U. S. DEPARTMENT OF THE INTERIOR

FORTY-SIXTH ANNUAL REPORT OF THE DIRECTOR OF THE GEOLOGICAL SURVEY

TO THE SECRETARY OF THE INTERIOR

FOR FISCAL YEAR ENDED JUNE 30, 1925

DEPARTMENT OF THE INTERIOR
Hubert Work, Secretary

U. S. GEOLOGICAL SURVEY
George Otis Smith, Director

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1925

WASHINGTON
GOVERNMENT PRINTING OFFICE
1925

Directors of the Geological Survey

CLARENCE KING, 1879–1881
JOHN WESLEY POWELL, 1881–1894
CHARLES DOOLITTLE WALCOTT, 1894–1907
GEORGE OTIS SMITH, 1907–

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ANNUAL REPORT

OF THE

DIRECTOR OF THE GEOLOGICAL SURVEY

DEPARTMENT OF THE INTERIOR,
GEOLOGICAL SURVEY,
October 14, 1925.

SIR: The appropriations made directly for the work of the Geological Survey for the fiscal year 1925 included 10 items, amounting to $1,735,423. In addition $110,000, to be disbursed under the direction of the Public Printer, was appropriated for printing the reports of the Survey, and allotments of $10,000 for miscellaneous printing and binding and of $4,944.75 for miscellaneous supplies were made to the Survey from appropriations for the Interior Department.

A detailed statement of the amounts appropriated and expended is given at the end of this report. The balance shown is $15,175.31.

COOPERATION

Cooperation with the States and other public agencies continued as in other years. The value of the mapping and investigative work of the Survey and the necessity of expediting the completion of this physical inventory of the country's resources is now so widely recognized that 37 States as well as many counties and municipalities shared with the Federal Government in meeting the cost.

The total amount thus contributed was $739,537.94. Funds aggregating $231,208.90 were placed to the credit of the Geological Survey for services rendered to other Government bureaus and offices. Balances at the end of the year amounted to about $15,000, and the total expenditure, measuring the amount of work accomplished during the year, was $2,690,994.53.

GEOLOGY AND INDUSTRY

The "discovery" of geology during recent years by many branches of the mineral industry, notably the petroleum industry, is having a noticeable effect on geologic work in the United States. The most conspicuous immediate result has been to accent the economic applications of geology and to increase greatly the number of geologists professionally engaged in applying their science to the problems of oil discovery and mining. Early in this movement in the petroleum field the chief work was structural mapping, but with the rapid acquisition and drilling of the areas of easily recognized favorable structural conditions and the intensified struggle to find new pools the difficulties and refinements of the work have increased, and the

leaders among the oil geologists have broadened their activities and are seeking to utilize all applicable branches of geology and related sciences in their quest. There is an increasing demand for refined stratigraphic and paleontologic work. Isostatic, seismologic, and other physical methods are being applied, and the chemistry of waters and oils is investigated for any light it may throw on correlation, on the limits of pools, and on any other factors that may control or direct the search for oil.

There are comparable but less accentuated trends in other fields of economic geology. The United States has reached that point in the utilization of many of its mineral supplies where the easily discovered deposits are known and under development. It may indeed have already passed the peak of production in some of the most essential among these fundamental necessities of civilized life in its present form. The commercial world realizes this situation but dimly, if at all, but the technical staffs of the mineral industries are well aware that the task of finding reserves to keep the industries going is year by year becoming more difficult. This need stimulates the demand for any helpful information, and in this field geologic science is fundamental and its aid is being sought more and more. Furthermore, there is a growing recognition of the value of basic researches, which may throw light on the laws that control the occurrence of the useful minerals. The geologist in commercial work, though he may be finely trained and with splendid capacity, is usually so busily engaged in applying the known principles of his profession that he has little opportunity to develop new principles.

The research institutions having geologic staffs are, under these conditions, more and more expected to supply the basic geologic data needed in the development of our mineral resources. The details of small areas, such as mines or oil pools, can often be determined with entire adequacy by the practicing mining engineer or economic geologist, but accurate geologic maps of larger districts and determinations of the rock succession and the stratigraphic details, the large features of structure, the paleontology, the sources and extent of mineralization, and the rocks most likely to be affected by it—these are a few of the items in the regular work of the geologic branch that are in constant demand by geologists who are practicing their profession in the mining world.

The geologic staff of the Survey, with its associates in chemistry and physics, attempts to meet, within the limitations of men and means available, these needs of the economic group in the profession and at the same time to conduct a modicum of research for the general advancement of the science, as one of the important departments of human knowledge, which is doing its share to increase man's acquaintance with his environment, that he may adapt himself more successfully to that environment. Always, however, it is to be remembered that the pure research of to-day may find distinct application to-morrow. In this sense all the Geological Survey's work is economic.

SUMMARY OF THE WORK OF THE YEAR

The itemized summary of the principal features of the year's program of work is given below, and statements in detail may be found under the headings of the several branches of the Survey. Outstand-

ing items in the year's list of accomplishments were the continuation of exploration of Naval Oil Reserve No. 4 in arctic Alaska, the preparation for publication of the engineering results of the survey of the Colorado Canyon, and the publication of a geologic map of Wyoming. These three projects well illustrate the general purpose of all the investigative work.

The topographers and geologists in the Alaskan exploration are now filling in the largest blank space on the map and at the same time determining the degree of probability that here in arctic Alaska may be found petroleum to meet naval and other needs.

The issue, in October, 1925, of a water-supply paper on the water power and flood control of Colorado River makes available for use the results of a long series of river measurements and surveys by the Geological Survey. Projects for the control of this river and the development of its resources can now be discussed and undertaken with a knowledge of the engineering facts.

The geologic map of Wyoming, published this year, is a splendid example of map making and map printing. The knowledge of the geology of this State, largely gained through the earlier Federal surveys, has been greatly augmented in the last two decades by the detailed examinations of the public lands in the determination of their value for coal and oil, and making this general map available for the use of the many citizens who are actively engaged in the development of these resources is believed to be most opportune. Similar maps of Oklahoma and New Mexico are ready for engraving, and the whole western territory should be covered by geologic maps on the uniform scale of 8 miles to the inch. The State of Arizona, with the cooperation of the Federal Survey, has just issued such a map, and assistance has been given to Colorado and to Montana in similar projects.

WORK IN GEOLOGY

Made geologic surveys in 36 States and in Alaska, including geologic mapping, determination of stratigraphy, structure, and geologic history, and examination of mineral resources.

Cooperated with 13 States in geologic work.

Made special studies in 8 States in relation to oil and gas, in 6 States in relation to coal, in 2 States in relation to arsenic resources, and in 4 States in relation to phosphate deposits.

Continued study of the microorganisms of oil sands in connection with determination of underground structure.

Continued study of origin and distribution of oil shale and the nature of the contained organic material from which oil may be derived by distillation. Gained much information by microscopic, chemical, biologic, and botanic studies.

Completed three special field investigations in metalliferous geology in the Leadville district, Colo.; the copper region of Lake Superior; and the Mother Lode, Calif.

Prepared a geographic handbook and map of New England.

Cooperated with the Georgia Geological Survey in the publication of a report on the physical geography of Georgia; with the State of Virginia on a report on the Valley coal fields; with the State of Kansas on the geology and oil possibilities of Russell County, Kans.; and with 7 States in the preparation of their respective State geologic maps.

Cooperated with Indian Office concerning leasing of oil lands on Indian reservations, with the Forest Service in the examination of proposed extensions of national forests, and with the Bureau of Reclamation in the examination of reservoir and dam sites.

Published a new geologic map of Wyoming.

Continued investigations of potash deposits in Texas.
Revised map of oil-shale reserves in Colorado for the Navy Department.
Took over the work of the Hawaiian Volcanic Observatory.

WORK ON MINERAL RESOURCES

Cooperated with 14 States and with the Bureaus of the Census and Mines in the collection of mineral statistics.

Issued weekly reports on the production of coal, monthly reports on oil, and the usual number of annual reports.

Prepared for printing the report of the late United States Coal Commission.

Worked on a world atlas on fuel reserves.

WORK IN CHEMISTRY AND PHYSICS

Made quantitative analyses and studies of 1,386 mineral specimens and identified 3,191 specimens for the public.

Continued analyses of potash samples from wells in Texas and Utah.

Continued investigations of the porosity of oil sands.

Conducted temperature tests of the deepest well in the world, 7,700 feet, near Long Bridge, Pa.

WORK IN ALASKA

Maintained 11 field parties in Alaska during the field season.

Continued geologic and topographic mapping and investigation of the mineral resources of the Territory, making geologic surveys, including reconnaissance and exploratory, of 23,080 square miles, and similar topographic surveys of 21,900 square miles.

Continued the survey of Naval Petroleum Reserve No. 4, in northern Alaska, for the Navy Department.

Arranged with the Bureau of Aeronautics for the airplane photographing of islands of southeastern Alaska in order to expedite topographic and geologic mapping of some 18,000 square miles of difficult territory, and cooperated with the General Land Office in making topographic surveys in southeastern Alaska.

TOPOGRAPHIC WORK

Surveyed for mapping 17,323 square miles in the United States, resurveyed 529 square miles, made river-profile surveys of 857 linear miles, and ran 7,170 linear miles of primary levels.

Established 1,872 permanent bench marks, occupied 113 triangulation stations, ran 4,429 miles of primary traverse lines, and set 1,109 permanent marks.

Mapped 481 square miles in Hawaii.

Published 75 new standard topographic maps, 42 river plans and profiles, advance photolithographs of 93 new topographic maps (to be engraved later), and 88 photolithographs of new topographic maps for which publication is not otherwise provided.

Cooperated in topographic mapping with 21 States and Hawaii, 7 counties, 1 municipality, and 7 Federal bureaus.

Constructed air-route maps for the Air Service, United States Army, from New Orleans to Beaumont, Tex.; from Iowa City, Iowa, to Omaha; and from Omaha to North Platte, Nebr.

WORK ON WATER RESOURCES

Continued stream measurements at 1,715 gaging stations in the United States and Hawaii, 30 States cooperating, to determine the quantity of water available for irrigation, power, industrial, municipal, and other uses.

Conducted underground-water studies in 19 States and Hawaii.

Made 364 water analyses.

Issued monthly and annual statements on the production of electricity and consumption of fuel by public-utility power plants; also a statement on the developed water power of the United States.

Made examinations of promising dam sites covering the 100-mile section of Colorado River between Pierces Ferry and the lower end of Black Canyon, Ariz.

Made surveys of the power and irrigation value of 6 tributaries of the Colorado, and completed 12 other similar river projects.

WORK IN CLASSIFICATION OF PUBLIC LANDS

Reported on 14,421 cases arising under the administration of the public-land laws.

Classified 159,040 acres of public land as coal land, 25,640 acres as prospective oil land, and 4,690 acres as phosphate land, and made other classifications resulting in net decreases of 509,729 acres in the total area withdrawn as possible coal land, of 55,418 acres in areas withdrawn as possible oil land, and of 334,941 acres in outstanding withdrawals for phosphate.

Recommended the addition of 27,880 acres to oil-shale reserves.

Reported on 6,443 applications for permits, leases, or patents under the mineral-land leasing laws.

Recommended the addition of 520,089 acres to the power-site reserves and the elimination of 35,753 acres.

Increased the area withdrawn under the Nevada ground-water reclamation act from 1,425,060 acres to 1,550,420 acres.

Recommended designations involving 534,869 acres of land available for settlement under the enlarged-homestead acts and the cancellation of designations involving 50,274 acres.

Recommended the addition of 3,055 acres to the public water reserves and the elimination of 1,555 acres.

Recommended the designation of 1,299,897 acres as stock-raising homestead land and the cancellation of designations covering 30,396 acres.

WORK IN PRINTING AND PUBLICATION

Edited and prepared for printing 20,372 pages of manuscript, and prepared indexes for 46 publications covering 9,689 pages.

Prepared 3,099 illustrations for reproduction in reports.

Edited for engraving 58 new topographic maps, 169 maps for reprinting, and 255 other maps.

Issued 187 books and pamphlets, including 10,966 pages; 131 new or revised maps; reprinted 158 maps—the editions aggregating 512,994 copies of books, 6,740 geologic maps and folios, and 765,323 topographic and other maps, a total of 1,285,057 copies.

Printed maps, folios, charts, etc., in a total of 3,727,389 copies, in part for 36 other Federal offices.

Distributed 650,842 books, 10,027 geologic folios, and 729,154 maps, of which 612,016 maps and folios were sold for $43,430.07.

WORK BY THE DIRECTOR

In addition to his administrative duties, the Director continued his service as chairman of the President's Naval Oil Commission and served in a somewhat similar capacity as chairman of the advisory committee selected by the four Cabinet officers forming the Federal Oil Conservation Board to assist them in their general study of the petroleum problem.

As in other years, some of the points of contact between the Survey's current work and the public are indicated by the following titles of addresses given by the Director and articles published during the year:

"Needed—a program for profits," International Petroleum Congress, Tulsa, Okla., October 7.

"Report on the London power conference," American Society of Mechanical Engineers, New York, November 20.

"Our mineral resources," National Crushed Stone Association, Cincinnati, Ohio, January 3.

"Power as labor's best friend," Industrial Foremen's Dinner, Worcester, Mass., January 23.

"Energy resources," Engineers' Club of Philadelphia, February 24.

Informal talks on the energy supply before the Churchman's Club and the Lions Club of Washington.

Two press memoranda on the use of electricity on European farms, giving personal observations in connection with attendance at the World Power Conference, London.

Interview on power, New York Times, September 7.

"What the Geological Survey is doing for the mining industry," Mining Congress Journal, October.

"Conserving our petroleum supply," The Spur, January 15.

"How will man's work be done?" Colliers Weekly, March 14.

PUBLICATIONS

The publications of the year consisted of 187 books and pamphlets of the regular series (including 2 reprints), 131 new or revised maps, 158 reprinted maps, and numerous circulars, lists of publications, etc. The total number of pages in the book publications was 10,966. Brief notices of these publications and descriptions of the areas represented by the new maps are given below, with the special purpose of showing the scope and character of the investigative work of the Geological Survey. The variety of the subjects treated and the mass of the resulting volumes, requiring more than 2 feet of shelf room for the year's product, explain why requests from individuals for all that the Survey publishes are no longer complied with. It is believed, however, that the descriptive notes given here will indicate the value of each volume or map to some large class of users.

FORTY-FIFTH ANNUAL REPORT of the Director of the United States Geological Survey to the Secretary of the Interior for the fiscal year ended June 30, 1924. 85 pp., 1 pl.

A detailed account of the work of the Geological Survey during the year.

PROFESSIONAL PAPER 92. The middle and upper Eocene floras of southeastern North America, by E. W. Berry. 212 pp., 65 pls., 9 figs.

Gives the results of several years of studies of the middle and upper Eocene fossil plants of the southern Coastal Plain, supplementing Professional Paper 91, which describes and interprets the extensive floras of the lower Eocene beds of the same region. This region is physiographically unique; it rivals the Paris Basin in the unity of its geologic history, in its stability in altitude, and in the abundance of its alternating marine faunas and terrestrial floras. Because of its large size, its proximity to the American Tropics, and its long, uniform, and relatively unbroken geologic record its fossil plants also furnish unique and invaluable suggestions as to the evolution and geographic distribution of floras.

PROFESSIONAL PAPER 127. The composition of the earth's crust, by F. W. Clarke and H. S. Washington. 123 pp.

A comprehensive statement, in general and in detail, of the mineral and elemental constitution of the crust of the earth. Considers broadly the character of the earth's crust and its interior, the general features of the igneous rocks that form the largest part of the crust, and the mineral constituents of those rocks.

PROFESSIONAL PAPER 132–F. Relations of the Wasatch and Green River formations in northwestern Colorado and southern Wyoming, with notes on oil shale in the Green River formation, by J. D. Sears and W. H. Bradley. 17 pp., 2 pls. (incl. 1 map), 2 figs.

Interest in the Eocene deposits of the Rocky Mountain and Plateau provinces has been stimulated by the discovery of vast quantities of oil shale in the Green River formation of Wyoming, Colorado, and Utah. This report describes the geologic relations of the Wasatch and Green River formations in a part of this area and draws conclusions as to their source of material, mode of origin, and other pertinent features. The method and place of deposition of the Green River formation, which largely determine the relative richness of the oil shale, are clearly set forth, and measured sections of the formation, with results of tests of the oil shale, are given.

PROFESSIONAL PAPER 132–G. Discovery of a Balkan fresh-water fauna in the Idaho formation of Snake River valley, Idaho, by W. H. Dall. 9 pp., 1 pl.

Describes a small fauna that contains some remarkable European forms hitherto unknown in the Western Hemisphere.

PROFESSIONAL PAPER 132–H. The resuscitation of the term Bryn Mawr gravel, by F. Bascom. 5 pp.

Gives a brief history of the nomenclature of the deposits in eastern Pennsylvania, Delaware, and Maryland known as the Brandywine formation.

PROFESSIONAL PAPER 132–I. Origin of the boghead coals, by Reinhardt Thiessen. 20 pp., 14 pls.

The boghead coals are close-grained brownish-black to black, very tough, elastic bituminous shales. Material of this sort is very rich in organic constituents and has been used in large quantities for the manufacture of kerosene that would not have the disagreeable odor of "coal oil." This paper gives the results of a study of boghead coals from New South Wales, Scotland, Alaska, and Pennsylvania. The author concludes that they consist largely of colonies of alga-like organisms heretofore not well known.

