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BIBLIOGRAPHY AND INDEX
OF THE
PUBLICATIONS OF THE UNITED STATES GEOLOGICAL SURVEY RELATING TO GROUND WATER

BY
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BIBLIOGRAPHY AND INDEX OF THE PUBLICATIONS OF THE UNITED STATES GEOLOGICAL SURVEY RELATING TO GROUND WATER.

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INTRODUCTION.

WORK DONE BY THE UNITED STATES GEOLOGICAL SURVEY.

The work of the United States Geological Survey includes investigations of the natural waters of the United States, both those which occur above and those which occur below the land surface. The waters below the surface are known as subsurface, subterranean, underground, or ground waters. According to the present usage of the Geological Survey the waters that occur below the surface in zones of saturation are called ground waters, and it is to these waters that the present bibliography and index applies.

In 1885 the Geological Survey published a paper by T. C. Chamberlin entitled "The requisite and qualifying conditions of artesian wells." But aside from this well-known paper it published practically nothing on the subject of ground water in the first 10 years of its existence except "Lists and analyses of mineral springs," by A. C. Peale; annual statistics on the production of mineral water, by A. C. Peale; and papers on the waters of Yellowstone National Park, by W. H. Weed and by F. A. Gooch and J. E. Whitfield.

In 1888, by act of Congress, the Geological Survey undertook irrigation investigations in the arid regions of the United States, which soon led to the problem of irrigation with artesian water. The Eleventh Annual Report, published in 1891, contains a section on artesian irrigation on the Great Plains and records of wells in 7 western States. In the Thirteenth Annual Report, published in 1893, there is a discussion by F. H. Newell on the occurrence and quantity of ground water in arid regions, with statistics on artesian wells and irrigation with well water in the United States. The need for more detailed information on the ground waters of the country became evident and resulted in a number of investigations. The first report dealing exclusively with eastern conditions was a paper by W J McGee, entitled "Potable waters of eastern United States," published in 1893. Systematic and extensive survey of the ground-

water resources of the United States was begun in 1903, when the division of hydrology was organized, with N. H. Darton in charge of the work in the West and M. L. Fuller in charge of the work in the East. Since that time the ground-water survey has been carried steadily forward, and the methods of investigation have gradually been refined and standardized. From 1908 to 1912 the division was in charge of W. C. Mendenhall, and since 1912 it has been in charge of O. E. Meinzer.

Altogether a vast amount of accurate information of both scientific and economic value has been accumulated on the ground waters of the United States. A total of 609 papers have been published (in 454 volumes) which contain information on the subject of ground water, of which 307 papers (in 171 volumes) relate primarily to this subject. Many of these papers include detailed maps showing the ground-water conditions in specific areas. In addition to the published reports there is a great quantity of data as yet unpublished on file at the Geological Survey.

Although the aggregate of the work done on the ground-water resources of the United States is great and includes some work in every State, yet the country is so large that extensive regions are still very inadequately covered, and the amount of work that remains to be done is indefinitely great.

SCOPE OF THE BIBLIOGRAPHY AND INDEX.

The present bibliography includes all publications prepared in whole or in part by the Geological Survey that treat any phase of the subject of ground water or any subject directly applicable to ground water, such as windmills, pumps, and other lifting devices, methods of water analysis, and methods of measuring the flow of water. It has a more limited scope than the bibliography by M. L. Fuller on ground-water papers published by the Geological Survey, 1879–1904 (Water-Supply Paper 120), in that it does not include papers that touch on the subject only incidentally. As in Fuller's bibliography, there is a brief abstract of each paper that is listed with special reference to its content on ground water. For papers dealing chiefly with other subjects page references are given to the parts relating to ground water.

The 454 volumes listed in this bibliography, comprise 207 water-supply papers, 22 annual reports, 4 monographs, 11 professional papers, 47 bulletins, 33 reports on mineral resources, 118 geologic folios, and 12 reports not published by the United States Geological Survey. Of the 171 volumes relating primarily to ground water 123 are water-supply papers.

The index includes only subjects relating to ground water. The areas covered by the reports are given under the individual States.

For more definite information on reports covering specific localities the index map (Pl. I, in pocket) should be consulted. The map does not, however, show all reports listed in the bibliography but only such as cover specific areas more or less thoroughly. Under the individual States in the index are given references to many reports which it was not practicable to show on the map.

HOW TO OBTAIN THE PAPERS LISTED IN THE BIBLIOGRAPHY.

The publications of the United States Geological Survey listed in this bibliography, except the monographs and geologic folios, can be obtained free as long as the Survey's stock lasts. An asterisk (*) indicates that this stock has been exhausted. Many of the publications so marked may, however, be purchased at the prices indicated from the Superintendent of Documents, Washington, D. C. If there is an asterisk and no price is given the publication can no longer be obtained from the Government.

Monographs can be purchased at the prices indicated from the Superintendent of Documents, Washington, D. C.

Geologic folios can be purchased at the prices indicated, from the Director, United States Geological Survey, Washington, D. C., except those marked with an asterisk (*), which are out of stock and can no longer be obtained from the Government. Those priced at 5 cents have been more or less damaged by smoke or water.

The publications of the Geological Survey can be consulted in most of the principal libraries of the country and also at the branch offices of the Geological Survey in a number of the larger cities.

The cooperative reports listed on pages 45–47 are not published by the United States Geological Survey and are not distributed by the Federal Government.

BIBLIOGRAPHY.

An asterisk (*) indicates that the publication referred to is out of stock (see section headed "How to obtain the papers listed in the bibliography," p. 3).

WATER-SUPPLY PAPERS.

*1. Pumping water for irrigation, by H. M. Wilson. 1896. 57 pp., 9 pls.

Describes various pumps and curious and antiquated lifting devices used chiefly in India and Egypt; also engines, windmills, water wheels, and other devices for producing power for lifting water; also storage reservoirs for holding pumped water until needed for irrigation.

*2. Irrigation near Phoenix, Ariz., by A. P. Davis. 1897. 98 pp., 31 pls. 15c.

Describes chiefly irrigation with surface waters but also contains some well data and discusses briefly the quantity of underflow (pp. 86–92). For more comprehensive reports on the region see Water-Supply Papers 136 and 375–B.

*4. A reconnaissance in southeastern Washington, by I. C. Russell. 1897. 96 pp., 7 pls. 15c.

Describes the geography and geology, gives some well data, and discusses the artesian conditions and the irrigation prospects of an indefinite region in southeastern Washington.

*5. Irrigation practice on the Great Plains, by E. B. Cowgill. 1897. 39 pp., 12 pls.

Contains directions for constructing reservoirs for pumped well water (pp. 14–19).

*6. Underground waters of southwestern Kansas, by Erasmus Haworth. 1897. 65 pp., 12 pls. 15c.

Covers a rectangular area comprising all of Meade County, nearly all of Seward, Haskell, and Gray counties, and parts of Ford and Finney counties. Describes the physiography, geology, water supplies, and irrigation developments of the area. Discusses the waters of the Dakota sandstone and of the Tertiary formations.

*7. Seepage water of northern Utah, by Samuel Fortier. 1897. 50 pp., 3 pls. 10c.

Describes the water supplies of Cache Valley and the seepage waters in Ogden Valley. Discusses the loss of ground water by evaporation, transpiration, and seepage.

*8. Windmills for irrigation, by E. C. Murphy. 1897. 49 pp., 8 pls. 10c.

Describes the apparatus and methods used in making tests of windmills during the summer of 1896 in the vicinity of Garden City, Kans. Gives the results of these tests and draws conclusions.

*9. Irrigation near Greeley, Colo., by David Boyd. 1897. 90 pp., 21 pls.

Describes the water supplies, irrigation developments, and agricultural practice in the valley of Cache la Poudre River, a tributary of the South Platte. Discusses the legislative and judicial control of the water supplies (including ground water), the source and disposal of ground water, the use of ground water, the effects of alkali waters on soil, pumping of ground water, and artesian wells.

*10. Irrigation in Mesilla Valley, N. Mex., by F. C. Barker. 1898. 51 pp., 11 pls. 10c.

Describes primitive methods of irrigation and agriculture employed in the valley of the Rio Grande between Fort Seldon, N. Mex., and El Paso, Tex. Describes pumping for irrigation with windmills and steam engines.

*12. Underground waters of a portion of southeastern Nebraska, by N. H. Darton. 1898. 56 pp., 21 pls.

Covers an area that includes Lancaster, Seward, York, Fillmore, Hamilton-Clay, Hall, Adams, Buffalo, Kearney, and Phelps counties and parts of Saline, Gosper, and Dawson counties. Describes the physiography, geology, and ground waters of the area and discusses briefly the prospects for obtaining water from deep-seated formations.

*13. Irrigation systems in Texas, by W. F. Hutson. 1898. 68 pp., 10 pls.

Describes and discusses irrigation works and projects in Texas, considering both surface and ground waters as sources of supply. Superseded by Water-Supply Paper 71.

*14. New tests of certain pumps and water lifts used in irrigation, by O. P. Hood. 1898. 91 pp., 1 pl. 10c.

Discusses the mechanics and efficiency of reciprocating and of water lifts of various other types.

*17. Irrigation near Bakersfield, Cal., by C. E. Grunsky. 1898. 96 pp., 16 pls.

Describes irrigation with surface water and contains also a statement on early pumping from wells for irrigation at Lindsay, San Joaquin Valley, Cal. (p. 94).

*18. Irrigation near Fresno, Cal., by C. E. Grunsky. 1898. 94 pp., 14 pls. 10c.

Describes irrigation with surface water and contains a brief discussion of the loss of water from Kings River and Fresno Canal and its effect on the water table (pp. 71–79).

*20. Experiments with windmills, by T. O. Perry. 1899. 97 pp., 12 pls. 15c.

Gives data and discusses results of numerous laboratory experiments with wind-driven wheels. Describes the apparatus and methods used.

*21. Wells of northern Indiana, by Frank Leverett. 1899. 82 pp., 2 pls.

Gives well data by counties for the northern part of the State and contains two maps of Indiana and western Ohio, showing the character and depth of the glacial drift and its relation to water supplies.

*25. Water resources of the State of New York, Part II, by G. W. Rafter. 1899. pp. 105–200, 12 pls. 15c.

Discusses chiefly water storage and power and canal projects but also contains data in regard to seepage from canals (pp. 159–160, 173–178) and quantities of water yielded by the sand deposits of Long Island (pp. 191–198).

*26. Wells of southern Indiana, by Frank Leverett. 1899. 64 pp. 5c.

Gives well data by counties for the southern part of the State.

27. (See p. 47.)

28. (See p. 47.)

*29. Wells and windmills in Nebraska, by E. H. Barbour. 1899. 85 pp., 27 pls. 15c.

Describes home-made windmills, various other water-lifting devices, salt-water wells, and blowing and freezing wells; gives well data and promiscuous information in regard to ground water.

*30. Water resources of the Lower Peninsula of Michigan, by A. C. Lane. 1899. 97 pp., 7 pls.

Discusses the use of water and the effects of quality with respect to the various uses. Describes the geology and ground-water conditions in the area covered.

*31. Lower Michigan mineral waters, by A. C. Lane. 1899. 97 pp., 4 pls. 10c.

Discusses the economic value of mineral waters and the interpretation and classification of water analyses; contains analyses of water from various geologic formations and generalizations in regard to them; also discusses sanitary conditions of drinking waters.

*34. Geology and water resources of a portion of southeastern South Dakota, by J. E. Todd. 1900. 34 pp., 10 pls. 10c.

Covers a rectangular area that includes parts of Turner, Hutchinson, Bonhomme, Yankton, and Clay counties. Describes the geology and the surface and ground waters with special reference to the artesian water in the Dakota sandstone. Contains a geologic map and maps showing depths to bed rock, depths to the water at the base of the till, and depths to the artesian water. This area is also covered by Geologic Folios 96 and 97.

36. (See pp. 47–48.)

37. (See p. 48.)

39. (See p. 48.)

*41. The windmill; its efficiency and economic use, Part I, by E. C. Murphy. 1901. 72 pp., 14 pls. 5c.

See under Water-Supply Paper 42.

*42. The windmill; its efficiency and economic use, Part II, by E. C. Murphy. 1901. pp. 77–147, 2 pls. 10c.

Nos. 41 and 42 give a classification of windmills, describe early experiments with windmills and tests made by the writer, describe the apparatus and methods used in making these tests, and discuss the results of the tests.

*45. Water storage on Cache Creek, Cal., by A. E. Chandler. 1901. 48 pp., 10 pls. 15c.

Contains data in regard to wells and irrigation with ground water near Woodland, Sacramento Valley, Cal. (pp. 23–26).

50. Operations at river stations, 1900, Part IV. 1901. 96 pp.

Includes a section on "Computations of seepage in Colorado," pp. 299–306, in which are given data on seepage, chiefly seepage into rivers, and conclusions as to the relation of irrigation to seepage.

52. Operations at river stations, 1900, Part VI. 1901. pp. 495–575.

Contains a section entitled "Construction of wells in southern California" (pp. 497–498).

*53. Geology and water resources of Nez Perce County, Idaho, Part I, by I. C. Russell. 1901. 86 pp., 10 pls. 10c.

See under Water-Supply Paper 54.

*54. Geology and water resources of Nez Perce County, Idaho, Part II, by I. C. Russell. 1901. Pages 87–141.

Nos. 53 and 54 relate to an indefinite area in western Idaho including a part of Nez Perce County and to adjacent areas of Washington and Oregon. They describe briefly the physiography, geology, soils, water supplies, and mineral resources of the region.

The information on ground water, all of which is given in Water-Supply Paper 54, includes meager data with recommendations in regard to springs, "horizontal wells" or infiltration tunnels, and artesian wells. No. 54 also contains a short bibliography of artesian waters.

55. Geology and water resources of a portion of Yakima County, Wash., by G. O. Smith. 1901. 68 pp., 7 pls. 10c.

Describes the geography, geology, and surface and ground waters of an area comprising about 50 square miles in the vicinity of Yakima. Discusses the artesian basins in detail and gives well data. The part of this area west of Yakima is also covered by Geologic Folio 86, which contains a more detailed geologic map and also contains a discussion of the artesian and other ground-water conditions.

*57. Preliminary list of deep borings in the United States, Part I (Alabama–Montana), by N. H. Darton. 1902. 60 pp. 5c.

See under Water-Supply Papers 61 and 149.

*58. Storage of water on Kings River, Cal., by J. B. Lippincott. 1902. 101 pp., 32 pls. 15c.

Contains discussions of ground water for irrigation and of alkali conditions and includes records of 854 wells (pp. 22–24, 53–88). Contains map (Pl. V) showing locations of wells listed in the table.

*59. Development and application of water near San Bernardino, Colton, and Riverside, Cal., Part I, by J. B. Lippincott. 1902. 95 pp., 11 pls.

See under Water-Supply Paper 60.

*60. Development and application of water near San Bernardino, Colton, and Riverside, Cal., Part II, by J. B. Lippincott. 1902. pp. 96–141. 15c.

Nos. 59 and 60 give descriptions of pumping plants and of ground-water supplies. No. 60 contains records of 412 wells in Redlands quadrangle and of 478 wells in San Bernardino quadrangle. No. 59 includes a topographic map showing contours of water table, areas of artesian flow in 1897 and 1900, irrigated areas and locations of wells for which records are given.

*61. Preliminary list of deep borings in the United States, Part II (Nebraska–Wyoming), by N. H. Darton. 1902. 67 pp. 5c.

Nos. 57 and 61 contain tabular data in regard to wells and other borings more than 400 feet deep. They give information as to the depths, diameters, and yields of the wells, the head, temperature, and quality of the water, and purposes for which the boring was done. The data are given by States, and the States are arranged alphabetically. The States from Alabama to Montana, inclusive, are covered by No. 57, and the States from Nebraska to Wyoming, inclusive, by No. 61. A revised edition for all States was published in 1905 as Water-Supply Paper 149.

62. Hydrography of the southern Appalachian Mountain region, Part I, by H. A. Pressey. 1902. 95 pp., 25 pls.

Contains a paragraph on large springs in the Watauga River basin (p. 82).

*66. Operations at river stations, 1901, Part II. 1902. 188 pp. 10c.

Contains a brief description of the springs, flowing wells, and ground-water conditions in the vicinity of Carrizo Springs, Tex. Includes an analysis of the Carrizo Springs mineral water (p. 63).

*67. The motions of underground waters, by C. S. Slichter. 1902. 106 pp., 8 pls. 15c.

Discusses the origin, depth, and amount of ground waters; the porosity and permeability of rocks and soils; the causes, rates, and laws of the movements of ground water, the surficial and deep zones of circulation, the recovery of water by wells, and the shape and position of the water table. Gives simple methods of measuring the yield of flowing wells. Describes artesian wells at Savannah, Ga.

70. Geology and water resources of the Patrick and Goshen Hole quadrangles, in eastern Wyoming and western Nebraska, by G. I. Adams. 1902. 50 pp., 11 pls. 15c.

Describes the geology and contains some information on springs and wells in these quadrangles.

71. Irrigation systems of Texas, by T. U. Taylor. 1902. 137 pp., 9 pls. 10c.

Discusses the principal irrigation systems, giving special attention to the irrigation of rice. Contains data in regard to numerous springs and artesian and other wells.

75. Report of progress of stream measurements for the calendar year 1901, by F. H. Newell. 1903. 246 pp., 13 pls.

Contains, on pages 204 and 205, records of discharge of 33 flowing wells in Moxie Valley, near Yakima, Wash.

77. The water resources of Molokai, Hawaiian Islands, by Waldemar Lindgren. 1903. 62 pp., 4 pls. 10c.

Describes the geography, geology, and water resources of the island of Molokai, including springs and wells. Describes the occurrence of water in lava and its quality as affected by the sea. Contains a discussion and estimate of the quantity of ground water available for irrigation.

*78. Preliminary report on artesian basins in southwestern Idaho and southeastern Oregon, by I. C. Russell. 1903. 53 pp., 2 pls. 5c.

Describes briefly the geology of a part of the Snake River plains in Canyon and Owyhee counties, Idaho, and Malheur and Harney counties, Oreg. Discusses the conditions on which artesian flow depends and describes springs and wells in the Lewis, Otis, Harney, and Whitehorse artesian basins. Describes artesian wells in alluvial deposits and discusses the size of drill holes, the methods of casing, the preservation of well records, and the importance of laws to govern the use of artesian waters. Gives a list of publications bearing on artesian waters.

84. Report of progress of stream measurements for the calendar year 1902, by F. H. Newell, Part III, Western Mississippi River and western Gulf drainage. 1903. 200 pp.

Contains a brief description of Barton Springs, near Austin, Tex. (pp. 152, 153). See also Water-Supply Papers 132 and 174.

85. (See p. 48.)

89. Water resources of the Salinas Valley, Cal., by Homer Hamlin. 1904. 91 pp., 12 pls. 15c.

Includes data in regard to ground water and pumping plants and a map showing the area of artesian flow and the areas irrigated with water obtained from wells.

90. Geology and water resources of part of the lower James River valley, S. Dak., by J. E. Todd and C. M. Hall. 1904. 47 pp., 23 pls. 35c.

Describes the geology, surface waters, and artesian and other ground waters of a rectangular area comprising Davison, Hanson, Sanborn, Beadle, and Miner counties and parts of Kingsbury, Jerauld, Aurora, and McCook counties. Includes a geologic map of the area and maps showing areas of artesian flow, depths to Dakota sandstone, head of artesian water, depths to bed rock, and depths to water at the base of the till. The area is also described in Geologic Folios 99, 100, 113, and 114.

91. The natural features and economic development of the Sandusky, Maumee, Muskingum, and Miami drainage areas in Ohio, by B. H. and M. S. Flynn. 1904. 130 pp. 10c.

Includes descriptions of numerous public water supplies obtained from wells and springs (pp. 58–124).

98. (See p. 48.)

*99. Report of progress of stream measurements for the calendar year 1903. Part III, Western Mississippi River and western Gulf of Mexico drainage, by J. C. Hoyt. 1904. 422 pp., 1 pl. 25c.

Contains on pages 235–237 a description and discharge record of Meramec Spring, near Meramec, Mo. See also Water-Supply Papers 131, 173, and 209. Contains, on page 321, the discharge records of 16 springs in Oklahoma.

101. Underground waters of southern Louisiana, by G. D. Harris, with discussions of their uses for water supplies and for rice irrigation, by M. L. Fuller. 1904. 98 pp., 11 pls. 20c.

Describes the geology and ground-water conditions of the area, gives data in regard to artesian wells, and outlines methods of well drilling, pumping, and rice irrigation. Includes 23 analyses of ground water.

102. Contributions to the hydrology of eastern United States, 1903; M. L. Fuller, geologist in charge. 1904. 522 pp. 30c.

Contains a list of publications of the United States Geological Survey relating to ground water, with special reference to springs. Gives an account of the organization and of the work of the division of hydrology (ground water). Contains notes on wells, springs, and general water resources, arranged by counties, in the following States:

Maine, by W. S. Bayley. Contains records of 224 wells and 130 springs and analyses of 3 well waters and of 3 spring waters (pp. 27–55).

New Hampshire, by J. M. Boutwell. Contains records of 35 wells and 107 springs and analyses of 9 well waters and 12 spring waters (pp. 56–72).

Vermont, by G. H. Perkins. Contains a table giving data in regard to the water supplies of Vermont towns, contains also 111 partial analyses of waters from wells, springs, streams, and lakes and records of 44 wells and 90 springs (pp. 73–93).

Massachusetts, by W. O. Crosby and Laurence LaForge. Contains records of 162 wells and 40 springs and analyses of 7 well waters and 17 spring waters (pp. 94–118).

Rhode Island, by W. O. Crosby. Contains records of 24 wells and 12 springs and analyses of 2 well waters and 3 spring waters (pp. 120–126).

Connecticut, by H. E. Gregory. Contains records of about 470 wells and 84 springs and analyses of 19 well waters and 19 spring waters (pp. 127–168).

New York, by F. B. Weeks. Contains records of 371 wells and 228 springs and analyses of 14 well waters (pp. 169–206).

Georgia, by S. W. McCallie. Contains a table giving data in regard to water supplies of cities and villages in the State. Contains records of 90 wells and 100 springs and a table giving the yields of 14 springs. Includes analyses of water from 1 well and 1 spring (pp. 207–237).

Florida, by M. L. Fuller. Contains records of 242 wells and 43 springs and analyses of 11 well waters and 9 spring waters. Gives the yields of some very large springs (pp. 238–275).

Alabama, by E. A. Smith. Contains notes on numerous wells by counties (pp. 276–331).

Mississippi, by L. C. Johnson and E. C. Eckel. Contains records of 265 wells (pp. 332–357).

Tennessee, by L. C. Glenn. Contains records of 78 wells (pp. 357–367).

102. Contributions to the hydrology of eastern United States, 1903—Continued.

Kentucky, by L. C. Glenn. Contains records of 16 wells and 2 analyses of artesian water (pp. 369–373).

Arkansas, by A. H. Purdue. Contains records of 96 wells and 33 springs and analyses of 3 well waters (pp. 374–388).

Missouri, by E. M. Shepard. Contains records of 105 wells and 112 springs and analyses of 13 well waters and 34 spring waters (pp. 389–440). Includes brief papers on wells of Joplin and vicinity, by W. S. T. Smith (pp. 404–409), and the water supply of Livingston County, by R. Hawkins (pp. 410–416).

Minnesota, by C. W. Hall. Contains records of about 800 shallow wells, about 200 deep wells, and 76 springs; includes an analysis of water from a spring at Mankato (pp. 441–488).

