot springs.**Timpas quadrangle**, map: U. S. G. S.**Tin.** *General:* Rolker, 3; van Diest, 13.

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production, 1888, 1892: Day, 4, 7; Henahan, 1.

**Topaz Butte**, crystal beds: Smith, W. B., 1.

phenacite: Penfield, 1.

**Tourmaline, General:** Sterrett, 2.

production 1906-1907: Thom, 1, 2.

**Tousland**, coal: Hayden, 19.**Trachorheites:** Endlich, 1, 7; Peale, 7, 8.**Triassic.***Stratigraphic.**General:* Endlich, 1, 5; Hayden, 6,

12, 14, 19, 22; Holmes, 2; King,

1; Lakes, 6, 10; Marvin, 1;

Newberry, 3; Peale, 5, 7, 8;

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Colorado Range: Hague and Emons, 1.

Denver Basin: Eldridge, 2.

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Grand River valley: Riggs, 3;

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Rabbit Ears district: Grout, Worcester, and Henderson, 1.

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Engineer Mountain: Cross, 41.

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Red Beds: Cross and Howe, 1.

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Shinarump group: Cross, 36.

Trimble Springs, water analysis: Lee,  
H. A., 9.

Trinidad, *General*: Endlich, 4; St.  
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artesian wells: Lakes, 3.

Barela Mesa, coal: McLaughlin, J.  
E., 1.

building stone: Merrill, 2.

coal, analysis: Lakes, 3, 6.

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ling, 3; Darton, 9; Englemann,  
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Laughlin, J. E., 1; Potter, W. B.,  
1; Richardson, 2; Stevenson, 8;  
Stone, 8; Whiteside, 2.

coke: Eilers, 4; Englemann, 2;  
Lakes, 3; Potter, W. B., 1;  
Weeks, J. D., 3.

geology: Conkling, 3; Lakes, 6;  
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graphite: Lakes, 3.

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**Tungsten, *General***: Ackerman, E., 1;

Ekeley, 1; Fleck, 4; Frenzel, A.  
B., 1; George, 3; Henahen, 1;  
Hess, 5; Hills, V. G., 2; Lakes,  
143; Lee, H. A., 4; Ohly, 8; Ran-  
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milling, Boulder County: Carl, 1;  
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production, 1898: Rothwell, 8—  
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17, 18—1899, Ohly, 1—1900: Ores  
and Metals, 3; Struthers, 1—  
1901: Lee, H. A., 8; Struthers,  
2—1904: Judd, 1—1905: Ingalls,  
4; Ores and Metals, 9—1906:  
Ingalls, 5; Thom, 1—1907: In-  
galls, 6; Thomas, K., 1; Thom,  
2—1908: Collins, G. E., 8;  
George, 2; Ingalls, 7—1909: Col-  
lins, G. E., 9; Hess, 2; Ingalls,  
8—1910: Dalzell, 3; Fay, 1;  
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Turkey Creek, coal: Stone, 8.

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Turquoise, La Jara, Conejos County:  
Sterrett, 3, 7.

production, 1888, 1892-1893, 1901:  
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Saguache County: Jones, F. A., 1.

Twin Butte, laccolites: Gilbert, 6.

Twin Lakes, *General*: Hayden, 14, 30.  
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minerals, analysis: Clarke, F. W.,  
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- Tyndall Glacier:** Henderson, J., 15.
- Uinta Basin,** map: Eldridge, 6.
- Uinta Mountains, *General:*** Powell, 3.  
     chert, analysis of: King, 1.  
     Green River, antecedent to (?):  
     Davis, 4.
- Uinta Range:** Cope, 60; King, 1;  
     White, 4.  
     geology: White, 24, 26.
- Unaweep Canyon:** Gannett, 4, 9; Peale,  
     8.  
     map: Peale, 8.
- Uncompahgre Canyon:** Cross and  
     Howe, 1; Ransome, 3.
- Uncompahgre Mountains:** Endlich, 7.  
     pre-Cambrian: Van Hise, 2.
- Uncompahgre Peak:** Endlich, 3; Mar-  
     shall, 3.
- Uncompahgre Plateau:** Gannett, 4, 9;  
     Peale, 8.
- Uncompahgre region, *General:***  
     Wheeler, G. M., 4.  
     gypsum: Siebenthal, 1.  
     map: Siebenthal, 1.
- Uncompahgre River,** hydrology: New-  
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- Uncompahgre Valley,** coal: Peale, 8.  
     map: Clason Map Co.  
     reclamation work: Quinton, 1.
- Underground waters:** Apishapa quad-  
     rangle: Stose, G. W., 1.
- Arkansas Valley:** Darton, 5; Gil-  
     bert, 5.
- Boulder district:** Fenneman, 5.
- Cripple Creek district:** Cross and  
     Penrose, 1; Lindgren and Ran-  
     some, 1, 3.
- eastern Colorado:** Hay, Robert, 2.
- Georgetown district:** Spurr, Gar-  
     rey, and Ball, 1.
- Geyser mine:** Emmons, 23.
- Rosita-Silver Cliff district:** Spurr,  
     Garrey, and Ball, 1.
- Silverton:** Cross, Howe, and Ran-  
     some, 1.
- Sterling:** Slichter and Wolff, 1.
- Upper Blue River,** mining, 1867: Hol-  
     lister, 1.
- Uranium, *General:*** Becke, 1; Berthoud,  
     4; Blanc, 1; Endlich, 5; Fleck,  
     3; Frenzel, A. B., 1; Henning, 2;  
     Hess, 5; Hillebrand and Ran-  
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- Chemistry, minerals, and ores:***  
     radio-activity, radium, produc-  
     tion, etc.: Baskerville, 1; Bas-  
     tin, 2; Boltwood, 1; Collins, 8, 9;  
     Cumenge and Freidel, 1; Curran,  
     1, 2; Endlich, 6; Fleck, 2, 3, 4;  
     Fleck and Haldane, 1, 2; Fisch-  
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     6; Rutherford and Boltwood, 1;  
     Schaaf-Regelman, 1; Strutt, 1;  
     Tovote, 1.
- bibliography of Colorado uranium:**  
     George, 4a.
- Boulder and Gilpin counties:**  
     Wood, 1.
- Gilpin County, Central City:**  
     Pearce, 10.
- Gilpin County:** Hess, 1; Rickard,  
     F., 1; Tovote, 1.
- Montrose County:** Mines and Min-  
     ing, 1; Ohly, 1.
- production 1893, 1897:** Rothwell,  
     2, 6—1899, 1901-1905: Day, 12,  
     14, 15, 16, 17, 18—1906: Thom,  
     1—1907: Ingalls, 6; Thom, 2—  
     1908: Collins, G. E., 8—1909:  
     Hess, 2—1911: Of, 1; Parker, E.  
     W., 7—by counties: Lee, H. A.,  
     7.
- southeastern Utah:** Boutwell, 1.
- western Colorado:** Hillebrand and  
     Ransome, 1; W——, C. H., 3.
- Ute Indian War,** map: Rand, McNally  
     and Co., 3.
- Ute Pass,** fault and sandstone dikes:  
     Crosby, 2.  
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- Vanadium, General:** Benicke, 1; Carl, 1, 3; E. and M. J., 46, 47; Fischer, S., 1, 2; Fleck, 3, 4; Hess, 1, 5; Hillebrand and Ransome, 2; Lakes, 153; Lindgren, 9; Mg. World, 8, 9.
- Chemistry, ores, minerals, metallurgy, mining, etc.:** Baskerville, 1; Berthoud, 4; Collins, 8, 9; Cross and Purington, 1; Curran, 1; Endlich, 6; Fleck, 2; Fleck and Haldane, 1, 2; Gale, 2, 6; George, 4a; Henning, 2; Hess, 1, 2, 3, 4, 5; Hillebrand, 5, 11; Hillebrand and Ransome, 1, 2; Lakes, 67, 143, 165, 205; Lindgren, 9; Moore and Kithil, 1; Ohly, 1, 11, 12; Pearce, 10; Phillips, 1; Schaaf-Regelman, 1; Thomas, K., 2; Zalinsky, 1.
- bibliography of Colorado vanadium:** George, 4a.
- Boulder County:** Wood, 1, 2.
- Greenhorn Mountains:** E. and M. J., 44.
- Montrose County:** Mines and Mining, 1; Ohly, 1.
- Paradox Valley:** Salt Lake Mg. Rev., 2.
- Placerville:** Hess, 4.
- production 1900-1905:** Day, 13, 14, 15, 16, 17, 18—1907: Ingalls, 6; Thom, 2—1909: Collins, G. E., 9; Hess, 2—1910: Dalzell, 4; Fay, 1; Hess, 3; Warwick, 4—1911: Of, 1; Parker, E. W., 7.
- Rio Blanco County:** Fleck and Haldane, 1.
- San Miguel County:** Fleck, 3; Hess, 3. *See also* Newmire, Placerville, Paradox Valley, Fall Creek.
- southeastern Utah:** Boutwell, 1.
- southwestern Colorado:** Thomas, K., 2.
- Telluride:** Zalinsky, 1.
- western Colorado:** Hillebrand and Ransome, 1; W—, C. H., 3.
- Vermilion Creek:** King, 1.
- Vernal, coal field, map:** Gale, 7.
- Vertebrata, General:** Cope, 14, 16, 26, 30, 37, 46, 49, 50, 52, 61, 62, 65, 68; Lull, 1; Marsh, 4, 5, 35, 39, 46; Roger, 1; Wortman, 1; Wortman and Matthew, 1; Zittel, 2, 3.
- Arapahoe formation, Denver:** Emmons, Cross, and Eldridge, 2.
- bibliography and catalogue:** Hay, O. P., 1.
- Cretaceous:** Cope, 19, 22; Emmons, Cross, and Eldridge, 2.
- Dakota:** Cope, 27.
- Denver, near:** Cannon, 11.
- Denver beds:** Cope, 69; Marsh, 46.
- Dolores:** Cross, Spencer, and Pur-ing, 1.
- Equus beds:** Cope, 66.
- Florissant:** Cockerell, 34.
- Jurassic, Denver Basin:** Emmons, Cross, and Eldridge, 2.
- Jurassic:** Knight, W. C., 1; Leidy, 1a.
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- Pliocene, northern Colorado:** Cope, 18.
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- Silurian, Canon City:** Walcott, 3, 3a, 5.
- Tertiary:** Cope, 60; Emmons, Cross, and Eldridge, 2; Hayden, 13; Leidy, 1, 2.
- Titanotherium beds:** Hatcher, 2.
- Victor, Ajax mill:** Of, 1.
- Anna Lee mine:** Lakes, 62.
- gold:** Lakes, 41.
- Golden Cycle mill:** Henahan, 1.
- Independence mine:** Rickard, T. A., 19.
- Portland mill:** Edgerton, 1; Henahan, 1.
- Vilas quadrangle, map:** U. S. G. S.
- Volcanic ash, General:** Woolsey, 1.
- Durango:** Woolsey, 1.
- dust, Green River district:** Montgomery, 1.
- production 1897:** Rothwell, 6.

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- analyses: King, 1.
- andesites: King, 1.
- basalts: King, 1.
- dacites: King, 1.
- fusion: King, 1.
- genesis and classification: King, 1.
- propylites: King, 1.
- rhyolites: King, 1.

**Vulcan, mining: Spurr, Garrey, and Ball, 1.**

- rickardite: Ford, 1.

**Vulcanism, General: Ball, S.H., 1; Blow, 1; Comstock, 8; Conkling, 1; Cope, 6; Emmons, 4, 15; Endlich, 1, 2, 3, 4, 5, 7, 8; Farish, 1, 2; Gilbert, 2; Hayden, 6, 14, 19, 22, 26; Hague and Emmons, 1; Hills, R. C., 3; Holmes, 2, 6; King, 1; Lakes, 54; Loew, 2; Marvine, 1, 2; Newberry, 3; Peale, 5, 7, 8; Pirsson, 2; Powell, 6; Purington, 3; Schiel, 1; Schwarz, 1; Scudder, 9, 10, 14; Stevenson, 3, 7; St. John, 1; Stone, 7; Wadsworth, 1; White, 4.**

- Archuleta County: Lee, H. A., 9.
- Aspen: Henrich, 2.
- Boulder, Magnolia district, olivinite dike: Whitaker, 1.
- Boulder County, Sugarloaf: Hoggarty, 1.
- Boulder County, trachyte: Breed, 1.
- Boulder County, Valmont dike: Lakes, 124.
- Cebolla hot springs: Rickard, 23.
- Cenozoic eruptions: Hills, R. C., 20.
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- coal, anthracite, Gunnison County: Lakes, 6.
- coal, changed by heat: Lakes, 172.
- craters: van Diest, 9.
- Crested Butte coal field: Lakes, 6.
- Cripple Creek, limburgite: Stevens, E. A., 1.

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- Cripple Creek, subterranean gases: Lindgren, 3; Lindgren and Ransome, 2, 3.
- Cripple Creek, volcanic rocks: Cross, 29.
- Cripple Creek volcano: Miller, G. W., 1; Rickard, T. A., 15.
- Cripple Creek: Cross and Penrose, 1; Lakes, 18, 21, 88; Lee, H. A., 9; Lindgren and Ransome, 3; Rickard, T. A., 15, 22, 26.
- Custer County, eruptive rocks: Cross, 12.
- Dotsero: Lakes, 6.
- Elk Range: Holmes, 1; Lakes, 143.
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- Eocene eruptions: Hills, R. C., 17.
- eruptive mountains: Peale, 9.
- eruptives: Rickard, F., 1.
- Evergreen: Ritter, 5.
- extinct volcanoes in Colorado: Lakes, 7.
- Florissant: Heilprin, 1.
- Glenwood, hot springs: Lakes, 6.
- Golden coal beds: Lakes, 6.
- Grahamite, dike of: Newsom, 1.
- Grand River coal field: Lakes, 72, 160.
- Grizzly Peak, granitic breccias: Stone, 7.
- Gunnison gold belt: Lakes, 20.
- Gunnison and Ouray districts: Lakes, 6.
- Hahns Peak: Draper, 1; Gale, 1; Lakes, 143.
- Hinsdale County: Lee, H. A., 9.
- hot springs, Glenwood: Lakes, 6.
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- coal, analysis of: Hills, R. C., 15.
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- granite-felsophyre: Hills, R. C., 15.
- lamprophyre: Hills, R. C., 15.
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- map: Hills, R. C., 15; U. S. G. S.
- monzonite porphyry: Hills, R. C., 15.
- Morrison: Lee, W. T., 6.
- paleontology, fossils from: Hollick, 2.
- petroleum: Hills, R. C., 15.
- physiography: Hills, R. C., 15.
- sandstone: Hills, R. C., 15.

**Ward, dike rock:** Palmer and Stoddard, 1.

- geology, economic: Emmons, 7.
- minerals: Loew, 1.
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- ore deposits: Rickard, T. A., 28.
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**arid regions:** Newell, 1.

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**Dakota water, Spanish Peaks:** Hills, R. C., 25.

**Denver well, analysis of:** Eakins, 5.

**Eocene, lower, Spanish Peaks:** Hills, R. C., 25.

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**streams:** Headden, 4.

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It was found impossible to include all references to water resources of the state. For information along this line consult—

1. Water Supply Papers, published by the U. S. Geol. Surv., especially Nos. 16, 18, 28, 37, 66, 75, 84, 99, 133, and 175. A general bibliography from 1879 to 1904 will be found in Water Supply Paper No. 120.

2. Annual reports of the U. S. Geol. Surv., under topics: water resources, underground water, irrigation, hydrography, stream measurements, reservoirs, names of streams, etc.

**Water supply, General:** Newell, 8.

**Apishapa quadrangle:** Stose, G. W., 1.

**Denver, near:** Foster, E. L., 1.

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**Ouray quadrangle:** Cross, Howe, and Irving, 1.

**plains:** Hay, Robert, 2.

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**Weathering, General:** Endlich, 4, 5, 8;

**Hayden, 6, 12, 14, 19; Holmes, 6;**

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- discoloration of rocks: Blake, W. P., 2.
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- ore deposits, Summit district: Hills, R. C., 3.
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- rock streams, Ouray quadrangle: Cross, Howe, and Irving, 1.
- rock streams, Needle Mountains: Cross, Howe, Irving, and Emmons, 1.
- Telluride mining district, effects on topography: Purington, 2.
- Weld County**, altitudes in: Wilson et al., 3.
- map: Clason Map Co.
- Wells**, Arkansas Valley: Darton, 13.
- Dakota, in, Boulder district: Fenneman, 5.
- Denver Basin: Emmons, Cross, and Eldridge, 2.
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- flowing, Boulder district: Fenneman, 5.
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- rocks, analyses: Clarke and Hillebrand, 1.
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- West San Miguel**, map: Holmes, 6.

- Wet Mountains**, minerals from, list: Charlton, 3.
- pre-Cambrian: Van Hise, 1.
- Wheatstone Mountain**, geology: Cross, 23.
- White Cross**, mining area: Woolsey, 2.
- White Earth River**: Peale, 8.
- White Pine**, iron ore: Chauvenet, 8; Harder, 2.
- map: Harder, 2.
- White River**, *General*: Bechler, 2; Chittenden, 2; Endlich, 5, 7, 8; White, 4.
- coal, analysis of: Hollister, 1.
- coal field, map: Gale, 7, 8; Hewett, 1.
- fossil insects, Chagrin Valley: Scudder, 8.
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- Indian reservation, map: Nell, 3.
- map: U. S. G. S.
- oil, Black Gulch: Gale, 5; Hollister, 1.
- paleontology: White, 6b.
- physiography: Chittenden, 2.
- plateau: Hills, 20.
- Williams Canyon**, paleontology, fossils described: Walcott, 14.
- Williams Fork**, Yampa River: White, 4.
- Williams River**: Bechler, 1.
- Williams River valley**: Marvine, 1.
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- Willow Creek**, Draper, 2.
- placer mining: Hartley, C., 2.
- Wind Cave**: LeCouppey de la Forest, 1.
- Wind River**, Wind River and Huerfano beds in Huerfano lake basin: Osborn, 1.
- Witherite**: Ohly, 2.
- Wonsitz Valley**: White, 4.
- Woolton**, coal mines: Hills, R. C., 25.
- Yampa**, coal field. *See* Routt County.