PROFESSIONAL PAPER 132–J. Aniakchak Crater, Alaska Peninsula, by W. R. Smith. 18 pp. (incl. title-page, contents, and index to volume), 4 pls., 1 fig.

Describes a gigantic crater that resembles in many respects that which holds Crater Lake, in Oregon, though the two are of entirely different types, Crater Lake representing the so-called calderas, formed by collapse, and Aniakchak being the result of explosion.

PROFESSIONAL PAPER 134. Upper Cretaceous and Tertiary formations of the western part of the San Juan Basin, Colo. and N. Mex., by J. B. Reeside, jr., and Flora of the Animas formation, by F. H. Knowlton, 121 pp., 19 pls. (incl. 1 map), 5 figs.

The geology and paleontology of the San Juan Basin have been under study for many years, but much of the early work was of a strictly reconnaissance type and left many problems to be solved by later and more detailed observation. This paper summarizes the earlier knowledge of the stratigraphy and presents some of the results of later work that contribute to its better interpretation.

PROFESSIONAL PAPER 135. The composition of the river and lake waters of the United States, by F. W. Clarke. 203 pp.

A compilation of several thousand analyses, representing about 650 different rivers and lakes, collected during a long systematic investigation. Some of the tables are accompanied by attempts to discover relations between the waters and their lithologic origin.

BULLETIN 750–C. Observations on the rich silver ores of Aspen, Colo., by E. S. Bastin. 24 pp., 1 pl., 10 figs.

A paper giving the results of microscopic study of samples of the Aspen silver ores, which throw some light on their origin.

BULLETIN 750–D. New and known minerals from the Utah-Colorado carnotite region, by F. L. Hess. 18 pp., 8 pls.

Brief description of the new minerals vanoxite and rauvite, also of meta-torbernite, zippeite, and tyuyamunite.

BULLETIN 750–E. Deposits of magnesia alum near Fallon, Nev., by D. F. Hewett. 10 pp., 2 figs.

Describes recently discovered deposits that are of interest because the application of alum to certain hard soils in arid regions makes them more pervious to water and therefore susceptible of cultivation. Such soils exist near Fallon, and the alum can find a local market.

BULLETIN 750–F. Molybdenite in the Rocky Bar district, Idaho, by F. C. Schrader. 15 pp., 1 pl., 3 figs.

Describes several deposits of molybdenite, the chief ore mineral of the metal molybdenum, which is used in hardening steel.

BULLETIN 750–G. Bauxite in northeastern Mississippi, by E. F. Burchard. 55 pp., 3 figs.

Deposits of bauxite, a source of metallic aluminum, were recently discovered in northeastern Mississippi by a nontechnical but keen prospector who was guided in his search by a description given in a geologic report in 1861, more than a quarter of a century before bauxite was known to occur in the United States. Further prospecting has shown that the deposits contain about 1,500,000 tons. The bulk of the material is of low grade, but there are many uses for such ore. This report describes the geology of the deposits and contains many analyses, also a bibliography.

BULLETIN 750. Contributions to economic geology (short papers and preliminary reports), 1923–24, Part I, Metals and nonmetals except fuels; F. L. Ransome, G. F. Loughlin, G. R. Mansfield, and E. F. Burchard, geologists in charge. v, 148 pp., 12 pls., 30 figs.

Contains papers on rare minerals in Utah, Colorado, and Idaho, silver ores in Colorado and Utah, magnesia alum in Nevada, and bauxite in Mississippi, previously published as advance chapters.

BULLETIN 751–C. Geology and possible oil and gas resources of the faulted area south of the Bearpaw Mountains, Mont., by Frank Reeves. 48 pp., 5 pls. (incl. 2 maps), 5 figs.

Based on an investigation of the oil and gas resources of the area mentioned and a study of the faults, which are unique in extent and character. Contains maps and sections showing structure and a preliminary account of the faults. Concludes that the conditions are theoretically favorable for the occurrence of commercial accumulations and justify further test wells.

BULLETIN 751–D. Geologic structure of San Juan Canyon and adjacent country, Utah, by H. D. Miser. 45 pp., 6 pls. (incl. 1 map), 1 fig.

San Juan Canyon, in southeastern Utah, a winding chasm with close precipitous walls as much as half a mile high, is continuous for 133 miles except for short stretches of open country. This report gives data obtained during an exploration that had as its primary object the mapping and study of the river in connection with proposed power and storage projects along the San Juan and the Colorado. The San Juan oil field lies within the region studied.

BULLETIN 751–E. The Scobey lignite field, Valley, Daniels, and Sheridan counties, Mont., by A. J. Collier. 80 pp., 9 pls. (incl. 1 map), 3 figs.

Gives information concerning a lignite field covering over 2,000 square miles in the extreme northeast corner of Montana. To obtain data for classification of the public land with regard to lignite, the area was examined in considerable detail, and the information presented in the paper is correspondingly complete.

BULLETIN 751–F. The Ekalaka lignite field, southeastern Montana, by C. M. Bauer. 41 pp., 5 pls. (incl. 2 maps), 1 fig.

Presents the results of a geologic examination of an area of more than 3,000 square miles in southeastern Montana, in which lignite is the chief mineral resource.

BULLETIN 751–G. Geology and oil and gas prospects of part of Moffat County, Colo., and southern Sweetwater County, Wyo., by J. D. Sears. 57 pp., 3 pls. (incl. 1 map), 3 figs.

Covers an area of 2,800 square miles in the northwest corner of Colorado and the adjacent part of Wyoming, in which the existence of oil-saturated rocks and of well-developed domes and anticlines has drawn attention to the possibility of finding petroleum and natural gas in commercial quantities there.

BULLETIN 751. Contributions to economic geology (short papers and preliminary reports), 1923–24, Part II, Mineral fuels; K. C. Heald and W. T. Thom, jr., geologists in charge. vi, 326 pp., 37 pls. (incl. 9 maps), 25 figs.

Contains seven papers previously published in separate form, on oil or gas in Colorado, Wyoming, Oklahoma, Montana, and Utah and lignite in Montana.

BULLETIN 753. Geology and oil resources of a part of Los Angeles and Ventura counties, Calif., by W. S. W. Kew. 210 pp., 17 pls. (incl. 5 maps), 7 figs.

In the region described in this report the first petroleum used by white men in California was obtained by the padres of the early missions, who gathered tar from natural seepages. The pioneer attempt at refining was made in 1856, and from 1860 to 1900 there was considerable activity in exploiting the oil resources of this region. Within the last few years the advancing price of crude oil has stimulated a renewal of interest in the region, and some new territory has been developed. This latest work has been done acording to modern geologic principles, in marked contrast to the haphazard location of wells in the early days. A geologic report on part of this area was published in 1907, but since that time the knowledge of California geology has greatly advanced, and the present report includes results of a more recent survey.

BULLETIN 755–D. The Cold Bay-Chignik district, Alaska, by W. R. Smith and A. A. Baker. 72 pp., 5 maps, 1 fig.

Describes the geology and geography of an area on the southeast side of the Alaska Peninsula, west of Kodiak Island, gives notes on petroleum seepages and coal beds, and includes analyses of samples of the coal.

BULLETIN 755. Mineral resources of Alaska: report on progress of investigations in 1922, by A. H. Brooks and others. 239 pp., 12 pls. (maps), 2 figs.

The annual summary of the work of the Geological Survey in Alaska. Contains a sketch of the mining industry, papers on the Chitina Valley, the region traversed by the Alaska Railroad, and the Cold-Bay-Chignik district, and a list of recent Survey publications on Alaska.

BULLETIN 756. Oil and gas fields of the Lost Soldier-Ferris district, Wyo., by A. E. Fath and G. F. Moulton. 63 pp., 8 pls. (incl. 2 maps), 2 figs., 1 insert.

Most of the land in the Lost Soldier-Ferris district forms a part of the Federal domain, and this report presents the geologic findings of an examination made to obtain data for classifying the public land. The district contains six oil and gas fields. The report contains structure maps and a large correlation table for the principal Wyoming fields.

BULLETIN 757. Geology and coal resources of the Axial and Monument Butte quadrangles, Moffat County, Colo., by E. T. Hancock. vi, 134 pp., 19 pls. (incl. 1 map), 6 figs.

Describes an area of about 450 square miles that includes parts of two great coal-bearing basins—the Green River Basin on the north and the Uinta Basin on the south. The completion of the Moffat tunnel will doubtless lead to extensive exploitation of the great reserves of coal in this area. The coal resources comprise subbituminous and bituminous coal, most of which lies fairly near the surface—at depths of 900 to 1,200 feet.

BULLETIN 758. Bibliography of North American geology for 1921–22, by J. M. Nickles. 275 pp.

One of the regular series of bibliographies prepared in the Survey library. An essential tool for every worker in geology.

BULLETIN 759. Geology of the Bristow quadrangle, Creek County, Okla., with reference to petroleum and natural gas, by A. E. Fath. iv, 63 pp., 13 pls., 3 figs.

The Bristow quadrangle lies between two of Oklahoma's greatest oil fields, the Cushing and Glenn. A geologic investigation of this area disclosed two promising anticlines, and before the investigation was completed a preliminary report describing these anticlines was issued. Development work based on this report proved that the anticlines controlled good oil and gas pools, and the investigation was continued. This paper gives the results of the whole work, with additional information based on brief subsequent visits. It includes suggestions as to drilling in untested parts of the area.

BULLETIN 760–B. The physical features of central Massachusetts, by W. C. Alden. 99 pp., 17 pls. (incl. 3 maps), 11 figs.

Describes the surface features of an upland area of about 1,800 square miles. The rocks now exposed in this area must have been formed at great depths, and therefore their exposure is due to the removal of great thicknesses of overlying rock by weathering and stream erosion. This paper sets forth the later geologic history of the "worn-down mountain region" thus produced and gives special attention to the events of Quaternary time, when the region was covered with a vast sheet of ice. The clear traces of its presence left by the glacier are described and pictured, and the paper contains a topographic map showing the location of the glacial features.

BULLETIN 760–C. Erosion by solution and fill, by W. T. Lee. 17 pp., 8 pls., 5 figs.

A discussion of the removal of material by solution and its redeposition elsewhere that are common processes in a limestone region, with special reference to Carlsbad Cavern, N. Mex., an unusually large cavity, which because of its size and the splendor of its onyx decorations has been made a national monument. Contains a map and profiles of the cavern region and illustrations of some of the most striking features in the cavern.

BULLETIN 760–D. Pedestal rocks in stream channels, by Kirk Bryan. 14 pp. (incl. title-page, contents, and index to volume), 2 pls.

Describes certain "mushroom" rocks that resemble those formed by wind scour but are due to differential stream erosion.

BULLETIN 761. Molybdenum deposits, a short review, by F. L. Hess. 39 pp., 10 pls., 4 figs.

Gives an epitome of the world's larger molybdenum resources, in order that those who are interested in mining molybdenum may appraise the competition they must meet and that those who are interested in the use of molybdenum may estimate the probable supply. The largest known deposits of molybdenite, the chief mineral of molybdenum, are in the United States.

BULLETIN 762. Geology and ore deposits of the Rochester district, Nev., by Adolph Knopf. 88 pp., 4 pls. (incl. 2 maps), 5 figs.

The Rochester silver-mining district ranks second among the silver districts of western Nevada, though far below Tonopah. The ore deposits owe their value to enrichment by descending surface water and consequently are not likely to extend to great depth. This fact has set a limit to the ground in which it is worth while to search for ore. The deposits show an unusual mineralogic association, including several rare minerals. This report, besides describing the district, throws considerable new light on the geology of the Humboldt Range.

BULLETIN 763. Geology and ore deposits of the Aravaipa and Stanley mining districts, Graham County, Ariz., by C. P. Ross. vi, 120 pp., 13 pls., 8 figs.

The presence of deposits of silver, copper, and lead in the Aravaipa-Stanley region has been known for 50 years, but development has been hindered by inaccessibility and lack of capital. Improvement in conditions governing the mining industry in general will probably stimulate development in this region, and its future may be regarded optimistically. This report sets forth the geology of the region and describes the ore deposits and the mines and prospects.

BULLETIN 764. Phosphate deposits in the Wind River Mountains, near Lander, Wyo., by D. D. Condit. 45 pp., 3 pls. (incl. 1 map), 1 fig.

Beds of high-grade phosphate rock underlie many thousands of square miles in Montana, Idaho, Wyoming, and Utah. The rock has been mined at a few places, but the output has been only a small fraction of that of the United States. The gradual depletion of fertility in the wheat-producing areas is bringing closer the time when much of this land must be artificially renewed. This report describes some phosphate deposits in west-central Wyoming that lie within convenient reach of the wheat belt and are close to a main-line railway.

BULLETIN 765. Geology of the region around Lead, S. Dak., and its bearing on the Homestake ore body, by Sidney Paige. 62 pp., 11 pls. (incl. 2 maps), 19 figs.

Gives results of a study of the nature and origin of the ore body in the Homestake mine, perhaps the greatest gold mine in the world. The work was part of a more general study of the geology and mineral resources of the Black Hills. The report shows how the conclusions reached can be applied directly in the development of the ore body and the search for new ore bodies and indicates features that should be subject to further study.

BULLETINS 766–A to 766–BBB. Spirit leveling in California, 1896–1923; C. H. Birdseye, chief topographic engineer.

The results of leveling in California were published in separate leaflets, each covering one degree of latitude and longitude. Chapter A contains a general statement in regard to the work and an index map of California, and chapter BBB gives a table of secondary elevations.

BULLETIN 769. The geologic time classification of the United States Geological Survey compared with other classifications, accompanied by the original definitions of era, period, and epoch terms, a compilation, by M. G. Wilmarth. vi, 138 pp., 1 pl.

The increased emphasis given by many geologists to the results of diastrophism as the basis of stratigraphic classification has led to the proposal of several major changes in classification, but the geologists who have proposed changes have differed among themselves, so that several classifications are now current, both in the United States and in Europe. This bulletin contains a chart in which a number of these classifications are compared, quotes the original definitions of the major terms, and indicates the changes they have undergone.

BULLETIN 770. The data of geochemistry (fifth edition), by F. W. Clarke. 841 pp.

All rocks are subject to the action of various agencies which bring about chemical changes. Every such change implies a disturbance of chemical equilibrium and eventually a reestablishment of the maximum possible stability under the new conditions. To determine what changes are possible and how and when they occur, to observe the phenomena that attend them, and to note their final results are the functions of the geochemist. The literature on geochemistry is vast but widely scattered and in part difficult of access. To bring some of the data together, to formulate a few of the problems, and to present certain general conslusions in their modern form are the purposes of this memoir. The present volume is the fifth edition of this work, of which the first edition was published in 1908 and the fourth in 1920. The text has been revised and enlarged for this edition. The book has an exceptionally complete index and is of great value to all students of geology and chemistry.

BULLETIN 772. A reconnaissance of the Point Barrow region, Alaska, by Sidney Paige, W. T. Foran, and James Gilluly. v. 33 pp., 9 pls. (incl. 1 map), 4 figs.

Report on an expedition made in 1923 as a part of the plan to search Naval Petroleum Reserve No. 4 for evidence of petroleum. The project originated with the Department of the Navy, which supplied the funds for carrying it out. The expedition surveyed two large oil seepages and learned much about the geology of a belt extending from the coast 50 to 200 miles inland. The information obtained showed that further geologic exploration of the region was fully justified, and a second expedition, a report on which is now in preparation, was made in 1924, and a third in 1925. The expedition of 1923 also discovered an extensive coal field. It threw much light on the geology and physical features of more than 10,000 square miles, or nearly a third of the reserve, and obtained the information needed to plan the subsequent surveys efficiently and economically.

BULLETIN 773–A. Alaska's mineral resources and production, 1923, by A. H. Brooks; An early Tertiary placer deposit in the Yentna district, by S. R. Capps; Administrative report, by A. H. Brooks, 89 pp., 2 figs.

The twentieth annual summary of geologic work in Alaska shows that although the days of quick returns from bonanza placer mining are passed, the Alaskan mining industry is gradually being built up on a stable basis and has been especially stimulated by the completion of the Alaska Railroad and the consequent lowering of mining cost. From 1880 to the end of 1923 Alaska's mineral production amounted to $517,627,000, of which about $341,000,000 was in gold. The value in 1923 was $20,000,000. This pamphlet contains also a short report on a placer deposit where the conditions indicate a large area favorable for prospecting.

BULLETIN 773–B. Mineral investigations in southeastern Alaska, by A. F. Buddington. 73 pp., 2 pls. (maps), 5 figs.

Describes ore deposits in the Hyder district, adjacent to the British Columbia boundary; nickel-copper deposits on some of the southeastern Alaska islands; gold deposits in the Sitka, Juneau, and Ketchikan districts; copper prospects in the Juneau district; and magnetite, silver, barite, and zinc at other localities.

BULLETIN 773–C. The occurrence of copper on Prince William Sound, Alaska, by F. H. Moffit. 20 pp.

Copper deposits on Prince William Sound were staked as early as 1897, and interest grew rapidly until 1907, but unfavorable financial conditions have since reduced prospecting almost to the vanishing point. This paper sets forth the geologic relations of the deposits and includes some new material obtained from a field study in 1923. The ore bodies are mainly of low grade, and the surface exposures are a fair indication of what may be expected below.

BULLETIN 780–A. The Melrose phosphate field, Mont., by R. W. Richards and J. T. Pardee. 36 pp., 2 pls. (maps), 2 figs.