Lower Michigan, by W. F. Cooper. Contains records of 198 wells and 31 springs and analyses of 11 well waters and 15 spring waters (pp. 489–512).

104. The underground waters of Gila Valley, Ariz., by W. T. Lee. 1904. 71 pp., 5 pls. 10c.

Describes the topography and geology of the Gila Valley between The Buttes, 12 miles east of Florence, and the mouth of Salt River; treats of the source, amount, and quality of water in the valley fill and the methods of recovering this water; includes well data and water analyses.

105. The water powers of Texas, by T. U. Taylor. 1904. 116 pp., 17 pls.

Gives data regarding Hackberry Springs (2 miles northwest of Toyah Lake) and Santa Rosa Spring, near Santa Lucia, in Pecos County (pp. 14, 15).

106. Water resources of the Philadelphia district, by Florence Bascom. 1904. 75 pp., 4 pls. 5c.

Describes the geology and the streams, springs, wells, and public water supplies of an area comprising the Germantown, Norristown, Philadelphia, and Chester quadrangles. Discusses artesian conditions and prospects in the crystalline rocks, the Triassic formations, and the formations of the Coastal Plain. The area is also described in Geologic Folio 162, which contains considerable information on ground water.

108. Quality of water in the Susquehanna River drainage basin, by M. O. Leighton, with an introductory chapter on physiographic features, by G. B. Hollister. 1904. 76 pp., 4 pls. 15c.

Contains analyses of ground waters and discussions of the quality of these waters.

110. Contributions to the hydrology of eastern United States, 1904; M. L. Fuller, geologist in charge. 1905. 211 pp., 5 pls. 10c.

Contains the reports in the following list. Most of those covering specific areas do not include any maps.

Description of underflow meter used in measuring the velocity and direction of underground water, by Charles S. Slichter (pp. 17–31).

The California or "stovepipe" method of well construction, by Charles S. Slichter (pp. 32–36).

Approximate methods of measuring the yield of flowing wells, by Charles S. Slichter (pp. 37–42).

Corrections necessary in accurate determinations of flow from vertical well casings, from notes furnished by A. N. Talbot (pp. 43–44).

Experiment relating to problems of well contamination at Quitman, Ga., by S. W. McCallie (pp. 45–54).

The new artesian water supply at Ithaca, N. Y., by F. L. Whitney (pp. 55–64).

Drilled wells of the Triassic area of the Connecticut Valley, by W. H. C. Pynchon (pp. 65–94).

Triassic rocks of the Connecticut Valley as a source of water supply, by M. L. Fuller (pp. 95–112).

Spring system of the Decaturville dome, Camden County, Mo., by E. M. Shepard (pp. 113–125).

Water resources of the Fort Ticonderoga quadrangle, Vt. and N. Y., by T. N. Dale (pp. 126–129).

Water resources of the Taconic quadrangle, N. Y., Mass., and Vt., by F. B. Taylor (pp. 130–133).

Water resources of the Watkins Glen quadrangle, N. Y., by R. S. Tarr (pp. 134–140). The ground-water conditions of this quadrangle are described more fully in Geologic Folio 169.

Water resources of the central and southwestern highlands of New Jersey, by Laurence La Forge (pp. 141–155).

110. Contributions to the hydrology of eastern United States, 1904—Continued.

Water resources of the Chambersburg and Mercersburg quadrangles, Pa., by G. W. Stose (pp. 156–158). The ground-water conditions of these quadrangles are described more fully in Geologic Folio 170.

Water resources of the Curwensville, Patton, Ebensburg, and Barnesboro quadrangles, Pa., by F. G. Clapp (pp. 159–163). The ground-water conditions of the Barnesboro and Patton quadrangles are also briefly described in Geologic Folio 189, and those of the Ebensburg quadrangle in Geologic Folio 133. The ground waters of the Curwensville, Barnesboro, and Patton quadrangles are also briefly described in Bulletin 531-d.

Water resources of the Elders Ridge quadrangle, Pa., by R. W. Stone (pp. 164, 165). The ground-water conditions of this quadrangle are also described in Bulletin 256 (with geologic map) and in Geologic Folio 123.

Water resources of the Waynesburg quadrangle, Pa., by R. W. Stone (pp. 166, 167). The ground-water conditions of this quadrangle are also described in Geologic Folio 121.

Water resources of the Accident and Grantsville quadrangles, Md., by G. C. Martin (pp. 168–170). The ground-water conditions of these quadrangles are also described in Geologic Folio 160.

Water resources of the Frostburg and Flintstone quadrangles, Md. and W. Va., by G. C. Martin (pp. 171–173).

Water resources of Cowee and Pisgah quadrangles, N. C., by H. S. Gale (pp. 174–176). The ground-water conditions of the Pisgah quadrangle are described also in Geologic Folio 147.

Water resources of the Middleboro-Harlan region of southeastern Kentucky, by G. H. Ashley (pp. 177–178).

Summary of the water supply of the Ozark region in northern Arkansas, by G. I. Adams (pp. 179–182).

Notes on the hydrology of Cuba, by M. L. Fuller (pp. 183–200).

111. Preliminary report on the underground waters of Washington, by Henry Landes. 1905. 85 pp., 1 pl. 10c.

Describes briefly by counties the deep wells, springs, and municipal water supplies of the State.

*112. Underflow tests in the drainage basin of Los Angeles River, by Homer Hamlin. 1905. 55 pp., 7 pls. 5c.

Describes in detail the methods and apparatus used in making measurements of the rate and volume of underflow and gives the results of underflow tests made in the valley of Los Angeles River in 1902 and 1903.

113. The disposal of strawboard and oil-well wastes, by R. L. Sackett and Isaiah Bowman. 1905. 52 pp., 4 pls. 5c.

The second part of this paper describes briefly the geology and ground waters of the region about Marion, Ind., and the contamination of rock wells and streams by waste oil and brine.

*114. Underground waters of eastern United States; M. L. Fuller, geologist in charge. 1905. 285 pp., 18 pls. 25c.

Contains a paper entitled "Occurrence of underground waters," by M. L. Fuller, in which are discussed the source, quantity, and temperature of ground waters, the permeability and storage capacity of water-bearing formations, the recovery of water through springs and wells, the conditions that produce artesian flow and the general ground-water conditions in eastern United States (pp. 18–40).

Contains also brief reports on ground water in the following States, each of which includes a bibliography:

Maine, by W. S. Bayley (pp. 41–56). Includes analyses of 35 spring waters.

New Hampshire, by M. L. Fuller (pp. 57–59).

Vermont, by G. H. Perkins (pp. 60–67). Includes a sketch map of the State, showing water-bearing deposits and analyses of 3 spring waters.

Massachusetts and Rhode Island, by W. O. Crosby (pp. 68–75).

Connecticut, by H. E. Gregory (pp. 76–81). Includes a sketch map of the State, showing the rock formations.

New York, by F. B. Weeks (pp. 82–92). Includes a sketch map of the State, showing the rock formations.

New Jersey, by G. N. Knapp (pp. 93–103). Includes a sketch map of the State, showing the ground-water provinces, and 5 geologic sections, showing the water-bearing formations of the Coastal Plain.

Pennsylvania, by M. L. Fuller (pp. 104–110). Includes a sketch map of the State, showing the main geologic systems.

*114. Underground waters of eastern United States—Continued.

Delaware, by N. H. Darton (pp. 111–113). Includes geologic sections showing water-bearing formations.

Maryland, by N. H. Darton and M. L. Fuller (pp. 114–123). Includes geologic sections showing water-bearing formations.

District of Columbia, by N. H. Darton and M. L. Fuller (pp. 124–126). Includes geologic sections showing water-bearing formations.

Virginia, by N. H. Darton and M. L. Fuller (pp. 127–135). Includes geologic sections showing water-bearing formations.

North Carolina, by M. L. Fuller (pp. 136–139).

South Carolina, by L. C. Glenn (pp. 140–152). Includes geologic sections showing water-bearing formations.

Georgia, by S. W. McCallie (pp. 153–158). Includes a sketch map of the State, showing areas of artesian flow.

Florida, by M. L. Fuller (pp. 159–163).

Alabama, by E. A. Smith (pp. 164–170). Includes a sketch map of the State, showing ground-water conditions.

Mississippi, by L. C. Johnson (pp. 171–178). Includes a geologic sketch map of the State.

Louisiana and southern Arkansas, by A. C. Veatch (pp. 179–187). Includes sketch maps showing ground-water conditions.

Northern Arkansas, by A. H. Purdue (pp. 188–197). Includes a geologic sketch map and sections of the area.

Tennessee and Kentucky, by L. C. Glenn (pp. 198–208).

Missouri, by E. M. Shepard (pp. 209–219). Includes sketch maps showing the geology and and ground-water conditions of the State.

Iowa, by W. H. Norton (pp. 220–225).

Minnesota, by C. W. Hall (pp. 226–232).

Wisconsin, Northern Peninsula of Michigan and the portion of Illinois north of the Carboniferous deposits, by Alfred R. Schultz (pp. 232–241). Includes a sketch map of the region showing the outcrops of the "Potsdam" and St. Peter sandstones.

Lower Michigan, compiled from report by A. C. Lane (pp. 242–247). Includes a geologic sketch map and a section of the area.

Illinois, by Frank Leverett (pp. 248–257). Includes a geologic sketch map and a section of the State.

Indiana, by Frank Leverett (pp. 258–264). Includes sketch maps of the State, showing the geology, the depth of the glacial drift, and the relation of wells to depths of drift.

Ohio, by Frank Leverett (pp. 265–270). Includes sketch maps of the State showing the geology, the depths of the glacial drift, and the relation of wells to the depth of drift.

West Virginia, by M. L. Fuller (pp. 271–272).

116. Water problems of Santa Barbara, Cal., by J. B. Lippincott. 1905. 99 pp., 8 pls. 10c.

Deals chiefly with surface waters but contains data on deep city wells and collecting tunnel and analysis of tunnel water (pp. 33–42, 57).

118. Geology and water resources of a portion of east-central Washington, by F. C. Calkins. 1905. 96 pp., 4 pls. 5c.

Describes briefly the geology of the Columbia Plains and the Kittitas Valley, gives information in regard to the streams, springs, and wells, and discusses the artesian prospects.

120. Bibliographic review and index of papers relating to underground waters published by the United States Geological Survey, 1879–1904, by M. L. Fuller. 1905. 128 pp. 10c.

Lists all papers that contain information on ground water. Gives brief abstracts of these papers in regard to ground water, with page references for papers dealing mainly with other subjects. Contains an index of the papers listed in so far as they relate to ground water.

*122. Relation of the law to underground waters, by D. W. Johnson. 1905. 55 pp. 5c.

Defines and classifies ground waters and gives common-law rules and State legislative acts relating to their use.

*123. Geology and underground water conditions of the Jornada del Muerto, N. Mex., by C. R. Keyes. 1905. 42 pp., 9 pls. 15c.

This report is superseded by Water-Supply Paper 188.

127. (See p. 48.)

130. (See p. 48.)

131. Report of progress of stream measurements for the calendar year 1904, Part VIII, Platte, Kansas, Meramec, Arkansas, and Red River drainages, by M. C. Hinderlider and J. C. Hoyt. 1905.

Contains, on pages 123–125, a description and discharge record for Meramec Spring, near Meramec, Mo. See also Water-Supply Papers 99, 173, and 209.

132. Report of progress of stream measurements for the calendar year 1904, Part IX, Western Gulf of Mexico and Rio Grande drainages, by T. U. Taylor and J. C. Hoyt. 1905. 132 pp., 2 pls.

Contains descriptions of the following springs in Texas: Lipan and Kickapoo springs near San Angelo (p. 43); Barton and Mormon springs, near Austin (pp. 44 and 45); Toyah Spring, at Toyahville (pp. 121 and 122); and Santa Rosa Spring near Fort Stockton (p. 122). (See also p. 127.)

133. (See p. 48.)

135. (See p. 48.)

136. Underground waters of Salt River valley, Ariz., by W. T. Lee. 1905. 196 pp., 23 pls. 25c.

Describes the geology of that part of the valley in which Phoenix and Mesa are situated. Gives well records and discusses the quantity and chemical character of the ground waters, the duty of water for irrigation, and the cost of pumping. Contains maps showing the geology and the position of the water table.

*137. Development of underground waters in the eastern coastal-plain region of southern California, by W. C. Mendenhall. 1905. 140 pp., 7 pls. 35c.

Describes the ground-water conditions and the irrigation systems in the Anaheim and Santa Ana quadrangles in Los Angeles and Orange counties. Discusses the effects of development and drought on ground-water levels, contains records of 2,765 wells, and includes maps showing original areas of artesian flow, areas of artesian flow in 1904, ground-water levels, irrigated lands, and locations of wells and pumping plants. Includes also a general map of the "Valley of southern California," showing contours of the water table, original areas of artesian flow, and areas of artesian flow in 1904.

*138. Development of underground waters in the central coastal-plain region of southern California, by W. C. Mendenhall. 1905. 162 pp., 5 pls. 25c. See under Water-Supply Paper 139.

Describes the ground-water conditions and the irrigation systems in the Downey and Las Bolas quadrangles, in Los Angeles and Orange counties. Discusses the effects of development and drought on ground-water levels, contains records of 3,323 wells, and includes maps showing original areas of artesian flow, areas of artesian flow in 1904, ground-water levels, irrigated lands, and locations of wells and pumping plants. Contains also the general map mentioned under Water-Supply Paper 137.

*139. Development of underground waters in the western coastal-plain region of southern California, by W. C. Mendenhall. 1905. 105 pp., 8 pls. 25c.

Describes the ground-water conditions and the irrigation systems in the Santa Monica and Redondo quadrangles, in Los Angeles County. Discusses the effects of development and drought on changes in ground-water levels, contains records of 2,097 wells, and includes maps showing original areas of artesian flow, areas of artesian flow in 1904, ground-water levels, irrigated lands, and locations of wells and pumping plants. Contains also the general map mentioned under Water-Supply Paper 137.

140. Field measurements of the rate of movement of underground waters, by C. S. Slichter. 1905. 122 pp., 15 pls. 15c.

Discusses the capacity of sand to transmit water, describes the under-flow meter devised by the author and laboratory experiments on the flow of water through sands and gravels, and gives results of measurements of underflow in Rio Hondo, San Gabriel, and Mohave River valleys, Cal., and on Long Island, N. Y. Discusses specific capacities of wells, gives results of tests of wells and pumping plants in the Rio Grande valley in New Mexico and Texas and the Arkansas Valley in Kansas, and describes the "stovepipe" method of well construction.

141. Observations on the ground waters of the Rio Grande valley, by C. S. Slichter. 1905. 83 pp., 5 pls. 5c.

Describes investigation of the underflow in the valley of the Rio Grande in Texas and New Mexico, gives details of tests of pumping plants near El Paso, Tex., in Mesilla Valley, N. Mex., and near Berino, N. Mex., and gives analyses of well waters and data concerning wells at and near El Paso.

*142. The hydrology of San Bernardino Valley, Cal., by W. C. Mendenhall. 1905. 124 pp., 12 pls. 25c.

Describes the source, circulation, quantity, temperature, and chemical character of the ground water, gives records of 890 wells, and contains maps showing changes in areas of artesian flow and in ground-water levels, and locations of wells, pumping plants, and irrigated lands. This paper, like Nos. 137, 138, 139, and 219, also contains a general map of the "Valley of southern California," showing contours of water table, original areas of artesian flow, and areas of artesian flow in 1904.

144. The normal distribution of chlorine in the natural waters of New York and New England, by D. D. Jackson. 1905. 31 pp., 5 pls. 10c.

Discusses the content of sodium chloride in coast and inland waters and its value in indicating pollution of streams and wells. Describes the solutions and methods used in determinations of chlorine. Contains maps showing the normal distribution of chlorine in surface and ground waters in the New England States and New York, and tables giving data on which the maps are based.

145. Contributions to the hydrology of eastern United States, 1905; M. L. Fuller, geologist in charge. 1905. 220 pp., 6 pls. 10c.

Contains the reports in the following list. Most of those covering specified areas do not include any maps.

Hydrologic work in eastern United States and publications on ground waters, by M. L. Fuller (pp. 9–29).

The drainage of ponds into drilled wells, by R. E. Horton (pp. 30–39).

Two unusual types of artesian flow, by M. L. Fuller (pp. 40–45).

Construction of so-called fountain and geyser springs, by M. L. Fuller (pp. 46–50).

A convenient gage for determining low artesian heads, by M. L. Fuller (pp. 51, 52).

Water resources of the Catatonk area, N. Y., by E. M. Kindle (pp. 53–57). The ground-water conditions in this quadrangle are also described in Geologic Folio 169.

Water resources of the Pawpaw and Hancock quadrangles, W. Va., Md., and Pa., by G. W. Stose and G. C. Martin (pp. 58–63). The ground-water conditions in these quadrangles are also described in Geologic Folio 179.

Water resources of the Nicholas quadrangle, W. Va., by G. H. Ashley (pp. 64–66).

Water resources of the Mineral Point quadrangle, Wis., by U. S. Grant (pp. 67–73). The ground-water conditions in this quadrangle are also described in Geologic Folio 145.

Water resources of the Joplin district, Mo.–Kans., by W. S. T. Smith (pp. 74–83). The ground-water conditions in this quadrangle are also described in Geologic Folio 148, but analyses are given only in the water-supply paper.

Water resources of the Winslow quadrangle, Ark., by A. H. Purdue (pp. 84–87). The ground-water conditions in this quadrangle are also described in Geologic Folio 154.

Water resources of the contact region between the Paleozoic and Mississippi embayment deposits in northern Arkansas, by A. H. Purdue (pp. 88–119).

Water resources of the Portsmouth-York region, N. H. and Maine, by G. O. Smith (pp. 120, 128).

A ground-water problem in southeastern Michigan, by M. L. Fuller (pp. 129–147).

Water supplies at Waterloo, Iowa, by W. H. Norton (pp. 148–155).

Water supply from glacial gravels near Augusta, Maine, by G. O. Smith (pp. 156–160).

Water-supply from the delta type of sand plain, by W. O. Crosby (pp. 161–178).

Waters of a gravel-filled valley near Tully, N. Y., by G. B. Hollister (pp. 179–184).

Notes on certain hot springs of the southern United States, by W. H. Weed (pp. 185–206).

Notes on certain large springs of the Ozark region, Mo. and Ark., compiled by M. L. Fuller (pp. 207–210).

146. Proceedings of second conference of engineers of the Reclamation Service, with accompanying papers, compiled by F. H. Newell, chief engineer. 1905. 267 pp. 15c.

Contains a brief account of the organization of the hydrographic [water resources] branch, including the division of hydrology [ground water]. Includes the following papers relating to ground water, drilling methods, and pumping for irrigation.

Pumping underground water in southern California, by F. C. Finkle.
Diamond-drill methods, by G. A. Hammond.
Underground waters of southern California, by W. C. Mendenhall.
Cost of power for pumping irrigating water, by H. A. Storrs.

*148. Geology and water resources of Oklahoma, by C. N. Gould. 1905. 178 pp., 22 pls. 20c.

Covers only the original Territory of Oklahoma, not the eastern part of the State. Describes the topography and geology and the streams, springs, and wells; discusses artesian conditions, outlines the water supplies by counties; treats of irrigation from reservoirs, springs, and wells; and gives 154 analyses of well waters and a table containing records of 261 wells. Includes a geologic map.

149. Preliminary list of deep borings in the United States, second edition with additions, by N. H. Darton. 1905. 175 pp. 10c.

Gives location, depth, diameter, yield, water level, and other available information concerning wells 400 feet or more in depth; includes all wells listed in Water-Supply Papers 57 and 61. Contains some data in regard to every State in the United States, arranged alphabetically by States and counties. Mentions principal publications relating to deep borings.

*150. Weir experiments, coefficients, and formulas, by R. E. Horton. 1906. 189 pp., 38 pls. 15c.

Superseded by Water-Supply Paper 200.

*151. Field assay of water, by M. O. Leighton. 1905. 77 pp., 4 pls. 10c.

Describes apparatus, reagents, and methods for rapid field determinations of turbidity, color, iron, hardness, carbonates, bicarbonates, sulphates, chlorides, and calcium in water.

152. A review of the laws forbidding pollution of inland waters in the United States (second edition), by E. B. Goodell. 1905. 149 pp. 10c.

Includes laws relating to wells and springs.

*153. The underflow in Arkansas Valley in western Kansas, by C. S. Slichter. 1906. 90 pp., 3 pls. 15c.

Discusses the origin and extent of the underflow, the fluctuation of ground-water level, and the chemical composition of the water. Gives results of underflow measurements and tests of the rate of evaporation of ground water. Gives summaries and details of pumping tests and analyses of river and well waters.

*154. The geology and water resources of the eastern portion of the Panhandle of Texas, by C. N. Gould. 1906. 64 pp., 15 pls. 10c.

Describes the topography and geology and the streams and springs, discusses the ground-water conditions and irrigation, and gives detailed data by counties. Includes a geologic map.

*155. Fluctuation of the water level in wells, with special reference to Long Island, N. Y., by A. C. Veatch. 1906. 83 pp., 9 pls. 25c.

Gives data on ground-water levels and discusses fluctuations due to rainfall, evaporation, barometric changes, temperature changes in rivers, changes in lake levels, tidal changes, irrigation, the construction of dams, ground-water developments, deforestation, cultivation of the soil, drainage, and other causes.

*157. Underground water in the valleys of Utah Lake and Jordan River, Utah, by G. B. Richardson. 1906. 81 pp., 9 pls. 20c.

Describes the geology and the ground-water conditions and gives numerous well records. Includes maps showing depths to ground water and areas of artesian flow.

158. Preliminary report on the geology and underground waters of the Roswell artesian area, N. Mex., by C. A. Fisher. 1906. 29 pp., 9 pls. 15c.

Describes the geology and ground-water conditions of the artesian basin which extends along Pecos River from Roswell to Lake McMillan. Discusses the area and extent of the artesian basin, the source, quantity, pressure, quality, and conservation of the artesian water, and the irrigation with this water. Gives well records and analyses and contains maps showing the area of artesian flow and the intake area.

159. Summary of the underground-water resources of Mississippi, by A. F. Crider and L. C. Johnson. 1906. 86 pp., 6 pls. 20c.

Describes the geology and the ground-water conditions of the State. Gives notes on wells by counties, records of deep wells, and chemical analyses. Includes a geologic map (Pl. I) and a map showing ground-water conditions (Pl. V).

*160. Underground-water papers, 1906; M. L. Fuller, geologist in charge. 1906. 104 pp., 1 pl.

Gives an account of work done in 1905 and lists of publications relating to ground waters; also contains the following reports:

Significance of the term "artesian," by M. L. Fuller (pp. 9–15).

Representation of wells and springs on maps, by M. L. Fuller (pp. 16–18).

Occurrence of water in crystalline rocks, by E. E. Ellis (pp. 19–28).

Flowing-well districts in the eastern part of the northern peninsula of Michigan, by Frank Leverett (pp. 29–53).

Drainage of wet lands in Arkansas by wells, by A. F. Crider (pp. 54–58).

Total amount of free water in earth's crust, by M. L. Fuller (pp. 59–72).

Use of fluorescein in the study of underground waters, by R. B. Dole (pp. 73–85).

Peculiar mineral waters from crystalline rocks of Georgia, by M. L. Fuller (pp. 86–91).

Problems of water contamination, by Isaiah Bowman (pp. 92–95).

Instances of improvement of water in wells, by M. L. Fuller (pp. 96–100).

*163. Bibliographic review and index of underground-water literature published in the United States in 1905, by M. L. Fuller, F. G. Clapp, and B. L. Johnson. 1906. 130 pp. 15c.

