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**Bibliography and Index
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by

AGNES B. GRAMETBAUR



**DIVISION OF FORESTRY, GEOLOGY, PARKS
AND HISTORIC SITES**

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Trenton, N. J.

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LETTER OF TRANSMITTAL

Mr. Charles P. Wilber, Director,
Div. of Forestry, Geology, Parks & Historic Sites.

Sir:

Many people interested in the geology of New Jersey have expressed a desire for a bibliography and index of that subject such as many of the other states have made available. The attached manuscript is an answer to that demand and I recommend its publication as Bulletin 59 of the Geologic Series. It is a pleasure to acknowledge here the debt owed to Miss Agnes Grametbauer, the author, whose patience in compiling this very complete work has been exceeded only by her generosity in making it available for publication without charge. Acknowledgement of substantial financial support in meeting the present high cost of publication is also gratefully made to the Department of Geology of Princeton University, and the Bureau of Mineral Research at Rutgers University. In thus concretely recognizing the value of Miss Grametbauer's work, these agencies are also demonstrating a cooperation which is warmly appreciated, and which will be reciprocated in full measure.

Respectfully yours,

MEREDITH E. JOHNSON,
State Geologist.

BIBLIOGRAPHY AND INDEX OF THE GEOLOGY OF NEW JERSEY TO JULY 1, 1945

by

AGNES B. GRAMETBAUR

INTRODUCTION

General Note

In this bibliography are listed books, bulletins, journals, articles, papers and reports on the geology of New Jersey that have been published from 1753 to July 1, 1945.

Part I, *Bibliography*, is a list of authors, arranged alphabetically. Each author's writings are listed under his name: (1) chronologically, and (2) alphabetically if there are several works in the same year, and are numbered.

Part II, *Index*, is an alphabetical list of subjects arranged: (1) according to a geographic area—either a major province or county; (2) a geologic period, and (3) numerous major heads. These heads are further subdivided according to the nature of the material indexed. Most of the papers are indexed under all three categories. In each instance, the name of the author and the serial number of his paper follow under the appropriate heading. Thus, the reader can find the title and reference of the paper in the Bibliography, Part I.

Sources of Information

The papers listed have, in a large part, been taken from the *Bibliography of North American Geology* through 1941. Entries after 1941 have been taken from various lists of publications of the United States Government Printing Office in Washington, D. C. Although there may be some minor omissions, it is thought that the entries since 1941 include all major contributions.

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The compiler expresses deep gratitude to the library staffs of the Science and Technology Department of the New York Public Library, the Library of the American Museum of Natural History, and the Engineering Societies Library for their untiring assistance in making the material available for consultation. She also desires to extend appreciation to Dr. Horace Elmer Wood, 2nd, and Dr. Herbert P. Woodward of the University of Newark, for their help in this work as well as their encouragement. The compiler is also grateful to Dr. H. B. Kummel for his advice and Mr. Meredith E. Johnson, State Geologist, for loaning her several papers from his personal library.

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PART II
Subject Index

KEY TO ABBREVIATIONS

**F. W. P.—Federal Writers' Project of the Works Progress Administration for
the State of New Jersey**

N. J. B.—New Jersey Boundaries

N. J. C. N. B.—New Jersey Commerce and Navigation Board

N. J. S. S. C. C. B.—New Jersey State Soil Conservation Committee Bulletins

N. J. S. W. P. C.—New Jersey State Water Policy Commission

**N. J. S. W. P. C. S. R.—New Jersey State Water Policy Commission Special
Reports**

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Materials, general: Day, 2, 3; Williams, A., 1.
Clay: Bascom, 2, 3; Cook, 7; Johnson, M. E., 5; Ries, 1, 4, 7; Rogers, H. D., 2; Williams, 2.
Greensand marl: Ashley, 1; Bascom, 2, 3; Cook, 6, 7, 19, 12, 14, 19, 25; Gordon, T. F., 1; Kummel, 67, 70; Lewis, H. C., 6; Mansfield, 1, 2, 3; Mitchell, 4; Pierce, 3; Rogers, H. D., 1, 2; Shreve, 1, 2; Wurtz, 1.
Iron: Bishop, 1; Smith, T. P., 1.
Peat: Waksman, 2.
Potash: Ashley, 1; Cook, 6, 19; Mansfield, 1, 2, 3; Kummel, 67, 70; Rogers, H. D., 2; Shreve, 1, 2; Wurtz, 1.
Sand and gravel: Bascom, 3, 3; Johnson, M. E., 5.
Stone: Cook, 88.
- Coastal Plain—Continued.
Engineering geology, inlets: Haupt, 1; N. J. C. N. B., 2, 3.
Floods and flood control.
Forestry and flood control: Gifford, 1.
Geodesy, surveying: Merrill, F. J. H., 1.
Geophysics.
Earthquake and seismology: Heck, 1.
Electrical measurements: Woollard, 6.
Gravitational measurements and stations: Ewing, 1; Woollard, 2, 3, 4, 5, 6.
Magnetism and magnetic surveys: Woollard, 2, 3, 4, 5, 6.
Seismic explorations: Ewing 1; Johnson, 11; Woollard, 1, 2, 6.
Glacial geology, general: Salisbury, 22.
Climatic evidence of: Taylor, 1.
Depositional features: Britton, 4; Fuller, 3.
- Mineralogy.
Mineral groups, silicates: Clark, 3; Cook, 84; Kummel, 70; Mansfield, 3; Wurtz, 1.
- Orogeny: Merrill, 5.
- Paleontology.
Plants, general: Berry, 15; Credner, 3; Hollick, 9, 10; Newberry, 6, 7; Ward, L. F., 1.
Thallophyta: Woolman, 6, 7, 9, 10, 17.
Spermatophyta: Lutz, 1; Newberry, 3; Taylor, 1.
Animals, general: Clark, 3, 10; Cooke, C. W., 1; Cope, 25; Credner, 3; Kummel, 56; Lyell, 1; Merrill, F. J. H., 1; Morton, 7; Richards, 5, 12, 14; Rogers, H. D., 2; Weiler, 5; Whitfield, 4; Woolman, 20, 21.
Protozoa: Bailey, J. W., 1; Jennings, 1; Reuss, 1; Toulmin, 1.
Brachiopoda: Clark, 3, 8; Forbes, 1; Say, 1; Whitfield, 1, 7.
Mollusca: Clark, 3; Forbes, 1; Richards, 11, 12; Say, 1; Stephenson, 1, 4; Whitfield, 1, 2, 3, 5, 7.
Arthropoda: Jennings, 1; Whitfield, 7.
Echinodermata: Clark, 3.
Chordata, Reptilia: Agassiz, 1; Cope, 2, 3, 12, 21, 22, 23; Leidy, 2; Owen, 1; Russell, L. S., 1.
- Peneplanes: Crosby, 1; Shaw, 1; Stoes, 3.
- Petrology.
Sedimentary rocks, rock types, clay: Ries, 4.
Gravel: Salisbury, 7, 29.
Greensand marl: Ashley, 1; Clark, 3; Cook, 123; Haldeman, 1; Mansfield, 3; Rogers, H. D., 2.
Sand: Rogers, H. D., 2; Salisbury, 7, 29.
Till: Salisbury, 7.
- Physical geography: Bascom, 2, 3; Bayley, 4; Clark, 3, 10; Coman, 2; Cook, 2, 4, 64; Darton, 14; Davis, 4, 6; Johnson, D. W., 6; Kummel, 77, 78; Lewis, 11; MacClintock, 6; McGee, 1; Rogers, H. D., 2; Salisbury, 3, 9, 10, 15, 29; Schöpf, 1; Shattuck, 2; Smock, 4; Vermeule, 3.
- Shoreline features, general: Cook, 90; Nelson, 3.
Beaches: Cook, 7, 23; Haupt, 3; Merrill, F. J. H., 1; N. J. C. N. B., 1, 2, 3; Salisbury, 17; Wheeler, E. S., 1.

Coastal Plain—Continued.

Shoreline features—Continued.

Erosional and depositional: Cook, 96; Flint, 1, 2; Haupt, 1, 3; Johnson, D. W., 1; MacClintock, 1, 2, 5, 6; Merrill, F. J. H., 1; N. J. C. N. B., 1, 3; Richards, 1, 7; Salisbury, 9, 29; Wheeler, E. S., 1; Woodman, 1; Anonymous, 2.

Marshes: Cook, 5, 7, 84; Merrill, F. J. H., 1; Salisbury, 17, 18; Vermeule, 3; Waksmann, 2; Wheeler, E. S., 1.

Recent shoreline oscillations: Anteva, 1, 2; Cook, 3, 5, 84; Flint, 1; Fuller, 3; Johnson, D. W., 1; Kummel, 76; Lindenkohl, 2; MacClintock, 1; Merrill, F. J. H., 1; Richards, 4, 5, 7; Salisbury, 13, 21, 29; Shattuck, 2.

Submarine canyons: Lindenkohl, 2; Spencer, J. W. W., 1.

Terraces (marine): Anteva, 2; Flint, 1, 2; Fuller, 3; MacClintock, 1; Merrill, F. J. H., 1, 5; Richards, 9, 17; Salisbury, 9, 29; Shattuck, 2.

Soils.

Composition: Bascom, 3; Blair, 3; Cook, 38, 79; Salisbury, 18, 19, 21; Wherry, 6.

Soil conservation: N. J. S. S. C. C. B., 2, 3.

Soil erosion: N. J. S. S. C. C. B., 2, 3, 6.

Soil and forestry: Gifford, 1.

Stratigraphy, general: Dryden, 1; Rogers, H. D., 1, 2.

Cretaceous: Berry, 15; Bibbins, 1; Britton, 1; Clark, 4, 6, 10, 11, 12, 13; Conrad, 14; Cook, 2, 3, 7, 64, 105, 113, 122, 123; Cooke, C. W., 1; Cope, 22; Credner, 3; Darton, 14; Dryden, 1; Finch, 1; Fuller, 3; Gabb, 7; Greacen, 1; Hayes, A. O., 1; Hill, 1; Knapp, 5; Kummel, 50, 56; Lea, 2; Lewis, S., 1; McGee, 1; Mansfield, 1; Marsh, 12; Mather, 1; Morton, 2, 3, 6; Richards, 15; Rogers, H. D., 4; Schöpf, 1; Uhler, 1; Vanuxem, 7; Ward, L. F., 1; Weller, 5, 7, 9; Wheeler, E. S., 1; White, 1.

Tertiary: Britton, 1; Clark, 1, 3, 4, 5, 10, 13; Cook, 105, 113, 122, 123; Cooke, C. W., 1; Credner, 3; Dall, 1; Fuller, 3; Greacen, 1; Harris, 1; Heilprin, 1; Johnson, 11; Kummel, 50, 56; McGee, 1; Mansfield, 1; Morton, 6; Richards, 14, 17; Salisbury, 7, 9, 10, 21, 29; Shattuck, 2; Toulmin, 1; Vanuxem, 7; Weller, 5; Wheeler, E. S., 1; White, 1; Wood, 2; Woolman, 4.

Quaternary: Clark, 13; Cook, 64; Flint, 1; Fuller, 3; Kummel, 50; MacClintock, 2, 6; McGee, 1; Merrill, F. J. H., 1, 4; Richards, 17; Salisbury, 3, 7, 10, 21, 29; Shattuck, 2; Vanuxem, 7; Wood, 2.

Streams and surface drainage.

Deposition: Flint, 1; Salisbury, 29.

Drainage history: Lindenkohl, 2.

Erosion: Salisbury, 29.

Structural geology, general: Cook, 64.

Local structures, faults: Woolard, 1.

Sheets and sills: Woolard, 1.

Minor structures, unconformities: Clark, 10.

Regional features, Coastal Plain: Bascom, 2, 3; Hollick, 3; Johnson, 12; Mansfield, 5; Shattuck, 2.

Coastal Plain—Continued.

Techniques, field trips: Clark, 2; Torrey, R. H., 1.

Water supply.

Ground water, general: Barksdale, 7; Critchlow, 3; Knapp, 4; Sanford, 1; Thompson, 1, 2; Twitchell, 11; Vermeule, 17.

Wells: Bascom, 2, 3; Critchlow, 3; Darton, 11; Johnson, D. W., 1; Knapp, 3, 4; Sanford, 1; Schöpf, 1; Smith, T. F., 1; Thompson, 1; Twitchell, 11; Vermeule, 4, 9, 17.

Mineral content: Sanford, 1.

Surface water, general: Bascom, 2, 3; Cook, 46; Thompson, 2; Vermeule, 3, 4, 5, 7, 9.

Stream flow: Vermeule, 6, 8.

Water power: Vermeule, 3, 6, 8.

Wind work.

Deposition: Cook, 23; Merrill, F. J. H., 1; Salisbury, 17, 29.

Erosion: N. J. C. N. B., 1; N. J. S. S. C. C. B., 6.

Coke. See Economic geology: materials.

Concretions: See Petrology: sedimentary rocks; sedimentary features.

Conglomerates. See Petrology: sedimentary rocks.

Conservation and development.

Forestry: Coman, 2; Cook, 112, 118; Gifford, 1, 2; Pinchot, 1; Vermeule, 10, 11, 16, 18.

Reclamation of land, general: Cook, 15, 16, 21, 26, 28, 47, 50; Salisbury, 18.

Cape May Marshes: Cook, 4.

Delaware Basin: Cook, 21.

Hackensack Meadows: Cook, 21; Vermeule, 8, 14, 19; Woolman, 12.

Jersey City Meadows: Russell, 5; Vermeule, 19.

Maurice River: Cook, 15, 21.

Newark Basin: Cook, 21; Vermeule, 12, 14, 19.

Passaic Basin: Bowser, 1; Cook, 21, 26, 30, 40, 47, 63, 109, 117, 125, 133, 139; Hamilton, W. L., 2; Howell, G. W., 1, 2, 3; Kummel, 1; Vermeule, 12, 20, 21.

Pequest Basin: Bowser, 2; Cook, 30, 40, 47, 50, 55, 63, 67, 75, 83, 90, 99, 109, 117, 126, 133, 139; Howell, G. W., 1, 2.

Salem Marshes: Cook, 15, 21; Vermeule, 8.

Walkill Basin: Bowser, 3; Snell, 2.

Soil. See Soil conservation.

Copper. See Economic geology: materials.

Mineralogy: native elements

Cretaceous.

Climate and weather, fulgurite: Barrows, W. L., 1.

Economic geology.

Materials:

Clay: Clark, 10, 41, 77, 94; Day, 5; Johnson, M. E., 5; Ries, 1, 2, 4, 5, 6, 7; Smock, 3; Storm, 1.

Greensand marl: Ashley, 1; Clark, 10; Cook, G. H., 1, 6, 7, 123; Kummel, 70; Mansfield, 1, 2, 3, 5; Pierce, 3; Shreve, 1; Wheeler, 1; Wurtz, 1; Zodac, 2.

Mineral wool: Van Voorhis, 1.

Potash: Ashley, 1; Kummel, 70; Mansfield, 1, 2, 3, 4; Shreve, 1; Wurtz, 1.

Cretaceous—Continued.

Economic geology—Continued.

Materials—Continued.

Sand and gravel: Johnson, M. E., 5.

Stone: Hawes, 2.

Geophysics, seismic explorations: Ewing, 1, 2.

Mineralogy.

Mineral groups, general: Hawkins, 12.

Hydrocarbons: Abbott, 5; Kunz, 1.

Oxides: Hawkins, 14; Leidy, 14.

Phosphates: Cutshub, 1.

Silicates: Fisher, 1; Hawkins, 10, 14;

Mansfield, 3; Schneider, 1.

Sulphides: Chester, 4; Hamilton, S. H., 1; Marshall, 1.

Paleontology.

Indeterminate remains.

Coprolites: Dekay, 2.

Footprints: Woodward, 2.

Plants, general: Berry, 5, 7, 15; Credner, 3;

Hollick, 7, 9, 10; Newberry, 5, 7, 9;

Ward, L. F., 1.

Thallophyta: Berry, E. W., 1, 2, 17;

Chryslar, 8; Edwards, 3; Newberry, 13.

Bryophyta: Newberry, 13.*Pteridophyta*: Berry, 4, 8, 9, 10, 17;

Conrad, 14; Newberry, 13.

Spermatophyta: Bailey, I. W., 1; Berry, E. W., 1, 2, 3, 4, 6, 8, 9, 10, 12, 13, 16, 17, 18;

Chryslar, 1, 2; Conrad, 14;

Holden, 1, 2; Hollick, 4, 8; Jeffrey, 1;

Newberry, 2, 8, 10, 13; Stevens, 1.

Animals, general: Clark, 3, 10; Conrad, 10;

Cooke, C. W., 1; Lyell, 1; Morton, 8;

Richards, 16; Weller, 5, 8; Whitfield, 4.

Protozoa: Bagg, 1, 2; Bailey, J. W., 1;

Jennings, 1; Lea, 1; Reuss, 1; Weller, 9;

Woodward, A., 1, 2.

Porifera: Fenton, 1; Gabb, 3; Shimer, 1.*Coelenterata*: Gabb, 1; Lonsdale, 1;

Vsughan, 1; Weller, 9.

"Vermetes": Howell, B. F., 2; Morton, 4;

Weller, 9.

Bryozoa: Gabb, 4; Gregory, 1; Weller, 9.*Brachiopoda*: Clark, 8; Forbes, 1; Morton, 5, 7;

Weller, 9; Whitfield, 1.

Mollusca: Conrad, 2, 3, 9, 12, 13, 15;

Forbes, 1; Gabb, 1, 2, 5, 6, 9, 10; Hollick, 4, 8;

Johnson, C. W., 1; Lea, 2, 3, 4;

Morton, S. G., 1, 4, 5, 7, 8, 11;

Pilsbry, 2, 4; Prather, 1; Richards, 13, 15;

Roemer, 1; Say, 1; Stephenson, 2;

Weller, 6, 9; Whitfield, 1, 2, 3, 5, 6;

Woolman, 7, 8; Anonymous 30.

Arthropoda: Jennings, 1; Pilsbry, 3;

Rathbun, 1; Weller, 6, 9.

Echinodermata: Conrad, 1; Morton, 5, 7, 8;

Woolman, 7, 9.

Chordata, general: Cope, 25.*Pisces*: Cope, 11, 15, 19; Fowler, H. W., 1;

Leidy, 6, 8; Marsh, 6.

Reptilia: Agassiz, 1; Cope, 1, 2, 3, 6, 7, 10, 12, 14, 16, 17, 21, 22, 23;

Foulke, 1; Hays, 1; Leidy, 2, 3, 4, 8, 9, 10, 11, 13;

Marsh, 1, 7, 9; Morton, 7, 9, 10, 11;

Owen, 1; Rapp, 1; Russell, L. S., 1; Troxell, 1, 2;

Whitfield, 8; Wieland, 1, 2, 3;

Woolman, 12.

Cretaceous—Continued.

Paleontology—Continued.

Animals—Continued.

Chordata—Continued.

Aves: Cope, 22; Marsh, 5, 10.*Mammalia*: Leidy, 3, 5; Mitchell, 2.

Petrology.

Sedimentary rocks.

Rock types, clay: Hawkins, 14; Prather, 1;

Smock, 3; Stephenson, 3; Storm, 1.

Gravel: Newberry, 3.

Greensand marl: Ashley, 1; Cook, 128;

Haldeman, 1; Mansfield, 3; Prather, 1.

Sand: Barksdale, 5; Colony, 1; Prather, 1.

Sedimentary features, concretions: Willcox, 1.

Shoreline features, general: Chaffee, 1.

Soils, composition: Salisbury, 18; Wherry, 5.

Stratigraphy: Bascom, 2, 3; Berry, 5, 15, 17;

Bibbins, 1; Britton, 1; Clark, 3, 4, 6, 9, 10, 11, 12, 13;

Conrad, 14; Cook, 7, 17, 64, 105, 113, 122, 128, 133;

Cooke, C. W., 1; Cope, 22;

Cozzens, 1; Credner, 3; Darton, 14;

Dryden, 1; Eaton, 1; Finch, 1;

Fowler, H. W., 1; Fuller, 3; Gabb, 7;

Graecen, 1; Hayes, A. O., 1; Hill, 1;

Hollick, 4, 7; Jennings, 1; Knapp, 2, 5, 26;

Kummel, 50, 56, 78; Lea, 2; Lewis, 11;

Lyell, 1; Maclure, 1; McGee, 1;

Mansfield, 1, 5; Marsh, 12; Mather, 1;

Meek, 1, 2, 3; Morton, 2, 3, 5, 6;

Prather, 1; Richards, 15, 16; Rogers, H. D., 4;

Salisbury, 17; Schöpf, 1; Shattuck, 1;

Stephenson, 1; Uhler, 1; Vanuxem, 7;

Ward, L. F., 1; Weller, 5, 7, 8, 9;

Wheeler, 1; White, 1; Woolman, 8, 15.

Streams and surface drainage, water gaps and wind gaps: Stose, 1.

Structural geology.

Local structures.

Folds: Hawkins, 2.

Techniques, field trips: Clark, 2.

Volcanism: Stephenson, 3.

Water supply.

Artificial recharge: Barksdale, 11.

Ground water, general: Thompson, 2, 4, 6;

Twitshell, 11.

Wells: Barksdale, 5; Bascom, 1, 2;

Cook, 82, 92, 105, 116, 124; Critchlow, 3;

Darton, 11; Knapp, 3, 4; Kummel, 27, 54;

N. J. S. W. P. C., 5; Smock, 8, 12;

Upson, 1; Woolman, 6, 7, 9, 10, 13, 15, 16, 17, 18, 19, 20, 21.

Mineral content: Barksdale, 5.

Crystalline limestone. See Petrology: metamorphic rocks, marbles.

Crystallography. See Mineralogy.

Cumberland County.

Climate and weather.

Fulgurite: Richardson, 1.

Precipitation: Cook, 76; Smock, 4.

Tables: Smock, 6.

Temperature: Cook, 76.

Conservation and development.

Forestry: Cook, 113.

Reclamation of land, Maurice River: Cook, 15, 21.

Economic geology.

Localities, mines, general: Sanford, 2;

Schrader, 1.

Cumberland County—Continued.

Economic geology—Continued.

Materials, general: Sanford, 2; Schrader, 1; Twitchell, 2.

Clay: Cook, 60; Jenkins, 3, 5; Johnson, M. E., 1, 4; Kummel, 26, 60; Ries, 2, 5, 6; Smock, 19; Twitchell, 1.

Greensand marl: Cook, G. H., 1, 3; Smock, 19.

Iron: Boyer, Charles Shimer, 1; Cook, 73.

Oil: Kummel, 67, 68.

Sand and gravel: Cook, 59; Johnson, M. E., 1, 3, 4, 7, 8, 9, 10; Kummel, 33, 53, 60; Rogers, H. D., 1; Salisbury, 10, 13; Twitchell, 1, 2, 10, 12; Anonymous, 20.

Geodesy.

Bench marks: Cook, 127, 136; Plummer,

1; Vermeule, 15; Anonymous, 26, 29.

Surveying: Bowser, 5; Cook, 127; Vermeule, 15; Viele, 2; Anonymous, 23, 29.

Geophysics.

Gravitational measurements and stations: Ewing, 2.

Magnetic and magnetic surveys: Vermeule, 2, 15.

Seismic explorations: Ewing, 2.

Mineralogy.

Mineral groups, general: Canfield, 1.

Paleontology.

Plants: *Spermatophyta*: Britton, 2; Hollick, 1, 5, 6.

Animals, *Coelenterata*: Richards, 14.

Brachiopoda: Richards, 14.

Mollusca: Conrad, 4, 5, 8; Gabb, 1; Heilprin, 3, 4; Pilabry, 6; Richards, 14; Tucker, 1; Woolman, 11.

Arthropoda: Pilsbry; Richards, 14.

Chordata, Pisces: Cope, 11; Fowler, H. W., 1; Leidy, 8; Marsh, 6.

Reptilia: Cope, 22, 26; Rapp, 1.

Mammalia: Cope, 13, 26; Leidy, 5, 8; Marsh, 3.

Soils.

Composition: Blair, 3, 5; Bonsteel, 1, 2; Cook, 62, 72; Engle, 1; Patrick, 1.

Soil and forestry: Coman, 2.

Stratigraphy.

Tertiary: Richards, 8; Salisbury, 17.

Quaternary: Salisbury, 11, 13, 17.

Streams and surface drainage, lakes, ponds and swamps: Vermeule, 3, 8, 15.

Water supply.

Ground water, wells: Cook, 124; Darton, 11, 12, 13; Kummel, 54; N. J. S. W. P. C., 5; Smock, 8, 9, 12; Upson, 1; Woolman, 3, 8, 7, 9, 19, 20, 21.

Surface water, general: Cook, 98; Grover, 21, 22, 23, 24, 25, 26, 27, 28; Newell, 1; Parker, G. L., 1, 2, 3; Paulsen, 1.

Stream gauging and gauging stations: Grover, 21, 22, 23, 24, 25, 26, 27, 28; Hartwell, 2; Newell, 1; Parker, G. L., 1, 2, 3; Paulsen, 1.

Dams. See Engineering geology.

Delaware Water Gap. See Streams and surface drainage: water gaps and wind gaps.

Delaware Watershed. See Conservation and development: Delaware Basin; Floods and flood control: Delaware watershed; Streams and surface drainage: drainage history.

Devonian Period.

Economic geology, stone: Hawes, 2.

Paleontology.

Animals, general: Kindle, 1; Willard, 4.

Coelenterata: Weller, 4.

"Vermes": Weller, 4.

Bryozoa: Weller, 4.

Brachiopoda: Weller, 4.

Mollusca: Weller, 4.

Arthropoda: Hitchcock, C. H., 1; Weller, 4.

Echinodermata: Weller, 4.

Stratigraphy: Barrell, 1; Bayley, 4; Cook, 17, 108; Darton, 6, 10; Johnson, 11; Kindle, 1; Kitchell, 2; Kummel, 19, 26, 73; Lewis, 11; Merrill, F. J. H., 2, 3; Prosser, 1; Snell, 2; Spencer, 4; Walcott, 2; Weller, 2, 4; Willard, 4.

Diatomaceous earth. See Economic geology: materials.

Diatomite. See Economic geology: materials. Dickerson mine. See Morris County; Economic geology; localities.

Dinosaurs. See Paleontology, *Reptilia*.

Drift. See Glacial geology: depositional features.

Earthquakes. See also Geophysics: earthquakes and seismology. Lynch, 1.

Economic Geology.

Economic history: Baker, G. W., 1;

Bangs, 1; Barber, 1; Bayley, 3; Beco, 1; Bishop, 1; Black, 2; Boyer, Charles Shimer, 1; Buffet, 1; Clayton, 1; Cook, 39, 68, 73, 120, 129; Credner, 2; Cummins, 1; Day, 1, 20; Eckley, 2; Farrington, 2; F. W. P., 1; Folsom, 1; Franklin, 1; Glover, 1; Gordon, T. F., 1; Granbery, 1, 2; Haight, 1; Harvey, 1; Hawkins, 18; Hermelin, 1; Honeyman, 1, 2; Jackson, 8; Keith, 1; Kitchell, 2, 5, 6; Kummel, 10; Latrobe, 1; Lee, O. I., 1; Lewis, J. V., 4; Manchester, 2; Mitchell, 4; Morse, 1; Nelson, 3, 4; N. J. Z. C., 1; O'Callaghan, 1, 2, 3; Palache, 7, 17; Pierson, 1; Piggott, 1; Platt, J. C., 1; Raum, 1; Richter, 1; Rickard, 1; Ricord, 1, 2; Ridgway, 1; Roche, 1; Sachs, 2; Scranton, 1; Shampansore, 1; Shuster, 1; Smock, 2, 15; Snell, 1; Spencer, 4, 6; Stevens, 1; Tuttle, 1, 2; Urquhart, 1; Webster, 1; Weed, 2, 4; Weld, 1; Westervelt, 1; Wetherill, 1; Whitehead, 1, 2, 3, 4; Whitney, J. D., 1; Winterbotham, 1; Woodward, H. P., 1; Anonymous, 1, 3, 4, 7, 8, 9, 10.

Localities.

Mines, general: Barber, 1; Bayley, 3, 4; Bishop, 1; Cook, 11, 17, 29, 31, 35, 39, 42, 68, 69, 73, 85, 93, 102, 111, 121; Credner, 2; Dickeson, 3; Fackenthal, 1; Hamilton, S. H., 3; Honeyman, 1; Hughes, 1, 2, 3; Jenkins, 2, 4, 6, 7; Johnson, M. E., 6, 9; Katz, 7, 9, 11, 14; Kiessling, 1, 4, 7, 11; Kitchell, 2, 4, 6; Kummel, 12, 18, 21, 30, 34, 40, 43, 45, 53, 60, 70; Larison, 1; Manchester, 2; Mitchell, 4; Nason, 7;

Economic geology—Continued.

Localities—Continued.

Mines—Continued.

- O'Callaghan, 1, 2, 3; O'Hara, 1, 2; Pehrson, 1; Putnam, B. T., 1; Raum, 1; Rickard, 1; Ricord, 2; Rogers, H. D., 1, 2; Sanford, 2; Schrader, 1; Smock, 1, 2, 15; Snell, 2; Twitchell, 1, 6, 7, 8; Weed, 2; Winterbotham, 1; Woodward, H. P., 1; Anonymous, 1, 4.
- American: Apgood, 1; Bishop, 1; Bond, 1; Cook, 99; Gordon, T. F., 1; Hamilton, S. H., 3; Honeyman, 2; Kummel, 7, 10, 12, 18, 48, 51, 53; Lewis, J. V., 1, 4; Piggott, 1; Rogers, H. D., 2; Torrey, J., 1; Weed, 1, 2, 4; Whitney, J. D., 1; Woodward, H. P., 1.
- Andover: Bayley, 3; Cook, 17, 111; Diegan, 2; Hermelin, 1; Kitchell, 2, 4, 6; Putnam, B. T., 1; Scranton, 1; Spencer, 4; Anonymous, 1.
- Beach Glen: Bayley, 3; Cook, 17, 68, 78, 102, 111, 121, 129; Hamilton, S. H., 3; Jenkins, 2, 6, 7; Kitchell, 4; Kummel, 12, 18; Nason, 7; Smock, 1.
- Chimney Rock: Apgood, 1; Bond, 2; Keith, 1; Lewis, J. V., 1, 4; Messler, 1; Snell, 1; Woodward, H. P., 1.
- Dickerson: Barber, 1; Bayley, 3, 4; Bishop, 1; Cook, 17, 68, 78, 102, 111, 121, 129; Gordon, T. F., 1; Honeyman, 2; Jenkins, 1; Kitchell, 4, 6; Kummel, 36; Nason, 7; Putnam, B. T., 1; Rogers, H. D., 1, 2; Smock, 1, 15; Tuttle, 1, 2; Anonymous, 4.
- Flemington: Clemson, 1; Cook, 17; Credner, 2; Dickerson, 1, 2; Lewis, J. V., 1, 4; Piggott, 1; Rogers, H. D., 1, 2; Snell, 1; Whitney, J. D., 1; Woodward, H. P., 1.
- Franklin Furnace: Alger, 1; Baker, G. W., 1; Bayley, 3; Beco, 1; Blake, 2; Cook, 17, 86, 52, 68, 73, 85, 102, 111, 121; Credner, 2; Darton, 5; Day, 13; Detmold, 1; Dürre, 1; Farrington, 2; Fitch, 1; Gordon, T. F., 1; Groth, 1; Haight, 1; Hamilton, S. H., 3; Harder, 1; Honeyman, 2; Hughes, 1, 2, 3; Jackson, 2, 4, 5; Jenkins, 2, 4, 6, 7; Johnson, 8, 9, 10; Katz, 3; Kemp, 4, 6, 7; Kerr, 1; Klessling, 6, 9, 18; Kitchell, 2, 4, 8; Kummel, 12, 18, 21, 30, 36, 40, 48, 51, 53; Leith, 1; Loughlin, 2, 3, 4, 5, 6; McCaskey, 1, 2, 3, 4; Manchester, 2; Manley, 5; Nason, 2, 7, 13; N. J. Z. C., 1; O'Hara, 1, 2; Palache, 7, 17; Parker, E. W., 3, 5, 7, 9, 11, 13; Pehrson, 1; Platt, J. C., 1; Putnam, B. T., 1; Rastall, 1; Ries, 8; Rogers, H. D., 1; Scranton, 1; Shuster, 1; Smock, 1, 14; Snell, 2; Spencer, 3, 4, 8; Spurr, 1; Stevens, 1; Twitchell, 10; Weeks, 1; Wetherill, 1; Whitney, J. D., 1; Wilkens, 1; William, A., 1; Wolf, 8, 13; Anonymous, 1, 2, 7, 8.
- Griggstown: Apgood, 1; Bond, 1; Cook, 17; Hamilton, S. H., 3; Lewis, J. V., 1, 4; Piggott, 1; Rogers, H. D., 1, 2; Weed, 3, 4; Whitney, J. D., 1; Woodward, H. P., 1; Anonymous, 8.
- Hacklebarney: Bayley, 3, 4; Cook, 17,

Economic geology—Continued.