Describes the geology and phosphate resources of two areas in southwestern Montana, near the Oregon Short Line Railroad. The deposits are not as good as the beds in many parts of the Idaho fields, though they probably have some advantage over the Idaho deposits in that they are close to a potential supply of cheap acid—the smelters at Anaconda, Butte, and Great Falls.

WATER-SUPPLY PAPER 509. Surface water supply of the United States, 1919–20, Part IX, Colorado River basin; N. C. Grover, chief hydraulic engineer; Robert Follansbee, A. B. Purton, and H. D. McGlashan, district engineers. v, 269 pp., 2 pls.

WATER-SUPPLY PAPER 513. Surface water supply of the United States, 1919–20, Part XII, North Pacific slope drainage basins, B. Snake River basin; N. C. Grover, chief hydraulic engineer; G. C. Baldwin, G. L. Parker, C. G. Paulsen, A. B. Purton, and F. F. Henshaw, district engineers. 384 pp., 2 pls.

WATER-SUPPLY PAPER 514. Surface water supply of the United States, 1919–20, Part XII, North Pacific slope drainage basins, C, Lower Columbia River basin and Pacific slope drainage basins in Oregon; N. C. Grover, chief hydraulic engineer; F. F. Henshaw and G. L. Parker, district engineers. 210 pp., 2 pls.

Three of the regular reports on stream gaging, covering the two years ended September 90, 1320.

WATER-SUPPLY PAPER 516. Surface water supply of Hawaii, July 1, 1919, to June 30, 1920; N. C. Grover, chief hydraulic engineer; J. E. Stewart, district engineer. 165 pp.

Gives the results of measurements of the flow of streams in the Hawaiian Islands during the period indicated. Most of the work was done in cooperation with the Territorial Government, the Hawaiian Department of the United States Army, the city and county of Honolulu, and private persons and corporations.

WATER-SUPPLY PAPER 517. Water powers of the Great Salt Lake basin, by R. R. Woolley, with an introduction by N. C. Grover. 286 pp., 13 pls. (incl. 7 maps), 8 figs.

Contains a large amount of detailed information bearing on the power resources of the Great Salt Lake basin, which covers about 27,000 square miles in Utah, Nevada, Idaho, and Wyoming. The capacity of the 50 hydroelectric plants installed by the end of 1923 was over 225,000 horsepower. The maximum estimate of additional potential power at 65 sites investigated is 115,000 horsepower. The market for power is indicated by the statement that in or near the basin raw materials are easily accessible for extensive steel manufacture, for a colossal chemical industry, and for utilizing the by-products from a great coke industry.

WATER-SUPPLY PAPER 518. Ground water in Musselshell and Golden Valley counties, Mont., by A. J. Ellis and O. E. Meinzer. 98 pp., 5 pls. (incl. 1 map), 11 figs.

A report giving the results of an investigation made in response to a general demand for more water in a semiarid part of central Montana. Describes the rock formations and their capacity to hold and carry water, the artesian conditions, the quality of the water, the utilization of rain and surface waters, and the ground-water conditions by townships. Prepared in cooperation with the State engineer, the Department of Chemistry of the State College, and the Water Laboratory of the Montana Board of Health.

WATER-SUPPLY PAPER 519. Ground water in Santa Clara Valley, Calif., by W. O. Clark. 217 pp., 19 pls. (incl. 15 maps), 20 figs.

Report on an investigation made in cooperation with the California State Department of Engineering to estimate the quantity of ground water available annually in different parts of Santa Clara Valley and to determine how the supply can be best conserved and utilized. This valley is a region of intensive agricultural development and is one of the richest valleys in California. The famous Santa Clara prunes form the leading crop, and apricots are also grown in large quantities. Both these crops are almost wholly dependent on ground water for irrigation.

WATER-SUPPLY PAPER 520–C. Power resources of Snake River between Huntington, Oreg., and Lewiston, Idaho, by W. G. Hoyt. 27 pp.

Sets forth the potential power in the greater part of the 200-mile stretch of Snake River that forms a portion of the boundary between Idaho and Oregon. In a part of this stretch the canyon of the Snake is deeper and narrower than the Grand Canyon at El Tovar. Estimates of power are given for sixteen undeveloped sites, some of which will no doubt be utilized in response to the demand for power arising from the increasing industrial development of the Northwest.

WATER-SUPPLY PAPER 520–D. Base exchange in ground water by silicates as illustrated in Montana, by B. C. Renick. 22 pp., 3 pls., 1 fig.

Studies of ground water in an area in east-central Montana show that the water near the surface is relatively high in calcium and magnesium, which with increasing depth are exchanged for sodium (and potassium?), the result being a natural softening of the water. This paper considers the processes involved, which appear to differ from those that produce ore enrichment or deep brines.

WATER-SUPPLY PAPER 520–E. The artesian-water supply of the Dakota sandstone in North Dakota, with special reference to the Edgeley quadrangle, by O. E. Meinzer and H. A. Hard. 25 pp., 2 pls., 2 figs.

The Dakota sandstone, with the overlying impermeable shale, forms the most remarkable artesian basin in the United States with respect to its great extent and the tremendous pressure under which the water was originally held. The first well to reach this sandstone was put down in 1882, and it is estimated that by 1923 there were about 18,000 artesian wells tapping this reservoir in North and South Dakota. The original pressure has of course greatly declined, and many of the wells have ceased to flow. This paper is based on an investigation made in cooperation with the North Dakota Geological Survey covering about 230 artesian wells in the southeastern part of the State. It sets forth a program for checking the rate of decline and conserving the existing flowing wells.

WATER-SUPPLY PAPER 520–F. Temperature of water available for industrial use in the United States, by W. D. Collins. 10 pp., 4 pls.

The importance of water supply as a limiting factor in industrial development may be determined not only by its quantity or quality but by its temperature. This paper shows the mean monthly temperature of surface water and of air at or near 20 cities for periods ranging from one year to twelve years.

WATER-SUPPLY PAPER 520–G. Some floods in the Rocky Mountain region, by Robert Follansbee and P. V. Hodges. 40 pp. (incl. title-page, contents, list of illustrations, and index to volume), 1 pl. (map), 3 figs.

Describes the principal floods that occurred in Wyoming and Colorado in 1923 and gives the results of a study of the areas in Colorado most subject to the so-called cloudburst floods, which are especially disastrous to railroads and highways.

WATER-SUPPLY PAPER 521. Surface water supply of the United States, 1921, Part I, North Atlantic slope drainage basins; N. C. Grover, chief hydraulic engineer; C. H. Pierce, C. C. Covert, O. W. Hartwell, A. H. Horton, and G. C. Stevens, district engineers. vi, 294 pp., 2 pls.

WATER-SUPPLY PAPER 523. Surface water supply of the United States, 1921, Part III, Ohio River basin; N. C. Grover, chief hydraulic engineer; O. W. Hartwell, A. H. Horton, Lasley Lee, H. E. Grosbach, W. E. Hall, and W. R. King, district engineers. vi, 316 pp., 2 pls.

WATER-SUPPLY PAPER 525. Surface water supply of the United States, 1921, Part V, Hudson Bay and upper Mississippi River basins; N. C. Grover, chief hydraulic engineer; W. A. Lamb, S. B. Soulé, H. E. Grosbach, and E. D. Burchard, district engineers. 197 pp., 2 pls.

WATER-SUPPLY PAPER 531. Surface water supply of the United States, 1921, Part XI, Pacific slope basins in California; N. C. Grover, chief hydraulic engineer; H. D. McGlashan and F. F. Henshaw, district engineers. vii, 304 pp., 2 pls.

WATER-SUPPLY PAPER 532. Surface water supply of the United States, 1921, Part XII, North Pacific slope drainage basins, A, Pacific basins in Washington and upper Columbia River basins; N. C. Grover, chief hydraulic engineer, G. L. Parker and W. A. Lamb, district engineers. 228 pp., 2 pls.

Five of the series of reports on stream gaging during the year ending September 30, 1921.

WATER-SUPPLY PAPER 535. Surface water supply of Hawaii, July 1, 1920, to June 30, 1921; N. C. Grover, chief hydraulic engineer; J. E. Stewart, district engineer.

The annual report on stream gaging in the Hawaiian Islands. Gives records obtained at about 70 stations on the four principal islands of the group.

WATER-SUPPLY PAPER 536. Surface water supply of the New-Kanawha River basin, W. Va.–Va.–N. C.; N. C. Grover, chief hydraulic engineer; A. H. Horton and G. C. Stevens, district engineers. iv, 282 pp., 2 pls.

A compilation of records of stream flow obtained at 32 gaging stations in the basin of New-Kanawha River since 1908.

WATER-SUPPLY PAPER 537. A study of coastal ground water, with special reference to Connecticut, by J. S. Brown. viii, 101 pp., 7 pls., 20 figs.

The intensive human activity concentrated along the seacoasts of the United States requires a great number of large and small water supplies, but at many places on the coast the proximity of salt water makes it difficult to obtain supplies of good quality. This paper was prepared to meet a demand for information as to the prospects of obtaining fresh water from wells sunk near the sea. It is based largely on field work on the coasts of Connecticut and Florida but contains data from many sources on coastal ground water in the United States and an annotated bibliography that includes the valuable but relatively inaccessible foreign literature.

WATER-SUPPLY PAPER 538. The San Juan Canyon, southeastern Utah, a geographic and hydrographic reconnaissance, by H. D. Miser. 86 pp., 22 pls. (incl. 1 map), 3 figs.

Report of the geographic and hydrographic phases of an exploration made in connection with proposed power and storage projects along the San Juan and the Colorado. The region trenched by the canyon, whose walls are in places half a mile high, is rough, arid, and difficult of access and has only a few score inhabitants. This paper gives a large amount of interesting information about the region, illustrated by numerous views, and a vivid description of the difficulties encountered in the reconnaissance.

WATER-SUPPLY PAPER 539. Geology and ground-water resources of Townsend Valley, Mont., by J. T. Pardee. iv, 61 pp., 2 pls., 7 figs.

Describes an area of about 600 square miles near Helena, Mont., in which farming and stock raising are the principal industries. Based on an examination made to determine whether flowing wells could be obtained on the unirrigated bench lands at the sides of the valley, where dry farming has been attempted in recent years with varying success. Concludes that although conditions favorable for artesian flow may exist in small areas, they are not general. Ground water is found in the bench lands at depths ranging from 100 to 300 feet.

WATER-SUPPLY PAPER 541. Surface water supply of the United States, 1922, Part I, North Atlantic slope drainage basins; N. C. Grover, chief hydraulic engineer; C. H. Pierce, C. C. Covert, A. W. Harrington, O. W. Hartwell, and A. H. Horton, district engineers. 264 pp., 2 pls.

One of the annual reports on stream gaging, giving results of measurements during the year ending September 30, 1922.

WATER-SUPPLY PAPER 560–A. Water power and irrigation in the Madison River basin, Mont., by J. F. Deeds and W. N. White. 32 pp., 2 figs.

Describes the basin of Madison River, at whose headwaters are the famous geysers of Yellowstone National Park. This basin yields annually more than 1,400,000 acre-feet of water that can be used for the development of hydroelectric power and for irrigation. Development within the park is prohibited by law, but the power resources of the rest of the basin are estimated at 154,000 horsepower, of which 18,000 horsepower has already been developed. About 2.1 per cent of the basin is irrigated, and about as much more is included in irrigation projects.

WATER-SUPPLY PAPER 560–B. Chemical character of ground waters of the northern Great Plains, by H. B. Riffenburg. 24 pp., 4 figs.

Covers an area extending from the eastern border of the Dakotas to the Rocky Mountain foothills and from the Canadian boundary into Wyoming and South Dakota. Based on a study of more than 1,000 published and unpublished analyses of ground water in this area.

WATER-SUPPLY PAPER 560–C. Index of analyses of natural waters in the United States, by W. D. Collins and C. S. Howard. 35 pp.

An annotated list of more than 350 published collections of analyses of natural waters, including general reports and reports relating to particular States.

MINERAL RESOURCES OF THE UNITED STATES, 1922. 3 advance chapters.

MINERAL RESOURCES OF THE UNITED STATES, 1923. 56 advance chapters.

MINERAL RESOURCES OF THE UNITED STATES, 1924. 2 advance chapters.

GEOLOGIC FOLIO 219. Central Black Hills, S. Dak., by N. H. Darton and Sidney Paige. 35 folio pages of text, 7 maps, 30 pls., 43 figs.

Description of four quadrangles (Deadwood, Rapid, Harney Peak, and Hermosa), covering an area of about 3,400 square miles in southwestern South Dakota, comprising much of the Black Hills uplift and, along its eastern margin, a wide belt of plains. The region consists largely of high forested ridges that are not well adapted to agriculture, and the chief industry is mining. The famous Homestake mine is at Lead, and other mines at Deadwood. The geology of this region is complicated and interesting. The central core of the Black Hills uplift consists of Algonkian rocks, and around it is upturned a nearly complete sequence of sedimentary formations ranging in age from Upper Cambrian to latest Cretaceous. Wind Cave, which is included in a national park, consists of extensive passages and chambers in the Pabasapa limestone, a formation of Mississippian age, in which also are Jewell Cave, a national monument, and several smaller caverns. The principal metalliferous resources of this region are the gold ores, though the gold that made the Black Hills famous in the early days was obtained from placers at Deadwood. The region contains also ores of lead-silver, tungsten, tin, and copper, together with deposits of mica, lithium, and tantalum and other minor mineral resources. In the eastern part artesian water is obtained from the Dakota sandstone.

TOPOGRAPHIC AND OTHER MAPS as follows. The maps marked with an asterisk (*) were published also with green overprint showing woodland.

Alaska

ALASKA. Scale, 1 inch=approximately 80 miles. (Map A.)

Revised edition of a base map of Alaska first published in 1909. This map does not show contours. The principal changes in the map are in the region of Katmai National Monument, in the region of Mount McKinley National Park, and on the Arctic slope, where considerable exploratory work has been done recently.

ALASKA RAILROAD—MATANUSKA COAL FIELD TO YANERT FORK: Latitude, 61° 30′ to 63° 50′; longitude, 146° 50′ to 151° 10′. Scale, 1 inch=4 miles; contour interval, 200 feet.

Topographic map of the area near the middle third of the Alaska Railroad, including the valleys of upper Matanuska River and upper Susitna River and a large part of the Mount McKinley National Park, with the peak of Mount McKinley, the highest in North America, which towers 20,300 feet above sea level.

ALASKA RAILROAD—YANERT FORK TO FAIRBANKS: Latitude, 63° 40′ to 65° 35′; longitude, 146° 40′ to 151° 20′. Scale, 1 inch=4 miles; contour interval, 200 feet.

Topographic map of the area near the northern third of the Alaska Railroad, including the Fairbanks gold mining district, near the end of the railroad; the Tolovana, Kantishna, Bonnifield, and Hot Springs district, in the Tanana basin; and the Rampart district, in the Yukon basin.

Arizona

CASA GRANDE: Latitude, 32° 45′ to 33°; longitude, 111° 45′ to 112°. Scale, 1 inch=1 mile; contour interval, 25 feet.

Map of an area in Pinal County, including on its eastern margin the town of Casa Grande, the point of departure for the famous Casa Grande ruin, about 15 miles northeast. The surface is mainly a plain that slopes from 1,470 to 1,225 feet above sea level. The highest point in the area is a summit of Double Peaks, in the extreme southwest corner, which rises 2,283 feet above sea level. The plain is well adapted to farming, lacking only an adequate supply of water. At present it receives a small amount from Gila River by the Casa Grande-Florence canal.

SIGNAL PEAK: Latitude, 32° 45′ to 33°; longitude, 111° 30′ to 111° 45′. Scale, 1 inch=1 mile; contour interval, 25 feet.

Map of an area in Pinal County, 50 miles northwest of Tucson. In the northeast corner of the area is the Casa Grande ruin, one of the best-preserved aboriginal pueblos of the Southwest, which lies within the Casa Grande National Monument. Above the monotonous plain rise two groups of mountains—the Casa Grande Mountains, in the southwestern part of the area, and a spur of the Sacaton Mountains, in the northern part. The highest peak shown, which is in the Casa Grande Mountains, stands 2,323 feet above sea level. The plain ranges in height from 1,575 to 1,370 feet. Not many years ago this plain was an uninhabited desert, but the Casa Grande-Florence canal, shown on the map, has now made it available for irrigation from Gila River. The supply of water, however, is not sufficient for its complete irrigation, and it is therefore still sparsely inhabited.

Arizona–Nevada

COLORADO RIVER: Plan and profile of Colorado River from Lees Ferry, Ariz., to Black Canyon, Ariz.-Nev., and Virgin River, Nev. Scale, 2 inches=1 mile; contour interval on land, 50 feet, on river surface, 5 feet; vertical scale of profiles, 1 inch=20 feet. 21 sheets (14 plans; 7 profiles).

Maps of that part of Colorado River that includes the Grand Canyon and a considerable stretch below it and of the lower part of Virgin River. The maps were made from surveys carried continuously along the Colorado for a distance of 356 miles and up Virgin River for 37 miles above its mouth. They show every stretch of still water and every rapid in the parts of the rivers surveyed and indicate by contour lines the slope of the cliffs on both sides for a height of 500 to 2,000 feet above the river. The surveys were made to determine the power available from these streams, and the maps show possible dam sites.

California

COMPTON: Latitude, 33° 48′ to 33° 54′; longitude, 118° 12′ to 118° 18′. Scale, 1 inch=2,000 feet; contour interval, 5 feet.