Lists practically all papers that contain any information on ground water; includes brief abstracts with respect to ground water, giving page references for reports dealing mainly with other subjects; contains index with respect to ground-water subjects of papers listed.

*164. Underground waters of Tennessee and Kentucky west of Tennessee River and of an adjacent area in Illinois, by L. C. Glenn. 1906. 173 pp., 7 pls. 25c.

Describes the topography and geology, discusses mineral waters and artesian conditions, and outlines the water resources by counties. Contains maps showing the geology and the head of the artesian water.

168. (See p. 48.)

170. Report of progress of stream measurements for the calendar year 1905, Part VI, Great Lakes and St. Lawrence River drainages, by R. E. Horton, F. W. Hanna, and J. C. Hoyt. 1906. 116 pp., 1 pl.

Contains, on pages 24 and 25, a description and a one-year record of discharge of Reeds Springs, near Albion, Mich.

173. Report of progress of stream measurements for the calendar year 1905, Part IX, Meramec, Arkansas, Red, and lower western Mississippi River drainages, by M. C. Hinderlider, J. M. Giles, and J. C. Hoyt. 1906. 105 pp., 1 pl.

Contains, on page 17, a description and discharge record of Meramec Spring, near Meramec, Mo. See also Water-Supply Papers 99, 131, and 209.

174. Report of progress of stream measurements for the calendar year 1905, Part X, western Gulf of Mexico and Rio Grande drainages, by T. U. Taylor and J. C. Hoyt. 1906. 113 pp., 1 pl.

Describes Bartons Springs, near Austin, Tex. (pp. 30, 31).

177. (See p. 48.)

*181. Geology and water resources of Owens Valley, Cal., by W. T. Lee. 1906. 28 pp., 6 pls. 15c.

Outlines the geology and ground-water conditions, gives well records, and discusses briefly the artesian prospects, the utilization of ground waters by installation of pumping and power plants, reservoir sites, and the significance of undrained lakes as registers of climate. See also Water-Supply Paper 294.

*182. Flowing wells and municipal water supplies in the southern portion of the southern peninsula of Michigan, by Frank Leverett and others. 1906. 292 pp., 5 pls. 50c.

See under Water-Supply Paper 183.

*183. Flowing wells and municipal water supplies in the middle and northern portions of the southern peninsula of Michigan, by Frank Leverett and others. 1907. 393 pp., 5 pls. 50c.

Nos. 182 and 183 describe in general the geology and ground-water conditions of the areas covered and give details by counties concerning flowing wells and municipal supplies. They contain numerous analyses and several geologic and artesian-water maps.

*184. The underflow of the South Platte Valley, by C. S. Slichter and H. C. Wolff. 1906. 42 pp. 5c.

Describes investigations of velocity, direction, and quantity of underflow at Ogalalla, Nebr. gives chemical analyses of the water, and discusses disadvantages of underflow canals or infiltration ditches. Describes also investigations at North Platte, Nebr., and gives suggestions for the construction of small pumping plants.

*188. Water resources of the Rio Grande Valley, N. Mex., and their development, by W. T. Lee. 1907. 59 pp., 10 pls. 20c.

Describes the topography and geology, reservoir sites, and the water resources of the valley. Gives the well data and outlines the ground-water conditions in the Santa Fe, Albuquerque, Belen, Jornada, La Mesa, and Mesilla districts. Discusses the origin, course, and quantity of the ground water, its character, and its utilization by means of wells and infiltration ditches. Contains several analyses of river and well waters and includes a topographic map of Mesilla Valley, showing depths to ground water.

*190. Underground waters of the Coastal Plain of Texas, by T. U. Taylor. 1907. 73 pp., 3 pls. 15c.

Describes the ground waters by counties; gives many well records and analyses; includes a map showing locations of artesian wells.

*191. The geology and water resources of the western portion of the Panhandle of Texas, by C. N. Gould. 1907. 70 pp., 7 pls. 15c.

Describes the topography and geology, the springs, streams, and shallow and deep-seated ground waters, and the utilization of the waters for irrigation. Gives detailed information by counties and includes a geologic map.

*193. The quality of surface waters in Minnesota, by R. B. Dole and F. F. Wesbrook. 1907. 171 pp., 7 pls. 25c.

Relates chiefly to surface waters but contains scattered notes on wells used for public supplies throughout the State, a table of data in regard to these wells (pp. 146–149), and a brief discussion of the comparative value of surface and ground waters (pp. 151–153).

*195. Underground waters of Missouri, their geology and utilization, by E. M. Shepard. 1907. 224 pp., 6 pls. 30c.

Describes the topography and geology of the State and discusses the water supplies by districts and counties; gives statistics of city water supplies, analyses of water, and many well sections and records; includes a map of the State, showing the locations of flowing and nonflowing deep wells.

197. (See p. 48.)

*199. Underground water in Sanpete and central Sevier valleys, Utah, by G. B. Richardson. 1907. 63 pp., 6 pls. 25c.

Describes the geology of the area and the sources, distribution, recovery, and quality of the ground waters; gives detailed descriptions and tabulated data concerning springs and wells; includes a map showing the geology and the depths to ground water.

*200. Weir experiments, coefficients, and formulas, by R. E. Horton. 1907. 195 pp., 38 pls. 35c.

Revision of Water-Supply Paper 150. A treatise on the theory of weirs, with tables and curves based on experiments.

*209. Surface water supply of lower western Mississippi River drainage, 1906, by R. I. Meeker and J. M. Giles. 1907. 79 pp., 2 pls. 15c.

Contains, on pages 21 and 22, a description and discharge record of Meramec Spring, near Méramec, Mo. See also Water-Supply Papers 99, 131, and 173. Contains, on page 74, discharge records of Antelope, Buffalo, and Sulphur springs, near Sulphur, Okla.

212. (See pp. 48–49.)

*213. Surface water supply of California, 1906, by W. B. Clapp, with a section on ground-water levels in southern California, by W. C. Mendenhall. 1907. 219 pp., 4 pls. 25c.

Gives the results of a series of measurements of water levels in wells made during 1904, 1905, and 1906 (pp. 189–205). Wells widely distributed over the various basins of southern California were selected in order that the data would give a basis for conclusions as to the fluctuations of the water table in each of these basins.

214. (See p. 49.)

*215. Geology and water resources of a portion of the Missouri River valley in northeastern Nebraska, by G. E. Condra. 1908. 59 pp., 11 pls. 40c.

Describes the geology, streams, springs, and shallow and artesian wells in Boyd, Knox, Cedar, Dixon, and Dakota counties, and in a part of Holt County; includes maps showing the geology and the artesian-water conditions; contains information on "blowing wells."

*216. Geology and water resources of the Republican River valley and adjacent areas, Nebraska, by G. E. Condra. 1907. 71 pp., 13 pls. 15c.

Describes the geography, geology, and surface and ground waters in Dundy, Hitchcock, Redwillow, Furnas, Harlan, Franklin, Webster, Nuckolls, Thayer, and Jefferson counties; includes a geologic map; contains information on "blowing wells."

*217. Water resources of Beaver Valley, Utah, by W. T. Lee. 1908. 57 pp., 1 pl. 10c.

Describes the geography, geology, streams, springs, and seepage waters of the eastern part of Beaver County. Gives data in regard to deep wells in the Beaver, Greenville, Adamsville, Minersville, and Milford districts, and at railroad stations between Beryl and Lynn. Discusses possible developments of additional irrigation supplies from surface and underground sources. Describes the quality of the water and contains field assays and laboratory analyses.

*219. Ground waters and irrigation enterprises in the foothill belt, southern California, by W. C. Mendenhall. 1908. 180 pp., 9 pls. 50c.

Covers the Pasadena, Pomona, and Cucamonga quadrangles, which lie south of the San Gabriel Mountains between Los Angeles and San Bernardino. Describes the geography, geology, and ground-water conditions, discusses fluctuation in ground-water levels and the conservation of the water supply, and gives the results of measurements of water levels in 1904, 1905, and 1906. Describes irrigation systems and gives records of 1,044 wells. Contains maps showing original areas of artesian flow, areas of artesian flow in 1904, ground-water levels, irrigated lands, and locations of wells and pumping plants. Contains also the general map that is described under Water-Supply Paper 142 and is included with Water-Supply Papers 137, 138, and 139.

*220. Geology and water resources of a portion of south-central Oregon, by G. A. Waring. 1908. 86 pp., 10 pls. 20c.

Describes the geography and geology, and the streams, lakes, and ground waters in the valleys of Goose Lake, Abert Lake, Chewaucan Marsh, Summer Lake, Silver Lake, Christmas Lake, Alkali Lake, and in Warner Valley and several smaller valleys lying chiefly in Lake County. Gives analyses of waters and of alkali in soil and includes a geologic map.

221. Geology and water resources of the Great Falls region, Mont., by C. A. Fisher. 1909. 89 pp., 7 pls. 20c.

Describes the geography and geology, and the surface waters, ground waters, and artesian conditions in an irregular area comprising parts of Cascade, Teton, Fergus, Chouteau, and Lewis and Clark counties. Discusses municipal water supplies, the chemical character of the water, water powers, irrigation, and agriculture; gives analyses of water; includes maps showing the geology, the locations of artesian wells, etc.

*222. Preliminary report on the ground waters of San Joaquin Valley, Cal., by W. C. Mendenhall. 1908. 52 pp., 1 pl. 10c.

Describes the geography, geology, and surface and ground waters of the entire valley. Discusses the origin, circulation, quantity, accessibility, and development of the ground waters; gives notes on the water supplies by counties; and includes a map showing areas of artesian flow and contours of the water table. Superseded by Water-Supply Paper 398.

*223. Underground waters of southern Maine, by F. G. Clapp, with records of deep wells, by W. S. Bayley. 1909. 268 pp., 24 pls. 55c.

Covers an area that lies almost entirely south of the 45th parallel. Describes the physiography, drainage, water-bearing rocks, the quantity, source, disposition, and temperature of the ground waters, and the recovery of water from springs, collecting galleries, tunnels, and wells. Discusses well-drilling methods and costs, municipal water supplies, and the quality of the ground waters. Gives detailed data for each county and records of deep wells. Includes a geologic map of southern Maine, and several diagrams showing the relative composition of waters from different kinds of rock.

*224. Some desert watering places in southeastern California and southwestern Nevada, by W. C. Mendenhall. 1909. 98 pp., 4 pls. 20c.

Describes the physical features of the region, gives hints on desert traveling and on finding water in desert places, describes main routes of travel, and gives detailed descriptions of springs, wells, and other watering places. Includes a map of the region showing roads and watering places.

*225. Ground waters of the Indio region, Cal., with a sketch of the Colorado Desert, by W. C. Mendenhall. 1909. 56 pp., 12 pls. 20c.

Describes the geography, geology, precipitation, and drainage, and the source, character, and development of ground waters in the Colorado Desert, with special reference to the Indio region, which is the name applied to the artesian basin extending from the vicinity of Indio to the Salton Sea. Contains a table of well data and a map of the Indio region showing areas of artesian flow, irrigated lands, and locations of wells and pumping plants.

*227. Geology and underground waters of South Dakota, by N. H. Darton. 1909. 156 pp., 15 pls. 40c.

Describes the geology and water horizons of the State, and discusses by counties the deep wells and well prospects. Gives notes on the construction and management of artesian wells. Includes maps showing the geology and the artesian conditions.

230. (See p. 49.)

*231. Geology and water resources of the Harney Basin region, Oreg., by G. A. Waring. 1909. 93 pp., 5 pls. 25c.

Describes the geography, geology, surface waters, ground waters, and artesian conditions of the Harney, Catlow, Alvord, Whitehorse, and Malheur River basins, which lie chiefly in Harney County. Discusses the conservation of the water supply, the temperatures of ground waters, and well drilling methods and costs. Includes a geologic map of the area.

232. Underground water resources of Connecticut, by H. E. Gregory, with a study of the occurrence of water in crystalline rocks, by E. E. Ellis. 1909. 200 pp., 5 pls. 20c.

Describes the physiography and geology, and the circulation, quantity, temperature, quality, and contamination of the ground water of the State. Discusses the water in the crystalline rocks, the Triassic sandstones and traps, and the glacial drift. Discusses also the methods of constructing wells and the character and use of the springs. Gives records of wells and springs and analyses of ground waters. Includes detailed descriptions of the towns of Warren, North Haven, and Branford Point.

233. Water resources of the Blue Grass region, Ky., by G. C. Matson, with a chapter on the quality of the waters, by Chase Palmer. 1909. 223 pp., 3 pls. 20c.

Describes the physiography, geology, soils, and water resources of an area covering 30 counties in the north-central part of Kentucky. Discusses the source, occurrence, quantity, and recovery of ground water, the artesian conditions, the collection and storage of rain water, and the municipal water supplies, the industrial uses and comparative hardness of the ground waters, and the various medicinal and table waters. Contains detailed data in regard to each county, and numerous well records and water analyses. Includes a geologic map of the area.

*234. Papers on the conservation of water resources. 1909. 96 pp., 2 pls. 15c.

Contains a paper on underground waters, by W. C. Mendenhall.

236. The quality of surface waters in the United States, Part I, Analyses of waters east of the one hundredth meridian, by R. B. Dole. 1909. 123 pp. 10c.

Contains analyses of surface waters exclusively, but includes a description of analytical methods, an outline of methods for expressing analytical results, and a discussion of the probable accuracy of analyses that are applicable to ground waters as well as to surface waters. Describes methods for the following determinations: Turbidity, total suspended solids, total dissolved solids, silica, iron, calcium, magnesium, sodium and potassium, carbonates, bicarbonates, sulphates, chlorine, nitrates, total acidity, and total iron. Also gives directions for the preparation of the necessary solutions.

240. Geology and water resources of the San Luis Valley, Colo., by C. E. Siebenthal. 1910. 128 pp., 13 pls. 25c.

Describes the geography and geology, and the artesian and other waters of the valley. Gives detailed data regarding the springs and the flowing and nonflowing wells, and discusses adequacy and permanence of the artesian supply, variations in flow, and temperature, quality and uses of the water, well-drilling methods and costs, and approximate methods for measuring the discharge of flowing wells. Contains several analyses and a map showing the area of artesian flow, the gas fields, and the area of colored water.

247. (See p. 49.)

250. (See p. 49.)

251. Surface-water supply of the United States, 1907–8, Part XI, California. 1910. 363 pp., 7 pls. 35c.

Contains a section (pp. 338-348) on "fluctuations in ground-water levels in the valley of southern California, by W. C. Mendenhall, in which are given results of measurements of depths to the water level in typical wells during 1907–8. These measurements were a continuation of the work reported in Water-Supply Paper 213. Contains also records of the discharge of springs as follows: Fish Springs, Seeley Springs, and Black Rock Springs, Cal. (p. 333); Bettles Rest Springs, Oreg. (p. 337); Fords Springs, and Olene Springs, Cal. (p. 338).

252. (See p. 49.)

254. The underground waters of north-central Indiana, by S. R. Capps, with a chapter on the chemical character of the waters, by R. B. Dole. 1910. 279 pp., 7 pls. 40c.

Covers the following 19 counties: Boone, Carroll, Cass, Clinton, Elkhart, Fulton, Grant, Hamilton, Hancock, Hendricks, Howard, Kosciusko, Madison, Marion, Marshall, Miami, St. Joseph, Tipton, and Wabash. Describes the geography and geology, the sources, movements, occurrence, and quantity of ground water and the methods of constructing wells and of lifting water. Describes in detail, for each county, the ground-water conditions and the water supplies for cities, villages, and rural districts. Discusses the methods of making water analyses and of expressing the results, the mineral constituents of natural waters, the influence of these constituents upon domestic, industrial, and medicinal uses of the water, and methods of purification. Compares the chemical composition of the waters in different geologic formations in the area and gives numerous analyses and field assays. Contains maps showing the distribution of rock formations and surface deposits, the thickness of the surface deposits, and the areas of artesian flow.

*255. Underground waters for farm use, by M. L. Fuller. 1910. 58 pp., 17 pls. 15c.

Discusses the various kinds of water-bearing formations and the relative safety of supplies from each. Describes different types of springs and their protection from pollution. Discusses dug and drilled wells with respect to their location, yield, cost, and safety from pollution. Discusses also cisterns and combination wells and cisterns.

256. Geology and underground waters of southern Minnesota, by C. W. Hall, O. E. Meinzer, and M. L. Fuller. 1911. 406 pp., 18 pls. 60c.

Covers Bigstone, Swift, Kandiyohi, Meeker, Wright, Anoka, and Washington counties and all of Minnesota south of these counties. Discusses the physiography, geologic history, geologic formations and their water-bearing capacities, artesian conditions, mineral quality of the ground waters, types of wells, methods of finishing wells in sand, methods of drilling in quartzite, "blowing" and "breathing" of wells, freezing of wells and other phenomena due to variations in atmospheric pressure, drainage into wells, and municipal water supplies. Gives detailed data, by counties, concerning the yield, head, and quality of water. Includes numerous analyses of water and maps showing the thickness and character of surface deposits, the depths to granitic rocks and Sioux quartzite, the distribution of water-bearing formations, the areas of artesian flow, and the quality of ground waters; also diagrams showing geographic variations in the quality of the waters from surface deposits and bedrocks.

*257. Well-drilling methods, by Isaiah Bowman. 1911. 139 pp., 4 pls. 15c.

Discusses briefly ground water in the United States and water-bearing formations; gives a history of well drilling in Asia, Europe, and the United States; and describes the various methods of drilling and the machinery used. Discusses the difficulties encountered in sinking wells, the flooding of oil wells, the contamination of water wells and methods of preventing contamination, the capacity of wells and methods of testing capacity, methods of measuring the depth of wells and of detecting the defection of drill holes, and the cost of sinking wells.

*258. Underground-water papers, 1910, by M. L. Fuller, F. G. Clapp, G. C. Matson, Samuel Sanford, and H. C. Wolff. 1911. 123 pp., 2 pls. 15c.

Contains the following papers:

Drainage by wells, by M. L. Fuller (pp. 6–22).

Freezing of wells and related phenomena, by M. L. Fuller (pp. 23–31).

Occurrence and composition of well waters in the slates of Maine, by F. G. Clapp (pp. 32–39).

Occurrence and composition of well waters in the granites of New England, by F. G. Clapp. (pp. 40–47).

Pollution of underground waters in limestone, by G. C. Matson (pp. 48–56).

Protection of shallow wells in sandy deposits, by M. L. Fuller (pp. 57–65).

Composition of mineral springs in Maine, by F. G. Clapp (pp. 66–74).

Saline artesian waters of the Atlantic Coastal Plain, by Samuel Sanford (pp. 75–86).

Magnetic wells, by M. L. Fuller (pp. 87–93).

Underground waters near Manassas, Va., by F. G. Clapp (pp. 94–97).

The utilization of the underflow near St. Francis, Kans., by H. C. Wolff (pp. 98–119).

259. The underground waters of southwestern Ohio, by M. L. Fuller and F. G. Clapp, with a discussion of the chemical character of the waters, by R. B. Dole. 1912. 228 pp., 9 pls. 35c.

Covers the following counties: Adams (western half), Brown, Butler, Clark, Clermont, Clinton, Darke (southern part), Greene, Hamilton, Highland (western half), Miami (southern part), Montgomery, Preble, and Warren. Describes the topography and geology, the water-bearing formations, the source, occurrence, and head of the water, and the municipal water supplies. Gives detailed information in regard to ground-water conditions by counties. Discusses methods of making water analyses and of expressing the results, mineral constituents of natural water and their effects with respect to its use for domestic, industrial, and medicinal purposes, and methods of purifying water. Gives numerous analyses and field assays. Includes maps showing the rock formations, the surface deposits, the thickness of surface deposits, structure contours, and areas of artesian flow. The chapter on the chemical character of the water is nearly the same as the chapter on the same subject in Water-Supply Paper 254.

*260. Preliminary report on the ground waters of Estancia Valley, N. Mex., by O. E. Meinzer. 1910. 33 pp. 5c.

Describes briefly the ground-water conditions in the valley and discusses the use of ground water for irrigation. Includes analyses but no maps. This report is superseded by Water-Supply Paper 275.

271. (See p. 49.)

273. Quality of the water supplies of Kansas, by H. N. Parker, with a preliminary report on stream pollution by mine waters in southeastern Kansas, by E. H. S. Bailey. 1911. 375 pp., 1 pl. 30c.

Describes the geology, ground water, and artesian basins of the State; discusses the significance of mineral constituents and classification of water; gives details concerning quality of ground water by counties and surface water by drainage basins; contains numerous assays and analyses of surface and ground waters; includes a geologic map of the State.

274. Some stream waters of the western United States, with chapters on sediment carried by the Rio Grande and industrial application of water analyses, by Herman Stabler. 1911. 188 pp. 15c.

Contains analyses of surface waters exclusively, but the discussion of industrial application of water analyses which it includes is as pertinent for ground waters as for surface waters. This discussion introduces "reacting coefficients" and "reacting values" and develops formulae for calculating, from analysis, the soap-consuming power of the water, the amount of softening constituents that it requires, the extent of foaming, priming, and corrosion that it will produce in boilers, the amount of scale and the hardness of the scale that it will deposit in boilers, and its quality for irrigation.

275. Geology and water resources of Estancia Valley, N. Mex., with notes on groundwater conditions in adjacent parts of central New Mexico, by O. E. Meinzer. 1911. 89 pp., 14 pls. 20c.

Describes the physiography, geology, soil, and climate of the valley, and discusses the source and disposal of ground water, the water table, artesian conditions, yields of wells, quantity of ground water available, quality of ground water, storage of storm waters, use of ground water for irrigation, types of wells, windmills, cost of pumping, and the alkali problems. Contains tables giving depths to water level in wells and analyses and assays of water from wells and springs. Contains also brief reports on physiography, geology, soil, ground water, and irrigation in Encino and Pinos Wells basins, and notes on wells at Vaughan. Includes maps showing physiography and Pleistocene and Recent geology, depths to the water table, and amount of chlorides and sulphates found in the ground waters.

*276. Geology and underground waters of northeastern Texas, by C. H. Gordon. 1911. 78 pp., 2 pls. 10c.

Covers an area comprising Bowie, Camp, Cass, Delta, Franklin, Hopkins, Lama, Morris, Red River, and Titus counties. Describes the geography and geology, and the artesian and other waters found in the various formations. Describes the water resources by counties. Gives tables of well data and analyses of ground waters and includes a geologic map of the area.

277. Ground water in Juab, Millard, and Iron counties, Utah, by O. E. Meinzer. 1911. 162 pp., 5 pls. 25c.

Describes briefly the physiography, geology, precipitation, soil, vegetation, streams, and industrial development, occurrence of water in bed rock and in unconsolidated sediments, artesian conditions, springs, the quality of ground waters, irrigation, construction of wells, and watering places on routes of travel. Describes in more detail Juab, Round, Little, Sage, Dog, Fernow, and Tintic valleys, the Tintic mining district, Pavant and Lower Beaver valleys, Old River Bed, Cherry Creek, the Drum, and Swasey Wash regions, Sevier Desert, Wah Wah Valley, Sevier Lake bottoms, White, Fish Springs, Snake, Parowan, and Rush Lake valleys and the Escalante Desert. Contains several water analyses.

278. Water resources of Antelope Valley, Cal., by H. R. Johnson. 1911. 92 pp., 7 pls. 25c.

Describes the drainage, climate, and physiography, and the water-bearing and non water-bearing formations of an area in Kern, Los Angeles, and San Bernardino counties. Discusses the artesian and other ground waters, the chemical character of the ground waters, certain fallacies as to the origin and quantity of artesian water, and the present and future development of the underground supplies. Contains a table of well data and a few chemical analyses, and includes a map showing water-bearing and nonwater-bearing formations and the area of artesian flow.