Localities—Continued.

Mines—Continued.

Hacklebarney—Continued.

- 85, 68, 102, 111, 121, 129; Jenkins, 1; Nason, 7; Putnam, B. T., 1.
- Hibernia: Bayley, 3; Cook, 17, 35, 68, 78, 102, 111, 121, 129; Darton, 14; Hamilton, S. H., 3; Hermelin, 1; Jenkins, 1, 2, 4, 6; Kitchell, 4, 6; Kemp, 7; Kummel, 12, 18, 21, 30, 36; Leith, 1; Nason, 7; Putnam, B. T., 1; Rogers, H. D., 1, 2; Tuttle, 1, 2; Wolf, 2; Anonymous, 4.
- High Bridge: Bayley, 3, 4; Cook, 17, 35, 68, 111, 129; Larison, 1; Putnam, B. T., 1.
- Mount Hope: Bayley, 3, 4; Cook, 17, 35, 68, 78, 102, 111, 121, 129; Cooke, S. R. B., 1; Hamilton, S. H., 3; Hermelin, 1; Hughes, 2, 3; Jenkins, 1, 2, 7; Klessling, 6, 9, 11; Kitchell, 4; Kummel, 12, 18, 21, 30; Nason, 2, 7; Needham, 2; O'Hara, 1, 2; Pehrson, 1; Putnam, B. T., 1; Ridgway, 1; Rogers, H. D., 1, 2; Smock, 1; Tuttle, 1; Twitchell, 3; Anonymous, 4.
- New Brunswick: Beck, 2; Hawkins, 18; Weid, 1; Whitney, J. D., 1; Winterbotham, 1; Woodward, H. P., 1.
- Oxford: Barber, 1; Bayley, 3, 4, 6; Bishop, 1; Cook, 17, 85, 68, 98, 102, 111, 121, 129; Cummins, 1; Gordon, T. F., 1; Hamilton, S. H., 3; Honeyman, 2; Jenkins, 1, 2, 7; Kitchell, 6; Kummel, 12, 18, 21; Nason, 2, 7; O'Hara, 1, 2; Putnam, B. T., 1; Ridgway, 1; Rogers, H. D., 1; Scranton, 1; Smith, L. L., 1; Smock, 15, 19.
- Pahaquarry: Barber, 1; Bond, 1; Cook, 17; Cummins, 1; Hamilton, S. H., 3; Honeyman, 2; Keith, 1; Kummel, 36, 51, 53; Parker, 7, 9, 11; Shampamore, 1; Shuster, 1; Smock, 19; Snell, 2; Twitchell, 1; Weed, 4; Woodward, H. P., 1.
- Ringwood: Bayley, 3; Cook, 17, 35, 68, 102, 111, 129; Hamilton, S. H., 3; Hermelin, 1; Jenkins, 1, 2, 7; Kitchell, 4, 6; Kummel, 12, 18, 21, 30; Nason, 7, 14; Putnam, B. T., 1; Ridgway, 1; Rogers, H. D., 1, 2; Smock, 1, 15; Tuttle, 1.
- Schuyler: Akerly, 1; Apgood, 1; Bangs, 1; Barber, 1; Bishop, 1; Black, 2; Bond, 1; Cook, 17; Credner, 2; Day, 20; Finch, 4; Folsom, 1, 2; Franklin, 1; Glover, 1; Gordon, T. F., 1; Granbery, 1, 2; Harvey, 1; Ives, 1; Keith, 1; Kemp, 4, 7; Kummel, 10, 12; Latrobe, 1; Lee, O. I., 1, 2; Lewis, J. V., 1, 4; Manchester, 2; Merrill, 6; Mitchell, 4; Morse, 1; Nelson, 1; O'Callaghan, 1; Palitsa, 1; Pierce, 1; Pierson, 1; Piggott, 1; Rickard, 1; Rogers, H. D., 1, 2; Russell, 6; Schaefer, 1; Smock, 19; Urganhart, 1; Von Zwaluwenberg, 1; Webster, 1; Weed, 2, 4; Westervelt, 1; Whitehead, 1, 2; Whitney, J. D., 1; Wickes, 1; Winfield, 1; Woodward, H. P., 1; Anonymous, 10, 11, 12, 13, 14.

Economic geology—Continued.

Localities—Continued.

Mines—Continued.

- Scrub Oak: Bayley, 3; Hughes, 2, 3; Jenkins, 7; Johnson, M. E., 6, 10; Kummel, 68; Roche, 1; Shore, 1; Smock, 1.
- Sterling Hill: Alger, 1; Baker, G. W., 1; Bayley, 3; Beco, 1; Blake, 2; Cook, 10, 12, 17, 26, 68, 73, 102, 111, 121; Credner, 2; Darton, 5; Detmold, 1; Dürre, 1; Farrington, 2; Fitch, 1; Groth, 1; Haight, 1; Harder, 1; Honeyman, 2; Hughes, 1, 2, 3; Jackson, 5, 8; Jenkins, 2; Johnson, S., 9, 10; Katz, 3; Kemp, 4, 6, 7; Kerr, 1; Kiessling, 6, 9, 11, 13; Kitchell, 2, 4; Leith, 1; Loughlin, 2, 3, 4, 5, 6; McCaskey, 1, 2, 3, 4; Manchester, 2; Nason, 7; N. J. Z. C., 1; Palache, 7, 17; Parker, 9, 11, 13; Pehrson, 1; Platt, J. C., 1; Ries, 8; Rogers, H. D., 1; Salton, 1; Shuster, 1; Smock, 14; Snell, 2; Spencer, 4, 6; Spurr, 1; Stevens, 1; Twitchell, 3; Weeks, 1; Wetherill, 1; Whitney, J. D., 1; Williams, A., 1; Wolff, 13; Anonymous, 1, 2, 7.
- Washington: Bayley, 3; Johnson, M. E., 6, 10.
- Wharton: Cooke, S. R. B., 1; Jenkins, 4, 6, 7; Kummel, 30, 36; O'Hara, 1, 2; Nason, 7; Ridgway, 1; Roche, 1.
- Quarries: Bayley, 6; Britton, 8; Clayton, 1; Cook, 11, 17, 31, 26, 71, 88, 114; Day, 2; Eckel, 1, 2, 3; Fenner, 1; Hamilton, S. H., 2; Hawes, 2; Iddings, 1; Johnson, M. E., 1, 3, 5, 6, 7, 8, 9, 10; Katz, 2; Kummel, 7, 16, 40; Larison, 1; Lewis, J. V., 6, 10; McCourt, 3; Manchester, 2; Merrill, 6; Moldenke, 1; Nason, 1, 2; Northrup, 1; Parker, 10, 12; Peck, 1, 2; Pierson, 1; Sachs, 2; Sanford, 2; Schrader, 1; Smock, 19; Twitchell, 1, 9, 12; Williams, A., 1; Anonymous, 16, 17.
- Materials, general: Meeker, 1.
- Ammonia: Day, 23, 24, 25; Katz, 1, 6, 10, 13; Kiessling, 5; Needham, 1, 2; Parker, E. W., 2, 4, 12; Shore, 1.
- Apatite: Kummel, 78; Lewis, 11; Parker, 6.
- Asbestos: Bayley, 4.
- Asphalt: Burchard, 1, 3, 3; Loughlin, 1; Stone, R. W., 1.
- Barite and barium chemicals: Day, 8; Hughes, 2; Katz, 1, 2, 10, 12, 13; Kiessling, 2, 3, 5, 6, 9, 11, 13; Kummel, 7; Loughlin, 1; Stone, R. W., 1, 2, 3.
- Cement: Bayley, 4, 6; Burchard, 1, 2, 3; Cook, 17, 64; Cummins, 1; Day, 6, 7, 8, 13, 15, 17, 19, 20, 21, 22, 23, 24, 25, 26; Eckel, 1, 2, 3; Hamilton, S. H., 2; Hughes, 1, 2, 3; Johnson, M. E., 1, 2, 3, 4, 5, 6, 7, 8, 9, 10; Katz, 1, 2, 4, 6, 8, 10, 12, 13; Kiessling, 2, 3, 5, 8, 10, 11, 12, 13, 15; Kummel, 45, 51, 53, 57, 60, 66, 78; Lewis, F. H., 1; Lewis, J. V., 11; Loughlin, 1, 2; Parker, E. W., 2, 4, 6, 8, 10, 12, 14; Peck, 2; Pehrson, 1; Rogers, H. D., 1, 2; Sanford, 2; Schrader, 1; Smock, 19; Stone, R. W., 1, 2,

Economic geology—Continued.

Materials—Continued.

Cement—Continued.

- 3; Twitchell, 1, 2, 3, 4, 5, 6, 8, 9, 10, 12; Anonymous, 16, 17.
- Clay: Bascom, 2, 3; Bayley, 4; Burchard, 1, 2, 3; Clark, 10; Clayton, 1; Cook, 3, 4, 7, 12, 17, 20, 24, 31, 36, 41, 52, 60, 64, 78, 77, 80, 83, 88, 94; Darton, 14; Day, 2, 3, 5, 6, 11, 13, 15, 17, 19, 20, 21, 22, 23, 24, 25, 26; Hughes, 1, 2, 3; Jenkins, 3, 5; Johnson, M. E., 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 13; Katz, 1, 2, 4, 6, 8, 10, 12, 13; Kiessling, 2, 3, 5, 6, 8, 9, 11, 13; Kummel, 1, 26, 51, 57, 60, 66, 78; Lewis, 11; Loughlin, 1, 2, 3; Nelson, 3; Parker, E. W., 2, 4, 6, 8, 10, 12, 14; Pehrson, 1; Raum, 1; Ries, 1, 2, 4, 5, 6, 7; Rogers, H. D., 1, 2; Salisbury, 6; Sanford, 2; Schrader, 1; Smock, 3, 19; Spencer, 4; Stone, R. W., 1, 3; Twitchell, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12; Westervelt, 1; Williams, A., 1, 2, 3.
- Coke: Burchard, 1, 2, 3; Day, 22, 23, 24, 25, 26; Hughes, 1, 2, 3; Johnson, M. E., 1, 2, 3, 4, 6, 7, 8, 9, 10; Katz, 1, 2, 4, 6, 8, 10, 12, 13; Kiessling, 2, 3, 5, 6, 8, 9, 11, 13; Kummel, 57, 60, 66; Loughlin, 1, 2; Needham, 1, 2; Parker, E. W., 2, 4, 8, 10, 12, 14; Pehrson, 1; Shore, 1; Stone, R. W., 1, 3; Twitchell, 2, 3, 6, 8, 9, 10, 12.
- Copper: Akerly, 1; Appgood, 1; Bangs, 1; Barber, 1; Bayley, 4; Beck, 2; Bishop, 1; Black, 2; Bond, 1, 2; Clayton, 1; Clemons, 1; Cook, 10, 12, 17, 24, 36, 42, 85, 99; Credner, 2; Cummins, 1; Darton, 14; Day, 20; Devereux, 1; Dickeson, 1, 2, 3; Douglass, 1; Emmmons, S. F., 1; Finch, 4; Folsom, 1, 2; Franklin, 1; Glover, 1; Gordon, T. F., 1; Granbery, 1, 2; Hamilton, S. H., 3; Harvey, 1; Hawkins, 13; Honeyman, 1, 2; Ives, 1; Johnson, 13; Kalm, 1; Keith, 1; Kemp, 4, 7; Kummel, 7, 10, 12, 18, 36, 48, 51, 53, 78; Larison, 1; Latrobe, 1; Lee, O. L., 1, 2; Lewis, J. V., 1, 3, 4, 11; Loughlin, 2, 3, 4; McCaskey, 3, 4; Maclure, 1; Manchester, 2; Merrill, 6; Messler, 1; Mitchell, 4; Morse, 1; Nelson, 1, 3; Newhouse, 1; O'Callaghan, 1, 2, 3; Paltsits, 1; Parker, 7, 9, 11; Pehrson, 1; Pierce, 1; Pierson, 1; Piggott, 1; Raum, 1; Richter, 1; Rickard, 1; Ricord, 2; Rogers, H. D., 1, 2; Sanford, 2; Schaeffer, 1; Schöpt, 1; Schrader, 1; Shampanoire, 1; Shuster, 1; Snell, 1; Torrey, J., 1; Twitchell, 1; Urquhart, 1; Von Zwaluwenberg, 1; Weed, 1, 2, 3, 4; Weld, 1; Westervelt, 1; Whitehead, 1, 2; Whitney, J. D., 1; Wickes, 1; Williams, A., 1; Winfield, 1; Winterbotham, 1; Woodward, H. P., 1; Anonymous, 3, 10, 11, 12, 13, 14.
- Diatomaceous earth: Day, 1, 8, 11, 13; Johnson, 9; Kummel, 78; Lewis, 11; Schrader, 1; Williams, 3.
- Diatomite: Johnson, 10, 13; Kiessling, 11, 18.

Economic geology—Continued.

Materials—Continued.

- Feldspar:** Burchard, 2, 3; Hughes, 1, 2, 3; Johnson, M. E., 1, 2, 3, 4, 6; Katz, 6, 8, 10, 13; Kiessling, 2, 3, 5, 6, 9, 11, 13; Loughlin, 1; Stone, R. W., 1; Twitchell, 9, 10, 12.
- Fertilizers, manufactured:** Williams, 2, 3.
- Fuel briquets:** Hughes, 1, 2, 3; Katz, 1, 2, 6, 8, 10, 12, 13; Kiessling, 2, 3, 5, 6, 9, 11, 13; Loughlin, 1; Pehrson; Stone, R. W., 1, 2, 3; Twitchell, 9, 10, 12.
- Fuller's earth:** Kiessling, 13.
- Furnace flux:** Burchard, 1, 2, 3; Katz, 1; Loughlin, 1; Parker, 8, 10, 14; Stone, 2, 3.
- Gas:** Day, 22, 23; 24, 25; Hawkins, 7; Katz, 1; Kiessling, 3, 11; Needham, 1, 2; Parker, E. W., 2, 4; Shore, 1; Stone, 2, 3.
- Gem stones:** Day, 6, 17; Katz, 1; Loughlin, 1; Nason, 4; Parker, 6; Stone, 2; Twitchell, 1; Williams, A., 1.
- Gold:** Cook, 36; Kemp, 7; O'Callaghan, 2; Wickes, 1.
- Graphite:** Bayley, 4; Cook, 10, 12, 36, 99, 121; Darton, 14; Day, 21, 22; Johnson, M. E., 3, 4, 5; Kummel, 45, 78; Lewis, 11; Nason, 2; Parker, E. W., 2, 6, 14; Sanford, 2; Schrader, 1; Spencer, 4; Stone, R. W., 1, 2; Williams, A., 1.
- Greensand marl:** Ashley, 1; Bascom, 2, 3; Burchard, 2, 3; Clark, 10; Cook, 1, 2, 3, 6, 7, 10, 12, 14, 17, 19, 25, 31, 36, 65, 73, 80, 86, 123; Day, 1, 2, 3, 4, 5, 7, 9, 21; Gordon, T. F., 1; Harlan, 1; Hughes, 1, 2, 3; Johnson, M. E., 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 13; Katz, 3; Kiessling, 11, 13; Kummel, 51, 57, 60, 66, 67, 70, 78; Lewis, H. C., 5; Lewis, J. V., 11; Loughlin, 1, 5; Mansfield, 1, 2, 3, 4, 5; Mitchell, 4; Parker, 10; Pehrson, 1; Pierce, 3; Raum, 1; Rogers, H. D., 1, 2; Sanford, 2; Schrader, 1; Shore, 1; Shreve, 1, 2; Smock, 19; Stone, R. W., 1, 3; Thoenen, 1; Twitchell, 1, 2, 3, 6, 8, 9, 10, 12; Waksman, 2; Wheeler, E. S., 1; Williams, A., 1, 2, 3; Wurtz, 1; Zodac, 2.
- Ground sand or quartz:** Hughes, 1; Katz, 6, 8; Kiessling, 2, 11, 13; Stone, R. W., 1; Twitchell, 9, 10, 12.
- Gypsum:** Katz, 13.
- Iron:** Baker, G. W., 1; Barber, 1; Bayley, 2, 3, 4, 6; Bishop, 1; Blake, 2; Boyer, Charles Shimer, 1; Buddington, 1; Buffet, 1; Clayton, 1; Cook, 7, 10, 11, 12, 17, 20, 24, 29, 31, 35, 37, 39, 40, 42, 45, 49, 52, 65, 68, 69, 73, 78, 80, 85, 86, 93, 99, 100, 101, 102, 111, 121, 123; Cooke, S. R. B., 1; Credner, 2, 4; Cummins, 1; Darton, 14; Day, 1, 2, 4, 5, 6, 7, 9, 10, 12, 14, 16, 18, 20, 21, 22, 23, 24, 25, 26; Detmold, 1; Diegnan, 2; Douglass, 1; Dürre, 1; Emmons, S. F., 1; Fackenthal, 1; Farrington, 2; Finch, 4; Fowler, 3; Gordon, T. F., 1; Hamilton, S. H., 3; Hermelin, 1; Honeyman, 2; Hughes, 1, 2, 3; Jackson, 5, 7, 9; Jenkins, 1, 2, 4, 5, 7; Johnson, M. E., 1, 2, 3, 4, 6, 7, 8, 9, 10, 13; Katz, 3, 5, 7, 9, 11, 14; Kemp,

Economic geology—Continued.

Materials—Continued.

Iron—Continued.

- 4, 7; Kiessling, 1, 4, 6, 7, 9, 11, 13; Kitchell, 2, 4, 5, 6; Kumamel, 12, 13, 21, 30, 40, 43, 45, 51, 53, 57, 60, 66, 68, 70, 78; Larison, 1; Leith, 1; Lewis, 11; Loughlin, 2, 3, 4, 5, 6; McCaskey, 1, 2, 3, 4; Maclure, 1; Merritt, 1; Messler, 1; Mitchell, 4; Morse, 1, 2; Nason, 2, 7, 13, 14; Needham, 1, 2; Nelson, 3, 4; Newhouse, 1; O'Callaghan, 1; O'Hara, 1, 2; Palache, 7; Parker, E. W., 1, 3, 5, 7, 9, 11, 13; Pehrson, 1; Pierce, 2; Platt, J. C., 1; Putnam, B. T., 1; Raum, 1; Ricord, 1, 2; Ridgway, 1; Roche, 1; Rogers, H. D., 1, 2; Sanford, 2; Schrader, 1; Scranton, 1; Shampanore, 1; Shore, 1; Shuster, 1; Singewald, 1; Smith, L. L., 1; Smith, T. P., 1; Smock, 1, 2, 15; Spencer, A. C., 1, 4, 5; Stevens, 1; Tarr, R. S., 1; Tuttle, 1, 2; Twitchell, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12; Webster, 1; Westervelt, 1; Wetherill, 1; Whithead, 3, 4; Whitney, 1; Ricord, 1, 2; Wickes, 1; Wilkens, 1; Williams, A., 1, 2, 3; Winterbotham; Anonymous, 1, 2, 4, 7, 8.
- Lime:** Bayley, 6; Burchard, 1, 2, 3; Cook, 2, 7, 10, 12, 17, 29, 31, 36, 73, 97; Darton, 14; Day, 3, 25, 26; Hughes, 1, 3; Johnson, M. E., 1, 2, 3, 4, 5, 7, 8, 9, 10, 13; Katz, 1, 2, 4, 5, 8, 12, 13; Kiessling, 2, 3, 5, 8, 10, 12, 13; Kitchell, 2; Kummel, 15, 40, 45, 51, 53, 57, 60, 66; Loughlin, 1; Mansfield, 5; Messler, 1; Parker, E. W., 2, 4, 5, 8, 10, 12, 14; Pehrson, 1; Rogers, H. D., 1, 2; Sanford, 2; Schrader, 1; Smock, 19; Stone, R. S., 1, 2, 3; Twitchell, 1, 2, 3, 8, 9, 10, 12.
- Magnesia (manufactured):** Johnson, 13; Needham, 1; Shore, 1.
- Magnesite (synthetic):** Anonymous, 28.
- Manganese:** Johnson, 13; Loughlin, 2; Williams, 2.
- Mica:** Bayley, 4; Burchard, 1, 3; Cook, 29, 31; Day, 13, 17; Parker, 12.
- Mineral paints:** Burchard, 1, 2, 3; Cook, 31; Day, 2, 5, 6, 7, 8, 11, 13, 15, 17, 19, 23; Katz, 4, 6, 8; Kummel, 57, 60, 66, 78; Lewis, 11; Schrader, 1; Stone, 3; Twitchell, 1, 2, 3, 6, 7, 8; Williams, 3.
- Mineral wool:** Johnson, 10, 13; Van Voorhis, 1.
- Oil:** Burchard, 3; Hawkins, 7; Johnson, M. E., 2, 3, 4; Kummel, 67, 68, 70, 71, 72, 78.
- Peat:** Bayley, 4; Burchard, 1, 2, 3; Cook, 14, 17; Darton, 14; Day, 24; Hughes, 2, 3; Johnson, M. E., 1, 5, 10, 13; Katz, 1, 2, 4, 6; Kiessling, 13; Kitchell, 2; Kummel, 41, 78; Lewis, 11; Loughlin, 1, 2; McCourt, 1; Parker, 6; Parmelee, 1, 2; Pehrson, 1; Rogers, H. D., 2; Sanford, 2; Schrader, 1; Smock, 19; Soper, 1; Stone, R. W., 1, 2, 3; Twitchell, 2, 5, 6, 7, 8, 9, 10, 12; Waksman, 1, 2; Anonymous, 1.

Economic geology—Continued.

Materials—Continued.

Potash: Ashley, 1; Blair, 1; Burchard, 2, 3; Cook, 2, 3, 6, 7, 19; Day, 1; Hart, 1; Kummel, 67, 70; Loughlin, 1; Mansfield, 1, 2, 3, 4, 5; Parker, 10; Rogers, H. D., 2; Shreve, 1, 2; Stone, R. W., 1, 2, 3; Thoenen, 1; Wurtz, 1.
 Pyrite: Day, 24, 26, 26; Loughlin, 1; Parker, E. W., 2, 4.

Sand and gravel: Bascom, 2, 3; Burchard, 1, 2, 3; Cook, 3, 17, 36, 59, 73; Darton, 14, 22, 23, 24, 25, 26; Hughes, 1, 2, 3; Johnson, M. E., 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 13; Katz, 1, 2, 4, 6, 8, 10, 12, 13; Kiessling, 2, 3, 5, 8, 10, 11, 12; Kummel, 1, 31, 33, 51, 53, 57, 60, 66, 78; Lewis, J. V., 6, 11; Loughlin, 1, 2; Parker, E. W., 2, 4, 6, 8, 10, 12, 14; Pehrson, 1; Rogers, H. D., 1, 2; Salisbury, 6, 10, 13; Sanford, 2; Schrader, 1; Smock, 19; Spencer, 4; Stone, R. W., 1, 2, 3; Twitchell, 1, 2, 3, 4, 5, 6, 7, 8, 10, 12; Anonymous, 20.

Silver: O'Callaghan, 1; Wickes, 1.

Stone: Akerly, 1; Bascom, 3; Bayley, 4, 6; Britton, 8; Burchard, 1, 2, 3; Cook, 11, 17, 29, 31, 36, 71, 88; Coons, 1; Darton, 14; Day, 1, 3, 4, 5, 6, 7, 8, 11, 13, 15, 17, 19, 20, 21, 22, 23, 24, 25, 26; Eckel, 1, 2; Hawes, 2; Hawkins, 4; Hughes, 1, 2, 3; Johnson, M. E., 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 13; Katz, 1, 2, 4, 6, 8, 10, 12, 13; Kiessling, 2, 3, 5, 8, 10, 12, 13; Kummel, 7, 33, 51, 57, 60, 66, 78; Lewis, 10, 11; Loughlin, 1, 2; McCourt, 3; Merrill, 6; Nason, 2; Parker, E. W., 2, 4, 6, 8, 10, 12, 14; Peck, 2; Pehrson, 1; Rogers, H. D., 1, 2; Russell, 5; Sanford, 2; Schrader, 1; Smock, 19; Spencer, 4; Stone, R. W., 1, 2, 3; Twitchell, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12; Webster, 1; Williams, A., 1, 3; Wolf, 6.

Talc and soapstone: Bayley, 4; Burchard, 1, 2, 3; Day, 6, 7, 8, 13, 15, 21, 22, 24, 25, 26; Hughes, 3; Johnson, M. E., 1, 2, 3, 4, 6; Katz, 1, 2, 4, 6, 8, 10, 12, 13; Kiessling, 2, 3, 5, 6, 9, 11, 13; Kummel, 60; Loughlin, 1; Parker, E. W., 2, 4, 6, 8, 10, 12, 14; Peck, 1, 2; Pehrson, 1; Sanford, 2; Schrader, 1; Stone, R. W., 1, 2, 3; Twitchell, 1, 2, 3, 8, 9, 10, 12.

Tar: Kiessling, 2, 5; Needham, 1, 2; Parker, 4, 12; Shore, 1.

White marl: Cook, 17, 56; Eckel, 2, 3; Kitchell, 2; Kummel, 15, 78; Rogers, H. D., 1; Van Voorhis, 1; Anonymous, 1.

Zinc: Alger, 1; Baker, G. W., 1; Barber, 1; Beco, 1; Bishop, 1; Blake, 2, 3; Cook, 7, 10, 12, 17, 24, 29, 31, 36, 42, 52, 65, 68, 69, 73, 80, 86, 99, 111, 121, 129; Credner, 2, 4; Darton, 5; Day, 2, 5, 6, 7, 9, 13, 16, 18, 20, 21, 22, 23, 24, 25, 26; Detmold, 1; Dürre, 1; Emmons, S. F., 1; Farrington, 2; Finch, 4; Fitch, 1; Fowler, 3; Groth, 1; Haight, 1; Hamilton, S. H., 3; Harder, 1; Honeyman, 2; Hughes, 1, 2, 3; Jackson, 4; Jenkins, 2, 4, 6, 7;

Economic geology—Continued.

Materials—Continued.

Zinc—Continued.

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- Ferromont mine.** See Dickerson mine.
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 Iron: Cook, 73; Smock, 19.
 Peat: McCourt, 1; Parmelee, 2; Shalnin, 1; Soper, 1.
 Sand and gravel: Lewis, J. V., 6; Smock, 19.
 Stone: Cook, 71, 88; Hawes, 2; Kummel, 7, 60; McCourt, 3; Russell, 5.
 Engineering geology, tunnels: Fluhr, 1.
 Floods and flood control, Passaic watershed: Hamilton, W. I., 2; Vermeule, 33.
 Geodesy.
 Bench marks: Cook, 136; Plummer, 1; Vermeule, 15, 29, 30; Anonymous, 24.
 Boundaries: N. J. B., 1, 5.
 Surveying: Bowser, 6; Cook, 127; Vermeule, 15; Viele, 2; Anonymous, 23.
 Geophysics, Magnetism and magnetic surveys: Locke, 1; Vermeule, 2, 15.
 Glacial geology.
 Climatic evidence of: Anonymous, 18.

Hudson County—Continued.

Glacial geology—Continued.

Depositional features: Fluhr, 1; Russell, 5; Salisbury, 4.

Erosional features: Salisbury, 4.

Mineralogy.

Mineral groups, general: Canfield, 1; Chamberlin, 1; Darton, 1; Kato, 1; Kunz, 2; Manchester, 1; Robinson, 1; Sanford, 2; Schrader, 1; Seymour, 1.

Borates: Darton, 2.

Carbonates: Bruce, 4; Ferrari, 1; Joy, 1; Rath, 1, 2; Rogers, A. F., 3; Whitlock, 2, 4.

Oxides: Nutall, 2.

Silicates: Bates, 1; Butler, 1; Clarke, 2; Dana, E. S., 1; Ford, 1; Leeds, 2; Martin, 2; Moses, 4; Nutall, 2; Peacock, 1; Rogers, 5; Selfridge, 1; Vanuxem, 5; Whitlock, 3; Whitney, 2.

Sulphides: Rogers, A. F., 1; Wherry, 4.

Zeolites: Bourne, 1; Canfield, 3; Manchester, 1; Whitlock, 3.

Mineral localities, general: Canfield, 1; Sanford, 2; Schrader, 1; Seymour, 1.

Bergen Hill: Bates, 1; Beck, 3; Bourne, 1; Canfield, 1, 3; Clarke, 2; Credner, 1; Dana, E. S., 1; Darton, 2; Ford, 1; Kato, 1; Kunz, 2; Levison, 2; Manchester, 1, 2; Moses, 4; Peacock, 1; Rath, 1, 2; Rogers, A. F., 2, 5; Russell, 5; Seymour, 1; Valiant, 3; Wherry, 4; Whitlock, 3, 4; Whitney, 2.

Hoboken: Bruce, 4; Canfield, 1; Chester, 4; Cozzens, 1; Ferrari, 1; Finch, 4; Joy, 1; Leeds, 2; Manchester, 2; Mitchell, 4; Nutall, 2; Robinson, 1; Rogers, A. F., 3; Russell, 5; Sanford, 2; Schrader, 1; Selfridge, 1; Seymour, 1; Smith, E. S. C., 1; Valiant, 3; Vanuxem, 5; Walker, 2.

Jersey City: Manchester, 2; Rogers, A. F., 2; Selfridge, 1; Whitlock, 2.

Snake Hill: Levison, 2; Manchester, 2; Perry, 1; Rogers, A. F., 2; Valiant, 3; Whitlock, 4.

Weehawken: Canfield, 1; Chamberlin, 1; Darton, 1; Kato, 1; Martin, 2; Rogers, A. F., 1, 5; Sanford, 2; Schrader, 1; Seymour, 1; Valiant, 3; Walker, 2.

Mineral springs: Peale, 1.

Paleontology.

Indeterminate remains, footprints: Gratacap, 1.

Plants, *Thallophyta*: Edwards, 1.

Animals, *Mollusca*: Richards, 2.

Chordata, *Pisces*: Eastman, 2; Gratacap.

Petrology.

Igneous rocks.

Intrusive rocks, diabase: Andreae, 1; Butler, 1; Dana, 4, 5; Hawes, 1; Irving, 2.

Metamorphic rocks.

Hornfels: Andreae, 1; Darton, 4; Irving, 2.

Serpentine: Julien, 1; Newland, 1; Nutall, 2.

Sedimentary rocks.

Rock types, sandstone: Dana, 3; Dar-

Hudson County—Continued.

Petrology—Continued.

Sedimentary rocks—Continued.
ton, 3; Schweitzer, 2.

Till: Salisbury, 4.

Sedimentary features.

Rain drops and hail prints: Gratacap, 1.

Ripple marks: Gratacap, 1.

Varves: Anonymous, 18.

Physical geography: Akerly, 1; Salisbury, 4.

Shoreline features, recent shoreline oscillations: Salisbury, 4.

Soils, composition: Salisbury, 4.

Stratigraphy.

Pre-Cambrian: Russell, 5.

Triassic: Fluhr, 1; Merrill, 6; Russell, 5.

Unknown age, Serpentine: Credner, 1.

Structural geology.

Local structures.

Faults: Merrill, 6.

Sheets and sills: Irving, 2; Kummel, 14.

Stocks: Cook, 95; Crosby, 1; Merrill, 6.

Water supply.

Ground water, wells: Cook, 74, 82, 98, 124, 142; Darton, 12, 13; Fuller, 1; Kummel, 27; N. J. S. W. P. C., 5; Peale, 1; Russell, 5; Silliman, 1; Smock, 3, 9; Woolman, 13, 16, 17, 18, 20.

Surface water, general: Cook, 48, 53, 98, 142; Hamilton, W. L., 1, 3; Hazen, 1; Moore, 3; N. J. S. W. P. C., 1, 2, 5; Vermeule, 7, 24, 26; Ward, J. D., 1.

Wind work, deposition: Salisbury, 4.

Hunterdon County.

Climate and weather.

Precipitation: Cook, 76; Smock, 4.

Tables: Smock, 6.

Temperature: Cook, 76.

Economic geology.

Localities.

Mines, general: Bayley, 3, 4; Cook, 29, 42, 68, 78, 102, 111, 121, 129; Day, 2; Nason, 7; Sanford, 2; Schrader, 1; Williams, A., 1; Woodward, H. P., 1.