Map of an area just north of Long Beach, including the newly developed Dominguez oil field. The Dominguez Hills rise to a height of 145 feet above the surrounding plain, most of which stands less than 50 feet above sea level.

*DINUBA: Latitude, 36° 30′ to 37°; longitude, 119° to 119° 30′. Scale, 1 inch=2 miles; contour interval, 100 feet.

Map of parts of Fresno and Tulare counties, on the west slope of the Sierra Nevada, in the eastern part of San Joaquin Valley. The surface slopes from 8,140 to 300 feet above sea level, being broken by many ridges and knobs that rise from 500 to 2,000 feet above the adjacent valleys. Kings River crosses the area, but the great canyon for which this river is noted lies in the next quadrangle to the east. The valley portion of the area is thickly settled, as it is well irrigated by water from Kings River.

INGLEWOOD: Latitude, 33° 54′ to 34°; longitude, 118° 18′ to 118° 24′. Scale, 1 inch=2,000 feet; contour interval, 5 feet.

Map of a small area that includes the southwestern part of Los Angeles and the town of Inglewood. The area is crossed from northwest to southeast by a range of hills, which is highest just north of Inglewood. Northeast of these hills lies a plain at an altitude of about 130 feet, upon which Los Angeles has been built, and southeast of the hills lies a lower plain, 50 to 75 feet in altitude, on which is much of the town of Inglewood. The southwest corner of the area includes some of the sand dunes that form a characteristic feature of the coast a few miles farther west.

JAMESAN: Latitude, 36° 37′ 30″ to 36° 45′; longitude, 120° 07′ 30″ to 120° 15′. Scale, 1 inch=½ mile; contour interval, 5 feet.

Map of a small area in Fresno County, about 19 miles west of Fresno, in the bottom of San Joaquin Valley. Kings River Slough, the uppermost tributary of the San Joaquin, flows across its southwest corner. From this slough the surface rises gradually toward the northeast, from 165 to 205 feet above sea level. The most prominent features on the map are the great canals and ditches by which the water from the Sierra Nevada is carried to different parts of the valley where it is utilized for growing crops.

POINT SUR: Latitude, 36° 15′ to 36° 30′; longitude, 121° 45′ to 122°. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of an area in Monterey County, on the coast. First edition published as a photolithograph in 1918. This edition shows new data including under-water contours and revised national-forest information.

TRANQUILLITY: Latitude, 36° 37′ 30″ to 36° 45′; longitude, 120° 15′ to 120° 22′ 30″. Scale, 1 inch=½ mile; contour interval, 5 feet.

Map of a small area in Fresno County that is crossed by Kings River Slough, the outlet of Lake Tulare. From this drainage channel the surface rises gently both northeastward and southwestward, the range in altitude being about 30 feet. The lowest point in the area is about 160 feet above sea level.

VENICE: Latitude, 33° 54′ to 34°; longitude, 118° 24′ to 118° 30′. Scale, 1 inch=2,000 feet; contour interval on land, 5 feet; on sea bottom, 5, 10, and 25 feet.

Map of an area on Santa Monica Bay, extending from Santa Monica and Venice to Manhattan Beach—the seaside playground of Los Angeles. Near Venice the shore consists of a low barrier beach built across the mouth of Ballona Creek valley. Southeast of Playa del Rey the surface is a barren wilderness of sand dunes, except in El Segundo, where a town has been built around a large oil refinery. In this part of the area the shore is bordered by a great ridge of sand 175 feet high, which is separated from the dune area to the east by a parallel depression, 65 to 125 feet above sea level. This ridge and depression are supposed to have been produced by an earthquake rift. The abrupt ending of the sand dunes at the southern edge of the valley of Ballona Creek may also be the result of earth movement.

WATTS: Latitude, 33° 54′ to 34°; longitude, 118° 12′ to 118° 18′. Scale, 1 inch=2,000 feet; contour interval, 5 feet.

Map of an area in Los Angeles County, including the southern part of Los Angeles and the suburban towns of Watts, Vernon, Huntington Park, South Gate, Lynwood, Compton, and Athens. The surface is essentially a plain that slopes from about 190 to 70 feet above sea level. The southwestern part is crossed by a low ridge that reaches an altitude of 220 feet west of Athens, but from the crest of this ridge to the southwest corner of the area the surface drops to an altitude of 50 feet.

Colorado

DENVER MOUNTAIN PARKS: Latitude, 39° 30′ to 39° 45′; longitude, 105° 10′ to 105° 40′. Scale, 1 inch=1 mile; contour interval, 100 feet.

Map of an area in Jefferson, Clear Creek, and Park counties, extending from Golden and Morrison to Mount Evans and including the canyon of Clear Creek from Golden to a point a few miles above Idaho Springs, Bear Canyon from Morrison to Evergreen, and some of the famous gold-mining territory on Chicago Creek southwest of Idaho Springs. This area is a noted mountain playground of the people of Denver and is visited annually by thousands of tourists.

*ELKHEAD CREEK: Latitude, 40° 30′ to 40° 45′; longitude, 107° 15′ to 107° 30′. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of parts of Moffat and Routt counties, in the drainage basin of Yampa River, which crosses the area in a rather broad valley near its southern margin. This part of the State is a dissected upland, the surface ranging in altitude from 6,200 to 9,400 feet. The area is sparsely settled. Agriculture can be carried on only by dry-land farming, except on the flood plain of the river.

*PILOT KNOB: Latitude, 40° 30′ to 40° 45′; longitude, 107° to 107° 15′. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of an area in Routt County, 25 miles west of Steamboat Springs. Yampa River flows westward not far beyond the southern margin of the area and crosses its southwest corner. The river is about 6,350 feet above sea level; the upland north of the river rises to 9,345 feet in Quaker Mountain and to 10,500 feet in Sand Mountain. The western part of the area may be considered a plateau that is bounded on the east by an irregular escarpment nearly 2,000 feet high, which, in a general way, marks the eastern margin of the Yampa coal field. East of this escarpment the surface descends to about 7,000 feet.

YAMPA RIVER: Plan and profile of Yampa River, Colo., from Green River to Morgan Gulch. Scale, 2 inches=1 mile; contour interval on land 20 feet, on river surface 5 feet; vertical scale of profiles, 1 inch=20 feet. 5 sheets (3 plans, 2 profiles).

These sheets show the course and profile of Yampa River, a tributary of Green River, from its mouth, near the Utah-Colorado boundary, eastward to Morgan Gulch.

Hawaii

ISLAND OF LANAI: Latitude, 20° 42′ 30″ to 20° 57′ 30″; longitude, 156° 47′ 30″ to 157° 5′. Scale, 1 inch=1 mile; contour interval, 50 feet.

The island of Lanai lies just south of Molokai and is about 17 miles long, measured on its northwest axis, and about 12 miles wide. It rises steeply from the sea on the south and west sides to an altitude of 1,200 to 1,500 feet and on the north and east sides even more steeply to the ridge forming the backbone of the island, which at places stands nearly 3,000 feet above the sea. A more or less flat upland occupies much of the central part of the island, and here the larger settlements are situated. Among the many unusual features shown are the almost entire absence of surface streams, the long pipe lines, the almost harborless coast, the numerous benches and scarps that characterize the western slope of the ridge, and the striking topographic differences between the northeastern and southwestern parts of the island.

*ISLAND OF MOLOKAI: Latitude, 21° to 21° 15′; longitude, 156° 40′ to 157° 20′. Scale, 1 inch=1 mile; contour interval, 50 feet.

The island of Molokai is near the middle of the Hawaiian group, lying 8 miles northwest of Maui and 23 miles southeast of Oahu. It is 39 miles in length from east to west and averages a little less than 7 miles in width. The island is entirely of volcanic origin except the coral reefs that fringe its south side. It has no large active volcanoes, but Mauna Loa, which rises to a height of 1,381 feet, is believed to be an old volcanic cone, and the great semicircular ridge in the eastern part of the island is believed to be the southern half of a giant crater whose northern half was engulfed by the sea in prehistoric time. Kamakou, the most imposing point on this ridge, towers to a height of 4,970 feet above the sea. The most striking surface features of the island are the enormous gulches that have been cut by the streams in the northern slope of this ridge, some of them to a depth of as much as 3,500 feet. The north shore is precipitous, having been cut off sharply by the fault that split the volcano. The island contains the noted leper settlement of Kalaupapa.

*KALAPAPA: Latitude, 19° 15 to 19° 30′; longitude, 154° 45′ to 155°. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of an area at the east end of the island of Hawaii. The surface features seem to be dominated by a line of small volcanic cones that trends northeastward nearly parallel to the coast, which is 3 to 4 miles distant. From this line of cones the surface descends steeply to the sea on the southeast and more gently on the north. The highest point in the area is Heiheiahulu, near its western edge, which rises 1,710 feet above sea level. The map shows several small lava flows and many fissures in the hardened lava, which run parallel with the line of cones.

*KILAUEA: Latitude, 19° 15′ to 19° 30′; longitude, 155° 15′ to 155° 30′. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of an area on the southeastern slope of the island of Hawaii, including the famous crater of Kilauea and most of the Hawaii National Park. The surface rises from sea level in the southeast corner of the area to a height of more than 10,000 feet on the flank of the great peak of Mauna Loa, but the slope is not regular, as the young and immense cone of Mauna Loa has been built on the older and lower cone of Kilauea. The surface consists largely of lava that has flowed out of volcanic vents at different times. The most interesting feature shown on the map is the crater of Kilauea, which has a length of 2¾ miles and a width of 2 miles. The only active vent in this great basin is the crater of Halemaumau, which has a diameter of about 1,200 feet. The old cone of Kilauea is marked by a great system of cracks that run in a southwesterly direction and near the sea by cliffs that trend in the same direction, which are supposed to mark displacements or faults.

*MAKUU: Latitude, 19° 30′ to 19° 45′; longitude, 154° 45′ to 155°. Scale 1 inch=1 mile; contour interval, 50 feet.

Map of a small area at the extreme east end of the island of Hawaii, including Cape Kumukahi. The surface slopes uniformly from the coast to an altitude of 900 feet. Near Cape Kumukahi the regularity of the surface is broken by a few volcanic craters, the largest of them Kapoho Crater, which is about half a mile in diameter and rises about 400 feet above the sloping plain.

*PUNA: Latitude, 19° 15′ to 19° 30′; longitude, 155° to 155° 15′. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of a part of the southeastern slope and shore of the island of Hawaii that lies just east of the crater of Kilauea and includes a part of the Hawaii National Park. The surface rises with considerable regularity from sea level to a height of 4,000 feet at Kilauea Iki Crater, which marks the summit of the old cone of Kilauea. On this slope are the numerous craters along a line that curves eastward from the crater and the cracks and escarpments which are the eastward continuation of similar features shown on the map of the Kilauea quadrangle.

Illinois

[See also Missouri-Illinois]

*ALEXIS: Latitude, 41° to 41° 15′; longitude, 90° 30′ to 90° 45′. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of an area in Mercer and Warren counties, about 10 miles northwest of Galesburg, in the northwestern part of Illinois. The surface back from the main streams is a remarkably level plain, ranging in altitude from about 700 to 780 feet. The streams, which are parallel and flow westward to Mississippi River, have cut their valleys from 50 to 100 feet below the surface of the plain, and the side branches have to some extent dissected the plain, but it still remains a distinct physiographic feature, showing clearly that the streams have cut their valleys in comparatively recent time.

*DIVERNON: Latitude, 39° 30′ to 39° 45′; longitude, 89° 30′ to 89° 45′. Scale 1 inch=1 mile; contour interval, 10 feet.

Map of an area just south of Springfield, lying mainly in Sangamon County but including small parts of Macoupin, Montgomery, and Christian counties. The surface is very flat except where the streams have cut into the plain to a depth of 10 to 40 feet. It ranges in altitude from 600 to 650 feet The map is of particular interest to teachers of physiography, for it shows the manner in which a newly made plain is gradually dissected—how the main streams and their branches grow headward until channels are formed in all parts of the area.

*HERSCHER: Latitude, 41° to 41° 15′; longitude 88° to 88° 15′. Scale 1 inch=1 mile; contour interval, 10 feet.

Map of an area in Illinois 50 miles south of Chicago, lying mainly in Kankakee County but including in its western part narrow strips of Grundy and Livingston counties. Kankakee River crosses the northeast corner, and the surface slopes toward this stream from a maximum altitude of 800 feet to about 600 feet. The river has trenched the plain to a depth of about 50 feet and is now flowing in a narrow gorge scarcely wider than its channel.

*KANKAKEE: Latitude, 41° to 41° 15′; longitude, 87° 45′ to 88°. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of parts of Kankakee and Iroquois counties. The principal town, Kankakee, is on the Egyptian Trail, a first-class automobile road, 55 miles south of Chicago. The area is drained by Kankakee River. The surface is generally flat or gently rolling and ranges in altitude from 550 to 741 feet. The level land along the river above Kankakee is the bottom of old Lake Kankakee, and the rather wide river valley is supposed to have formed the bottom of other lakes during the Great Ice Age.

*OREGON: Latitude, 42° to 42° 15′; longitude, 89° 15′ to 89° 30′. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of parts of Kankakee and Iroquois counties. The principal town, Kankakee, upland that stands about 900 feet above sea level. In the upland the small streams have cut rather broad valleys that have gentle slopes, but Rock River, the principal stream in the area, has cut a valley that is but little wider than the stream itself, and the slopes that lead down to it from the upland are at places very steep. The drainage was evidently rearranged when the glaciers covered this region. Rock River was formed along the western margin of the ice, and its valley is narrow and steep because it is new.

*RAYMOND: Latitude, 39° 15′ to 39° 30′; longitude, 89° 30′ to 89° 45′. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of an area about 20 miles south of Springfield, lying mainly in Montgomery County but including strips in Macoupin and Christian counties. The area is remarkable for the scarcity of streams, there being only two within its borders. The surface is a very perfect plain that lies at an altitude of about 650 feet, and because of the absence of well-marked drainage ways much of the area could not be farmed until it was drained artificially.

*TAYLORVILLE: Latitude, 39° 30′ to 39° 45′; longitude, 89° 15′ to 89° 30′. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of an area about 10 miles southeast of Springfield, lying mainly in Christian County but including a part of Sangamon County. Except for the trenches 10 to 15 feet deep cut by the larger streams, the surface is an almost unbroken plain, which ranges in altitude from 590 to 620 feet. This area illustrates the development of a drainage system on a new and very level plain. The plain was formed by the great ice sheet that passed over this part of the country, grinding off all projecting points and filling up most of the depressions in the surface. Sangamon River was the first stream to establish itself after the ice melted, and its course was probably determined by its old channel, which had not been completely obliterated. The tributary streams and their branches grew headward until the present drainage pattern was developed.

Illinois–Indiana

*MOMENCE: Latitude, 41° to 41° 15′; longitude, 87° 30′ to 87° 45′. Scale, 1 inch=1 mile; contour interval, 10 feet.

Map of an area in the valley of Kankakee River, about 50 miles south of Chicago. The area lies mainly in Illinois but extends into Indiana for about 1½ miles. The northern third of the area is a rolling upland that stands about 700 feet above sea level. The remainder is a flat plain on which there are many irregular knobs and knobby ridges 10 to 30 feet high. The plain was evidently the bottom of a lake that lay in front of a glacier, and the knobs, which are arranged in more or less regular lines, indicate the position of the ice front at different stages of the retreat of the ice.

Illinois–Missouri

*ALTO PASS: Latitude, 37° 30′ to 37° 45′; longitude, 89° 15′ to 89° 30′. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of an area bordering the Mississippi River bottoms, about 40 miles north of Cairo. The western third of the area includes the bottom over which Big Muddy River flows in a sinuous course to the Mississippi, which enters the area at two places on its western edge. This bottom is very flat and is in places so swampy that it can not be farmed. The most striking feature is the prominent bluff that bounds the river bottom on the east. This bluff, known as he Pine Hills, rises abruptly 800 feet above the plain, which has an altitude of 350 to 360 feet.

*QUINCY: Latitude, 37° 30′ to 37° 45′; longitude, 91° 15′ to 91° 30′. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of the part of the Quincy quadrangle that lies east of Mississippi River, including a large part of Adams County and a small strip, about half a mile wide, of Pike County, Ill. The most interesting feature shown on the map is Mississippi River, whose tortuous channel, numerous islands, and sandbars show that the stream is at times loaded with more earthy material than it can carry. The land between the river and the bluff on the east is a typical river bottom, marked by many bodies of stagnant water that occupy abandoned channels of the river. The map shows also the artificial levees by which most of the bottom land is protected from floods and made suitable for cultivation.

Indiana

[See Illinois-Indiana]

Iowa

*MELCHER: Latitude, 41° to 41° 15′; longitude, 93° to 93° 15′. Scale, 1 inch= 1 mile; contour interval, 20 feet.

Map of parts of Marion, Monroe, and Lucas counties about 35 miles southeast of Des Moines. The surface originally consisted of a fairly regular plain ranging in altitude from 940 to 1,040 feet. In this plain the streams, which are all tributary to Des Moines River, have sunk their channels to a depth of 100 to 200 feet, leaving the surface a rolling upland with steep slopes near the streams. This is essentially a prairie region, but almost every ravine contains a scanty growth of trees.

Kentucky

[See also Tennessee-Kentucky and Tennesseee-Missouri-Kentucky]

*CUB RUN: Latitude, 37° 15′ to 37° 30′; longitude, 86° to 86° 15′. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of parts of Grayson, Edmonson, Hart, and Hardin counties, in central Kentucky. This area is hilly and rather difficult of access. It is traversed from northeast to southwest by Nolin River, which is one of the crookedest rivers in the country. The length of the river measured on a median line through its bends is about 24 miles, but the actual length measured around the bends is about 56 miles.