288. (See p. 49.)

289. (See p. 49.)

293. Underground-water resources of Iowa, by W. H. Norton, W. S. Hendrixson, H. E. Simpson, O. E. Meinzer, and others. 1912. 994 pp., 18 pls. 70c.

Describes the topography, climate, and geology of the State, the occurrence of water in the various geologic formations, the artesian phenomena and the yields of artesian wells, the chemical composition of the ground waters, the municipal, domestic and industrial water supplies, and methods of drilling wells. Discusses corrosion of well casings and boilers and the deposition of scale in boilers. Gives a classification of mineral waters. Contains numerous sections of wells and about 400 water analyses. Gives detailed information concerning ground waters and city and village supplies by districts and counties. Includes maps showing the glacial and rock geology, structure contours of water-bearing formations, locations of deep wells, head of artesian water, and quality of ground water. Also includes numerous geologic sections showing depths to the principal water-bearing formations. Describes a method of casing deep wells with cement (p. 562).

294. An intensive study of the water resources of a part of Owens Valley, Cal., by C. H. Lee. 1912. 135 pp., 30 pls. 55c.

Relates to the Independence region, a segment of Owens Valley that is relatively isolated with respect to water supplies. Describes the underground reservoir of this region and the drainage basin tributary to it. Presents quantitative data on precipitation, stream flow, percolation into the underground reservoir from precipitation, streams, irrigation, and flood waters, evaporation and transpiration from soils in experimental tanks with various depths to water level, fluctuations of the water table, height of capillary rise of ground water, areas with specified depths to the water table within the range of capillary rise, and discharge from springs. Analyzes the data and calculates the annual intake and discharge of the underground reservoir and the available supply of ground water. Includes maps showing depths to ground water and other hydrologic features and also includes numerous diagrams. The results of the tank experiments and their application in estimating the discharge of ground water in closed desert basins are of general interest.

298. (See p. 49.)

*300. Water resources of California, Part III, Stream measurements in the Great Basin and Pacific coast river basins, by H. D. McGlashan and H. J. Dean. 1913. 956 pp., 4 pls. 55c.

Gives discharge records of springs and wells in California as follows: Grover Hot Springs (p. 198), Black Rock Springs (p. 393), Seeley Springs (p. 394), Slanson well (p. 680), Shasta Little Springs (p. 913), Anna Creek Spring (p. 914), Bettles Rest Springs (p. 915), Barclay Springs (p. 915), Fords Spring (p. 917), and Olene Springs (p. 918).

310. (See p. 49.)

314. (See p. 49.)

*315. The purification of public water supplies, by G. A. Johnson. 1913. 84 pp. 8 pls. 10c.

Includes a brief discussion of ground waters for municipal supplies; also information on methods of purification that are more or less applicable to ground waters.

316. Geology and water resources of a portion of south-central Washington, by G. A. Waring. 1913. 46 pp., 1 pl. 5c.

Covers an area of about 5,000 square miles comprising Benton County and parts of Franklin, Grant, Yakima, and Klickitat counties. Describes the climate, vegetation, physiography, and geology; discusses shallow and artesian waters and irrigation enterprises in Sunnyside and Reservation valleys, Horse Heaven Plateau, and the Columbia River plains, and irrigation along lower Yakima River; gives tabulated data concerning wells and springs; includes a geologic map.

*317. Geology and underground waters of the Wichita region, north-central Texas, by C. H. Gordon. 1913. 88 pp., 2 pls. 10c.

Covers Archer, Baylor, Clay, Foard, Hardeman, Haskell, Jack, Knox, Montague, Throckmorton, Wichita, Wilbarger, and Young counties. Describes the physiography and geology, the occurrence and quality of ground waters and their relation to rock structure, the effects of barometric changes on water levels, and the water-bearing formations; gives detailed information by counties; contains numerous sections of wells and water analyses; includes a geologic map.

318. Water resources of Hawaii, 1909–1911, by W. F. Martin and C. H. Pierce. 1913. 552 pp., 15 pls. 50c.

Describes chiefly surface-water supplies, but contains brief notes on ground-water supplies and data on the discharge of springs, infiltration tunnels, flowing wells, and pumped wells on several islands, as follows: Kauai, pumped wells (p. 144); Oahu, springs, pumped wells, and flowing wells (pp. 163, 187–196); Maui, pumped wells (pp. 258, 331–332); Hawaii, springs and infiltration tunnels (p. 408). Gives sections of wells on Oahu (pp. 191–193).

*319. Geology and ground waters of Florida, by G. C. Matson and Samuel Sanford. 1913. 445 pp., 17 pls. 60c.

Describes the characteristic upland, lowland, and coastal features of the State—the springs, lakes, caverns, sink holes, natural bridges, terraces, sand dunes, coral reefs, bars, inlets, tidal runways, pine lands, swamps, keys, and ocean currents. Describes in detail the geologic formations, the source, quantity, depth, circulation, and recovery of artesian and other ground waters. Gives detailed information concerning ground-water conditions and water supplies by counties. Contains numerous well sections and tables of well data and includes maps showing the geology and the Pleistocene terraces of the State.

320. Geology and water resources of Sulphur Spring Valley, Ariz., by O. E. Meinzer and F. C. Kelton, with a section on agriculture, by R. H. Forbes. 1912. 231 pp., 15 pls. 45c.

Covers Sulphur Spring Valley and contains a small amount of information on San Pedro, San Simon, and San Bernardino valleys. Describes the physiography, the drainage, the geology, with special reference to the Quaternary deposits in the valley, the seasonal and geographic distribution of the precipitation, the occurrence and level of the ground water, the flowing and nonflowing wells, the quality of ground waters with relation to derivative rocks, water levels, and underground circulation, the effects of quality on irrigation and other uses, the distribution of alkali in the soil, the relation of the alkali to the water table and to the drainage, and the relation of zones of vegetation to water supply and other geographic controls. Contains detailed data in regard to tests of 20 pumping plants and describes a portable weir used in making these tests. Gives the history of agriculture in the valley and discusses agricultural meth ods. Contains analyses of water and of alkali in the soil and includes maps showing the geology, vegetation, depths to ground water, elevation of the water table, quality of water, and alkali in soil.

326. (See p. 49.)

331. Surface water supply of the United States, 1912, Part X, Pacific coast basins in California, by H. D. McGlashan and G. C. Stevens. 1914. 442 pp., 2 pls. 30c.

Contains records for 1909 to 1912, inclusive, of water levels in the series of wells for which water-level data are given in Water-Supply Papers 213 and 251, with an introductory note by W. C. Mendenhall (pp. 425–434).

332. (See p. 49.)

333. Ground water in Boxelder and Tooele counties, Utah, by Everett Carpenter. 1913. 90 pp., 2 pls. 10c.

Covers all of Boxelder County and Tooele, Rush, and Skull valleys in Tooele County. Describes briefly the geography, geology, water in bedrock and in unconsolidated sediments, artesian conditions, springs, and quality of ground waters; gives detailed information by valleys; contains numerous assays of water; includes a guide to watering places on routes of travel and maps showing locations of flowing and nonflowing wells, springs, and roads.

*335. Geology and underground waters of the southeastern part of the Texas Coastal Plain, by Alexander Deussen. 1914. 365 pp., 9 pls. 55c.

Covers that part of the Coastal Plain of Texas occupied by the outcrop of Cenozoic rocks east of Brazos River and south of a line extending east and west through Jefferson, in Marion County. Describes the physiography, stratigraphy, geologic structure, occurrence of ground water, springs, artesian systems, and quality of water with reference to various uses and in relation to the geologic formations; gives detailed information by counties; contains numerous well sections and water analyses; includes maps showing the geology of the region and the structure contours and areas of artesian flow for the seven principal artesian reservoirs.

336. Water resources of Hawaii, 1912, by C. H. Pierce and G. K. Larrison. 1914. 392 pp. 50c.

Relates chiefly to surface waters, but contains data in regard to pumpage of wells and seepage of ditches on the Island of Kauai (p. 99), discharge of springs and flowing wells and fluctuations of water levels in wells on the Island of Oahu (p. 128), pumpage of wells on the Island of Maui (pp. 209–211), and of springs on the Island of Hawaii (p. 381).

338. Springs of California, by G. A. Waring. 1915. 410 pp., 13 pls. 60c.

Describes the physical features of California and discusses natural waters with respect to mineral analyses, source and amount of dissolved substances, therapeutic and other properties, temperature, and classification. Gives detailed descriptions of springs, particularly those which yield mineral waters or are used as centers of recreation or health resort. Contains numerous analyses and includes maps showing the geology of the State and the locations of hot, carbonated, and sulphur springs.

*340. Stream-gaging stations and publications relating to water resources, 1885–1913, by B. D. Wood. 1916. 195 pp. 15c.

Includes papers dealing with ground water. Issued also in separate chapters, as follows:

*(a) Part I. North Atlantic coast drainage basins, pp. 1–19.
(b) Part II. South Atlantic coast and eastern Gulf of Mexico drainage basins, pp. 21–30.
(c) Part III. Ohio River basin, pp. 31–42.
(d) Part IV. St. Lawrence River basin, pp. 43–52.
(e) Part V. Hudson Bay and upper Mississippi River drainage basins, pp. 53–61.
(f) Part VI. Missouri River basin, pp. 63–81.
(g) Part VII. Lower Mississippi River basin, pp. 83–93.
(h) Part VIII. Western Gulf of Mexico drainage basins, pp. 95–104.
(i) Part IX. Colorado River basin, pp. 105–116.
(j) Part X. The Great Basin, pp. 117–129.
*(k) Part XI. Pacific coast basins in California, pp. 131–146.
*(l) Part XII. North Pacific slope drainage basins, pp. 147–195.

341. Underground waters of the Coastal Plain of Georgia, by L. W. Stephenson and J. O. Veatch, and a discussion of the quality of the waters, by R. B. Dole. 1915. 539 pp., 21 pls. 50c.

Describes the physiography and geology, the source, quantity, and disposition of water supplies, the artesian and nonartesian waters, the quality and use of water from springs and wells, and the stratigraphic distribution of the ground water. Gives detailed information by counties. Discusses the quality of the water in relation to industrial, domestic, and medicinal uses, the purification of water, and the composition of surface waters, and of ground waters in relation to geologic formations, geographic position, and depth. Contains many well sections and water analyses and includes maps showing the geology, the areas of artesian flow and the locations and depths of wells.

343. Geology and water resources of Tularosa Basin, N. Mex., by O. E. Meinzer and R. F. Hare. 1915. 317 pp., 19 pls. 40c.

Covers a large area in south-central New Mexico between the Rio Grande and Pecos valleys, and also contains data in regard to the vicinity of El Paso, Tex. Describes the physiography and geology and gives data on precipitation and its seasonal and geographic distributions. Discusses the water in the valley fill in regard to intake zones, occurrence, disposal, yield, artesian head, methods of constructing wells, and quality of the water in relation to derivative rocks, water table, and water-bearing beds and with respect to its use for drinking, cooking, washing, steam making, and irrigation. Discusses likewise the water in Cretaceous and Carboniferous strata and in igneous rocks. Describes the soil and native vegetation in relation to water supplies, the irrigation from streams, springs, flood waters, and wells, the railroad and public water supplies. Contains a guide to watering places on routes of travel, and tables of well data, analyses of water and soil, and distances between watering places. Includes maps showing the geology, vegetation, depths to water, contours of the water table, and locations of watering places and connecting roads.

*345. Contributions to the hydrology of the United States, 1914; N. C. Grover, chief hydraulic engineer. 1915. 225 pp., 17 pls. 30c.

Issued also in separate chapters. The following chapters relate to ground water:

(a) Preliminary report on ground water for irrigation in the vicinity of Wichita, Kans., by O. E. Meinzer (pp. 1–9).

(b) Ground water for irrigation in the vicinity of Enid, Okla., by A. T. Schwennesen (pp. 11–23, Pl. I). Includes a note on ground water for irrigation on the Great Plains, by O. E. Meinzer.

*345. Contributions to the hydrology of the United States, 1914—Continued.

(c) Underground water of Luna County, N. Mex., by N. H. Darton (pp. 25-40, Pl. II). Includes the results of five pumping tests made by A. T. Schwennesen.

(d) Ground water for irrigation in the valley of North Fork of Canadian River near Oklahoma City, Okla., by A. T. Schwennesen (pp. 41-51, Pl. III).

(g) The water resources of Butte, Mont., by O. E. Meinzer (pp. 79-125, Pls. VII-VIII).

(h) Ground- water resources of the Niles cone and adjacent areas, Cal., by W. O. Clark (pp. 127-168, Pls. IX-XVII).

All except No. 345-a include maps showing ground-water conditions. No. 345-h contains numerous records of water levels in wells and an estimate of ground-water recharge in 1912-13 and 1913-14 based on fluctuations of the water table. It includes a series of graphs showing fluctuations of the water table and the source of the ground water.

358. Water resources of the Rio Grande Basin, 1888–1913, by Robert Follansbee, H. J. Dean, W. W. Follett, and G. A. Gray, 1915. 725 pp., 3 pls.

Contains data on seepage of water into and out of streams, and discussions of the data (pp. 679–694).

359. (See p. 49.)

360. (See p. 49.)

362. (See p. 49.)

364. Water analyses from the laboratory of the United States Geological Survey, tabulated by F. W. Clarke. 1914. 44 pp. 5c.

Contains 203 miscellaneous analyses of waters from rivers, lakes, wells, springs, and mines, which were made at various times in the chemical laboratory of the United States Geological Survey. Includes analyses of waters from wells, springs, or mines in the following 25 States: Arkansas, Arizona, California, Colorado, Florida, Illinois, Iowa, Kentucky, Maine, Michigan, Mississippi, Missouri, Montana, Nevada, New Mexico, North Carolina, Oklahoma, Pennsylvania, South Carolina, Tennessee, Texas, Utah, Virginia, West Virginia, and Wyoming.

365. Ground water in southeastern Nevada, by Everett Carpenter. 1915. 86 pp., 5 pls. 15c.

Covers an area of about 17,000 square miles in Clark, Lincoln, White, Pine, and Nye counties, including the vicinities of Geyser, Lund, Barnes, and Duckwater, on the north, and the vicinities of Sharp, Hiko, Alamo, and Indian Springs, on the west. Describes briefly the geography, geology, water in bedrock, and in unconsolidated deposits, artesian conditions, springs, and quality of water. Gives detailed information regarding water supplies in the Las Vegas drainage basin, Duck, Ursine, and Meadow valleys, White River drainage basin, Muddy and Virgin valleys, and Bristol, Delamar, Coal, Garden, Dry Lake, Indian Spring, and Railroad valleys. Contains water analyses, a guide to watering places on routes of travel, and a table of distances between watering places. Includes maps showing Pleistocene lake beds, areas of artesian flow, and locations of watering places.

370. (See p. 49–50.)

373. Water resources of Hawaii, 1913, by G. K. Larrison. 1915. 190 pp. 20c.

Relates chiefly to surface waters, but contains data on the discharge of springs, tunnels, and flowing wells on the island of Oahu (p. 103), springs on the island of Maui (p. 151), and springs on the island of Hawaii (p. 174).

374. Ground water in the Hartford, Stamford, Salisbury, Willimantic, and Saybrook areas, Conn., by H. E. Gregory and A. J. Ellis. 1916. 150 pp., 13 pls. 30c.

Covers the towns of Bloomfield, Canaan, East Hartford, East Windsor, Essex, Franklin, Greenwich, Hartford, Manchester, Newington, North Canaan, Old Lyme, Salisbury, Saybrook, Stamford, South Windsor, Westbrook, West Hartford, Wethersfield, Windham, and Windsor. Discusses the origin, circulation, quantity, and quality of the waters in stratified and unstratified drift, crystalline rocks, traps, Paleozoic limestones, and Triassic sandstones. Discusses ground water for municipal use and the construction of drilled, driven, and dug wells, and infiltration galleries. Describes the municipal pumping plants at Brookline, Mass., Brooklyn, N. Y., and Plainfield, N. J. Describes the ground water conditions in detail, by towns. Contains numerous tables of well data and water analyses, and includes maps showing water-bearing formation, depths to water, locations of wells, and woodlands.

*375. Contributions to the hydrology of the United States, 1915; N. C. Grover, chief hydraulic engineer. 1916. 181 pp., 9 pls. 15c.

Issued also in separate chapters. The following chapters relate to ground water:

(*a*) Ground water for irrigation in the Sacramento Valley, Cal., by Kirk Bryan (pp. 1-49. Pls. I-II).

(*b*) Ground water in Paradise Valley, Ariz., by O. E. Meinzer and A. J. Ellis (pp. 51-75, Pls. III-V).

(*d*) Ground water in Big Smoky Valley, Nev., by O. E. Meinzer (pp. 85-116, Pls. VI-VII).

(*g*) Ground water in Lasalle and McMullen counties, Tex., by Alexander Deussen and R. B. Dole (pp. 141-177, Pls. VIII-IX).

All of these papers include maps showing ground-water conditions. No. 375-A contains statistics on irrigation with ground water in Sacramento Valley and a discussion of problems relating to the construction of wells and to pumping for irrigation. No. 375-D contains data on ground-water intake and discharge and on irrigation with ground water. No. 375-G discusses water in the various geologic formations, especially with reference to its quality and quantity for irrigation; it contains tables of well data and water analyses.

380. The Navajo country—a geographic and hydrographic reconnaissance of parts of Arizona, New Mexico, and Utah, by H. E. Gregory. 1916. 219 pp., 29 pls. 80c.

Covers the Navajo and Hopi Indian reservations, in northeastern Arizona, northwestern New Mexico, and southeastern Utah, and some adjacent areas. Gives an outline of the history of the region; describes the geographic provinces, climate, soil, flora, fauna, and geology; describes also the streams and discusses factors influencing stream flow, irrigation with surface waters, storage of rain and surface waters for domestic and stock use, and water powers; discusses ground-water reservoirs, quality of ground water, artesian water, springs, and wells; gives data on watering places and recommendations for prospecting for water in various geographic provinces. Includes maps showing the geology, the locations of watering places, roads, and trails, and the areas covered by forests.

389. (See p. 50.)

390. (See p. 50.)

393. (See p. 50.)

394. (See p. 50.)

*397. Ground water in the Waterbury area, Conn., by A. J. Ellis, under the direction of H. E. Gregory. 1916. 73 pp., 4 pls. 15c.

Discusses the water in glacial drift and crystalline rocks, ground water for private and municipal uses, and methods of developing ground-water supplies. Describes the municipal pumping plants at Brookline, Mass., Brooklyn, N. Y., and Plainfield, N. J. Describes in detail the water-bearing formations and water supplies in the towns of Ansonia, Beacon Falls, Middlebury, Naugatuck, Oxford, Seymour, Thomaston, Waterbury, and Watertown. Contains tables of well data and water analyses, and includes a map showing areas underlain by stratified drift, rock outcrops, woodlands, and locations of wells and springs.

398. Ground water in San Joaquin Valley, Cal., by W. C. Mendenhall, R. B. Dole, and Herman Stabler. 1916. 310 pp., 5 pls. 25c.

Describes the development of irrigation in the Southwest and gives an outline of the geography and geology of the San Joaquin basin. Discusses briefly the origin, circulation, quantity, and availability of ground water, and its use for irrigation. Describes the quality of the surface and ground waters, the standards for classification, the methods of purifying water, and the effects of quality on use. Explains the variations in the quality of the water with its depth below the surface and with its geographic and geologic relations. Gives details of 55 pumping tests and summarizes and discusses the results. Gives numerous well records and water analyses and detailed descriptions by counties. Includes maps showing areas of artesian flow, contours of the water table, quality of ground water, and locations of the pumping plants investigated.

399. Geology and ground waters of northeastern Arkansas, by L. W. Stephenson and A. F. Crider, with a discussion of the chemical character of the waters, by R. B. Dole. 1916. 315 pp., 11 pls. 35c.

Covers an area of about 13,250 square miles extending from Mississippi River west to the Ozark province and from Missouri south to Arkansas River. Describes the physiography, geology, surface waters, stratigraphic distribution of ground waters, springs, artesian waters, and uses of ground water, especially in irrigating rice. Gives detailed descriptions, well sections, and tables of well data by counties. Discusses chemical standards of classification, methods of purification, and the quality of the waters in relation to the strata in which they occur, their geographic positions, and their depths below the surface. Includes numerous analyses and maps showing the geology, the areas of artesian flow, and the locations and depths of wells.

*400. Contributions to the hydrology of the United States, 1916; N. C. Grover, chief hydraulic engineer. 1917. 108 pp., 7 pls.

Issued also in separate chapters. The following chapters relate to ground water:

(*b*) Artesian water for irrigation in Little Bitterroot Valley, Mont., by O. E. Meinzer (pp. 9–37, Pls. I–IV).

(*e*) Ground water for irrigation in the Morgan Hill area, Cal., by W. O. Clark (pp. 61–106, Pls. V–VII).

Both papers include maps showing ground-water conditions. No. 400-E contains numerous well sections and records of water levels in wells and an estimate of the annual ground-water supply, based chiefly on fluctuations of the water table and porosity of the water-bearing deposits.

416. The divining rod, a history of water witching, with a bibliography, by A. J. Ellis. 1917. 55 pp.

Gives an outline of the history of the popular delusion known as "water witching" and points out fallacies in so-called "mechanical water finders." Advises the public against expending money "for the services of any water witch or for the use or purchase of any machine or instrument devised for locating underground water or other minerals." Lists numerous papers on the subject from 1532 to the present time.

418. Mineral springs of Alaska, by G. A. Waring, with a chapter on the chemical character of some surface waters of Alaska, by R. B. Dole and A. A. Chambers 1917. 114 pp., 9 pls.

Describes hot springs in 48 localities, carbonated springs in 12 localities, and sulphur springs in 13 localities, also iron springs and salt springs. Discusses the chemical character of the waters of Yukon, Tanana, Lowe, Copper, Stikine, and other rivers. Contains 32 analyses of spring waters and 38 analyses of surface waters. Includes a map of Alaska showing the locations of 108 groups of mineral springs in relation to volcanoes.

422. Ground water in Animas, Playas, Hachita, and San Luis basins, N. Mex., by A. T. Schwennesen (in press).

Covers the southern part of Grant County. Describes the physiography and geology and the ground-water conditions in each basin with respect to the occurrence, depth, quantity, quality, artesian conditions, and irrigation prospects. Gives well data, analyses of water, and analyses of the water-soluble contents of the soil. Contains a map of the area showing depths to the water table and other features.

423. Geology and water resources of Big Smoky, Clayton, and Alkali Spring valleys, Nev., by O. E. Meinzer. 1917. 167 pp., 15 pls.

Describes the physiography and geology with special reference to Quaternary events; gives data on precipitation, stream flow, seepage, springs, and wells; estimates intake and discharge of ground water; discusses criteria for recognizing shallow-water areas; discusses the quality of the water with reference to the geologic source of the valley fill, geographic provinces, and use describes public water supplies and discusses irrigation with ground water; contains analyses of water and of alkali in soil; includes maps showing Pleistocene lake features, depths to ground water, areas of ground water intake and discharge, and locations of watering places.