- Yampa Canyon and Plateau:** King, 1.
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- Yampa Plateau:** Powell, 2; White, 26.
- Yampa Plateau:** Hague and Emmons, 1; Powell, 2; White, 26. *See also* Blue Mountains.
- Yampa River, geology:** Bechler, 2; Powell, 1.
- Laramie: Cross, 18.
- paleontology: White, 6b.
- Williams Fork: White, 4.
- Yampa River Valley, General:** White, 4.
- Fortification Peak: Hague and Emmons, 1.
- geology, general: Hague and Emmons, 1.
- igneous rocks: Hague and Emmons, 1.
- physical features: Hague and Emmons, 1.
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- Yankee Girl:** Schwarz, 5; Weston, 2.
- Yule Creek.** *See* Gunnison County.
- Yule formation.** *See* list of formations, page 479.
- Yuma County, map:** Clason Map Co.
- volcanic ash: Woolsey, 1.
- water supply: Hay, R., 2.
- Zinc, General:** Bain, 5; Demaret, 1; Endlich, 5; Lakes, 76, 143; Mg. Rept., 45; Nat. Conservation Com., 1; Swart, 1.
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- Idaho Springs: Spurr and Garrey, 2.
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- metallurgy, treatment of ores at Canon City plant: Barber, P., 1; DeCou, 1; Lakes, 184; Mines and Mining, 5; Parmelee, 2.
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- Air: Schiel, 1.  
Alaskaite: Am. Jour. Sci., 1; Lewis, H. C., 1.  
Albertite: Kneeland, 1.  
Alkali syenite porphyry: Clarke, F. W., 8.  
Allanite: Clarke, F. W., 6; Eakins, 1.  
Altaite: Endlich, 6.  
Alumina: Kedzie, 1.  
Alunite: Clarke, F. W., 6; Cross, 16; Cross and Spencer, 2; Eakins, 9; Hurlburt, 1.  
Alunogen: Headden, 6; Hobbs, 2.  
Analcite: Clarke, F. W., 6; Clarke and Hillebrand, 1; Cross and Hillebrand, 4; Steiger, G., 1.  
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Andesite: Clarke, F. W., 9; Crawford, 4; Cross, 1, 12; Hillebrand, 11; Hoggarty, 1; Kedzie, 1; Ransome, 3.  
Andesite breccia, altered: Clarke, F. W., 8; Ransome, 3.  
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Apophyllite: Clarke, F. W., 6; Cross and Hillebrand, 2, 4.  
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Astrophyllite: Clarke, F. W., 6; Eakins, 7, 8; Endlich, 6.  
Augite: Clarke, F. W., 6.  
Augite andesite: Clarke and Hillebrand, 1.  
Augite diorite: Clarke and Hillebrand, 1; Cross, 12.  
Augite-mica syenite: Clarke and Hillebrand, 1; Emmons, Cross, and Eldridge, 2.  
Augite monzonite: Clarke, F. W., 8.  
Augite syenite: Clarke, F. W., 8; Cross, Spencer, and Purington, 1.  
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Biotite trachyte: Clarke, F. W., 8.  
Bismuth: Hillebrand, 1.  
Bole: Clarke, F. W., 6; Cross and Hillebrand, 4.  
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Cement: Bancroft, G. J., 3; Lakes, 204.  
Cerussite: Warren, C. H., 1.  
Chabazite: Clarke, F. W., 6; Cross and Hillebrand, 4.

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- Chert: King, 1.
- Chloropal: Cross and Penrose, 1.
- Clay: Clarke and Hillebrand, 1; Day, 10; Richardson, 3; Schaller, 1.
- Coal, 37 from Rocky Mountain region: Belden, Delamater, and Groves, 1.
- Coal: Campbell, 1, 2, 5; Chisholm, 3; Clark, R. N., 1; Cross, Spencer, and Purington, 1; Day, 7, 18; Drown, 1; Eakins, 6; Eldridge, 2; Emmons, Cross, and Eldridge, 1, 2; Endlich, 4, 6; E. and M. J., 3, 37; Fenneman and Gale, 1; Fernald, 2; Fleck and Haldane, 1; Frazer, 2; Gale, 3, 5, 7; Gardner, J. H., 1; Goldman, 1; Grout, 1; Hayden, 4, 12; Headden, 8, 9; Her- rick, 2; Hills, R. C., 6, 15, 22, 24; Hodge, 1; Hosea, 2, 4; Hollister, 1; Jones, J. D., 2; Koenig, 3; Lakes, 3, 4, 6, 8, 58, 69, 72, 90, 105, 116, 117, 128, 149, 154, 157, 160, 161; Lee, W. T., 10, 13; Lesquereux, 2; Loew, 1; Lord, 1, 2; Macfarlane, 1; Martin, 2; Marvine, 1; McLaughlin, J. E., 1; McNeil, 1, 4; Meade, 1; Merriam, 1; Parker, Holmes, and Campbell, 1, 2; Parsons and Liddell, 1; Peale, 7, 8; Potter, W. B., 1; Raymond, 1, 7; Richardson, 1, 2; Rickard, T. A., 23; School of Mines, 1; Shaler, 2; Taff, 1; Thiele, 1; Washburne, 4, 5; Weeks, 1; Weston, 5, 6; Williams, C. P., 1; Woodruff, E. G., 1.
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- Coke: Day, 7; Lakes, 4, 128; School of Mines, 1; Weeks, J. D., 3.
- Coloradoite: Endlich, 6.
- Columbite: Clarke, F. W., 6; Genth, 1a; Hillebrand, 1.
- Cosalite: Cross and Hillebrand, 4.
- Covellite: Thornton, 1.
- Cryolite: Clarke, F. W., 6; Cross and Hillebrand, 3, 4; Ohly, 2.
- Cuprobismutite: Clarke, F. W., 6.
- Cyrtolite: Clarke, F. W., 6; Genth, 1.
- Dacite: Clarke and Hillebrand, 1.
- Danalite: Genth, 1.
- Diabase: Clarke, F. W., 7.
- Diaspore: Clarke, F. W., 6; Cross, 16; Eakins, 9.
- Diorite: Clarke and Hillebrand, 1; Crawford, 4; Cross, 23; Cross, Spencer, and Purington, 1; Hillebrand, 11; Purington, 2.
- Diorite-monzonite: Cross and Purington, 1.
- Diorite porphyry: Clarke, F. W., 8, 9; Clarke and Hillebrand, 1; Crawford, 4; Cross, Spencer, and Purington, 1; Hillebrand, 11.
- Dolerite: Clarke and Hillebrand, 1.
- Dolomite: Chauvenet, 1; Clarke and Hillebrand, 1; Crawford, 4; Ohly, 2; Spurr, 1.
- Efflorescence on sandstone: Eakins, 4.
- Elpasolite: Clarke, F. W., 6.
- Emmonsite: Hillebrand, 12, 13.
- Empressite: George, 5.
- Enargite: Burton, B. S., 1; Headden, 6; Thornton, 1.
- Enstatite diabase porphyry: Clarke and Hillebrand, 1.
- Epidote: Clarke, F. W., 6; Eakins, 10.
- Epsomite: Hobbs, 2.
- Eruptive rocks, Mosquito Range: Emmons, 9.
- Fayalite: Hidden and Mackintosh, 1.
- Feather alum: Bailey, E. H. S., 1.
- Feldspar: Clarke, F. W., 6; Geijsbeek, 1; Headden, 4.
- Felsite porphyry: Palmer and Stoddard, 1.
- Ferberite: Ekeley, 1; George, 3.
- Fire clay: Clarke and Hillebrand, 1; Emmons, Cross, and Eldridge, 2; Fisher, 1; Furman, 1; Geijsbeek, 1; Lakes, 165; Mg. Rept., 33; Stose, 1; Ward, W. S., 1.
- Fluorspar: Burchard, E. F., 6.
- Freieslebenite (mineral wool): Clarke, F. W., 6.
- Gabbro: Clarke, F. W., 8; Cross and Purington, 1.
- Gabbro porphyry: Clarke, F. W., 5, 8; Cross and Purington, 1.
- Gadolinite: Eakins, 1.

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- Garnet: Clarke, F. W., 6; Cross, 8; Eakins, 10; Koenig, 1; Penfield and Sperry, 1.
- Gas: Curtis, H. H., 1; George, 5; Lindgren, 3.
- Gearksutite: Clarke, F. W., 6; Cross and Hillebrand, 3, 4.
- Goldschmidtite: Hobbs, 1.
- Granite: Chauvenet, 1; Clarke, F. W., 8, 9; Clarke and Hillebrand, 1; Crawford, 4; Hague and Emmons, 1; Henry, 1; Lakes, 94, 165.
- Granite gneiss: Clarke, F. W., 8; Clarke and Hillebrand, 1.
- Granite porphyry: Clarke and Hillebrand, 1; Crawford, 4.
- Granitite: Clarke and Hillebrand, 1.
- Guitermanite: Clarke, F. W., 6; Cross and Hillebrand, 4; Hillebrand, 3.
- Gypsum: Burchard, E. F., 5; Clarke, F. W., 6; Henahan, 1; Ransome, 2.
- Halloysite: Clarke, F. W., 6; Ransome, 2.
- Halotrichite: Bailey, E. H. S., 1, 2.
- Hematite: Day, 3; Rolker, 1.
- Henryite: Endlich, 6.
- Hessite: Endlich, 6.
- Heulandite: Clarke, F. W., 6; Eakins, 9.
- Hinsdalite: Larsen and Schaller, 1; Schaller, W. T., 3.
- Hornblende andesite: Van Horn, 3.
- Hornblende-mica porphyrite: Crawford, 4.
- Hornblende porphyrite: Clarke and Hillebrand, 1.
- Hübnerite: Clarke, F. W., 6; Cross and Hillebrand, 4; Ekeley, 1; Genth, 2; George, 3; Hillebrand, 1.
- Hydrophane: Kunz, 1.
- Hypersthene: Clarke, F. W., 6; Clarke and Hillebrand, 1.
- Hypersthene andesite: Clarke and Hillebrand, 1.
- Igneous rocks in Colorado: Spur, Garrey, and Ball, 1.
- Ilesite: Am. Jour. Sci., 1.
- Interspherulitic mass: Clarke and Hillebrand, 1.
- Iron, meteoric: Headden, 12.
- Iron ore, bog: Lakes, 5.
- Iron ore: Chauvenet, 3, 4, 5, 6; Clark, R. N., 1; Devereux, 1; Drown, 1; Putnam, 1; Raymond, 7; Singewald, 1.
- Jarosite: Clarke, F. W., 6; Koenig, 2; Ransome, 2.
- Kaolinite: Clarke, F. W., 6; Cross and Hillebrand, 4; Cross and Penrose, 1; Loew, 1; Rickard, T. A., 15.
- Kobellite: Kellar, 1.
- Krennerite: Chester, 2.
- Lamprophyre: Clarke, F. W., 5, 8; Cross and Spencer, 1.
- Latite: Clarke, F. W., 8; Ransome, 3.
- Latite-phonolite: Clarke, F. W., 8.
- Laumontite: Clarke, F. W., 6; Cross and Hillebrand, 2, 4.
- Lava: Chauvenet, 1.
- Lepidomelane: Clarke, F. W., 6.
- Levynite: Clarke, F. W., 6; Cross and Hillebrand, 4.
- Limestone, alteration product: Ransome, 2.
- Limestone, blue: Clarke and Hillebrand, 1; Emmons, 9; Lakes, 2.
- Limestone, crystalline: Kedzie, 1.
- Limestone, dolomitic: Clarke and Hillebrand, 1.
- Limestone, in tepee core: Darton, 13; Fisher, 1.
- Limestone, oölitic: Clarke and Hillebrand, 1.
- Limestone, serpentinous: Clarke and Hillebrand, 1.
- Limestone, white: Clarke and Hillebrand, 1.
- Limestone: Burchard, E. F., 8; Chauvenet, 1, 6; Clarke and Hillebrand, 1; Crawford, 4; Eckel, 1; Fisher, 1; Hague and Emmons, 1; Kedzie, 1; Lakes, 165, 204; Martin, 1; Stose, 1.
- Lionite: Endlich, 6.
- Loess: Clarke, F. W., 9; Clarke and Hillebrand, 1.
- Löllingite: Clarke, F. W., 6; Cross and Hillebrand, 4; Hillebrand, 1.
- Magnesite: Ohly, 2.

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- Manganese iron ore: Lakes, 26; Penrose, 1.
- Manganiferous ores: Weeks, J. D., 5.
- Marble: Chauvenet, 1; Day, 11; Lakes, 226.
- Mesolite: Clarke, F. W., 6; Cross and Hillebrand, 2, 4; Patton, 4.
- Meteorite: Butters, 1; Smith, J. L., 1, 2.
- Mica: Clarke, F. W., 2, 3.
- Mica andesite: Blake, J. C., 1.
- Mica schist: Clarke, F. W., 8.
- Mineral springs, radium-bearing: Headden, 5.
- Mineral springs: Peale, 14.
- Mineral waters. *See* water.
- Mineral wool: Clarke, F. W., 6.
- Minerals from Gold Hill: Endlich, 1.
- Minium: Hawkins, 1.
- Mizzonite: Clarke, F. W., 6.
- Molybdate: Schaller, 2.
- Monchiquite: Clarke, F. W., 8.
- Monzonite, quartz bearing: Cross and Spencer, 1.
- Monzonite: Clarke, F. W., 5, 9; Cross, Howe, and Ransome, 1; Cross and Purington, 1; Cross, Spencer, and Purington, 1.
- Monzonitic facies of diorite mass: Clarke, F. W., 8.
- Monzonitic porphyry: Clarke, F. W., 8; Ransome, 3.
- Mordenite: Clarke, F. W., 4.
- Muscovite: Clarke, F. W., 6.
- Natramblygonite: Schaller, W. T., 3.
- Natrolite: Clarke, F. W., 6; Cross and Hillebrand, 4.
- Nepheline basalt: Clarke and Hillebrand, 1; Cross and Penrose, 1.
- Nepheline syenite: Clarke, F. W., 9; Clarke and Hillebrand, 1; Cross and Penrose, 1; Hillebrand, 11.
- Nepheline tephrite: Clarke, F. W., 7, 8.
- Nevadite: Crawford, 4.
- Oil: Gale, 5; Kirkbride, 1; Lakes, 97, 146, 195a; Lee, H. A., 9; Ohly, 9; Washburne, 2.
- Olivine basalt: Clarke, F. W., 8.
- Olivinite: Whitaker, 1.
- Ores, Battle Mountain: Guiterman, F., 1.
- Ores, Cripple Creek: Cross and Penrose, 1; Baker, 1; Graton, 1; Smith, F. C., 1.
- Ores, Custer County: Emmons, 23.
- Ores, Dudley smelter: Peters, 1.
- Ores, Geyser mine: Emmons, 24.
- Ores, Gilpin County, California mine: Rickard, F., 1.
- Ores, Idaho Springs: Bain, 2.
- Ores, Lake City: Emmons and Irving, 3.
- Ores, Leadville: Butler, G. M., 2; Free-land, T., 1; Iles, 3; Rolker, 2.
- Ores, Ouray County: Kedzie, 1.
- Ores, oxidized: Ransome, 2.
- Ores, Pikes Peak quadrangle: Mathews, 2.
- Ores, Red Cliff: Lakes, 122; Kedzie, 1.
- Ores, Red Mountain: Kedzie, 1.
- Ores, Rico: Rickard, T. A., 7.
- Ores, Rosita: Clark, R. N., 2.
- Ores, telluride, Cripple Creek: Crowe, 1.
- Ores, Telluride, Liberty Bell Mine: Winslow, 2.
- Ores, Telluride, Smuggler - Union mines: Porter, 1.
- Orthoclase: Clarke, F. W., 6; Clarke and Hillebrand, 1; Crawford, 4; Endlich, 6.
- Ozokerite: Ohly, 5.
- Pachnolite: Clarke, F. W., 6; Cross and Hillebrand, 3.
- Palladium: Headden, 6.
- Pearceite: Penfield, 8.
- Peridote: Clarke and Hillebrand, 1.
- Peridotite: Clarke, F. W., 9; Cross, 12.
- Petzite: Endlich, 6; Hillebrand, 9.
- Phenacite: Penfield and Sperry, 2.
- Phonolite: Clarke, F. W., 9; Clarke and Hillebrand, 1; Cross, 10; Cross and Penrose, 1; Hillebrand, 11.
- Phosgenite: Warren, C. H., 1.
- Pickeringite: Endlich, 6.
- Picrotitanite: Whitaker, 1.
- Pitchblende: Ohly, 12.

## CHEMICAL ANALYSES—Continued

- Pitchstone, devitrified: Clarke and Hillebrand, 1.
- Plagioclase basalt: Clarke and Hillebrand, 1.
- Polybasite: Genth, 1a; Penfield and Pearce, 1; Spurr, 1.
- Porphyrite: Clarke, F. W., 5; Crawford, 4.
- Porphyrite, quartz: Clarke and Hillebrand, 1.
- Porphyrite, quartz-hornblende-mica: Clarke and Hillebrand, 1.
- Porphyritic diorite: Clarke, F. W., 5; Crawford, 4.
- Porphyritic granitite: Clarke, F. W., 5.
- Porphyritic lamprophyre: Clarke, F. W., 5, 8.
- Porphyry: Crawford, 4; Cross, 23; Clarke and Hillebrand, 1; Patton, 10.
- Potosi volcanic series: Cross, Howe, and Ransome, 1.
- Prosopite: Clarke, F. W., 6; Cross, 3; Hillebrand, 8.
- Proustite: Van Horn, 1.
- Proversose: Cross, 34.
- Psilomelane: Clarke, F. W., 6; Emmons, 23.
- Ptilolite: Clarke, F. W., 4, 6; Cross and Eakins, 1, 2; Dana, E. S., 7.
- Pyrite: Kraus and Scott, 1.
- Pyroxene: Clarke, F. W., 6; Eakins, 10.
- Pyroxene andesite: Clarke, F. W., 8; Clarke and Hillebrand, 1; Cross, Howe, and Ransome, 1.
- Pyroxene-hornblende andesite: Clarke, F. W., 8.
- Quartz alunite: Clarke and Hillebrand, 1.
- Quartz-biotite latite: Clarke, F. W., 8; Cross, Howe and Irving, 1.
- Quartz diaspore: Clarke and Hillebrand, 1.
- Quartz diorite: Crawford, 4.
- Quartz-hornblende-mica porphyrite: Crawford, 4.
- Quartz latite: Clarke, F. W., 8; Crawford, 4; Cross, Howe, and Ransome, 1.
- Quartz latite porphyry: Crawford, 4.
- Quartz monzonite: Clarke, F. W., 5, 8, 9; Crawford, 4.
- Quartz monzonite gneiss: Crawford, 4.
- Quartz monzonite porphyry: Clarke, F. W., 8; Crawford, 4; Cross, Howe, and Irving, 1.
- Quartz porphyrite: Crawford, 4.
- Quartz porphyry: Clarke, F. W., 9; Cross, 23; Palmer and Fulton, 1.
- Quartz-pyroxene latite: Clarke, F. W., 8; Cross, Howe, and Irving, 1.
- Quartz syenite porphyry: Cross, Howe, and Ransome, 1.
- Quartz trachyte: Cross, 41, 42.
- Quartzite, lower: Kedzie, 1.
- Quartzite: Kedzie, 1.
- Rhodo-chrosite: Kunz, 1.
- Rhyolite: Clarke, F. W., 8; Clarke and Hillebrand, 1; Crawford, 4; Cross, 8, 12; Eakins and Chatard, 1; Lakes, 94; Larsen, E. S., 1.
- Rhyolite residual glass: Clarke and Hillebrand, 1.
- Rhyolite tuff: Clarke and Hillebrand, 1; Lakes, 165.
- Rhyolitic vitrophyre: Clarke, F. W., 5, 8.
- Riebeckite granite: Clarke, F. W., 8.
- Riebeckite: Clarke and Steiger, 2.
- Rocks of Colorado: Iddings, 3; Washington, 1, 2.
- Rocks from Cripple Creek district: Miller, G. W., 1.
- Rocks from Cripple Creek volcano: Graton, 1.
- Rocks from Elk Mountains: Crawford, 4.
- Rocks from Glenwood Springs: Spurr, 1.
- Rocks from Monarch-Tomichi district: Crawford, 4.
- Rocks from Pikes Peak district: Mathews, 2.
- Rocks from Pueblo quadrangle: Gilbert, 7.
- Rocks from Rosita and Silver Cliff: Cross, 27.