*FRANKFORT: Latitude, 38° to 38° 15′; longitude, 84° 45′ to 85°. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of an area in the "blue grass" region with Frankfort, the capital of the State, in its northern part. The surface consists of an upland plain, 800 to 900 feet above sea level, in which Kentucky River has cut a gorge whose walls are at many places 300 feet high and nearly vertical. The gorge winds across the area in great loops or meanders. In places the river has abandoned its old gorge by cutting off the narrow neck of the meander, leaving a loop-shaped valley with a flat floor that is poorly drained. A noted example is the abandoned meander in which the city of Frankfort stands.

*LEITCHFIELD: Latitude, 37° 15′ to 37° 30′; longitude, 86° 15′ to 86° 30′. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of an area in Grayson, Edmonson, and Butler counties. The surface is hilly, and the hills rise 100 to 400 feet above the bottoms of the adjacent valleys. The beds of rock beneath the surface nearly everywhere lie flat, and hard beds here and there form flat-topped hills and ridges. In the northern part of the area sharper ridges indicate the presence of upturned beds of rock.

Louisiana

*SAREPTA: Latitude, 32° 45′ to 33°; longitude, 93° 15′ to 93° 30′. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of part of Webster Parish and about 15 square miles of Bossier Parish. This area includes the Spring Hill-Sarepta gas field and the recently discovered oil field of Cotton Valley. The main streams flow in flat, swampy valleys a mile or more wide, and the upland is of the gently rolling type that is generally characteristic of the Coastal Plain. The altitude ranges from 160 to 420 feet. Settlement is largely confined to the well-drained parts of the upland, and probably not over 40 per cent of the area is cleared and farmed.

Maine

*LONG POND: Latitude, 45° 30′ to 45° 45′; longitude 70° to 70° 15′. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of part of Somerset County, about 15 miles west of Moosehead Lake. The surface consists generally of an upland that ranges from 1,200 to 1,500 feet above sea level, upon which stand almost conical knobs or short ridges. Bean Brook Mountain rises to a height of 2,620 feet above sea level. The country is an almost unbroken wilderness. The principal settlements and the main lines of travel are along Moose River, which crosses the area from west to east, and on Long Pond, which is an expanded part of the river. The surface of the area bears the marks of having been greatly modified by the ice sheet that passed over it in glacial time, disarranging the drainage lines, smoothing the slopes of the knobs, and dumping masses of loose material here and there.

Missouri

[See also Illinois-Missouri and Tennessee-Missouri-Kentucky]

*BRAYMER: Latitude, 39° 30′ to 39° 45′; longitude, 93° 45′ to 94°. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of an area on Missouri River, about 20 miles north of Lexington. The surface is a gently rolling upland, 900 to 1,000 feet above sea level. Into this upland Shoal Creek has cut a broad valley, the bottom of which is irregular in outline but very flat.

*CHULA: Latitude, 39° 45′ to 40°; longitude, 93° 15′ to 93° 30′. Scale, 1 inch=1 mile; contour interval, 20 feet.

The Chula quadrangle includes parts of Livingston, Grundy, and Linn counties, but only its western half is shown on the map. The surface is a rolling upland from 780 to 880 feet above sea level. The valley of Medicine Creek crosses the area from north to south. The flatness of this valley floor indicates that the flow of the stream has been arrested, causing the silt held in supension to be dropped and the valley to be "drowned" in silt.

*DAWN: Latitude, 39° 30′ to 39° 45′; longitude, 93° 30′ to 93° 45′. Scale, 1 inch=1 mile; contour interval, 20 feet.

The Dawn quadrangle includes parts of Carroll and Livingston counties, but only its northern half is shown on the map. Grand River, the largest stream in the area, crosses its northeast corner, and Shoal Creek, a tributary of Grand River, flows across it in a valley that ranges from 1 to 2 miles in width. The surface away from the streams is gently rolling and ranges in altitude from 660 to 986 feet. The valleys of both Grand River and Shoal Creek have been silted up until they are now so flat that drainage is impeded. A large drainage ditch has been cut in the valley of Shoal Creek.

*HALE: Latitude, 39° 30′ to 39° 45′; longitude, 93° 15′ to 93° 30′. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of parts of Charlton, Livingston, and Lynn counties. Only the northern half of the area bounded by the parallels and meridians indicated is shown. The area mapped is crossed by Grand River, whose valley is very flat and ranges in width from 2 to 5 miles. The upland on either side is gently rolling and ranges in altitude from 640 to 890 feet. Grand River has a very slight fall in this area. Owing to its low gradient, the river flows in a very meandering course.

*MAYSVILLE: Latitude, 39° 45′ to 40°; longitude, 94° 15′ to 94° 30′. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of an area in De Kalb County, 50 miles northeast of Kansas City. The surface consists of a rolling upland, which has little variety in any part of the area. The divide between the drainage basins of Grand River on the east and Missouri River on the west passes through this area, and on that low ridge the highest points reach an altitude of 1,060 feet.

*PERRYVILLE: Latitude, 37° 30′ to 37° 45′; longitude, 89° 45′ to 90° Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of an area in Perry, Bollinger, and Cape Girardeau counties, just west of Mississippi River and about 65 miles from St. Louis. The gently rolling surface slopes eastward from an altitude of a little more than 800 feet to about 400 feet. A belt of nearly level land in the vicinity of Perryville is characterized by a great many sink holes, showing that it is underlain by limestone, in which there are many caverns and underground channels.

*PLATTSBURG: Latitude, 39° 27′ 21″ to 39° 45′; longitude, 94° 15′ to 94° 30′. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of a part of Clinton County, about 30 miles north of Kansas City. The map has been extended about 3 miles south of the Plattsburg quadrangle, to the southerly boundary of Clinton County. The highest points are 1,080 feet above sea level; but in other parts of the area the ridges are only slightly lower, attaining about 1,060 feet.

*WINSTON: Latitude, 39° 45′ to 40°; longitude, 94° to 94° 15′. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of an area about 50 miles northeast of Kansas City, lying mainly in Daviess County, but including strips of De Kalb and Caldwell counties. The surface is a gently rolling upland, which ranges in altitude from 750 to about 1,070 feet.

Missouri–Illinois

*CAPE GIRARDEAU: Latitude, 37° 15′ to 37° 30′; longitude, 89° 30′ to 89° 45′. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of an area in southeastern Missouri, 25 miles northwest of Cairo, Ill., mainly in Cape Girardeau County. Most of the area is part of the Ozark Plateaus. The low land along the south edge belongs to the Mississippi alluvial plain.

Nevada

[See Arizona-Nevada]

New Mexico

STATE OF NEW MEXICO, topographic map. Scale, 1 inch=8 miles; contour interval, 100 meters (328 feet).

A map showing by brown contour lines the diversified configuration of the surface of New Mexico. The township subdivisions, the county boundaries, the forest and other Government reservations, and railroads, towns, and villages are shown in black; the drainage in blue. The contour lines show many notable features of the landscape that will be of interest to travelers on roads or in the air, to students of physiography, and to engineers engaged in development of railroads, automobile roads, and irrigation projects. As climate, crops, water supply, and the distribution of forests are closely related to altitude, a contour map indicates the distribution of lands suitable for various uses.

New York

*ANDES: Latitude, 42° to 42° 15′; longitude, 74° 45′ to 75°. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of an area that lies mainly in Delaware County but includes small parts of Ulster and Sullivan counties. The surface consisted originally of a high but probably rolling plateau in which East Branch of Delaware River and its tributaries have cut a network of steep-sided ravines that range in depth from 500 to 1,300 feet. The hilltop ranges from about 2,300 feet to more than 2,900 feet above sea level. The highest ridge, which lies just west of Middle Mountain, is the western end of the Catskill Mountains, which rise elsewhere to a height of 4,025 feet.

*ARCADE: Latitude, 42° 30′ to 42° 45′; longitude, 78° 15′ to 78° 30′. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of an area about 20 miles east-southeast of Buffalo, lying mainly in Wyoming County but including parts fo Allegheny, Cattaraugus, and Erie counties. The surface is an upland which ranges in altitude from 1,800 to 2,100 feet. Many of the valleys that originally crossed the area have been partly or wholly filled by boulder clay brought in by the great ice sheet that invaded this region from the north and modified the courses of the streams. At one time the ice sheet blocked Cattaraugus Creek about 20 miles west of this area, forming a lake, the upper end of which reached the site of Yorkshire, in the southwest corner of the area.

*BELMONT: Latitude, 42° to 42° 15′; longitude, 78° to 78° 15′. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of an area in Allegany County, about midway between Jamestown and Elmira, on the divide between the Mississippi and St. Lawrence drainage basins. Its northeast corner is crossed by Genesee River, whose valley, about a mile wide, is almost the only level land in the area. The rest of the area is composed entirely of hills separated by narrow valleys. If these valleys were filled the surface would be a nearly smooth plain, ranging in altitude from 2,200 to about 2,500 feet. The lowest point is in the valley of Genesee River.

*ELLICOTTVILLE: Latitude, 42° 15′ to 42° 30′; longitude, 78° 30′ to 78° 45′. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of an area about 25 miles southeast of Buffalo. The surface consists almost entirely of hills and ridges, most of them rounded and few less than 2 square miles in extent. The highest of these is McCarty Hill, which reaches an altitude of 2,304 feet. If the valleys were filled the surface would be that of a sloping, somewhat rolling plain. Such was probably its condition ages ago; then the streams cut their present valleys, leaving the hills as unreduced remnants of the old plain.

*FRANKLINVILLE: Latitude, 42° 15′ to 42° 30′; longitude, 78° 15′ to 78° 30′. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of an area 35 miles southeast of Buffalo, lying mainly in the northeastern part of Cattaraugus County but including a strip about 3 miles wide in Allegany County. The surface consists of large hills with flat or rounded summits, which stand 2,000 to 2,200 feet or more above sea level. The hills are distributed in great groups, between which there are pronounced valleys, cut 400 to 600 feet below the level of the upland. Several of the valleys cross the area from north to south, but the drainage is divided near the middle of the area, that flowing to the south finding its way into Allegheny River and that flowing to the north reaching the Great Lakes.

*SPRINGVILLE: Latitude, 42° 30′ to 42° 45′; longitude, 78° 30′ to 78° 45′. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of an area 10 miles southeast of Buffalo, lying mainly in Erie County but including a few square miles of Cattaraugus County. The surface is an upland that ranges in altitude from 1,200 to 1,800 feet. The valleys of several creeks divide the upland into large rounded hills or ridges, such as abound in a large area in the southwestern part of the State, including the Finger Lake region. The sides of the valleys were long ago smoothed by the passage of glaciers over this area; since that time the numerous minor streams that flow down these slopes have carved parallel channels until the slopes are ridged like giant washboards.

Oregon

*LEBANON: Latitude, 44° 30′ to 44° 45′; longitude, 122° 45′ to 123°. Scale, 1 inch=1 mile; contour interval, 25 feet. (New edition, showing entire quadrangle; previous edition showed only a part of the southern half.)

Map of an area in the eastern part of the Willamette Valley, just east of Albany, drained by Santiam River. The lower part of it ranges from 250 to 300 feet above sea level. Many isolated buttes and ridges rise 100 to 1,100 feet above this plain, standing out as prominent landmarks in an otherwise unbroken expanse. The highest peak in the area is Peterson Butte, 1,430 feet above sea level.

Pennsylvania

[See also West Virginia-Pennsylvania]

*DU BOIS: Latitude, 41° to 41° 15′; longitude, 78° 45′ to 79°. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of an area in Jefferson and Clearfield counties, in the bituminous coal field, about 70 miles northeast of Pittsburgh. The surface consists of a hilly upland, which ranges in altitude from about 1,800 to about 2,000 feet. Most of the area is drained by streams that flow into Allegheny River, but a few square miles is drained by tributaries of the West Branch of Susquehanna River. The lowest point in the divide between these drainage basins has an altitude of about 1,620 feet. The lowest point in the area is on Sandy Lick Creek, 1,300 feet above sea level.

* MAUCH CHUNK: Latitude, 40° 45′ to 41°; longitude, 75° 30′ to 75° 45′. Scale, 1 inch=1 mile.

Map of parts of Carbon, Monroe, Lehigh, and Northampton counties, named for the town of Mauch Chunk, which stands at the east end of the Southern Anthracite field. The area is crossed by Lehigh River, which has cut its way southeastward across the plateaus and ridges of the area regardless of their height. In some of the gaps thus cut the crest of the ridge is 1,100 feet above the stream. The highest point in the area is Stony Ridge, in the northern part, which rises 1,960 feet above sea level. The lowest point, on Lehigh River at Slatington, is 360 feet above sea level.

* MOUNT UNION: Latitude, 40° 15′ to 40° 30′; longitude, 77° 45′ to 78°. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of an area that lies mainly in Huntington and Mifflin counties. The largest town is Mount Union, which is by air line 31 miles east of Altoona and 55 miles west of Harrisburg. The most striking surface features are the great parallel mountain ridges and the long, narrow valleys between them. Jacks Mountain, which is cut by Juniata River just west of Mount Union, is the highest ridge, attaining a height of 2,360 feet in Butler Knob.

* OIL CITY: Latitude, 41° 15′ to 41° 30′; longitude, 79° 30′ to 79° 45′. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of an area that lies mainly in Venango County but includes small parts of Clarion and Forest counties. The principal town in the area is Oil City, which was the center of the petroleum industry that followed the drilling of the first oil well at Titusville, 14 miles to the north. Allegheny River crosses the northern part of the area. Near the main streams the plateau has been deeply trenched by the smaller tributaries, which flow in narrow ravines about 400 feet deep. Back from the main streams the country is a rolling plateau from 1,400 to 1,500 feet above sea level. The lowest point in the area, on Allegheny River, is a little less than 1,000 feet above sea level. The highest point is a knob just south of Powell Corners, which rises to 1,700 feet.

* STODDARTSVILLE: Latitude, 41° to 41° 15′; longitude, 75° 30′ to 75° 45′. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of part of the Pocono Plateau in Carbon, Monroe, Luzerne, and Lehigh counties, about 12 miles south of Scranton. The surface is a gently rolling plain that stands about 1,800 feet above sea level, above which many knobs and ridges rise 100 to 400 feet higher. The drainage from the plateau is carried off by Lehigh River, which crosses the area in a gorge 300 to 400 feet deep.

* TIONESTA: Latitude, 41° 15′ to 41° 30′; longitude, 79° 15′ to 79° 30′. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of an area lying mainly in Clarion and Forest counties. The surface ranges in altitude from about 1,600 feet on the west to 1,700 feet on the east. Allegheny River crosses the northwest corner of the area, and Clarion River crosses its southeast corner.

South Dakota

PIERRE: Latitude, 44° 15′ to 44° 30′; longitude, 100° 15′ to 100° 30′. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of an area in Hughes and Stanley counties, including the city of Pierre, the capital of the State. The undissected surface of the area stands about 1,800 feet above sea level. Into this plain Missouri River has cut a trench a little more than a mile wide and nearly 400 feet deep. Bad River, which enters the master stream just opposite Pierre, has cut a similar trench about half a mile wide. In the Ice Age a great glacier lay on the northeast side of the Missouri, and the part of the plain it covered was plastered over with débris gathered by the ice in its passage from regions far north.

Tennessee–Kentucky

*LILLYDALE: Latitude, 36° 30′ to 36° 45′; longitude, 85° 15′ to 85° 30′. Scale, 1 inch=1 mile; contour interval, 20 feet.

The Lillydale quadrangle is about equally divided between Tennessee and Kentucky. This map shows only the southern half of the quadrangle, which includes parts of Clay, Overton, and Picket counties, Tenn. The surface consists of an upland plateau from 900 to 1,100 feet above sea level. Above this plateau rise a number of knobs that are several hundred feet higher. The highest point in the area mapped is Pilot Knob, 1,398 feet above sea level. The plateau has been trenched so deeply and completely by the small streams draining into Obey River that but little level land remains. The most striking feature shown on the map is the deeply cut, meandering channel of Obey River.

Tennessee–Missouri–Kentucky

*REELFOOT LAKE: Latitude, 36° 15′ to 36° 30′; longitude, 89° 15′ to 89° 30′. Scale, 1 inch=1 mile; contour intervals, 5 and 20 feet.

Map of an area that lies chiefly in Lake and Obion counties, Tenn., but includes a small part of Missouri in one of the bends of Mississippi River and a very small strip of Kentucky. This area contains Reelfoot Lake, a body of water that lies in a depression caused by the New Madrid earthquake in 1812. The lake has long been noted as the haunt of great hosts of game birds. It is now owned by the State of Tennessee, and land on the banks of the lake is being purchased for a State park and game preserve. The Mississippi bottom land stands about 300 feet above sea level and is bounded on the east by the river bluff, which rises abruptly to heights of 100 to 150 feet.

Texas

*ARANSAS PASS: Latitude, 27° 45′ to 28°; longitude, 97° to 97° 15′. Scale 1 inch=1 mile; contour interval, 5 feet.

Map of an area on the coast of Texas that includes parts of Aransas, San Patricio, and Nueces counties, also the well-known Aransas Pass, which is the main water highway to the Port of Corpus Christi. Facing the open water of the Gulf of Mexico are Mustang and St. Joseph islands, which are nothing more than a narrow band of sand dunes that form part of the great barrier beach that lines most of the Texas coast. Here and there the barrier beach is cut by a narrow pass that affords a means of communication between the Gulf and the protected waters of the shallow bays. Aransas Pass is one of the most traveled of these waterways. Behind the barrier beach lie Corpus Christi Bay, Redfish Bay, and Aransas Bay and several marshy islands.