Flemington: Clemson, 1; Cook, 17; Credner, 2; Dickeson, 1, 2; Lewis, J. V., 1, 4; Piggott, 1; Rogers, H. D., 1, 2; Snell, 1; Whitney, J. D., 1; Woodward, H. P., 1.

High Bridge: Bayley, 3, 4; Cook, 17, 35, 68, 111, 129; Larison, 1; Putnam, B. T., 1.

Quarries: Cook, 71, 88; Hawes, 2; Johnson, M. E., 1; Kummel, 7, 15; Larison, 1; Lewis, 10; McCourt, 3; Parker, 10, 12; Sanford, 2; Schrader, 1; Smock, 19.

Materials, general: Day, 2; Sanford, 2; Schrader, 1; Twitchell, 2; Williams, A., 1.

Cement: Kummel, 15.

Clay: Cook, 41, 64; Jenkins, 3, 5; Kummel, 26, 66; Ries, 2, 5, 6; Smock, 19; Twitchell, 1, 2, 3.

Copper: Barber, 1; Beck, 2; Clemson, 1; Dickeson, 1, 2; Larison, 1; Lewis, J. V., 1, 4; Piggott, 1; Rogers, H. D., 1, 2; Smock, 19; Snell, 1; Whitney, J. D., 1; Woodward, H. P., 1.

Hunterdon County—Continued.

Economic Geology—Continued.

Materials—Continued.

Graphite: Bayley, 4; Kummel, 45; Nason, 2; Smock, 19.

Iron: Bayley, 8; Boyer, Charles Shimer, 1; Cook, 29, 35, 42, 68, 73, 78, 102, 111, 129; Fackenthal, 1; Larison, 1; Nason, 7; Putnam, B. T., 1; Smock, 19; Anonymous, 4.

Lime: Cook, 73; Kummel, 50.

Manganese: Harder, 1; Loughlin, 2; Williams, 2.

Sand and gravel: Cook, 59; Lewis, J. V., 6; Smock, 19.

Stone: Cook, 71, 88; Eckel, 1, 2; Hawes, 2; Kummel, 7, 60; Lewis, 10; McCourt, 8; Smock, 19.

Zinc: Kummel, 10.

Engineering geology, reservoirs and dams: Hamilton, W. I., 8.

Floods and flood control, Delaware watershed: Vermeule, 20.

Geodesy.

Bench marks: Cook, 87, 127, 136; Plummer, 1; Vermeule, 15, 80.

Surveying: Bowser, 5; Cook, 127; Vermeule, 15; Anonymous, 23.

Geophysics, magnetism and magnetic surveys: Vermeule, 2, 15; Anonymous, 23.

Glacial geology.

Depositional features: Salisbury, 1, 28; Wright, A. A., 1.

Erosional features: Salisbury, 1.

Mineralogy.

Mineral groups, general: Canfield, 1; Hawkins, 8; Sanford, 2; Schrader, 1; Wherry, 2.

Carbonates: Eyerman, 2.

Borosilicates: Tomlinson, 1.

Silicates: Hess, 1; Shannon, 1.

Sulphides: Beck, 2; Honess, 1.

Zeolites: Honess, 1.

Mineral localities, general: Canfield, 1; Valiant, 8.

Flemington: Beck, 2.

Paleontology.

Indeterminate remains, footprints: Eyerman, 1, 2.

Plants, general: Lewis, H. C., 4.

Pteridophyta: Newberry, 12.

Petrology.

Igneous rocks.

Intrusive rocks.

Diabase: Tomlinson, 1.

Dike rocks: Ransome, 1.

Nepheline syenite: Ransome, 1.

Sedimentary rocks, rock types, argillite: Hawkins, 4.

Soils, composition: Blair, 4, 6; Burke, 1; Cook, 72; Patrick, 2, 3.

Stratigraphy.

Pre-Cambrian: Bayley, 4.

Cambrian: Bayley, 4; Ludlum, 1.

Ordovician: Bayley, 4.

Triassic: Bascom, 3, 5; Bayley, 4; Ludlum, 1; Salisbury, 17.

Quaternary: MacClintock, 4.

Structural geology.

Local structures, faults, Flemington: Bascom, 5; Lyman, 1; Wheeler, 1.

Hunterdon County—Continued.

Water supply.

Ground water, wells: Cook, 74; Darton, 12, 13; Kummel, 54; N. J. S. W. P. C., 5; Smock, 9; Upson, 1; Woolman, 6, 13, 16, 17, 18, 19, 20.

Mineral content: Collins, 1; Dole, 1; Myers, 2.

Surface water, general: Barrows, 1, 2; Cook, 53, 98; Critchlow, 1; Grover, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28; Hamilton, W. I., 8; Hartwell, 1; Horton, 1, 2; Hoyt, 1; Newell, 1, 2, 3; N. J. S. W. P. C., 5; Parker, G. L., 1, 2, 3; Paulsen, 1.

Stream gauging and gauging stations: Barrows, 1, 2; Critchlow, 1; Grover, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28; Hartwell, 2; Horton, 1, 2; Hoyt, 1; Newell, 1, 2, 3; Parker, G. L., 1, 2, 3; Paulsen, 1.

Weathering: MacClintock, 4.

Hydrocarbons. See Mineralogy: mineral groups.

Infusorial earth. See Economic geology: materials, diatomaceous earth.

Inlets. See Engineering geology.

Intrusive rocks. See Petrology: igneous rocks.

Iron. See Economic geology: materials; Mineralogy: native elements.

Jenny Jump Mountain. See Warren County; Mineralogy: mineral localities.

Jersey City. See Hudson County; Mineralogy: mineral localities.

Jurassic Period.

Paleontology.

Plants, general: Hollick, 7, 9, 10.

Animals, *Chordata*, *Pisces*: Redfield, 10.

Peneplanes: Kummel, 78; Stone, 8.

Stratigraphy: Kummel, 78; Lewis, H. C., 3; Lewis, J. V., 11; Marsh, 12; Merrill, 6; Russell, 8; White, 1.

Kames and kettles. See Glacial geology: depositional and erosional features.

Kittatinny limestone. References included under Cambrian.

Lakes. See Glacial geology: glacial lakes; Streams and surface drainage: lakes.

Lake Hackensack. See Glacial geology: glacial lakes.

Lake Passaic. See Glacial geology: glacial lakes.

Lake Pequest. See Glacial geology: glacial lakes.

Lime. See Economic geology: materials.

Limestone. See Economic geology: materials, stone; Petrology: sedimentary rocks.

Magnetism and magnetic surveys. See Geophysics.

Manasquan Inlet. See Monmouth County; Engineering geology: inlets; Shoreline features: erosional and depositional.

Manganese. See Economic geology: materials.

Manganiferous residuum. See Economic geology: zinc.

Marbles. See Economic geology: stone; Petrology: metamorphic rocks.

Marshes. See Coastal Plain; Conservation and development: reclamation of land; Shoreline features.

Maurice River. See Conservation and development: reclamation of land.

Mercer County.

Climate and weather.

Precipitation: Cook, 76; Smock, 4.

Tables: Smock, 6.

Temperature: Cook, 76.

Conservation and development, forestry: Cook, 118.

Economic geology.

Localities, quarries: Cook, 71, 88; Hawes, 2; Johnson, M. E., 1; Kummel, 7; Lewis, 10; McCourt, 3; Parker, 10; Sanford, 2; Schrader, 1; Smock, 19.

Materials, general: Sanford, 2; Schrader, 1; Twitchell, 2.

Clay: Burchard, 1, 2, 3; Cook, 20, 64, 73, 80; Jenkins, 3, 5; Johnson, M. E., 1, 4, 7; Kummel, 26, 51, 60, 66; Parker, 12, 14; Raum, 1; Ries, 2, 5, 6; Smock, 3; Stone, R. W., 1; Twitchell, 1, 2, 3.

Greensand marl: Cook, G. H., 1.

Iron: Boyer, Charles Shimer, 1; Nelson, 4.

Peat: McCourt, 1; Soper, 1.

Sand and gravel: Johnson, M. E., 3, 4; Kummel, 31; Salisbury, 10.

Stone: Cook, 71, 88; Hawes, 2; Hawkins, 4; Kummel, 7, 60; Lewis, J. V., 10; McCourt, 3; Smock, 19; Twitchell, 1, 2.

Geodesy.

Bench marks: Cook, 119, 127, 136; Plummer, 1; Vermeule, 15, 30, 31; Anonymous, 21, 25.

Surveying: Bowser, 5; Cook, 127; Vermeule, 15; Anonymous, 23.

Geophysics.

Gravitational measurements and stations: Bowie, 1.

Magnetism and magnetic surveys: Locke, 1; Vermeule, 2, 15; Anonymous, 23.

Seismic explorations: Ewing, 1.

Glacial geology, depositional features: Salisbury, 28.

Mineralogy.

Mineral groups, general: Canfield, 1; Hawkins, 3; Seymour, 1; Robinson, 1; Vanartsdalen, 1.

Hydrocarbons: Abbott, 5; Wister, 1.

Silicates: Conrad, 1; Gordon, 2.

Sulphides: Honess, 1; Lewis, 14.

Zeolites: Honess, 1; Anonymous, 31.

Mineral localities, general: Canfield, 1; Hawkins, 3; Seymour, 1.

Hopewell: Canfield, 1; Lewis, 14; Manchester, 2; Seymour, 1; Valiant, 3.

Princeton: Hawkins, 3; Manchester, 2; Robinson, 1; Valiant, 3; Anonymous, 31.

Paleontology.

Indeterminate remains, trails: Abel, 1, 2; Caster, 1.

Petrology.

Sedimentary rocks, rock types, argillite: Hawkins, 4.

Gravel: Campbell, 1.

Soils, composition: Blair, 4; Bonsteel, 2; Burke, 1; Cook, 62, 72; Lee, 2; Patrick, 2.

Mercer County—Continued.

Stratigraphy.

Cretaceous: Bascom, 3; Salisbury, 17; Shattuck, 1.

Jurassic: Lewis, H. C., 3.

Triassic: Bascom, 3; Salisbury, 17.

Quaternary: Bascom, 3; Campbell, 1;

Salisbury, 11, 17.

Structural geology.

Local structures, faults, Hopewell: Hawkins, 17.

Trenton gravels: Abbott, 1, 2, 3, 6; Belt, 1; Coman, 1; Cook, 61; Haynes, 1; Holmes, 1; Kummel, 6; Lewis, H. C., 1, 2, 5; Martin, 1; Mercer, 1; Putnam, F. W., 1; Richards, 10; Salisbury, 2, 3, 12, 14, 29; Shaler, 1; Volk, 1; Wilson, T., 1; Woodman, 3; Woodworth, 2; Wright, G. F., 1, 2, 4, 5, 6.

Water supply.

Artificial recharge: Barksdale, 11.

Ground water, wells: Cook, 48, 66, 98;

Critchlow, 2, 3; Darton, 11, 12, 13;

Fuller, 2; Kummel, 27, 54; N. J. S. W.

P. C., 5; Smock, 8, 9; Woolman, 9, 10,

13, 16, 17, 18, 19.

Mineral content: Collins, 1.

Surface water, general: Cook, 98, 142;

Critchlow, 1; Grover, 12, 13, 14, 15, 16,

17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27,

well, 1; Hazen, 1; Moore, 3; N. J. S.

Parker, G. L., 1, 2, 3; Paulsen, 1.

Stream gauging and gauging stations:

Critchlow, 1; Grover, 12, 13, 14, 15, 16,

17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27,

28; Hartwell, 2; Parker, G. L., 1, 2,

3; Paulsen, 1.

Wind work, deposition: Knapp, 1; Kummel, 6; Salisbury, 14.

Metallic paints. See Economic geology; materials, mineral paints.

Meteorites: Gay-Lussac, 1; Goldsmith, 2;

Keeley, 1; Manchester, 2; Shepherd, 3;

Vaux, 1.

Mica. See Economic geology; materials.

Middlesex County.

Climate and weather, fulgurite: Barrows, W. L., 1; Myers, 1.

Precipitation: Barksdale, 1; Cook, 76.

Tables: Smock, 6.

Temperature: Berry, 19; Cook, 76.

Conservation and development, forestry: Cook, 112.

Economic geology.

Localities.

Mines, general: Bayley, 3; Cook, 78;

Piggott, 1; Sanford, 2; Schrader, 1;

Winterbotham, 1; Woodward, H.

P., 1.

New Brunswick: Beck, 2; Hawkins,

18; Weld, 1; Whitney, J. D., 1;

Winterbotham, 1; Woodward, H.

P., 1.

Quarries: Clayton, 1; Cook, 71, 88;

Parker, 10; Sanford, 2; Schrader, 1;

Smock, 19.

Materials, general: Sanford, 2; Schrader,

1; Twitchell, 2.

Clay: Burchard, 1, 2, 3; Clayton, 1;

Cook, 3, 20, 31, 36, 41, 64, 80, 83, 94,

97; Day, 11; Jenkins, 5; Johnson, M.

E., 1, 4; Knapp, 26; Kummel, 60, 66;

Middlesex County—Continued.

Economic geology—Continued.

Materials—Continued.

Clay—Continued.

Loughlin, 1; Parker, 12, 14; Ries, 2, 4, 5, 6, 7; Smock, 3, 19; Stone, R. W., 1; Twitchell, 1, 2, 3, 12.

Copper: Barber, 1; Beck, 2; Bishop, 1; Clayton, 1; Hawkins, 18; Morse, 1; Piggott, 1; Lewis, J. V., 4; Schöpf, 1; Smock, 19; Whitney, J. D., 1; Winterbotham, 1; Woodward, H. P., 1.

Gas: Hawkins, 7.

Greensand marl: Cook, G. H., 1.

Iron: Bayley, 3; Boyer, Charles Shimer, 1; Clayton, 1; Cook, 73, 78, 99.

Oil: Hawkins, 7.

Peat: McCourt, 1; Parmelee, 2; Soper, 1.

Sand and gravel: Johnson, M. E., 1, 3, 4, 7, 8, 9, 10; Kummel, 31, 53, 60; Salisbury, 10; Twitchell, 1, 2, 10, 12.

Stone: Cook, 71, 88; Lewis, 10; Smock, 19.

Floods and flood control, Raritan watershed: Vermeule, 5.

Geodesy.

Bench marks: Cook, 87, 119, 127, 136; Plummer, 1; Vermeule, 15, 30, 31; Anonymous, 21.

Boundaries: N. J. B., 4, 6.

Surveying: Bowser, 5; Cook, 64, 89, 127; Vermeule, 15; Anonymous, 23.

Geophysics.

Gravitational measurements and stations: Bowie, 1.

Magnetism and magnetic surveys: Locks, 11; Vermeule, 2, 15; Anonymous, 23.

Glacial geology, general: Hawkins, 2.

Depositional features: Salisbury, 1, 28.

Erosional features: Salisbury, 1.

Mineralogy.

Mineral groups, general: Canfield, 1; Giordano, 1; Hawkins, 12; Sanford, 2; Schrader, 1; Seymour, 1.

Native elements: Beck, 2; Chester, 4.

Carbonates: Beck, 2; Finch, 2; Hawkins, 6.

Oxides: Beck, 2; Hawkins, 14.

Silicates: Beck, 2; Gruner, 2; Hawkins, 10, 14, 18.

Sulphates: Hawkins, 6, 18; Manley, 2.

Sulphides: Giordano, 1; Hamilton, S. H., 1; Hopping, 1, 2; Lee, H. R., 1; Manley, 3, 4, 6; Marshall, 1.

Mineral localities, general: Canfield, 1; Sanford, 2; Schrader, 1; Seymour, 1.

New Brunswick: Beck, 2; Canfield, 1; Finch, 2; Gruner, 2; Hawkins, 6, 18; Manchester, 2; Manley, 2; Sanford, 2; Schrader, 1; Seymour, 1; Valiant, 3.

South Amboy: Canfield, 1; Manchester, 2; Seymour, 1; Valiant, 3.

Mineral springs: Peale, 1.

Paleontology.

Plants, general: Newberry, 9.

Thallophyta: Berry, 17; Chrysler, 3; Edwards, 3; Newberry, 13.

Bryophyta: Newberry, 13.

Pteridophyta: Berry, 9, 17, 18; Conrad, 14; Newberry, 13.

Spermatophyta: Bailey, I. W., 1; Berry, E. W., 1, 8, 9, 13, 17, 18, 19; Chrysler,

Middlesex County—Continued.

Paleontology—Continued.

Plants—Continued.

Spermatophyta—Continued.

1, 2; Conrad, 14; Jeffrey, 1; Newberry, 9, 10, 13.

Animals.

Mollusca: Conrad, 11, 15; Richards, 13, 15.

Arthropoda: Conrad, 14.

Petrology.

Sedimentary rocks.

Rock types.

Gravel: Campbell, 1; Lucke, 4, 6.

Sand: Barksdale, 5.

Shoreline features, recent shoreline oscillations: Cook, 112.

Soils, composition: Blair, 6; Bonsteel, 2; Burke, 1; Cook, 62, 72; Jennings, 2; Lee, L. L., 2; Patrick, 3.

Stratigraphy.

Triassic: Bascom, 3; Bayley, 1; Merrill, 6; Salisbury, 17.

Cretaceous: Bascom, 3; Clark, 3, 9; Eaton, 1; Merrill, 6; Salisbury, 17.

Tertiary: Clark, 9.

Quaternary: Bascom, 3; Campbell, 1; Clayton, 1; Cook, 110; Hollick, 2; MacClintock, 4; Salisbury, 11, 13, 17.

Streams and surface drainage.

Deposition: Lucke, 5.

Drainage history, 5.

Lakes, ponds, swamps: Vermeule, 3, 8, 15.

Structural geology.

Local structures.

Faults: Hawkins, 2; Ries, 4.

Folds: Hawkins, 2.

Regional features, Coastal Plain: Hawkins, 7.

Techniques, field trips: Kato, 2.

Water supply.

Artificial recharge: Barksdale, 11.

Ground water, wells: Barksdale, 1, 3, 4, 6, 8, 9, 10; Cook, 66, 74, 82, 98, 124, 142; Critchlow, 3; Darton, 11, 12, 13; Fuller, 1, 2; Kummel, 27, 54; N. J. S. W. P. C., 5; Peale, 1; Schaefer, 1; Silliman, 1; Smock, 9; Woolman, 9, 10, 13, 16, 17, 19, 20.

Ground water—Continued.

Mineral content: Barksdale, 5; Collins, 1.

Surface water, general: Cook, 48, 53, 98, 142; Critchlow, 1; Grover, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28; Hamilton, W. L., 1, 3; Hartwell, 1; Hazen, 1; Moore, 3; N. J. S. W. P. C., 5; Parker, G. L., 1, 2, 3; Paulsen, 1.

Stream gauging and gauging stations:

Critchlow, 1, 2; Grover, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28; Hartwell, 2; Parker, G. L., 1, 2, 3; Paulsen, 1.

Water fluctuations: Barksdale, 1, 3, 4, 5, 6, 8, 9, 10; Schaefer, 1.

Weathering: MacClintock, 4.

Wind work, storms (hurricane and tornado):

Bache, 1; Beck, 1; Clayton, 1; Espy, 1; Hare, 1, 2; Johnson, W. R., 1; Redfield, 2.

Millington. See Morris County; Mineralogy: mineral localities.

Mine Hill mine. See Franklin Furnace.

Mineralogy.

- Collections: Bates, 2; Foshag, 1; Drake, 1. 2; Gordon, 3; Manley, 5; Morton, J. F., 1; Wilkerson, 1.
- Crystallography: Allen, 1; Aminoff, 1, 2; Bauer, 2, 4, 5, 6; Beck, 3; Berman, 2; Blake, 1; Brush, 3; Buerger, 1; Canfield, 2, 4; Casperson, 2; Cook, C. W., 1; Dana, E. S., 1; Eakle, 1; Egleston, 1; Fenner, 3, 4, 5, 6, 8; Ford, 1, 2; Foshag, 5; Frondel, 1; Genth, 1; Glenn, 2; Gordon, 5, 7; Grosser, 1; Gruner, 2; Haff, 1; Hawkins, 3, 5, 6, 8, 11, 12, 15, 16, 18; Herman, 1; Hess, 1; Honess, 1, 2; Hopping, 1; Hunt, 2; Kloos, 1; Koenig, 4; Kraus, 1; Larsen, 2, 5; Levison, 4; Manchester, 1; Manley, 4; Moore, 1; Moses, 1, 2, 3, 4; Nason, 4; Nuttall, 1; Palache, 1, 2, 3, 4, 5, 6, 8, 10, 11, 12, 17, 18, 19, 20; Peacock, 1; Penfield, 3, 7, 8; Phillips, 3, 4; Pirsson, 1; Pratt, 1; Rath, 1, 2; Roepper, 1, 2; Rogers, A. F., 1, 2, 3, 5; Schaller, 1, 3, 4, 6, 7; Sundius, 1; Troost, 1; Van Horn, 1; Vanuxem, 6; Warren, 1; Wherry, 1, 3, 4, 5; Whitlock, 1, 2, 3, 4, 5; Zachariasen, 1.
- Minerals of New Jersey, general: Cleveland, 1; Dana, J. D., 1; Dana, E. S., 2; Manchester, 2; Newhouse, 1; Pierce, 1; Robinson, 1; Rogers, H. D., 2; Seymour, 1.
- Mineral groups.
- General: Bauer, 6; Beck, 2; Britton, 3; Canfield, 1; Casperson, 2; Chamberlin, 1; Chester, 4; Cozzens, 1; Darton, 1; Day, 2; Ehrman, 1; Fenner, 4; Fowler, S., 1, 3; Giordano, 1; Gordon, S. G., 1, 5, 7; Hawkins, 1, 3, 4, 8, 12, 13; Herman, 1; Hoadley, 1; Hunt, J. H., 1, 2; Kato, 1; Kemp, 6; Kitchell, 4; Koenig, 4, 5; Kunz, 2; Levison, 2; Lewis, 12; Manchester, 1; Morton, J. F., 1; Moses, 2; Northrup, 1; Nuttall, 1; Olpp, 1; Palache, 1, 12, 13, 17; Parker, 6; Pierce, 1, 2; Ries, 8; Rogers, 5; Sachs, 2; Sanford, 2; Schrader, 1; Shepard, 1, 2; Smock, 19; Spencer, 4; Spurr, 1; Torrey, J., 1; Troost, 2; Valiant, 1, 2; Vanartsdalen, 1; Vanuxem, 4, 6; Westgate, 2; Williams, A., 1, 2; Woodward, H. P., 1; Zodiac, 1.
- Native elements: Bayley, 1; Beck, 2; Black, 2; Bowen, 1; Chester, 4; Cook, 40; Cornwall, 2; Darton, 7; Devereux, 1; Eyerman, 2; Foote, 1; Haff, 1; Lewis, 16; Palache, 19; Papish, 1; Schaeffer, 1; Smock, 19; Weed, 2, 4; Wolff, 7; Woodward, H. P., 1.
- Arsenates: Foshag, 2, 3, 5; Palache, 6, 8, 18.
- Arsenides: Bauer, 2; Buerger, 1; Palache, 19.
- Borates: Bauer, 5; Berman, 2; Brush, 2; Darton, 2; Gruner, 1; Penfield, 2; Poitevin, 1.
- Boroarsenates: Palache, 5; Tomlinson, 1.
- Carbonates: Bauer, 4; Beck, 2; Breithaupt, 2; Browning, 1; Bruce, 4; Diognan, 3; Ferrari, 1; Finch, 2; Hawkins, 6, 15; Hoadley, 2; Joy, 1; Krieger, 1; Levison, 1, 3; Nichols, 1, 2, 3; Penfield, 4; Rath, 1, 2; Roepper, 1; Rogers, A. F., 2, 3; Smith, E. S. C., 1; Tyler, S. W., 1; Whitlock, 1, 2, 4; Wurtz, 3.

Mineralogy—Continued.

Mineral groups—Continued.

- Chlorides: Hawkins, 6.
- Fluorides: Bruce, 3; Gibbs, 1.
- Hydrocarbons: Abbott, 5; Beck, 2; Finch, 4; Goldsmith, 1; Kunz, 1; Russell, 2; Wester, 1.
- Oxides: Alger, 1, 3; Aminoff, 2; Bakley, 3; Beck, 2; Beco, 1; Berman, 1; Berthier, 1; Blake, 1; Breithaupt, 1; Bruce, 1, 2; Brush, 3; Casperson, 1; Cook, 100; Cornwall, 1; Deacon, 1; Dittler, 1; Egleston, 1; Farrington, 3; Fonda, 1; Ford, 3; Fowler, 2; Frondel, 1; Grenzig, J. A., 1; Grosser, 1; Harcourt, 1; Hawkins, 14; Hayes, A. A., 1, 2; Leidy, 14; Levi, 1; Moore, 1, 2; Moses, 3, 5; Nuttall, 1, 2; Palache, 6, 20; Papish, 1; Phillips, 3, 4; Reamer, 1; Ricketts, 1; Ries, 3; Roepper, 1; Schaller, 3; Seybert, 3; Seyms, 1; Shepard, 4; Silliman, 1; Smith, E. S. C., 1; Spencer, A. C., 1; Stevens, 1; Stone, G. C., 1; Thomson, 1; Troost, 3; Van Horn, 1; Vanuxem, 3; Whitney, F. L., 1; Anonymous, 2.
- Phosphates: Alger, 2; Browne, 1; Cutbush, 1; Jackson, 6; Penfield, 1; Thomson, 1; Vanuxem, 1.
- Silicates: Allen, 1; Aminoff, 1; Bates, 1; Bauer, 1, 3, 7, 8; Beck, 2, 3; Beco, 1; Berwerth, 1; Blix, 1; Bowen, 1; Brown, 1; Bruce, 2; Brush, 1; Butler, 1, 2; Canfield, 2; Chester, 1, 2, 3; Clark, 3; Clarke, 1, 2, 3; Conrad, 1; Cook, C. W., 1; Cook, G. H., 64; Cornwall, 1; Dana, E. S., 1; Dana, J. D., 2; Delesse, 1; Eakle, 1; Fenner, 5, 6, 8; Fisher, 1; Foote, 1; Ford, 1, 2, 4; Foshag, 1, 4, 6; Fowler, 2; Gage, 1; Genth, 1; Glenn, 1, 2; Gordon, 2, 3, 4; Grenzig, A. J., 1; Gruner, 2, 3; Gunnell, 1; Hart, 1; Hawkins, 5, 10, 14, 18; Hess, 1; Hey, 1; Hillebrand, S., 1; Hillebrand, W. F., 1; Honess, 2; Hunt, T. S., 1, 2, 3; Hussack, 1; Jackson, C. T., 1, 3; Keeley, 1; Kloos, 1; Koenig, 1, 2, 3; Kummel, 70; Larsen, 1, 2, 3, 4, 5; Leeds, 1, 2; Levison, 4; Lewis, 15; Macadam, 1; Manchester, 3; Mansfield, 3, 5; Martin, 2; Mixer, 1; Moses, 4; Nason, 2, 4; Nichols, 3; Northrup, 3; Nuttall, 1, 2; Palache, 2, 3, 4, 6, 9, 10, 11, 15, 16, 18; Papish, 1; Pardee, 1; Parsons, 1; Peacock, 1; Penfield, 3, 5, 6, 7, 8; Phillips, 2; Pirsson, 1; Pisani, 1; Pough, 1; Pratt, 1; Rammsberg, 1; Renwick, 1; Ricketts, 1; Ries, 3; Riggs, 1; Roepper, 1, 2; Rogers, A. F., 4, 5; Schaller, 1, 6, 7; Schneider, 1; Selridge, 1; Seybert, 1, 2, 4, 5; Shannon, 1, 2, 3, 4, 5; Shepard, 4; Smith, E. S. C., 1; Smith, L. L., 2; Spencer, L. J., 1, 2; Stone, G. C., 1; Storm, 1; Sundius, 1; Thomson, 1; Troost, 1, 3; Tyler, S. A., 1; Vanuxem, 2, 5; Warren, 1; Wherry, 1, 2, 3; Whitlock, 3; Whitney, 2; Wolff, 9, 10, 11; Wurtz, 1, 2; Zachariasen, 1; Anonymous, 9.
- Sulphates: Allen, 1; Bauer, 5; Chilton, 1; Fenner, 5; Hawkins, 6, 11, 16, 18; Manley, 2; Mitchell, 1; Schaller, 2, 5; Wherry, 1, 5; Wilson, E. H., 1.

Mineralogy—Continued.

Mineral groups—Continued.

Sulphides: Beck, 2; Black, 2; Eyerman, 2; Hamilton, S. H., 1; Harcourt, 2; Henry, 1; Honess, 1; Hopping, 1, 2; Giordano, 1; Kraus, 1; Lee, H. R., 1; Lewis, 14; Manley, 3, 4, 6; Marshall, 1; Nason, 2; Papish, 1; Rogers, A. F., 1; Silliman, 1; Weeds, 2; Wherry, 4; Whitlock, 5.

Zeolites: Beck, 3; Benn, 1; Bourne, 1; Canfield, 3; Diegnan, 1; Drake, 2; Fenner, 4; Gordon, S. G., 1, 6; Hawkins, 13; Honess, 1; Hunt, J. H., 2; Manchester, 1; Moses, 1; Sachs, 1; Schaller, 2, 4; Whitlock, 3; Anonymous, 31.

Mineral localities.

General: Canfield, 1; Day, 2; Lewis, 16; Manchester, 2; Northup, 2; Robinson, 1; Rogers, H. D., 1; Sanford, 2; Schrader, 1; Seymour, 1; Shephard, 2; Smock, 19; Valiant, 3; Williams, A., 1.

American Mine: Beck, 2; Bowen, 1; Manchester, 2; Robinson, 1; Selfridge, 1; Seymour, 1; Torrey, J., 1; Valiant, 3; Weed, 4.

Beemerville: Manchester, 2; Smith, 2; Valiant, 3.

Bergen Hill: Bates, 1; Beck, 3; Bourne, 1; Canfield, 3; Clarke, 2; Credner, 1; Dana, E. S., 1; Darton, 2; Ford, 1; Kato, 1; Kuns, 2; Levison, 2; Manchester, 1, 2; Moses, 4; Peacock, 1; Rath, 1, 2; Rogers, A. F., 2, 5; Russell, 5; Seymour, 1; Valiant, 3; Wherry, 4; Whitney, 2; Whitlock, 3, 4.

Chimney Rock: Beck, 3; Chester, 4; Hawkins, 8; Manchester, 2; Sanford, 2; Schrader, 1; Seymour, 1; Valiant, 3.

Flemington: Beck, 2.

Franklin Furnace: Alger, 1, 3; Aminoff, 1, 2; Bauer, 1, 2, 3, 4, 6, 7, 8; Berman, 1, 2; Berthier, 1; Blix, 1; Breithaupt, 1; Browning, 1; Bruce, 1, 3; Brush, 1, 2, 3; Buerger, 1; Chester, 1, 2, 3, 4; Clarke, 2; Cornwall, 1, 2; Delesse, 1; Dittler, 1; Eakle, 1; Farrington, 3; Finch, 4; Foote, 1; Ford, 2, 3, 4; Foshag, 1, 2, 3, 4, 5, 6; Fowler, S., 1, 2, 3; Frondel, 1; Gage, 1; Genth, 1; Gibbs, 1; Gordon, S. G., 3, 4, 5, 6, 7; Gordon, T. F., 1; Grosser, 1; Gruner, 1; Gunnell, 1; Haff, 1; Harcourt, 1; Henry, 1; Hay, 1; Hillebrand, W. F., 1; Hoadley, 1; Honess, 2; Hunt, T. S., 1, 2, 3; Jackson, C. T., 1, 3, 4; Kemp, 6; Kloos, 1; Koenig, 1, 2, 3, 4, 5; Kraus, 1; Krieger, 1; Larsen, 1, 2, 3, 4, 5; Levi, 1; Levison, 3, 4; Lewis, 15; Manchester, 2; Mixer, 1; Moses, 2, 5; Newhouse, 2; Nichols, 1, 2, 3; Nutall, 1; Olpp, 1; Palache, 1, 2, 3, 4, 5, 6, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20; Papish, 1; Pardee, 1; Parsons, 1; Peacock, 1; Penfield, 1, 2, 3, 6, 7, 8; Phillips, 2, 3, 4; Pirsson, 1; Pisani, 1; Poitevin, 1; Pough, 1; Ricketts, 1; Ries, 8; Robinson, 1; Roepper, 1, 2; Sanford, 2; Schaller, 1, 6; Schrader, 1; Selfridge, 1; Seymour, 4; Seymour, 1; Seyms, 1; Shannon, 2, 3, 4; Shepard, 1, 4; Smith, E. S. C., 1; Spencer, A. C., 6; Spencer, L. J., 1, 2; Spurr, 1; Stone, G. C., 1; Sundus,

Mineralogy—Continued.