## CHEMICAL ANALYSES—Continued

- Rocks from Tomichi and Monarch district: Crawford, 4.
- Rocks from West Elk Mountains: Crawford, 4.
- Roscoelite: Endlich, 6; Hillebrand and Ransome, 2.
- Rutile: Clarke, F. W., 6; Genth, 1; Schaller, W. T., 3; Smith, W. B., 2.
- Samarskite: Clarke, F. W., 6; Hillebrand, 4.
- Sandstone, alteration product: Ransome, 2.
- Sandstone: Chatard, 1; Chauvenet, 1; Day, 5; Hague and Emmons, 1; Lakes, 95.
- Sanidine: Clarke and Hillebrand, 1.
- Schirmerite: Endlich, 6.
- Scolecite: Clarke, F. W., 6; Cross and Hillebrand, 4; Eakins, 10.
- Shale: Fisher, 1; Martin, 1; Van Hise, 3.
- Silver: Emmons, 24; Kedzie, 1; Pearce, R., 12.
- Sinter: Emmons, 23, 24.
- Slate: Van Hise, 3.
- Smaltite: Iles, 2.
- Soda: Hayden, 12.
- Sodium carbonate: Hosker, 1, 2.
- Soils: Loew, 3; Emmons, 7; Van Hise, 3.
- Spessartite: Clarke, F. W., 6.
- Spherulites in rhyolite: Clarke and Hillebrand, 1; Eakins and Chatard, 1.
- Stilbite: Clarke, F. W., 6; Cross and Hillebrand, 4.
- Sulphantimonites: Eakins, 2.
- Sulphur ore: Larsen and Hunter, 1; Schaller, W. T., 13.
- Syenite: Clarke, F. W., 8, 9; Clarke and Hillebrand, 1; Cross, 12.
- Syenite lamprophyre: Clarke and Hillebrand, 1; Hillebrand, 11.
- Sylvanite: Clarke, F. W., 1; Endlich, 6; Ohly, 10; Palache, 1; Rickard, T. A., 16.
- Tellurium associated with arsenopyrite: Headden, 3.
- Tellurium: Bailar, 1; Bailar and Woodward, 1; Endlich, 6; Hillebrand and Allen, 1; Jennings, 1; Pearce, R., 9, 13; Purington, 2; Rickard, T. A., 16; Woodward, 1.
- Tennantite: Penfield and Pearce, 1; Spurr, 1.
- Tetradymite: Hillebrand, 13; Genth, 1a.
- Thomsonite: Clarke, F. W., 6; Clarke and Steiger, 2; Patton, 4; Steiger, 1.
- Thomsonite spherules: Cross and Hillebrand, 4.
- Tinguaitite: Clarke, F. W., 5; Clarke and Hillebrand, 1.
- Topaz: Clarke, F. W., 6.
- Trachyte: Breed, 1; Clarke, F. W., 8; Clarke and Hillebrand, 1; Cross, 12.
- Trachyte-phonolite: Cross and Penrose, 1.
- Trachydolerite: Clarke, F. W., 8.
- Tscheffkinitite: Eakins, 7.
- Tuff: Emmons, Cross and Eldridge, 2.
- Tuff, andesite: Lakes, 118.
- Tungsten: Cooper, C. A., 1; Ekeley, 1; George, 3; Lindgren, 6; Ohly, 8; Walker, 1.
- Tysonite: Allen and Comstock, 1; Clarke, F. W., 6; Hillebrand, 8, 10.
- Uraninite: Clarke, F. W., 6; Endlich, 6; Fleck, 4; Hillebrand, 5.
- Uranite: Day, 12.
- Uranium, chemical estimation of: Griffin, C. E., 1.
- Vanadiferous sandstones: Day, 13; Hillebrand and Ransome, 1.
- Vanadium, chemical estimation of: Griffin, C. E., 1.
- Vanadium mica: Day, 13.
- Vanadium in porphyry: Hillebrand, 11.
- Vanadium: Fleck, 4.
- Vesuvianite: Clarke, F. W., 6.
- Vitrophyre: Clarke, F. W., 8; Cross and Purington, 1.
- Vogesite: Clarke, F. W., 8.
- Volcanic ash: Woolsey, 1.
- Warrenite: Clarke, F. W., 6.



## CHEMICAL ANALYSES—Continued

- Water, Arkansas Valley: Clarke, F. W., 9; Gilbert, 5.
- Water, artesian: Clarke, F. W., 9; Chauvenet, 2; Strong, W. C., 1.
- Water, Custer County, Geyser mine: Clarke, F. W., 9; Emmons, 23, 24.
- Water, Dakota sandstone, eastern Colorado: Darton, 13.
- Water, Denver wells: Clarke, F. W., 9; Emmons, Cross, and Eldridge, 2; Foster, E. L., 1.
- Water, Good Hope mine: Rickard, T. A., 23.
- Water, Idaho Springs, Stanley mine: Clarke, F. W., 9.
- Water, mineral springs: Clarke, F. W., 9; Chauvenet, 7; Cross, Howe, and Irving, 1; Emmons, 24; Endlich, 4; Hayden, 6; Headden, 5, 14; Jones, L. J. W., 1; Lakes, 23; Lee, H. A., 1, 9; Lowther and Knowles, 1; Peale, 1, 3, 15; Smith, J. A., 1; Stevenson, 3; Strieby, 1.
- Water, San Luis Valley: Fleck, 1; Headden, 13; Siebenthal, 4.
- Water, spring: Eakins, 5; Fisher, 1; Gale, 5; Lee, H. A., 9; Spurr, 1; Spurr, Garrey, and Ball, 1.
- Water, Sterling: Slichter and Wolff, 1.
- Water, Steamboat Springs: Lowther and Knowles, 1.
- Water, White river: Gale, 5.
- Water: Headden, 4.
- Wheelerite: Endlich, 6.
- Witherite: Ohly, 2.
- Wolframite: Ekeley, 1; George, 3.
- Xenotime: Penfield, 6.
- Zircon: Endlich, 6; Hillebrand, 4.
- Zinkenite: Clarke, F. W., 6; Cross and Hillebrand, 4; Hillebrand, 2.
- Zunyite: Clarke, F. W., 6; Cross and Hillebrand, 4; Hillebrand, 3; Penfield, 6; Ransome, 3.

## MINERALS DESCRIBED

(See also lists of Colorado minerals in Dana, E. S., 8; Endlich, 1, 3, 4, 5, 6; Frazer, 1; Hollister, 1; Randall, J. S., 1; Smith, J. A., 1.)

- Acanthite: Chester, 1.
- Actinolite: Crawford, 4; Hollister, 1.
- Aegirine: Lindgren and Ransome, 3.
- Agate: Hollister, 1; Sterrett, 2.
- Alabandite: Patton, 10; Smith, W. B., 2.
- Alabaster: Hollister, 1.
- Alaskaite: Am. Jour. Sci., 1; Lewis, H. C., 1.
- Albertite: Cross, 5; Denton, 1; Kneeland, 1; Koenig, 4.
- Albite: Lindgren and Ransome, 3; Smith, W. B., 1.
- Allanite: Eakins, 1; Iddings and Cross, 1; Ransome, 5.
- Altaite: Cross, 5; Genth, 1, 2.
- Alum: Hollister, 1.
- Alumina: Kedzie, 1.
- Alunite: Butler and Gale, 1; Cross, 16; Cross and Spencer, 1; Eakins, 9; Hurlburt, 1; Larsen, 2; Lindgren and Ransome, 3; Ransome, 3.
- Alunogen: Headden, 6; Hobbs, 2.
- Amazonstone: Hollister, 1; Lakes, 75; Peale, 5.
- Amethyst: Hollister, 1.
- Ammonium oxide: Kedzie, 1.
- Amphibole: Cross, 14; Graton, 1; Min. Mag., 1; Ransome, 5.
- Analcite: Clarke and Steiger, 1; Cross, 5; Cross and Hillebrand, 4; Graton, 1; Lakes, 6; Lindgren and Ransome, 3; Patton, 4.
- Andradite: Crawford, 4; Patton, 10.
- Anglesite: Crawford, 3, 4; Patton, 10.
- Anhydrite: Hollister, 1.
- Anorthite: Lindgren and Ransome, 3.

## MINERALS DESCRIBED—Continued

- Antimony: Cross and Penrose, 1; Hollister, 1.
- Antunite: Lakes, 143.
- Apatite: Lindgren and Ransome, 3; Ransome, 5.
- Apophyllite: Cross, 5; Cross and Hillebrand, 2, 4; Lakes, 6; Patton, 4.
- Aquamarine: Cross, R. T., 1; Hollister, 1.
- Aragonite: Patton, 4; Min. Mag., 1.
- Arvedsonite: Cross, 5; Koenig, 1b; Lindgren and Ransome, 3; Min. Mag., 1.
- Argentite: Crawford, 4; Cross and Howe, 1; Cross and Ransome, 1; Lakes, 5; Patton, 10; Ransome, 2, 3; Van Horn, 1, 2.
- Arsenic: Hollister, 1.
- Arsenopyrite: Irving and Bancroft, 1; Lakes, 143.
- Asbestos: Crawford, 4; Hollister, 1.
- Asphaltum: Lee, H. A., 2.
- Astrophyllite: Cross, 5; Eakins, 8; Min. Mag., 1.
- Atacamite: Lakes, 143.
- Augite: Cross, 11; Lindgren and Ransome, 3.
- Augite and diopside: Ransome, 5.
- Aventurine quartz: Hollister, 1.
- Azurite: Crawford, 3, 4; Hollister, 1; Lakes, 143; Patton, 10; Ransome, 5.
- Barite: Crawford, 4; Cross, 5; Cross and Howe, 1; Cross and Ransome, 1; Hollister, 1; Irving and Bancroft, 1; Kemp, 1; Lindgren and Ransome, 3; Patton, 10; Ransome, 2, 3, 5.
- Bastnäsite: Allen and Comstock, 1; Cross, 5; Hidden, 3; Hillebrand, 8, 10; Kunz, 2; Min. Mag., 1.
- Beegerite: Cross, 5; König, 2; Min. Mag., 1.
- Bertrandite: Penfield, 2, 3.
- Beryl: Hills, R. C., 12; Hollister, 1; Penfield, 4.
- Beryllium minerals: Penfield, 4.
- Biotite: Cross, 5; Lewis, 1, 2; Lindgren and Ransome, 3; Ransome, 5.
- Bismuth: Irving and Bancroft, 1; Mg. Rev., 6.
- Bismuthinite: Cross and Howe, 1; Ransome, 3, 5.
- Bismuthite: Cross, 5; Genth, 2.
- Bloodstone: Hollister, 1.
- Blue vitrol: Hollister, 1.
- Bole: Cross and Hillebrand, 4.
- Bornite: Crawford, 4; Cross and Howe, 1; Patton, 10; Pearce, 2; Ransome, 3.
- Bournonite: Cross and Howe, 1; Lakes, 143; Ransome, 3.
- Brochantite: Cross, 5.
- Cairngorm stone: Hollister, 1.
- Calamine: Clarke, F. W., 9; Crawford, 3, 4; Farrington and Tillotson, 1; Grabill, 1.
- Calaverite: Hillebrand, 7, 10; Lindgren and Ransome, 3; Penfield, 7; Penfield and Ford, 1; Rickard, T. A., 16; Smith, G. F. H., 1.
- Calcareous spar: Hollister, 1.
- Calcite: Crawford, 3, 4; Cross and Hillebrand, 4; Cross, Howe, and Ransome, 1; Cross and Penrose, 1; Cross and Ransome, 1; Headden, 7, 11; Lindgren and Ransome, 3; Patton, 4, 10; Purington, 2; Ransome, 2, 3, 5.
- Calcium sulphate: Kedzie, 1.
- Carnelian: Hollister, 1.
- Carnotite: Blanc, 1; Clarke, F. W., 9; Fleck and Haldane, 1, 2; Gale, 2, 6; Hess, 4; Hillebrand and Ransome, 1, 2; Mg. World, 2, 3; Ohly, 1, 11; W—, C. H., 3. *See also* Uranium in general index.
- Cassiterite: Smith, W. B., 1.
- Celesite: Cross, 5; Lindgren and Ransome, 3.
- Cerargyrite: Crawford, 4; Lakes, 5, 21; Patton, 10.
- Cerussite: Brinsmade, 1; Crawford, 3, 4; Lakes, 5, 21, 143; Patton, 10; Ransome, 5; Warren, C. H., 1.
- Ceylonite (spinel): Read, 1.
- Chabazite: Cross, 5; Cross and Hillebrand, 4; Lakes, 6; Patton, 4.
- Chalcanthite: Lakes, 143; Lindgren and Ransome, 3; Patton, 10.
- Chalcedony: Hollister, 1; Lindgren and Ransome, 3; Patton, 1.

## MINERALS DESCRIBED—Continued

- Chalcocite: Crawford, 3, 4; Cross and Howe, 1; Irving and Bancroft, 1; Lindgren and Ransome, 3; Ransome, 3.
- Chalcopyrite: Crawford, 3, 4; Cross, Howe, and Ransome, 1; Cross and Ransome, 1; Hollister, 1; Irving and Bancroft, 1; Lindgren and Ransome, 3; Patton, 10; Ransome, 2, 3.
- Chlorite: Crawford, 4; Cross and Ransome, 1; Hollister, 1; Lindgren and Ransome, 3; Ransome, 2, 5.
- Chloropal: Lindgren and Ransome, 3.
- Chromite: Lakes, 143; Patton, 10.
- Chrysocolla: Crawford, 4; Hollister, 1; Lakes, 143; Lindgren and Ransome, 3; Ransome, 5.
- Chrysoprase: Hollister, 1.
- Cinnabar: Lindgren and Ransome, 3.
- Coal: Lindgren and Ransome, 3.
- Coloradoite: Cross, 5; Dana, E. S., 1; Genth, 1a; Hillebrand, 9; Rickard, T. A., 16.
- Columbite: Cross, 5; Headden, 6; Min. Mag., 1; Smith, J. L., 3; Smith, W. B., 1.
- Copper: Crawford, 3, 4; Cross and Ransome, 1; Cross and Penrose, 1; Hollister, 1; Lindgren and Ransome, 3; Patton, 10; Purington, 2; Ransome, 2, 3.
- Copper carbonates: Lakes, 21.
- Copper, gray. *See* tetrahedrite.
- Corundum: Finlay, G. T., 2; Pratt, 1.
- Cosalite: Cross, 5; Cross and Hillebrand, 4; Hillebrand, 1; Pearce, 3.
- Crocoite: Lakes, 143.
- Cryolite: Cross, 5; Cross and Hillebrand, 4; Halland, 1; Ohly, 2.
- Cuprite: Crawford, 3, 4; Patton, 10.
- Cyrtolite: Genth, 1.
- Danalite: Genth, 1.
- Derbyshire spar: Hollister, 1.
- Diallage: Lindgren and Ransome, 3.
- Diaspore: Cross, 16; Eakins, 9; Melville, 1.
- Diopside: Crawford, 4.
- Diopside and augite: Ransome, 5.
- Dolomite: Crawford, 3, 4; Cross, Howe, and Ransome, 1; Lindgren and Ransome, 3; Patton, 5; Ransome, 3.
- Dolomite and calcite: Irving and Bancroft, 1.
- Domingite: Eakins, 2.
- Dumortierite: Finlay, G. I., 2.
- Egeran: Hollister, 1.
- Elaterite: Weston, 4.
- Elpasolite: Cross and Hillebrand, 4.
- Embolite: Cross, 5.
- Emerald: Hollister, 1.
- Emmonsite: Hillebrand, 12, 13; Lindgren and Ransome, 3.
- Empressite: George, 5.
- Enargite: Burton, 1; Cross, 5; Crawford, 4; Cross, Howe, and Ransome, 1; Cross and Ransome, 1; Headden, 6; Patton, 10; Pirsson, 1; Ransome, 3; Spencer, L. J., 1.
- Epidote: Cross and Ransome, 1; Hollister, 1; Ransome, 5; Smith, W. B., 2.
- Epsomite: Hobbs, 2; Lindgren and Ransome, 3.
- Erubescite: Hollister, 1.
- Evansite: Min. Mag., 1.
- Fayalite: Hidden, 1; Hidden and Mackintosh, 1.
- Feather alum: Bailey, 1.
- Ferberite: George, 3.
- Ferrotellurite: Dana, E. S., 1; Min. Mag., 1.
- Fluorite: Crawford, 4; Cross, Howe, and Ransome, 1; Cross and Penrose, 1; Cross and Ransome, 1; Lindgren and Ransome, 3; Patton, 10; Purington, 2; Ransome, 2; Smith, W. B., 1.
- Fluorite: Crawford, 4; Lakes, 21; Ransome, 3.
- Gadolinite: Eakins, 1; Patton, 10.
- Gahnite: Crawford, 4.
- Galena: Crawford, 3, 4; Cross, Howe, and Ransome, 1; Cross and Ransome, 1; Irving and Bancroft, 1; Lakes, 21, 143; Lindgren and Ransome, 3; Patton, 10; Ransome, 2, 3.

## MINERALS DESCRIBED—Continued

- Garnet: Bailey, Rath, and Grider, 1; Crawford, 4; Cross, 8; Cross and Ransome, 1; Hollister, 1; Min. Mag., 1; Penfield and Sperry, 1; Ransome, 5; Smith, W. B., 2.
- Gearksutite: Cross, 3, 5; Cross and Hillebrand, 4.
- Gilsonite: Weston, 4.
- Glockerite: Lindgren and Ransome, 3.
- Goethite: Cross, 5.
- Gold: Crawford, 4; Cross, 5; Cross, Howe, and Ransome, 1; Cross and Ransome, 1; Eilers, 3; Irving and Bancroft, 1; Lindgren and Ransome, 3; Patton, 10; Ransome, 2, 3, 5.
- Gold (crystals): Hollister, 1; Lakes, 218.
- Gold (wire): Mg. Sci., 5.
- Goldschmidtite: Hobbs, 1.
- Goslarite: George, 5.
- Grahamite: Newberry, 10; Wurtz, 1.
- Graphite: Bastin, 1; Ihne, 1.
- Greenockite: Crawford, 4.
- Gütermannite: Cross, 5; Cross and Hillebrand, 4; Cross, Howe, and Ransome, 1; Hillebrand, 3; Ransome, 3.
- Gypsum: Cross and Penrose, 1; Cross and Ransome, 1; Hollister, 1; Lindgren and Ransome, 3; Patton, 10; Ransome, 2.
- Halotrichite: Bailey, 1, 2.
- Heliotrope: Hollister, 1.
- Hematite: Crawford, 3, 4; Cross, Howe, and Ransome, 1; Patton, 10; Ransome, 3, 5; Smith, W. B., 1.
- Hessite (auriferous): Cross, 5; Genth, 1a; Palache, 1; Silliman, 1.
- Heulandite: Eakins, 9.
- Hinsdalite: Irving and Bancroft, 1; Larsen and Schaller, 1.
- Hornblende: Lindgren and Ransome, 3; Min. Mag., 1.
- Hübnerite: Cross, 5; Cross, Howe, and Ransome, 1; Cross and Hillebrand, 4; Genth, 2; George, 3; Hillebrand, 1; Lindgren and Ransome, 3; Ransome, 3.
- Hyalite: Hollister, 1.
- Hydrophane: Church, A. H., 1; Kunz, 1.
- Hypersthene: Ransome, 5.
- Idocrase: Hollister, 1.
- Ilesite: Am. Jour. Sci., 1; Iles, 1.
- Ilsemanite: Lindgren and Ransome, 3.
- Jamesonite: Patton, 10.
- Jarosite: Cross, 5; Genth, 1a; Koenig, 2.
- Jasper: Hollister, 1.
- Kaolin: Patton, 10.
- Kaolinite: Cross, 5; Cross and Hillebrand, 4; Cross, Howe, and Ransome, 1; Cross and Penrose, 1; Cross and Ransome, 1; Dana, E. S., 6; Hills, R. C., 5; Lindgren and Ransome, 3; Milch, 1; Ransome, 2, 5.
- Kobellite: Kellar, 1; Min. Mag., 1.
- Krennerite: Chester, 2; Genth, 1a; Lindgren and Ransome, 3.
- Labradorite: Hunt, 1; Lindgren and Ransome, 3; Ransome, 5.
- Laumontite: Cross, 5; Cross and Hillebrand, 4; Lakes, 6; Patton, 4.
- Lavenite: Graton, 1.
- Lead: Cross and Hillebrand, 4.
- Levyneite: Cross and Hillebrand, 4.
- Limonite: Crawford, 3, 4; Cross, 5; Lakes, 143; Lindgren and Ransome, 3; Patton, 10; Ransome, 5; Smith, W. B., 1.
- Löllingite: Cross, 5; Cross and Hillebrand, 4; Hillebrand, 1.
- Magnetite: Crawford, 3, 4; Lindgren and Ransome, 3; Patton, 10; Ransome, 3; Patton, 10; Ransome, 2, 5; Snedaker, 2.
- Magnolite: Dana, E. S., 1; Genth, 1a; Min. Mag., 1.
- Malachite: Crawford, 3, 4; Hollister, 1; Lakes, 5, 143; Patton, 10; Ransome, 5.
- Mallardite: Lindgren and Ransome, 3.
- Manganese: Chauvenet, 8; Crawford, 4; Cross and Penrose, 1; Hollister, 1; Lakes, 143.