OIL AND GAS FIELDS OF THE STATE OF TEXAS. Scale, 1 inch=about 12 miles.

Map, in two sheets, showing by distinctive colors and symbols, on a new base, productive oil and gas fields, localities at which oil or gas has been produced, main pipe lines, oil refineries, and salt domes that have produced or may produce oil. Water features are printed in blue, cultural features in gray, oil fields and wells in green, gas fields and wells in red, and pipe lines, oil refineries, and salt domes in purple. The map shows the location of the Balcones fault zone.

*PETRONILLAS: Latitude, 27° 30′ to 27° 45′; longitude, 97° 30′ to 97° 45′. Scale, 1 inch=1 mile; contour interval, 5 feet.

Map of an area in the southern part of Texas, about 100 miles from Brownsville. It lies mainly in Nueces County but includes a strip, about 4 miles wide, of the northern part of Kleberg County. The surface of the area is a very smooth plain, which ranges from 40 to 60 feet above sea level. In this plain Agua Dulce Creek, which in its upper stretches is known as Petronilla Creek, has cut a channel so recently that it has not yet been widened much beyond the space actually occupied by the water, but the small tributaries are working their way headward and will eventually dissect the plain.

Utah–Wyoming

GREEN RIVER: Plan and profile of Green River from Green River, Utah, to Green River, Wyo. Scale, 1 inch=½ mile; contour interval on land 20 feet, on river surface 5 feet; vertical scale of profiles, 1 inch=20 feet. 16 sheets (10 plans, 6 profiles).

Sheets A–J show the course of Green River in the canyons it has cut through the Uinta Mountains and, by means of surface contour lines, the form of the canyon walls to a height of a few hundred feet above the level of the river. Sheets K–P show the profile of the surface of the river throughout the stretch mapped. The profile shows marked differences in slope, which depends on the character of the rocks, being very flat in the soft Tertiary rocks but steep where the river is cutting the very hard rocks of the Uinta Mountains. The steepest slope for a mile or more is in Split Mountain Canyon, where the river descends 125 feet in 5 miles.

Vermont

*BARRE: Latitude, 44° to 44° 15′; longitude, 72° 30′ to 72° 45′. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of parts of Washington and Orange counties, just south of Montpelier. The surface is very hilly, and the hills and ridges rise 100 to 1,700 feet above the adjacent valleys. The lowest points are 520 feet above sea level, where Winooski and Dog rivers leave the area on its northern border. The highest peak is Bald Mountain, 2,586 feet above sea level. Winooski River flows at nearly right angles to the general trend of the mountains, and its valley is a much traveled avenue of communication eastward and westward. Travel northward and southward is greatly facilitated by many long valleys, which contain well-traveled highways and lines of railroad. The map shows, east of longitude 72° 30′, a strip of territory about 2 miles wide so as to include all of Barre and the great granite quarries southeast of the city.

*ENOSBURG FALLS: Latitude, 44° 45′ to 45°; longitude, 72° 45′ to 73°. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of an area that lies mainly in Franklin County and extends north to the Canadian line. It includes a small part of Lamoille County. Most of the area lies in the foothill belt on the west side of the Green Mountains, but the extreme southeast corner embraces a small part of the mountains and the northwest corner some of the terrace plains of the Lake Champlain region. The area is crossed by Missisquoi River, which flows westward to Lake Champlain. The lowest point of the surface, about 200 feet above sea level, is on Missisquoi River near East Highgate, and the highest point, 1,900 feet above sea level, is the summit of Peaked Mountain.

*IRASBURG: Latitude, 44° 45′ to 45°; longitude, 72° 15′ to 72° 30′. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of an area in Orleans County, extending to the Canadian boundary. The most prominent feature shown is the broad valley of Missisquoi River, which here flows due north into Canada but at a point a few miles west returns into the United States and continues its course westward to Lake Champlain. West of Missisquoi River are the foothills of the Green Mountains. East of Missisquoi River is the eastern ridge of the Green Mountains, which bears the local name Lowell Mountains. The eastern border of the Green Mountains in this area is marked roughly by Black River, which flows into Lake Memphremagog, a small part of which is shown in the northeast corner of the area.

Virginia

[See also West Virginia–Virginia]

*CALLANDS: Latitude, 36° 45′ to 37°; longitude, 79° to 79° 45′. Scale, 1 inch=1 mile; contour interval, 20 feet.

Map of parts of Franklin, Henry, and Pittsylvania counties, about 18 miles from the south boundary of the State and 20 to 25 miles east of the unbroken escarpment of the Blue Ridge. The surface is a fine example of rolling plain, which ranges in height from 900 to 1,100 feet above sea level. In this plain the streams have intrenched themselves to a depth of 20 to 200 feet. Above this gently rolling surface three ridges stand as on a platform. The highest is Turkeycock Mountain, 1,840 feet above sea level. Less than half the area is under cultivation, but the cultivated lands are widely distributed.

Washington

*HANFORD: Latitude, 46° 30′ to 46° 45′; longitude, 119° 15′ to 119° 30′. Scale, 1 inch=1 mile; contour interval, 25 feet.

Map of parts of Benton and Franklin counties, 50 miles due east of Yakima. The line between these counties follows Columbia River, which crosses the area from northwest to southeast. The altitude ranges from 350 to 1,200 feet above sea level. The most striking surface feature is the long line of bluffs, 300 to 500 feet high, that border the river on the east and overlook the broad plain to the west. The southern part of this plain is composed largely of sand dunes. West of Hanford Gable Mountain, a basaltic ridge 600 feet high, rises like an island above the plain.

OTHELLO: Latitude, 46° 45′ to 47°; longitude, 119° to 119° 15′. Scale, 1 inch=1 mile; contour interval, 25 feet.

Map of an area in southeastern Washington that embraces parts of Adams and Grant counties. A small part of Saddle Mountain is in the extreme southwest corner of the area. The principal towns are Othello and Warden.

SCOOTENEY LAKE: Latitude, 46° 30′ to 46° 45′; longitude, 119° to 119° 15′. Scale, 1 inch=1 mile; contour interval, 25 feet.

Map of an area in southeastern Washington, 20 miles north of Pasco, on Columbia River. The area lies mostly in Franklin County but includes a strip a mile wide in Adams County. The surface of the western part of the area is a plateau, which slopes from an altitude of about 1,300 feet to about 900 feet. East of the escarpment that bounds this plateau are a number of drainage channels that form a belt ranging in width from 3½ to 7 miles. These channels slope southward and discharge their water into Columbia River a short distance beyond the southwest corner of the area.

West Virginia

*CIRCLEVILLE: Latitude, 38° 30′ to 38° 45′; longitude, 79° 15′ to 79° 30′. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of part of Pendleton County, about 40 miles northwest of Harrisonburg, Va. The area lies in the western part of the Appalachian Valley province and contains a succession of northeastward-trending ridges and valleys. The largest valleys are those occupied by North Fork, South Branch, and Moorefield River, all branches of Potomac River, which crosses the Appalachian Valley province farther north. The highest point in the area is Kile Knob, on North Fork Mountain, 4,566 feet above sea level, and the lowest point is 1,490 feet above sea level, near Painter School, on South Branch of Potomac River.

*DURBIN: Latitude, 38° 30′ to 38° 45′; longitude, 79° 45′ to 80°. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of parts of Randolph and Pocahontas counties, 15 miles due south of Elkins. The area is traversed from south-southwest to north-northeast by a strip of the Allegheny Plateau, whose western edge is called Cheat Mountain. The northern part of the eastern edge of this strip is called Shavers Mountain, and the southern part is called Back Allegheny Mountain. The steep and nearly straight escarpments that bound the plateau are parallel on the west with the broad, level valley of Tygart River, a branch of Cheat River, and on the east with the very narrow valley of Greenbrier River, a branch of New River. About midway through the strip of plateau, in a crooked valley 600 to 900 feet deep, flows Shavers Fork, also a branch of Cheat River. The plateau, which is wooded throughout and almost uninhabited, reaches altitudes of 4,000 to over 4,600 feet above sea level. Its escarpments are about 1,000 feet high.

*HORTON: Latitude, 38° 45′ to 39°; longitude, 79° 30′ to 79° 45′. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of an area about 8 miles east of Elkins and 60 miles southwest of Cumberland, Md., lying mainly in Randolph County. The eastern two-thirds of the area lies within the Appalachian Valley province and is made up of ridges and valleys that trend about N. 23° E. The western third, a part of the Appalachian Plateaus, lies about 4,000 feet above sea level.

KINGWOOD: Latitude, 39° 15′ to 39° 30′; longitude, 79° 30′ to 79° 45′. Scale, 1 inch=1 mile; contour interval, 50 feet.

Revised map of the Kingwood quadrangle, which lies about 16 miles southeast of Morgantown. The contours and drainage are unchanged, but the culture has been revised so as to show all towns, schools, mines, and automobile roads.

West Virginia–Pennsylvania

MORGANTOWN: Latitude, 39° 30′ to 39° 45′; longitude, 79° 45′ to 80°. Scale, 1 inch=1 mile; contour interval, 20 feet.

Revised map of the Morgantown quadrangle, the original of which was issued in 1902. The present map shows no change in contours or in drainage, but the culture has been completely revised, showing Morgantown, now a large city, and many smaller places that have grown materially since the original map was published and others that have sprung up where coal mines have been opened.

West Virginia–Virginia

*CASS: Latitude, 38° 15′ to 38° 30′; longitude, 79° 45′ to 80°. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of an area that lies mainly in Pocahontas County, W. Va. The boundary between the Appalachian Valley province and the Appalachian Plateaus passes through the northwestern part of this area, being marked here by the east base of Back Allegheny Mountain. Southeast of this boundary there are ridges and valleys that trend N. 35° E., and northwest of it is a plateau that stands at an altitude of about 4,800 feet.

*FORT SEYBERT: Latitude, 38° 30′ to 38° 45′; longitude, 79° to 79° 15′. Scale, 1 inch=1 mile; contour interval, 50 feet.

The Fort Seybert quadrangle embraces parts of Pendleton County, W. Va., and Rockingham County, Va., but this map shows only the part in West Virginia. The surface is marked by a number of parallel northeasward-trending ridges and valleys, which are drained mainly by Moorefield River, a tributary of the Potomac. The altitude of the surface ranges from 1,350 to 4,345 feet.

*MCDOWELL: Latitude, 38° 15′ to 38° 30′; longitude, 79° 15′ to 79° 30′. Scale, 1 inch=1 mile; contour interval, 50 feet.

The McDowell quadrangle includes the southern part of Pendleton County, W. Va., and adjoining parts of Highland and Augusta counties, Va., but only the part of the area that lies in West Virginia is shown on this map. The area includes the southward continuation of the alternating ridges and valleys shown on the map of the Circleville quadrangle, W. Va. Moorefield River is the largest stream, and all the drainage flows north-northeastward to the Potomac. Shenandoah Mountain, whose crest is followed by the boundary between Virginia and West Virginia, is the longest and highest of the ridges. It attains at Reddish Knob an altitude of 4,398 feet.

PETERSTOWN: Latitude, 37° 15′ to 37° 30′; longitude, 80° 45′ to 81°. Scale, 1 inch= 1 mile; contour interval, 50 feet.

Revised map of a part of the Peterstown quadrangle, representing only the area north of the crest of the ridge formed by East River and Peters Mountains, most of which lies in West Virginia. The West Virginia-Virginia boundary line follows the crest of the ridge, except at the crossing of New River, where it swings to the north, leaving as part of Virginia a tract about 4 miles wide and 6 miles long. East of New River the surface of the plateau is about 2,000 feet above sea level, but west of the river it ranges in altitude from 2,500 to 2,900 feet. This area lies southeast of the Appalachian coal field, and much of the surface rock is limestone or limy shale.

*SPRUCE KNOB: Latitude, 38° 30′ to 38° 45′; longitude, 79° 30′ to 79° 45′. Scale, 1 inch=1 mile; contour interval, 50 feet.

Map of parts of Randolph, Pendleton, and Pocahontas counties, W. Va., and Highland County, Va. The surface is broken and in places rugged. It ranges in altitude from 2,100 to 4,860 feet. Most of the area is forest-covered; there are few settlements and only small areas of tillable land.

Wyoming

[See also Utah-Wyoming]

GEOLOGIC MAP OF WYOMING: Scale, 1 inch=8 miles. Issued in two forms—(*a*) in two sheets, rolled, in a tube, suitable for mountaing on cloth; or (*b*) trimmed, pasted together, folded, and bound in a cover like those of the folios of the Geologic Atlas.

A map 38 by 56 inches showing the areal geology of the entire State in considerable detail. The base indicates the county and township lines, towns, railroads, and other works of man in black, and the drainage in blue. Geologic formations are distinguished by 51 patterns in 10 colors. Compilation of the geology from published and unpublished Survey reports and from outside sources required several years. The map will supply a long-felt need of oil companies and others interested in the development of the State and will also be of great value to educational institutions.

STATE OF WYOMING. Scale, 1 inch=8 miles.

Revised base map of the State of Wyoming. Shows in black names and boundaries of counties, national parks, national monuments, national forests, elk and bird reservations, Indian and military reservations, and railroads, towns, and small settlements, and in blue rivers, many of the smaller streams, reservoirs, and large irrigation canals. This map does not show contours.

Shaded relief maps

Besides the maps listed above, the following maps have been published in an edition on which the forms of relief are shown both by brown contour lines, as on the regular topographic map, and by shading in light grayish olive, which gives the map the appearance of a model of the surface with the light striking it from the northwest. The shading makes the inequalities of the surface more readily apparent to the inexperienced map reader than the contour lines alone.

Pennsylvania:
Milton.
Williamsport.

West Virginia:
Hanging Rock.
White Sulphur Springs.

Standard symbols

STANDARD SYMBOLS adopted by the Board of Surveys and Maps, United States of America.

A colored chart, 20 by 33 inches, showing the conventional symbols to be used on maps, classified under the following headings: Works and structures, boundaries, marks, and monuments; drainage; relief; land classification; hydrography, dangers, obstructions; aids to navigation, etc.; aerial navigation; military; lettering.

GEOLOGIC BRANCH

SCOPE AND ORGANIZATION OF WORK

The work of the geologic branch was performed throughout the fiscal year by three coordinate divisions. The general organization during the year has been as follows:

Geologic branch: W. C. Mendenhall, chief geologist.
Division of geology: W. C. Mendenhall, geologist in charge.
Division of mineral resources: F. J. Katz, geologist in charge.
Division of chemistry and physics: George Steiger, chief chemist, acting in charge.

At the end of the year the division of mineral resources was transferred by Executive Order to the Department of Commerce.

APPROPRIATIONS

The acts carrying Survey appropriations for the fiscal year ending June 30, 1925 (43 Stat. 419–420, 708), provide the following amounts for the direct work of the geologic branch:

Geologic surveys	$335,562
Scientific assistants (geologists, paleontologists, and chemists)	18,050
Mineral resources	127,940
Chemical and physical research	40,000
	521,552

In addition, the geologic field work requisite for the classification of mineral lands was done by means of an appropriation made for the classification of the public lands, at a total cost of $46,300.

DIVISION OF GEOLOGY

ORGANIZATION AND PERSONNEL

The division of geology includes nine sections, as indicated below:

Geology of metalliferous deposits, G. F. Loughlin, geologist in charge.
Paleontology and stratigraphy, T. W. Stanton, geologist in charge.
Glacial geology, W. C. Alden, geologist in charge.
Geology of iron and steel metals, E. F. Burchard, geologist in charge.
Coastal Plain investigations, L. W. Stephenson, geologist in charge.
Areal geology, Sidney Paige, geologist in charge.
Geology of nonmetalliferous deposits, G. R. Mansfield, geologist in charge.
Geology of fuels, W. T. Thom, jr., geologist in charge. (Sections of geology of oil and gas fields and geology of coal fields combined September 15, 1924.)
Petrology, C. S. Ross, geologist acting in charge.

In addition to the units of administrative organization the division includes two administrative committees—the committee on geologic names, T. W. Stanton, chairman, and the physiographic committee, M. R. Campbell, chairman. These committees consider

in detail all problems falling within their respective fields and advise the chief geologist of their findings as a basis for administrative action.

The division also exercises technical supervision over the section of geologic map editing and administrative control over the Hawaiian Volcano Observatory, of which T. A. Jaggar, jr., is in charge, at the Kilauea Volcano.

At the beginning of the fiscal year the division included 132 geologists of various grades. During the year 6 resigned; 19, mostly members of college faculties who were serving on a basis of pay "when actually employed" and who had in recent years devoted little time to Survey work, were dropped from the Survey rolls; 2 were retired; and 3 were added to the force, so that the number on the rolls at the end of the year was 108. The division included 4 draftsmen (2 temporary), 1 having died during the year, and 5 preparators of fossils, 1 having been appointed and 2 having retired during the year. In the clerical and messenger force there were 6 accessions and 6 separations, leaving a total of 31 employed at the end of the year.

K. C. Heald, who had had charge of the section of geology of oil and gas fields since January 1, 1921, resigned to accept an assistant professorship at Yale University.