425. Contributions to the hydrology of the United States, 1917; N. C. Grover, chief hydraulic engineer. 1918.

Issued also in separate chapters. The following papers relate to ground water:

(*a*) Ground water in San Simon Valley, Ariz., by A. T. Schwennesen, with a chapter on agriculture by R. H. Forbes (pp. 1–35, Pls. I–III). Describes the physiography and geology of the valley, the upper water horizon, and the deeper artesian horizon of the San Simon and Bowie areas, the ground water in the Rodeo and Artesia valleys, and the irrigation supplies from flowing and nonflowing wells; contains 39 analyses of well and spring waters, numerous records of deep wells and maps showing areas of artesian flow, depth to water table, and lands irrigated with well water; also includes a chapter by R. H. Forbes on soil, vegetation, and agricultural prospects.

(*b*) Ground water for irrigation in Lodgepole Valley, Wyo.-Nebr., by O. E. Meinzer (pp. 37–69 Pls. IV–VI). Describes the physiography and geology of Lodgepole Valley and the adjacent region and the water in the alluvial gravel and in the Tertiary and Cretaceous formations; discusses irrigation with ground water; gives well data and analyses of 20 well waters and 2 samples from Lodgepole Creek; contains maps showing the geology and the depths to the water table; also includes data on the cost of pumping for irrigation in western Nebraska, by H. C. Diesem, U. S: Department of Agriculture.

(*d*) Ground water in Reese River valley and adjacent parts of Humboldt River valley, Nev., by G. A. Waring (pp. 95–129, Pls., VII–XII). Describes the physiography, geology, ground-water conditions, and irrigation prospects. Contains well and spring data and analyses of ground waters. Includes a map showing the geology, shallow-water areas, and areas of artesian flow.

(*e*) Ground water in Quincy Valley, Wash., by A. T. Schwennesen and O. E. Meinzer (pp. 131–158, Pl. XIII–XIV). A preliminary report which outlines the physiographic features, climate, and agricultural conditions of Quincy Valley and adjacent regions; describes the character and distribution of the Yakima basalt, Pleistocene lake beds, and Pleistocene outwash gravels, and discusses quantity, quality, and head of water in each of these formations; discusses present and prospective irrigation with ground water. Contains a sketch map showing contours of the water table.

428. Artesian water in the vicinity of the Black Hills, S. Dak., by N. H. Darton (in press).

Describes the geology and artesian-water conditions in areas covered in previous reports but in the light of additional data. Discusses the artesian prospects of the Dakota, Minnelusa, and Deadwood sandstones. Contains a map showing the geology and the depths to the water-bearing sandstones.

430. Surface water supply of Hawaii, July 1, 1913, to June 30, 1915; N. C. Grover, chief hydraulic engineer; G. K. Larrison, district engineer. 1917. 329 pp.

Contains data on the discharge of springs, tunnels, and flowing wells on the Island of Oahu (pp. 205–207).

445. Surface water supply of Hawaii, July 1, 1915, to June 30, 1916; N. C. Grover, chief hydraulic engineer; G. K. Larrison, district engineer. 1917. 224 pp.

Contains discharge records for springs near Kailua, Oahu (pp. 97–99), and for Kahoma development tunnel, near Lahaina, Maui (pp. 156, 157).

ANNUAL REPORTS.

*Fifth Annual Report (1883–84). 1885. 469 pp., 58 pls. $2.25.

The following paper relates to ground water:

*(A 5 c) The requisite and qualifying conditions of artesian wells, by T. C. Chamberlin (pp. 125 to 173, Pl. XXI). This is the first paper published by the United States Geological Survey on the subject of ground water. It is a clear, accurate, and comprehensive statement of the conditions that produce artesian basins and give rise to flowing wells, and is regarded as authoritative on the subject.

*Ninth Annual Report (1887–88). 1889. 717 pp., 88 pls. $2.

The following paper relates to ground water:

*(A 9 d) Formation of travertine and siliceous sinter by the vegetation of hot springs, by W. H. Weed (pp. 613–676, Pls. LXXVIII–LXXXVII). Describes the Mammoth Hot Springs and other hot springs and geysers of Yellowstone National Park, also hot springs in New Zealand; gives analyses and discusses the chemical character of the waters from these springs and the deposits which they form.

Eleventh Annual Report (1899–90). Part II. Irrigation. 1891. 395 pp., 30 pls. and maps. $1.25.

*(A 11 II c) Includes a section on artesian irrigation on the Great Plains (pp. 260–278), in which the limitations imposed by quantity, head, and cost are discussed, and irrigation by means of artesian wells in various countries is described. Records are given of wells in Kansas, Minnesota, Montana, Nebraska, North Dakota, South Dakota, and Texas.

Thirteenth Annual Report (1891–92). Part III. Irrigation. 1893. 486 pp., 77 pls. $1.85.

The following papers relate in part to ground water:

*(A 13 III a) Water supply for irrigation, by F. H. Newell (pp. 7–99, Pls. CVIII–CX). Includes a brief discussion on "subsurface waters" (pp. 28–30), giving statistics on artesian wells and irrigation with well water in the United States in 1890, and commenting accurately on quantity, occurrence, and discharge of water in desert valleys.

*(A 13 III b) American irrigation engineering, by H. M. Wilson (pp. 100–349, Pls. CXI–CXLVI). Includes a chapter on subsurface or ground waters with special reference to irrigation (pp. 326–346), in which are discussed artesian and pumped wells, underflow dams, infiltration galleries, and subirrigation.

Fourteenth Annual Report (1892–93). *Part II. Accompanying papers. 1893. 597 pp., 73 pls. $2.10.

The following papers relate to ground water:

*(A 14 II a) Potable waters of the eastern United States, by W J McGee (pp. 1 to 47). Discusses cistern water, stream waters, and ground waters, including mineral springs and artesian wells.

*(A 14 II b) Natural mineral waters of the United States, by A. C. Peale (pp. 49–88, Pls. III and IV). Discusses the history, origin, flow, classification, and geographic distribution of mineral and thermal springs, the chemical composition and analysis of spring waters, and the utilization of mineral waters. Gives a list of American mineral spring resorts.

Sixteenth Annual Report (1894–95). *Part II. Papers of an economic character. 1895. 598 pp., 43 pls. $1.25.

The following papers relate in part to ground water:

*(A 16 II e) The public lands and their water supply, by F. H. Newell (pp. 457–533, Pls. XXXV–XXXIX). Describes the public lands and the streams, wells, and reservoirs as sources of water supply; contains a brief but comprehensive and farsighted discussion of the ground-water resources of the West (pp. 499–502); includes brief notes on ground water in Arizona, California, Colorado, Idaho, Kansas, Nebraska, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, and Washington (pp. 504–533).

(A 16 II f) Water resources of a portion of the Great Plains, by Robert Hay (pp. 535–588, Pls. XL–XLII). Describes an indefinite area that lies on both sides of the east boundary of Colorado and extends from the vicinity of Smoky Hill River northward to the North Platte, thus comprising parts of Colorado, Nebraska, and Kansas. Discusses the lakes, streams, and springs of the area, the underflow of the river bottoms, and the water-bearing strata beneath the higher lands, the source, quantity, and rate of percolation of ground water, the wells in the valleys and on the uplands, the unsuccessful wells, artesian conditions, "blowing" wells and the temperatures of the well waters. Describes briefly the topography and geology of the region and the utilization of the water supply.

Seventeenth Annual Report (1895–96). *Part II. Economic geology and hydrography. 1896. 864 pp., 113 pls. $2.35.

The following papers relate to ground water:

(A 17 II f) The underground water of the Arkansas Valley in eastern Colorado, by G. K. Gilbert (pp. 551–601, Pls. LVI–LXVIII). Relates to an indefinite region adjacent to Arkansas River, in southeastern Colorado. Describes the topography, geology, artesian conditions, and intake areas of the region, the water in the Dakota sandstone, in the upland sands, beneath the terraces, and in the dune sands, and the underflow of rivers and creeks. Includes a sketch map showing the depths to artesian water. See also Professional Paper 52.

(A 17 II g) Preliminary report on artesian waters of a portion of the Dakotas, by N. H. Darton (pp. 603–694, Pls. LXIX–CVII). Covers the part of South Dakota lying east of the 101st meridian and the part of North Dakota lying east of the 101st meridian and south of the 47th parallel. Gives an outline of the geologic relations, describes the water horizons and the extent of the artesian waters, gives detailed information by counties concerning wells and prospects for obtaining wells, discusses the origin, quantity, head, and quality of the artesian waters and their use for developing power, gives data by counties regarding irrigation with artesian water and directions as to the construction and management of artesian wells. Includes maps showing the areas of artesian flow supplied from the Dakota sandstone and from glacial drift, respectively, the height to which the artesian water will rise, the depths to principal artesian horizon of the Dakota sandstone, and contours of the surface of the bedrock.

*(A 17 II h) The water resources of Illinois, by Frank Leverett (pp. 695–849, Pls. CVIII–CXIII). Describes the topography, drainage, precipitation, run-off, navigable rivers, water powers, wells supplying water for cities, villages, and rural districts, wells in alluvium, glacial drift, and Tertiary and Paleozoic formations, and flowing wells. Contains tabulated well data and water analyses, and includes maps of Illinois and eastern Indiana showing the distribution of Pleistocene deposits, the relation of glacial drift to ground-water supplies, the elevation of the St. Peter sandstone, and areas in which there are flowing wells supplied by glacial drift. Also contains a map of Wisconsin and northern Illinois showing the main intake areas of the "Potsdam" and St. Peter sandstones.

Eighteenth Annual Report (1896–97). *Part II. Papers chiefly of a theoretic nature. 1897. 653 pp., 105 pls. $1.65.

The following paper relates to ground water:

*(A 18 II b) Geology of portions of the Edwards Plateau and Rio Grande Plain adjacent to Austin and San Antonio, Tex., with special reference to the occurrence of artesian and other underground waters, by R. T. Hill and T. W. Vaughan (pp. 193–322, Pls. XXI–LXIV.) Describes the geography, geology, water-bearing formations, springs, and flowing and nonflowing wells. Discusses the artesian conditions, the probable identity of source of artesian and fissure-spring waters, and the quality of the artesian water. Contains water analyses and includes a map of the vicinity of Austin showing the relations of the springs and artesian wells to the geology.

Eighteenth Annual Report (1896–97). *Part IV. Hydrography. 1897. 756 pp., 102 pls. $1.75.

The following papers relate to ground water:

*(A 18 IV b) The water resources of Indiana and Ohio, by Frank Leverett (pp. 419–560, Pls. XXXIII–XXXVII). Describes the drainage systems, the ground-water conditions, the flowing and nonflowing wells in glacial drift and rock formations, and the mineral springs. Contains numerous well records and water analyses. Gives data regarding water supplies for cities and villages derived from surface and underground sources. Includes maps of Indiana and Ohio showing the Pleistocene deposits, the older geologic formations, and the relation of ground-water supplies to the depth of the glacial drift.

*(A 18 IV c) New development in well boring and irrigation in eastern South Dakota, by N. H. Darton (pp. 561–616, Pls. XXXVIII–XLVII). Describes the progress that was made in 1896 in drilling wells and in irrigating with artesian waters in Aurora, Beadle, Bonhomme, Brule, Buffalo, Charles Mix, Davison, Douglas, Hanson, Hutchinson, Jerauld, Sanborn, Spink, and Yankton counties, and in areas west of Missouri River. Discusses the temperature, pressure, and flow of the artesian waters, the extent of the artesian basin, and the position of the bedrock. Gives analyses of waters from Missouri River and from artesian wells in the Sanborn basin. Includes maps showing the rate of increase of temperature in wells with depth, contours of the bedrock surface, and flow of wells.

Nineteenth Annual Report (1897–98). *Part II. Papers chiefly of a theoretic nature. 1899. 958 pp., 172 pls. $2.65.

The following papers relate to ground water:

*(A 19 II b) Principles and conditions of the movements of ground water, by F. H. King (pp. 59–294, Pls. VI–XVII). Discusses the quantity of water stored in soil, in sandstone, and in other rocks, the depth to which ground water penetrates, the gravitational, thermal, and capillary movements of ground water, and the configuration of the water table. Gives the results of tests made by the author and by earlier investigators of the flow of air and water through rigid, porous media and through sands, sandstones, and silts. Summarizes these results and draws conclusions regarding the relation of velocity to pressure. Discusses also the influence of form, diameter, and arrangement of sand grains on velocity, the methods of determining diameters of sand grains, the growth of rivers, the rate of seepage into filtration ditches, the interference of wells, and related subjects.

*(A 19 II c) Theoretical investigation of the motion of ground waters, by C. S. Slichter (pp. 295–384, Pl. XVII). A mathematical discussion of the laws governing the movements of ground water, the discharge of flowing wells, and the mutual interference of wells. Includes a bibliography on the motion of ground waters and related topics.

Nineteenth Annual Report (1897–98). *Part IV. Hydrography. 1898. 814 pp., 118 pls. $1.85.

The following papers relate to ground water:

*(A 19 IV b) The rock waters of Ohio, by Edward Orton (pp. 633–717, Pls. LXXI–LXXIII.) Describes the principal geologic formations of Ohio and the waters which they yield; gives detailed information regarding the water supplies of many cities and villages; discusses the flowing wells in various localities, including those in the preglacial channels of Allen, Auglaize, and Mercer counties; and includes a number of water analyses.

*(A 19 IV c) Preliminary report on the geology and water resources of Nebraska west of the 103d meridian, by N. H. Darton (pp. 727–785, Pls. LXXIV–CXVIII). Describes the general geology of Nebraska, and the topography, geology, and water horizons of the area covered by the reports. Gives information on springs, streams, irrigation, climate, and timber, and of elevations of various points. Includes a general geologic map of Nebraska and more detailed maps of the portion of the State west of the 103d meridian, showing the geology and the ground-water conditions. Reprinted as Professional Paper 17.

Twenty-first Annual Report (1899–1900). *Part IV. Hydrography. 1901. 768 pp., 156 pls. $2.35.

The following papers relate in part to ground water:

*(A 21 IV a) Report of progress of stream measurements for the calendar year 1899, by F. H. Newell (pp. 9–488, Pls. I–LVII). Includes brief notes on ground-water supplies at Kearney, Nebr. (pp. 216–217), Alamosa, Colo. (p. 265 and Pl. IV, *A*), San Pedro Valley, Ariz. (pp. 352–353 and Pl. XXXI, *A*), Mohave Valley, Cal. (p. 472, and Pl. LII), Los Angeles River valley, Cal. (p. 474), Lytle Creek valley, Cal. (pp. 481–482), and Mission Valley, Cal. (p. 486). The plates referred to are photographs of flowing wells or other ground-water features.

*(A 21 IV b) Preliminary description of the geology and water resources of the southern half of the Black Hills and adjoining regions in South Dakota and Wyoming, by N. H. Darton (pp. 489–599, Pls. LVIII–CXII). Covers an area comprising about 5,500 square miles in southwestern South Dakota and the adjoining portion of Wyoming. Describes the topography, geology, water horizons, wells, surface waters, irrigation, soil, mineral resources, climate, and timber of the area. Includes maps showing the geology, the depths to the Dakota sandstone, and other ground-water conditions.

*(A 21 IV *c*) The High Plains and their utilization, by W. D. Johnson (pp. 601–741, Pls. CXIII–CLVI). Describes the area lying in an irregular belt about midway across the long eastward slope of the Great Plains and including parts of Wyoming, Nebraska, Colorado, Kansas, New Mexico, and Texas. Gives a comprehensive description of the physiographic features and Tertiary deposits of the region and a critical discussion of their interpretation. Discusses precipitation, climate, and the use of streams and storm waters for irrigation. Describes the artesian conditions, with special reference to the Meade artesian basin, and explains the principles of artesian and other ground waters. Concluded in the Twenty-second Annual Report, Pt. IV.

Twenty-first Annual Report (1899–1900). *Part VII. Geography and geology of the Black and Grand prairies, Tex., with detailed descriptions of the Cretaceous formations and special reference to artesian waters, by R. T. Hill. 1901. 666 pp., 71 pls. $1.90.

Gives a general description of the geography of a region including Texas, Oklahoma, and New Mexico east of the Rio Grande, and describes in more detail the geography and geology of the Black and Grand prairies. Discusses the principles governing artesian and other ground waters, the artesian systems of Texas, and the quality of the waters of these systems. Describes the artesian conditions by counties and gives analyses. Includes maps showing the geology, the locations of artesian wells, and the outcrop of, depths to, and areas of artesian flow from the Trinity, Paluxy, and Woodbine formations.

Twenty-second Annual Report (1900–1901). Part IV. Hydrography. 1902. 690 pp., 65 pls. $2.20.

The following paper relates to ground water:

*(A 22 IV c). The High Plains and their utilization, by W. D. Johnson (pp. 631–669, Pls. LI–LXV). This is the concluding part of the paper on the High Plains and their utilization begun in the Twenty-first Annual Report, Part IV. It discusses the occurrence of water, consolidated and unconsolidated formations, the origin and level of the ground water of the High Plains, the utilization of ground water for stock raising and irrigation, and methods of constructing wells.

MONOGRAPHS.

25. The glacial Lake Agassiz, by Warren Upham. 1896. 658 pp., 38 pls. $1.70.

Contains a chapter (pp. 523–582) on "Artesian and common wells of the Red River Valley," which discusses the sources of artesian water, the fresh waters in the drift sheets, the saline and alkaline waters in the Dakota sandstone, and the use of artesian water for irrigation; contains analyses of waters from wells, streams, and lakes in Red River Valley and the adjoining region; and gives notes on wells in Clay, Kittson, Marshall, Norman, Polk, Traverse, and Wilkin counties, in Minnesota; in Cass, Grand Forks, Pembina, Richland, Traill, and Walsh counties, in North Dakota; and in a part of the area covered by Lake Agassiz, in Manitoba. The monograph includes numerous maps relating to the Pleistocene geology of the region and a map (Pl. XXXVII) showing the distribution and depths of artesian wells in glacial drift and bedrock.

27. Geology of the Denver Basin in Colorado, by S. F. Emmons, Whitman Cross, and G. H. Eldridge. 1896. 556 pp., 31 pls. $1.50.

Contains a discussion of the water in the Pleistocene deposits (pp. 272, 273) and a section on artesian wells (pp. 401–465). Discusses the history of artesian-water developments in Colorado, the water-bearing horizons, the artesian structure, the quantity of artesian water, and the yield and decrease in yield of flowing wells. Includes three analyses of well waters and maps showing the geology of the region and the original area of artesian flow.

38. The Illinois glacial lobe, by Frank Leverett. 1899. 817 pp., 24 pls. $1.60.

Includes a chapter (pp. 550–788) on "Wells of Illinois," which contains a general discussion of artesian and other wells, a table of municipal water supplies derived from underground sources, and a detailed description of wells and ground-water conditions in practically every county in the State. The monograph includes maps showing the geology, the distribution of wells, the intake areas of "Potsdam" and St. Peter sandstones, and the relation of glacial drift to ground-water supplies.

*47. A treatise on metamorphism, by C. R. Van Hise. 1904. 1286 pp., 13 pls.

This comprehensive treatise deals in much detail with the chemical and physical laws governing ground water, especially in the following sections: "Chemical and physical principles controlling the action of ground water" (pp. 65–123), "Circulation and work of ground water" (pp. 123–158), "The belt of weathering" (pp. 411–429), "The belt of cementation" (pp. 566–594), and "Work of aqueous solutions in segregating ores" (pp. 1072–1198).

PROFESSIONAL PAPERS.

*17. Preliminary report on the geology and water resources of Nebraska west of the 103d meridian, by N. H. Darton. 1903. 69 pp., 43 pls. 25c.

Reprint of a paper in the Nineteenth Annual Report, Part IV, with slight changes.

*32. Preliminary report on the geology and underground-water resources of the central Great Plains, by N. H. Darton. 1905. 433 pp., 72 pls. $1.80.

Covers South Dakota, Nebraska, central and western Kansas, eastern Colorado, and eastern Wyoming. Describes the geography, geology, and water horizons; gives deep-well data and well prospects by counties; also describes other mineral resources. Includes maps showing the geology, locations of deep wells, structure of the Dakota sandstone, depths to this sandstone, head of artesian water, and areas of artesian flow.

*44. Underground-water resources of Long Island, N. Y., by A. C. Veatch, C. S. Slichter, Isaiah Bowman, W. O. Crosby, and R. E. Horton. 1906. 394 pp., 34 pls. $1.25.

Describes the geologic formations, the source and occurrence of ground water, and the conditions necessary to obtain flowing wells; gives data in regard to the springs, streams, ponds, lakes, artesian and other deep wells, the water table and its fluctuations, blowing wells, and waterworks; contains records of the rate of movement of the ground water and results of sizing and filtration tests; gives well records and notes concerning representative wells. Includes water analyses and maps showing the geology, contours of the water table, and locations of wells and waterworks.

*46. Geology and underground-water resources of northern Louisiana and southern Arkansas, by A. C. Veatch. 1906. 422 pp., 51 pls. $1.50.

Covers Louisiana north of the 31st parallel, about the southern half of Arkansas, and adjacent areas in Texas, Oklahoma, and Mississippi. Describes the physiography and geology of the region, the principles governing ground waters and their application to this region, the water-bearing formations with reference to springs and to the artesian pressure, quality, and availability of the water, the occurrence of mineral waters, the hygienic value of deep-well waters, and methods and costs of constructing wells. Contains a description of the ground-water conditions in each county and tables of well data arranged by counties, with notes giving well sections and water analyses. Contains also a dictionary of altitudes, arranged by counties. Includes maps showing the geology of the region, the structure contours of the Nacatoch and Bingen formations, areas of artesian flow supplied by these formations, depths to the Sabine and Cockfield sands, and areas of artesian flow supplied by these sands.

*51. Geology of the Bighorn Mountains, by N. H. Darton. 1906. 129 pp., 47 pls.

Describes the geology of the region in detail and contains a brief discussion (pp. 119 and 120) of the probable depths and water-bearing conditions of the principal sandstones. Includes a geologic map.

*52. Geology and underground waters of the Arkansas Valley in eastern Colorado, by N. H. Darton. 1906. 90 pp., 28 pls.

Describes the geology of the greater part of the drainage basin of Arkansas River in Colorado, the source, depths, head, areas of artesian flow, quantity, and quality of the water in the Dakota sandstone, and the occurrence and quality of the waters in the Red Beds, Morrison formation, Laramie and associated formations, later Tertiary deposits, and dune sands. Includes numerous well sections, several water analyses, and maps showing the geology, depths to Dakota sandstone, areas of artesian flow, and areas not underlain by Dakota sandstone. A preliminary report on the same region, by G. K. Gilbert, was published in the Seventeenth Annual Report, part 2, 1896, pp. 1–51.

*53. Geology and water resources of the Bighorn Basin, Wyo., by C. A. Fisher. 1907. 72 pp., 16 pls.

Describes the geography, geology, water-bearing formations, irrigation developments, mineral waters, and other mineral resources of the basin. Includes a geologic map.

*56. Geography and geology of a portion of southwestern Wyoming, with special reference to coal and oil, by A. C. Veatch. 1907. 178 pp., 26 pls. 60c.

Covers the southwest corner of Wyoming and a small adjacent portion of Utah. Gives a detailed description of the geology and a brief discussion of the water-bearing formations. Includes a geologic map with structure contours.

*65. Geology and water resources of the northern portion of the Black Hills and adjoining regions in South Dakota and Wyoming, by N. H. Darton. 1909. 105 pp., 24 pls. 40c.

Describes the geology of the sedimentary rocks and discusses their mineral resources, including their water supplies. Contains also information concerning the timber, climate, and surface waters available for irrigation and stock raising. Includes maps showing the geology, outcrops of and depths to principal water-bearing formations, and areas of artesian flow.

*90. Shorter contributions to general geology, 1914; David White, chief geologist. 1915. 199 pp., 21 pls. 40c.