## MINERALS DESCRIBED—Continued

- Manganiferous iron ores: Weeks, J. D., 5.
- Manganiferous silver ores: Weeks, J. D., 5.
- Manganite: Smith, W. B., 2.
- Marcasite: Lindgren and Ransome, 3.
- Mariposite: Hess, 4.
- Melanterite: Patton, 10.
- Melonite: Cross, 5; Hillebrand, 2, 9.
- Mercury: Lakes, 174.
- Mesolite: Cross, 5; Cross and Hillebrand, 2, 4; Lakes, 6; Patton, 4.
- Meteoric iron: Headden, 12.
- Mica: Clarke, F. W., 2, 3; Hollister, 1; Purington, 2; Schwarz, 4.
- Microcline: Cross, 5; Koenig, 1a; Lindgren and Ransome, 3; Ransome, 5; Smith, W. B., 1.
- Mimetite: Crawford, 3; Patton, 10.
- Minium: Hawkins, 1.
- Mirabilite: Lindgren and Ransome, 3.
- Molybdenite: Crawford, 4; Cross, Howe, and Ransome, 1; Hollister, 1; Lindgren and Ransome, 3; Ransome, 3; Schaaf-Regelman, 1; Schaller, 2; Sebben, 1.
- Molybdite: Crawford, 4; Schaller, 3, 4.
- Monazite: Schaaf-Regelman, 1.
- Morencite: Lindgren and Ransome, 3.
- Muscovite: Lindgren and Ransome, 3; Ransome, 5; Smith, W. B., 1.
- Natrolite: Cross and Hillebrand, 4; Lakes, 6; Lindgren and Ransome, 3.
- Natron: Headden, 13.
- Nepheline: Lindgren and Ransome, 3.
- Niccolite: Cross, 5.
- Nosean: Lindgren and Ransome, 3.
- Oligoclase: Lindgren and Ransome, 3.
- Olivine: Lindgren and Ransome, 3.
- Onyx: Hollister, 1.
- Opal: Hollister, 1; Lindgren and Ransome, 3; Patton, 1.
- Orthoclase: Lindgren and Ransome, 3; Purington, 2; Ransome, 5.
- Ozokerite: Ohly, 5.
- Pachnolite: Cross, 3, 5; Cross and Hillebrand, 4.
- Palladium: Headden, 6.
- Pearceite: Penfield, 8.
- Petzite: Eilers, 3; Genth, 1a; Hillebrand, 9; Lindgren and Ransome, 3; Rickard, T. A., 16.
- Phenacite: Cross, 5; Cross and Hillebrand, 4; Hidden, 12; Penfield, 1, 4; Penfield and Sperry, 2; Smith, W. B., 1, 2.
- Phosgenite: Warren, C. H., 1.
- Picrotitanite: Whitaker, 1.
- Pitchblende. *See* Uranium.
- Platinum: Kemp, 3.
- Polybasite: Cross, Howe, and Ransome, 1; Lakes, 5, 21, 143; Penfield, 8; Penfield and Pearce, 1; Ransome, 2, 3.
- Prosopite: Cross, 5; Cross and Hillebrand, 3, 4; Hillebrand, 8.
- Proustite: Cross, Howe, and Ransome, 1; Irving and Bancroft, 1; Patton, 10; Ransome, 2, 3; Van Horn, 1, 2.
- Psilomelane: Clarke, F. W., 9; Crawford, 3, 4; Lindgren and Ransome, 3; Patton, 10.
- Ptilolite: Clarke, F. W., 4; Cross and Eakins, 1, 2; Dana, E. S., 5, 7.
- Pyrrargyrite: Irving and Bancroft, 1; Patton, 10.
- Pyrite: Ayres, 1; Crawford, 3, 4; Cross, Howe, and Ransome, 1; Cross and Penrose, 1; Cross and Ransome, 1; Irving and Bancroft, 1; Kraus and Scott, 1; Lakes, 5, 21, 143; Lindgren and Ransome, 3; Patton, 10; Purington, 2; Ransome, 2, 3, 5; Schaller, 1; Smith, W. B., 2; Spurr, Garrey, and Ball, 1.
- Pyrolusite: Crawford, 3, 4; Patton, 10.
- Pyromorphite: Patton, 10.
- Pyroxene: Cross, 1, 14; Cross and Ransome, 1.
- Pyrrhotite: Crawford, 4.
- Quartz: Crawford, 3, 4; Cross, 5; Cross, Howe, and Ransome, 1; Cross and Penrose, 1; Cross and Ransome, 1; Grabill, 1; Irving and Bancroft, 1; Lindgren and Ransome, 3; Patton, 10; Purington, 2; Ransome, 2, 3, 5; Smith, W. B., 1; Tassin, 1.
- Quartz (smoky): Peale, 5.

## MINERALS DESCRIBED—Continued

- Ralstonite: Cross, 5; Cross and Hillebrand, 4.  
 Rhodochrosite: Cross, 5; Cross and Ransome, 1; Dana, E. S., 6; Irving and Bancroft, 1; Kunz, 1; Lindgren and Ransome, 5; Patton, 10; Ransome, 2, 3.  
 Rhodonite: Ransome, 3.  
 Rickardite: Ford, 1, 2.  
 Riebeckite: Clarke and Steiger, 2; Murgoci, G. M., 1.  
 Roscoelite: Genth, 1a; Henahen, 1; Hillebrand and Ransome, 2; Lindgren, 6, 9; Lindgren and Ransome, 3; Min. Mag., 1.  
 Rosin, mineral: Hollister, 1.  
 Ruby silver: Lakes, 5.  
 Rutile: Genth, 1; Lindgren and Ransome, 3; Smith, W. B., 2.  
 Sanfordite: Ores and Metals, 6a.  
 Sanidine: Cross, 4, 6.  
 Sapphire: Smith, W. B., 2.  
 Sardonyx: Hollister, 1.  
 Scheelite: George, 3; Mg. Rept., 14.  
 Schirmerite: Cross, 5; Genth, 1a.  
 Schorlomite: Koenig, 1.  
 Scolecite: Cross and Hillebrand, 4; Lakes, 6.  
 Selenite: Gale, 6.  
 Selenium: Ohly, 3.  
 Sericite: Cross and Ransome, 1; Ransome, 2.  
 Serpentine: Crawford, 4; Emmons, 9; Hollister, 1; Lindgren and Ransome, 3; Patton, 10.  
 Siderite: Lakes, 5; Patton, 10; Purington, 2; Ransome, 5.  
 Siderophyllite: Cross, 5; Lewri, H. C., 1a.  
 Silver: Crawford, 4; Cross, Howe, and Ransome, 1; Cross, 5; Cross and Ransome, 1; Patton, 10; Ransome, 2, 3, 5.  
 Smaltite: Cross, 5; Iles, 2; Min. Mag., 1; Smith, W. B., 1.  
 Smithsonite: Crawford, 3, 4; Grabill, 1; Ransome, 5.  
 Sodalite: Lindgren and Ransome, 3.  
 Specularite: Cross and Ransome, 1; Lindgren and Ransome, 3; Ransome, 2.  
 Sphalerite: Crawford, 3, 4; Cross, Howe, and Ransome, 1; Cross and Ransome, 1; Irving and Bancroft, 1; Lakes, 5, 21; Ransome, 2, 3, 5.  
 Spinel (ceylonite): Read, 1.  
 Staffelite: Min. Mag., 1.  
 Stephanite: Crawford, 4; Lakes, 5; Patton, 10; Ransome, 2.  
 Stibnite: Cross, Howe, and Ransome, 1; Lakes, 6; Lindgren and Ransome, 3; Patton, 10; Ransome, 3.  
 Stilbite: Cross, 5; Cross and Hillebrand, 4; Lindgren and Ransome, 3; Patton, 4.  
 Stromeyerite: Cross, Howe, and Ransome, 1; Pearce, 2; Ransome, 3.  
 Sulphantimonites: Eakins, 2.  
 Sulphobismuthites: Cross, Howe, and Ransome, 1; Ransome, 3.  
 Sulphur: Ransome, 5.  
 Sylvanite: Blake, 1b; Clarke, F. W., 9; Cross, 5; Davis, W. H., 1; Genth, 1a; Lindgren and Ransome, 3; Moses, 2; Palache, 1; Penfield, 7; Rickard, T. A., 8, 16; Silliman, 1.  
 Tantalum: Schaaf-Regelman, 1.  
 Tellurite: Cross, 5; Genth, 1, 2.  
 Tellurium: Cross, 5; Cross, Howe, and Ransome, 1; Cross and Penrose, 1; Dana, E. S., 1; Genth, 1a; Grabill, 1; Headden, 3; Hess, 1; Hillebrand, 13; Hillebrand and Allen, 1; Irving and Bancroft, 1; Jennings, 1; Kemp, 2; Lakes, 25, 56, 61, 174; Lindgren, 7; Lindgren and Ransome, 3; Marvin, 1; Mg. Rev., 6; Ohly, 3; Palache, 1; Pearce, 11; Ransome, 3; Schaller, 1; Sharwood, 1; Silliman, 1; W—, C. H., 2.  
 Tennantite: Crawford, 4; Patton, 10; Penfield and Pearce, 1.  
 Tenorite: Crawford, 3, 4.

## MINERALS DESCRIBED—Continued

- Tetradymite: Hillebrand, 13.
- Tetrahedrite: Crawford, 4; Cross, Howe, and Ransome, 1; Cross and Ransome, 1; Grabill, 1; Hollister, 1; Irving and Bancroft, 1; Lakes, 5, 21; Lindgren and Ransome, 3; Patton, 10; Ransome, 2, 3.
- Thomsenolite: Cross, 5.
- Thomsonite: Clarke and Steiger, 2; Cross, 5; Cross and Hillebrand, 4; Lakes, 6; Patton, 4.
- Titanite: Ransome, 5.
- Titanium: Chauvenet, 3, 4, 8; Hayden, 14; Jennings, 2; Lindgren and Ransome, 3; Putnam, 1; Schaaf-Regelman, 1; Singewald, 1, 2.
- Topaz: Cross, R. T., 2; Cross, 5, 8; Cross and Hillebrand, 1, 4; Eakle, 1; Min. Mag., 1; Penfield and Minor, 1; Smith, W. B., 1.
- Tourmaline: Lindgren and Ransome, 3; Min. Mag., 1; Patton, 3; Upham, 2.
- Tremolite: Crawford, 4.
- Tungsten minerals: Cooper, C. A., 1; George, 3; Mg. Rept., 14; Ohly, 8; Ransome, 3; Schaaf-Regelman, 1.
- Turgite: Crawford, 3, 4; Smith, W. B., 1.
- Tysonite: Allen and Comstock, 1; Cross, 5; Dana, E. S., 2; Hidden, W. E., 3; Hillebrand, 8, 10; Kunz, 2; Min. Mag., 1.
- Uraninite: Cross, 5; Hill, N. P., 1.
- Uranium minerals: Becke, 1; Blanc, 1; E. and M. J., 27; Fleck, 3; Fleck and Haldane, 1; Hill, N. P., 1; Hillebrand, 5; Hillebrand and Ransome, 1; Lee, H. A., 7; Mines and Mining, 1; Mg. Rev., 2; Ohly, 1; Ohtegnot, 1; Ores and Metals, 7; Ross, 1; Schaaf-Regelman, 1; Tovote, 1.
- Vanadium minerals: Fleck, 3; Fleck and Haldane, 1; Hillebrand and Ransome, 1, 2; Mines and Mining, 1; Ross, G. M., 1; Schaaf-Regelman, 1.
- Vandiestite: Pearce, 13.
- Von Diestite: E. Cumenge, 1.
- Warrenite: Eakins, 2.
- Wavellite: Lindgren and Ransome, 3.
- Willemite: Randall, 1.
- Wolframite: George, 3; Mg. Rept., 14; Moses, 1.
- Wollastonite: Cross and Ransome, 1.
- Wulfenite: Crawford, 3, 4; Lakes, 143.
- Wurtzite: George 5.
- Xenotime: Hidden, 1; Penfield, 6.
- Zeolites: Cross and Hillebrand, 2, 4; Emmons, Cross, and Eldridge, 2; Lakes, 218; Marvin, 1.
- Zinc blende: Crawford, 4; Lindgren and Ransome, 3; Weed, W. H., 1.
- Zinc spinel: Crawford, 4.
- Zinckenite: Cross, 5; Cross and Hillebrand, 4; Cross, Howe, and Ransome, 1; Hillebrand, 2; Patton, 10; Ransome, 3.
- Zircon: Cross, 5; Cross and Hillebrand, 1, 4; Genth, 1; Koenig, 1b; Lindgren and Ransome, 3; Min. Mag., 1; Ransome, 5.
- Zirconium: Schaaf-Regelman, 1.
- Zunyite: Cross, 5; Cross and Hillebrand, 4; Cross, Howe, and Ransome, 1; Hillebrand, 3; Penfield, 6; Ransome, 3.

## ROCKS DESCRIBED

- Adamellite gneiss: Spurr, Garry, and Ball.
- Aegirine and aegirine-augite in phonolite: Graton, 1.
- Agglomerate: Larsen, 1.
- Alaskite phonolite: Spurr, Garrey, and Ball.
- Alaskitic quartz monzonite porphyry: Spurr, Garrey, and Ball.
- Alkali syenite porphyry: Clarke, F. W., 8; Mg. Sci., 2; Spurr, Garrey, and Ball.
- Amphibole and hornblende schist: Patton, 8.

## ROCKS DESCRIBED—Continued

- Amphibolite: Cross, 14; Emmons, 2, 9.  
 Analcite basalt: Cross, 28.  
 Analcite in phonolite: Graton, 1.  
 Andesite breccia: Clarke, F. W., 8; Cross, 24.  
 Andesite, hypersthene: Cross, 1.  
 Andesite porphyry: Crawford, 4; Grout, Worcester and Henderson, 1.  
 Andesite, sanidine-bearing: Cross, 12.  
 Andesite: Comstock, 7; Crawford, 2, 4; Conkling, 2; Cross, 24, 27; Cross, Howe, and Ransome, 1; Cross, Howe, and Irving, 1; Cross and Penrose, 1; Cross and Purington, 1; Emmons, 9; George and Crawford, 1; Hills, R. C., 15; Hogarty, 1; Irving and Bancroft, 1; Kedzie, 1; Lakes, 18, 143; Larsen, 1; Patton, 8; Ransome, 5; Van Horn, 3.  
 Anorthosite: Graton, 1.  
 Anthophyllite-epidote rock: Crawford, 4.  
 Aplite: Crawford, 4; Cross, Howe, and Irving, 1; Patton, 10; Underhill, 4.  
 Aplitic granite: Clarke, F. W., 8.  
 Augite camptonite: Lee, H. A., 9.  
 Augite diorite: Cross, 12.  
 Augite granite porphyry: Hills, R. C., 25.  
 Augite-hornblende vogesite: Stose, 1.  
 Augite-mica syenite: Emmons, Cross, and Eldridge, 2.  
 Augite minette: Lee, H. A., 9.  
 Augite monzonite: Clarke, F. W., 8.  
 Augite syenite: Clarke, F. W., 8; Cross, Spencer, and Purington, 1.  
 Augite syenite porphyry: Cross and Penrose, 1.  
 Basalt: Comstock, 7; Conkling, 2; Crawford, 2; Draper, 1; Emmons, Cross, and Eldridge, 1, 2; Grout, Worcester, and Henderson, 1; Hills, R. C., 15, 24, 25; Lakes, 21, 143; Stevenson, 8.  
 Basalt-limburgite: Cross, 27.  
 Basalt, quartz-bearing: Iddings, 1.  
 Basic agglomerate: Cross, 24, 27.  
 Basic breccia: Cross, 24.  
 Basic dike rock: Clarke, F. W., 8; Cross and Ransome, 1; Cross, Spencer, and Purington, 1; Cross and Spencer, 1; Miller, G. W., 1.  
 Binary granite: Underhill, 4.  
 Biotite aplite: Patton, 7.  
 Biotite diorite porphyrite: Patton, 10.  
 Biotite gneiss: Patton, 8.  
     Howe, and Ransome, 1.  
 Biotite granite: Crawford, 4; Cross, Biotite latite: Mg. Sci., 2; Spurr, Garrey, and Ball, 1.  
 Biotite schist: Cross, Howe, and Irving, 1; Spurr, Garrey, and Ball, 1.  
 Biotite-sillimanite schist: Crawford, 4; Spurr, Garrey, and Ball, 1.  
 Bostonite: Mg. Sci., 2; Spurr, Garrey, and Ball, 1.  
 Breccia: Crawford, 4; Emmons, Cross and Eldridge, 1; Graton, 1; Grout, Worcester, and Henderson, 1; Lindgren and Ransome, 3; Miller, G. W., 1; Rickard, T. A., 15.  
 Breccia, igneous: Patton, 8.  
 Breccia, West Elk: Lee, W. T., 13.  
 Burns andesite: Cross, 27.  
 Burns latite complex: Cross, Howe, and Ransome, 1; Cross, 43 (in Irving and Bancroft, 1).  
 Cordierite hornfels: Crawford, 4.  
 Corundum in pegmatite: Finlay, G. I., 1, 2.  
 Dacite: Crawford, 2; Cross, 27; Spurr, Garrey, and Ball, 1; George and Crawford, 1.  
 Dacite porphyry: George and Crawford, 1; Grout, Worcester, and Henderson, 1.  
 Diabase: Crawford, 2; Cross, 1, 27; Cross, Howe, and Ransome, 1; Cross, Howe, and Irving, 1; Cross and Penrose, 1; Graton, 1; Patton, 7; Stose, 1.  
 Diabase and syenite: Cross, 24.  
 Diorite: Ball, S., 1; Conkling, 2; Crawford, 4; Cross, 21, 23, 27; Cross, Spencer, and Purington, 1; Emmons, 9; Emmons, Cross, and Eldridge, 1; George and Crawford, 1; Lakes, 143; Patton, 8, 10; Spurr and Garrey, 1; Underhill, 4.