At the end of the year C. Whitman Cross and W. H. Dall were automatically retired from the service, having reached or passed the retirement age. Each of them is a leader in his particular field, and each had been connected with the Survey for more than 40 years. Doctor Cross is best known for his excellent geologic studies in the mountain region of Colorado, for his leadership in petrologic work, and as one of the authors of the quantitative system of rock classification. Doctor Dall is a widely recognized authority on Tertiary and living mollusks.

ALLOTMENTS AND EXPENDITURES

The funds available for the work of the division of geology for the fiscal year were as follows:

Geologic surveys	$335,562
Classification of lands	46,300
Scientific assistants	14,233
Search for potash deposits (allotted from appropriation for chemical and physical research)	3,850
Repayments, etc	2,127
	402,072

The expenditures from these funds may be classified by subjects approximately as follows:

Hawaiian volcanology	$10,850
Geology of metalliferous deposits	70,000
Geology of nonmetalliferous deposits	13,250
Geology of fuels (oil, gas, coal)	84,300
Scientific researches not directly connected with economic geology (paleontology, glaciation, Coastal Plain formations, etc.)	123,000
Supervision, administration, salaries of clerical, technical, and skilled-labor forces, purchase and repair of instruments, office supplies, etc	100,000
Unexpended balance	672
	402,072

Of the amounts available for geologic work, approximately $85,000 was used directly to pay field expenses, including those incurred in the search for potash. About 70 per cent of this amount was expended for work done west of the one hundredth meridian and about 30 per cent for work done east of it.

COOPERATION

The Geological Survey cooperates with other organizations, State and Federal, by assigning its members to the study of special problems, either wholly or partly at the expense of the organization that requests the cooperation. During the year the Forest Service, the General Land Office, the Office of Indian Affairs, the Department of Justice, the Bureau of Reclamation, several States, and the National Research Council thus received the benefit of the special training available in the branch. The cost to the cooperating organizations, in the form of salaries assumed or field expenses borne, was $9,659.

Examples of such cooperative work with State surveys are the completion of a geologic map and an accompanying report giving a description of the rock formations of Arizona, the preparation of a geologic map of Alabama and an accompanying text, and the preparation of a geologic map of Oklahoma. The Oklahoma map was prepared in cooperation with the State Geological Survey and the oil geologists and oil companies of the State through the National Research Council. In cooperation with the Oklahoma Geological Survey a map showing the geologic structure of northeastern Oklahoma was compiled from data furnished by the cooperating organizations and by oil companies that have operated in this region. This map was published by the Federal Survey for the State.

Among other results achieved by cooperation are a report on the physical geography of Georgia, published by the Georgia Geological Survey; a report on the Valley coal fields of Virginia, published by the Virginia Geological Survey; and a report on the geology and oil possibilities of Russell County, Kans., to be published by the Kansas Geological Survey.

The identification of fossils sent in from different parts of the United States and from Canada, the West Indies, Central and South America, Africa, China, and Japan is a cooperative service of great usefulness to various scientific organizations but more particularly to the oil companies that are now scouring the world for a new supply of petroleum.

In its capacity of expert adviser in the solution of problems involving geology and mineral economics the cooperation of the Survey is increasingly requested by Federal departments and bureaus. Such cooperation was maintained with the Office of Indian Affairs in matters involving the leasing of oil lands in Indian reservations, with the Bureau of Reclamation in the examination of reservoirs and dam sites, and with the Forest Service in the examination of proposed extensions to national forests.

The Hawaiian Volcano Research Association also cooperates with the Survey in the publication of the Monthly Bulletin of the Hawaiian Volcanic Observatory.

GENERAL REVIEW OF THE WORK OF THE YEAR

The work of the year, which is set forth below in detail by States, has been, as heretofore, so directed as to assist the economic development of the country's mineral resources. It is gratifying, however, that many so-called "purely scientific" investigations are by-products of the work of solving "practical" problems.

The geologic work that affords the basis for the classification of coal lands goes steadily forward from year to year by the use of such funds as are available for it. In connection with this work certain kinds of research concerning coal are pressingly demanded, such as research regarding its composition, its origin, its classification, and its special fitness for use in particular industries.

The general study of oil fields and of oil-field problems has been continued throughout the year. This work has included studies of structure in developed fields and undeveloped areas, studies of the relations of pools to structure, and inquiries as to the origin of oil. One of the more recent lines of investigation is the study by the aid of the microscope of the character of the oil sands and the micro-organisms that they may contain, in order to identify these sands even though they may lie at a depth of several thousand feet. By such methods well logs in a field can be more accurately compared, and the underground structure can be determined in places where the surface structure is obscured or where the structure at depth does not correspond with that at the surface.

Throughout the year the study of the origin and distribution of oil shale and the nature of the contained organic material from which oil may be derived by destructive distillation has been continued, and much information has been gained by microscopic, chemical, biologic, and botanic studies. The results of these studies may have an important bearing upon the commercial uses to which this shale may be put in the search for oil when failing supplies necessitate the location of the less easily exploited sources.

A graphic exhibition of the work of the Survey of interest to the petroleum industry was prepared and installed at the International Petroleum Exposition and Congress in Tulsa, Okla., October 2–11, 1924.

The present year witnessed the completion of three important investigations in metalliferous geology. One of these, covering the Leadville district of Colorado, has yielded a report which is now in the hands of the editors and illustrators; for another, covering the copper region of Lake Superior, the field work has been completed, and the preparation of a report is well advanced; and for the third, covering the Mother Lode of California, the field work is completed and the report is in preparation.

The Survey is carrying on a number of investigations in different parts of the country that are throwing additional light on structural problems—that is, on the forms that rocks assume under intense pressure in the earth's crust, the conditions under which such stresses originate, and the way in which they have operated in the geologic past. Among these studies are several worthy of mention here. (1) The examinations, noted in the following pages, of domes and anticlines that may contain oil, though these are

comparatively simple structural features, have led to some significant conclusions regarding the form that rocks assume under various stresses. (2) The study of broad areas in the basin and range province, mainly in Nevada, has disclosed the most complicated geologic structure, the result of stresses acting in different directions and at different times in the past, in what has been generally supposed to be a region of very simple faulted blocks of the earth's crust. (3) A cooperative investigation has resulted in a report published by the Virginia Geological Survey which describes in considerable detail one of the largest overthrust faults known in the Appalachian region, in which the plane of the fault has been folded and the overthrust mass rests upon coal beds of considerable economic importance.

WORK OF THE YEAR BY STATES

ALABAMA

Field.—In connection with the revision of the geologic map of Alabama to be issued by the State in cooperation with the United States Geological Survey, Charles Butts completed studies of the Paleozoic areas; L. W. Stephenson did supplemental work on geologic boundaries of the Cretaceous in east-central Alabama; and C. W. Cooke, assisted by W. S. Hoffmeister and Stuart Mossom, completed studies of the Tertiary formations. E. F. Burchard examined bauxite in Colbert County, and C. S. Ross visited numerous arsenic prospects near Cragford.

Office.—The revised cooperative geologic map of the State has been completed by Messrs. Butts, Stephenson, and Cooke, and the text to accompany it is in preparation, Mr. Butts preparing the description of the Paleozoic areas and Messrs. Stephenson and Cooke that of the Cretaceous, Tertiary, and Quaternary formations. E. F. Burchard, assisted by Charles Butts, prepared a paper on the economic geology of the Birmingham district for the American Institute of Mining and Metallurgical Engineers. H. D. Miser prepared a short paper on rocks penetrated by a well near Florence (Bulletin 781–A). G. H. Girty has in preparation a paper on the Carboniferous fauna from the town of Trinity.

ARIZONA

Field.—Edward Sampson completed a field examination of asbestos near Globe, Ariz.; G. I. Finlay, assisted by Carle H. Dane, completed a reconnaissance examination of the Four Corners area of Arizona and Utah, for land classification. F. L. Hess visited deposits of rare metals at Copper Creek, Table Mountain, Dripping Springs, Casa Grande, Bisbee, and the Huachuca Mountains. D. F. Hewett examined manganese deposits near Aguila. F. E. Matthes accompanied the congressional subcommittee on appropriations for the Department of Interior through Grand Canyon National Park.

Office.—N. H. Darton completed the geologic map of Arizona and the report on the geology of the State, in cooperation with the Arizona Bureau of Mines and Geology, which is to publish the map and report. He also prepared for the American Association for the Advancement of Science a paper on the geologic map of Arizona. G. I. Finlay and C. H. Dane prepared for the land-classification branch a report on the Four Corners area. C. P. Ross read proof of his papers on the Aravaipa and Stanley mining districts (Bulletin 763) and the Banner and Saddle Mountain districts (Bulletin 771). D. F. Hewett prepared for publication in the Engineering and Mining Journal-Press a brief report on the occurrence of carnotite near Aguila. M. N. Short is preparing a paper on the origin of deep-level chalcocite at Superior. C. R. Longwell prepared a report on the geology of the Muddy Mountains, Nev., which includes a section on the Grand Wash Cliffs in western Arizona. G. H. Girty studied Carboniferous and Lower Triassic fossils from the State.

Publications.—Bulletin 763; Press Notice 2119, on the Aravaipa and Stanley mining districts.

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ARKANSAS

Field.—R. D. Mesler collected fossils near Gilbert and Tomahawk, Ark., in connection with stratigraphic studies of the region. H. D. Miser visited several manganese mines in the Batesville district and collected fossils from the Batesville sandstone (Carboniferous). E. F. Burchard examined bauxite in the Little Rock district. T. W. Stanton made a field study of the stratigraphy and paleontology of the Lower Cretaceous (Comanche series) at Murfreesboro, in the Caddo Gap quadrangle. C. H. Dane made a brief examination of the Cretaceous outcrop in southwestern Arkansas. L. W. Stephenson studied the stratigraphic and age relations of Upper Cretaceous formations in the vicinity of Ben Lomond, Sevier County.

Office.—W. C. Mendenhall, W. T. Thom, jr., H. D. Miser, and L. W. Stephenson conferred with G. C. Branner, State geologist, concerning the preparation of a cooperative geologic map of Arkansas and a report on oil resources of the Coastal Plain of the State. E. W. Berry conferred with the State geologist regarding the study of fossil plants from Arkansas. H. D. Miser assembled the Geological Survey's unpublished geologic maps for use in preparing the geologic map to be published by the State. He also prepared a few paragraphs on manganese in the Batesville district for Mineral Resources, 1923. H. D. Miser and C. S. Ross prepared a paper on the volcanic material in the Upper Cretaceous of southwestern Arkansas and southeastern Oklahoma, which was published in the American Journal of Science early in 1925, and they began the preparation of an official report on the same subject. G. H. Girty continued work on a report on the fossil fauna of the Morrow formation of Arkansas. He also studied the Boone fossil fauna at Batesville and began the preparation of a paper on the Batesville fauna. L. W. Stephenson studied fossils from the Upper Cretaceous (Gulf series) of Arkansas, in connection with the preparation of a paper on the stratigraphy of the Gulf series of Texas. R. D. Mesler studied Beekmantown fossils and fossils from the proposed Ozarkian system of E. O. Ulrich, and E. W. Berry reported on collections of fossil plants from Arkansas.

CALIFORNIA

Field.—W. P. Woodring and P. V. Roundy, assisted by H. W. Hoots, completed the mapping of the geology of the Elk Hills district, Calif., in Naval Oil Reserve No. 1. H. W. Hoots mapped the structure and studied the stratigraphy of the Wheeler Ridge district and the area extending from the edge of the San Emigdio foothills west to San Emigdio Creek. W. C. Mendenhall and P. V. Roundy visited this district with Mr. Hoots. Adolph Knopf, assisted by T. B. Nolan, made a detailed study of the gold veins of the Mother Lode belt. F. L. Hess examined deposits of rare metals and collected samples of ores. H. G. Ferguson did geologic field work in the Allegheny-Grass Valley region. G. F. Loughlin spent a few days in studying the North Star mine, at Grass Valley. E. S. Larsen and W. T. Schaller investigated the geologic conditions that control the formation of pegmatites and their associated rare minerals in the vicinity of Pala and Mesa Grande. D. F. Hewett carried on field studies in the Ivanpah quadrangle. L. F. Noble examined a colemanite deposit at Red Mountain, near Shoshone; made stratigraphic studies in the Death Valley region, studying the Tertiary beds near Tecopa Pass, on the border of Pahrump Valley; and made a short trip with H. S. Gale to the Kramer borax mine. He examined in company with Prof. William M. Davis the region along the San Andreas rift through Cajon Pass to Valyermo and examined the Pacoima and Santa Anita dam sites for the chief engineer of the Los Angeles County flood-control district. F. E. Matthes accompanied the congressional subcommittee on appropriations for the Department of the Interior through Sequoia National Park. He also made a physiographic reconnaissance through the Tehipite quadrangle. C. D. Avery collected oil data in San Francisco and Los Angeles and, with H. W. Hoots, made field investigations and collected oil data in Bakersfield, Taft, and Maricopa and in the vicinity of Devil's Den, Tar Creek, Timber Creek, and the Piper and Temescal wells.

Office.—F. E. Matthes completed the revision of his bulletin on the origin of Yosemite Valley, and F. C. Calkins completed his report on the bedrock of the Yosemite region. Mr. Matthes continued work on his report on

the physiography of the upper San Joaquin basin and made preliminary studies for work in the Kings River basin. He also prepared a paper on evidences of recurrent glaciation in the Sierra Nevada for the National Academy of Sciences, and another on the Devil's Postpile, in the Sierra Nevada, for presentation to the American Association for the Advancement of Science. K. C. Heald read and edited a report by W. S. W. Kew on oil in southern California and, with C. E. Dobbin and W. T. Thom, jr., a report by W. A. English on the geology and oil resources of the Puente Hills. T. W. Stanton held conferences with geologists at San Francisco, the University of California, and Stanford University, and studied fossil collections at the two universities. L. F. Noble continued the preparation of his report on salines in California, nearly completed the study of the Kaibab limestone section in Buckskin Gulch, made some progress on his paper on the Leach Trough fault, and continued work on the San Andreas rift. Adolph Knopf and T. B. Nolan have in preparation a report on the resurvey of the Mother Lode district. H. W. Hoots prepared a report on the geology of the Wheeler Ridge and adjoining San Emigdio Hills, Kern County, for the land-classification branch, and has in preparation a report on the same subject for Survey publication. W. H. Dall studied fossils from Eagle Lake, Catalina Island, San Pedro, and other areas; prepared a paper on the Pleistocene fauna of San Pedro, for the Proceedings of the United States National Museum; and reported on fossils received from R. H. Palmer, Stanford University. F. H. Knowlton studied and reported on fossil plants from auriferous gravel. Edwin Kirk reported on Devonian fossils. H. G. Ferguson has in preparation a report on the geology and ore deposits of the Allegheny district. W. P. Woodring and P. V. Roundy are writing a report on the geology and oil resources of the Elk Hills district. A report was prepared by Mr. Woodring for the land-classification branch on sec. 16, T. 30 S., R. 23 E., and another on the geology of San Nicolas Island.

Publications.—Bulletin 753; Press Notice 18183, "Oil in southern California."

COLORADO

Field.—F. L. Hess continued the field examination of uranium and other rare minerals in Colorado. J. B. Eby continued field work in the east end of the Yampa coal field, mapping the Pilot Knob quadrangle and doing special work in the Daton Peak and Mount Harris quadrangles. M. R. Campbell, assisted for a short time by A. A. Baker and then by N. W. Bass, mapped in the spring of 1925 the Mount Harris quadrangle, in the extreme southeast point of the Yampa coal field, and reexamined certain areas in the Daton Peak and Pilot Knob quadrangles. Kirtley Mather, James Gilluly, and R. G. Lusk completed reconnaissance studies of the possibilities of oil in northeastern Colorado. W. H. Bradley, assisted by C. E. Erdman, completed geologic mapping of oil-shale lands in Rio Blanco County, and Mr. Bradley made a reconnaissance survey of Naval Oil Shale Reserve No. 1. W. W. Boyer completed his examination of coal outcrops in the Red Mesa and Ignacio quadrangles and in company with J. B. Reeside, jr., visited certain localities in the Red Mesa quadrangle for the purpose of making a study of Mesozoic and Tertiary stratigraphy. C. E. Dobbin and Mr. Reeside made a reconnaissance examination of the Fox Hills, Laramie, Arapahoe, and Denver formations in the Denver Basin. G. F. Loughlin studied new mine developments at Leadville and in the Cripple Creek district.