Issued also in separate chapters. The following paper relates in part to ground water:
(*h*) A deep well at Charleston, S. C., by L. W. Stephenson, with a report on the mineralogy of the water, by Chase Palmer (pp. 69–94).

94. Economic geology of Gilpin County and adjacent parts of Clear Creek and Boulder counties, Colo., by E. S. Bastin and J. M. Hill. 1917. 379 pp., 23 pls.

Discusses, on pages 134 to 152, the relation of ground water to ore deposition, especially the relation of the water table to the downward enrichment of gold, silver, and copper ores. Contains, however, almost no data regarding ground water.

95. Shorter contributions to general geology, 1915; David White, chief geologist. 1916. 120 pp., 7 pls. 20c.

Issued also in separate chapters. The following paper relates in part to ground water:
*(*a*) The composition of muds from Columbus Marsh, Nev., by W. B. Hicks (pp. 1–11). Gives data in regard to shallow wells on Columbus Marsh.

BULLETINS.

*32. Lists and analyses of the mineral springs of the United States (a preliminary study), by A. C. Peale. 1886. 235 pp.

Defines mineral waters, gives lists of springs by States, and contains 819 analyses of spring waters.

*47. Analyses of waters of the Yellowstone National Park, with an account of the methods of analysis employed, by F. A. Gooch and J. E. Whitfield. 1888. 84 pp.

Describes methods used in analyzing natural waters and contains analyses of 43 geyser, spring, and surface waters in Yellowstone National Park.

*108. A geological reconnaissance in central Washington, by I. C. Russell. 1893. 108 pp., 12 pls. 15c.

Describes the main geologic features of a region lying approximately between the 119th and 121st meridians and between the 46th and 48th parallels. Gives conclusions regarding prospects for artesian wells and includes a sketch geologic map. This bulletin is largely superseded by Water-Supply Papers 55, 118, and 316.

*131. Report of progress of the division of hydrography for the calendar years 1893 and 1894, by F. H. Newell. 1895. 126 pp. 15c.

Gives the discharge of Barton Spring, near Austin, Tex., as 17 second-feet on November 13, 1894 (p. 92). Contains records of wells collected by Robert Hay in Nebraska, Colorado, and Kansas (pp. 92–126).

*138. Artesian-well prospects in the Atlantic Coastal Plain region, by N. H. Darton. 1896. 232 pp., 19 pls.

Describes briefly the geologic structure and the ground-water conditions in the Atlantic Coastal Plain. Covers the Coastal Plain areas of New York, New Jersey, Delaware, Maryland, District of Columbia, Virginia, North Carolina, South Carolina, and eastern Georgia, giving for each of these States a discussion of the geologic relations and well prospects, tabulated data regarding deep wells, and notes giving well sections, water analyses, and other detailed information not found in the tables. Includes maps and sections showing ground-water conditions.

*140. Report of progress of the division of hydrography for 1895, by F. H. Newell. 1896. 356 pp. 25c.

Gives descriptions and discharge records for the following springs in Texas: San Marcos Spring, San Antonio and San Pedro springs, Las Moras Spring, San Felipe Springs, and Barton Springs (pp. 83–86). Contains data on seepage and evaporation in Nebraska and Kansas (pp. 347–350).

*164. Reconnaissance in the Rio Grande coal fields of Texas, by T. W. Vaughan. 1900. 100 pp., 11 pls. 20c.

Contains brief notes on artesian wells in the vicinities of Eagle Pass and Carrizo springs. See especially pp. 25, 50–52.

*199. Geology and water resources of the Snake River Plains of Idaho, by I. C. Russell. 1902. 192 pp., 25 pls. 25c.

Gives a general sketch of the geography and geology of an indefinite region in Idaho adjacent to Snake River. Discusses artesian and other ground-water conditions and includes a meager amount of well data.

*227. The United States Geological Survey, its origin, development, organization, and operations. 1904. 205 pp., 9 pls. 25c.

Includes a brief account (pp. 84–88) of the Division of Hydrology (ground water) and of the investigations relating to ground water made by the United States Geological Survey prior to 1904.

*238. Economic geology of the Iola quadrangle, Kans., by G. I. Adams, Erasmus Haworth, and W. R. Crane. 1904. 83 pp., 11 pls. 25c.

Describes the geology and contains a geologic map of the quadrangle. Discusses briefly the water-bearing formations and the quality of their waters (p. 77).

252. Preliminary report on the geology and water resources of central Oregon, by I. C. Russell. 1905. 138 pp., 24 pls. 15c.

Covers an indefinite region that lies partly in the Great Basin and partly in the basin of Deschutes River, and includes portions of Malheur, Harney, and Crook counties. Describes the geography and geology of the region, gives meager data regarding the surface and ground waters, discusses briefly the artesian conditions in the Deschutes basin, and makes suggestion concerning records of artesian wells.

*264. Record of deep-well drilling for 1904, by M. L. Fuller, E. F. Lines, and A. C. Veatch. 1905. 106 pp. 10c.

Discusses the importance of accurate well records to drillers, to owners of oil, gas, and water wells, and to geologists. Describes methods of work. Gives tabulated records of wells in 39 States and Territories, and detailed records of wells in California, Colorado, Illinois, Iowa, Kansas, Mississippi, Missouri, New Jersey, New York, Ohio, Pennsylvania, Texas, and West Virginia.

265. Geology of the Boulder district, Colo., by N. M. Fenneman. 1905. 101 pp., 5 pls. 15c.

Describes the geology of a rectangular area 16 miles north and south by 9 miles east and west, in the southwestern part of which is situated the city of Boulder. Discusses briefly (pp. 67–69) the flowing wells and water-bearing formations, including the Dakota sandstone. Contains a geologic map of the area.

*282. Oil fields of the Texas-Louisiana Gulf Coastal Plain, by N. M. Fenneman. 1906. 146 pp., 11 pls.

Includes well records and discussions of phenomena related to wells, drilling methods, and movements, temperatures, and salinity of ground waters.

*285. Contributions to economic geology, 1905; S. F. Emmons and E. C. Eckel, geologists in charge. 1906. 506 pp., 13 pls.

Issued also in separate chapters. The following paper contains information on ground water:

*(f) Coal and oil in southern Uinta County, Wyo., by A. C. Veatch (pp. 331–353, Pls. X–XII). Describes the geology of an area that occupies Tps. 12 to 23 N., Rs. 115 to 121 W., inclusive, in Uinta County, Wyo. Contains a geologic map and a brief statement in regard to artesian conditions and prospects (p. 353). This area is covered more fully in Professional Paper 56.

*298. Record of deep-well drilling for 1905, by M. L. Fuller and Samuel Sanford. 1906. 299 pp. 25c.

Gives an account of progress in the collection of well records and samples. Contains tabulated records of wells in 48 States and Territories and detailed records of wells in Alabama, Arizona, Arkansas, California, Colorado, Delaware, Florida, Georgia, Illinois, Indiana, Indian Territory, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Minnesota, Mississippi, Missouri, Montana, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, South Dakota, Texas, Utah, Washington, West Virginia, and Wisconsin.

*300. Economic geology of the Amity quadrangle, eastern Washington County, Pa., by F. G. Clapp. 1907. 145 pp., 8 pls. 30c.

Contains a description of the geology of the quadrangle and a map showing outcrops and structure. Includes brief statements on water supplies and water-bearing formations (pp. 130–134). The quadrangle is covered more fully in Geologic Folio 144, which also contains information on ground water.

*308. A geologic reconnaissance in southwestern Nevada and eastern California, by S. H. Ball. 1907. 218 pp., 3 pls. 40c.

Contains a brief section on "Hydrology," which discusses streams, springs, tanks, wells, and signs of water (pp. 18–23). Contains descriptions of specific areas which give detailed information regarding springs, wells, and other watering places. Includes a geologic map that also shows watering places and connecting roads.

*319. Summary of the controlling factors of artesian flows, by Myron L. Fuller. 1908. 44 pp., 7 pls. 10c.

Describes underground reservoirs, the sources of ground water, the confining agents, the primary and modifying factors of artesian circulation, the essential and modifying factors of artesian flow, and typical artesian systems.

*330. The data of geochemistry, by F. W. Clarke. 1908. 716 pp.

Superseded by Bulletin 616.

*350. Geology of the Rangely oil district, Rio Blanco County, Colo., with a section on the water supply, by H. S. Gale. 1908. 61 pp., 4 pls. 20c.

Describes the geology and contains a geologic map of an area including approximately Tps. 1, 2, and 3 N., Rs. 101, 102, and 103 W., 6th principal meridian. Discusses the water supplies in this area, including artesian wells (p. 58).

*352. Geologic reconnaissance of a part of western Arizona, by W. T. Lee, with notes on the igneous rocks of western Arizona, by Albert Johannsen. 1908. 99 pp., 11 pls. 25c.

Describes the geography and geology and contains a geologic sketch map of western Arizona north of longitude 33° 30′, including the valley of Colorado River and Hualpai, Big Sandy, Detrital-Sacramento, Williams, and McMullen valleys. Contains a section on water supplies, which includes well data and discussion of ground-water prospects.

364. Geology and mineral resources of the Laramie Basin, Wyo. (a preliminary report), by N. H. Darton and C. E. Siebenthal. 1909. 81 pp., 8 pls. 20c.

Describes the geology and contains a geologic map. Includes a section on ground water (pp. 67–78), in which are given well data and 6 water analyses. A part of the area is covered by Geologic Folio 173, which also contains information on ground water.

395. Radioactivity of the thermal waters of Yellowstone National Park, by Herman Schlundt and R. B. Moore. 1909. 35 pp., 4 pls. 10c.

Describes the apparatus and methods used and presents and discusses the results of the experiments.

435. A reconnaissance of parts of northwestern New Mexico and northern Arizona, by N. H. Darton. 1910. 88 pp., 17 pls. 35c.

Describes the geology and contains a geologic map of the region. Includes data in regard to wells at 24 stations on the Atchison, Topeka & Santa Fe R. R. (pp. 75–81).

438. Geology and mineral resources of the St. Louis quadrangle, Mo.-Ill., by N. M. Fenneman. 1911. 73 pp., 6 pls. 25c.

Describes the geology and contains a geologic map of a rectangular area 31 miles east and west by 17 miles north and south, including the city of St. Louis. Discusses the water resources, including springs, flowing wells, and deep wells ending in Carboniferous and Ordovician formations (pp. 65–69). The part of this area that lies in Illinois is also covered by Bulletin 5 of the Illinois Geographical Survey. (See S 3.)

447. Mineral resources of Johnstown, Pa., and vicinity, by W. C. Phalen and Lawrence Martin. 1911. 142 pp., 7 pls. 25c.

Describes the geology and contains a map of the Johnstown quadrangle showing structure contours. Includes a very brief description of water supplies and ground-water conditions (pp. 136–137), which is reprinted in Geologic Folio 174, covering the same quadrangle.

*471. Contributions to economic geology, 1910, Part II, Mineral fuels; M. R. Campbell, geologist in charge. 1912. 663 pp., 62 pls. $1.05.

Issued also in separate chapters. The following paper contains information on ground water:

*(a) The Powder River oil field, Wyo., by C. H. Wegemann (pp. 56–75). Describes the geology and contains a geologic map of a quadrangular area which includes Tps. 40–42 N., R. 81 W., and portions of adjoining townships. Contains brief notes on water supplies, including water-bearing formations (pp. 58, 59).

*479. The geochemical interpretation of water analyses, by Chase Palmer. 1911. 31 pp. 5c.

Discusses the expression of chemical analyses and the chemical character and properties of natural waters. Gives a classification of waters based on property values and reacting values, and discusses the character of the waters of certain rivers as interpreted from the analyses. Discusses also the relation of the properties of water to geologic formations, silica in river water, and the character of the water of Mississippi River, the Great Lakes, and St. Lawrence River as indicated by chemical analyses.

491. The data of geochemistry (second edition) by F. W. Clarke. 1911. 782 pp.

Superseded by Bulletin 616.

506. Geology and mineral resources of the Peoria quadrangle, Ill., by J. A. Udden. 1912. 103 pp., 9 pls. 25c.

Describes the physiography and geology of a 15-minute quadrangle that includes the cities of Peoria and Pekin. Contains detailed well records and a section on water resources, in which are discussed the water-bearing formations, and the quality, quantity, head, temperature, and use of the artesian waters (pp. 90–97). Includes 8 chemical analyses and maps showing the geology and locations of artesian wells.

*529. The enrichment of sulphide ores, by W. H. Emmons. 1913. 260 pp. 20c.

Contains a section on underground circulation (pp. 26–31), in which are discussed the "vadose" and deeper circulation and the region of nearly stagnant waters. Contains also 37 analyses of mine waters with discussion (pp. 60–74) and a discussion of chemical changes in descending sulphate waters (pp. 89–91) and related subjects. See also Bulletin 625.

*530. Contributions to economic geology, 1911, Part I, Metals and nonmetals except fuels; Waldemar Lindgren, chief geologist. 1913. 400 pp., 7 pls. 30c.

Issued also in separate chapters. The following papers relate in part to ground water:

*(b) The occurrence of potash salts in the bitterns of the eastern Unites States, by W. C. Phalen (pp. 313–329). Includes brief statements in regard to the stratigraphic occurrence and origin of salt water in New York, Michigan, Ohio, West Virginia, Kansas, and Louisiana; also contains analyses.

(r) Salines in Silver Peak Marsh, Nev., by R. B. Dole (pp. 330–345). Includes records of 14 borings, 8 to 55 feet deep, a description of methods used in boring, and analyses of water from these holes and from wells and springs in the vicinity.

*531. Contributions to economic geology, 1911, Part II, Mineral fuels; M. R. Campbell, geologist in charge. 1913. 361 pp., 24 pls. 45c.

Issued also in separate chapters. The following papers contain information on ground water.

*(c) Geology and petroleum resources of the De Beque oil field, Colo., by E. G. Woodruff (pp. 54–68, Pl. VI). Contains a description of the geology and a geologic map of a square area covering Tps. 7 and 8 S., Rs. 97 and 98 W., in the vicinity of De Beque, in Mesa and Garfield counties. Includes a brief statement on artesian water in the area (p. 61).

*(d) Geologic structure of the Punxsutawney, Curwensville, Houtzdale, Barnesboro, and Patton quadrangles, central Pennsylvania, by G. H. Ashley, and M. R. Campbell (pp. 69–89, Pls. VII–VIII). Discusses the geologic structure of the five quadrangles named and includes a map showing structure contours. It contains a brief statement in regard to shallow and deep wells and artesian prospects (pp. 88–89). The ground water in the Barnesboro and Patton quadrangles is also briefly described in Geologic Folio 189, and the ground water in these two quadrangles and in the Curwensville quadrangle is briefly described in Water Supply Paper 110.

*540. Contributions to economic geology, 1912, Part I, Metals and nonmetals except fuels; David White, chief geologist. 1914. 563 pp., 11 pls. 45c.

Issued also in separate chapters. The following papers contain information on ground water:

*(n) Prospecting for potash in Death Valley, Cal., by H. S. Gale (pp. 407–415). Includes detailed sections of five wells, 30 to 70 feet deep, with data in regard to their waters, practically all of which are salty, as is shown by the analyses given.

Potash tests at Columbus Marsh, Nev., by H. S. Gale (pp. 422–427). Includes detailed sections of two wells, 32 and 82 feet deep, respectively, with data in regard to their waters, some of which are not salty.

*(p) Potash in western saline deposits, by J. H. Hance (pp. 457–469). Gives total solids in waters from various wells and springs in the drainage basins of Railroad Valley, Fourmile Flat, and Dixie Salt Marsh, in Nevada, and the record of a 305-foot well at Adamana, Ariz.

*541. Contributions to economic geology, 1912, Part II, Mineral fuels; M. R. Campbell, geologist in charge. 1914. 532 pp., 29 pls. 50c.

Issued also in separate chapters. The following paper contains information on ground water:

(d) Oil and gas near Green River, Grand County, Utah, by C. T. Lupton (pp. 115–133, Pl. VI). Describes the geology and contains a geologic map of an area of about 300 square miles southeast of the town of Green River. Contains meager data in regard to wells, water supplies, and artesian conditions (pp. 117–123).

*543. Geology and geography of a portion of Lincoln County, Wyo., by A. R. Schultz. 1914. 141 pp., 11 pls. 50c.

Describes the geology and contains a geologic map of an area in the central part of Lincoln County, between Green River and the Salt River Range (Tps. 22–39 N., Rs. 113–117 W.). Includes a brief discussion of ground water and artesian prospects (pp. 134, 135).

575. Geology of the Standing Rock and Cheyenne River Indian reservations, North and South Dakota, by W. R. Calvert, A. L. Beekly, V. H. Barnett, and M. A. Pishel. 1914. 49 pp., 8 pls. 15c.

Covers an area lying west of Missouri River, north of Cheyenne River, and south of Cannonball River, and extending westward to 102d meridian. Describes the geology and contains a geologic map of the area. Includes a brief discussion of the water in the Dakota and Fox Hills sandstones and in other formations (pp. 24–25).

*582. Mineral deposits of the Santa Rita and Patagonia mountains, Ariz., by F. C. Schrader, with contributions by J. M. Hill. 1915. 373 pp., 25 pls. 50c.

Includes a brief statement in regard to water supplies from both surface and underground sources (pp. 364–367).

606. Origin of the zinc and lead deposits of the Joplin region, Missouri, Kansas, and Oklahoma, by C. E. Siebenthal. 1915. 283 pp., 11 pls. 25c.

A theoretical treatise which relates to underground circulation in the Ozark region. Discusses artesian circulation and flowing wells (pp. 33–37), geochemical interpretation of water analyses, and acidity, neutrality, and alkalinity of natural waters (pp. 81–88). Reviews, discusses, and classifies analyses of zinc-bearing and related waters from various parts of the United States and from foreign countries (pp. 88–155).

616. The data of geochemistry (third edition), by F. W. Clarke. 1915. 821 pp. 45c.

Earlier editions were published as Bulletins 330 and 491. Contains a discussion of the statement and interpretation of water analyses, and a chapter on "Mineral wells and springs" (pp. 179–216). Discusses the definition and classification of mineral waters, changes in the composition of water, deposits of calcareous, ocherous, and siliceous materials made by water, vadose and juvenile waters, and thermal springs in relation to volcanism. Describes the different kinds of ground water and gives typical analyses. Includes a brief bibliography of papers containing water analyses.

618. Geology and underground water of Luna County, N. Mex., by N. H. Darton. 1916. 188 pp., 13 pls.

Describes the geography and geology, the mineral resources, the water supplies from streams, springs, and wells, and the irrigation development from surface and ground waters. Discusses the source, quantity, and quality of the ground waters and the extent of the water-bearing strata and gives well data by townships. Includes maps showing the geology, the contours of the water table, and the depths to ground water.

*621. Contributions to economic geology, 1915, Part II, Mineral fuels; M. R. Campbell and David White, geologists in charge. 1916. 375 pp., 25 pls. 60c.

Issued also in separate chapters. The following chapters contain information on ground water:

*(e) A reconnaissance in Palo Pinto County, Tex., with special reference to oil and gas, by C. H. Wegemann (pp. 51–59). Gives a brief description of the geology of the county with a note on the prospects of obtaining water of good quality from deep sources.

*(l) Oil and gas near Basin, Big Horn County, Wyo., by C. T. Lupton (pp. 157–190, Pl. XVII). Describes the geology and contains a geologic map of parts of Tps. 50–52 N., Rs. 92 and 93 W. Includes a brief description of the water supplies and of the water-bearing sand with a table giving percentages of oil and gas wells that obtained water in each of these sand strata (pp. 164–166). It also includes well records that contain some data in regard to water (pp. 186–189).

625. The enrichment of ore deposits, by W. H. Emmons. 1917. 530 pp., 7 pls.

This paper is a revision of Bulletin 529 with a somewhat enlarged scope.

627. The lignite field of northwestern South Dakota, by D. E. Winchester, C. J. Hares, E. R. Lloyd, and E. M. Parks. 1916. 169 pp., 11 pls. 25c.

Describes the geology and contains geologic maps of Harding and Perkins counties. Describes the drainage and water supply and contains a small amount of data on deep wells not given in Water-Supply Paper 227.

628. Geology and coal resources of Castle Valley, in Carbon, Emery, and Sevier counties, Utah, by C. T. Lupton. 1916. 88 pp., 12 pls. 20c.

Describes the geology and contains a geologic map of an area lying between the Wasatch Plateau and the San Rafael Swell, in east-central Utah, and extending from the vicinity of Mounds, on the Denver & Rio Grande Railroad, southwestward about 80 miles. Describes the drainage and water resources, including the prospects of finding water in the Dakota sandstone and underlying McElmo formation.

641. Contributions to economic geology, 1916, Part II, Mineral fuels; David White, G. H. Ashley, and M. R. Campbell, geologists in charge.

Issued also in separate chapters. The following chapters contain information on ground water:

(*b*) The oil and gas geology of the Foraker quadrangle, Osage County, Okla., by K. C. Heald (pp. 17–48, Pls. II–III). Contains, on page 20, a brief statement in regard to ground-water conditions.

(*i*) Anticlines in central Wyoming, by C. J. Hares (pp. 233–280, Pl. XXIII). Covers nearly 5,000 square miles in Natrona and Fremont counties, west of Casper and southeast of Lander. Contains, on pages 235 and 236, a brief discussion of the water supply, including statements regarding various hot springs, springs of large size, sulphur springs, and other mineral springs, also a statement regarding water-bearing formations and artesian prospects. Includes a geologic map.

647. The Bull Mountain coal fields, Musselshell and Yellowstone counties, Mont., by L. H. Woolsey, R. W. Richards, and C. T. Lupton. 1917. 218 pp., 36 pls.

Gives detailed data regarding water supplies, including ground water, for the following townships: Tps. 5–8 N., R. 24 E.; Tps. 5–8 N., R. 25 E.; Tps. 5–8 N., R. 26 E.; Tps. 5–9 N., R. 27 E.; Tps. 5–9 N., R. 28 E.; Tps. 5–9 N., R. 29 E.; Tps. 5–9 N., R. 30 E.; Tps. 5–9 N., R. 31 E.; T. 8 N., R. 32 E. See pages 16, 17, 65–214.

653. Chemical relations of the oil-field waters in San Joaquin Valley, Cal., by G. S. Rogers. 1917. 119 pp.

Discusses water-bearing sands and dry sands in oil fields, the origin of salt water, and the relation of salt water to the occurrence of oil and to geologic structure in oil fields. Classifies the oil-field waters and gives the distribution of their principal constituents. Discusses the chemical relation between water and the hydrocarbons and the significance of water analyses in prospecting for oil. Gives 80 analyses of ground waters in the Coalinga, Kern River, Lost Hills, McKittrick, Midway, and Sunset oil fields, Cal.

656. Anticlines in the southern part of the Big Horn Basin, Wyo., a preliminary report on the occurrence of oil, by D. F. Hewett and C. T. Lupton. 1917. 192 pp., 32 pls.

Covers a large region in northwestern Wyoming, west of the Big Horn Mountains. Gives detailed data regarding surface waters, springs, wells, and ground-water prospects in the numerous anticlinal areas described in the report. See pages 15, 16, 56–188. Includes a geologic map and section.

658. Geologic structure in the Cushing oil and gas field, Okla., and its relation to the oil, gas, and water, by C. H. Beal. 1917. 64 pp., 11 pls.