## ROCKS DESCRIBED—Continued

- Diorite-monzonite: Cross and Purington, 1.
- Diorite porphyrite: Patton, 10.
- Diorite porphyry: Clarke, F. W., 8; Cross and Purington, 1; Cross, Spencer, and Purington, 1; Emmons, 27; Lee, H. A., 9; Spurr, 1.
- Dolerite: Conkling, 2; Emmons, Cross, and Eldridge, 2.
- Dolomite: Spurr, 1.
- Dolomitic quartzite: Spurr, 1.
- Eolus granite: Cross, 41.
- Epidote rock: Crawford, 4.
- Eureka rhyolite: Cross, 43; Cross, Howe, and Ransome, 1.
- Evergreenite: Ritter, 5.
- Felsite: Crawford, 2; Patton, 8.
- Feldspar basalt (tephrite): Stevens, E. A., 2.
- Floetz trap: James, 1.
- Fulgurite: Hills, R. C., 16.
- Gabbro: Cross, 41; George and Crawford, 1; Lakes, 143.
- Gabbro-diorite: Cross and Purington, 1.
- Gabbro porphyry: Clarke, F. W., 8.
- Garnet schist: Crawford, 4; Cross, Howe, and Irving, 1.
- Glauconitic grit: Spurr, 1.
- Gneiss: Ball, S., 1; Cross, 27; Cross, Howe, and Irving, 1; Emmons, 2, 9; George, 3; Graton, 1; Patton, 10; Spurr and Garrey, 1; Underhill, 4.
- Granite, Alma type: Patton, 10.
- Granite, Aspen type: Spurr, 1.
- Granite, Central City type: Underhill, 4.
- Granite, Crested Butte type: Emmons, Cross, and Eldridge, 1.
- Granite, Cripple Creek type: Clarke, F. W., 8; Graton, 1; Mathews, 1, 2; Rickard, T. A., 15.
- Granite, Eolus: Cross, Howe, and Irving, 1.
- Granite, fine grained: Lakes, 18; Mathews, 1, 2.
- Granite, Georgetown type: Ball, 1; Spurr and Garrey, 1.
- Granite, Monarch-Garfield type: Crawford, 3, 4.
- Granite, Monarch-Tomichi type: Crawford, 4.
- Granite, Montezuma type: Patton, 7.
- Granite, Mosquito Range type: Emmons, 9.
- Granite, muscovite-biotite: Cross, Howe, and Ransome, 1.
- Granite, Needle Mountains type: Cross, Howe, Irving, and Emmons, 1.
- Granite, Pikes Peak type: Crosby, 1; Cross, 24; Lakes, 18; Mathews, 1, 2.
- Granite, Rosalie: Spurr, Garrey, and Ball.
- Granite, Rosita Hills type: Cross, 27.
- Granite, Santa Fe type: Patton, 7.
- Granite, Silver Plume type (corn granite): Mg. Sci., 2.
- Granite, Summit type: Mathews, 1, 2.
- Granite, Tenmile type: Cross, Howe, and Irving, 1.
- Granite, Trimble type: Cross, Howe, and Irving, 1.
- Granite, Troutdale type: Underhill, 4.
- Granite, Twilight type: Cross, Howe, and Irving, 1.
- Granite, white: Henry, 1.
- Granite, Whitehead type: Cross, Howe, and Irving, 1.
- Granite: Conkling, 2; Cross and Penrose, 1; Emmons, 2; George, 3; Lakes, 143; Underhill, 4.
- Granite-felsophyre: Hills, R. C., 15, 25.
- Granite gneiss: Clarke, 8; Crawford, 4; Gunther, 1; Patton, 8; Spurr, Garrey, and Ball, 1.
- Granite porphyry: Crawford, 4; Cross, Howe, and Irving, 1; Hills, R. C., 25; Lee, H. A., 9; Spurr, Garrey, and Ball, 1.
- Granitic breccia: Stone, 7.
- Granodiorite: Cross, Howe, and Irving, 1.
- Greenstone: Howe, 1.
- Henson tuff: Cross, 43; Cross, Howe, and Irving, 1.

## ROCKS DESCRIBED—Continued

- Hinsdale volcanic series: Cross, 43 (in Irving and Bancroft, 1).
- Hornblende andesite: Van Horn, 3.
- Hornblende-biotite diorite porphyrite: Patton, 10.
- Hornblende diorite porphyrite: Patton, 10.
- Hornblende gneiss: Patton, 7, 10; Spurr, Garrey, and Ball, 1.
- Hornblende monzonite porphyry: Cross and Ransome, 1; Cross and Spencer, 1.
- Hornblende schist: Crawford, 4; Cross, Howe, and Ransome, 1.
- Hornblende schist and amphibolite: Patton, 8.
- Hornblendite: Crawford, 4; Spurr, Garrey, and Ball, 1.
- Intermediate series: Cross and Purington, 1.
- Lacustrine sands: Hastings, 1.
- Lamprophyre dike: Clarke, F. W., 8; Cross, 41; Cross, Howe, and Irving, 1.
- Lamprophyre: Clarke, F. W., 8; Crawford, 2; Hills, R. C., 15, 24, 25.
- Latite: Clarke, F. W., 8; Crawford, 2, 3, 4; Cross, Howe, and Irving, 1; Clarke, F. W., 8.
- Latite-phonolite: Clarke, F. W., 8; Miller, G. W., 1.
- Latite porphyry: Crawford, 2, 3, 4; George and Crawford, 1; Graton, 1; Underhill, 4.
- Leucitophyre: Graton, 1.
- Limbargite: Crawford, 2; Stevens, E. A., 1, 2.
- Limestone, crystallized: Kedzie, 1.
- Limestone, magnesian: Farish, 3.
- Marble: Crawford, 4.
- Mica andesite: Blake, J. C., 1.
- Mica dacite: Cross, 27.
- Mica schist: Clarke, F. W., 8; Crawford, 4.
- Micaceous granite: Clarke, F. W., 8.
- Minette: Stose, 1.
- Monchiquite: Clarke, F. W., 8.
- Monzonite: Ball, 1; Cross, 41; Cross and Ransome, 1; Cross and Spencer, 1; Cross, Spencer, and Purington, 1.
- Monzonite-diorite: Crawford, 4.
- Monzonite porphyry: Clarke, 8; Crawford, 4; Cross, 41; Hills, R. C., 15, 25; Patton, 8; Ransome, 5.
- Nepheline basalt: Cross and Penrose, 1; Stevens, 2.
- Nepheline dolerite: Conkling, 2.
- Nepheline phonolite: Graton, 1.
- Nepheline syenite: Cross and Penrose, 1.
- Olivine basalt: Clarke, 8; George and Crawford, 1; Grout, Worcester, and Henderson, 1.
- Olivine-bearing augite vogesite: Stose, 1.
- Olivine-plagioclase basalt: Stose, 1.
- Olivine syenite: Graton, 1.
- Olivinitic marble: Crawford, 4.
- Ophicalcite: Crawford, 4.
- Pegmatite: Ball, S., 1; Finlay, G. I., 2; Crawford, 4; George, 3; Mg. Sci., 2; Patton, 8, 10; Spurr and Garrey, 1; Spurr, Garrey, and Ball, 1; Underhill, 4.
- Pegmatite, corundum-bearing: Finlay, G. I., 1, 2.
- Peridotite: Cross, 11, 12, 27.
- Phonolite: Cross, 10, 24; Cross and Penrose, 1; Graton, 1; Lakes, 143; Miller, G. W., 1.
- Picayune andesite: Cross, Howe, and Ransome, 1.
- Picayune volcanic group: Cross, 43 (in Irving and Bancroft, 1).
- Pitchstone porphyry: Crawford, 4.
- Plagioclase basalt: Cross and Penrose, 1; Lee, H. A., 9.
- Porphyrite: Cross, 23; Emmons, 2, 9; Emmons, Cross, and Eldridge, 1.
- Porphyritic biotite granite: Spurr, Garrey, and Ball, 1.
- Porphyritic diorite: Emmons, Cross, and Eldridge, 1.
- Porphyritic granite: Crawford, 4; Cross and Howe, 1.

## ROCKS DESCRIBED—Continued

- Porphyritic lamprophyre: Clarke, F. W., 8.  
 Porphyry, Aspen type: Henrich, 2; Lakes, 2.  
 Porphyry, Bear Mountain type: Patton, 7.  
 Porphyry, Calico Peak type: Cross and Ransome, 1; Cross and Spencer, 1.  
 Porphyry, Georgetown type: Spurr and Garrey, 1.  
 Porphyry, granite: Patton, 7.  
 Porphyry, gray: Emmons, 9.  
 Porphyry, Grayback type: Patton, 8.  
 Porphyry, green: Emmons, 9.  
 Porphyry, Hahns Peak type: George and Crawford, 1.  
 Porphyry, Leadville or White: Emmons, 3, 9; Gale, 1; Julien, 1; Lakes, 5, 21; Patton, 10.  
 Porphyry, Lincoln: Emmons, 9; Patton, 10.  
 Porphyry, Monarch-Garfield: Crawford, 3.  
 Porphyry, Mosquito: Emmons, 9.  
 Porphyry, Mount Zion: Emmons, 9.  
 Porphyry, Sacramento: Emmons, 9.  
 Porphyry, Silverheels: Emmons, 9.  
 Porphyry, Silverton type: Cross and Howe, 1.  
 Porphyry: Emmons, 2; Lakes, 5, 143; Patton, 7.  
 Potosi volcanic series: Cross, Howe, and Ransome, 1; Cross, Howe, and Irving, 1; Cross and Purington, 1; Cross, 43 (in Irving and Bancroft, 1).  
 Pringle andesite: Cross, 27.  
 Pronolite (phonolite): Lakes, 18.  
 Propylite: Comstock, 7.  
 Prowersose (syenite lamprophyre): Cross, 34.  
 Pyritiferous porphyry: Emmons, 9.  
 Pyroxene andesite: Clarke, F. W., 8; Cross, Howe, and Ransome, 1; Cross, Howe, and Irving, 1.  
 Pyroxene-hornblende andesite: Clarke, F. W., 8.  
 Pyroxene latite: Cross, 43 (in Irving and Bancroft, 1).  
 Pyroxene monzonite porphyry: Cross and Ransome, 1.  
 Pyroxene: Crawford, 2.  
 Quartz basalt: George and Crawford, 1.  
 Quartz-biotite diorite: Patton, 10.  
 Quartz-biotite latite: Clarke, F. W., 8.  
 Quartz diorite: Crawford, 4; Larsen, 1; Mg. Sci., 2; Spurr, Garrey, and Ball, 1.  
 Quartz diorite porphyrite: Patton, 10.  
 Quartz gneiss: Spurr, Garrey, and Ball, 1.  
 Quartz-hornblende diorite: Patton, 10.  
 Quartz latite: Clarke, F. W., 8; Grout, Worcester, and Henderson, 1; Irving and Bancroft, 1; Larsen, 1.  
 Quartz latite porphyry: Crawford, 4.  
 Quartz monzonite: Clarke, F. W., 8; Crawford, 3, 4; Cross, Howe, and Ransome, 1; Cross, Howe, and Irving, 1.  
 Quartz monzonite gneiss: Crawford, 4; Mg. Sci., 2; Irving and Bancroft, 1; Ransome, 5; Spurr, Garrey, and Ball, 1.  
 Quartz monzonite porphyry: Clarke, F. W., 8; Crawford, 3, 4; Lee, W. T., 13; Patton, 10; Spurr, Garrey, and Ball, 1.  
 Quartz porphyry: Cross, 23; Gunther, 1; Lakes, 21; Palmer, 1; Palmer and Fulton, 1; Patton, 8; Spurr, 1.  
 Quartz-pyroxene latite: Clarke, F. W., 8.  
 Quartz trachyte: Cross, 41.  
 Quartzite: Crawford, 4; Cross, Howe, and Irving, 1; Cross and Spencer, 1; Kedzie, 1.  
 Quartzite, lower: Emmons, 9; Kedzie, 1.  
 Quartzite, Parting: Emmons, 9, 27; Spurr, 1.  
 Quartzite, pink: Kedzie, 1.  
 Riebeckite granite: Clarke, F. W., 8.  
 Riebeckite rocks: Murgoci, 1.

## ROCKS DESCRIBED—Continued

- Rhyolite: Clarke, F. W., 8; Comstock, 7; Crawford, 4; Cross, 8, 12, 23, 24, 27; Cross, Howe, and Ransome, 1; Cross, Howe, and Irving, 1; Cross and Penrose, 1; Cross and Purington, 1; Emmons, 9, 27; Emmons, Cross, and Eldridge, 1; George and Crawford, 1; Irving and Bancroft, 1; Graton, 1; Lakes, 18, 21, 143; Miller, G. W., 1; Stevenson, 8.
- Rhyolite porphyry: Crawford, 4.
- Rhyolitic vitrophyre: Clarke, F. W., 8.
- Sandstone: James, 1.
- Sandstone dike rock: Cross, 25.
- Sanidine rhyolite: Cross, 6.
- San Juan tuff: Cross, Howe, and Irving, 1; Cross, Howe, and Ransome, 1; Cross and Purington, 1; Cross, 43 (in Irving and Bancroft, 1).
- Schist: Berg, 1; Cross, 20; Cross, Howe, and Ransome, 1; Cross and Penrose, 1; Graton, 1; Howe, 1; Grout, Worcester, and Henderson, 1; Patton, 10.
- Silverton volcanic series: Cross, Howe, and Ransome, 1; Cross, 43 (in Irving and Bancroft, 1).
- Sodalite phonolite: Graton, 1.
- Smoky-quartz granite: Crawford, 4.
- Spherulites: Cross, 15; Patton, 2.
- Syenite: Clarke, F. W., 8; Cross, 12, 27; Crawford, 4; Graton, 1; Miller, G. W., 1.
- Syenite gneiss: Gunther, 1.
- Syenite porphyry: Cross, Spencer, and Purington, 1.
- Titanite phonolite: Graton, 1.
- Topaz rhyolite: Cross, 8.
- Tourmaline and tourmaline schists: Upham, 2.
- Trachorheites: Endlich, 1, 7; Peale, 7, 8.
- Trachydolerite: Clarke, F. W., 8; Graton, 1; Lindgren and Ransome, 3.
- Trachyte: Breed, 1; Clarke, F. W., 8; Comstock, 7; Conkling, 2; Cross, 12, 24, 27; Draper, 1; Lakes, 18, 21, 143; Miller, G. W., 1; Pearce, 1; Stevenson, 8.
- Trachytic phonolite: Cross and Penrose, 1.
- Tuff and breccia: Cross and Penrose, 1.
- Tuff, Burns: Cross, Howe, and Irving, 1.
- Tuff, Florissant: Wadsworth, 1.
- Tuff, Henson: Cross, Howe, and Irving, 1.
- Twilight granite: Cross, 41.
- Vanadiferous sandstone: Hess, 4.
- Vogesite: Clarke, F. H., 8; Graton, 1; Lee, H. A., 9.
- Volcanic breccia: Crawford, 4.
- Volcanic rocks: King, 1.

## GEOLOGICAL FORMATIONS GROUPED ACCORDING TO AGE

(R. D. George.)

Where difference of opinion exists as to the age of formations, they are listed in two or more groups. In the less probable age groups the names are in parentheses.

## Cenozoic

*Quaternary* (see *Quaternary* in the general index):

Alluvial deposits.

Alluvium.

(Bishop Mountain Conglomerate.)

(Browns Park.)

Dune sand.

*Quaternary*.—Continued.

Eolian soil.

Glacial or Lake beds.

Loess.

Wash beds.

(Wyoming Conglomerate.)

## GEOLOGICAL FORMATIONS GROUPED ACCORDING TO AGE—Continued

## Cenozoic—Continued

*Tertiary:*

Alamosa.  
 Alnwick.  
 Amyzon.  
 Animas.  
 Arapahoe.  
 Arikaree.  
 Bad Lands group.  
 Bishop Mountain Conglomerate.  
 Bitter Creek.  
 Bridger.  
 Browns Park.  
 Brule.  
 Castle Conglomerate.  
 Castle Rock Conglomerate.  
 Ceratops beds.  
 Chadron.  
 Cuchara.  
 Dawson Arkose.  
 Denver.  
 Florissant.  
 Fort Union.  
 High Park.  
 Gallisteo.  
 Green River.  
 Horsetail Creek.  
 Huerfano.  
 Lacustrine (Scott, W. B., 3).  
 Lake beds, in part.  
 Loup Fork.  
 Loup River.

*Tertiary.*—Continued.

Mauvaises Terres (White River).  
 Middle Park.  
 Monument Creek.  
 Niobrara of King.  
 Nussbaum.  
 Ogallala.  
 Ohio.  
 Ohio Creek.  
 Pawnee Creek.  
 Pliocene.  
 (Point of Rocks).  
 Poison Canyon.  
 Post-Laramie.  
 Puerco.  
 Puerco Marl.  
 Ruby.  
 San Juan.  
 San Miguel.  
 Santa Fe.  
 Shoshone.  
 Telluride.  
 Titanotherium beds.  
 Uinta.  
 Vermillion Creek.  
 Wasatch (Wahsatch).  
 Washakie.  
 White River.  
 Wind River.  
 Wyoming Conglomerate.

## Mesozoic

*Cretaceous:*

(Animas beds.)  
 Apishapa.  
 (Arapahoe.)  
 (Bad Lands group.)  
 Benton.  
 (Bitter Creek.)  
 Bowie.  
 Carlile.  
 (Ceratops beds.)  
 Colorado.  
 Comanche.  
 (Cuchara.)  
 Dakota.

*Cretaceous.*—Continued.

(Denver.)  
 Escarpment sandstone.  
 Fox Hills.  
 Graneros.  
 Greenhorn.  
 Halymenites.  
 Hell Creek.  
 Henrys Fork.  
 (Huerfano.)  
 Hygiene.  
 Judith River.  
 Laramie.  
 Lewis.

## GEOLOGICAL FORMATIONS GROUPED ACCORDING TO AGE—Continued

## Mesozoic—Continued

*Cretaceous*.—Continued.

Lignitic.  
 Mancos.  
 Mesaverde.  
 (Middle Park.)  
 Montana.  
 (Monument Creek.)  
 (Morrison.)  
 Niobrara.  
 (Ohio and Ohio Creek.)  
 Paonia.  
 Pictured Cliff.  
 Pierre.  
 Platte series.  
 Point of Rocks.  
 (Poison Canyon.)  
 Purgatoire.  
 Rollins.  
 (Ruby and Ruby Creek.)  
 Salt Wells.  
 Sulphur Creek.  
 Tepee zone (Pierre).  
 Timpas.  
 Trinidad.  
 Trout Creek.  
 Twenty Mile.  
 Vermejo.

*Jurassic*:

Atlantosaurus beds.  
 Baptonodon beds.  
 Flaming Gorge.  
 Gunnison.  
 La Plata.  
 McElmo.  
 Mariposite Sandstone.  
 Morrison.  
 Red Beds, in part.  
 Sauranodon.  
 Saurian Conglomerate.  
 Saurian Sandstone.  
 Sundance.  
 White Cliff.

*Triassic*:

Chugwater, possibly upper part.  
 Dolores.  
 Lykins, possibly upper part.  
 Red Beds, in part.  
 Shinarump, in part.  
 Upper Wyoming, possibly upper part.  
 Vermillion Cliff.  
 Wyoming, possibly part of the Upper Wyoming.

## Paleozoic

*Permian*:

Chugwater, lower part, possibly all.  
 Crinkled Sandstone, probably.  
 Cutler.  
 Jaque Mountain.  
 Kangaroo, probably Permo-Pennsylvanian.  
 Lykins, lower part.  
 Maroon, upper may be Permian.  
 Permo-Carboniferous of King, and in part the Permo-Carboniferous of other early writers.  
 Red Beds.  
 Rico.  
 Shinarump, in part.  
 Upper Carboniferous of Hayden geologists and other early workers, in part.  
 Upper Wyoming, in large part.  
 Wyoming, part of Upper Wyoming.