Mineral localities—Continued.

Franklin Furnace—Continued.

1; Tarr, W. A., 1; Torrey, J., 1; Thomson, 1; Troost, 1, 2, 3; Valiant, 3; Van Horn, 1; Vanuxem, 2, 3, 4, 6; Warren, 1; Wolff, 7, 9, 10, 11; Zachariasen, 1. Great Notch: Brown, 1; Cook, C. W., 1; Fenner, 4, 5, 6; Gordon, S. G., 1; Johnson, M. E., 4; Levison, 2; Papka, 1; Manchester, 2; Rogers, A. F., 2; Sachs, 1, 2; Valiant, 3; Whitlock, 4; Wilson, E. H., 1; Zodiac, 1.

Hamburg: Fowler, 3; Hussack, 1; Manchester, 2; Riggs, 1; Robinson, 1; Seymour, 1; Torrey, J., 1; Valiant, 3.

Hoboken: Bruce, 4; Chester, 4; Cozzens, 1; Ferrari, 1; Finch, 4; Joy, 1; Leeds, 2; Manchester, 2; Mitchell, 4; Nutall, 2; Robinson, 1; Rogers, A. F., 3; Russell, 5; Sanford, 2; Schrader, 1; Selfridge, 1; Seymour, 1; Smith, E. S. C., 1; Valiant, 3; Vanuxem, 5; Walker, 2.

Hopewell: Lewis, 14; Manchester, 2; Seymour, 1; Valiant, 3.

Jenny Jump Mountain: Chester, 4; Manchester, 2; Sanford, 2; Schrader, 1; Seymour, 1; Valiant, 2, 3; Westgate, 2.

Jersey City: Manchester, 2; Rogers, A. F., 2; Selfridge, 1; Whitlock, 2.

Millington: Hawkins, 8; Manchester, 2.

Montville: Clarke, 1; Gruner, 3; Hillebrand, S., 1; Manchester, 2; Sanford, 2; Schrader, 1; Selfridge, 1; Seymour, 1; Shannon, 5; Valiant, 3.

New Brunswick: Beck, 2; Finch, 2; Gruner, 2; Hawkins, 6, 18; Manchester, 2; Manley, 2; Sanford, 2; Schrader, 1; Seymour, 1; Valiant, 3.

Newton: Bruce, 2; Chilton, 1; Fowler, 2, 3; Manchester, 2; Seymour, 1; Shephard, 1; Valiant, 3.

North Plainfield: Hawkins, 1, 5, 8, 15; Manchester, 2.

Oxford: Chester, 4; Manchester, 2; Valiant, 5.

Paterson and West Paterson: Allen, 1; Bates, 1; Beck, 3; Benn, 1; Canfield, 3, 4; Casperson, 1, 2; Diegnan, 1; Ehrman, 1; Fenner, 4, 5, 6, 8; Glenn, 2; Gordon, S. G., 1; Gordon, T. F., 1; Grenz, A. J., 1; Grenz, J. A., 1; Hawkins, 11, 13; Hoadley, 2; Hunt, J. H., 1, 2; Levison, 2; Lewis, 14; Manchester, 2, 3; Morton, J. F., 1; Northup, 2, 3; Nutall, 1; Papke, 1; Peacock, 1; Penfield, 5; Pierce, 1; Robinson, 1; Rogers, A. F., 2; Schaller, 1, 2, 3, 4, 5, 7; Seymour, 1; Smith, E. S. C., 1; Torrey, J., 1; Valiant, 1, 3; Wherry, 3, 5; Whitlock, 1, 2, 4, 5.

Phillipsburg: Sanford, 2; Schrader, 1; Seymour, 1; Valiant, 3.

Plainfield: Manchester, 2; Valiant, 3.

Princeton: Hawkins, 8; Manchester, 2; Robinson, 1; Valiant, 3.

Rocky Hill: Chester, 4; Clarke, 3; Hess, 1; Manchester, 2; Seymour, 1; Shannon, 1; Valiant, 3.

Mineralogy—Continued.

- Mineral localities—Continued.**
 Schuyler mine: Beck, 2; Darton, 7; Hawkins, 8; Lee, O. L., 1; Manchester, 2; Robinson, 1; Rogers, A. F., 4; Sanford, 2; Schrader, 1; Seymour, 1; Valiant, 3.
 Short Hills: Glenn, 1; Manchester, 2; Valiant, 3.
 Snake Hill: Levison, 2; Manchester, 2; Perry, 1; Rogers, A. F., 2; Valiant, 3; Whitlock, 4.
 Somerville: Beck, 2; Bowen, 1; Manchester, 2; Robinson, 1; Selfridge, 1; Seymour, 1; Torrey, J., 1; Valiant, 3; Weed, 4.
 South Amboy: Manchester, 2; Seymour, 1; Valiant, 3.
 Sparta: Fowler, 3; Herman, 1; Leeds, 1; Manchester, 2; Nutall, 1; Robinson, 1; Seybert, 1, 2, 5; Seymour, 1; Silliman, 1; Torrey, J., 1; Troost, 1; Valiant, 3.
 Sterling Hill: Alger, 1; Bauer, 5; Bretthaupt, 1, 2; Brush, 1; Canfield, 2; Cornwall, 2; Dana, J. D., 2; Farrington, 1; Fowler, S., 1, 3; Finch, 4; Gunnell, 1; Herman, 1; Kemp, 6; Manchester, 2; Mixer, 1; Moore, 1, 2; Newhouse, 2; Nutall, 1; Palache, 1, 9, 12, 15, 17, 19, 20; Penfield, 4; Pratt, 1; Ries, 8; Robinson, 1; Roeppler, 1; Sanford, 2; Schrader, 1; Seymour, 1; Seyms, 1; Shepard, 1, 4; Smith, E. S. C., 1; Spencer, A. C., 6; Spencer, L. J., 1; Stone, G. C., 1; Tarr, W. A., 1; Troost, 3; Tyler, S. W., 1; Valiant, 3; Vanuxem, 4, 6; Whitney, F. L., 1; Wurtz, 2.
 Upper Montclair: Drake, 3; Levison, 1, 2; Manchester, 2; Moses, 1, 2, 3; Rogers, A. F., 2; Schaller, 4; Whitlock, 4.
 Washington: Valiant, 3.
 Weehawken: Chamberlin, 1; Darton, 1; Kato, 1; Manchester, 2; Martin, 2; Rogers, A. F., 1, 5; Sanford, 2; Schrader, 1; Seymour, 1; Valiant, 3; Walker, 2.
 Mineral paints. See Economic geology; materials.
 Mineral springs. See also Water supply: mineral content. Barber, 1; Burchard, 1, 2, 3; Day, 2, 4, 5, 6, 7, 8, 11, 13, 15, 17, 19, 20, 21, 22, 23, 24, 25, 26; Katz, 1, 2, 4; Kummel, 66; Loughlin, 1; Mitchell, 3, 4; Morse, 1; Parker, E. W., 2, 4, 6, 8, 10, 12, 14; Peale, 1; Pierson, 1; Stone, R. W., 1, 2, 3; Twitchell, 2, 3, 8, 9, 10; Williams, 2.
 Mineral wool. See Economic geology; materials.
Monmouth County.
 Climate and weather.
 Precipitation: Cook, 76; Smock, 4.
 Tables: Smock, 6.
 Temperature: Cook, 76.
 Wind, storms: Johnson, D. W., 2.
 Conservation and development, forestry: Cook, 118.
 Economic geology.
 Localities, mines, general: O'Callaghan, 3.
 Materials, general: Sanford, 2; Schrader, 1; Twitchell, 2.
 Clay: Clark, 10; Cook, 86; Jenkins, 3, 5; Johnson, M. E., 1, 4; Kummel, 26, 60, 66; Ries, 2, 5, 6; Smock, 19; Twitchell, 1, 2, 3.
 Copper: O'Callaghan, 3.

Monmouth County—Continued.

- Economic geology—Continued.**
Materials—Continued.
 Greensand marl: Clark, 10; Cook, G. H., 1, 2, 3, 36, 78, 80, 128; Johnson, 9; Mansfield, 5; Pierce, 3; Raun, 1; Smock, 19; Wheeler, 1; Zodac, 2.
 Iron: Bayley, 3; Bishop, 1; Boyer, Charles Shimer, 1; Cook, 39, 73; Anonymous, 4.
 Lime: Cook, 2.
 Oil: Kummel, 70, 71, 72.
 Peat: Kummel, 41.
 Potash: Cook, 2; Mansfield, 5.
 Sand and gravel: Johnson, M. E., 3, 4, 7, 8; Kummel, 31, 60; Salisbury, 10, 13.
 Engineering geology.
 Bridges: Kummel, 58.
 Canals: Kummel, 58; Vermeule, 22.
 Inlets: Haupt, 2, 3, 5; Kummel, 46, 49, 64, 65, 67, 68, 69; Lucke, 1; Vermeule, 22, 27, 28.
 Geodesy.
 Bench marks: Cook, 87, 119, 127, 136; Plummer, 1; Vermeule, 15, 31; Anonymous, 27.
 Boundaries: N. J. B., 4.
 Surveying: Bowser, 5; Cook, 127; Vermeule, 15; Viele, 2; Anonymous, 23.
 Geophysics.
 Magnetism and magnetic surveys: Vermeule, 2, 15; Anonymous, 23.
 Seismic explorations: Ewing, 1.
 Meteorites: Gay-Lussac, 1; Keeley, 1; Shephard, 2; Vaux, 1.
Mineralogy.
 Mineral groups, general: Canfield, 1; Seymour, 1.
 Oxides: Seybert, 3.
 Phosphates: Cutbush, 1.
 Silicates: Keeley, 1.
 Mineral localities, general: Canfield, 1; Seymour, 1; Valiant, 3.
Paleontology.
 Indeterminate remains, coprolites: Dekay, 4.
 Plants, general: Baker, 2; Berry, 5.
Thallophyta: Berry, E. W., 1, 2; Kain, 1.
Pteridophyta: Berry, 2, 4, 8, 10.
Spermatophyta: Berry, E. W., 1, 2, 3, 4, 6, 8, 9, 10, 12, 14, 16; Holden, 1, 2; Hollick, 4, 8; Newberry, 13; Stevens, 1.
 Animals, general: Richards, 16; Weller, 8.
Protozoa: Bagg, 1, 2.
Porifera: Shimer, 1.
 "Vermes": Howell, B. F., 2; Morton, 5.
Bryozoa: Graeven, 1.
Mollusca: Conrad, 2, 3, 6, 7, 12; Gabb, 2, 5, 10; Hollick, 4, 8; Lea, 1; Prather, 1; Morton, S. G., 1, 5; Rowland, 1; Weller, 6; Whitfield, 9.
Arthropoda: Pilsbry, 3; Van Rensselaer, 1; Weller, 6.
Chordata, *Pisces*: Cope, 11, 15, 18; Fowler, H. W., 1; Marsh, 6.
Reptilia: Conrad, 14; Cope, 7, 8, 12, 14, 20, 22, 24, 27; Dekay, 3, 4; Leidy, 9, 11; Marsh, 1, 2, 3, 7; Morton, 5; Rapp, 1; Troxell, 1, 2; Wieland, 1, 2, 3; Whitfield, 8.
Aves: Marsh, 4, 5, 10, 11; Wetmore, 1.

Monmouth County—Continued.

Paleontology—Continued.

Animals—Continued.

Mammalia: Baker, 2; Cope, 18, 20; Dekay, 1; Leidy, 12; Lockwood, 1; Marsh, 4, 7; Mitchell, 2; Van Rensselaer, 2; Wood, 1.

Petrology.

Sedimentary rocks.

Rock types.

Clay: Prather, 1.
Gravel: Newberry, 3.
Greensand marl: Prather, 1.
Sand: Colony, 1; Prather, 1.

Sedimentary features, concretions: Willcox, 1.

Physical geography: Akerly, 1.

Sandy Hook: Akerly, 1; Bache, 2; Cook, 7; Merrill, F. J. H., 1.

Shoreline features.

Erosional and depositional: Haupt, 5; Hayes, A. O., 1; Johnson, D. W., 2; Kummel, 49; Woodman, 2.

Recent shoreline oscillations: Bache, 2; Johnson, D. W., 3; Woodman, 2.

Terraces (marine): Coman, 1.

Soils.

Composition: Blair, 2, 7; Bonsteel, 2; Burke, 1; Cook, 72; Jenning, 2; Lee, L. L., 1, 2.

Soil and forestry: Coman, 2; Pratt, I. H., 1.

Stratigraphy.

Cretaceous: Bascom, 3; Berry, 5; Clark, 3; Eaton, 1; Hayes, A. O., 1; Knapp, 2; Prather, 1; Salisbury, 17; Shattuck, 1; Weller, 8.

Tertiary: Bascom, 3; Clark, 3, 7; Coman, 1; Conrad, 7; Salisbury, 11, 13, 17; Shattuck, 1.

Quaternary: Bascom, 3; Hollick, 2; Salisbury, 11, 13, 17.

Streams and surface drainage, lakes, ponds.

Swamps: Vermeule, 3, 8, 15.

Techniques, field trips: Lobeck, 1.

Water supply.

Ground water, general: Thompson, 4.

Wells: Barksdale, 4, 6, 8, 9, 10; Cook, 74, 98, 105, 116, 124, 142; Critchlow, 3; Darton, 11, 12, 13; Fuller, 1, 2; Knapp, 3; Kummel, 27, 54; N. J. S. W. P. C., 5; Schaefer, 1; Smock, 8, 9, 12; Upson, 1; Woolman, 9, 10, 13, 16, 17, 18, 19, 20, 21.

Mineral content: Collins, 1; Cook, 105; Myers, 2.

Surface water, general: Critchlow, 1;

Cook, 98; Grover, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28; Hartwell, 1; N. J. S. W. P. C., 5; Parker, G. L., 1, 2, 3; Paulsen, 1; Thompson, 4.

Stream gauging and gauging stations:

Critchlow, 1; Grover, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28; Hartwell, 2; Parker, G. L., 1, 2, 3; Paulsen, 1.

Water fluctuations: Barksdale, 4, 6, 8, 9, 10; Schaefer, 1.

Wind work.

Deposition: Bache, 2.

Erosion: Johnson, D. W., 3.

Monmouth County—Continued.

Wind work—Continued.

Storms (hurricane and tornado): Johnson, D. W., 3; Kummel, 49.

Montville. See Morris County; Mineralogy: mineral localities.

Moraines. See Glacial geology: depositional features.

Morris County.

Climate and weather.

Precipitation: Cook, 76; Smock, 4.

Tables: Smock, 6.

Conservation and development.

Reclamation of land, Passaic Basin: Bowser, 1; Cook, 21, 126; Hamilton, W. I., 2.

Economic geology.

Economic history: Whitehead, 4.

Localities.

Mines, general: Bayley, 3; Cook, 29, 31,

35, 42, 68, 78, 85, 93, 102, 121, 129;

Day, 2; Hughes, 1, 2, 3; Jenkins, 2,

4, 6, 7; Johnson, 9; Kitchell, 4; Kum-

mel, 18, 21, 36, 40, 45; Nason, 7;

O'Hara, 1, 2; Sanford, 2; Schrader,

1; Williams, A., 1; Winterbotham, 1.

Beach Glen: Bayley, 3; Cook, 17, 68,

78, 102, 111, 121, 129; Hamilton, S.

H., 3; Jenkins, 2, 6, 7; Kitchell, 4;

Kummel, 12, 18; Nason, 7; Smock, 1.

Dickerson: Barber, 1; Bayley, 3, 4;

Bishop, 1; Cook, 17, 68, 78, 102, 111,

121, 129; Gordon, T. F., 1; Honeyman,

2; Jenkins, 1; Kitchell, 4, 6; Kummel,

36; Nason, 7; Putnam, B. T., 1;

Rogers, H. D., 1, 2; Smock, 1, 15;

Tuttle, 1, 2; Anonymous, 4.

Hacklebarney: Bayley, 3, 4; Cook, 17,

35, 68, 102, 111, 121, 129; Jenkins, 1;

Nason, 7; Putnam, B. T., 1.

Hibernia: Bayley, 3; Cook, 17, 35, 68,

78, 102, 111, 121, 129; Darton, 14;

Hamilton, S. H., 3; Hermelin, 1; Jen-

kens, 1, 2, 4, 6; Kemp, 7; Kitchell, 4,

6; Kummel, 12, 18, 21, 30, 36; Leith,

1; Nason, 7; Putnam, B. T., 1; Rog-

ers, H. D., 1, 2; Smock, 15; Tuttle, 1;

Wolf, 2; Anonymous, 4.

Mount Hope: Bayley, 3, 4; Cook, 17, 35,

68, 78, 102, 111, 129; Cooke, S. R. B.,

1; Hamilton, S. H., 3; Hermelin, 1;

Hughes, 2, 3; Jenkins, 1, 2, 7; Kiess-

ling, 6, 9, 11; Kitchell, 4; Kummel,

18, 21, 30; Nason, 2, 7; Needham, 2;

O'Hara, 1, 2; Pehrson, 1; Putnam,

B. T., 1; Ridgway, 1; Rogers, H. D.,

1, 2; Smock, 1, 15; Tuttle, 1; Twitch-

ell, 3; Anonymous, 4.

Scrub Oak: Bayley, 3; Hughes, 1, 2, 3;

Jenkins, 7; Johnson, M. E., 6, 10;

Kummel, 68; Pehrson, 1; Roche, 1;

Shore, 1; Smock, 1.

Wharton: Cooke, S. R. B., 1; Jenkins,

4, 6, 7; Kummel, 30, 36; Nason, 7;

O'Hara, 1, 2; Ridgway, 1; Roche, 1.

Quarries: Britton, 8; Cook, 36, 71; Hawes,

2; Kummel, 7; Lewis, 10; McCourt, 8;

Northup, 1; Parker, 10, 12; Peck, 1;

Sanford, 2; Schrader, 1; Smock, 19.

Materials, general Day, 2; Sanford, 2;

Schrader, 1; Twitchell, 2; Williams,

A., 1.

Morris County—Continued.

Economic Geology—Continued.

Materials—Continued.

- Clay: Cook, 64; Jenkins, 3, 5; Johnson, M. E., 1; Kummel, 26; Ries, 2.
- Copper: Raum, 1.
- Graphite: Bayley, 4; Cook, 12; Smock, 19.
- Iron: Barber, 1; Bayley, 3; Bishop, 1; Boyer, Charles Shimer, 1; Buffet, 1; Cook, 20, 29, 31, 35, 42, 68, 73, 78, 80, 86, 93, 97, 102, 111, 121, 129; Cooke, S. R. B., 1; Credner, 4; Fackenthal, 1; Finch, 4; Gordon, T. F., 1; Hamilton, S. H., 3; Hughes, 1, 2, 3; Hermelin, 1; Honeyman, 2; Jenkins, 1, 2, 6, 7; Johnson, M. E., 1, 2, 3, 4, 6, 7, 8, 9, 10, 13; Kemp, 7; Kiessling, 9, 11; Kitchell, 4, 5, 6; Kummel, 12, 18, 21, 30, 36, 43, 45, 60, 66, 68; Leith, 1; Mitchell, 4; Morse, 2; Nason, 7; Needham, 1, 2; O'Hara, 1, 2; Pehrson, 1; Putnam, B. T., 1; Raum, 1; Ridgway, 1; Roche, 1; Rogers, H. D., 1, 2; Shore, 1; Smock, 1, 2, 15, 19; Tuttle, 1, 2; Twitchell, 1, 2, 3, 5, 6, 7, 8, 9, 10, 12; Webster, 1; Whitehead, 4; Whitney, J. D., 1; Winterbotham, 1; Anonymous, 4.
- Peat: Kummel, 41; McCourt, 1, 2; Parmelee, 2; Soper, 1.
- Sand and gravel: Cook, 36; Johnson, M. E., 1, 3, 4, 7, 8, 9, 10; Kummel, 60; Lewis, J. V., 6; Twitchell, 1, 10, 12.
- Stone: Britton, 8; Cook, 36, 71; Hawes, 2; Kummel, 7, 60; Lewis, 10; McCourt, 3; Smock, 19.

Engineering geology.

- Channels: Hamilton, W. I., 2; Vermeule, 32.
- Reservoirs and dams: Cook, 53; Hamilton, W. I., 2, 3; Hazen, 1; Moore, 3; Vermeule, 21, 24, 32, 33.
- Floods and flood control, Passaic watershed: Hamilton, W. I., 2; Vermeule, 20, 21, 32, 33.
- Geodesy.
- Bench marks: Cook, 136; Plummer, 1; Vermeule, 15, 29, 30; Anonymous, 22.
- Surveying: Bowser, 1, 5; Cook, 89, 127; Vermeule, 15; Viele, 2, 3; Anonymous, 23.

- Geophysics, magnetism and magnetic surveys: Cook, 37, 101; Nason, 2, 7; Vermeule, 2, 15.

Glacial geology.

- Depositional features: Kummel, 75; Salisbury, 28.
- Glacial lakes, ponds, and rivers, general: Salisbury, 10.
- Lake Passaic: Kummel, 1, 75; Salisbury, 3, 6, 8.

Mineralogy.

- Mineral groups, general: Canfield, 1; Day, 2; Northup, 1; Sanford, 2; Schrader, 1; Seymour, 1; Williams, A., 1.
- Phosphates: Alger, 2.
- Silicates: Clarke, 1; Gruner, 3; Hillebrand, S., 1; Selfridge, 1.
- Mineral localities, general: Canfield, 1; Day, 2; Northup, 2; Sanford, 2;

Morris County—Continued.

Mineralogy—Continued.

Mineral localities—Continued.

- Schrader, 1; Seymour, 1; Williams, A., 1.
- Millington: Hawkins, 8; Manchester, 2.
- Montville: Canfield, 1; Clarke, 1; Gruner, 3; Hillebrand, S., 1; Manchester, 2; Sanford, 2; Schrader, 1; Selfridge, 1; Seymour, 1; Shannon, 5; Valiant, 3.
- Mineral springs: Mitchell, 3, 4; Morse, 1; Peale, 1.
- Paleontology.
- Animals.
- Mollusca*: Gabb, 6.
- Chordata, Pisces*: Eastman, 1, 2; Gale, 1; Newberry, 4, 5; Redfield, 1, 3.
- Mammalia*: Baker, 2; Jackson, J. B. S., 1; Stewart, 1.

Petrology.

- Igneous rocks.
- Extrusive rocks, basalt: Hawkins, 9.
- Intrusive rocks, dike rocks: Hawkins, 9.
- Metamorphic rocks.
- Gneiss: Wolff, 2.
- Serpentine: Merrill, G. P., 1, 2.
- Sedimentary rocks.
- Sedimentary features, varves: Reeds, 1.
- Soils, composition: Blair, 1, 4, 6; Cook, 62, 72; Jenning, 1; Patrick, 2, 3.

Stratigraphy:

- Pre-Cambrian: Bayley, 4.
- Cambrian: Bayley, 4.
- Ordovician: Bayley, 4.
- Silurian: Bayley, 4.
- Devonian: Bayley, 4.
- Triassic: Salisbury, 17.
- Quaternary: MacClintock, 4.
- Streams and surface drainage.
- Streams, lakes, and ponds, general: Vermeule, 3, 8, 15.
- Drainage history: Kummel, 1.
- Structural geology.
- Local structures.
- Dikes: Hawkins, 9.
- Faults: Bayley, 3.
- Folds: Wolff, 2.

Water supply:

- Ground water, general: Peale, 1; Thompson, 5.
- Wells: Cook, 74; Darton, 12, 13; Kummel, 54; N. J. S. W. P. C., 5; Smock, 12; Woolman, 13, 16, 17, 18.
- Mineral content: Barber, 1; Collins, 1.
- Surface water, general: Babb, 1, 2; Barrows, 1, 2, 3; Collins, 1; Cook, 53, 93, 132; Critchlow, 1; Croes, 1; Grover, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28; Hamilton, W. I., 3; Hartwell, 1; Hazen, 1; Horton, 1, 2; Hoyt, 1; Moore, 3; N. J. S. W. P. C., 5; Parker, G. L., 1, 2, 3; Paulsen, 1; Vermeule, 26.
- Stream gauging and gauging stations: Babb, 1, 2; Barrows, 1, 2, 3; Critchlow, 1; Grover, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28; Hartwell, 2; Horton, 1, 2; Hoyt, 1; Newell, 3; Parker, G. L., 1, 2, 3; Paulsen, 1.
- Weathering: MacClintock, 4.

- Mount Hope mine. See Morris County: Economic geology: localities.
- Mud cracks. See Petrology: sedimentary features.
- Native elements. See Mineralogy: mineral groups.
- Newark Meadows. See Conservation and development: reclamation of land.
- Newark series. See Triassic Period; Stratigraphy: Triassic.
- New Brunswick. See Middlesex County; Mineralogy: mineral localities.
- New Brunswick mines. See Middlesex County; Economic geology: localities.
- New England Upland province. See Appalachian region; Highlands of New Jersey; Structural geology: regional features.
- Newton. See Sussex County; Mineralogy: mineral localities.
- North Arlington mine. See Schuyler mine.
- North Plainfield. See Somerset County; Mineralogy: mineral localities.
- Ocean County.
- Climate and weather.
- Precipitation: Cook, 76; Smock, 4.
- Tables: Smock, 6.
- Economic geology.
- Materials, general: Sanford, 2; Schrader, 1; Twitchell, 2.
- Clay: Cook, 60, 64; Jenkins, 3, 5; Johnson, M. E., 1, 26, 31, 60; Ries, 2, 5, 6; Smock, 3; Twitchell, 1.
- Greensand: Cook, 1, 3, 128; Mansfield, 5.
- Iron: Boyer, Charles Shimer, 1.
- Oil: Johnson, M. E., 2, 3, 4; Kummel, 70.
- Potash: Mansfield, 5.
- Sand and gravel: Cook, 59; Johnson, M. E., 1, 3, 4; Kummel, 31; Salisbury, 10.
- Engineering geology.
- Canals: Kummel, 58; Vermeule, 22.
- Channels: Haupt, 4; Kummel, 46; Vermeule, 25.
- Inlets: Haupt, 2, 3; Lucke, 1.
- Geodesy.
- Bench marks: Cook, 119, 127, 136; Plummer, 1; Vermeule, 15; Anonymous, 27.
- Surveying: Bowser, 5; Cook, 127; Vermeule, 15; Anonymous, 23.
- Geophysics, magnetism and magnetic surveys: Vermeule, 2, 15; Anonymous, 23.
- Seismic explorations: Ewing, 1.
- Mineralogy.
- Mineral groups, general: Canfield, 1.
- Mineral localities, general: Valiant, 3.
- Paleontology.
- Indeterminate remains, footprints: Woodworth, 2.
- Plants, *Thallophyta*: Woolman, 5.
- Animals.
- Protozoa*: Bagg, 1, 2; Woodworth, 2.
- Porifera*: Fenton, 1.
- Bryozoa*: Greacen, 1.
- Brachiopoda*: Morton, 5.
- Mollusca*: Conrad, 2; Morton, S. G., 1; Anonymous, 30.
- Chordata, Pisces*: Fowler, H. W., 1; Leidy, 6.
- Petrology, sedimentary rocks, rock types, sand: Colony, 1.
- Ocean County—Continued.
- Shoreline features.
- Erosional and depositional: Hitchcock, C. B., 1; Lucke, 2, 3.
- Recent shoreline oscillations: Lucke, 2.
- Soils.
- Composition: Blair, 7; Bonsteel, 2; Burke, 1; Cook, 62, 72; Lee, L. L., 1, 2.
- Soil and forestry: Coman, 2; Platt, I. H., 1.
- Stratigraphy.
- Cretaceous: Shattuck, 1.
- Tertiary: Bascom, 3; Clark, 7; Greacen, 1; Salisbury, 17; Shattuck, 1.
- Quaternary: Bascom, 3; Salisbury, 11, 17.
- Streams and surface drainage, lakes, ponds, swamps, general: Vermeule, 3, 8, 15.
- Water supply.
- Ground water, wells: Darton, 11, 12, 13; Kummel, 54; N. J. S. W. P. C., 5; Smock, 9; Upson, 1; Woolman, 3, 6, 10, 13, 17, 18, 20, 21.
- Surface water, general: Grover, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28; N. J. S. W. P. C., 5; Parker, G. L., 1, 2, 3; Paulsen, 1.
- Stream gauging and gauging stations: Grover, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28; Hartwell, 2; Parker, G. L., 1, 2, 3; Paulsen, 1.
- Wind work, storms (hurricane and tornado): Cook, 84.
- Ogdensburg mine. See Sterling Hill mine.
- Oil. See Economic geology: materials.
- Orange Mountains. See Watchung Mountains.
- Ordovician Period.
- Economic geology.
- Materials.
- Cement: Eckel, 3; Hamilton, S. H., 2; Kummel, 15.
- Clay: Ries, 5.
- Mineral wool: Van Voorhis, 1.
- Stone: Hawes, 2; Lewis, 10.
- Paleontology.
- General: Kummel, 13.
- Animals.
- Coelenterata*: Weller, 4.
- "*Vermes*": Weller, 4.
- Bryozoa*: Weller, 4.
- Brachiopoda*: Weller, 4.
- Mollusca*: Weller, 4.
- Arthropoda*: Raymond, 1; Weller, 4.
- Petrology.
- Metamorphic rocks, slates: Kummel, 15.
- Sedimentary rocks, rock types, limestone: Kummel, 15.
- Stratigraphy: Bayley, 4; Cook, 17; Darton, 14; Eckel, 1, 2; Foerste, 1; Johnson, 11; Kummel, 13, 19, 26, 50, 63, 73; Lewis, 11; Ludlum, 1; Mather, 1; Miller, B. L., 1; Peck, 2; Richards, 16; Snell, 2; Spencer, 4; Weller, 3, 4.
- Taconic revolution: Willard, 2, 3.
- Water supply, ground water, wells: Kummel, 54; N. J. S. W. P. C., 5.
- Orogeny: Appleby, 1; Bascom, 5; Davis, 4; Merrill, 5; Peck, 2; Willard, 2, 3.
- Oxford mines. See Warren County; Economic geology: localities.
- Oxides. See Mineralogy: mineral groups.
- Pahaquarry mine. See Warren County; Economic geology: localities.

Paleogeography. See also period in question.

Baker, G. W., 1; Bascom, 2, 3, 5; Bayley, 4; Chaffee, 1; Clark, 3, 10; Cook, 95; Cope, 2; Crosby, 1; Davis, 2, 4, 5, 6; Fenner, 1, 2, 4; Hawkins, 4; Hobbs, 1; Johnson, D. W., 1, 6; Kindle, 1; Kummel, 2, 7, 9, 13, 77, 78; Larison, 1; Lewis, J. V., 2, 7; Lucke, 4; Ludlum, 1; Merrill, 6; Nelson, 2; Rogers, H. D., 2; Russell, 3, 5; Spencer, 4; Stose, 1; Willard, 2.

Paleontology.

Indeterminate remains.

Coprolites: Dekay, 2, 4.

Footprints: Cook, 117; Cope, 7, 22; Eastman, 1; Edwards, 4; Eyerman, 1, 2; Gratacap, 1; Nason, 1; Newberry, 4, 11; Redfield, 5, 6; Woodworth, 1.

Graphite streaks: Britton, 7.

Trails: Abel, 1, 2; Caster, 1.

Plants, general: Baker, 2; Credner, 3;

Berry, 5, 7, 9, 15; Hollick, 7, 10; Lewis, 7; MacClintock, 1; Newberry, 6, 7, 9; Russell, 8; Ward, L. F., 1.

Thallophyta: Berry, E. W., 1, 2, 7, 17; Britton, 7; Boyer, Charles Sumner, 1; Chrysler, 3; Edwards, 1, 2, 3; Kain, 1, 2; Lewis, H. C., 4; MacClintock, 6; Newberry, 13; Woolman, 2, 3, 4, 5, 6, 7, 9, 10, 13, 17, 21.

Bryophyta: Newberry, 13.

Pteridophyta: Berry, 2, 4, 8, 9, 10, 17, 19; Conrad, 14; Newberry, 12, 13.

Spermatophyta: Bailey, I. W., 1; Berry, E. W., 1, 2, 3, 4, 6, 8, 9, 10, 11, 12, 13, 14, 16, 17, 18, 19; Britton, 2; Chrysler, 1, 2; Conrad, 14; Holden, 1, 2; Hollick, 1, 4, 5, 6, 8, 10; Jeffrey, 1; Lutz, 1; Newberry, 2, 8, 9, 10, 12, 13; Potzger, 1; Stevens, 1; Taylor, 1; Woolman, 14, 15.