Discusses, on pp. 39, 44–61, the relation of ground water to bodies of oil and gas and to oil and gas bearing structures. Distinguishes "top water," "bottom water," and "edge water." Discusses the surfaces that form the contacts between bodies of ground water and bodies of oil or gas and differentiates these from ordinary water tables. Includes diagram showing movement of water into oil wells. Incidentally gives ground-water data of local value.

661. Contributions to economic geology, 1917, Part II, Mineral fuels; David White, G. H. Ashley, and M. R. Campbell, geologists in charge. 1918. 328 pp., 29 pls.

Issued also in separate chapters. The following chapter contains information on ground water:

(*d*) The Irvine oil field, Estill County, Ky., by E. W. Shaw (pp. 141–191; Pls. XI–XV). Discusses, on pages 176–179, the relation of ground water to the oil in this field, the character of so-called "dry sands," the mineral composition of the waters, and the relation of mineral composition to the origin of the water and oil. Includes four analyses of waters from the Estill Springs.

691. Contributions to economic geology, 1918. Part II, Mineral fuels; David White, G. H. Ashley, and M. R. Campbell, geologists in charge.

Issued also in separate chapters. The following chapter contains information on ground water:

(*c*) Geologic structure of the northwestern part of the Pawhuska quadrangle, Okla., by K. C. Heald (pp. 57–100, Pls. XIII–XV). Covers an area just south of the Kansas line and about 90 miles west of the Missouri line (T. 29 N., Rs. 8 and 9 E., and large parts of T. 28 N., R. 9 E.; T. 29 N., R. 8 E.; and T. 27 N., R. 8 E.). Discusses very briefly, on page 60, the ground-water conditions and the prospects of obtaining potable supplies in the sandstones penetrated in the oil wells. Contains a brief general statement regarding the quality of the ground waters.

REPORTS ON MINERAL RESOURCES.

The report on mineral resources for the calendar years 1883 and 1884 and the reports for each subsequent year contain sections on mineral waters, which give statistics, by calendar years, of production, importation, and exportation, lists of mineral springs, and other information in regard to the trade in the waters of the United States that are sold for medicinal or table use. The statistics are given largely by States.

The reports on mineral waters for successive years were prepared by the following authors:

1883–1900, inclusive, by A. C. Peale.
1901–1904, inclusive, anonymous.
1905, by M. L. Fuller.
1906–1909, inclusive, by Samuel Sanford.
1910–1912, inclusive, by G. C. Matson.
1913–1915, inclusive, by R. B. Dole.
1916, by A. J. Ellis.

In addition to the annual statistics, these reports contain the following papers relating to mineral waters:

*(M R 1882) Mineral Resources of the United States, 1882. 1883. 813 pp. 50c.

*(a) The divining rod, by R. W. Raymond (pp. 610–626). Gives a vivid historical review and discussion of the so-called "divining rod," which has been supposed to have virtue for finding ground water and other minerals, as well as for detecting criminals, etc.

*(M R 1905) Mineral Resources of the United States, 1905. 1906. 1403 pp.

Bibliography of mineral waters, by A. C. Peale (pp. 1308–1312). Includes a general bibliography and a bibliography for the United States, 1903–1905.

*(M R 1911) Mineral Resources of the United States, 1911, Part II, Nonmetals. 1912. 1224 pp., 9 pls. $1.

*(n) The concentration of mineral water in relation to therapeutic activity, by R. B. Dole (pp. 1175–1192). Discusses mineral constituents in relation to physiological reactions, minimum doses of inorganic substances, the therapeutic action of certain inorganic radicles, and tolerance for mineral matter in drinking water.

*(M R 1913) Mineral Resources of the United States, 1913, Part II, Nonmetals, 1914. 1617 pp., 9 pls. 80c.

(h) Published analyses of American mineral waters, by R. B. Dole (pp. 433–434). An incomplete bibliography of papers containing analyses of mineral waters.

Radioactivity of mineral waters, by R. B. Dole (pp. 435–440). Gives the radioactivity of 52 well-known waters from springs in Europe and the United States, compares their strength with that of radioactive compounds used in medical practice, and discusses the therapeutic uses of radioactive waters. Includes an incomplete bibliography of publications on radium, radioactivity, and radiotherapy.

(M R 1914) Mineral Resources of the United States, 1914, Part II, Nonmetals, 1916. 1122 pp., 5 pls.

A historical sketch of the mineral-water trade, by R. B. Dole (pp. 215–219). Tabulates and discusses the domestic production and importation from 1883 to 1914 and includes diagrams showing the annual production and the price during this period.

(M R 1916) Mineral Resources of the United States, 1916, Part II, Nonmetals. 1918.

Comparison of American and European mineral waters, by A. A. Chambers. 11 pp. Compares the analyses of certain chalybeate, carbonate, sulphide, chloride, and sulphate spring waters in the United States with the analyses of well-known mineral waters of Europe of similar types. Concludes that the counterparts of European waters can in general be found in this country. Contains a brief bibliography of mineral waters, chiefly those from American springs.

GEOLOGIC FOLIOS.

No.	Name of folio and year of publication.	State.	Author.	Boundaries.								Price.
				North.		South.		East.		West.		
	1894.			°	′	°	′	°	′	°	′	*Cents.*
*13	Fredericksburg	Md.-Va.	Darton, N. H.	38	30	38	00	77	00	77	30	.....
	1895.											
*17	Marysville	Cal.	Lindgren, Waldemar; Turner, H. W	39	30	39	00	121	30	122	00	.....
	1896.											
23	Nomini [a]	Md.-Va.	Darton, N. H.	38	30	38	00	76	30	77	00	5
*24	Three Forks [b]	Mont.	Peale, A. C.	46	00	45	00	111	00	112	00	.....
	1897.											
36	Pueblo [a]	Colo.	Gilbert, G. K.	38	30	38	00	104	30	105	00	5
*39	Truckee [b]	Cal.	Lindgren, Waldemar.	39	30	39	00	120	00	120	30	.....
	1898.											
42	Nueces [a]	Tex.	Hill, R. T.; Vaughan, T. W.	30	00	29	30	100	00	100	30	5
*45	Boise	Idaho	Lindgren, Waldemar.	44	00	43	30	116	00	116	30	.....
	1899.											
*55	Fort Benton	Mont.	Weed, W. H.	48	00	47	00	110	00	111	00	.....
*56	Little Belt Mountains. [b]	do	do	47	00	46	00	110	00	111	00	.....
*58	Elmoro [a]	Colo.	Hills, R. C.	37	30	37	00	104	00	104	30	.....
	1900.											
*64	Uvalde	Tex.	Vaughan, T. W.	29	30	29	00	99	30	100	00	.....
*66	Colfax	Cal.	Lindgren, Waldemar.	39	30	39	00	120	30	121	00	.....
67	Danville	Ill.-Ind.	Campbell, M. R.; Leverett, Frank.	40	15	40	00	87	30	87	45	5
68	Walsenburg [a]	Colo.	Hills, R. C.	38	00	37	30	104	30	105	00	5
	1901.											
*70	Washington [a]	D. C.-Va.-Md.	Darton, N. H.; Keith, Arthur.	39	00	38	45	76	45	77	15	.....
*71	Spanish Peaks [a]	Colo.	Hills, R. C.	37	30	37	00	104	30	105	00	.....
	1902.											
*76	Austin	Tex.	Hill, R. T.; Vaughan, T. W.	30	30	30	00	97	30	98	00	.....
*80	Norfolk	Va.-N. C.	Darton, N. H.									.....
*81	Chicago	Ill.-Ind.	Alden, W. C.	42	00	41	30	87	30	88	00	.....
*83	New York City	N. Y.-N. J.	Merrill, F. J. H.; Darton, N. H.; Hollick, Arthur; Salisbury, R. D.; Dodge, R. E.; Willis, Bailey; Pressey, H. A.	41	00	40	30	73	45	74	15	.....
84	Ditney	Ind.	Fuller, M. L.; Ashley, G. H.	38	30	38	00	87	00	87	30	5
85	Oelrichs [a]	S. Dak.-Nebr.	Darton, N. H.	43	30	43	00	103	00	103	30	5
	1903.											
86	Ellensburg	Wash.	Smith, G. O.	47	00	46	30	120	30	121	00	5
87	Camp Clarke	Nebr.	Darton, N. H.	42	00	41	30	103	00	103	30	5
88	Scotts Bluff	do	do	42	00	41	30	103	30	104	00	5
92	Gaines [b]	Pa.-N. Y.	Fuller, M. L.; Alden, W. C.	42	00	41	45	77	45	78	00	5
96	Olivet [a]	S. Dak.	Todd, J. E.	43	30	43	00	97	30	98	00	5
97	Parker [a]	do	do	43	30	43	00	97	00	97	30	5
99	Mitchell [a]	do	do	44	00	43	30	98	00	98	30	5
100	Alexandria [a]	do	Todd, J. E.; Hall, C. M.	44	00	43	30	97	30	98	00	5

[a] Includes map showing artesian or other ground-water conditions.
[b] Information on mineral water only.

Geologic folios—Continued.

No.	Name of folio and year of publication.	State.	Author.	Boundaries.								Price.
				North.		South.		East.		West.		
	1904.			°	′	°	′	°	′	°	′	*Cents.*
101	San Luis[a]	Cal.	Fairbanks, H. W.	35	30	35	00	120	30	121	00	5
102	Indiana	Pa.	Richardson, G. B.	40	45	40	30	79	00	79	15	5
103	Nampa	Idaho-Oreg.	Lindgren, Waldemar; Drake, N. F.	44	00	43	30	116	30	117	00	5
104	Silver City	Idaho	do	43	30	43	00	116	30	117	00	5
105	Patoka	Ind.-Ill.	Fuller, M. L.; Clapp, F. G.	38	30	38	00	87	30	88	00	5
106	Mount Stuart	Wash.	Smith, G. O.	47	30	47	00	120	30	121	00	5
107	Newcastle[b]	Wyo.-S. Dak.	Darton, N. H.	44	00	43	30	104	00	104	30	5
108	Edgemont[b]	S. Dak.-Nebr.	Darton, N. H.; Smith, W. S. T.	43	30	43	00	103	30	104	00	5
*111	Globe	Ariz.	Ransome, F. L.	33	30	33	15	110	45	111	00	.....
112	Bisbee	do	do	31	30	(c)		109	45	110	00	25
113	Huron[b]	S. Dak.	Todd, J. E.	44	30	44	00	98	00	98	30	5
114	De Smet[b]	do	Todd, J. E.; Hall, C. M.	44	30	44	00	97	30	98	00	5
	1905.											
117	Casselton-Fargo[b]	N. Dak.-Minn.	Hall, C. M.; Willard, D. E.	47	00	46	30	96	30	97	30	5
*120	Silverton[d]	Colo.	Cross, Whitman; Howe, Ernest; Ransome, F. L.	38	00	37	45	107	30	107	45	.....
*121	Waynesburg	Pa.	Stone, R. W.	40	00	39	45	80	00	80	15	.....
122	Tahlequah	Okla.-Ark.	Taff, J. C.	36	00	35	30	94	30	95	00	5
123	Elders Ridge	Pa.	Stone, R. W.	40	45	40	30	79	15	79	30	5
124	Mount Mitchell	N. C.-Tenn.	Keith, Arthur.	36	00	35	30	82	00	82	30	5
*127	Sundance[b]	Wyo.-S. Dak.	Darton, N. H.	44	30	44	00	104	00	104	30	.....
*128	Aladdin[b]	Wyo.-S. Dak.-Mont.	Darton, N. H.; O'Harra, C. C.	45	00	44	30	104	00	104	30	.....
*129	Clifton	Ariz.	Lindgren, Waldemar.	33	15	33	00	109	15	109	30	.....
	1906.											
*132	Muscogee	Okla.	Taff, J. A.	36	00	35	30	95	00	95	30	.....
*133	Ebensburg	Pa.	Butts, Chas.	40	30	40	15	78	30	78	45	.....
*135	Nepesta[b]	Colo.	Fisher, C. A.	38	30	38	00	104	00	104	30	.....
136	St. Marys	Md.-Va.	Shattuck, G. B.; Miller, B. L.	38	30	38	00	76	00	76	30	5
137	Dover	Del.-Md.-N. J.	Miller, B. L.	39	30	39	00	75	30	76	00	5
*138	Redding	Cal.	Diller, J. S.	41	00	40	30	122	00	122	30	.....
*140	Milwaukee special.	Wis.	Alden, W. C.	43	09	42	54	87	50	88	05	.....
*141	Bald Mountain-Dayton.	Wyo.	Darton, N. H.; Salisbury, R. D.	45	00	44	30	107	00	108	00	.....
*142	Cold Peak-Fort McKinney.	do	do	44	30	44	00	106	30	107	30	.....
	1907.											
*144	Amity	Pa.	Clapp, F. G.	40	15	40	00	80	00	80	15	.....
*145	Lancaster-Mineral Point.	Wis.-Iowa-Ill.	Grant, U. S.; Burchard, E. F.	43	00	42	30	90	00	91	00	.....
146	Rogersville	Pa.	Clapp, F. G.	40	00	39	45	80	15	80	30	5
147	Pisgah	N. C.-S. C.	Keith, Arthur.	35	30	35	00	82	30	83	00	5
148	Joplin district	Mo.-Kans.	Smith, W. S. T.; Siebenthal, C. E.	37	15	37	00	94	15	94	45	50
*149	Penobscot Bay	Maine.	Smith, G. O.; Bastin, E. S.; Brown, C. W.	44	30	44	00	68	30	69	00	.....
*150	Devils Tower[b]	Wyo.	Darton, N. H.; O'Harra, C. C.	45	00	44	30	104	30	105	00	.....
*151	Roan Mountain	Tenn.-N. C.	Keith, Arthur.	36	30	36	00	82	00	82	30	.....
*152	Patuxent[b]	Md.-D. C.	Shattuck, G. B.; Miller, B. L.; Bibbins, Arthur.	39	00	38	30	76	30	77	00	.....
*153	Ouray	Colo.	Cross, Whitman; Howe, Ernest; Irving, J. D.	38	15	38	00	107	30	107	45	.....
								94	00	94	30	.....
*154	Winslow	Ark.-Okla.	Purdue, A. H.	36	00	35	30					.....

[a] Information on mineral water only.
[b] Includes map showing artesian or other ground-water conditions.
[c] International boundary.
[d] Discusses mineral waters associated with the ore deposits and ground water in relation to the zone of oxidized ore and in relation to mine drainage.

Geologic folios—Continued.

No.	Name of folio and year of publication.	State.	Author.	Boundaries.								Price.
				North.		South.		East.		West.		
	1908.			°	′	°	′	°	′	°	′	*Cents.*
*155	Ann Arbor[a]	Mich	Russell, I. C.; Leverett, Frank.	42	30	42	00	83	30	84	00	.....
156	Elk Point[a]	S. Dak.-Nebr.-Iowa.	Todd, J. E	43	00	42	30	96	30	97	00	5
*157	Passaic	N. J.-N. Y	Darton, N. H.; Bayley, W. S.; Salisbury, R. D.; Kümmel, H. B.	41	00	40	30	74	00	74	30	.....
158	Rockland	Maine	Bastin, E. S	44	15	44	00	69	00	69	15	5
159	Independence	Kans	Schrader, F. C	37	30	37	00	95	30	96	00	5
160	Accident-Grantsville.	Md.-Pa.-W. Va.	Martin, G. C	39	45	39	30	79	00	79	30	5
*161	Franklin Furnace.	N. J	Spencer, A. C.; Kümmel, H. B.; Wolff, J. E.; Salisbury, R. D.; Palache, Charles.	41	15	41	00	74	30	74	45	.....
	1909.											
*162	Philadelphia	Pa.-N. J.-Del	Bascom, Florence; Clark, W. B.; Darton, N. H.; Kümmel, H. B.; Salisbury, R. D.; Miller, B. L.; Knapp, G. N.	40	15	39	45	75	00	75	30	.....
*163	Santa Cruz	Cal	Branner, J. C.; Newsom, J. F.; Arnold, Ralph.	37	30	36	55	122	00	122	30	.....
164	Belle Fourche[a]	S. Dak	Darton, N. H.; O'Harra, C. C.	45	00	44	30	103	30	104	00	5
165	Aberdeen-Redfield.[b]	do	Todd, J. E	45	30	44	30	98	00	99	00	5
166	El Paso	Tex	Richardson, G. B	32	00	31	30	106	00	106	35	5
*167	Trenton	N. J.-Pa	Bascom, Florence; Darton, N. H.; Kümmel, H. B.; Clark, W. B.; Salisbury, R. D.	40	30	40	00	74	30	75	00	.....
168	Jamestown-Tower.[a]	N. Dak	Willard, D. E.; Williams, H. S.	47	00	46	30	97	30	99	00	5
*169	Watkins Glen-Catatonk.	N. Y	Tarr, R. S.; Kindle, E. M.	42	30	42	00	76	00	77	00	.....
170	Mercersburg-Chambersburg.	Pa	Stose, G. W	40	00	39	45	77	30	78	00	5
	1910.											
172	Warren	Pa.-N. Y	Butts, Charles	42	00	41	45	79	00	79	15	5
173	Laramie-Sherman.	Wyo	Darton, N. H.; Blackwelder, Eliot; Siebenthal, C. E.	41	30	41	00	105	00	106	00	5
174	Johnstown	Pa	Phalen, W. C	40	30	40	15	78	45	79	00	5
175	Birmingham	Ala	Butts, Charles	34	00	33	30	86	30	87	00	5
	1912.											
179	Pawpaw-Hancock.	W. Va.-Md.-Pa.	Stose, G. W.; Schwartz, C. K.	39	45	39	30	78	00	78	30	5
181	Bismarck	N. Dak	Leonard, A. G	47	00	46	30	100	30	101	00	5
182	Choptank[a]	Md	Miller, B. L	39	00	38	30	76	00	76	30	5
183	Llano-Burnet	Tex	Paige, Sidney	31	00	30	30	98	00	99	00	5
184	Kenova[c]	Ky.-W. Va.-Ohio.	Phalen, W. C	38	30	38	00	82	30	83	00	5
	1913.											
185	Murphysboro-Herrin.	Ill	Shaw, E. W.; Savage, T. E.	38	00	37	45	89	00	89	30	25
186	Apishapa[a]	Colo	Stose, G. W	38	00	37	30	104	00	104	30	5
187	Ellijay[b]	Ga.-N. C	LaForge, Laurence; Phalen, W. C.	35	00	34	30	84	00	84	30	25
188	Tallula-Springfield.	Ill	Shaw, E. W.; Savage, T. E.	40	00	39	45	89	30	90	00	25
189	Barnesboro-Patton.	Pa	Campbell, M. R.; Clapp, F. G.; Butts, Charles.	40	45	40	30	78	30	79	00	25
190	Niagara	N. Y	Kindle, E. M.; Taylor, F. B.	43	30	43	00	78	30	79	00	50

[a] Includes map showing artesian or other ground-water conditions.
[b] Information on mineral water only.
[c] Contains no discussion of ground water but a section and data regarding oil and gas wells which give information as to depth at which salt water is found.

Geologic folios—Continued.

No.	Name of folio and year of publication.	State.	Author.	Boundaries.				Price.
				North.	South.	East.	West.	
	1914.			° ′	° ′	° ′	° ′	*Cents.*
191	Raritan	N. J.	Bayley, W. S.; Kümmel, H. B.; Salisbury, R. D.	41 00	40 30	74 30	75 00	25
192	Eastport	Maine	Bastin, E. S.; Williams, H. S.	45 00	44 45	67 00	67 15	25
193	San Francisco	Cal.	Lawson, A. C.	38 00	37 30	122 00	122 45	75
194	Van Horn	Tex.	Richardson, G. B.	31 30	31 00	104 30	105 00	25
	1915.							
195	Belleville-Breese	Ill.	Udden, J. A.; Shaw, E. W.	38 45	38 30	89 30	90 00	25
197	Columbus	Ohio	Hubbard, G. D.; Stauffer, C. R.; Bownocker, J. A.; Prosser, C. S.; Cumings, E. R.	40 15	39 45	82 45	83 15	25
198	Castle Rock	Colo.	Richardson, G. B.	39 30	39 00	104 30	105 00	25
	1916.							
199	Silver City	N. Mex.	Paige, Sidney; Darton, N. H.	33 00	32 30	108 00	108 30	25
200	Galena-Elizabeth.	Ill.-Iowa	Shaw, E. W.; Trowbridge, A. C.	42 30	42 15	90 00	90 30	25
201	Minneapolis-St. Paul.	Minn.	Sardeson, F. W.	45 15	44 45	93 00	93 30	25
203	Colorado Springs	Colo.	Finlay, G. I.	39 00	38 30	104 30	105 00	25
	1917.							
204	Tolchester	Md.	Miller, B. L.; Mathews, E. F.; Bibbins, A. B.; Little, H. P.	39 30	39 00	76 00	76 30	25
205	Detroit	Mich.	Sherzer, W. H.	42 30	42 00	82 45	83 30	50
206	Leavenworth-Smithville.	Mo.-Kans.	Hinds, Henry; Greene, F. C.	39 30	39 15	94 30	95 00	25
207	Deming	N. Mex.	Darton, N. H.	32 30	32 00	107 30	108 00	25

COOPERATIVE REPORTS NOT PUBLISHED BY THE UNITED STATES GEOLOGICAL SURVEY.

(S 1) Report of a reconnaissance in Trans-Pecos Texas, north of the Texas & Pacific Railway, by G. B. Richardson. Texas Univ. Min. Survey Bull. 9; Texas Univ. Bull. 23, Austin, Tex., 1904. 119 pp., 11 pls.

Describes the topography, geology, mineral resources, and ground waters of Toyah, Salt, and Hueco basins, Gypsum Plain, Guadalupe-Delaware Mountains, Diablo Plateau, and Rio Grande Valley. Contains a table of well data, well sections, and water analyses, and includes a map showing the geology and the locations of wells and springs.

(S 2) The underground water resources of Alabama, by E. A. Smith. Alabama Geol. Survey, Montgomery, Ala., 1907. 388 pp., 30 pls.

Describes the geography, geology, and climate of the State. Contains a general discussion in regard to the occurrence, circulation, and recovery of ground water and in regard to artesian wells. Gives detailed descriptions of wells, mineral waters, and ground-water conditions, with discussions of artesian prospects, by provinces, counties, and vicinities. Discusses the chemistry and classification of the waters from the various horizons and contains water analyses. Includes maps showing the geology and the areas of artesian flow.

(S 3) Water resources of the East St. Louis district, by Isaiah Bowman and C. A. Reeds. Illinois State Geol. Survey Bull. 5, Urbana, Ill., 1907. 128 pp., 4 pls.

Discusses the economic features of the district as a manufacturing site and describes the topography and geology and the water supplies from springs, cisterns, streams, lakes, reservoirs, and wells. Discusses underground drainage, fluctuations of the water table, water resources of the Karst, contamination of Karst water, unusual phenomena associated with springs and wells, and artesian conditions. Contains well sections and mineral and sanitary analyses of water. The water resources of a part of this area are also described in U. S. Geological Survey Bulletin 438.

(S 4) A preliminary report on the underground waters of Georgia, by S. W. McCallie. Georgia Geol. Survey Bull. 15, Atlanta, Ga., 1908. 370 pp., 30 pls.

Describes the physiography and geology of the State and discusses briefly precipitation, evaporation, and absorption by the soil. Describes in general the waters of the various geological formations, and in more detail the ground-water conditions in each county in the Coastal Plain, Crystalline area, and Paleozoic area. Contains numerous analyses of ground waters and discussions of their quality. Includes a chapter entitled "Experiment relating to problems of well contamination at Quitman" and one entitled "Blowing springs and wells of Georgia." Includes a table of data regarding public water supplies and a table of miscellaneous spring records. Also includes a geologic map of Georgia.