*Pennsylvanian (Upper Carboniferous)*:

Arkansas Sandstone.  
 Aubrey.  
 Badito.  
 Carboniferous (undivided) of earlier writers, in part.  
 Casper.  
 Coal Measures (Carboniferous). The same name has been applied to Cretaceous coal strata.  
 Creamy Sandstone.  
 Fountain.  
 Garfield.  
 Gleneyrie.  
 Hermosa.  
 Kangaroo, probably Permo-Pennsylvanian.  
 Lower Wyoming.  
 Lyons.

## GEOLOGICAL FORMATIONS GROUPED ACCORDING TO AGE—Continued

## Paleozoic—Continued

*Pennsylvanian (Upper Carboniferous).*

—Continued.

Middle Carboniferous of Hayden geologists is largely Pennsylvanian.

Pennsylvanian.

Red Beds, in part.

Red Wall, probably Mississippian at the base.

Robinson Limestone.

Shinarump, in part.

Tensleep.

(Uinta Sandstone.)

Upper Carboniferous of earlier literature, in part.

Upper Coal Measures of the King Survey are probably equivalent to the Weber (Pennsylvanian), and the Wasatch (Mississippian), of the Wasatch Mountains.

Wasatch, upper part.

Weber Grits.

Weber Limestone.

Weber Sandstone (Uinta Mountains).

Weber Shale.

*Mississippian (Lower Carboniferous):*

Blue Limestone, upper part.

Brown Limestone (Aspen).

Leadville Limestone, upper part.

Lower Carboniferous. The Hayden geologists appear to have used this term as a name for the lowest Carboniferous rocks locally present, without regard to their place in a full Carboniferous section.

Millsap.

Ouray, upper part.

Red Beds, in part.

Red Wall, possibly lower part.

Wasatch, lower part.

*Devonian:*

Blue Limestone, lower part.

Elbert.

Leadville Limestone, lower part.

Ouray, lower part.

(Parting Quartzite, probably Ordovician.)

*Devonian.—Continued.*

(Uinta Sandstone, probably Pre-Cambrian.)

*Silurian (Upper Silurian):*

Silurian strata have not been found in Colorado. The "Silurian" of the Hayden geologists includes strata ranging in age from Cambrian to middle Devonian. That of the earlier literature of the present U. S. Geological Survey is mainly Ordovician. The "Niagara" of the Hayden geologists is probably Ordovician.

*Ordovician (Lower Silurian):*

Calceferous.

Canadian.

Fremont.

Harding.

Lower Paleozoic, includes Ordovician.

Manitou.

Niagara of Hayden Survey.

Ogden, possibly Devonian.

Parting Quartzite.

Quebec, mainly.

Silurian. *See above.*

Tomichi.

Trenton.

White Limestone.

*Cambrian:*

Ignacio.

Lodore.

Lower Quartzite.

Potsdam.

Primordial.

Quebec group, in part.

Saratogan.

Sawatch.

Silurian of the earlier literature contains Cambrian.

(Uinta sandstone, probably Pre-Cambrian.)

Ute limestone, variously regarded as Cambrian, Ordovician, Silurian, Carboniferous, etc.

(White Limestone, probably Ordovician.)

## GEOLOGICAL FORMATIONS GROUPED ACCORDING TO AGE—Continued

## Proterozoic

*Pre-Cambrian (see general index):*

Algonkian.  
Huronian.  
Idaho Springs.  
Irving Greenstone.  
Laurentian.  
Needle Mountains.  
Pre-Cambrian, general.  
Red Creek Quartzite.

*Pre-Cambrian.—Continued.*

Uinta Quartzite (Sandstone) has been assigned to every age from Pennsylvanian to pre-Cambrian.  
Uncompahgre.  
Vallecito.  
Weber Quartzite of King, regarded by him as Pennsylvanian and Mississippian, but probably equivalent to the Uinta.

## GEOLOGICAL FORMATIONS DESCRIBED

- Alamosa formation, San Luis Valley: Siebenthal, 4.  
Algonkian: *See* Algonkian in general index.  
Alluvial deposits, Breckenridge: Lakes, 199.  
Alluvium, Quaternary: Darton, 13.  
Alnwick lake beds, Pikes Peak district: Cross, 24.  
Amyzon shales: Clark, W. B., 1; Cope, 43; Scudder, 12; Smith, J. H., 1.  
Animas, Durango-Gallup field: Shaler, 1.  
Animas: Cross, 18; Hills, R. C., 10; Howe, 2; Spencer, A. C., 1.  
Apishapa, Apishapa quadrangle: Stose, 1.  
Apishapa, Arkansas Valley: Darton, 9; Gilbert, 5.  
Apishapa, Cretaceous: Darton, 13.  
Apishapa, Elmoro quadrangle: Hills, R. C., 24.  
Apishapa, Nepesta quadrangle: Fisher, 1.  
Apishapa, Spanish Peaks: Hills, R. C., 25.  
Apishapa, Walsenburg quadrangle: Hills, R. C., 15.  
Arapahoe, Castle Rock district: Lee, W. T., 5; Richardson, 4.  
Arapahoe, Cretaceous (?): Darton, 13.  
Archean: *See* Archean in general index.  
Arapahoe, Denver Basin: Cannon, 10; Eldridge, 2; Emmons, Cross, and Eldridge, 2.  
Arapahoe, eastern Colorado: Darton, 7; Richardson, 4.  
Arapahoe: Cross, 18; Geijsbeek, 1; Hatcher, 3; Stanton and Knowlton, 1; Washburne, 5.  
Arikaree: Cragin, 3; Darton, 9, 13; Osborn, 4.  
Arkansas sandstone: Butters, 2; Endlich, 1, 5; Girty, 2.  
Atlantosaurus beds: Emmons, Cross, and Eldridge, 2; White, 19.  
Aubrey: Girty, 2; Powell, 3.  
Badito, Walsenburg quadrangle: Hills, R. C., 15.  
Badito: Butters, 2; Girty, 2.  
Bad Land group: Holmes, 2.  
Baptanodon beds: White, 19.  
Bellerophon limestone: Girty, 2; Powell, 3.  
Benton shale, Anthracite-Crested Butte quadrangle: Emmons, Cross, and Eldridge, 1.  
Benton, Apishapa quadrangle: Stose, 1.  
Benton, Arkansas Valley: Gilbert, 5.  
Benton, Boulder district: Fenneman, 5.  
Benton, Castle Rock: Lee, W. T., 5.  
Benton, Cretaceous: Darton, 9.  
Benton, Denver Basin: Cannon, 10; Emmons, Cross, and Eldridge, 2.  
Benton, eastern Colorado: Darton, 7.  
Benton, Florence: Eldridge, 4.



## GEOLOGICAL FORMATIONS DESCRIBED—Continued

- Benton, Hahns Peak: Gale, 1.  
 Benton, Rabbit Ears region: Grout, Worcester, and Henderson, 1.  
 Benton, San Juan: Comstock, 7.  
 Benton, southeastern Colorado: Stevenson, 8.  
 Benton, southern Colorado: Stevenson, 12.  
 Benton, Yampa: Fenneman and Gale, 1.  
 Benton: Eldridge, 1; Geijsbeek, 1; Hayden, 6, 19; Henderson, J., 10; King, 1; Lakes, 117, 165; Logan, 1; Martin, 1; Marvine, 1; Peale, 7; Ries, 1; Spencer, 1.  
 Bishop Mountain conglomerate: Gale, 8; Powell, 3.  
 Bitter Creek: Peale, 7; Powell, 3; Scott, W. B., 2; Stanton and Knowlton, 1.  
 Blue limestone, Alma: Patton, 10.  
 Blue limestone, Aspen: Henrich, 2; Newberry, 16; Spurr, 1.  
 Blue limestone, Carboniferous: Emmons, 9; Spurr, 1.  
 Blue limestone, Leadville: Emmons and Irving, 1; Girty, 2.  
 Blue limestone, San Miguel County: Spaulding, 1.  
 Blue limestone, Tenmile district: Emmons, 27.  
 Bowie, Grand Mesa district: Lee, W. T., 13.  
 Bridger beds, Huerfano lake basin: Cross, 18; Osborn, 1, 2, 4; Osborn and Wortman, 3.  
 Bridger beds, northwestern Colorado: Powell, 3; Smith, J. H., 1; White, 4.  
 Bridger beds: Cope, 54, 60; Hills, R. C., 19; King, 1; Peale, 7; Scott, W. B., 2, 3; White, 26b.  
 Brown limestone, Aspen: Henrich, 2; Newberry, 16.  
 Browns Park formation: Gale, 7, 8; Hague and Emmons, 1; King, 1; Powell, 3; White, 26.  
 Brule: Darton, 9; Osborn, 4.  
 Calcareous: Hayden, 19; Peale, 7.  
 Canadian: Peale, 7.  
 Carlile, Arkansas Valley: Gilbert, 5.  
 Carlile, Cretaceous: Darton, 13.  
 Carlile, eastern Colorado: Darton, 7.  
 Carlile, Elmoro quadrangle: Hills, R. C., 24.  
 Carlile, Nepesta quadrangle: Fisher, 1.  
 Carlile, Pueblo quadrangle: Gilbert, 7.  
 Carlile, Spanish Peaks: Hills, R. C., 25.  
 Carlile, Walsenburg: Hills, R. C., 15.  
 Castle Rock conglomerate: Lee, W. T., 5; Richardson, 4.  
 Ceratops beds, Wyoming, Converse County: Hatcher, 1.  
 Ceratops beds: Hatcher, 1, 3; Marsh, in Emmons, Cross, and Eldridge, 2; Knowlton, 3; Stanton, 5.  
 Chadron: Darton, 9; Osborn, 4.  
 Chart of formations from folios: Underhill, 3.  
 Chugwater: Darton, 7, 9, 13; Girty, 2.  
 Coal measures, age of: Chauvenet, 10.  
 Coal measures, Rio Blanco County: Gale, 2.  
 Coal measures, southeastern Colorado: van Diest, 10.  
 Coal measures: Holmes, 2; King, 1; Lakes, 186; Peale, 8.  
 Colorado, Aspen (Niobrara): Spurr, 1.  
 Colorado, Colorado Range: Hague and Emmons, 1.  
 Colorado, Denver Basin: Eldridge, 2; Emmons, Cross, and Eldridge, 2.  
 Colorado, North Park: Grout, Worcester, and Henderson, 1; Hague and Emmons, 1.  
 Colorado, northwestern Colorado: White, 4.  
 Colorado, Perry Park district: Kruger, Hamilton, and Enriquez, 1.  
 Colorado, Pikes Peak district: Cross, 24.  
 Colorado, Rabbit Ears region: Grout, Worcester, and Henderson, 1.  
 Colorado, shales: Hewett, 1.  
 Colorado, southeastern division: Endlich, 4.  
 Colorado, usage of term: Eldridge, 1.

## GEOLOGICAL FORMATIONS DESCRIBED—Continued

- Colorado: Henderson, J., 10; Holmes, 2; King, 1; Stevenson, 7, 13; White, 26.
- Comanche, Apishapa: Stose, 1.
- Comanche, correlation with Dakota: Stanton, 3.
- Comanche, Cretaceous, Darton, 9, 13.
- Comanche, eastern Colorado: Darton, 7.
- Comanche, southeastern Colorado: Darton, 11.
- Comanche (?): Henderson, J., 10.
- Creamy sandstone, eastern foothills: Butters, 2; Emmons, Cross, and Eldridge, 2; Fenneman, 5.
- Crinkled sandstone, eastern foothills: Butters, 2; Fenneman, 5; Henderson, 10.
- Cuchara, Cretaceous (?): Darton, 13.
- Cuchara, Spanish Peaks: Hills, R. C., 25.
- Cuchara, Trinidad: Richardson, 2.
- Cuchara, Walsenburg: Hills, R. C., 15.
- Cuchara: Hills, R. C., 19.
- Cutler, Durango quadrangle: Emmons, W. H., 1.
- Cutler, Engineer Mountain quadrangle: Cross, 41.
- Cutler, Needle Mountains: Cross, Howe, Irving, and Emmons, 1.
- Cutler, Ouray district: Irving, 2.
- Cutler, Rico quadrangle: Cross and Ransome, 1.
- Cutler, San Juan: Cross, 35; Cross and Howe, 1.
- Cutler, Silverton: Cross, Howe, and Ransome, 1; Cross, Howe, and Irving, 2; Howe, 2.
- Cutler: Butters, 2.
- Dakota, Anthracite-Crested Butte: Emmons, Cross, and Eldridge, 1.
- Dakota, Apishapa quadrangle: Stose, 1.
- Dakota, Arkansas Valley: Darton, 9, 13; Gilbert, 5.
- Dakota, Aspen: Spurr, 1.
- Dakota, Book Cliffs district: Richardson, 1.
- Dakota, Boulder district: Fenneman, 5; Henderson, J., 3.
- Dakota, Breckenridge district: Ransome, 5.
- Dakota, coal in: Stone, 8.
- Dakota, Colorado group: Hague and Emmons, 1.
- Dakota, Cretaceous: Darton, 9, 13; Spurr, 1.
- Dakota, Denver Basin: Cannon, 10; Eldridge, 2; Emmons, Cross, and Eldridge, 2.
- Dakota, Durango-Gallup field: Shaler, 1.
- Dakota, eastern Colorado: Darton, 7.
- Dakota, Elk Range: Holmes, 1.
- Dakota, Elmoro quadrangle: Hills, R. C., 24.
- Dakota, Engineer Mountain quadrangle: Cross, 41.
- Dakota, Florence: Eldridge, 5.
- Dakota formation, relation to Comanche: Stanton, 3.
- Dakota, Front Range: Stanton, 3.
- Dakota, Grand Mesa: Lee, W. T., 13.
- Dakota, Grand River district: Peale, 12.
- Dakota, Grand River Valley: Riggs and Farrington, 1.
- Dakota, Hahns Peak: Gale, 1; George and Crawford, 1.
- Dakota, LaPlata Mountains: Cross, Spencer, and Purington, 1.
- Dakota, Montrose County: Emmons, W. H., 3.
- Dakota, Morrison, relation to: Stanton, 3.
- Dakota, Nepesta quadrangle: Fisher, 1.
- Dakota, North Park: Grout, Worcester, and Henderson, 1; Hague and Emmons, 1.
- Dakota, northwestern Colorado: Gale, 8; Henderson, J., 13; White, 4.
- Dakota, ore in: Lakes, 135.
- Dakota, Ouray district, upper quartzite: Irving, 2.
- Dakota, Perry Park: Kruger, Hamilton, and Enriquez, 1.
- Dakota, Pikes Peak: Cross, 24.

## GEOLOGICAL FORMATIONS DESCRIBED—Continued

- Dakota, Placerville: Hillebrand and Ransome, 1.
- Dakota, Pueblo quadrangle: Gilbert, 7.
- Dakota, Rabbit Ears region: Grout, Worcester, and Henderson, 1.
- Dakota, Rico quadrangle: Cross and Ransome, 1.
- Dakota, Rio Blanco County: Gale, 2, 5.
- Dakota, San Juan: Comstock, 7.
- Dakota, southeastern division: Endlich, 4; Lee, W. T., 4, 7; Stevenson, 8.
- Dakota, southern Colorado: Stevenson, 12.
- Dakota, Telluride: Cross and Purington, 1, 2.
- Dakota, Uncompahgre region: Sieben-thal, 1.
- Dakota, Walsenburg: Hills, R. C., 15.
- Dakota, Yampa: Fenneman and Gale, 1, 2.
- Dakota: Cross, Howe, and Irving, 1; Endlich, 5; Gale, 7; Gardner, J. H., 1; Geijsbeek, 1; Hayden, 6, 12, 14, 19, 22; Henderson, J., 10; Holmes, 6; King, 1; Lakes, 67, 95, 117, 165; Lee, W. T., 9, 10; Martin, 1; Marvinne, 1; Peale, 7, 8; Ries, 1; Spencer, A. C., 1; Stevenson, 7; White, 26.
- Dawson arkose, Castle Rock area: Richardson, 4.
- Denver beds, age of: Cross, 13, 18, 19, 38; Knowlton, 3; Stanton, 5.
- Denver, Cretaceous (?): Darton, 13.
- Denver, Denver Basin: Cannon, 6, 10; Eldridge, 3; Emmons, Cross, and Eldridge, 2; Lakes, 165; Richardson, 4.
- Denver, eastern Colorado: Darton, 7.
- Denver, lacustrine or fluviatile?: Davis, W. M., 5.
- Denver, Tertiary: Cross, 13.
- Denver: Cross, 18; Dall, 1; Hatcher, J. B., 3; Spencer, A. C., 1; Washburne, 5.
- Doleritic breccia: Cross, 19.
- Dolores, LaPlata Mountains: Cross and Spencer, 1.
- Dolores, Montrose County: Emmons, W. H., 3.
- Dolores, Ouray district: Irving, 2; Purington, 3.
- Dolores, Placerville: Hillebrand and Ransome, 1.
- Dolores, Rico quadrangle: Cross and Ransome, 1; Cross and Spencer, 1.
- Dolores, San Juan: Cross and Howe, 1.
- Dolores, Telluride: Cross and Purington, 1.
- Dolores: Butters, 2; Cross, Howe, and Irving, 1; Hess, 4; Howe, 2; Lee, H. A., 9.
- Dune sands, Quaternary: Darton, 13.
- Elbert, Engineer Mountain quadrangle: Cross, 41.
- Elbert, Needle Mountains: Cross, Howe, Irving, and Emmons, 1.
- Elbert, Ouray district: Irving, 2.
- Elbert, Silverton: Cross, Howe, and Ransome, 1.
- Elbert: Cross, 33; Cross, Howe, and Irving, 1; Howe, 2.
- Eolian soil: San Juan: Cross, 37.
- Eolus granite, Needle Mountains: Cross, Howe, Irving, and Emmons, 1.
- Escarpment, lower: Holmes, 2.
- Escarpment, upper: Holmes, 2.
- Flaming Gorge, Rio Blanco field: Gale, 5, 8.
- Flaming Gorge: Powell, 3.
- Florissant lake beds, Pikes Peak district: Cross, 24.
- Fort Union group: Hayden, 19; Knowlton, 1; Newberry, 17; Smith, J. H., 1; Weed, 1a.
- Fountain, age of: Finlay, G. I., 3.
- Fountain, Boulder district: Butters, 2; Fenneman, 5.
- Fountain, Boulder and Larimer counties: Martin, 1.
- Fountain (?), Cripple Creek: Lindgren and Ransome, 3.
- Fountain, Manitou district: Finlay, G. I., 3.
- Fountain, Pikes Peak district: Cross, 24.