Animals, general: Clark, 3, 10; Conrad, 10;

14; Cook, 117; Cooke, 1; Credner, 3; Heilprin, 1; Kindle, 1; Lewis, 7; Kummel, 13; Lyell, 1; MacClintock, 1; Mawby, 1; Merrill, F. J. H., 1; Miller, R. L., 1; Morton, 7; Prather, 1; Richards, 5, 12; Rogers, H. D., 2; Russell, 8; Weller, 2, 4, 5, 8, 9; Whitfield, 4; Willard, 4; Woolman, 20, 21.

Protozoa: Bagg, 1, 2; Bailey, J. W., 1; Conrad, 10; Cushman, 1; Jennings, 1; Lea, 1; Lyell, 1; Pourtales, 1; Reuss, 1; Toulmin, 1; Weller, 4, 9; Woodward, A., 1, 2.

Porifera: Conrad, 10; Fenton, 1; Shimer, 1; Weller, 4.

Coelenterata: Barrett, 1, 2; Conrad, 10; Gabb, 1; Howell, B. F., 1; Lonsdale, 1; Richards, 6, 14; Vaughan, 1; Weller, 4, 9.

"Vermetes": Conrad, 10; Foerste, 1; Gabb, 1; Howell, B. F., 2; Morton, 5, 7; Weller, 4, 9.

Bryozoa: Canu, 1; Conrad, 10; Gabb, 1, 4, 8; Greacen, 1; Gregory, 1; Richards, 14; Weller, 4, 9.

Brachiopoda: Barrett, 1; Clark, 3, 8; Conrad, 10; Forbes, 1; Howell, B. F., 1; Morton, 5, 7; Richards, 14; Say, 1; Weller, 4, 5, 9; Whitfield, 1, 2, 7.

Mollusca: Baker, F. C., 1, 2; Browne, 1; Clark, 3; Conrad, 2, 3, 4, 5, 6, 7, 8, 9.

Paleontology—Continued.

Animals—Continued.

Mollusca—Continued.

10, 11, 12, 13, 14, 15; Cope, 4; Forbes, 1; Gabb, 1, 2, 5, 6, 9, 10; Heilprin, 3, 4; Hollick, 4, 8; Howell, B. F., 1; Johnson, C. W., 1; Lea, 1, 2, 3, 4; Leidy, 1; Miller, A. K., 1; Morton, S. G., 1, 3, 4, 5, 7, 8, 11; Pilsbry, 2, 4, 6; Prather, 1; Richards, 2, 11, 12, 13, 14, 15; Roemer, 1; Rowland, 1; Say, 1; Stephenson, 1, 2, 4; Tucker, 1; Weller, 1, 4, 5, 6, 9; Whitfield, 1, 2, 3, 5, 6, 7, 9; Woolman, 1, 4, 7, 8, 9, 11, 15; Anonymous, 30.

Arthropoda: Barrett, 1; Conrad, 14; Foerste, 1; Gabb, 11; Hitchcock, C. H., 1; Howell, B. F., 1; Jennings, 1; Morton, 5; Pilsbry, 3, 5; Rathbun, 1; Raymond, 1; Richard, 14; Van Ingen, 1; Van Rensselaer, 1; Weller, 1, 4, 6, 9; Whitfield, 7.

Echinodermata: Berry, C. T., 1; Clark, 3; Conrad, 1, 10; Gabb, 11; Morton, 5, 7, 8; Richards, 14; Weller, 4, 9; Woolman, 7.

Chordata, general: Cope, 10, 25; Woolman, 1.

Pisces: Conrad, 10; Cope, 11, 15, 18, 19; Credner, 3; Eastman, 1, 2; Fowler, H. W., 1; Gale, 1; Gratacap, 1; Leidy, 6, 7, 8; Marsh, 6; Morton, 7; Newberry, 4, 5, 11, 12; Redfield, 3, 4, 5, 6, 9, 10; Shainin, 1.

Reptilia: Agassiz, 1; Conrad, 14; Cope, 1, 2, 3, 5, 6, 7, 8, 10, 12, 14, 16, 17, 20, 21, 22, 23, 24, 26, 27; Dekay, 3, 4; Edwards, 4; Foulke, 1; Gilmore, 1; Harlan, 1, 2; Hays, 1; Huene, 1; Leidy, 2, 3, 4, 8, 9, 10, 11, 13; Marsh, 1, 2, 3, 7, 9; Mook, 1; Morton, 5, 7, 9, 10, 11; Owen, 1; Rapp, 1; Russell, L. S., 1; Troxell, 1, 2; Whitfield, 8; Wieland, 1, 2, 3; Woolman, 12.

Aves: Cope, 22; Marsh, 4, 5, 10, 11; Wetmore, 1.

Mammalia: Baker, 2; Conrad, 14; Cook, 99; Cope, 9, 13, 18, 20, 26; Dekay, 1; Hallowell, 1; Jackson, J. B. S., 1; Leidy, 3, 8, 12; Lockwood, 1; Marsh, 4, 7, 8; Maxwell, 1; Mitchell, 2; Morton, 6; Scott, 1, 2, 3; Stewart, 1; Van Rensselaer, 2; Wood, 1; Woolman, 15.

Paleozoic, stratigraphy, general: Van Ingen, 1.

Palisades. See also *Petrology*: igneous rocks, intrusive, diabase; Structural geology, sheets and sills; Triassic Period; Triassic Lowland.

General: Akerly, 1; Butler, 1, 2; Gordon, T. F., 1.

Mineralogy.

Mineral groups, general: Cozzens, 1.

Silicates: Hess, 1.

Petrology.

Igneous rocks, intrusive, diabase: Dana, 4; Hoppeck, 1; Irving, 1, 2; Lewis, 3; Newberry, 1; Sosman, 1; Walker, 1, 2; Wurtz, 4.

Metamorphic rocks, hornfels: Darton, 4; Irving, 2.

Palisades—Continued.

Petrology—Continued.

Sedimentary rocks.

Rock types.

- Sandstone: Dana, 3; Newberry, 1; Sosman, 1; Wurtz, 4, 5.
- Shales: Sosman, 1.

Stratigraphy, Triassic: Cozzens, 1.

Structural geology.

- Local structures, sheets and sills: Irving, 2; Julien, 2; Kummel, 14; Walker, 1, 2.

Passaic Basin. See Conservation and development: reclamation of land.

Passaic County.

Climate and weather, tables: Smock, 6.

Conservation and development.

Forestry: Cook, 118.

Reclamation of land.

- Hackensack Meadows: Vermeule, 19.
- Passaic Basin: Cook, 21, 26, 30, 40, 47, 63, 99, 109, 117, 126, 133, 139; Hamilton, W. I., 2; Howell, G. W., 1, 2, 3; Vermeule, 12.

Economic geology.

Economic history: Ricord, 1; Anonymous, 9.

Localities.

- Mines, general: Bayley, 3; Cook, 35, 42, 68, 78, 102, 129; Day, 2; Nason, 7; Sanford, 2; Schrader, 1; Williams, A., 1; Woodward, H. P., 1.

- Ringwood: Bayley, 3; Cook, 17, 35, 68, 78, 102, 111, 129; Hamilton, S. H., 3; Hermelin, 1; Jenkins, 1, 2, 7; Kitchell, 4, 6; Kummel, 12, 18, 21, 30; Nason, 7, 14; Putnam, B. T., 1; Ridgway, 1; Rogers, H. D., 1, 2; Smock, 1, 15; Tuttle, 1.

- Quarries: Cook, 31, 36, 71, 88; Fenner, 1; Hawes, 2; Johnson, M. E., 1; Kummel, 7; Lewis, 10; McCourt, 3; Parker, 10; Sachs, 2; Sanford, 2; Schrader, 1; Smock, 19.

Materials, general: Day, 2; Sanford, 2; Schrader, 1; Twitchell, 2; Williams, A., 1.

- Clay: Cook, 41, 64; Jenkins, 3, 5; Johnson, M. E., 1; Kummel, 26; Ries, 2; Smock, 19.

- Copper: Kummel, 10; Woodward, H. P., 1.

- Graphite: Cook, 99, 121; Nason, 2.

- Iron: Bayley, 3; Boyer, Charles Shimer, 1; Buffet, 1; Cook, 29, 35, 37, 42, 68, 78, 79, 102, 111, 129; Hamilton, S. H., 3; Hermelin, 1; Jenkins, 1, 2, 7; Kitchell, 5, 6; Kummel, 18, 21, 43, 60; Nason, 7, 14; Putnam, B. T., 1; Raun, 1; Ridgway, 1; Rogers, H. D., 1, 2; Smock, 1, 15, 19; Tuttle, 1; Twitchell, 1, 2, 6, 7, 8, 9, 10, 12; Anonymous, 4.

- Peat: McCourt, 1; Parmelee, 2; Soper, 1.
- Sand and gravel: Johnson, M. E., 3, 8; Kummel, 31; Lewis, J. V., 6.

- Stone: Cook, 31, 36, 71, 88; Hawes, 2; Kummel, 7, 60; Lewis, 10; McCourt, 3; Smock, 19; Twitchell, 1.

Engineering geology.

Aqueducts: Moore, 3.

Channels: Hamilton, W. I., 2; Vermeule, 32.

Passaic County—Continued.

Engineering geology—Continued.

- Reservoirs and dams: Cook, 53, 63, 126, 139; Croes, 1; Hamilton, W. I., 2; Hazen, 1; Moore, 3; Vermeule, 20, 21, 24, 26, 33.

Tunnels: Moore, 3.

- Floods and flood control, Passaic watershed: Hamilton, W. I., 2; Vermeule, 5, 7, 8, 11, 20, 21, 24, 26, 32, 33.

Geodesy.

- Bench marks: Cook, 136; Plummer, 1; Vermeule, 15, 29, 30; Anonymous, 22, 24.
- Boundaries: Cook, 44; N. J. B., 3.
- Surveying: Bowser, 5; Cook, 44, 127; N. J. B., 3; Vermeule, 16; Viele, 3; Anonymous, 23.

Geophysics, magnetism and magnetic surveys: Cook, 37; Locke, 1; Vermeule, 2, 15.

Glacial geology.

Depositional features: Kummel, 75.

Glacial lakes, ponds, and rivers, general: Salisbury, 10.

- Lake Passaic: Darton, 14; Kummel, 1, 75, 78; Nelson, 2; Salisbury, 3, 6, 8.

Mineralogy.

- Mineral groups, general: Canfield, 1; Casperson, 2; Ehrman, 1; Hunt, J. H., 1, 2; Morton, J. F., 1; Robinson, I.; Sachs, 2; Sanford, 2; Schrader, 1; Seymour, 1; Valiant, 1; Zodac, 1.

- Carbonates: Diegnan, 3; Hoadley, 2; Whitlock, 1, 4, 5.

- Oxides: Casperson, 1; Fonda, 1; Grenzig, J. A., 1; Schaller, 3.

- Silicates: Allen, 1; Bates, 1; Brown, 1; Cook, C. W., 1; Fenner, 5, 6, 8; Glenn, 2; Grenzig, A. J., 1; Manchester, 3; Northup, 3; Peacock, 1; Penfield, 5; Schaller, 1; Troost, 1; Wherry, 1, 3; Anonymous, 9.

- Sulphates: Allen, 1; Fenner, 5; Hawkins, 11; Schaller, 2, 5; Wherry, 1, 5.

- Sulphides: Lewis, 14; Whitlock, 6.

- Zeolites: Benn, 1; Canfield, 3; Diegnan, 1; Drake, 2; Gordon, S. G., 1; Hawkins, 13; Hunt, J. H., 2; Sachs, 1; Schaller, 2.

Mineral localities, general: Canfield, 1; Hawkins, 13; Manchester, 2; Sanford, 2; Schrader, 1; Seymour, 1.

- Great Notch: Brown, 1; Cook, C. W., 1; Fenner, 4, 5, 6; Gordon, S. G., 1; Levison, 2; Manchester, 2; Papke, 1; Rogers, A. F., 2; Sachs, 1, 2; Schaller, 4; Valiant, 3; Whitlock, 4; Wilson, E. H., 1; Zodac, 1.

- Paterson and West Paterson: Allen, 1; Bates, 1; Beck, 3; Benn, 1; Canfield, 1, 3, 4; Casperson, 1, 2; Diegnan, 1; Ehrman, 1; Fenner, 4, 5, 6, 8; Glenn, 2; Gordon, S. G., 1; Gordon, T. F., 1; Grenzig, A. J., 1; Grenzig, J. A., 1; Hawkins, 11, 13; Hoadley, 2; Hunt, J. H., 1, 2; Levison, 2; Lewis, 14; Manchester, 2, 3; Morton, J. F., 1; Northup, 2, 3; Nutall, 1; Papke, 1; Peacock, 1; Penfield, 5; Pierce, 1; Robinson, 1; Rogers, A. F., 2; Schaller, 1, 2, 3, 4, 5, 7; Seymour, 1; Smith, E. S. C., 1; Torrey, J., 1; Valiant, 1, 3; Wherry, 3, 5; Whitlock, 1, 4, 5.

Passaic County—Continued.

- Mineral springs: Peale, 1.
- Paleontology.
- Indeterminate remains, footprints: Newberry, 4; Redfield, 5, 6.
- Plants, *Thallophyta*: Edwards, 2.
- Animals, *Chordata*, *Pisces*: Redfield, 5, 6.
- Reptilia*: Gilmore, 1; Rapp, 1.
- Petrology.
- Igneous rocks, extrusive, basalt: Fenner, 3; Lewis, 13.
- Sedimentary rocks.
- Sedimentary features.
- Geodes: Grenzig, J. A., 1.
- Rain drops and hail prints: Lyell, 2; Redfield, 5, 6, 7.
- Ripple marks: Redfield, 5.
- Varves: Antevs, 1; Reeds, 1.
- Soils, composition: Blair, 1; Jenning, 1.
- Stratigraphy, Trassic: Merrill, 6.
- Streams and surface drainage.
- Drainage history: Barber, 1; Cook, 95; Fenner, 1; Kummel, 1; Nelson, 2.
- Lakes, ponds, swamps: Vermeule, 3, 8, 15.
- Water gaps and wind gaps: Hubbert, 1; Kummel, 1, 75, 78; Merrill, 6; Salisbury, 6, 8.
- Structural geology, minor structures, columnar jointing: Cook, 95; Merrill, 6.
- Techniques: Zodac, 1.
- Water supply.
- Ground water, wells: Cook, 74, 82, 98, 116, 124; Darton, 12, 13; Fuller, 2; Kummel, 27, 54; N. J. S. W. P. C., 5; Peale, 1; Smock, 9; Upson, 1; Woolman, 13, 16, 17, 18, 19, 20.
- Mineral content: Collins, 1; Myers, 2.
- Surface water, general: Collins, 1; Cook, 48, 53, 66, 83, 98, 132; Critchlow, 1; Croes, 1; Grover, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28; Hamilton, W. L., 1, 3; Hartwell, 1; Hazen, 1; Horton, 1, 2; Hoyt, 1; Moore, 3; Newell, 1, 2, 3; N. J. S. W. P. C., 1, 2, 5; Parker, G. L., 1, 2, 3; Paulsen, 1; Vermeule, 7, 24, 26.
- Stream gauging and gauging stations: Critchlow, 1; Grover, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28; Hartwell, 2; Horton, 1, 2; Hoyt, 1; Newell, 1, 2, 3; Parker, G. L., 1, 2, 3; Paulsen, 1; Vermeule, 8.
- Water power: Vermeule, 24.
- Passaic watershed. See Floods and flood control.
- Paterson. See Passaic County: Mineralogy: mineral localities.
- Peat. See Economic geology: materials.
- Peneplanes: Ashley, 2; Bascom, 2, 3, 5; Bayley, 4; Clark, 3; Cole, 1; Crosby, 1; Darton, 14; Davis, 4, 5, 6; Johnson, D. W., 1, 6; Kummel, 7, 77, 78; Merrill, 6; Newhouse, 1; Salisbury, 10, 15; Shaw, 1; Stose, 1, 2, 3; Ver Steeg, 1; Ward, 3.
- Pequest Basin. See Conservation and development: reclamation of land.
- Petrology.
- Igneous rocks.
- Extrusive rocks, basalt: Bascom, 3; Bayley, 4; Darton, 9, 14; Davis, 1, 2; Fenner, 1, 3, 4; Hawkins, 9; Iddings, 1;

Petrology—Continued.

- Igneous rocks—Continued.
- Extrusive rocks—Continued.
- Kummel, 3, 7, 9; Lewis, 9, 12, 13; Russell, I. C., 1, 8; Schweitzer, 3; Weed, 2.
- Intrusive rocks.
- Diabase: Andreae, 1; Bascom, 3; Bayley, 4; Britton, 5; Butler, 1, 2; Dana, 4, 5; Darton, 8, 9, 14; Davis, 2; Hawes, 1; Hoppock, 1; Irving, 1, 2; Kummel, 3, 7, 9; Lewis, 8, 9, 12; Newberry, 1; Sosman, 1; Tomlinson, 1; Walker, 1, 2; Westgate, 3; Wurtz, 4.
- Dike rocks: Arousseau, 1; Bayley, 2, 6; Britton, 3, 5; Cook, 92, 107; Davis, 1; Emerson, 1; Hawkins, 9; Kemp, 1, 2, 3, 5; Lewis, 10; Milton, 1; Nason, 6; Phillips, 1; Ransome, 1; Ries, 8; Russell, 8; Smith, L. L., 1; Spencer, 4; Watson, 1; Westgate, 3; Wolff, 5, 12.
- Nepheline syenite: Arousseau, 1; Bascom, 3; Emerson, 3; Kemp, 2; Lewis, 10; Ransome, 1; Spencer, 4.
- Trap (unclassified): Levison, 2; Nason, 1.
- Metamorphic rocks.
- Gneiss: Bayley, 2, 3, 4, 6; Britton, 3, 5; Cook, 100, 107; Darton, 14; Fenner, 7; Hinds, 1; Lewis, 10; Nason, 2; Ries, 8; Smith, L. L., 1; Spencer, 4; Westgate, 3; Wolff, 2, 5.
- Hornfels: Andreae, 1; Darton, 4; Irving, 2; Kummel, 3, 7, 9; Lewis, 9.
- Marble (crystalline limestone): Bayley, 2, 4, 6; Britton, 3, 5; Cook, 100; Darton, 14; Kummel, 33; Lewis, 10; Nason, 2, 11; Ries, 3; Spencer, 4; Westgate, 1, 2, 3; Wolff, 5.
- Schist: Bayley, 6; Britton, 3, 5.
- Serpentine: Britton, 3; Julien, 1; Lewis, 10; Merrill, G. P., 1, 2; Newland, 1; Nuttall, 2; Peck, 1, 2.
- Slate: Kummel, 3, 15; Lewis, 10.
- Quartzite: Ludlum, 1; Wolff, 5.
- Sedimentary rocks.
- Rock types, general: Bayley, 5; Raymond, 2; Russell, 6, 8.
- Argillite: Hawkins, 4; Kummel, 3, 7; Lewis, 10.
- Clay: Cook, 64; Hawkins, 14; Prather, 1; Ries, 4; Salisbury, 6, 13; Smock, 3; Storm, 1.
- Conglomerates: Fenner, 1; Kummel, 3, 7, 9; Miller, R. L., 1; Nason, 1, 3; Schuchert, 1; Spencer, 4.
- Gravel: Campbell, 1; Lucke, 4, 6; Newberry, 3; Salisbury, 7, 9, 10, 13, 29; Volk, 1; Wright, 6.
- Greensand marl: Ashley, 1; Clark, 3; Cook, 128; Haldeman, 1; Mansfield, 3, 5; Prather, 1; Rogers, H. D., 2.
- Limestone: Kummel, 15; Lewis, 10; Miller, R. L., 1; Nason, 11; Rogers, H. D., 2; Wolff, 5.
- Sand: Barksdale, 5; Colony, 1; Kummel, 21, 23; Lucke, 1; Prather, 1; Salisbury, 7, 9, 10, 13, 29.
- Sandstone: Dana, 3; Darton, 3; Davis, 2; Fenner, 1; Finch, 2; Kummel, 3, 7, 9; Lewis, 9, 10; Nason, 1; Newberry, 1; Schweitzer, 1, 2, 3; Sosman, 1; Wurtz, 4, 5.

Petrology—Continued.

Sedimentary rocks—Continued.

Rock types—Continued.

Shale: Fenner, 1; Kummel, 3, 7, 9; Nason, 1; Schuchert, 1; Schweitzer, 3; Sosman, 1.

Till: MacClintock, 3, 4; Salisbury, 2, 3, 4, 6, 7, 10, 22, 23, 24, 25; Ward, 3.

White marl: Cook, 56.

Sedimentary features

Concretions: Willcox, 1.

Geodes: Grenzig, J. A., 1; Manley, 1.

Mud cracks: Hawkins, 4.

Rain drops and hail prints: Gratacap, 1; Lewis, H. C., 4; Lyell, 2; Redfield, 4, 5, 6, 7; Russell, 3.

Ripple marks: Gratacap, 1; Redfield, 5; Russell, 3.

Varves: Antevs, 1; Reeds, 1, 2, 3, 4, 5; Anonymous, 18.

Phillipsburg. See Warren County; Mineralogy: mineral localities.

Phosphates. See Mineralogy: mineral groups. Physical geography. See also counties.

General: Davis, 3; F. W. P., 1; Gordon, T. F., 1; Kummel, 34; Morse, 1, 2; Salisbury, 7; Viele, 2; Ward, 3; Winterbotham, 1.

Major provinces.

Appalachian region: Bascom, 5; Bayley, 4; Cole, 1; Cook, 17; Cummins, 1; Davis, 6; Johnson, D. W., 4, 6; Kitchell, 2; Kummel, 78; Larison, 1; Lewis, 11; Lobeck, 1; McGee, 1; Messler, 1; Mitchell, 3; Nason, 8; Peck, 2; Rogers, H. D., 2; Salisbury, 10, 15, 23; Schöpf, 1; Smock, 4; Snell, 2; Stose, 1; Vermeule, 3, 11; Wolff, 5; Wright, A. A., 2.

Coastal Plain: Bascom, 2, 3; Bayley, 4; Clark, 3, 10; Coman, 2; Cook, 2, 4, 17, 64; Davis, 4, 6; Darton, 14; Johnson, D. W., 6; Kummel, 77, 78; Lewis, 11; MacClintock, 8; McGee, 1; Nelson, 3; Rogers, H. D., 2; Salisbury, 3, 9, 10, 15, 29; Schöpf, 1; Shattuck, 2; Smock, 4; Vermeule, 3.

New Jersey Highlands: Bayley, 4, 6; Cook, 100, 108; Davis, 4, 6; Darton, 14; Kitchell, 4; Nason, 2; Pierce, 2; Salisbury, 24; Spencer, 4; Vermeule, 3.

Triassic Lowland: Bascom, 3; Bayley, 4; Cook, 17, 140; Davis, 4, 5, 6; Darton, 14; Hayes, A. O., 1; Johnson, D. W., 4, 6; Kummel, 3, 7, 78; Lewis, 11; Lobeck, 1; Merrill, 6; Messler, 1; Moldenke, 1; Nason, 1; Pierce, 1; Rogers, H. D., 2; Salisbury, 2, 3, 4, 8, 10, 15, 25; Smock, 4; Vermeule, 3, 11; Westervelt, 1; Wickes, 1.

Plainfield. See Union County; Mineralogy: mineral localities.

Potash. See Economic geology: materials.

Pre-Cambrian Period.

Economic geology.

Localities, mines, general: Woodward, H. P., 1.

Franklin Furnace: Alger, 1; Darton, 5; Fitch, 1; Groth, 1; Haight, 1; Nason, 13; Palache, 17; Rastall, 1; Ries, 8; Spurr, 1; Stevens, 1; Wetherill, 1; Wolff, 13; Anonymous, 7, 8.

Ringwood: Nason, 14.

Pre-Cambrian Period—Continued.

Economic geology—Continued.

Localities—Continued.

Sterling Hill: Alger, 1; Darton, 5; Fitch, 1; Groth, 1; Haight, 1; Palache, 17; Ries, 8; Salton, 1; Spurr, 1; Stevens, 1; Wetherill, 1; Wolff, 13; Anonymous, 7.

Materials.

Cement: Eckel, 3.

Copper: Woodward, H. P., 1.

Graphite: Nason, 2.

Iron: Baker, G. W., 1; Bayley, 2, 3; Blake, 2; Cook, 37, 45, 100; Credner, 2; Darton, 14; Emmons, S. F., 1; Fowler, 3; Kemp, 4; Kummel, 43; Leith, 1; Merritt, 1; Nason, 2, 7, 13, 14; Ridgway, 1; Singewald, 1; Smith, L. L., 1; Smock, 1, 2; Spencer, A. C., 1, 5; Stevens, 1; Tarr, R. S., 1; Anonymous, 4, 7, 8.

Mineral wool: Van Voorhis, 1.

Stone: Hawes, 2; Kummel, 33; Lewis, 10; Nason, 2; Wolff, 6.

Zinc: Alger, 1; Baker, G. W., 1; Blake, 2, 3; Credner, 2; Darton, 5; Emmons, S. F., 1; Fitch, 1; Fowler, 3; Groth, 1; Haight, 1; Jackson, 4; Kemp, 4, 7; Kerr, 1; Leith, 1; Nason, 13; Palache, 14, 17; Rastall, 1; Ries, 8; Salton, 1; Spencer, 6; Spurr, 1; Tarr, W. A., 1; Weeks, 1; Wetherill, 1; Whitney, J. D., 1; Wolff, 13; Anonymous, 7, 8.

Geodesy, surveying: Cook, 133; Wolff, 3.

Geophysics.

Gravitational measurements and stations: Woollard, 7.

Magnetism and magnetic surveys: Nason, 21; Wilkens, 1; Woollard, 7.

Seismic explorations: Ewing, 2.

Mineralogy.

Mineral groups, general: Bauer, 6; Britton, 3; Chester, 3; Nutall, 1; Palache, 17; Westgate, 2.

Arsenides: Bauer, 2; Buerger, 1.

Borates: Bauer, 5; Berman, 2.

Carbonates: Bauer, 4.

Oxides: Alger, 1; Berman, 1; Bruce, 1; Cook, 100; Van Horn, 1.

Silicates: Bauer, 1, 3, 7, 8; Blix, 1; Chester, 1, 2; Conrad, 1; Nason, 4; Tyler, S. A., 1.

Sulphates: Bauer, 5.

Mineral localities.

Franklin Furnace: Alger, 1; Bauer, 1, 2, 3, 4, 6, 7, 8; Blix, 1; Bruce, 1; Buerger, 1; Chester, 1, 2, 3; Cornwall, 1, 2; Ford, 2, 4; Fosbarg, 1, 2, 3, 4, 5, 6; Fowler, S., 1, 2; Frondel, 1; Gage, 1; Genth, 1; Gibbs, 1; Gordon, 3, 4, 5, 6, 7; Grosser, 1; Gruner, 1; Haff, 1; Harcourt, 1; Palache, 17; Schaller, 6; Van Horn, 1.

Sterling Hill: Alger, 1; Bauer, 5; Cornwall, 2; Fowler, S., 1, 2; Palache, 17; Tarr, W. A., 1.

Paleontology.

Plants, *Thallophyta*: Berry, 7; Britton, 7.

Petrology.

Igneous rocks, intrusive.

Diabase: Britton, 5.

Dike rocks: Britton, 3, 5; Cook, 107;

Pre-Cambrian Period—Continued.

Petrology—Continued.

Igneous rocks—Continued

Milton, 1; Nason, 6; Westgate, 3; Wolff, 4.

Metamorphic rocks.

Gneiss: Bayley, 3, 4, 6; Britton, 3, 5; Cook, 100, 107; Darton, 14; Fenner, 7; Hinds, 1; Nason, 2; Smith, L. L., 1; Spencer, 4; Westgate, 3; Wolff, 2.
Marble (crystalline limestone): Bayley, 4, 6; Britton, 3, 5; Cook, 100; Darton, 14; Kummel, 33; Nason, 2, 11; Westgate, 2, 3.
Schist: Bayley, 6; Britton, 3, 5.

Sedimentary rocks, rock types, general: Bayley, 5.

Stratigraphy: Bayley, 2, 3, 4, 5, 6; Britton, 3, 5, 6; Cook, 7, 8, 17, 39, 100; Credner, 4; Dana, 7; Darton, 14; Emmons, E., 1; Farrington, 3; Jackson, 3; Johnson, 11; Kemp, 4; Kerr, 1; Kitchell, 4; Kummel, 26, 50, 78; Larison, 1; Lesley, 1; Lewis, 11; Maclure, 1; Mather, 1; Messler, 1; Nason, 2, 3, 9, 10, 12; Peck, 1, 2; Ries, 3; Russell, 5; Shepard, 1; Snell, 2; Spencer, A. C., 2, 3, 4; Van Hise, 1, 2; Vanuxem, 4; Westgate, 1, 3; Williams, H. S., 1; Wolff, 5, 8.

Structural geology.

Local structures.

Dikes: Milton, 1; Nason, 3.
Faults: Britton, 5; Farrington, 1; Nason, 2, 3.
Folds: Britton, 5; Wolff, 1.

Water supply, wells: Cook, 124; Kummel, 54. Princeton. See Mercer County; Mineralogy: mineral localities.

Pyrite. See Economic geology: materials.

Quartzite. See Petrology: metamorphic rocks. Quaternary.

Climate and weather, glacial climate: MacClintock, 1.

Economic geology.

Materials.

Clay: Cook, 77; Day, 5; Johnson, M. E., 5; Ries, 1, 2, 4, 5, 6; Smock, 3.
Peat: McCourt, 1; Kummel, 41; Soper, 1.
Sand and gravel: Kummel, 31.
White marl: Cook, 56.

Forest succession: Potzger, 1.

Geophysics, seismic explorations: Ewing, 1.

Glacial geology, general: Antevs, 1; Davis, 4; Hawkins, 2; Kummel, 75; MacClintock, 5; Reeds, 5; Salisbury, 22, 23, 24; Spencer, 4.

Climatic evidence of: MacClintock, 1, 2, 5; Reeds, 1, 2, 4; Richards, 1, 3, 5; Taylor, 1; Anonymous, 18.

Depositional features: Antevs, 1; Belt, 1; Britton, 4; Campbell, 1; Cook, 57, 61, 70, 81, 110; Culver, 1; Darton, 14; Fuller, 3; Johnson, 11; Kummel, 1, 50; Leverett, 1; MacClintock, 1, 2; Merrill, 6; Reeds, 1, 2, 4; Russell, 5; Salisbury, 1, 2, 3, 5, 6, 7, 8, 10; Smock, 5; Snell, 2; Upham, 1; Ward, F., 1, 2, 3; Winchell, 1; Wright, A. A., 1, 2; Wright, G. F., 2, 3.

Erosional features: Belt, 1; Cook, 57, 61, 70, 81; Darton, 14; Dwight, 1; Jackson,

Quaternary—Continued.

Glacial geology—Continued.

Erosional features—Continued.

2; Kummel, 1; Salisbury, 1, 2, 3, 6, 7, 10; Ward, 2, 3; Wright, A. A., 2.

Glacial lakes, ponds, and rivers, general: Cook, 81; Merrill, 6; Salisbury, 3, 25, 28.

Lake Hackensack: Reeds, 3.

Lake Passaic: Cook, 81; Darton, 14; Kummel, 1; Nelson, 2; Salisbury, 3, 6, 8.

Mineralogy.

Mineral groups.

Silicates: Clark, 3.

Sulphates: Hawkins, 11.

Orogeny: Merrill, 5.

Paleontology.

Plants, general: Baker, 2; Hollick, 9, 10.

Thallophyta: Edwards, 1; MacClintock, 6.

Pteridophyta: Berry, 18.

Spermatophyta: Berry, 11, 14, 19;

Britton, 2; Hollick, 5, 6; Potzger, 1;

Taylor, 1; Woolman, 14, 15.

Animals, general: Merrill, F. J. H., 1; Richards, 5.

Coelenterata: Richards, 6.

Mollusca: Baker, F. C., 1, 2; Conrad,

14; Cope, 4; Leidy, 1; Richards, 2,

11; Woolman, 15.

Chordata, Aves: Marsh, 4.

Mammalia: Baker, 2; Conrad, 14;

Cope, 9, 20; Dekay, 1; Lockwood,

1; Maxwell, 1; Scott, 1, 2, 3; Stew-

art, 1; Van Rensselaer, 2; Wool-

man, 15.

Petrology.

Sedimentary rocks.

Rock types.

Gravel: Campbell, 1; Lucke, 6; Salisbury, 7, 9, 10, 29.

Greensand marl: Clark, 3.

Sand: Salisbury, 7, 9, 10, 29.