(S 5) The Coastal Plain of North Carolina, by W. B. Clark, B. L. Miller, L. W. Stephenson, B. L. Johnson, and H. N. Parker. North Carolina Geol. and Econ. Survey, vol. 3, Raleigh, N. C., 1912. 552 pp., 42 pls.

Consists of two parts bound in one volume. Part I describes the physiography and geology; Part II describes the water resources both surface and underground. Part II opens with a bibliography and a general discussion of the ground-water conditions but consists chiefly of detailed descriptions, by counties, of the topography, geology, ground-water conditions, and artesian prospects, with tables giving well data. These county descriptions are followed by a discussion of the quality of the water, by counties, and tables of analyses. The volume contains maps of the Coastal Plain of North Carolina showing the distribution of the surficial deposits and the underlying formations, the position of the basement rocks, and the areas in which potable water can be obtained from the various formations.

(S 6) Subterranean storage of flood waters by artificial methods in San Bernardino Valley, Cal., by C. H. Lee. Conservation Commission of California Rept. for 1912, Sacramento, Cal., 1912. pp. 335–400, 3 pls.

Gives history and methods of water spreading and amount of water spread along Santa Ana River and other streams. Gives data in regard to precipitation, run-off, and stream percolation in the San Bernardino Basin. Describes the ground-water reservoir in this basin, giving data on fluctuations of the water table and the artesian head. Discusses ground-water fluctuations in other basins in Southern California and draws conclusions as to the effect of water spreading. Includes a map showing the original area of artesian flow in the San Bernardino Basin and the areas in 1904 and 1912, also locations of wells and of lands used for spreading water.

(S 7) Ground-water resources of Indian Wells Valley, Cal., by C. H. Lee. Conservation Commission of California Rept. for 1912, Sacramento, Cal., 1912. pp. 401–429, 5 pls.

A brief report covering an arid valley (also known as Salt Wells Valley) that lies mostly in northeastern Kern County but extends into Inyo and San Barnardino counties and comprises a part of the area included in Tps. 25-27, Rs. 38–40. Gives information in regard to precipitation, stream flow, evaporation of ground water, and water supply available by pumping from wells.

(S 8) The underground water resources of the Coastal Plain province of Virginia, by Samuel Sanford. Virginia Geol. Survey Bull. 5, Charlottesville, Va., 1913. 361 pp., 1 pl.

Describes and discusses the topography, geology, origin, occurrence, and emergence of ground water, types of springs and their pollution, artesian conditions, cisterns, collecting tunnels, types of wells, magnetic wells, and freshening of deep water. Gives detailed information on wells and ground-water conditions by counties and contains tables of well data and of analyses of spring and well waters. Includes a map showing the areas of artesian flow and the quality of the ground waters.

(S 9) The underground and surface water supplies of Wisconsin, by Samuel Weidman and A. R. Schultz. Wisconsin Geol. and Nat. Hist. Survey Bull. 35, Madison, Wis., 1915. 664 pp., 5 pls.

Describes the geography and geology of the State and the conditions controlling local ground waters and artesian waters. Describes the flowing wells and artesian prospects, the springs and mineral waters, the uses of water supplies, and the quality of water from various geologic sources and from the rivers and lakes of the State. Gives detailed descriptions by counties with well sections and water analyses. Includes maps showing the geology, the surface of the pre-Cambrian rocks, the head of artesian water, and the areas of soft and hard water.

(S 10) Memorandum on the geology of the ground waters of the Island of Antigua, B. W. I., by T. W. Vaughan. Imperial Dept. Agr. for the West Indies, West Indian Bull., vol. 14, No. 4, 1915. pp. 276–280.

Outlines the physiography and geology of Antigua and their bearing on ground-water conditions. Discusses the prospects of obtaining artesian and other ground waters; also discusses the quality of the ground waters, especially with reference to salt. Includes a sketch map of the island showing the geology. Reference is made to the work of H. A. Tempany, chemist and superintendent of agriculture for the Leeward Islands, who published two papers on the same subject, containing some detailed spring and well data and a number of analyses of ground water. The papers by Tempany are as follows: "The water supply of Antigua" (West Indian Bull., vol. 12, No. 4) and "The ground waters of Antigua" (West Indian Bull., vol. 14, No. 4).

(S 11) Reports on condition of water supply at Savannah, Ga. Mayor of Savannah Ann. Rept., 1915.

Contains the following papers submitted by the United States Geological Survey:

Preliminary report on Savannah Water Supply, by L. W. Stephenson and R. B. Dole. Pp. 1–14.

The water supply of Savannah, Ga., by R. B. Dole. Pp. 15–89.

These papers discuss the yield and head of the artesian wells of Savannah, the consumption of water, the sanitary and chemical quality of the water, and the cost of operation. They give the results of fluorescein tests and several analyses of surface and ground waters. They conclude with recommendations for future developments.

(S 12) Report of the Water Commission of the Territory of Hawaii to the Governor of Hawaii, by G. K. Larrison, A. G. Smith, and T. F. Sedgwick. Honolulu, 1917. 53 pp., map, diagrams, and tables.

Discusses and gives data regarding artesian water on the Island of Oahu, the relation of precipitation to artesian head, the discharge of flowing and pumped wells, the interference of wells, the progress of artesian well boring, and waste of water from artesian wells. Includes a proposed law relating to the use of water from artesian wells. The data were collected by R. C. Rice and R. D. Klise, of the United States Geological Survey, under the direction of T. F. Sedgwick.

MISCELLANEOUS SPRING RECORDS.

Miscellaneous records of the discharge of springs in papers not elsewhere listed.

Water-Supply Paper.	Pages on which data are given.	Date of measurement.	Name.	State.	Location.	Discharge.
						Sec.-ft.
27.....	45	Dec. 20, 1898	Silver Spring.....	Fla.....	Near Ocala.....	822
27.....	45	Dec. 21, 1898	Kissingen Spring.....	...do.....	Bartow.....	31
27.....	45	Dec. 22, 1898	Blue Spring.....	...do.....	Juliet.....	778
27.....	45	Dec. 23, 1898	Itchatucknee Spring....	...do.....	Near Fort White.....	403
28.....	130	Mar. 26, 1898	Barton Spring.....	Tex.....	Austin.....	20
28.....	130	May 3, 1898	.....do.....	...do.....	.....do.....	30
28.....	130	.....do.....	.....do.....	...do.....	.....do.....	31
28.....	130	Dec. 23, 1898	.....do.....	...do.....	.....do.....	19
28.....	130	Dec. 24, 1898	.....do.....	...do.....	.....do.....	19
36.....	147	May 30, 1899	Dooley Spring.....	Ga.....	3 miles south of Fairmount.	.92
36.....	147	.....do.....	Drove Mill Spring.....	...do.....	Near Cash.....	16.2
36.....	147	.....do.....	Baker's mill spring.....	...do.....	5 miles south of Fairmount.	3.9
36.....	147	June 24, 1899	Colina Spring.....	...do.....	Near Colina.....	.28
36.....	147	.....do.....	Arnold Spring.....	...do.....	1 mile south of Colina.....	.38
36.....	147	.....do.....	J. R. Byrd's spring.....	...do.....	2½ miles northwest of Fairmount.	.47
36.....	147	.....do.....	R. W. Lander's spring.	...do.....	3 miles east of Pinelog.....	4.27
36.....	147	.....do.....	J. A. Johnson's spring.	...do.....	2½ miles east of Pinelog....	.48
36.....	147	.....do.....	Oakhill Church Spring.	...do.....	.....do.....	1.85
36.....	147	June 26, 1899	Hayse Spring.....	...do.....	Folsom.....	.35
36.....	147	.....do.....	Cedar Spring.....	...do.....	Mostetters Mill, 1½ miles west of Folsom.	4.45
36.....	147	.....do.....	Trimble Spring.....	...do.....	2 miles north of Adairsville.	2.35
36.....	147	.....do.....	Gardners Spring.....	...do.....	5 miles north of Adairsville.	.41

Miscellaneous records of the discharge of springs in papers not elsewhere listed—Contd.

Water-Supply Paper.	Pages on which data are given.	Date of measurement.	Name.	State.	Location.	Discharge.
						Sec.-ft.
36....	147	June 26, 1899	Blackwood Spring.....	Ga.....	5 miles southeast of Calhoun.	1
37....	277	June 30, 1899	Las Moras Spring.....	Tex.....	Fort Clark, near Brackettville, and 10 miles from Spofford.	60
37....	277	Dec. 24, 1895	.....do.....	...do.....	.....do.....	21
37....	277	June 29, 1899	San Felipe Springs.....	...do.....	Below San Madre ditch diversion, near Del Rio.	84
37....	277	.....do.....	San Madre Ditch.....	...do.....	Near Del Rio.....	29
39....	434	Aug. 21, 1899	Pacoima submerged dam.	Cal.....	(By pumping).....	.24
39....	440	June 13, 1899	Wooden Spring Branch.	Nebr....	Sec. 25, T. 35 N., R. 29 W.	2.14
85....	126	Aug. 4, 1902	Spring.....	Nev.....	½ mile north of Heitman's house.	.74
85....	126	.....do.....	.....do.....	...do.....	Near Heitman's house.....	.35
85....	126	Sept. 8, 1902	.....do.....	...do.....	.....do.....	.27
85....	126	Aug. 4, 1902	.....do.....	...do.....	South of Heitman's house.	1.08
85....	126	Sept. 8, 1902	.....do.....	...do.....	.....do.....	1.06
85....	126	Aug. 4, 1902	.....do.....	...do.....	Heitman's.....	2.39
85....	126	Sept. 8, 1902	.....do.....	...do.....	.....do.....	2.35
85....	246	June 10 and 11, 1902.	Springs.....	Idaho...	All springs flowing into Snake River, between Shoshone Falls and the Cedars.	112
98....	293	July 20, 1903	Big Springs.....	Ala.....	Tuscumbia.....	177
127....	120	Apr. 19, 1904	.....do.....	Ga.....	½ mile from left bank Flint River, about 4 miles down stream from Albany.	135
127....	120	Sept. 23, 1904	.....do.....	...do.....	.....do.....	44
127....	120	Nov. 16, 1904	.....do.....	...do.....	.....do.....	26.4
127....	175	Jan. 21, 1904	Cave Spring.....	...do.....	Cave Spring.....	5.3
130....	192	Sept. 11, 1904	Giant Springs.....	Mont....	Great Falls.....	202
133....	358	Aug. 31, 1904	Heitman's springs.....	Nev.....	Mouth of Cañyon.....	1.2
133....	358	.....do.....	Monfrena Springs.....	...do.....	.....do.....	1.2
133....	364	Oct. 4, 1904	Big Spring.....	Utah....	Tributary to Rock Creek, in Duchesne River basin.	7.4
135....	271	Aug. 10, 1904	Hawley Springs.....	Idaho...	½ mile below Heise post office.	.8
135....	272	Aug. 17, 1904	Thurman Springs.....	...do.....	North Fork of Snake River above Marysville.	.2
135....	272	.....do.....	West Bald Cabin Springs.	...do.....	.....do.....	.2
135....	272	.....do.....	East Bald Cabin Springs.	...do.....	.....do.....	1.5
135....	272	.....do.....	Green Springs.....	...do.....	.....do.....	.6
135....	272	Aug. 18, 1904	Blue Springs.....	...do.....	.....do.....	3.6
135....	272	.....do.....	Grizzly Spring.....	...do.....	.....do.....	5.3
135....	272	Aug. 20, 1904	Caldwell Spring No. 1.	...do.....	.....do.....	.5
135....	272	.....do.....	Caldwell Spring No. 2.	...do.....	.....do.....	.3
135....	272	Aug. 22, 1904	Sorenson Spring.....	...do.....	.....do.....	.8
135....	273	Aug. 23, 1904	Bear or Little Spring...	...do.....	East bank of Henry Fork of North Fork of Snake River.	.5
135....	273	.....do.....	Thompson Springs.....	...do.....	.....do.....	5
135....	273	.....do.....	Garner Spring.....	...do.....	.....do.....	.9
135....	273	Aug. 25, 1904	Whitman Spring.....	...do.....	Tributaries of Henry Lake.	1.7
135....	273	.....do.....	Rock Springs.....	...do.....	.....do.....	.7
135....	273	.....do.....	Sherwood Springs.....	...do.....	.....do.....	1.2
135....	273	.....do.....	Big Spring.....	...do.....	.....do.....	1.2
135....	273	.....do.....	Golf Spring.....	...do.....	.....do.....	.7
168....	98	Apr. 26, 1905	Blue Spring.....	Ga.....	4 miles from Albany on road to Hardaway.	69
168....	101	Mar. 10, 1905	Warm Springs.....	...do.....	½ mile from Warm Springs station.	3.2
168....	101	Apr. 20, 1905	.....do.....	...do.....	.....do.....	1.47
168....	101	.....do.....	.....do.....	...do.....	.....do.....	1.48
177....	85	Dec. 4, 1905	Fish Springs.....	Cal.....	Near Big Pine.....	29
177....	245	Aug. 29, 1905	Little Shasta Springs....	...do.....	Little Shasta.....	20
197....	241	Mar. 10, 1905	Warm Springs.....	Ga.....	½ mile from Warm Springs railroad station.	3.2
197....	241	Apr. 20, 1905	.....do.....	...do.....	.....do.....	1.47
197....	241	.....do.....	Warm Springs.....	Ga.....	.....do.....	1.48
197....	302	Jan. 21, 1904	Cave Spring.....	...do....	Cave Spring.....	5.3
212....	92	July 11, 1906	A. Bayter's dug well and springs.	Utah....	.....	.11
212....	92	July 12, 1906	N. Green's spring.....	...do....	Near fence No. 48.....	.25

Miscellaneous records of the discharge of springs in papers not elsewhere listed—Contd.

Water-Supply Paper.	Pages on which data are given.	Date of measurement.	Name.	State.	Location.	Discharge.
						Sec.-ft.
212	92	July 13, 1906	Gillie's springs	Utah	SE. ¼ sec. 4, T. 29 S., R. 7 W.	0.82
212	92	do	2 springs	do	Hannah Gale's farm	1.35
212	92	do	do	do	O. W. Gale's pasture	.68
212	92	July 14, 1906	Farnsworth & Bastian Bros. spring.	do	On Indian Creek	.11
212	92	July 20, 1906	Jeddy Dean's dug well	do	Beaver City	.25
212	92	do	J. H. Cartwright spring	do	do	.05
212	92	do	2 springs of W. E. Yardley.	do	do	.23
212	92	do	Jos. Jackson's 2 springs	do	South Beaver	.37
212	92	Aug. 21, 1906	Datson's warm springs	do	1 mile east of Minersville	.13
214	154	Oct. 19, 1906	Warm Springs	Oreg	Warm Springs Agency	260
230	160	May 7, 1902	Paxton Spring	Nebr	Sec. 19, T. 15 N., R. 27 W.	.8
247	118	Jan. 7, 1907	Antelope Spring	Okla	Sulphur	3.2
247	118	do	do	do	do	3.4
247	118	do	Buffalo Spring	do	do	6.1
250	143	Aug. 31, 1907	Roaring Springs	Oreg	Southwest base of Steens Mountain.	5
252	284	Aug. 6, 1907	Spring	do	Chris. Dennaen's, sec. 2, T. 25 S., R. 36 E.	4
271	242	Oct. 1, 1909	Beetle's rest spring	do	Klamath Agency sawmill.	24
288	135	Dec. —, 1910	Hancock Spring	Tex	Lampasas	7.4
288	135	do	Hanna Spring	do	do	.9
288	135	Aug. —, 1910	Barton Springs	do	Austin	19
289	220	Sept. 6, 1910	Artesian well	Nev	Las Vegas	.43
289	220	do	Every (?)	do	do	1.56
298	390	Sept. 9, 1902	Dotta Spring	Cal	Big Meadows	109
298	390	June 12, 1905	do	do	do	50
298	390	July 3, 1905	do	do	do	99
298	390	Aug. 5, 1905	do	do	do	84
298	390	Sept. 2, 1905	do	do	do	89
298	390	Oct. 18, 1905	do	do	do	90
298	390	Dec. 14, 1905	do	do	do	77
298	390	June 21, 1906	do	do	do	122
298	390	Aug. 3, 1906	do	do	do	94
310	196	Apr. 20, 1911	Roaring Springs	Oreg	Sec. 6, T. 34 S., R. 32 E., in Catlow Valley. (?)	6.05
310	196	Aug. 14, 1911	Threemile Springs	do	¼ mile below head of Threemile Creek in Catlow Valley.	.3
310	196	Apr. 13, 1911	Thompson Springs	do (?)	Tumtum Lake Basin near Denio-Andrews stage road.	.28
310	196	Apr. 11, 1911	Knox Springs	do	Sec. 22, T. 31 S., R. 32½ E., in Harney Valley. (?)	1.5
314	81	Aug. 28, 1909	Spring	Alaska	Fish River Basin, Seward Peninsula.	6.4
314	173	July 10, 1907	do	do	Grand Central River Basin, Seward Peninsula.	3.8
326	364	July 5, 1912	Buckholz Springs	Mont	SE. ¼ SW. ¼ sec. 28, T. 21 N., R. 7 W., near Augusta.	1.1
326	365	Sept. 14, 1912	Giant Springs	do	Great Falls	192
332	275	Mar. 31, 1911	Drumheller Springs	Wash	Crab Creek drainage basin	20
332	275	Jan. 18, 1912	do	do	do	20.6
332	275	Mar. 16, 1912	do	do	do	17.8
359	255	Mar. 12, 1912	Hunts Spring	Utah	Central	3.0
360	285	Aug. 21, 1913	Warm Creek Spring	do	Near Fayette	3.9
360	285	Aug. 3, 1913	Nolen Spring	do	Near Mills	6.4
360	286	Aug. 16, 1913	Preston Big Spring	Nev	Near Preston	7.6
360	286	do	Spring No. 4	do	700 feet northwest of Preston post office.	.9
360	286	do	Spring No. 2	do	200 feet west and 150 feet north of Preston post office.	3.7
360	286	do	Spring No. 3	do	500 feet north of Preston post office.	2.8
360	286	Aug. 23, 1913	Warm Springs	Oreg	Bridge at "OO" Ranch, Harney Lake Basin—main channel only.	20.9
362	749	July 1, 1913	Intermittent spring	Wash	SW. ¼ sec. 13, T. 5 N., R. 10 E.	49.7
370	808	Aug. 6, 1907	Spring	Oreg	Chris. Dennaen's, sec. 2, T. 25 S., R. 36 E.	4
370	811	May 7, 906	Minnehaha Spring	do	Near Hermiston.	2.6
370	811	Sept. 27, 1905	Cold Springs	do	do	1.6
370	811	Oct. 6, 1905	do	do	do	1.5

Miscellaneous records of the discharge of springs in papers not elsewhere listed—Contd.

Water-Supply Paper.	Pages on which data are given.	Date of measurement.	Name.	State.	Location.	Discharge.
						Sec.-ft.
370....	811	Oct. 2, 1905	Gillette Springs.....	Oreg....	Near Echo.....	2
370....	817	Sept. 20, 1908	Anna Creek Spring.....	...do....	Arants.....	2.7
370....	818	Aug. 7, 1907	Beetles Rest Spring....	...do....	½ mile north of Klamath Agency.	25
370....	818	Mar. 23, 1908	.....do.....	...do....	.....do.....	26
370....	818	Apr. 27, 1908	.....do.....	...do....	.....do.....	25
370....	818	Oct. 1, 1909	.....do.....	...do....	.....do.....	24
370....	818	May 8, 1910	Barclay Springs.....	...do....	Upper Klamath Lake Basin.	1.7
370....	820	May 16, 1908	Olene Springs.....	...do....	Near Olene.....	2.9
370....	821	Aug. 31, 1907	Roaring Springs.....	...do....	Southwest side of Steens Mountain.	5
389....	191	Apr. 26, 1914	Toquerville Springs....	Utah....	East side of Ash Creek, just above Toquerville.	1
389....	191	Feb. 12, 1914	Hunts Spring.....	...do....	Hunt's ranch, 1 mile southeast of Central.	3.2
389....	191	Apr. 27, 1914	.....do.....	...do....	.....do.....	3
389....	191	Dec. 11, 1913	Stone Cabin Spring....	Nev.....	7 miles northwest of Noapa.	2
389....	191	May 23, 1914	.....do.....	...do....	.....do.....	1.8
389....	191	July 17, 1914	.....do.....	...do....	.....do.....	1.8
389....	191	Aug. 7, 1914	.....do.....	...do....	.....do.....	1.8
389....	191	Aug. 26, 1914	.....do.....	...do....	.....do.....	1.8
389....	192	Sept. 23, 1913	Ash Meadow Springs....	...do....	Near Amargosa.....	3.4
390....	297	June 21, 1914	Upper Mollen Springs..	Utah....	Near Mills.....	5.6
390....	297	July 23, 1914	.....do.....	...do....	.....do.....	7.7
390....	297	Aug. 28, 1914	.....do.....	...do....	.....do.....	4.7
390....	297	June 21, 1914	Lower Mollen Springs..	...do....	.....do.....	6.8
390....	297	Aug. 28, 1914	.....do.....	...do....	.....do.....	7.6
390....	297	Oct. 16, 1913	Preston Big Spring.....	Nev.....	Preston.....	7.6
390....	297	.....do.....	Spring.....	...do....	200 feet northwest of Preston post office.	3.6
390....	297	.....do.....	.....do.....	...do....	Near Gee's at Preston.....	2
390....	298	July 14, 1914	Parsnip Springs.....	Oreg....	At mouth of Camas Creek.	1.3
391....	328	Aug. 24, 1914	Big Spring.....	...do....	Fort Klamath-Crescent, road crossing.	61.4
391....	328	Aug. 12, 1914	.....do.....	...do....	.....do.....	70.8
391....	328	.....do.....	.....do.....	...do....	¾ mile below road below last spring.	62.5
391....	328	Aug. 27, 1914	Roger Spring.....	...do....	¾ mile above mouth of Sycan River.	5
393....	241	Mar. 24, 1914	Warm Springs.....	Idaho...	Near Henry.....	.6
393....	241	Apr. 17, 1914	.....do.....	...do....	.....do.....	1
393....	241	May 2, 1914	.....do.....	...do....	.....do.....	1.2
393....	241	June 26, 1914	.....do.....	...do....	.....do.....	1.4
393....	241	Aug. 6, 1914	.....do.....	...do....	.....do.....	1.1
394....	173	Aug. 15, 1914	Springs.....	Oreg....	Tributary to Deschutes River between Spring River and West's bridge.	13.5
394....	173	Aug. 14, 1914	.....do.....	...do....	Tributary to Deschutes River between West's bridge and Benham Falls.	28.4
394....	174	July 3, 1914	Intermittent springs...	Wash...	Near Trout Lake.....	32.6
394....	174	Sept. 16, 1914	.....do.....	...do....	.....do.....	0
394....	174	Mar. 18, 1914	3 springs.....	Oreg....	1½ miles west of Parkdale..	13.3

INDEX.

The following abbreviations are used in the index:

W, Water-supply paper (pp. 5–29).
A, Annual report (pp. 29–32).
M, Monograph (pp. 32–33).
P, Professional paper (pp. 33–34).
B, Bulletin (pp. 34–40).
MR, Report on mineral resources (p. 42).
GF, Geologic folio (pp. 43–45).
S, Cooperative report not published by the United States Geological Survey (pp. 45–47).

Names of formations and geologic ages are entered as used in the reports indexed without revision to bring them into accord with current usage.

A.

B.

C.

E.

F.

G.

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