## GEOLOGICAL FORMATIONS DESCRIBED—Continued

- Fountain, Pueblo: Gilbert, 7.
- Fountain: Butters, 2; Girty, 2; Henderson, J., 10, 11.
- Fox Hills, Arkansas Valley: Gilbert, 5.
- Fox Hills, Boulder district: Fenneman, 5.
- Fox Hills, Castle Rock district: Lee, W. T., 5.
- Fox Hills, Cretaceous: Darton, 9, 13.
- Fox Hills, Denver Basin: Cannon, 10; Eldridge, 2; Emmons, Cross, and Eldridge, 2.
- Fox Hills, eastern Colorado: Cannon, 5; Darton, 7; Hayden, 20.
- Fox Hills, Florence: Eldridge, 5.
- Fox Hills, Grand River district: Peale, 12.
- Fox Hills, northwestern Colorado: White, 4, 26.
- Fox Hills, paleobotany: Cockerell, 9.
- Fox Hills, paleontology: Cragin, 2.
- Fox Hills, San Juan: Comstock, 7.
- Fox Hills southeastern division: Endlich, 4.
- Fox Hills, southern Colorado: Stevenson, 12.
- Fox Hills: Cope, 19; Eldridge, 1; Endlich, 5; Geijsbeek, 1; Hayden, 6, 19; Henderson, J., 10; King, 1; Lakes, 95, 165; Martin, 1; Marvine, 1; Newberry, 16; Peale, 7; Ries, 1; Spencer, A. C., 1; Stevenson, 5.
- Fremont limestone, Canon City: Walcott, 3.
- Fremont limestone, eastern Colorado: Darton, 7.
- Fremont limestone, Ordovician: Darton, 9, 13.
- Fremont limestone, Pikes Peak: Cross, 24.
- Fremont limestone: Darton, 14; Girty, 2.
- Gallisteo sand group: Hayden, 6, 12; Peale, 7.
- Garfield, Monarch-Tomichi: Crawford, 4.
- Glacial or lake beds, Mosquito Range: Emmons, 9.
- Gleneyrie, Manitou district: Finlay, G. I., 3.
- Graneros, Arkansas Valley: Gilbert, 5.
- Graneros, Apishapa quadrangle: Stose, 1.
- Graneros shale, Cretaceous: Darton, 13.
- Graneros shale, eastern Colorado: Darton, 7.
- Graneros shale, Elmore quadrangle: Hills, R. C., 24.
- Graneros shale, Nepesta quadrangle: Fisher, 1.
- Graneros shale, Pueblo quadrangle: Gilbert, 7.
- Graneros shale, Walsenburg: Hills, R. C., 15.
- Granitic rocks: Hollister, 1.
- Gray porphyry, Leadville: Emmons and Irving, 1.
- Greenhorn, Apishapa quadrangle: Stose, 1.
- Greenhorn, Arkansas Valley: Gilbert, 5.
- Greenhorn, Cretaceous: Darton, 13.
- Greenhorn, eastern Colorado: Darton, 7.
- Greenhorn, Elmore quadrangle: Hills, R. C., 24.
- Greenhorn, Nepesta quadrangle: Fisher, 1.
- Greenhorn, Pueblo quadrangle: Gilbert, 7.
- Greenhorn, Walsenburg quadrangle: Hills, R. C., 15.
- Green River, Grand Mesa: Lee, W. T., 13.
- Green River, Grand River district: Peale, 12.
- Green River, northwestern Colorado: Gale, 8; Powell, 3; White, 4, 26.
- Green River, Rio Blanco oil fields: Gale, 5.
- Green River: Endlich, 5; Gale, 7; King, 1; Lee, W. T., 10; Peale, 7.
- Gunnison, Anthracite-Crested Butte: Emmons, Cross, and Eldridge, 1.
- Gunnison, Aspen: Spurr, 1.
- Gunnison, Grand Mesa: Lee, W. T., 13.

## GEOLOGICAL FORMATIONS DESCRIBED—Continued

- Gunnison, Telluride: Purington, 2.  
 Gunnison: Lee, W. T., 10, 13.  
 Halymenites sandstone: Hewett, 1; Stevenson, 8.  
 Harding sandstone, Canon City: Walcott, 3.  
 Harding sandstone, eastern Colorado: Darton, 7.  
 Harding sandstone, Ordovician: Darton, 9, 13.  
 Harding sandstone, Pikes Peak: Cross, 24.  
 Harding sandstone, Pueblo quadrangle: Gilbert, 7.  
 Harding sandstone: Darton, 14; Girty, 2.  
 Hell Creek beds: Brown, B., 1; Knowlton, 3; Stanton, 5.  
 Henrys Fork group: Peale, 8; Powell, 3.  
 Hermosa, Engineer Mountain quadrangle: Cross, 41.  
 Hermosa, Needle Mountains: Cross, Howe, Irving, and Emmons, 1.  
 Hermosa, Ouray district: Irving, 2; Purington, 3.  
 Hermosa, Rico quadrangle: Cross and Ransome, 1; Cross and Spencer, 1.  
 Hermosa, Silverton: Cross, Howe, and Ransome, 1.  
 Hermosa: Cross, Howe, and Irving, 1; Girty, 2; Howe, 2.  
 High Park beds, Pikes Peak district: Cross, 24; Cross and Penrose, 1.  
 Horsetail Creek: Darton, 9; Osborn, 4.  
 Huerfano, Spanish Peaks: Hills, R. C., 25.  
 Huerfano, Trinidad: Richardson, 2.  
 Huerfano: Cross, 18; Hills, R. C., 13, 19; Lakes, 156; Osborn, 2; Smith, J. H., 1; Weller, 1.  
 Huronian: Hague and Emmons, 1; King, 1.  
 Hygiene sandstone: Fenneman, 5; Henderson, J., 10.  
 Idaho Springs: Patton, 7; Spurr, Garey, and Ball, 1.  
 Ignacio quartzite, Engineer Mountain: Cross, 41.  
 Ignacio quartzite, Needle Mountains: Cross, Howe, Irving, and Emmons, 1.  
 Ignacio quartzite, Rico Mountains: Cross and Ransome, 1.  
 Ignacio quartzite, Silverton: Cross, Howe, and Ransome, 1.  
 Ignacio quartzite: Cross, 33; Cross, Howe, and Irving, 1; Howe, 2.  
 Ingleside, eastern foothills: Butters, 2.  
 Irving greenstones, Needle Mountains: Cross, Howe, Irving, and Emmons, 1.  
 Jaque Mountain: Emmons, 27.  
 Judith River beds: Peale, 18; Stanton and Knowlton, 1.  
 Kangaroo: Monarch-Tomichi: Crawford, 4.  
 Lacustrine: Scott, W. B., 3.  
 Lake beds, age of: Cross, 18.  
 Lake beds, Hahns Peak: George and Crawford, 1.  
 Lake beds, Leadville: Emmons, 2; Emmons and Irving, 1.  
 Lake beds, Mosquito Range: Emmons, 9.  
 Lake beds: Cross, 27; Marvine, 1.  
 Lake beds. *See also* Alnwick, High Park, Middle Park, etc.  
 LaPlata sandstone: Engineer Mountain, Cross, 41.  
 LaPlata, Montrose County: Emmons, W. H., 3.  
 LaPlata, ore deposits in: Lindgren, 9.  
 LaPlata, Ouray district: Irving, 2.  
 LaPlata, Placerville: Hess, 4; Hillebrand and Ransome, 1, 2; Lindgren, 9.  
 LaPlata, Rico Mountains: Cross and Spencer, 2.  
 LaPlata, sandstone: Cross, Howe, and Irving, 1; Cross and Ransome, 1; Cross and Spencer, 1; Hess, 4; Howe, 2; Lee, H. A., 9; Lindgren, 9.  
 LaPlata, San Juan: Cross and Howe, 2.  
 LaPlata, Telluride: Cross and Purington, 1; Purington, 2.  
 LaPlata: Cross, 35; Girty, 2; Woolsey, 1.

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- Laramie, age of: Bannister, 1; Cross, 18; Knowlton, 3; Stanton, 5; Veach, 1.
- Laramie, Anthracite-Crested Butte: Emmons, Cross, and Eldridge, 1.
- Laramie, Aspen: Spurr, 1.
- Laramie, Boulder: Fenneman, 5.
- Laramie, Castle Rock: Lee, W. T., 5.
- Laramie, coal-bearing: Hills, R. C., 22; Lakes, 149.
- Laramie, correlation: White, 7.
- Laramie, Crested Butte: Warren, E. R., 2.
- Laramie, Cretaceous: Darton, 9, 13.
- Laramie, Denver Basin: Cannon, 10; Cross, 3, 13; Eldridge, 2; Emmons, Cross, and Eldridge, 2.
- Laramie, Durango coal field: Taff, 1.
- Laramie, Durango-Gallup field: Shaler, 1; Shaler and Gardner, 1.
- Laramie, eastern Colorado: Darton, 7.
- Laramie, Elmoro quadrangle: Hills, R. C., 24.
- Laramie, extent and correlation: White, 7.
- Laramie, Florence: Eldridge, 5.
- Laramie, Grand River district: Peale, 12.
- Laramie, Hahns Peak: George and Crawford, 1.
- Laramie, literature: Hay, O. P., 3.
- Laramie, northwestern Colorado: Gale, 8; White, 4, 26.
- Laramie, ore in: Lakes, 135.
- Laramie, origin: Veatch, 1.
- Laramie, paleontology: Hollick, A., 2.
- Laramie, relation to earlier and later formations: White, 25.
- Laramie, Routt County: E. and M. J., 37.
- Laramie, Shoshone group: Cross, 38.
- Laramie, southeastern Colorado: Stevenson, 8; van Diest, 10.
- Laramie, southern Colorado: Stevenson, 6, 10, 12.
- Laramie, Spanish Peaks: Hills, R. C., 25.
- Laramie, Trinidad: Richardson, 2.
- Laramie, Walsenburg quadrangle: Hills, R. C., 15.
- Laramie, western Wyoming and adjacent regions: Peale, 13.
- Laramie, Yampa: Fenneman and Gale, 2.
- Laramie: Eldridge, 1; Endlich, 5; Gale, 7; Gardner, J. H., 1; Geijsbeek, 1; Hayden, 19; Henderson, J., 10; Howe, 2; King, 1; Lakes, 95, 117, 165; Lee, W. T., 11, 12, 14; Martin, 1; Newberry, 12, 16; Peale, 17; Spencer, A. C., 1; Stevenson, 7; Washburne, 5.
- Laurentian: Hague and Emmons, 1; Hunt, 4; King, 1.
- Leadville limestone. *See also* Blue limestone.
- Leadville limestone, Alma: Patton, 10.
- Leadville limestone, Anthracite-Crested Butte: Emmons, Cross, and Eldridge, 1.
- Leadville limestone, Aspen, Carboniferous: Spurr, 1.
- Leadville limestone: Raymond, 11.
- Leadville porphyry, Alma: Patton, 10.
- Lewis shale, Durango-Gallup field: Shaler, 1; Shaler and Gardner, 1.
- Lewis shale, LaPlata Mountains: Cross and Spencer, 1.
- Lewis shale, northwestern Colorado: Gale, 8.
- Lewis shale, Yampa: Fenneman and Gale, 2.
- Lewis shale: Gale, 7; Lee, W. T., 14.
- Lignites, age of: Cope, 12; Stevenson, 3.
- Lignitic, age of Laramie: Bannister, 1.
- Lignitic, Denver: Brooks, 1; Mally, 1.
- Lignitic, eastern Colorado: Hayden, 20.
- Lignitic, Golden: Berthand, 2.
- Lignitic, Marshall mine: Hayden, 15.
- Lignitic, paleontology: Lesquereux, 2.
- Lignitic, Rocky Mountain region: Lesquereux, 5, 6.

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- Lignitic, southeastern division: Endlich, 4.
- Lignitic: Cross, 19; Dana, J. D., 2; Endlich, 1; Hayden, 14, 18, 19, 22; Holmes, 2; Marvine, 1; Peale, 5, 7; West, H. T., 1.
- Lodore group: Berkey, 1; Emmons, 32; Gale, 8; Hague and Emmons, 1; King, 1; Powell, 3; Weeks, 15.
- Loup Fork: Cope, 54, 60.
- Loup River beds: Hayden, 19.
- Lower Carboniferous, Aspen: Henrich, 2; Newberry, 16. *See* Brown limestone.
- Lower quartzite, Cambrian: Emmons, 9.
- Lower quartzite, Leadville: Emmons and Irving, 1.
- Lykins, Boulder district: Butters, 2; Fenneman, 5.
- Lykins: Henderson, J., 10; Martin, 1.
- Lyons, Boulder and Larimer counties: Butters, 2; Fenneman, 5; Martin, 1.
- Lyons, stains on: Tillman, 1.
- Lyons: Henderson, J., 10.
- Mancos, Book Cliffs: Richardson, 1.
- Mancos, Cretaceous section: Stanton, 2.
- Mancos, Durango coal field: Taff, 1.
- Mancos, Durango-Gallup field: Shaler, 1; Shaler and Gardner, 1.
- Mancos, Engineer Mountain: Cross, 41.
- Mancos, Grand Mesa: Lee, W. T., 13.
- Mancos, Hahns Peak: George and Crawford, 1.
- Mancos, LaPlata Mountains: Cross, Spencer, and Purington, 1.
- Mancos, Ouray district: Irving, 2.
- Mancos, northwestern Colorado: Gale, 8; Henderson, J., 13.
- Mancos, Placerville: Hillebrand and Ransome, 1.
- Mancos, Rico quadrangle: Cross and Ransome, 1; Holmes, 4.
- Mancos, Rio Blanco: Gale, 2, 5.
- Mancos, Telluride: Cross and Purington, 1; Purington, 2.
- Mancos, Yampa: Fenneman and Gale, 2.
- Mancos: Cross, Howe, and Irving, 1; Gale, 7; Gardner, J. H., 1; Howe, 2; Lee, W. T., 9, 10, 13, 14.
- Manitou, eastern Colorado: Darton, 7.
- Manitou, Ordovician: Darton, 9, 13.
- Manitou, Pikes Peak district: Cross, 24.
- Manitou: Darton, 14; Girty, 2.
- Mariposite sandstone: Hess, 4.
- Maroon, Anthracite-Crested Butte: Emmons, Cross, and Eldridge, 1.
- Maroon, Aspen: Spurr, 1.
- Maroon, Grand Mesa: Lee, W. T., 13.
- Maroon, Tenmile: Emmons, 27.
- Maroon: Girty, 2.
- Mauvaises Terres or White River: Marsh, 1.
- McElmp, Engineer Mountain: Cross, 41.
- McElmo, LaPlata Mountains: Cross, Spencer, and Purington, 1.
- McElmo, Montrose County: Emmons, W. H., 3.
- McElmo, Ouray district: Irving, 2.
- McElmo, Placerville: Hess, 4; Hillebrand and Ransome, 1, 2.
- McElmo, Rico quadrangle: Cross and Ransome, 1; Cross and Spencer, 1.
- McElmo, San Juan: Cross and Howe, 1.
- McElmo, Telluride: Cross and Purington, 1.
- McElmo: Cross, 35; Cross, Howe, and Irving, 1; Howe, 2; Lee, H. A., 9.
- Mesaverde, Book Cliffs: Richardson, 1.
- Mesaverde, Durango coal field: Shaler, 1; Shaler and Gardner, 1; Taff, 1.
- Mesaverde, Grand Mesa: Lee, W. T., 13.
- Mesaverde, LaPlata mountains: Cross, Spencer, and Purington, 1.
- Mesaverde, northwestern Colorado: Gale, 8; Henderson, 13.
- Mesaverde, Rio Blanco oil field: Gale, 5.
- Mesaverde, Yampa: Fenneman and Gale, 2.

## GEOLOGICAL FORMATIONS DESCRIBED—Continued

- Mesaverde: Cross, Howe, and Irving, 1; Gale, 7; Gardner, J. H., 1; Hayden, 22; Holmes, 2; Howe, 2; Lee, W. T., 10, 13, 14.
- Middle Park formation: Cross, 18, 19; Eldridge, 6.
- Millsap, Carboniferous-Triassic: Darton, 9, 13.
- Millsap, eastern Colorado: Darton, 7.
- Millsap (?), Manitou region: Finlay, G. I., 3.
- Millsap, Pikes Peak district: Cross, 24.
- Millsap, Pueblo quadrangle: Gilbert, 7.
- Mississippian, map showing: Willis, 2.
- Mississippian: Girty, 2.
- Molas, Engineer Mountain: Cross, 41.
- Molas, Needle Mountains: Cross, Howe, Irving, and Emmons, 1.
- Molas, Ouray district: Irving, 2.
- Molas, Silverton: Cross, Howe, and Ransome, 1.
- Molas: Cross, Howe, and Irving, 1; Girty, 2; Howe, 2.
- Montana, Anthracite-Crested Butte: Emmons, Cross, and Eldridge, 1.
- Montana, Aspen, (Pierre): Spurr, 1.
- Montana, Cretaceous: Lakes, 157.
- Montana, Denver Basin: Emmons, Cross, and Eldridge, 2.
- Montana, Florence oil field: Eldridge, 5.
- Montana, ore in: Lakes, 135.
- Montana, Pikes Peak district: Cross, 24.
- Montana, Rabbit Ears region: Grout, Worcester, and Henderson, 1.
- Montana, usage of term: Eldridge, 1.
- Montana: Lakes, 99, 117, 165.
- Monument Creek, age of: Darton, 12.
- Monument Creek, Castle Rock: Lee, W. T., 5; Richardson, 4.
- Monument Creek, Denver district: Cannon, 10; Eldridge, 2; Emmons, Cross, and Eldridge, 2.
- Monument Creek, Palmer Lake: Cannon, 9.
- Monument Creek, Tertiary: Darton, 13.
- Monument Creek: Hayden, 6, 12, 14, 18, 19; Lakes, 6; Peale, 7; Richardson, 4.
- Morrison, Apishapa quadrangle: Stose, 1.
- Morrison, Boulder district: Fenneman, 5.
- Morrison, Canon City: Stanton, 3.
- Morrison, Castle Rock: Lee, W. T., 5.
- Morrison, correlation, Comanche and Dakota: Stanton, 3.
- Morrison, Cretaceous: Darton, 9, 13.
- Morrison, Denver Basin: Emmons, Cross, and Eldridge, 2.
- Morrison, eastern Colorado: Darton, 7.
- Morrison, fresh water beds: Henderson, J., 10.
- Morrison, Front Range: Stanton, 3.
- Morrison, Perry Park: Kruger, Hamilton, and Enriquez, 1.
- Morrison, Pikes Peak district: Cross, 24.
- Morrison, Pueblo: Gilbert, 7.
- Morrison, Purgatory River: Stanton, 3.
- Morrison, Rabbit Ears region: Grout, Worcester, and Henderson, 1.
- Morrison, Rio Cimarron: Stanton, 3.
- Morrison (?), southeastern Colorado: Lee, W. T., 4.
- Morrison, Walsenburg quadrangle: Hills, R. C., 15.
- Morrison: Cross, 22; Girty, 2; Henning, 3; Lee, W. T., 6; Martin, 1.
- Needle Mountain group, Engineer Mountain: Cross, 41.
- Niagara: Hayden, 12; Peale, 5.
- Niobrara, Anthracite-Crested Butte: Emmons, Cross, and Eldridge, 1.
- Niobrara, Apishapa quadrangle: Stose, 1.
- Niobrara, Arkansas Valley: Gilbert, 5.
- Niobrara, Boulder district: Fenneman, 5.
- Niobrara, Castle Rock: Lee, W. T., 5.
- Niobrara, Colorado Range: Hague and Emmons, 1.
- Niobrara, Cretaceous: Darton, 9.
- Niobrara, Denver Basin: Cannon, 10; Emmons, Cross, and Eldridge, 2.