Till: MacClintock, 3, 4; Salisbury, 2, 3, 7, 10; Ward, 3.

Sedimentary features, varves: Antevs, 1; Reeds, 1, 2, 3, 4; Anonymous, 18.

Shoreline features.

Beaches: Haupt, 3; Wheeler, 1.

Erosional and depositional: Cook, 81, 96;

Flint, 1; Haupt, 2, 3; Hitchcock, 1;

Johnson, D. W., 1; Kummel, 1; Lucke,

1, 3; MacClintock, 2, 5.

Marshes: Cook, 84; Wheeler, 1.

Recent shoreline oscillations: Antevs, 2;

Cook, 5, 84, 112; Flint, 1; Fuller, 3;

Johnson, D. W., 1; Kummel, 76; Lind-

enkohl, 2; Lucke, 1, 2; MacClintock, 1;

Merrill, F. J. H., 1; Richards, 4, 5;

Salisbury, 4, 29.

Submarine canyons: Dana, 6; Linden-

kohl, 1; Spencer, J. W. W., 1, 2.

Terraces (marine): Antevs, 2; Flint, 1, 2;

Fuller, 3; Merrill, 5; Richards, 9.

Soils, composition: Salisbury, 18, 19; Wherry, 6.

Stratigraphy: Baker, 2; Bascom, 2, 3, 4;

Bayley, 4; Berry, 19; Campbell, 1; Clark,

13; Clayton, 1; Conrad, 14; Cook, 4, 17,

64, 81, 110; Cope, 22; Darton, 14; Hollick,

2; Flint, 1; Fluhr, 1; Fuller, 3; Kummel,

26, 50, 78; Larison, 1; Lewis, 11; Mac-

- Quaternary--Continued.
- Stratigraphy--Continued.
- Clintock, 2, 4, 6; McGee, 1; Merrill, F. J. H., 1, 4; Pilsbry, 1; Reeds, 4; Richards, 17; Salisbury, 2, 3, 7, 10, 11, 13, 17, 21, 29; Shattuck, 2; Vanuxem, 7; Wood, 2; Woolman, 15.
- Streams and surface drainage.
- Deposition: Flint, 1.
- Drainage history: Dana, 6; Kummel, 1; Lindenkohl, 1.
- Water gaps and wind gaps: Kummel, 1.
- Structural geology, regional features, Coastal Plain: Hollick, 3.
- Trenton gravels: Abbott, 1, 2, 3, 6; Belt, 1; Coman, 1; Cook, 61; Haynes, 1; Holmes, 1; Kummel, 6; Lewis, H. C., 1, 2, 6; Martin, 1; Mercer, 1; Putnam, F. W., 1; Richards, 10; Salisbury, 2, 3, 12, 14, 29; Shaler, 1; Volk, 1; Wilson, T., 1; Woodman, 3; Woodworth, 2; Wright, G. F., 1, 2, 4, 5, 6.
- Water supply.
- Artificial recharge: Barksdale, 11.
- Ground water, general: Barksdale, 4; Thompson, 5; Twitchell, 11.
- Wells: Critchow, 3; Kummel, 27, 54; N. J. S. W. P. C., 5; Woolman, 7, 10, 13, 18, 19, 20, 21.
- Weathering: MacClintock, 3, 4.
- Wind work, deposition: Knapp, 1; Kummel, 6; Salisbury, 14.
- Radioactivity: Keevil, 1.
- Rain drops. See Petrology: sedimentary features.
- Raritan watershed. See floods and flood control.
- Reservoirs. See Engineering geology.
- Ringwood mine. See Passaic County; Economic geology: localities.
- Ripple marks. See Petrology: sedimentary features.
- Rivers (revolutionary history). See Shoreline features: submarine canyons; Streams and surface drainage: drainage history; Glacial geology.
- Rocky Hill mine. See Somerset County; Economic geology: localities.
- Salem County.
- Climate and weather.
- Precipitation: Smock, 4.
- Tables: Smock, 6.
- Conservation and development.
- Forestry: Cook, 113.
- Reclamation of land, Salem Marshes: Cook, 15, 21; Vermeule, 8.
- Economic geology.
- Materials, general: Sanford, 2; Schrader, 1; Twitchell, 2.
- Clay: Jenkins, 3, 5; Johnson, M. E., 1; Kummel, 26; Ries, 2, 5, 6.
- Greensand marl: Clark, 10; Cook, G. H., 1, 3, 73, 80, 128; Mansfield, 4, 5; Smock, 19; Thoenen, 1.
- Lime: Smock, 19.
- Potash: Mansfield, 4, 5; Thoenen, 1.
- Sand and gravel: Cook, 59; Johnson, M. E., 3; Kummel, 31; Salisbury, 10, 13.
- Geodesy.
- Bench marks: Cook, 127, 136; Plummer, 1; Vermeule, 15; Anonymous, 26, 29.
- Salem County--Continued.
- Geodesy--Continued.
- Surveying: Bowser, 5; Cook, 127; Vermeule, 15; Viele, 2; Anonymous, 23, 29.
- Geophysics.
- Gravitational measurements and stations: Ewing, 2.
- Magnetism and magnetic surveys: Vermeule, 2, 15.
- Seismic explorations: Ewing, 2.
- Mineralogy.
- Mineral groups, general: Canfield, 1.
- Silicates: Schneider, 1.
- Mineral localities, general: Valiant, 3.
- Paleontology.
- Animals.
- Protozoa: Bagg, 1, 2.
- Bryozoa: Greacen, 1.
- Mollusca: Richards, 14.
- Chordata, Pisces: Fowler, H. W., 1.
- Reptilia: Cope, 22; Leidy, 9; Rapp, 1.
- Petrology.
- Sedimentary rocks, rock types, gravel: Campbell, 1.
- Soils.
- Composition: Blair, 3, 5; Bonsteel, 1, 2; Cook, 62, 72; Engle, 1; Patrick, 1.
- Soil and forestry: Coman, 2.
- Stratigraphy.
- Cretaceous: Salisbury, 17.
- Tertiary: Salisbury, 17.
- Quaternary: Bascom, 2, 4; Campbell, 1; Miller, B. L., 1; Salisbury, 11, 13, 17.
- Streams and surface drainage, lakes, ponds, swamps: Vermeule, 3, 8, 15.
- Water supply.
- Ground water, wells: Barksdale, 10; Bascom, 1; Cook, 98; Darton, 11, 12, 13; Fuller, 2; Kummel, 54; N. J. S. W. P. C., 5; Smock, 12; Woolman, 6, 7, 9, 13, 16, 18, 19, 20, 21.
- Surface water, general: Cook, 98; Grover, 21, 22, 23, 24, 25, 26, 27, 28; N. J. S. W. P. C., 5; Parker, G. L., 1, 2, 3; Paulsen, 1.
- Stream gauging and gauging stations: Grover, 21, 22, 23, 24, 25, 26, 27, 28; Hartwell, 2; Parker, G. L., 1, 2, 3; Paulsen, 1.
- Water power: Bascom, 1.
- Water fluctuations: Barksdale, 10.
- Salem Marshes. See Conservation and development: reclamation of land.
- Sand. See Economic geology: materials; Petrology: sedimentary rocks.
- Sand dunes. See Wind work: deposition.
- Sandstone. See Economic geology: stone; Petrology: sedimentary rocks.
- Sandy Hook. See also Monmouth County; Shoreline features: erosional and depositional.
- Akerly, 1; Bache, 2; Cook, 7; Merrill, F. J. H., 1.
- Schist. See Petrology: metamorphic rocks.
- Schuyler mine. See Bergen County; Economic geology: localities; Mineralogy: mineral localities; Triassic Period.
- Scrub Oak mine. See Morris County; Economic geology: localities.
- Second River mine. See Schuyler mine.
- Seismic explorations. See Geophysics.
- Seismology. See Geophysics.

- Serpentine.** See Economic geology: materials; Petrology: metamorphic rocks; Stratigraphy.
- Shale.** See Petrology: sedimentary rocks.
- Shark River Inlet.** See Monmouth County; Engineering geology: inlets; Shoreline features: erosional and depositional.
- Shoreline features.** See also Paleogeography. General: Chaffee, 1; Cook, 90; Nelson, 8; Salisbury, 6.
- Beaches:** Cook, 4, 7, 17, 23; Haupt, 3; Merrill, F. J. H., 1; N. J. C. N. B., 1, 2, 3; Salisbury, 17; Wheeler, 1.
- Erosional and depositional:** Cook, 81, 96; Davis, 6; Flint, 1, 2; Haupt, 1, 2, 3, 5; Hayes, A. O., 1; Hitchcock, C. B., 1; Johnson, D. W., 1, 2; Kummel, 1, 49; Lucke, 1, 2, 3; MacClintock, 1, 2, 5, 6; Merrill, F. J. H., 1; N. J. C. N. B., 1, 2, 3; Richards, 1, 7; Salisbury, 9, 15, 29; Vermeule, 27, 28; Wheeler, 1; Woodman, 1, 2.
- Shoreline features—Continued.**
- Marshes:** Cook, 4, 5, 7, 17, 84; Merrill, F. J. H., 1; Salisbury, 17, 18; Vermeule, 3, 14, 15; Waksman, 2; Wheeler, 1.
- Recent shoreline oscillations:** Antevs, 1, 2; Bache, 2; Beesley, 2; Coman, 1; Cook, 3, 4, 5, 7, 84, 112; Flint, 1; Fuller, 3; Hollick, 9, 10; Johnson, D. W., 1, 3; Kummel, 76, 77; Lindenkohl, 2; Lucke, 1, 2; MacClintock, 1; Merrill, F. J. H., 1; Richards, 4, 5, 7; Russell, 5; Salisbury, 3, 4, 10, 13, 15, 19, 21, 29; Shattuck, 2; Woodman, 2.
- Submarine canyons:** Akerly, 1; Antevs, 1; Dana, 6; Johnson, D. W., 1; Kummel, 77; Lindenkohl, 1, 2; Russell, 5; Spencer, J. W. W., 1, 2; Stose, 3.
- Terraces (marine):** Antevs, 2; Coman, 1; Flint, 1, 2; Fuller, 3; MacClintock, 1; McGee, 1; Merrill, F. J. H., 1, 8; Richards, 9, 17; Salisbury, 9, 22, 29; Shattuck, 2.
- Short Hills.** See Essex County; Mineralogy: mineral localities.
- Silicates.** See Mineralogy: mineral groups.
- Silver.** See Economic geology: materials.
- Silurian Period.**
- Economic geology.**
- Localities, mines, Pahaquarry:** Cummins, 1; Keith, 1; Woodward, H. P., 1.
- Materials.**
- Cement:** Eckel, 3.
- Copper:** Keith, 1; Weed, 4; Woodward, H. P., 1.
- Stone:** Hawes, 2; Lewis, 10.
- Mineralogy, mineral groups, silicates:** Tyler, S. A., 1.
- Paleontology.**
- Animals.**
- Protozoa:** Weller, 4.
- Coelenterata:** Barrett, 1, 2; Weller, 4.
- Bryozoa:** Weller, 4.
- Brachiopoda:** Barrett, 1; Weller, 4.
- Mollusca:** Weller, 4.
- Arthropoda:** Barrett, 1; Weller, 4.
- Stratigraphy:** Barrett, 1; Bayley, 4; Billingsley, 1; Cook, 17, 103; Darton, 10, 14; Foerste, 1; Johnson, 11; Kitchell, 2; Kummel, 19, 26, 50, 78; Larison, 1; Lesley, 1; Lewis, 11; Mather, 1; Merrill, 2, 3; Peck, 2; Prosser, 1; Schuchert, 1; Snell, 2; Spencer, 4; Walcott, 2; Weller, 2, 4; Willard, 1.
- Taconic revolution:** Willard, 2, 3.
- Silver.** See Economic geology: materials; Mineralogy: native elements.
- Sinks.** See Streams and surface drainage: erosion.
- Slate.** See Economic geology: materials; Petrology: metamorphic rocks.
- Snake Hill.** See Mineralogy: mineral localities; Structural geology: local structures, stocks.
- Soils.**
- Composition:** Bascom, 3; Bayley, 4; Blair, 1, 2, 3, 4, 5, 6, 7, 8; Bonsteel, 1, 2; Burke, 1; Coman, 2; Cook, 4, 17, 22, 23, 27, 30, 36, 62, 72, 79, 95; Engle, 1; Jennings, 1, 2; Kummel, 3, 31, 63, 78; Lee, L. L., 1, 2; Lewis, 11; Patrick, 1, 2, 3; Russell, 5; Salisbury, 4, 13, 19, 21; Volk, 1; Westervelt, 1; Wherry, 6; Winterbotham, 1.
- Soil conservation:** Cook, 4; N. J. S. S. C. C. B., 1, 2, 3, 5; Waksman, 1, 2.
- Soil erosion:** N. J. S. S. C. C. B., 2, 3, 4, 5, 6.
- Soil and forestry:** Coman, 2; Cook, 3; Gifford, 1; Hollick, 9, 10; N. J. S. S. C. C. B., 4; Platt, I. H., 1; Vermeule, 11, 16.
- Somerset County.**
- Climate and weather.**
- Precipitation:** Smock, 4.
- Tables:** Smock, 6.
- Economic geology.**
- Localities.**
- Mines, general:** Cook, 35, 42, 68, 78, 102, 111; Nason, 7; Sanford, 2; Schrader, 1; Woodward, H. P., 1.
- American:** Apgood, 1; Bishop, 1; Bond, 1; Cook, 85, 99; Devereux, 1; Gordon, T. F., 1; Hamilton, S. H., 3; Honeyman, 2; Kummel, 7, 10, 12, 18, 48, 51, 53; Lewis, J. V., 1, 4; Piggott, 1; Rogers, H. D., 2; Schaeffer, 1; Torrey, J., 1; Weed, 1, 2, 4; Whitney, J. D., 1; Woodward, H. P., 1.
- Chimney Rock:** Apgood, 1; Barber, 1; Bond, 2; Keith, 1; Lewis, J. V., 1, 4; Messler, 1; Snell, 1; Woodward, H. P., 1.
- Griggstown:** Apgood, 1; Bond, 1; Cook, 17; Hamilton, S. H., 3; Lewis, J. V., 4; Piggott, 1; Rogers, H. D., 1, 2; Weed, 3, 4; Whitney, J. D., 1; Woodward, H. P., 1.
- Rocky Hill:** Lewis, J. D., 1; Winterbotham, 1.
- Quarries:** Cook, 71, 88; Hawes, 2; Johnson, M. E., 1; Kummel, 7; Lewis, 10; McCourt, 3; Parker, 10, 12; Sanford, 2; Schrader, 1; Smock, 19.
- Materials, general:** Sanford, 2; Schrader, 1; Twitchell, 2.
- Clay:** Cook, 64; Jenkins, 3, 5; Johnson, M. E., 1; Ries, 2, 5, 6; Twitchell, 1.
- Copper:** Apgood, 1; Barber, 1; Bishop, 1; Bond, 2; Cook, 42, 85; Devereux, 1; Gordon, T. F., 1; Hamilton, S. H., 3; Honeyman, 2; Keith, 1; Kummel, 7, 10, 12, 18, 51, 53; Lewis, J. V., 1, 4; Messler, 1; Mitchell, 4; Morse, 1; Piggott, 1; Rogers, H. D., 1, 2; Schaeffer, 1; Schöpf, 1; Smock, 19; Snell, 1; Torrey, J., 1; Weed, 1, 2, 3; Whitney, 1.

- Continued.
Continued.
- Copper—Continued.
J. D., 1; Winterbotham, 1; Woodward, H. P., 1.
Iron: Cook, 29, 35, 42, 68, 78, 102, 111; Messler, 1; Nason, 7; Putnam, B. T., 1; Anonymous, 4.
Peat: McCourt, 1; Parmelee, 2; Soper, 1.
Sand and gravel: Lewis, J. V., 6; Smock, 19.
Stone: Cook, 71, 88; Eckel, 1; Hawes, 2; Kummel, 7, 60; Lewia, 10; McCourt, 3; Smock, 19.
- Engineering geology, reservoirs and dams: Hazen, 1; Moore, 3.
Floods and flood control.
Passaic watershed: Hamilton, W. L., 2; Vermeule, 33.
Raritan watershed: Vermeule, 20.
- Geodesy.
Bench marks: Cook, 87, 119, 127, 136; Plummer, 1; Vermeule, 15, 30; Anonymous, 21.
Surveying: Bowser, 5; Cook, 89, 127; Vermeule, 15; Anonymous, 23.
- Geophysics, magnetism and magnetic surveys: Vermeule, 2, 15.
- Glacial geology.
Depositional features: Kummel, 75; Salisbury, 1, 28.
Erosional features: Salisbury, 1.
Glacial lakes, ponds, and rivers, Lake Passaic: Kummel, 1; Salisbury, 8, 9.
- Mineralogy.
Mineral groups, general: Canfield, 1; Hawkins, 1, 6; Robinson, 1; Sanford, 2; Schrader, 1; Seymour, 1; Williams, A., 1.
Native elements: Beck, 2; Devereux, 1; Schaeffer, 1.
Carbonates: Hawkins, 15.
Hydrocarbons: Beck, 2.
Silicates: Bowen, 1; Clarke, 3; Hawkins, 5; Hess, 1; Selfridge, 1; Shannon, 1.
Sulphates: Hawkins, 16.
- Mineral localities, general: Canfield, 1; Manchester, 2; Sanford, 2; Schrader, 1; Seymour, 1; Williams, A., 1.
Bound Brook: Beck, 3; Canfield, 1; Chester, 4; Hawkins, 8; Manchester, 2; Sanford, 2; Schrader, 1; Seymour, 1; Valiant, 3.
North Plainfield: Canfield, 1; Hawkins, 1, 5, 8, 15; Manchester, 2.
Rocky Hill: Canfield, 1; Chester, 4; Clarke, 3; Hess, 1; Manchester, 2; Seymour, 1; Shannon, 1; Valiant, 3.
Somerville: Beck, 2; Bowen, 1; Canfield, 1; Manchester, 2; Robinson, 1; Selfridge, 1; Seymour, 1; Valiant, 3; Weed, 4.
- Petrology.
Igneous rocks.
Extrusive rocks, basalt: Lewis, 13.
Intrusive rocks, dike rocks: Phillips, 1.
Sedimentary rocks.
Rock types, gravel: Campbell, 1; Lucke, 6.
Sedimentary features, geodes: Manley, 1.
- Somerset County—Continued.
Soils, composition: Blair, 4, 6; Burke, 1; Cook, 72; Lee, L. L., 2; Patrick, 2, 3.
Stratigraphy.
Pre-Cambrian: Bayley, 4.
Triassic: Bascom, 3; Bayley, 4; Messler, 1; Salisbury, 17.
Quaternary: Bascom, 3; Campbell, 1; Salisbury, 11.
- Somerset County—Continued.
Streams and surface drainage, drainage history: Kummel, 1.
Structural geology.
Local structures, faults: Hawkins, 17.
Minor structures, columnar jointing: Bond, 2.
Water supply.
Artificial recharge: Barksdale, 11.
Ground water, wells: Cook, 116, 124; Darton, 12, 13; Fuller, 2; Kummel, 27, 54; N. J. S. W. P. C., 5; Smock, 9; Woolman, 16, 17, 18, 19.
Mineral content: Collins, 1; Dole, 1; Myers, 2.
Surface water, general: Barrows, H. K., 1, 2, 3; Collins, 1; Cook, 88; Critchlow, 1; Grover, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28; Hamilton, W. L., 1, 3; Hartwell, 1; Hazen, 1; Horton, 1, 2; Hoyt, 1; Moore, 3; N. J. S. W. P. C., 5; Parker, G. L., 1, 2, 3; Paulsen, 1; Vermeule, 7.
Stream gauging and gauging stations: Barrows, H. K., 1, 2, 3; Critchlow, 1; Grover, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28; Hartwell, 2; Horton, 1, 2; Hoyt, 1; Newell, 3; Parker, G. L., 1, 2, 3; Paulsen, 1.
- Somerville mine. See American mine.
South Amboy. See Middlesex County: Mineralogy: mineral localities.
Sparta. See Sussex County: Mineralogy: mineral localities.
Sterling Hill mine. See Sussex County: Economic geology: localities; Mineralogy: mineral localities; Pre-Cambrian Period.
Stone. See Economic geology: materials.
Stratigraphy.
General: Cook, 7, 9, 11; Cozens, 1; Rogers, H. D., 1, 2; Salisbury, 20; Van Ingen, 1; Wilmarth, 1.
Pre-Cambrian: Bayley, 2, 3, 4, 5, 6; Britton, 3, 5, 6; Cook, 7, 8, 17, 100; Credner, 4; Dana, 7; Darton, 14; Emmons, E., 1; Farrington, 3; Jackson, 3; Johnson, 11; Kemp, 4; Kerr, 1; Kitchell, 4; Kummel, 26, 50, 78; Larison, 1; Lesley, 1; Lewis, 11; MacLure, 1; Mather, 1; Messler, 1; Nason, 2, 8, 9, 10, 12; Peck, 1, 2; Ries, 8; Russell, 5; Shephard, 1; Snell, 2; Spencer, A. C., 2, 3, 4; Van Hise, 1, 2; Varuxem, 4; Westgate, 1, 3; Williams, H. S., 1; Wolf, 5, 8.
Cambrian: Bayley, 4; Cook, 7, 8, 17; Dana, 7; Darton, 10; Emmons, E., 1; Foerste, 1; Johnson, 11; Kummel, 13, 26, 50, 53, 78; Larison, 1; Lewis, 11; Ludlum, 1; Mather, 1; Messler, 1; Miller, R. L., 1; Nason, 8, 9, 10, 12; Peck, 1, 2; Shephard, 1; Snell, 2; Spencer, 4; Van Hise, 1, 2; Vanuxem, 4; Walcott, 1, 2; Weller, 1, 3, 4; Westgate, 3; Williams, H. S., 1; Wolf, 5.

Stratigraphy--Continued.

- Ordovician: Bayley, 1; Cook, 17; Darton, 14; Foerste, 1; Johnson, 11; Kummel, 13, 26, 50, 63, 78; Lewis, 11; Ludlum, 1; Mather, 1; Miller, R. L., 1; Peck, 2; Richards, 16; Snell, 2; Spencer, 4; Weller, 3, 4.
- Silurian: Barrett, 1; Bayley, 4; Billingsley, 1; Cook, 17, 108; Darton, 10, 14; Foerste, 1; Johnson, 11; Kitchell, 2; Kummel, 26, 50, 78; Larison, 1; Lesley, 1; Lewis, 11; Mather, 1; Merrill, F. J. H., 2, 3; Peck, 2; Prosser, 1; Schubert, 1; Snell, 2; Spencer, 4; Walcott, 2; Weller, 2, 4; Willard, 1.
- Devonian: Barrell, 1; Bayley, 4; Cook, 17, 108; Darton, 6, 10; Johnson, 11; Kindle, 1; Kitchell, 2; Kummel, 26, 50, 78; Lewis, 11; Merrill, F. J. H., 2, 3; Prosser, 1; Snell, 2; Spencer, 4; Walcott, 2; Weller, 2, 4.
- Triassic: Akerly, 1; Bascom, 3, 5; Bayley, 4; Cook, 7, 17, 71, 95, 103, 114, 131, 140; Cozzens, 1; Credner, 1, 2, 4; Darton, 14; Fenner, 2; Fluhr, 1; Hawkins, 4; Hayes, A. O., 1; Hobbs, 1; Kalm, 1; Kummel, 2, 3, 7, 8, 9, 26, 50, 78; Larison, 1; Lewis, J. V., 5, 11; Ludlum, 1; Lyman, 2, 3; MacIure, 1; Marsh, 12; Mather, 1; Mawby, 1; Merrill, 6; Messler, 1; Nason, 1, 3, 6; Redfield, 8; Russell, 3, 5, 9; Salisbury, 17; Schöpf, 1.
- Jurassic: Lewis, H. C., 3; Marsh, 12; Merrill, 6; White, 1.
- Cretaceous: Bascom, 2, 3; Berry, 5, 15, 17; Bibbins, 1; Britton, 1; Clark, 3, 4, 6, 9, 10, 11, 12, 13; Conrad, 14; Cook, 2, 3, 7, 17, 64, 105, 113, 122, 128, 133; Cooke, C. W., 1; Cope, 22; Cozzens, 1; Credner, 3; Darton, 14; Dryden, 1; Eaton, 1; Finch, 1; Fowler, H. W., 1; Fuller, 3; Greacen, 1; Hayes, A. O., 1; Hill, 1; Hollick, 4, 7; Jennings, 1; Knapp, 2, 5, 26; Kummel, 50, 56, 78; Lea, 2; Lewis, J. V., 11; Lewis, S., 1; Lyell, 1; MacIure, 1; McGee, 1; Mansfield, 1, 5; Marsh, 12; Mather, 1; Meek, 1, 2, 3; Merrill, 6; Morton, 2, 3, 5, 6; Prather, 1; Richards, 15, 16; Rogers, H. D., 4; Salisbury, 17; Schöpf, 1; Shattuck, 1; Uhler, 1; Vanuxem, 7; Ward, L. F., 1; Weller, 5, 7, 8, 9; Wheeler, 1; White, 1; Woolman, 8, 15.
- Tertiary: Bascom, 2, 3; Britton, 1; Clark, 1, 3, 4, 5, 7, 9, 10, 13; Coman, 1; Conrad, 7, 14; Cook, 17, 105, 113, 122, 128; Cooke, C. W., 1; Credner, 3; Dall, 1; Fuller, 3; Greacen, 1; Harris, 1; Heilprin, 1, 4; Johnson, 11; Kummel, 26, 50, 56, 78; Lewis, 11; McGee, 1; Mansfield, 1, 5; Meek, 2; Morton, 6; Richards, 14, 17; Salisbury, 7, 9, 10, 11, 13, 17, 21, 29; Shattuck, 1, 2; Toulmin, 1; Vanuxem, 7; Weller, 5; Wheeler, 1; White, 1; Wood, 2; Woolman, 4.
- Quaternary: Baker, 2; Bascom, 2, 3, 4; Bayley, 4; Berry, 19; Campbell, 1; Clark, 13; Clayton, 1; Conrad, 14; Cook, 4, 17, 64, 81, 110; Cope, 22; Darton, 14; Flint, 1; Fluhr, 1; Fuller, 3; Hollick, 2; Kummel, 26, 60, 78; Larison, 1; Lewis, 11; MacClintock, 2, 4, 6; McGee, 1; Merrill, F. J. H., 1, 4; Miller, B. L., 1; Pilsbry, 1; Reeds, 4; Richards, 17; Salisbury, 2, 3, 7,

Stratigraphy--Continued

- Quaternary--Continued
10, 11, 18, 17, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.
- Unknown age, Serpentine: Credner, 1.
- Stream flow. See Water supply: surface water.
- Stream gauging and gauging stations. See Water supply: surface water.
- Streams and surface drainage.
General: Kitchell, 4; Salisbury, 15; Smock, 6; Vermeule, 3, 8, 15, 16, 17, 20.
- Deposition: Barrell, 1; Campbell, 1; Flint, 1; Kummel, 9; Lucke, 4, 5, 6; MacClintock, 1; Merrill, 5; Russell, 3; Salisbury, 10, 15, 23, 25, 29; Shattuck, 2; Wakeman, 2; Winchell, 1.
- Drainage history: Akerly, 1; Barber, 1; Bayley, 4; Campbell, 1; Clark, 3, 9; Cook, 95; Credner, 1; Dana, 6; Darton, 14; Davis, 4, 5, 6; Fenner, 1; Fuller, 3; Hamilton, W. L., 2; Hubbert, 1; Johnson, D. W., 1, 6; Julien, 2; Kummel, 1, 75, 78; Lindenkohl, 1, 2; Lucke, 4, 5, 6; Merrill, 6; Pilsbry, 1; Nason, 1; Nelson, 2; Rogers, H. D., 2; Russell, 4; Salisbury, 2, 3, 6, 7, 8, 10, 15, 22, 23, 25, 28, 29; Snell, 2; Spencer, A. C., 4; Spencer, J. W. W., 1, 2; Thompson, 5; Urquhart, 1; Ver Steeg, 1; Walter, 1; Ward, 3; Weld, 1.
- Erosion.
General: Davis, 6; Hubbert, 1; Salisbury, 15, 29.
- Caves and sinks: Salisbury, 10, 11, 23.
- Lakes, ponds, swamps: Bayley, 4; Cook, 53, 98; Fenner, 1; Kitchell, 4; La Forge, 1; Salisbury, 10, 23; Vermeule, 3, 8, 15.
- Water gaps and wind gaps: Campbell, 1; Cook, 95; Cummins, 1; Davis, 5; Hubbert, 1; Johnson, D. W., 6; Kummel, 1, 75, 78; Lucke, 6; Merrill, 6; Salisbury, 6, 8, 15, 29; Snell, 2; Stose, 1; Ver Steeg, 1; Walter, 1.
- Structural geology.
General: Cook, 17, 64; Willard, 2; Woollard, 4.
- Local structures:
Dikes: Arousseau, 1; Bayley, 4; Darton, 9; Hawkins, 9; Kemp, 2; Larison, 1; Milton, 1; Nason, 3, 8; Rogers, H. D., 3; Spencer, 4; Spurr, 1.
- Faults: Bascom, 3, 5; Bayley, 2, 3, 4; Britton, 5; Casperson, 2; Cook, 39, 71, 95, 100, 103, 140; Darton, 9, 10; Davis, 2; Ewing, 1; Farrington, 1; Fenner, 1; Fluhr, 1; Hawkins, 2, 4, 17; Johnson, 11; Kummel, 2, 3, 7, 8, 9, 13, 15; Lewis, J. V., 1, 2, 5, 7; Ludham, 1; Lyman, 1; Merrill, 6; Nason, 2, 3, 7, 14; Peck, 1; Ries, 4, 8; Russell, 3; Smock, 1; Spencer, 4; Spurr, 1; Stose, 2; Wheeler, 1; Wolff, 5; Woollard, 1.
- Folds: Bayley, 4; Blake, 2; Britton, 5; Cook, 39, 100, 107, 133; Davis, 2; Hawkins, 2; Kummel, 2, 3, 7, 9, 13, 15; Lewis, J. V., 2, 7; Ludham, 1; Nason, 13; Peck, 1; Ries, 8; Smock, 1; Spencer, 4; Spurr, 1; Wheeler, 1; Wolff, 1, 2, 5.
- Intrusions: Arousseau, 1; Fenner, 7; Spencer, 4.
- Sheets and sills: Apgood, 1; Bayley, 4; Cook, 95; Darton, 9, 14; Davis, 2; Fenner, 1, 2, 7; Iddings, 1; Irving, 2;

Structural geology—Continued.
 Local structures—Continued.
 Sheets and sills—Continued.
 Johnson, 11; Julien, 2; Kummel, 2, 7, 8, 9, 14; Lewis, J. V., 2, 5, 7, 9; Lyman, 3; Merrill, 6; Nason, 5; Russell, 5, 8; Walker, 1, 2; Woollard, 1; Wurtz, 4.
 Stocks (Snake Hill): Cook, 95; Crosby, 1; Merrill, 6.
 Minor structures.
 Columnar jointing: Bayley, 4; Bond, 2; Cook, 95, 114; Credner, 2; Darton, 9; Davis, 2; Finch, 4; Heilprin, 2; Iddings, 1; Lewis, 9; Merrill, 6; Moldenke, 1; Pierson 1.
 Jointing and joints: Appleby, 1.
 Unconformities: Britton, 3; Clark, 10; Cook, 107, 108; Hayes, A. O., 1; Lewis, 7; Miller, R. L., 1; Nason, 12; Redfield, 8; Willard, 2; Wolf, 5.
 Regional features.
 Coastal Plain: Bascom, 2, 3; Hawkins, 7; Hollick, 3; Johnson, 12; Mansfield, 5; Shattuck, 2.
 Green Pond synclinorium: Cook, 108; Darton, 6, 10; Kummel, 19; Merrill, F. J. H., 3.
 New Jersey Upland: Appleby, 1; Baker, G. W., 1; Bayley, 4; Cook, 100; Darton, 14.
 Triassic basin: Bascom, 3, 5; Bayley, 4; Cook, 95; Darton, 14; Davis, 1; Hawkins, 4; Hobbs, 1; Lewis, 7; Lyman, 3; Merrill, 6; Newhouse, 1; Russell, 3, 4, 8; Stose, 2; Wheeler, 1.
 Submarine canyons. See Shoreline features.
 Suckasunny mine. See Dickerson mine.
 Sulphates. See Mineralogy: mineral groups.
 Sulphides. See Mineralogy: mineral groups.
 Surface water. See Water supply.
 Surveying. See Geodesy.
 Sussex County.
 Climate and weather.
 Precipitation: Smock, 4.
 Tables: Smock, 6.
 Conservation and development.
 Reclamation of land.
 Pequest Basin: Cook, 109.
 Walkkill Basin: Bowser, 3; Cook, 16, 99.
 Economic geology.
 Economic history: Whitehead, 4.
 Localities.
 Mines, general: Bayley, 3; Cook, 17, 31, 35, 42, 68, 73, 102, 111; Day, 2; Jenkins, 1; Kitchell, 2, 4; Nason, 7; O'Hara, 1, 2; Putnam, B. T., 1; Sanford, 2; Schrader, 1; Shuster, 1; Spencer, 4; Twitchell, 2; Williams, A., 1; Anonymous, 1.
 Andover: Bayley, 3; Bishop, 1; Cook, 17, 111; Diegnan, 2; Hermelin, 1; Kitchell, 2, 4, 6; Putnam, B. T., 1; Scranton, 1; Spencer, 4; Anonymous, 1.
 Franklin Furnace: Alger, 1; Baker, G. W., 1; Bayley, 3; Beco, 1; Bishop, 1; Blake, 2; Cook, 17, 31, 36, 52, 68, 73, 80, 85, 102, 111, 131; Credner, 2; Darton, 5; Day, 12; Detmold, 1; Dürre, 1; Farrington, 2; Fitch, 1; Gordon, T. F., 1; Groth, 1; Haight, 1; Hamilton, S. H., 3; Harder, 1; Honey-