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- Niobrara, eastern Colorado: Darton, 7.  
 Niobrara, Florence: Eldridge, 5.  
 Niobrara, ore in: Lakes, 135.  
 Niobrara, Pueblo quadrangle: Gilbert, 7.  
 Niobrara, Rabbit Ears region: Grout, Worcester, and Henderson, 1.  
 Niobrara, San Juan: Comstock, 7.  
 Niobrara, southeastern Colorado: Stevenson, 8.  
 Niobrara, southern Colorado: Stevenson, 12.  
 Niobrara, Tertiary: Hague and Emmons, 1; King, 1.  
 Niobrara, Yampa: Fenneman and Gale, 1.  
 Niobrara: Eldridge, 1; Geijsbeek, 1; Hayden, 6, 19; Henderson, J., 10; King, 1; Lakes, 99, 117, 165, 204; Logan, 1; Martin, 1; Marvine, 1; Peale, 7; Ries, 1; Spencer, 1.  
 Nussbaum, Apishapa quadrangle: Stose, 1.  
 Nussbaum, Elmore quadrangle: Hills, R. C., 24.  
 Nussbaum, Nepesta quadrangle: Fisher, 1.  
 Nussbaum, Pueblo quadrangle: Gilbert, 7.  
 Nussbaum, Spanish Peaks: Hills, R. C., 25.  
 Nussbaum, Tertiary: Darton, 13.  
 Nussbaum, Walsenburg: Hills, R. C., 15.  
 Ogalalla: Darton, 9, 13; Osborn, 4.  
 Ogden Quartzite: Berkey, 1; Emmons, 32; Gale, 8; Hague and Emmons, 1; King, 1; Weeks, 15.  
 Ohio, Anthracite-Crested Butte: Emmons, Cross, and Eldridge, 1.  
 Ohio Creek, Grand Mesa: Lee, W. T., 10, 13.  
 Ouray, Engineer Mountain: Cross, 41.  
 Ouray, Monarch-Tomichi: Crawford, 4.  
 Ouray, Needle Mountains: Cross, Howe, Irving, and Emmons, 1; Hay, O. P., 2.  
 Ouray, Ouray district: Irving, 2.  
 Ouray, Rico Mountains: Cross and Ransome, 1; Cross and Spencer, 1.  
 Ouray, Silverton: Cross, Howe, and Spencer, 1.  
 Ouray: Cross, Howe, and Irving, 1; Girty, 2; Howe, 2; Kindle, 1; Purington, 3.  
 Paonia, Grand Mesa: Lee, W. T., 13.  
 Parting quartzite, Alma: Patton, 10.  
 Parting quartzite, Aspen: Henrich, 2.  
 Parting quartzite, Cambrian: Emmons, 9.  
 Parting quartzite, Leadville: Emmons and Irving, 1.  
 Parting quartzite, Tenmile district: Emmons, 27.  
 Parting quartzite: Cross, 33; Girty, 2; Spencer, A. C., 2.  
 Pawnee Creek: Osborn, 4.  
 Pennsylvanian, Monarch-Tomichi district: Crawford, 4.  
 Pennsylvanian: Girty, 2; Henderson, J., 10.  
 Permo-Carboniferous, San Juan: Read, 4.  
 Permo-Carboniferous: Butters, 2; King, 1; Peale, 7, 8.  
 Pictured Cliff group: Holmes, 2.  
 Pierre, Arkansas Valley: Gilbert, 5.  
 Pierre, Boulder district: Fenneman, 5.  
 Pierre, Canon City: Washburne, 5.  
 Pierre, Castle Rock: Lee, W. T., 5.  
 Pierre, Cretaceous: Darton, 9, 13.  
 Pierre, Denver Basin: Cannon, 10; Emmons, Cross, and Eldridge, 2.  
 Pierre, eastern Colorado: Darton, 7.  
 Pierre, Elmore quadrangle: Hills, R. C., 24.  
 Pierre, Florence: Eldridge, 5.  
 Pierre, Nepesta quadrangle: Fisher, 1.  
 Pierre, Pueblo quadrangle: Gilbert, 7.  
 Pierre, Rabbit Ears region: Grout, Worcester, and Henderson, 1.  
 Pierre, San Juan: Comstock, 7.  
 Pierre, southeastern Colorado: Stevenson, 8.  
 Pierre, southern Colorado: Stevenson, 12.  
 Pierre, Spanish Peaks: Hills, R. C., 25.

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- Pierre, Tepee Buttes: Gilbert and Gulliver, 1.
- Pierre, Walsenburg quadrangle: Hills, R. C., 15.
- Pierre: Eldridge, 1; Geijsbeek, 1; Hayden, 6, 19; Henderson, J., 9, 10; King, 1; Martin, 1; Marvine, 1; Peale, 7; Richardson, 2; Ries, 1; Spencer, A. C., 1; White, 4.
- Platte series: Cragin, 3.
- Pliocene (?), Apishapa quadrangle: Stose, 1.
- Point of Rocks: Powell, 3.
- Poison Canyon, Cretaceous (?): Darton, 13.
- Poison Canyon, Spanish Peaks: Hills, R. C., 25.
- Poison Canyon, Trinidad: Richardson, 2.
- Poison Canyon, Walsenburg: Hills, R. C., 15.
- Poison Canyon: Osborn, 2, 4.
- Post-Laramie, coal-bearing, northwestern Colorado: Gale, 8.
- Post-Laramie deposits of Colorado: Cross, 18, 19; Hills, 17, 21.
- Potosi rhyolite, Needle Mountains: Cross, Howe, Irving, and Emmons, 1.
- Potosi rhyolite, Telluride: Cross and Purington, 1.
- Potosi rhyolite: Cross, 32; Cross and Purington, 1; Finch, 1; Howe, 2; Lee, H. A., 9; Purington, 3.
- Potosi volcanics, Creede: Emmons and Larsen, 1.
- Potsdam, contact with Archean: Hovey, 1.
- Potsdam: Endlich, 5; Hayden, 14; King, 1; Peale, 5, 7, 8.
- Pre-Cambrian. *See* Pre-Cambrian in general index.
- Primordial period: Endlich, 5; Peale, 7.
- Prozoic: Endlich, 5.
- Puerco, Durango-Gallup field: Shaler, 1.
- Puerco, southern Colorado: Scott, W. B., 3; Smith, J. H., 1.
- Puerco: Cope, 54, 60, 63; Howe, 2; Newberry, 17.
- Purgatoire, Apishapa quadrangle: Stose, 1.
- Quartzite, Monarch-Tomichi: Crawford, 4.
- Quebec: Hague and Emmons, 1; King, 1; Peale, 5, 7.
- Red Beds, Carboniferous and Triassic (?): Darton, 13.
- Red Beds, Castle Rock: Lee, W. T., 5.
- Red Beds, Colorado Range: Butters, 2; Hague and Emmons, 1.
- Red Beds, Denver Basin: Cannon, 10.
- Red Beds, Durango quadrangle: Emmons, W. H., 1.
- Red Beds, eastern slope: Butters, 2; Hayden, 24.
- Red Beds, Florence: Eldridge, 5.
- Red Beds, Fremont County: Lindgren, 8.
- Red Beds, Grand River district: Peale, 12.
- Red Beds, Hahns Peak: Gale, 1; George and Crawford, 1.
- Red Beds, North Park: Hague and Emmons, 1.
- Red Beds, Perry Park: Cannon, 7.
- Red Beds, Rabbit Ears region: Grout, Worcester, and Henderson, 1.
- Red Beds, San Miguel County: Spaulding, 1.
- Red Beds, southwestern Colorado: Cross and Howe, 1; S—, C., 1.
- Red Beds, Triassic, Aspen: Spurr, 1.
- Red Beds, western Colorado: Cross, 35.
- Red Beds: Endlich, 5; Gale, 2; Girty, 2; Hayden, 5, 6, 14, 19, 22; Henderson, J., 11; King, 1; Lakes, 95; Marvine, 1; Peale, 8.
- Red Creek Quartzite: Powell, 3.
- Red Wall: Powell, 3.
- Rhyolite, Castle Rock district: Lee, W. T., 5.
- Rhyolite, Needle Mountains: Cross, Howe, and Irving, 1.
- Rico, Engineer Mountain: Cross, 41.

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- Rico, Needle Mountains: Cross, Howe, Irving, and Emmons, 1.
- Rico, Rico quadrangle: Cross and Ransome, 1; Cross and Spencer, 1; Ransome, 2.
- Rico, Silverton: Cross and Howe, 1.
- Rico: Butters, 2; Girty, 2.
- River beds: Peale, 7.
- Robinson: Emmons, 27.
- Rollins sandstone, Grand Mesa: Lee, W. T., 13.
- Ruby, Anthracite-Crested Butte: Emmons, Cross, and Eldridge, 1.
- Ruby, Grand Mesa: Lee, W. T., 13.
- Ruby (Wasatch): Lee, W. T., 10.
- Salt Wells: Powell, 3.
- San Juan, Telluride: Cross and Purington, 1.
- San Juan breccias: Purington, 3, 7.
- San Juan tuff, Needle Mountains: Cross, Howe, Irving, and Emmons, 1.
- San Juan tuff, Ouray district: Irving, 2.
- San Juan tuff: Cross, Howe, and Irving, 1; Howe, 2; Cross, 32; Finch, 1; Lakes, 50; Lay, 1; Lee, H. A., 9; Spaulding, 1; Winslow, 2.
- San Miguel, Camp Bird mine: Titcomb, 1.
- San Miguel, Telluride: Cross, 30; Cross and Purington, 1; Purington, 2.
- San Miguel: Cross, 30; Hills, R. C., 11, 17; Lakes, 50; Lay, 1; Lee, H. A., 9; Spaulding, 1.
- Santa Fe: San Luis Valley, Siebenthal, 4.
- Saratogan: Cross and Ransome, 1.
- Sauranodon beds: White, 19.
- Saurian sandstone: Denver Basin, Cannon, 10.
- Sawatch, Anthracite-Crested Butte: Emmons, Cross, and Eldridge, 1.
- Sawatch, Tenmile quadrangle: Emmons, 27.
- Sawatch: Girty, 2.
- Sawatch quartzite, Monarch-Tomichi: Crawford, 4.
- Section, Aguilar coal field: Lakes, 117.
- Section, Alma, South Mosquito Gulch: Patton, 10.
- Section, Animas canyon: Hawn, L., 1; Lakes, 223.
- Section, Arkansas River to New Mexico line: Butters, 2.
- Section, Arkins: Butters, 2.
- Section, Aspen region: Lakes, 2, 21.
- Section, Bear Canyon: Butters, 2.
- Section, Bellvue: Butters, 2.
- Section, Book Cliffs: Lakes, 96.
- Section, Boulder: Butters, 2; Fenneman, 5; Lakes, 124.
- Section, Box Elder Canyon: Butters, 2.
- Section, Carter Lake: Butters, 2.
- Section, Chicago Park, Gunnison County: Mg. Rept., 11.
- Section, Colorado: Lakes, 21.
- Section, Colorado-New Mexico boundary: Cope, 54.
- Section, Colorado Springs: Butters, 2.
- Section, Colorado-Wyoming boundary: Darton, 15.
- Section, Cottonwood Creek: Butters, 2.
- Section, Deer Creek: Butters, 2.
- Section, Eagle County, Battle Mountain: Tilden, 1.
- Section, Florence: Lakes, 86; Newberry, 15.
- Section, foot hills, eastern Colorado: Lakes, 3, 93, 111.
- Section, Front Range: Lakes, 125.
- Section, Glenwood Springs: Newberry, 11.
- Section, Grand River near Grand Junction, Book Cliffs, Debeque: Lakes, 104.
- Section, Gunnison County, Chicago Park: Mg. Rept., 11.
- Section, Hahns Peak: Parsons and Liddell, 1.
- Section, Heygood Canyon: Butters, 2.
- Section, Huerfano County: Lakes, 147.
- Section, Indian Creek: Butters, 2.
- Section, LaPlata Mountains: Lakes, 87.
- Section, Larimer County, North Table Mountain: Butters, 2.
- Section, Las Animas River: Clayton, 1.

## GEOLOGICAL FORMATIONS DESCRIBED—Continued

- Section, Leadville: Ameling, 2; Miller, G. W., 1; Robbins, F., 1.
- Section, Leadville, cut by Yak tunnel: Arrington and Stotesbury; 1.
- Section, Lefthand Creek: Butters, 2.
- Section, Leyden coal mine: Mg. Rept., 35.
- Section, Lyons: Butters, 2.
- Section, Masonville: Butters, 2.
- Section, Morrison: Butters, 2.
- Section, Nepesta quadrangle: Fisher, 1.
- Section, one hundred and second meridian: Hay, R., 1.
- Section, Owl Canyon: Butters, 2.
- Section, Park County: Lakes, 5.
- Section, Perry Park: Butters, 2.
- Section, Pictou: Meade, 1.
- Section, Pitkin County: Lakes, 5.
- Section, Purgatory Canyon: Stevenson, 8.
- Section, Ralston Creek: Butters, 2.
- Section, Rio Blanco County: Lakes, 97.
- Section, Rocky Mountains, generalized: Ball, J., 1.
- Section, St. Charles River: Hawn, L., 1.
- Section, Sand Creek: Butters, 2.
- Section, South Park: Lakes, 115; Mg. Rev., 5.
- Section, South Table Mountain: Butters, 2.
- Section, southwestern Colorado: Lakes, 107.
- Section, Sterling: Lakes, 112.
- Section, Stout: Butters, 2.
- Section, Trinidad coal field: Stevenson, 8.
- Section, Turkey Creek: Butters, 2.
- Sedimentary rocks, San Juan: Snedaker, 1.
- Shinarump: Cross, 36; Gale, 8; Girty, 2; Powell, 3.
- Shoshone group: Cross, 38; Richardson, 2.
- Silverton series: Cross, 32; Finch, 1; Purington, 3, 7.
- Stratigraphy: Hayden, 14, 28; Lesquereux, 2.
- Sulphur Creek: Powell, 3.
- Sundance, eastern Colorado: Butters, 2; Darton, 7.
- Sundance, marine beds: Henderson, J., 10.
- Telluride, Engineer Mountain: Cross, 41.
- Telluride, Silverton: Cross and Howe, 1.
- Telluride: Cross, Howe, and Irving, 1; Finch, 1; Hills, R. C., 11, 17.
- Tensleep: Butters, 2; Darton, 9, 13; Henderson, J., 11.
- Tepee zone, Pierre shale: Gilbert, 5, 7.
- Timpas, Apishapa quadrangle: Stose, 1.
- Timpas, Arkansas Valley: Gilbert, 5.
- Timpas, Cretaceous: Darton, 13.
- Timpas, Elmore quadrangle: Hills, R. C., 24.
- Timpas, Nepesta quadrangle: Fisher, 1.
- Timpas, Spanish Peaks: Hills, R. C., 25.
- Timpas, Walsenburg quadrangle: Hills, R. C., 15.
- Timpas: Logan, 1.
- Titanotherium beds: Hatcher, 2.
- Tomichi limestone: Crawford, 4.
- Trenton: Endlich, 5; Girty, 2; Wolcott, 3.
- Trinidad, Elmore quadrangle: Hills, R. C., 24.
- Trinidad, Spanish Peaks: Hills, R. C., 25.
- Trinidad, Walsenburg: Hills, R. C., 25.
- Trinidad: Lakes, 156, 158; Richardson, 2; Washburne, 5.
- Trout Creek, Yampa: Fenneman and Gale, 2.
- Twenty Mile sandstone, Yampa: Fenneman and Gale, 2.
- Uinta formation, Tertiary: Clark, W. B., 1; Cope, 60; Gale, 2, 3, 5, 6, 7, 8; King, 1; Osborn, 4; Scott, W. B., 2; Smith, J. H., 1; White, 4, 26b.

## GEOLOGICAL FORMATIONS DESCRIBED—Continued

- Uinta Quartzite, Pre-Cambrian: Berkey, 1; Emmons, 32; Gale, 8; Girty, 2; Hague and Emmons, 1; King, 1; Powell, 3; Weeks, 15; White, 26b.
- Uncompahgre, Engineer Mountain: Cross, 41.
- Uncompahgre, Needle Mountains: Cross, Howe, Irving, and Emmons, 1.
- Uncompahgre, Ouray district: Irving, 2.
- Uncompahgre, Rico Mountains: Cross and Ransome, 1.
- Uncompahgre, Silverton: Cross, Howe, and Ransome, 1.
- Uncompahgre: Emmons, W. H., 2; Cross, Howe, and Irving, 1.
- Upper Coal-Measures: Berkey, 1; Emmons, 2, 9, 32; Hague and Emmons, 1; King, 1; Weeks, 15.
- Vallecito, Needle Mountains: Cross, Howe, Irving, and Emmons, 1.
- Vermejo: Lee, 12.
- Vermilion Cliff group: Gale, 8; Girty, 2; Powell, 3.
- Vermilion Creek, Routt County: Gale, 4; Hague and Emmons, 1; King, 1.
- Wasatch, Durango-Gallup field: Shaler, 1.
- Wasatch, Grand Mesa: Lee, W. T., 13.
- Wasatch, Grand River district: Peale, 12.
- Wasatch limestone: Berkey, 1; Emmons, 32; Hague and Emmons, 1; King, 1; Powell, 3; Weeks, 15.
- Wasatch, northwestern Colorado: Gale, 8; Henderson, J., 13; Smith, J. H., 1; White, 4, 26.
- Wasatch, Rio Blanco oil field: Gale, 5.
- Wasatch, Routt County: Gale, 4.
- Wasatch, San Juan and Yampa districts: Cope, 15.
- Wasatch: Cope, 54; Endlich, 5; Girty, 2; Hayden, 27; Lee, W. T., 10; Scott, W. B., 3.
- Washakie: Osborn, 4; Scott, W. B., 2.
- Wash Beds, Leadville: Emmons and Irving, 1.
- Weber, Anthracite-Crested Butte: Emmons, Cross, and Eldridge, 1.
- Weber, Aspen, Carboniferous: Spurr, 1.
- Weber, Tenmile district: Emmons, 27.
- Weber: Girty, 2.
- Weber grits, Alma: Patton, 10.
- Weber grits, Carboniferous: Emmons, 9.
- Weber quartzite, northwestern Colorado: Berkey, 1; Emmons, 32; Gale, 8; Hague and Emmons, 1; King, 1; Powell, 3; Weeks, 15; White, 4.
- Weber shales, Carboniferous: Emmons, 9.
- White Cliff, Rio Blanco oil field: Gale, 5.
- White Cliff: Gale, 8; Girty, 2; Powell, 3.
- White limestone, Alma district: Patton, 10.
- White limestone, Cambrian: Emmons, 9.
- White limestone, Leadville: Emmons and Irving, 1.
- White porphyry, Alma: Patton, 10.
- White porphyry, Leadville: Emmons and Irving, 1.
- White River: Cope, 54, 60; Darton, 9, 13; Hayden, 19; King, 1; Matthew, 1a; Osborn, 1, 4; Peale, 7.
- Wind River: Hayden, 19; Hills, 10, 13, 19; Osborn, 1, 2, 4; Osborn and Wortman, 3; Scott, W. B., 2.
- Wyoming, Breckenridge: Ransome, 5.
- Wyoming, Carboniferous-Triassic: Darton, 9.
- Wyoming, Chugwater, eastern Colorado: Darton, 7.
- Wyoming Conglomerate: Hague and Emmons, 1; King, 1. *See* Bishop Mountain Conglomerate.
- Wyoming, Denver Basin: Emmons, Cross, and Eldridge, 2.
- Wyoming, Fountain, eastern Colorado: Darton, 7.
- Wyoming, Front Range, Red Beds: Butters, 2; Fenneman, 6.
- Wyoming, lower: Butters, 2.

**GEOLOGICAL FORMATIONS DESCRIBED—Continued**

Wyoming, lower, Perry Park: Kruger, Hamilton, and Enriquez, 1.	Wyoming: Girty, 2. Yampa: Girty, 2; Powell, 3.
Wyoming, Tenmile district: Emmons, 27.	Yule, Anthracite-Crested Butte: Em- mons, Cross, and Eldridge, 1.
Wyoming, upper: Butters, 2.	Yule, Tenmile quadrangle: Emmons, 27.
Wyoming, upper, Perry Park: Kruger, Hamilton, and Enriquez, 1.	Yule: Girty, 2.