Sussex County—Continued.
 Economic geology—Continued.
 Localities—Continued.
 Mines—Continued.
 Franklin Furnace—Continued.
 man, 2; Hughes, 1, 2, 3; Jackson, C. T., 4, 5; Jenkins, 2, 4, 6, 7; Johnson, 8, 9, 10; Katz, 3; Kemp, 4, 7; Kerr, 1; Kiessling, 6, 9, 11, 13; Kitchell, 2, 4, 6; Kummel, 12, 13, 21, 30, 36, 40, 45, 51, 53, 57, 60; Leith, 1; Loughlin, 2, 3, 4, 5, 6; McCaskey, 1, 3, 3, 4; Manchester, 2; Manley, 5; Nason, 2, 7, 13; N. J. Z. C., 1; O'Hara, 1, 2; Palache, 7; Parker, E. W., 3, 5, 9, 13; Pehrson, 1; Platt, J. C., 1; Putnam, B. T., 1; Rastall, 1; Ries, 3; Rogers, H. D., 1; Scranton, 1; Shuster, 1; Smock, 1, 14, 19; Snell, 2; Spencer, 3, 4, 6; Spurr, 1; Stevens, 1; Twitchell, 10; Weeks, 1; Wetherill, 1; Whitney, J. D., 1; Wilkens, 1; Williams, A., 1; Wolf, 8, 13; Anonymous, 1, 2, 7, 8.
 Sterling Hill: Alger, 1; Baker, G. W., 1; Bayley, 3; Blake, 2; Beco, 1; Bishop, 1; Cook, 10, 17, 31, 36, 68, 73, 78, 102, 111, 121; Credner, 2; Darton, 5; Detmold, 1; Dürre, 1; Farrington, 2; Fitch, 1; Groth, 1; Haight, 1; Harder, 1; Honeyman, 2; Hughes, 1, 2, 3; Jackson, 5, 8; Jenkins, 2; Johnson, 8, 9, 10; Katz, 3; Kemp, 4, 7; Kerr, 1; Kiessling, 6, 9, 11, 13; Kitchell, 2, 4; Leith, 1; Loughlin, 2, 3, 4, 5, 6; McCaskey, 1, 2, 3, 4; Manchester, 2; Mixer, 1; Nason, 7; N. J. Z. C., 1; Palache, 7; Parker, 9, 13; Pehrson, 1; Platt, J. C., 1; Rogers, H. D., 1; Salton, 1; Smock, 14, 19; Snell, 2; Spencer, 4, 6; Spurr, 1; Stevens, 1; Twitchell, 3; Weeks, 1; Wetherill, 1; Whitney, J. D., 1; Williams, A., 1; Wolf, 13; Anonymous, 1, 2.
 Quarries: Cook, 31, 88; Hawes, 2; Kummel, 15; Lewis, 10; McCourt, 3; Parker, 10, 12; Sanford, 2; Schrader, 1; Smock, 19.
 Materials, general: Day, 2; Sanford, 2; Schrader, 1; Williams, A., 1.
 Cement: Eckel, 3; Kummel, 15.
 Clay: Cook, 64; Jenkins, 3, 5; Kummel, 26; Ries, 2, 5; Smock, 19.
 Diatomite: Johnson, 10.
 Gem Stones: Williams, 2.
 Graphite: Cook, 36.
 Iron: Baker, G. W., 1; Barber, 1; Bayley, 3; Bishop, 1; Blake, 2; Boyer, Charles Shimer, 1; Cook, 20, 31, 35, 37, 42, 68, 73, 78, 85, 93, 102, 111; Credner, 2; Detmold, 1; Diegnan, 2; Dürre, 1; Fackenthal, 1; Farrington, 2; Gordon, T. F., 1; Hermelin, 1; Honeyman, 2; Jackson, 5, 7; Jenkins, 1; Kitchell, 2, 4, 5, 6; Kummel, 43; Nason, 7, 13; O'Hara, 1, 2; Palache, 7; Putnam, B. T., 1; Scranton, 1; Shuster, 1; Smock, 1, 19; Spencer, A. C., 1, 4; Stevens, 1; Wetherill, 1; Whitehead, 4; Wilkens, 1; Anonymous, 1, 2, 4, 7, 8.
 Lead: Smock, 19;
 Lime: Cook, 12, 29, 36, 73; Kitchell, 2; Kummel, 45, 60; Smock, 19.

Sussex County—Continued.

Economic geology—Continued.

Materials—Continued.

Manganese: Johnson, 13; Loughlin, 2; Williams, 2.

Mineral wool: Van Voorhis, 1.

Peat: Johnson, 10; Kitchell, 2; Kummel, 41; McCourt, 1, 2; Parmelee, 2; Soper, 1; Twitchell, 9, 12; Waksman, 2; Anonymous, 1.

Sand and gravel: Johnson, M. E., 1, 3, 4.

Silver: Smock, 19.

Stone: Cook, 31, 88; Eckel, 1, 2; Hawes, 2; Kummel, 33; Lewis, 10; McCourt, 3; Smock, 19; Twitchell, 1, 2; Wolff, 6.

White marl: Cook, 56; Eckel, 3; Kitchell, 2; Kummel, 15; Van Voorhis, 1; Anonymous, 1.

Zinc: Alger, 1; Baker, G. W., 1; Barber, 1; Beco, 1; Bishop, 1; Blake, 2, 3; Cook, 10, 12, 29, 31, 36, 52, 58, 73, 78, 80, 86, 97, 111, 121, 129; Credner, 2, 4; Darton, 5; Day, 12; Detmold, 1; Dürre, 1; Farrington, 2; Finch, 4; Fitch, 1; Groth, 1; Haight, 1; Hamilton, S. H., 3; Harder, 1; Honeyman, 2; Hughes, 1, 2, 3; Jackson, 4; Jenkins, 2, 4; Johnson, M. E., 1, 2, 3, 4, 6, 7, 8, 9, 10, 13; Katz, 3; Kemp, 4, 6, 7; Kerr, 1; Kiessling, 6, 9, 11, 13; Kitchell, 2, 4; Kummel, 12, 18, 21, 30, 36, 40, 45, 51, 53, 57, 60, 66; Leith, 1; Loughlin, 2, 3, 4, 5, 6; McGaskey, 1, 2, 3, 4; Manchester, 2; Mitchell, 4; Nason, 13; Needham, 1, 2; N. J. Z. C., 1; O'Hara, 1, 2; Palache, 7, 17; Parker, E. W., 3, 5, 7, 9, 11, 13; Pehrson, 1; Platt, J. C., 1; Rastall, 1; Raum, 1; Ries, 8; Rogers, H. D., 1; Salton, 1; Shore, 1; Shuster, 1; Smock, 14, 19; Snell, 2; Spencer, 4, 6; Spurr, 1; Tarr, W. A., 1; Twitchell, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12; Weeks, 1; Wetherill, 1; Whitney, J. D., 1; Wilkens, 1; Williams, A., 1, 3; Wolff, 8, 13; Anonymous, 1, 2, 7, 8.

Engineering geology.

Canals: Snell, 2.

Dams: Snell, 2.

Geodesy.

Bench marks: Cook, 136; Vermeule, 15, 29, 20.

Boundaries: Cook, 44; N. J. B., 3.

Surveying: Bowser, 3, 5; Cook, 44, 89, 127; Marshall, 1; N. J. B., 3; Vermeule, 15; Viele, 1, 2, 3; Anonymous, 23.

Geophysics.

Magnetism and magnetic surveys: Cook, 37; Vermeule, 2, 15; Wilkens, 1; Anonymous, 23.

Glacial geology, general: Salisbury, 23.

Depositional features: Salisbury, 5.

Erosional features: Jackson, 2.

Glacial lakes, ponds, and rivers: Salisbury, 7, 10.

Mineralogy.

Mineral groups, general: Bauer, 6; Canfield, 1; Day, 2; Fowler, 1, 3; Gordon, 5, 7; Hoadley, 1; Herman, 1; Kemp, 6; Kitchell, 4; Koenig, 3, 5; Olpp, 1; Palache, 1, 12, 13, 17; Ries, 8; Robinson, 1; Sanford, 2; Schrader, 1; Seymour, 1; Shepard, 1; Spencer, 4; Torrey, J., 1;

Sussex County—Continued.

Mineralogy—Continued.

Mineral groups—Continued.

Troost, 2; Vanuxem, 4, 6; Williams, A., 1.

Native elements: Cornwall, 2; Foote, 1; Haff, 1; Palache, 19; Papish, 1; Smock, 19; Wolff, 7.

Arsenates: Foshag, 2, 3, 5; Palache, 6, 8, 13.

Arsenides: Bauer, 2; Buerger, 1; Palache, 19.

Borates: Bauer, 5; Berman, 2; Brush, 2; Gruner, 1; Penfield, 2; Poitevin, 1.

Boroarsenates: Palache, 5.

Carbonates: Bauer, 4; Breithaupt, 2; Browning, 1; Krieger, 1; Levison, 3; Nichols, 1, 2, 3; Penfield, 4; Roepper, 1; Tyler, S. W., 1; Wurtz, 3.

Fluorides: Bruce, 3; Gibbs, 1.

Oxides: Alger, 1, 3; Aminoff, 2; Beco, 1; Berman, 1; Berthier, 1; Blake, 1; Breithaupt, 1; Bruce, 1; Brush, 3; Cornwall, 1; Dittler, 1; Farrington, 3; Ford, 3; Fowler, 2; Frondel, 1; Grosser, 1; Harcourt, 1; Hayes, A. A., 1, 2; Levi, 1; Moore, 1, 2; Moses, 2, 5; Nuttall, 1; Palache, 6, 20; Papish, 1; Phillips, 3, 4; Ricketts, 1; Ries, 8; Seyms, 1; Shepard, 4; Silliman, 1; Spencer, A. C., 1; Stone, G. C., 1; Thomson, 1; Troost, 3; Van Horn, 1; Vanuxem, 3; Whitney, F. L., 1; Anonymous, 2.

Phosphates: Penfield, 1.

Silicates: Aminoff, 1; Bauer, 1, 3, 7, 8; Beco, 1; Blix, 1; Bruce, 2; Brush, 1; Canfield, 2; Chester, 1, 2, 3; Clarke, 2; Cornwall, 1; Dana, J. D., 2; Delesse, 1; Eakle, 1; Foote, 1; Ford, 2, 4; Foshag, 1, 4, 6; Fowler, S., 2; Gage, 1; Genth, 1; Gordon, 3, 4; Gunnell, 1; Hey, 1; Hillebrand, W. F., 1; Honess, 2; Hunt, 1, 2, 3; Hussak, 1; Jackson, C. T., 1, 2; Kloos, 1; Koenig, 1, 2, 3; Larsen, 1, 2, 3, 4, 5; Leeds, 1; Levison, 4; Lewis, 15; Mixer, 1; Nichols, 3; Nuttall, 1; Palache, 2, 3, 4, 6, 9, 10, 11, 15, 16, 18; Papish, 1; Pardee, 1; Parsons, 1; Peacock, 1; Penfield, 3, 6, 7, 8; Phillips, 2; Pirsson, 1; Pisani, 1; Pough, 1; Pratt, 1; Renwick, 1; Ricketts, 1; Ries, 3; Riggs, 1; Roepper, 1, 2; Schaller, 1, 6; Seybert, 1, 2, 4, 5; Selfridge, 1; Shannon, 2, 3, 4; Smith, 2; Spencer, L. J., 1, 2; Stone, G. C., 1; Sundius, 1; Thomson, 1; Troost, 1, 3; Vanuxem, 2; Warren, 1; Wolff, 9, 10, 11; Wurtz, 2; Zachariasen, 1.

Sulphates: Bauer, 5; Chilton, 1; Mitchell, 1.

Sulphides: Harcourt, 1; Henry, 1; Kraus, 1; Papish, 1; Silliman, 1.

Zeolites: Gordon, 6.

Mineral localities, general: Canfield, 1; Day, 2; Sanford, 2; Schrader, 1; Seymour, 1; Williams, A., 1.

Beermerville: Manchester, 2; Smith, 2; Valiant, 3.

Franklin Furnace: Alger, 1, 3; Aminoff, 1, 2; Bauer, 1, 2, 3, 4, 6, 7, 8; Berman, 1, 2; Berthier, 1; Blix, 1; Breithaupt, 1; Browning, 1; Bruce, 1, 3; Brush, 1, 2, 3; Buerger, 1; Canfield, 1;

Sussex County—Continued.

Mineralogy—Continued.

Mineral localities—Continued.

Franklin Furnace—Continued.

Chester, 1, 2, 3, 4; Clarke, 2; Cornwall, 1, 2; Delesse, 1; Dittler, 1; Eakle, 1; Farrington, 3; Finch, 4; Foote, 1; Ford, 2, 3, 4; Foshag, 1, 3, 4, 5, 6; Fowler, S., 1, 2, 3; Frondel, 1; Gage, 1; Genth, 1; Gibbs, 1; Gordon, S. G., 2, 4, 5, 7; Gordon, T. F., 1; Grosser, 1; Gruner, 1; Gunnell, 1; Haff, 1; Harcourt, 1; Henry, 1; Hey, 1; Hillebrand, W. F., 1; Hoadley, 1; Honess, 2; Hunt, T. S., 1, 2, 3; Jackson, C. T., 1, 3, 4; Keevil, 1; Kemp, 6; Kloos, 1; Koenig, 1, 2, 3, 4, 5; Kraus, 1; Krieger, 1; Larsen, 2, 3, 4, 5; Levi, 1; Levison, 3, 4; Lewis, 15; Manchester, 2; Mitchell, 4; Mixer, 1; Moses, 2, 5; Newhouse, 2; Nichols, 1, 2, 3; Nuttall, 1; Olipp, 1; Palache, 1, 2, 3, 4, 5, 6, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20; Papish, 1; Pardee, 1; Parsons, 1; Peacock, 1; Penfield, 1, 2, 3, 6, 7, 8; Phillips, 2, 3, 4; Pisani, 1; Poitevin, 1; Pough, 1; Ricketts, 1; Ries, 8; Robinson, 1; Roepfer, 1, 2; Sanford, 2; Schaller, 1, 6; Schrader, 1; Selfridge, 1; Seybert, 4; Seymour, 1; Seyms, 1; Shannon, 2, 3, 4; Shepard, 1, 4; Silliman, 1; Smith, E. S. C., 1; Spencer, A. C., 6; Spencer, L. J., 1, 2; Spurr, 1; Stone, G. C., 1; Sundius, 1; Tarr, W. A., 1; Thomson, 1; Torrey, J., 1; Troost, 1, 2, 3; Valiant, 3; Van Horn, 1; Vanuxem, 2, 3, 4, 6; Warren, 1; Wolff, 7, 9, 10, 11; Zachariassen, 1.

Hamburg: Canfield, 1; Fowler, 3; Husack, 1; Manchester, 2; Riggs, 1; Robinson, 1; Seymour, 1; Torrey, J., 1; Valiant, 3.

Newton: Bruce, 2; Canfield, 1; Chilton, 1; Fowler, 2, 3; Manchester, 2; Seymour, 1; Shepard, 1; Valiant, 3.

Sparta: Canfield, 1; Fowler, 3; Herman, 1; Leeds, 1; Manchester, 2; Nuttall, 1; Robinson, 1; Seybert, 1, 2, 5; Seymour, 1; Silliman, 1; Torrey, J., 1; Troost, 1; Valiant, 3.

Sterling Hill: Alger, 1; Bauer, 5; Breithaupt, 1, 2; Brush, 1; Canfield, 1, 2; Cornwall, 2; Dana, J. D., 2; Farrington, 1; Finch, 4; Fowler, S., 1, 3; Gunnell, 1; Herman, 1; Keevil, 1; Kemp, 6; Manchester, 2; Moore, 1, 2; Newhouse, 2; Nuttall, 1; Palache, 1, 9, 12, 15, 17, 19, 20; Penfield, 4; Pirsion, 1; Pratt, 1; Ries, 8; Robinson, 1; Roepfer, 1; Sanford, 2; Schrader, 1; Seymour, 1; Seyms, 1; Shepard, 1, 4; Smith, E. S. C., 1; Spencer, A. C., 6; Spencer, L. J., 1; Stone, G. C., 1; Tarr, W. A., 1; Troost, 3; Tyler, S. W., 1; Valiant, 3; Vanuxem, 4, 6; Whitney, F. L., 1; Wurtz, 2.

Paleontology.

Indeterminate remains, graphite streaks: Britton, 7.

Plants, *Thallophyta*: Britton, 7.

Animals, general: Weller, 2.

Sussex County—Continued.

Paleontology—Continued.

Animals—Continued.

Coelenterata: Barrett, 1, 2.

Brachiopoda: Barrett, 1.

Arthropoda: Barrett, 1; Van Ingen, 1; Weller, 1.

Petrology.

Igneous rocks, intrusive.

Dike rocks: Arousseau, 1; Cook, 32; Emerson, 1; Kemp, 1, 2, 3, 5; Milton, 1; Nason, 6; Wolff, 4, 5, 12.

Nepheline syenite: Arousseau, 1; Emerson, 2; Kemp, 2.

Metamorphic rocks.

Gneiss: Hinds, 1; Wolff, 5.

Marble (crystalline limestone): Kummel, 38; Nason, 11; Westgate, 1, 3; Wolff, 5.

Quartzite: Wolff, 5.

Sedimentary rocks.

Rock types.

Limestone: Nason, 11; Wolff, 5.

White marl: Cook, 56.

Soils, composition: Blair, 1, 4, 6; Cook, 72;

Jenning, 1; Patrick, 2, 8.

Stratigraphy, general: Snell, 2.

Pre-Cambrian: Bayley, 4; Cook, 8; Dana, 7; Nason, 8, 9, 10, 12; Ries, 8; Spencer, A. C., 2, 3; Vanuxem, 4; Westgate, 1; Williams, H. S., 1; Wolff, 5, 8.

Paleozoic, general: Van Ingen, 1.

Cambrian: Bayley, 4; Cook, 8; Dana, 7; Nason, 8, 9, 10, 12; Vanuxem, 4; Weller, 1; Westgate, 1, 3; Williams, H. S., 1; Wolff, 5.

Ordovician: Bayley, 4.

Silurian: Barret, 1; Weller, 2.

Devonian: Weller, 2.

Quaternary: MacClintock, 4.

Streams and surface drainage history.

Drainage history: Walter, 1.

Lakes, ponds, swamps: Vermeule, 3, 8, 15.

Water gaps and wind gaps: Walter, 1.

Structural geology.

Local structures.

Dikes: Arousseau, 1; Kemp, 2; Milton, 1; Spurr, 1.

Faults: Farrington, 1; Spurr, 1.

Folds: Blake, 2; Nason, 13; Spurr, 1.

Intrusions: Arousseau, 1.

Minor structures, unconformities: Nason, 12.

Techniques, field trips: Manley, 5.

Water supply.

Ground water, wells: Kummel, 54; N. J. S. W. P. C., 5; Spencer, 4; Upson, 1; Woolman, 13, 16, 17, 18, 19.

Mineral content: Collins, 1; Myers, 2.

Surface water, general: Barrows, 2, 3;

Collins, 1; Cook, 53, 98; Critchlow, 1; Grover, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28; Hartwell, 1; Hoyt, 1; N. J. S. W. P. C., 5; Parker, G. L., 1, 2, 3; Paulsen, 1; Vermeule, 7.

Stream gauging and gauging stations:

Barrows, 2, 3; Critchlow, 1; Grover, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28; Hartwell, 2; Hoyt, 1; Parker, G. L., 1, 2, 3; Paulsen, 1.

Water power: Spencer, 4.

Weathering: MacClintock, 4.

- Tacomic revolution: Bascom, 5; Willard, 3.
 Talc. See Economic geology: materials.
 Tar. See Economic geology: materials.
 Techniques, general: Cook, 119, 120; Davis, 6; Kummel, 59, 61; MacClintock, 3; Salisbury, 10; Vermeule, 1; Woodard, 6; Zodac, 1.
 Field trips: Clark, 2; F. W. P., 1; Grimsley, 1; Hayes, A. O., 1; Johnson, D. W., 4, 5; Kato, 2; Kerr, 1; Kummel, 75; Lobeck, 1; Manley, 5; Torrey, R. H., 1; "A Tramp," 1.
 Terminal moraine. See Glacial geology: depositional features.
 Terraces (marine): See Shoreline features.
 Tertiary Period.
 Economic geology.
 Materials.
 Clay: Day, 5; Ries, 1, 2, 4, 5, 6.
 Greensand marl: Ashley, 1; Cook, G. H., 1, 123; Kummel, 70; Mansfield, 1, 2, 3, 5; Pierce, 3; Shreve, 1; Wheeler, 1; Wurtz, 1.
 Potash: Ashley, 1; Kummel, 70; Mansfield, 1, 2, 3, 4; Shreve, 1; Wurtz, 1.
 Sand and gravel: Cook, 69; Kummel, 38.
 Geophysics, seismic explorations: Ewing, 1, 2.
 Mineralogy.
 Mineral groups.
 Hydrocarbons: Goldsmith, 1.
 Oxides: Leidy, 14.
 Silicates: Gruner, 2; Mansfield, 3; Schneider, 1.
 Mineral localities, New Brunswick: Gruner, 2.
 Paleontology.
 Plants, general: Berry, 7; Hollick, 9, 10.
Thallophyta: Kain, 1, 2; Woolman, 2, 3, 4, 5, 6, 7, 9, 13, 17, 21.
Spermatophyta: Hollick, 1; Newberry, 2.
 Animals, general: Clark, 10; Conrad, 10; Cooke, C. W., 1; Richards, 12; Weller, 5.
Protozoa: Bagg, 2; Cushman, 1; Jennings, 1; Toulmin, 1; Woodward, A., 1; Woodworth, 2.
Coelenterata: Richards, 14.
Bryozoa: Cann, 1; Gabb, 1, 4, 8; Greacen, 1; Richards, 14.
Brachiopoda: Clark, 3; Richards, 14; Whitfield, 1, 7.
Mollusca: Clark, 3; Conrad, 4, 6, 7, 8, 12; Gabb, 1, 5, 10; Heilprin, 3, 4; Lea, 1; Pilabry, 6; Miller, A. K., 1; Morton, S. G., 1; Richards, 12, 14; Rowland, 1; Stephenson, 4; Tucker, 1; Whitfield, 1, 2, 3, 5, 7, 9; Woolman, 1, 4, 9, 11.
Arthropoda: Jennings, 1; Pilabry, 5; Richards, 14; Van Rensselaer, 1; Whitfield, 7.
Echinodermata: Berry, C. T., 1; Gabb, 11; Richards, 14.
Chordata, general: Woolman, 1.
Pisces: Cope, 11, 15, 18; Fowler, H. W., 1; Leidy, 6, 7, 8; Marsh, 6.
Reptilia: Conrad, 14; Cope, 2, 5, 7, 8, 10, 20, 22, 24, 26; Leidy, 9; Marsh, 2, 3; Mook, 1; Rapp, 1.
Aves: Cope, 22; Marsh, 5, 11; Wetmore, 1.
 Tertiary Period—Continued.
 Paleontology—Continued.
 Animals—Continued.
 Chordata—Continued.
Mammalia: Cope, 9, 13, 13, 26; Leidy, 5, 8, 12; Marsh, 4, 7, 8; Wood, 1.
 Petrology.
 Sedimentary rocks.
 Rock types.
 Clay: Hawkins, 14.
 Greensand marl: Ashley, 1; Cook, 128; Mansfield, 3.
 Sand: Colony, 1; Kummel, 38.
 Soils, composition: Salisbury, 18; Wherry, 6.
 Stratigraphy: Bascom, 2, 3; Britton, 1; Clark, 1, 3, 4, 5, 7, 9, 10, 13; Coman, 1; Conrad, 7, 14; Cook, 17, 105, 113, 122, 128; Cooke, C. W., 1; Credner, 3; Dall, 1; Fowler, H. W., 1; Fuller, 3; Greacen, 1; Harris, 1; Heilprin, 1, 4; Johnson, 11; Kummel, 26, 50, 56, 78; Lewis, 11; McGee, 1; Mansfield, 1, 5; Meek, 2; Morton, 6; Richards, 8, 14, 17; Salisbury, 7, 9, 10, 11, 17, 21, 29; Shattuck, 1, 2; Toulmin, 1; Vanuxem, 7; Weller, 5; Wheeler, 1; White, 1; Wood, 2; Woolman, 4.
 Techniques, field trips: Clark, 2.
 Ground water, general: Barksdale, 2; Thompson, 2, 3; Twitchell, 11.
 Wells: Barksdale, 2; Cook, 82, 98, 116, 124; Critchlow, 3; Darton, 11; Knapp, 3, 4; Kummel, 27, 54; N. J. S. W. P. C., 5; Sanford, 1; Smock, 8, 9, 12; Thompson, 1; Woolman, 1, 2, 3, 5, 6, 7, 9, 10, 13, 16, 17, 18, 19, 20, 21.
 Till. See Glacial geology: depositional features; Petrology: sedimentary rocks.
 Topography: See Geodesy; Physical geography.
 Trap rock. See Petrology: igneous rocks.
 Trenton gravels. See Also Mercer County; Quaternary.
 Abbott, 1, 2, 3, 6; Belt, 1; Comans, 1; Cook, 61; Lewis, H. C., 1, 2, 5; Haynes, 1; Holmes, 1; Kummel, 6; Martin, 1; Mercer, 1; Putnam, F. W., 1; Richards, 10; Salisbury, 2, 3, 12, 14, 28, 29; Shaler, 1; Volk, 1; Wilson, T. I.; Woodman, 3; Woodworth, 2; Wright, G. F., 1, 2, 4, 5, 6.
 Triassic basin. See Structural geology: regional features; Triassic Period.
 Triassic Lowland. See also Physical geography; Triassic Period.
 Climate and weather.
 Precipitation: Leighton, 2.
 Temperature: Cook, 91; Smock, 4, 6.
 Conservation and development, forestry: Vermeule, 10, 11.
 Economic geology.
 Localities.
 Mines, general: Credner, 2.
 Quarries: Nason, 1.
 Materials.
 Clay: Johnson, M. E., 5.
 Copper: Apgood, 1; Cook, 99; Credner, 2; Darton, 14; Emmons, S. F., 1; Kemp, 4; Lewis, J. V., 3; Manchester, 2; Newhouse, 1; Weed, 4; Woodward, H. P., 1.
 Iron: Kemp, 4; Newhouse, 1.
 Peat: Waksman, 2.
 Stone: Darton, 14; Johnson, M. E., 5; Merrill, 6.

Triassic Lowland—Continued.
 Floods and flood control.
 Passaic watershed: Hollister, 1; Leighton, 2; Vermeule, 13.
 Raritan watershed: Vermeule, 8, 11, 13.
 Geodesy, surveying: Vermeule, 10.
 Geology, general: Moldenke, 1; Pierce, 1.
 Geophysics.
 Electrical measurements: Woollard, 6.
 Gravitational measurements and stations: Woollard, 2, 4, 5, 6, 7.
 Magnetism and magnetic surveys: Woollard, 2, 4, 5, 6, 7.
 Seismic explorations: Woollard, 1, 2.
 Glacial geology, general: Reeds, 5; Salisbury, 22, 25.
 Depositional features: Britton, 4; Cook, 57, 61, 70, 81; Darton, 14; Leverett, 1; Merrill, 6; Russell, 7; Salisbury, 2, 3, 7, 10, 26; Smock, 5; Upham, 1; Wright, A. A., 2; Wright, G. F., 3.
 Erosional features: Cook, 57; 61, 70, 81; Darton, 14; Salisbury, 2, 3, 10; Wright, A. A., 2.
 Glacial lakes, ponds, and rivers: Cook, 81.
 Mineralogy, general: Pierce, 1.
 Mineral groups, general: Lewis, 12; Woodward, H. P., 1.
 Native elements: Lewis, 16; Woodward, H. P., 1.
 Mineral localities, general: Newhouse, 1.
 Paleogeography: Hobbs, 1; Russell, 5.
 Paleontology.
 Indeterminate remains, footprints: Cook, 117; Cope, 22; Eastman, 1; Nason, 1; Newberry, 11.
 Plants, general: Hollick, 9, 10; Newberry, 11.
 Thallophyta: Edwards, 2.
 Spermatophyta: Newberry, 12.
 Animals, general: Cook, 117; Mawby, 1.
 Chordata, Pisces: Newberry, 11, 12; Redfield, 4, 9, 10.
 Peneplanes: Stose, 3.
 Petrology.
 Igneous rocks.
 Extrusive rocks, basalt: Bayley, 4; Darton, 9; Davis, 2; Fenner, 4; Kummel, 9; Lewis, 9, 12; Russell, 1, C., 1.
 Intrusive rocks.
 Dibase: Bayley, 4; Darton, 8, 9; Davis, 2; Kummel, 9; Lewis, 8, 9, 12.
 Dike rocks: Davis, 1.
 Trap (unclassified): Levison, 2; Nason, 1.
 Metamorphic rocks, hornfels: Kummel, 9; Lewis, 9.
 Sedimentary rocks.
 Rock types.
 Conglomerates: Kummel, 9; Nason, 1, 3.
 Sandstone: Davis, 2; Finch, 2; Kummel, 9; Lewis, 9; Nason, 1.
 Shales: Kummel, 9; Nason, 1.
 Till: Salisbury, 3.
 Sedimentary features.
 Rain drops and hail prints: Redfield, 4; Russell, 3.
 Ripple marks: Russell, 3.
 Physical geography: Bascom, 3; Bayley, 4; Cole, 1; Cook, 140; Darton, 14; Davis, 4, 5, 6; Hayes, A. O., 1; Johnson, D. W., 4.

Triassic Lowland—Continued.
 Physical geography—Continued.
 6; Kummel, 3, 7, 78; Lewis, 11; Lobeck, 1; Merrill, 6; Messler, 1; Moldenke, 1; Pierce, 1; Rogers, H. D., 2; Salisbury, 2, 3, 8, 10, 15; Smock, 4; Vermeule, 3; Westervelt, 1; Wickes, 1.
 Shoreline features, marshes: Waksman, 2.
 Soils, composition: Bascom, 3; Cook, 38, 79, 95; Kummel, 3; Salisbury, 18.
 Stratigraphy, general: Rogers, H. D., 1, 2.
 Triassic: Cook, 7, 71, 95, 103, 114, 131, 140; Credner, 2, 4; Darton, 14; Fenner, 2; Finlay, 1; Hayes, A. O., 1; Kummel, 2, 7, 9, 50; Lewis, J. V., 5; Lyman, 2, 3; Mather, 1; Mawby, 1; Merrill, 6; Nason, 1, 3, 5; Redfield, 8; Russell, 3, 5, 8, 9; Schöpf, 1.
 Jurassic: Merrill, 6.
 Quaternary: Cook, 81; Salisbury, 2.
 Streams and surface drainage, general: Darton, 14.
 Drainage history: Russell, 4.
 Water gaps and wind gaps: Cook, 95.
 Structural geology.
 Local structures.
 Dikes: Darton, 9.
 Faults: Bayley, 4; Cook, 71, 95, 103, 140; Darton, 9; Davis, 2; Hawkins, 4; Kummel, 2, 3, 4, 7, 8, 9; Lewis, J. V., 1, 2, 5; Merrill, 6; Stose, 2.
 Folds: Davis, 2; Kummel, 2, 3, 7, 9; Lewis, J. V., 2, 7.
 Sheets and sills: Apgood, 1; Bayley, 4; Cook, 95; Darton, 9, 14; Davis, 2; Fenner, 2; Johnson, 11; Kummel, 7, 8; Lewis, J. V., 2, 5, 9; Lyman, 3; Merrill, 6; Nason, 5; Woollard, 1; Wurtz, 4.
 Minor structures.
 Columnar jointing: Cook, 114; Darton, 9; Davis, 2; Lewis, 9.
 Unconformities: Redfield, 8.
 Regional features, Triassic basin: Bascom, 3; Bayley, 4; Cook, 95; Darton, 14; Davis, 1; Hawkins, 4; Hobbs, 1; Lewis, 7; Lyman, 3; Merrill, 6; Newhouse, 1; Russell, 3, 4, 8; Stose, 2; Wheeler, 1.
 Techniques, field trips: Johnson, D. W., 4, 5; Lobeck, 1; Torrey, R. H., 1.
 Water supply.
 Ground water, general: Critchlow, 3; Knapp, 4; Thompson, 2; Twitchell, 11; Vermeule, 17.
 Wells: Bascom, 3; Knapp, 3; Vermeule, 4, 9, 17.
 Surface water, general: Cook, 46; Hollister, 1; Leighton, 1, 2; Merrill, 6; Vermeule, 3, 4, 9.
 Stream flow: Vermeule, 6, 8, 11.
 Water power: Leighton, 1; Vermeule, 3, 5, 6, 8.
 Triassic Period.
 Economic geology.
 Localities.
 Mines, general: Woodward, H. P., 1.
 American: Apgood, 1; Lewis, J. V., 1; Woodward, H. P., 1.
 Chimney Rock: Apgood, 1; Keith, 1; Lewis, J. V., 1; Woodward, H. P., 1.
 Flemington: Clemons, 1; Lewis, J. V., 1; Woodward, H. P., 1.

Triassic Period—Continued.

Economic geology—Continued.

Localities—Continued.

Mines—Continued.

Griggstown: Apgood, 1; Woodward, H. P., 1.

New Brunswick: Hawkins, 18; Woodward, H. P., 1.

Rocky Hill: Lewis, J. V., 1.

Schuyler: Apgood, 1; Black, 2; Granbery, 1, 2; Keith, 1; Lewis, J. V., 1; Pierce, 1; Woodward, H. P., 1; Anonymous, 10.

Quarries: Iddings, 1; Northup, 1; Sache, 2.

Materials, general: Pierce, 1.

Clay: Ries, 2, 5.

Copper: Apgood, 1; Black, 2; Bond, 1, 2; Clayton, 1; Clemon, 1; Cook, 99; Credner, 2; Emmons, S. F., 1; Granbery, 1, 2; Hawkins, 18; Keith, 1; Kemp, 4, 7; Kummel, 48; Lewis, J. V., 1, 3, 4; Merrill, 6; Newhouse, 1; Pierce, 1; Van Zwaluwenberg, 1; Weed, 1, 2, 3, 4; Whitney, J. D., 1; Woodward, H. P., 1; Anonymous, 10.

Iron: Newhouse, 1.

Manganese: Harder, 1; Williams, 2.

Stone: Akerly, 1; Cook, 71; Hawes, 2; Johnson, M. E., 5; Lewis, J. V., 10; Merrill, 6; Russell, 5.

Zinc: Cook, 42.

Geology, general: Moldenke, 1; Pierce, 1.

Geophysics:

Gravitational measurements and stations: Woollard, 7.

Magnetism and magnetic surveys: Locke, 1; Woollard, 7.

Seismic explorations: Ewing, 1; Woollard, 1.

Glacial geology, depositional features: Russell, 7; Wright, A. A., 1.

Mineralogy.

Mineral groups, general: Cozens, 1; Fenner, 4; Hawkins, 1, 3, 6, 8, 13; Hunt, J. H., 1, 2; Kunz, 2; Levinson, 2; Lewis, 12; Manchester, 1; Newhouse, 1; Northup, 1; Nuttall, 1; Pierce, 1; Valiant, 1; Vanartsdalen, 1; Woodward, H. P., 1.

Native elements: Chester, 4; Darton, 7; Lewis, 16; Woodward, H. P., 1.

Borates: Darton, 2.

Borosilicates: Tomlinson, 1.

Carbonates: Diegman, 3; Hawkins, 15; Hoadley, 2; Rogers, A. F., 2, 3; Whitlock, 1, 2, 4.

Hydrocarbons: Russell, 2.

Oxides: Moses, 3; Reamer, 1.

Silicates: Bates, 1; Beck, 3; Bowen, 1; Brown, 1; Butler, 1; Clarke, 3; Dana, E. S., 1; Fenner, 5, 6, 8; Glenn, 1, 2; Grenzig, A. J., 1; Hawkins, 18; Hess, 1; Leeds, 2; Martin, 2; Rogers, 5; Wherry, 1, 3; Whitney, 2; Whitlock, 3.

Sulphates: Fenner, 5; Hawkins, 16, 18; Schaller, 5; Wherry, 1; Wilson, E. H., 1.

Sulphides: Lewis, 14; Wherry, 4; Whitlock, 5.

Zeolites: Beck, 3; Bourne, 1; Fenner, 4; Gordon, S. G., 1; Hawkins, 13; Hunt, J. H., 2; Manchester, 1; Moses, 1; Schaller, 2, 4; Whitlock, 3; Anonymous, 31.

Triassic Period—Continued.

Mineralogy—Continued.

Mineral localities.

Bergen Hill: Bates, 1; Beck, 3; Bourne, 1; Dana, E. S., 1; Darton, 2; Kunz, 2; Manchester, 1; Rogers, 5; Wherry, 4; Whitlock, 3.

Bound Brook: Beck, 3; Hawkins, 8.

Great Notch: Fenner, 5, 6; Gordon, S. G., 1; Papke, 1; Schaller, 4; Wilson, E. H., 1.

Hoboken: Cozens, 1; Leeds, 2; Rogers, A. F., 3.

Hopewell: Lewis, 14.

Millington: Hawkins, 3.

New Brunswick: 18.

North Plainfield: Hawkins, 3, 15.

Paterson and West Paterson: Bates, 1; Beck, 3; Canfield, 4; Casperson, 2; Fenner, 5, 6, 8; Glenn, 2; Gordon, S. G., 1; Grenzig, A. J., 1; Hawkins, 11, 13; Hoadley, 2; Hunt, J. H., 1, 2; Lewis, 14; Papke, 1; Pierce, 1; Schaller, 2, 3, 4, 5, 7; Valiant, 1; Wherry, 3; Whitlock, 1.

Plainfield: Hawkins, 1.

Rocky Hill: Clarke, 3.

Schuyler: Darton, 7; Hawkins, 3.

Short Hills: Glenn, 1.

Somerville: Bowen, 1.

Snake Hill: Perry, 1.

Upper Montclair: Moses, 1, 3; Schaller, 4.

Weehawken: Martin, 2; Rogers, 5.

Paleontology.

General: Cook, 71.

Indeterminate remains.

Footprints: Cope, 7, 22; Edwards, 4; Eyerman, 1, 2; Gratacap, 1; Nason, 1; Newberry, 4, 11; Redfield, 5, 6; Woodworth, 1.

Trails: Abel, 1, 2; Caster, 1.

Plants, general: Berry, 7; Hollick, 9, 10; Lewis, H. C., 4; Newberry, 11.

Thallophyta: Edwards, 2.

Pteridophyta: Newberry, 12.

Spermatophyta: Newberry, 12.

Animals.

Mollusca: Conrad, 11.

Chordata, Pisces: Eastman, 1, 2; Gale, 1; Gratacap, 1; Newberry, 4, 5, 11, 12; Redfield, 1, 3, 4, 5, 6, 9, 10; Shænin, 1.

Reptilia: Cope, 2, 10; Edwards, 4; Gilmore, 1; Huene, 1; Rapp, 1.

Petrology.

Igneous rocks.

Extrusive rocks, basalt: Bascom, 3; Bayley, 4; Darton, 9, 14; Davis, 1, 2; Fenner, 1, 3, 4; Hawkins, 9; Iddings, 1; Kummel, 7, 9; Lewis, 9, 12, 13; Russell, I. C., 1; Schweitzer, 3; Weed, 2.

Intrusive rocks.

Diabase: Andreae, 1; Bascom, 3; Bayley, 4; Butler, 1, 2; Dana, 4, 5; Darton, 8, 9, 14; Davis, 2; Hawes, 1; Hopcock, 1; Irving, 1, 2; Kummel, 7, 9; Lewis, 8, 9, 12; Newberry, 1; Soeman, 1; Tomlinson, 1; Walker, 1, 2; Wurtz, 4.

Triassic Period—Continued.

Petrology—Continued.

Igneous rocks—Continued.

Intrusive rocks—Continued.

Dike rocks: Davis, 1; Hawkins, 9; Phillips, 1.

Trap (unclassified): Levison, 2; Nason, 1.

Metamorphic rocks, hornfels: Andrese, 1; Darton, 4; Irving, 2; Kummel, 7, 9; Lewis, 9.

Sedimentary rocks.

General: Raymond, 2; Russell, 8.

Argillite: Hawkins, 4; Kummel, 7.

Conglomerates: Fenner, 1; Kummel, 7, 9; Nason, 1, 3.

Sandstone: Dana, 3; Darton, 3; Davis, 2; Fenner, 1; Finch, 2; Kummel, 7, 9; Lewis, 9; Nason, 1; Newberry, 1; Schweitzer, 1, 2, 3; Sosman, 1; Wurtz, 4, 5.

Shales: Fenner, 1; Kummel, 7, 9; Nason, 1; Schweitzer, 3; Sosman, 1.

Sedimentary Rocks—Continued.

Sedimentary features.

Mud cracks: Hawkins, 4.

Rain drops and hail prints: Gratacap, 1; Lyell, 2; Redfield, 4, 5, 6, 7.

Ripple marks: Gratacap, 1; Redfield, 5.

Soils, composition: Salisbury, 18.

Stratigraphy.

Triassic: Akerly, 1; Bascom, 3, 5; Bayley, 4; Cook, 7, 17, 71, 95, 103, 114, 181, 140; Cozzens, 1; Credner, 1, 2, 4; Darton, 14; Fenner, 2; Finlay, 1; Fluhr, 1; Hawkins, 4; Hayes, A. O., 1; Hobbs, 1; Kalm, 1; Kummel, 2, 3, 7, 8, 9, 26, 50, 78; Larson, 1; Lewis, J. V., 5, 11; Ludlum, 1; Lyman, 2, 3; MacClure, 1; Marsh, 12; Mather, 1; Mawby, 1; Merrill, 6; Messler, 1; Nason, 1, 3, 5; Redfield, 8; Russell, 3, 5, 8, 9; Salisbury, 17; Schöpf, 1.

Streams and surface drainage, water gaps and wind gaps: Hubbert, 1.

Structural geology.

Local structures.

Dikes: Darton, 9; Hawkins, 9; Rogers, H. D., 3.

Faults: Casperson, 3; Cook, 71, 95, 103, 140; Darton, 9; Davis, 2; Fenner, 1; Fluhr, 1; Hawkins, 17; Kummel, 4; Lewis, J. V., 2; Lyman, 1; Merrill, 6; Stose, 2; Wheeler, 1; Woollard, 1.

Folds: Davis, 2; Lewis, J. V., 2, 7.

Sheets and sills: Cook, 95; Darton, 9, 14; Davis, 2; Fenner, 1; Iddings, 1; Irving, 2; Johnson, 11; Julien, 2; Kummel, 14; Lewis, J. V., 2, 7, 9; Merrill, 6; Nason, 5; Walker, 1, 2; Wurtz, 4.

Stocks: Cook, 95; Merrill, 6.

Minor structures.

Columnar jointing: Cook, 95, 114; Darton, 9; Davis, 2; Heilprin, 2; Iddings, 1; Lewis, 9; Merrill, 6.

Unconformities: Lewis, 7.

Regional features, Triassic basin: Cook,

95; Darton, 14; Davis, 1; Lewis, 7; Lyman, 3; Merrill, 6; Russell, 4; Stose, 2; Wheeler, 1.

Vulcanism: Darton, 14.

Triassic Period—Continued.

Water supply.

Artificial recharge: Barksdale, 11.

Ground water, general: Critchlow, 3; Twitchell, 11.

Wells: Cook, 74, 82, 124; Knapp, 3; Kummel, 27, 34, 72; N. J. S. W. P. C., 5; Silliman, 1; Upson, 1; Vermeule, 23; Woolman, 9, 13, 16, 17, 19, 20.

Weathering: Raymond, 2.

Trilobites. See Paleontology: animals, *arthropoda*.

Tunnels. See Engineering geology.

Union County.

Climate and weather.

Precipitation: Critchlow, 4; Smock, 4.

Tables: Smock, 8.

Conservation and development.

Forestry: Cook, 118.

Reclamation of land, Newark Meadows: Vermeule, 12, 14, 19.

Economic geology.

Localities.

Mines, general: Honeyman, 1; Woodward, H. P., 1.

Quarries: Johnson, M. E., 1; Kummel, 7; Lewis, 10; Parker, 10; Sanford, 2; Schrader, 1.

Materials, general: Sanford, 2; Schrader, 1; Twitchell, 2.

Clay: Johnson, M. E., 1; Jenkins, 3, 5; Ries, 2.

Copper: Apgood, 1; Honeyman, 1; Kalm, 1; Woodward, H. P., 1.

Peat: McCourt, 1; Parmelee, 2; Soper, 1.

Sand and gravel: Lewis, J. V., 5.

Stone: Hawes, 2; Kummel, 7, 60; Lewis, 10.

Floods and flood control, Passaic watershed: Hamilton, W. I., 2; Vermeule, 33.

Geodesy.

Bench marks: Cook, 136; Plummer, 1; Vermeule, 15, 29, 30; Anonymous, 22, 24.

Boundaries: N. J. B., 1, 5, 6.

Surveying: Bowser, 5; Cook, 127; Vermeule, 15; Anonymous, 23.

Geophysics, magnetism and magnetic surveys: Vermeule, 2, 15.

Glacial geology.

Depositional features: Kummel, 75; Salisbury, 28.

Glacial lakes, ponds, and rivers, Lake Passaic: Kummel, 75; Salisbury, 3, 6.

Mineralogy.

Mineral groups, general: Canfield, 1; Sanford, 2; Schrader, 1.

Carbonates: Whitlock, 2.

Hydrocarbons: Russell, 2.

Mineral localities, general: Canfield, 1.

Plainfield: Canfield, 1; Manchester, 2; Valiant, 3; Whitlock, 2.

Paleontology, plants, *Thallophyta*: Edwards, 1.

Petrology, sedimentary rocks, rock types, gravel: Campbell, 1.

Soils, chemical composition: Blair, 6; Patrick, 3.

Stratigraphy; Triassic: Merrill, 6.

Quaternary: Campbell, 1.

Water supply.

Ground water, wells: Cook, 98; Critchlow, 4; Darton, 12, 18; Fuller, 1, 2; Kummel,

Union County—Continued.

Water supply—Continued.

Ground water—Continued.

27, 54; N. J. S. W. P. C., 5; Smock, 9; Tribus, 1; Upson, 1; Woolman, 9, 13, 16, 17, 18, 19, 20.

Mineral content: Collins, 1.

Surface water, general: Collins, 1; Cook, 53, 98, 142; Critchlow, 1; Croes, 1; Grover, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28; Hamilton, W. L., 1, 3; Hartwell, 1; Hazen, 1; Moore, 3; N. J. S. W. P. C., 1, 2, 5; Parker, G. L., 1, 2, 3; Paulsen, 1; Vermeule, 7, 26.

Stream gauging and gauging stations: Critchlow, 1; Grover, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28; Hartwell, 2; Parker, G. L., 1, 2, 3; Paulsen, 1.

Water fluctuations: Critchlow, 4.

Upper Montclair. See Essex County; Mineralogy: mineral localities.

Varves. See Petrology: sedimentary rocks, sedimentary features.

Vertebrates. See Paleontology: Animals, *Chorodata*.

Vulcanism: Akerly, 1; Apgood, 1; Bayley, 4; Cook, 95; Darton, 8, 9, 14; Davis, 2; Fenner, 1, 3, 4; Hellprin, 2; Iddings, 1; Kummel, 7, 9; Larison, 1; Lewis, J. V., 2, 5, 7, 9, 12, 13; Mawby, 1; Merrill, 6; Miller, R. L., 1; Moldenke, 1; Nason, 5; Redfield, 3; Russell, 3; Stephenson, 3; Wherry, 1.

Walkkill Basin. See Conservation and Development: reclamation of land.

Warren County.

Climate and weather, tables: Smock, 6.

Conservation and development, reclamation of land, Pequest Basin: Bowser, 2; Cook, 16, 26, 30, 40, 47, 50, 55, 63, 67, 75, 83, 90, 99, 109, 117, 126, 133, 139; Howell, G. W., 1, 2.

Economic geology.

Localities.

Mines, general: Bayley, 3, 4, 6; Cook, 29, 31, 35, 42, 78, 93, 102, 121, 129; Day, 2; Hughes, 2, 3; Jenkins, 1; Nason, 7; O'Hara, 1, 2; Sanford, 2; Schrader, 1; Williams, A., 1.

Oxford: Barber, 1; Bayley, 3, 4, 6; Bishop, 1; Cook, 17, 35, 88, 73, 85, 93, 102, 111, 121, 129; Cummins, 1; Gordon, T. F., 1; Hamilton, S. H., 3; Honeyman, 2; Jenkins, 1, 2, 7; Kitchell, 6; Kummel, 12, 18, 21; Nason, 2, 7; O'Hara, 1, 2; Putnam, B. T., 1; Ridgway, 1; Rogers, H. D., 1; Scranton, 1; Smith, L. L., 1; Smock, 15, 19.

Pahaquarry: Barber, 1; Bond, 1; Cook, 17; Cummins, 1; Hamilton, S. H., 3; Honeyman, 2; Keith, 1; Kummel, 36, 51, 53; Parker, 7, 9, 11; Shampansore, 1; Shuster, 1; Smock, 19; Snell, 2; Twitchell, 1; Weed, 4; Woodward, H. P., 1.

Washington: Bayley, 3; Hughes, 2, 3; Johnson, M. E., 6, 10; Pehrson, 1.

Quarries: Cook, 31, 88; Hamilton, S. H., 2; Hawes, 2; Johnson, M. E., 3, 7, 9; Kummel, 15; Lewis, 10; McCourt, 3;

Warren County—Continued.

Economic geology—Continued.

Localities—Continued.

Quarries—Continued.

Parker, 10, 12; Peck, 1; Sanford, 2; Schrader, 1; Smock, 19; Anonymous, 16, 17.

Materials, general: Day, 2; Sanford, 2; Schrader, 1; Twitchell, 2; Williams, A., 1.

Cement: Bayley, 6; Cummins, 1; Day, 6; Eckel, 1, 2, 3; Hamilton, S. H., 2; Johnson, M. E., 3, 4, 7, 9; Kummel, 15, 45, 51, 53, 60, 66; Lewis, F. H., 1; Peck, 2; Smock, 19; Twitchell, 1, 2, 3, 4, 5, 6, 8, 9, 10, 12; Anonymous, 16, 17.

Clay: Jenkins, 3, 5; Johnson, M. E., 1; Kummel, 26; Ries, 2; Smock, 19.

Copper: Barber, 1; Cummins, 1; Dickenson, 3; Hamilton, S. H., 3; Honeyman, 2; Keith, 1; Kummel, 36, 51, 53; Parker, 7, 9, 11; Shampansore, 1; Shuster, 1; Smock, 19; Twitchell, 1; Weed, 4; Woodward, H. P., 1.

Graphite: Cook, 36.

Iron: Barber, 1; Bayley, 3, 6; Bishop, 1; Boyer, Charles Shimer, 1; Cook, 20, 29, 31, 35, 42, 68, 73, 78, 93, 97, 102, 111, 120; Cummins, 1; Fackenthal, 1; Gordon, T. F., 1; Hamilton, S. H., 3; Honeyman, 2; Hughes, 2, 3; Jackson, 9; Jenkins, 1, 2, 7; Johnson, M. E., 6, 10, 13; Kiessling, 9; Kitchell, 6; Kummel, 12, 18, 21, 30, 43, 60; Nason, 7; Needham, 1, 2; O'Hara, 1, 2; Pehrson, 1; Putnam, B. T., 1; Raun, 1; Ridgway, 1; Scranton, 1; Shampansore, 1; Shore, 1; Smock, 15, 19; Twitchell, 1, 9, 10; Anonymous, 4.

Lime: Bayley, 6; Cook, 12, 31, 73, 97; Kummel, 60.

Mineral wool: Van Voorhis, 1.

Peat: Bayley, 4; Kummel, 41; McCourt, 1, 2; Parmelee, 2; Soper, 1; Twitchell, 8, 9, 12.

Sand and gravel: Johnson, M. E., 1, 3; Kummel, 31.

Silver: Smock, 19.

Stone: Bayley, 6; Cook, 31, 88; Eckel, 2; Kummel, 33; Lewis, 10; McCourt, 3; Smock, 19; Twitchell, 1, 2, 8, 10, 12.

Talc and soapstone: Kummel, 60; Peck, 1, 2; Smock, 19; Twitchell, 3, 8, 10, 12.

White marl: Cook, 56; Eckel, 3; Kummel, 15; Van Voorhis, 1.

Zinc: Cook, 99.

Engineering geology, canals: Cummins, 1.

Floods and flood control, Delaware watershed: Vermeule, 20.

Geodesy.

Bench marks: Cook, 87, 136; Plummer, 1; Vermeule, 15, 29, 30.

Surveying: Bowser, 2, 5; Cook, 89, 127; Vermeule, 15; Viele, 2; Anonymous, 23.

Geophysics, magnetism and magnetic surveys: Cook, 68; Vermeule, 2, 15; Anonymous, 23.

Glacial geology, general: Salisbury, 23.

Depositional features: Salisbury, 1, 28; Ward, F., 1, 2, 3; Wright, A. A., 1.

Erosional features: Salisbury, 1; Ward, 2, 3.

Warren County—Continued.
 Glacial geology—Continued.
 Glacial lakes, ponds, and rivers, general:
 Salisbury, 10.
 Mineralogy.
 Mineral groups, general: Canfield, 1; Day,
 2; Sanford, 2; Schrader, 1; Seymour,
 1; Valiant, 2; Westgate, 2; Williams,
 A., 1.
 Native elements: Eyerman, 2; Smock, 19.
 Oxides: Roepper, 1.
 Sulphides: Eyerman, 2.
 Mineral localities, general: Canfield, 1;
 Day, 2; Schrader, 1; Seymour, 1;
 Williams, A., 1.
 Jenny Jump Mountain: Canfield, 1;
 Chester, 4; Manchester, 2; Sanford, 2;
 Schrader, 1; Seymour, 1; Valiant, 2, 3;
 Westgate, 2.
 Oxford: Chester, 4; Manchester, 2;
 Valiant, 3.
 Phillipsburg: Canfield, 1; Sanford, 2;
 Schrader, 1; Seymour, 1; Valiant, 3.
 Washington: Valiant, 3.
 Paleontology.
 Animals, general: Kindel, 1.
Mollusca: Baker, F. C., 1, 2; Leidy, 1.
Arthropoda: Weller, 1.
Chordata, Mammalia: Baker, 2; Max-
 well, 1; Scott, 1, 2, 3.
 Petrology.
 Igneous rocks.
 Intrusive rocks.
 Diabase: Westgate, 3.
 Dike rocks: Westgate, 3.
 Metamorphic rocks.
 Gneiss: Westgate, 3.
 Marble (crystalline limestone): Kum-
 mel, 33; Westgate, 1, 2, 3.
 Serpentine: Peck, 1.
 Sedimentary rocks.
 Till: Ward, 3.
 White marl: Cook, 56.
 Sedimentary features, geodes: Manley, 1.
 Soils, composition: Blair, 1, 4, 8; Cook, 62,
 72; Jennings, 1; Patrick, 2.
 Stratigraphy, general: Snell, 2.
 Pre-Cambrian: Bayley, 4; Emmons, E., 1;
 Nason, 8; Westgate, 1, 3.
 Cambrian: Bayley, 4; Emmons, E., 1;
 Ludlum, 1; Nason, 8, 9; Weller, 1;
 Westgate, 1.
 Ordovician: Bayley, 4; Ludlum, 1.
 Triassic: Salisbury, 17.
 Quaternary: MacClintock, 4.
 Streams and surface drainage.
 Drainage history: Walter, 1.
 Lakes, ponds, swamps: Vermeule, 3, 8, 15.
 Water gaps and wind gaps: Cummins,¹ 1;
 Stose, 1; Walter 1.
 Structural geology.
 Local structures.
 Faults: Peck, 1.
 Folds: Peck, 1.
 Water supply.
 Ground water, wells: Fuller, 1, 2; Kum-
 mel, 54; N. J. S. W. P. C., 5; Wool-
 man, 13, 16, 17, 20.
 Mineral content: Collins, 1.
 Surface water, general: Babb, 1, 2, 3;
 Barrows, H. K., 1, 2, 3; Collins, 1;

Warren County—Continued.
 Water Supply—Continued.
 Surface water—Continued.
 Cook, 98; Critchlow, 1; Grover, 3, 5,
 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21,
 22, 23, 24, 25, 26, 27, 28; Hartwell, 1;
 N. J. S. W. P. C., 5; Parker, G. L.,
 1, 2, 3; Paulsen, 1.
 Stream flow: Cook, 139.
 Stream gauging and gauging stations:
 Babb, 1, 2, 3; Barrows, H. K., 1, 2, 3;
 Critchlow, 1; Grover, 1, 2, 3, 5, 7, 8,
 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20,
 21, 22, 23, 24, 25, 26, 27, 28; Hartwell,
 2; Parker, G. L., 1, 2, 3; Paulsen, 1.
 Weathering: MacClintock, 4; Ward, 3.
 Washington mine. See Warren County; Econ-
 omic geology: mines; Mineralogy: min-
 eral localities.
 Watching Mountains. See Petrology: igneous
 rocks, extrusive, basalt; Structural geol-
 ogy: sheets and sills; vulcanism.
 Water gaps. See Streams and surface drainage.
 Water supply.
 Artificial recharge: Barksdale, 11.
 Ground water, general: Barksdale, 2, 7;
 Cook, 66, 74, 82, 98, 116, 124, 132;
 Critchlow, 3; Croes, 1; Darton, 12, 13,
 14; Fuller, 1, 2; Hazen, 1; Johnson,
 M. E., 7, 9; Knapp, 3, 4; Kummel, 27,
 54, 72, 78; La Forge, 1; Lewis, 11; N. J.
 S. W. P. C., 5; Peale, 1; Sanford, 1;
 Silliman, 1; Smock, 12; Thompson, 1, 2,
 3, 4, 5, 6; Tribus, 1; Twitchell, 11;
 Vermeule, 4, 5, 7, 8, 17, 23, 26; Wool-
 man, 2, 3, 4, 5, 6, 7, 9, 10, 15, 16, 17, 18,
 19, 20; Anonymous, 19.
 Wells: Barksdale, 1, 2, 3, 4, 5, 6, 8, 9, 10;
 Bascom, 1, 2, 3; Bayley, 4; Cook, 4, 48,
 66, 74, 82, 98, 99, 105, 116, 124, 132,
 133, 142; Critchlow, 2, 3, 4; Croes, 1;
 Darton, 11, 12, 13, 14; Fuller, 1, 2;
 Hamilton, W. I., 1; Johnson, D. W., 7;
 Johnson, M. E., 2, 4, 8, 10, 13; Knapp,
 3, 4; Kummel, 27, 54, 65, 68, 72; Morse,
 1; N. J. S. W. P. C., 5; Peale, 1; Rus-
 sell, 5; Sanford, 1; Schaefer, 1; Schöpf,
 1; Silliman, 1; Smith, T. P., 1; Smock,
 8, 9, 12; Spencer, 4; Thompson, 1, 3, 4,
 5, 6; Tribus, 1; Twitchell, 11; Upson,
 1; Vermeule, 4, 9, 23, 26; Woolman, 1,
 2, 3, 4, 5, 6, 7, 10, 13, 16, 17, 18, 19,
 20, 21.
 Mineral content: Barksdale, 2, 5; Burch-
 ard, 1, 2, 3; Collins, 1; Cook, 17, 48, 53,
 74, 82, 98, 105, 116, 124, 142; Croes, 1;
 Darton, 11; Day, 2, 4, 5, 6, 7, 8, 11, 13,
 15, 17, 19, 20, 21, 22, 23, 24, 25, 26;
 Dole 1; Hartwell, 1; Katz, 1, 2, 4;
 Kummel, 51, 57, 60, 66; Loughlin, 1;
 Mansfield, 5; Mitchell, 3, 4; Moore, 3;
 Morse, 1; Myers, 2, 3, 4; N. J. S. W.
 P. C., 2; Parker, E. W., 2, 4, 6, 8, 10,
 12, 14; Peale, 1; Pierson, 1; Platt, I. H.,
 1; Sanford, 1; Smith, T. P., 1; Stone,
 R. W., 1, 2, 3; Thompson, 1, 3, 4, 5, 6;
 Twitchell, 1, 2, 3, 4, 5, 7, 8, 9, 10; Ver-
 meule, 8, 9, 23; Ward, J. D., 1.
 Surface water, general: Babb, 1, 2, 3; Barks-
 dale, 2; Barrows, H. K., 1, 2, 3; Bascom,
 2, 3; Bayley, 4; Collins, 1; Cook, 17, 46,

Water supply—Continued.

Surface water, general—Continued.

48, 53, 66, 83, 98, 99, 115, 132, 133, 142; Critchlow, 1, 2, 3; Croes, 1; Doie, 1; Grover, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28; Hamilton, W. I., 1, 3, Hartwell, 1, 2; Hazen, 1; Hollister, 1; Horton, 1, 2; Hoyt, 1; Johnson, 13; Kummel, 65, 67, 68, 69, 70, 71; La Forge, 1; Leighton, 1, 2; Merrill, 6; Moore, 3; Newell, 1, 2, 3; N. J. S. W. P. C., 1, 2, 4, 5; Parker, G. L., 1, 2, 3; Paulsen, 1; Spencer, 4; Thompson, 2, 3, 4; Vermeule, 3, 4, 5, 7, 8, 9, 15, 16, 17, 18, 24, 26; Ward, J. D., 1; Anonymous, 19.

Stream flow: Bascom, 1; Cook, 139; Croes, 1; Hartwell, 1, 2; Hollister, 1; Vermeule, 5, 6, 8, 11.

Stream gauging and gauging stations: Babb, 1, 2, 3; Barrows, H. K., 1, 2, 3; Critchlow, 1, 2; Grover, 1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28; Hamilton, W. I., 1; Hartwell, 2; Hollister, 1; Horton, 1, 2; Hoyt, 1; Newell, 1, 2, 3; Parker, G. L., 1, 2, 3; Paulsen, 1; Vermeule, 5, 6, 7, 8.

Water power: Bascom, 1, 2; Kummel, 68; La Forge, 1; Leighton, 1; N. J. S. W. P. C., 4; Spencer, 4; Vermeule, 3, 5, 6, 7, 8, 24.

Water supply—Continued.

Water fluctuations Barksdale, 1, 2, 3, 4, 5, 6, 8, 9, 10; Critchlow, 4; Schaefer, 1; Thompson, 3, 4.

Weather. See Climate and weather.

Weathering: MacClintock, 3, 4; Salisbury, 22; Ward, 3.

Weehawken. See Hudson County; Mineralogy: mineral localities.

Wells. See Water supply: ground water.

West Paterson. See Passaic County; Mineralogy: mineral localities.

Wharton mines. See Morris County; Economic geology: localities.

White marl. See Economic geology: materials; Petrology: sedimentary rocks.

Wind gaps. See Streams and surface drainage.

Wind work.

Deposition: Bache, 2; Cook, 23; Haupt, 2; Knapp, 1; Kummel, 6; Merrill, F. J. H., 1; Russell, 5; Salisbury, 3, 4, 12, 14, 15, 17, 22, 23, 29; Woodman, 1, 3.

Erosion: Berry, 19; Johnson, D. W., 3; N. J. S. W. P. C., 1, 6.

Storms (hurricane and tornado): Bache, 1; Beck, 1; Clayton, 1; Cook, 84; Espy, 1; Hare, 1, 2; Johnson, D. W., 3; Johnson, W. R., 1; Kummel, 49; Redfield, 2.

Zeolites. See Mineralogy: mineral groups.

Zinc. See Economic geology: materials.