Office.—C. W. Cross, E. S. Larsen, and C. S. Ross continued the preparation of reports on the geology of the San Juan region, and W. W. Atwood and K. F. Mather brought nearly to completion their report on the Quaternary geology and physiography of the same region. A paper on physiographic surfaces in the Front Range of Colorado and their equivalents on the Great Plains was prepared by K. F. Mather for presentation to the Geological Society of America. G. F. Loughlin completed the revision of the Leadville report and began work on a paper entitled "Guides to ore at Leadville." W. H. Bradley submitted an informal report on topography, drainage, and trails of Naval Oil Shale Reserve No. 1 and revised the map of oil-shale reserves in Colorado, for the Navy Department. A paper on the origin of the Green River formation was written by Mr. Bradley for publication in the Bulletin of the American Association of Petroleum Geologists. He also prepared a report on the stratigraphy of the Green River formation in the Uinta Basin. F. H. Knowlton reported on fossil plants from the Green River formation. K. F. Mather, James Gilluly,

and R. G. Lusk worked on a report on the oil and gas prospects of northeastern Colorado, and Mr. Mather, assisted by Mr. Lusk, wrote a press bulletin on oil and gas prospects in that region, and one on the probable depth of the Dakota sand in northeastern Colorado. Adolph Knopf completed a brief report on recent developments in the Aspen district. W. W. Boyer and J. B. Reeside, jr., wrote a press notice on prospects for oil and gas in and near the Barker Creek dome, Colorado and New Mexico, and Mr. Boyer prepared land-classification data covering coal cases in that district. Mr. Boyer also prepared township reports on coal classification in the Grand Mesa coal field and a report and map of the Cinder Buttes coal field, La Plata County. J. B. Eby prepared land-classification data on the eastern part of the Yampa coal field and wrote a press notice on analyses of the Yampa coals. He wrote a preliminary draft of a report on the eastern Yampa area, the paleontologic parts of which were revised by Mr. Reeside; a paper on contact metamorphism of coals in Colorado, which he presented before the American Institute of Mining and Metallurgical Engineers; and a press notice regarding oil and gas possibilities in the Slater dome, Routt County. W. T. Thom, jr., and J. B. Eby revised the report of E. T. Hancock on geology and coal resources of the Meeker quadrangle, Moffat and Rio Blanco counties. Sidney Paige prepared a paper on the relation of the La Plata formation of southwestern Colorado to the plateau group in the plateau county of Colorado for the American Association for the Advancement of Science. G. H. Girty studied Carboniferous fossils. E. O. Ulrich and R. D. Mesler prepared fossils obtained from formations belonging to the system Mr. Ulrich proposes to call Ozarkian. J. B. Reeside, jr., and T. W. Stanton studied Cretaceous invertebrates. W. T. Lee revised his report on the correlation of formations in eastern Colorado and central Wyoming. C. S. Ross began a paper on the petrology of Fortification Rocks, near Craig.

Publications.—Bulletins 750–C, 750–D, 751–G, 757; Professional Paper 132–F, 134; press notices on the Yampa coal field (No. 17848), prospects for oil or gas in the Slater dome, in northwestern Colorado (No. 17987), oil and gas in northeastern Colorado (No. 17854), prospects for oil and gas in and near the Barker Creek dome, Colorado and New Mexico (No. 17976), and estimated depth of sandstone in northeastern Colorado that may yield oil (No. 1522).

CONNECTICUT

Arthur Keith and Laurence LaForge held a conference in eastern Connecticut with Dr. William N. Rice, Prof. W. G. Foye, and Prof. H. P. Little on the possible southward extension of the Carboniferous rocks of central Massachusetts into Connecticut.

DISTRICT OF COLUMBIA

Arthur Keith collected geologic data revealed by excavations in the District of Columbia.

FLORIDA

Field.—C. W. Cooke conferred with the assistant State geologist relative to the correlation of Florida limestones, studied coastal terraces, and examined outcrops of the Tampa and Ocala formations. Julia Gardner studied the geology of Tampa and vicinity.

Office.—Julia Gardner continued studies of fossils from the Alum Bluff group, transmitted Part IV of her report on the Mollusca of Alum Bluff of Florida, revised Part V, and incorporated in the first three parts the results of her study of fossils received since they were written. J. T. Pardee prepared reports on the classification of phosphate lands near Ocala and in the central and northern parts of the State. W. C. Mansfield began a paper on the Choctawhatchee marl of Florida. W. H. Dall reported on Pliocene fossils.

GEORGIA

Field.—Charles Butts examined lands in northern Georgia for the Forest Service, in conformity with the Weeks Act. C. S. Ross visited copper, gold, and asbestos mines at Lincolnton and near Thompson, Dahlonega, Cleveland,

and Hollywood in connection with a reconnaissance of the metalliferous deposits of the eastern United States. C. W. Cooke studied the coastal terraces of the State.

Office.—C. W. Cooke, M. R. Campbell, Arthur Keith, and Laurence LaForge completed the cooperative report on the physical geography of Georgia, which was published by the Georgia Geological Survey. Julia Gardner wrote a short paper on the Marks Head marl of Georgia for outside publication. Charles Butts prepared a report on his examination of lands in northern Georgia for the Forest Service. C. W. Cooke wrote a paper on the coastal terraces of Georgia, for presentation to the American Association for the Advancement of Science.

HAWAII

T. A. Jaggar, jr., and R. H. Finch continued observations at the Hawaiian Volcano Observatory, Kilauea Volcano. Mr. Jaggar joined the expedition of the U. S. S. *Whippoorwill* to explore the islands of Howland and Baker. The Monthly Bulletin (published in cooperation with the Volcano Research Association) and the Volcano Letter, a weekly news leaflet of the Hawaiian Volcano Research Association, were issued. W. H. Dall reported on fossils from Midway Island for D. Thasnum, and also on fossils from Hawaii. R. H. Finch prepared articles on earthquakes at Kapoho, Island of Hawaii, in April, 1924, and seismic sequences of the explosive eruption of Kilauea in May, 1924, for publication in the Bulletin of the Seismological Society of America.

IDAHO

Field.—E. F. Burchard inspected deposits of iron ore in Idaho, accompanied on one trip by F. B. Laney, of the Idaho Bureau of Mines and Geology. Edward Sampson did geologic field work in the Pend Oreille area, in cooperation with the Idaho Bureau of Mines and Geology. C. P. Ross completed field work in the Wood River region, made some examinations on Salmon River between Challis and Stanley, completed field work on the quicksilver deposits near Yellow Pine, and, assisted by W. H. Newhouse, began field investigations in the Castro quadrangle. J. T. Pardee examined sections of land near Driggs, for phosphate.

Office.—Edward Sampson and J. L. Gillson continued the preparation of a cooperative report on the Pend Oreille district. Mr. Sampson gave a paper on native arsenic from northern Idaho, jointly with Mr. Gillson, at the New York meeting of the Society of Economic Geologists. D. F. Hewett and W. T. Schaller prepared an article on the genesis of hisingerite in the Wood River district, Blaine County, for publication in the American Journal of Science. F. C. Schrader and C. P. Ross wrote a report on the antimony and quicksilver deposits of the Yellow Pine district. G. R. Mansfield revised his report on the geology and mineral resources of southeastern Idaho, which was submitted for publication; reviewed material for a paper on the physiography of southeastern Idaho for the Geological Society of Washington; and prepared a discussion of V. R. D. Kirkham's paper on phosphate in Idaho in relation to world supplies, which was transmitted to the American Institute of Mining and Metallurgical Engineers. He also prepared a paper on the origin of the Phosphoria formation, for delivery before the Society of Economic Geologists, reported on the classification of phosphate lands in the Portneuf quadrangle, and continued work on his report on this quadrangle. C. P. Ross completed a chapter on the Wood River district of the Hailey quadrangle and revised the chapter on the general geology of this quadrangle originally written by L. G. Westgate. He also wrote a paper for publication in the Pan-American Geologist on Tertiary planation in eastern Oregon and central Idaho, and also one for presentation before the American Association for the Advancement of Science. J. L. Gillson rewrote a paper on zircon, a contact mineral at Pend Oreille, for unofficial publication. G. H. Girty studied and reported on Carboniferous fossils; W. H. Dall reported on Pleistocene fossils; and F. H. Knowlton reported on Pleistocene fossil wood. A paper was prepared by J. P. Buwalda on the age of the Payette formation and the old erosion surface in Idaho for publication in Science.

Publications.—Bulletin 750–F, Professional Paper 132–G.

ILLINOIS

E. F. Burchard visited several points in Illinois in connection with Mineral Resources work on cement. G. H. Girty studied Carboniferous invertebrate fossils, and F. H. Knowlton reported on a collection of fossil plants from Illinois for the Colorado Museum.

INDIANA

G. F. Loughlin is preparing a report on Indiana limestone.

IOWA

Field.—M. I. Goldman examined gypsum deposits at Fort Dodge, Iowa. Frank Leverett had a field conference with Prof. G. F. Kay, State geologist, on the interpretation of glacial features of Iowa.

Office.—G. H. Girty studied Carboniferous fossils of the State and continued work on his report on the typical Kinderhook fauna.

KANSAS

Field.—Frank Leverett studied glacial drift and associated deposits in the northeastern part of Kansas and carried on field work with a view to determining the extent of the ice in the first glacial stage, as compared with that of the second stage. The Director, the chief geologist, David White, K. C. Heald, W. T. Thom, jr., and R. C. Moore, State geologist, held a conference concerning general cooperative projects in Kansas, and later W. T. Thom, jr., W. W. Rubey, N. W. Bass, and R. C. Moore conferred regarding special lines of investigation to be carried out. Mr. Bass in the course of cooperative work collected well data, mapped geologic structure, and measured sections in Rooks, Hays, Ellis, Rush, Hamilton, Trego, Barton, Ness, and Hodgeman Counties. He visited the Dakota outcrop in Morton and Stanton counties and the Greenhorn outcrop in southeastern Gray County. W. C. Mendenhall accompanied him on a reconnaissance trip from Syracuse east and north to Ellis and Russell counties, thence south to Great Bend. M. I. Goldman studied gypsum deposits at Wichita. W. T. Thom, jr., visited the Rainbow Bend oil district, and E. F. Burchard in connection with Mineral Resources work on cement visited several localities in the State.

Office.—N. W. Bass prepared press notices on the Syracuse anticline and the geologic structure of western Kansas, to be issued by the Kansas Geological Survey. He also began cooperative reports on Ellis County, Hamilton County, Kansas stream valleys, and the salt deposits of western Kansas. J. B. Reeside, jr., reported on Cretaceous fossils collected by N. W. Bass in central and southwestern Kansas and by W. W. Rubey and N. W. Bass in Russell County and revised paleontologic parts of their report on this region. A cooperative report on Russell County by R. C. Moore, W. W. Rubey, N. W. Bass, and M. N. Bramlette was completed in June and submitted for publication as a bulletin of the State Geological Survey. K. C. Heald compiled data regarding the Americus limestone of Kansas and the Foraker limestone of Oklahoma for a discussion of their correlation. P. V. Roundy examined fossils and well cuttings in connection with his studies of micropaleontology. F. H. Knowlton reported on Dakota fossil plants. T. W. Stanton reviewed a report on the fauna and stratigraphy of the Comanche rocks.

KENTUCKY

Field.—Frank Leverett studied the Pleistocene geology of Kentucky for the Kentucky Geological Survey while on leave without pay. W. T. Lee examined Mammoth Cave and took many photographs of its stalactites and stalagmites, in the interest of the Southern Appalachian National Park Commission.

Office.—W. T. Lee summarized the results of his investigations in Mammoth Cave and submitted a report to the Southern Appalachian National Park Commission. Frank Leverett prepared a report on the Pleistocene formations of Kentucky for the State Geological Survey.

LOUISIANA

Field.—C. H. Dane examined, to obtain data for land classification, the prospective and partly developed oil and gas districts of Cotton Valley, Spring Hill, Shongaloo, Urania, and Oakland, La. He conferred with the State Conservation Department and oil geologists regarding the status of development of several other fields in Louisiana, including those of Lake Charles and Lockport, and examined Cretaceous outcrops on some salt domes in the northern part of the State. W. T. Thom, jr., conferred with members of the Louisiana State Conservation Commission and with members of the Shreveport Geological Society regarding the surface and subsurface geology of northern Louisiana and visited the Cotton Valley and other fields. L. W. Stephenson examined Cretaceous outcrops at the Prothro and Rayburn salt domes, Bienville Parish, and the cap rocks at the Winnfield salt dome, Winn Parish.

Office.—M. I. Goldman continued petrographic studies of cap rock from salt domes of Louisiana and Texas and rewrote his paper on this subject for publication in the bulletin of the American Association of Petroleum Geologists. K. C. Heald wrote a short paper on sandstone inclusion in salt in mine on Averys Island. W. C. Mansfield prepared a report on Eocene fossils from the State. T. W. Stanton examined fossils from a deep well in northern Louisiana, and E. W. Berry worked on fossil plants from the State. L. W. Stephenson studied fossils from the Upper Cretaceous (Gulf series) in connection with the preparation of a paper on the stratigraphy of the Gulf series of Texas. C. H. Dane prepared reports for the land-classification branch on the Urania, Oakland, Lockport, and Lake Charles districts.

MAINE

W. H. Dall reported on fossils from Maine. W. S. Burbank prepared a cooperative report on the petrology of the sediment of the Gulf of Maine and Bay of Fundy, for the United States Bureau of Fisheries.

MARYLAND

Field.—G. R. Mansfield made a trip to diatomaceous earth deposits west of Dunkirk, Md. A. I. Jonas, for the Maryland Geological Survey, continued cooperative field work in Carroll, Frederick, and Montgomery counties. W. C. Mansfield examined Miocene strata and collected fossils along the Calvert Cliffs, from Parkers Creek to and beyond Cove Point; he also studied Pleistocene deposits and fossils at Wailes Bluff and Langley Bluff. L. W. Stephenson made field investigations in St. Marys County, in connection with Mr. Mansfield's study of late Tertiary and Quaternary faunas of the Atlantic Coastal Plain.

Office.—The Carroll County report was continued by A. I. Jonas, and a final geologic map was transmitted to the State geologist of Maryland. Some time also was given by Miss Jonas to the map of Frederick County. W. C. Mansfield examined Pleistocene fossils from Wailes Bluff and Langley Bluff and prepared a paper on Pleistocene mollusks collected by himself at these localities. Mr. Mansfield also began a paper on the climatic conditions indicated by the molluscan fauna of the Chesapeake group of Maryland and Virginia.

MASSACHUSETTS

Field.—Laurence LaForge examined the Skinner coal mine, near West Mansfield, Mass. L. M. Prindle continued geologic work in the Greylock and Berlin quadrangles. Arthur Keith and Laurence LaForge conferred with Dr. William N. Rice, Prof. W. G. Foye, and Prof. H. P. Little on the possible southward extension of the Carboniferous rocks of central Massachusetts into Connecticut.

Office.—Work on the Taconic folio was continued by L. M. Prindle. Laurence LaForge wrote an informal report on the Skinner coal mines, and he also continued the preparation of the Boston folio. W. T. Thom, jr., prepared recommendations regarding prospecting for coal in the Narragansett Basin, southwestern Massachusetts, for the Massachusetts Special Commission on the Necessaries of Life. W. C. Alden prepared a paper for presentation at a meeting of Clark Geographers at Clark University on the physiography

and glacial geology of central Massachusetts. W. H. Dall reported on fossils from Marthas Vineyard.

Publication.—Bulletin 760–B.

MICHIGAN

Field.—B. S. Butler and his assistant, W. S. Burbank, continued geologic studies in the Michigan copper district. E. O. Ulrich consulted with representatives of the Michigan State Survey and of the University of Michigan at Ann Arbor with regard to the preparation of a new classification of the Paleozoic rocks of the State and a new geologic map of Michigan. Frank Leverett studied and mapped surficial geology in Alpena and Roscommon counties in cooperation with the Michigan Geological Survey. E. F. Burchard visited several localities in Michigan in connection with Mineral Resources work on cement.

Office.—B. S. Butler, assisted by W. S. Burbank, worked on the text and illustrations of his general report on the geology and ore deposits of the Michigan copper region and prepared a geologic map of the south end of the region. G. H. Girty began a report on the fauna of the Marshall sandstone and also worked on Carboniferous fossils of the State. Frank Leverett, in continuation of his cooperative work, revised his report on the surface geology and agricultural conditions of Antrim and Ogemaw counties for publication by the Michigan Geological Survey.

MINNESOTA

Frank Leverett continued work on a report on the surficial geology of Minnesota. F. H. Knowlton prepared a report on fossil plants from Minnesota for C. J. Hodgson, of the Coast and Geodetic Survey.

MISSISSIPPI

Field.—C. W. Cooke, assisted by Stuart Mossom, did some field work in Mississippi on the revision of the geologic map of the State.

Office.—L. W. Stephenson began the revision of a report on the ground waters of Mississippi. C. W. Cooke revised the map of the Claiborne and Wilcox groups (Eocene) for the revised geologic map to accompany cooperative reports on the general geology and ground waters of the State. M. N. Bramlette and H. D. Miser prepared a report on well-log correlations in northeastern Mississippi and northwestern Alabama. O. C. Postley wrote a press bulletin on oil possibilities of the Vicksburg-Jackson area.

Publications.—Bulletin 750–G; Press Notice 18088, on possible oil and gas near Vicksburg and Jackson.

MISSOURI

Field.—Frank Leverett examined the Pleistocene deposits on Mississippi River in the region of Cape Girardeau, Mo. E. F. Burchard visited several places in Missouri in connection with Mineral Resources work on cement.

Office.—C. E. Siebenthal made a map of the lead regions in southeastern Missouri for the Bureau of Mines. G. H. Girty worked on a report on the Pennsylvania faunas of the Joplin region and studied and reported on Carboniferous fossils from Missouri. R. D. Mesler prepared fossils collected by E. O. Ulrich, members of the Missouri Geological Survey, and himself. E. O. Ulrich worked on the Eminence faunas from Missouri localities.

MONTANA

Field.—Sidney Paige examined the Lewis overthrust fault. A. A. Baker made an examination of the northward extension into Montana of the Sheridan coal field. He also mapped the geology and coal resources of several townships east of Tongue River and examined townships in northern Fergus County to determine their value as coal lands. A. J. Collier, in connection with the classification of possible oil lands, visited the McCue well, in Chouteau County, and the Bowes dome, Blaine County, and collected well data in the Kevin-Sunburst oil field. He also examined Judith River coals in an area south and west of the Fort Belknap Indian Reservation to obtain data for land classification. W. W. Rubey, M. N. Bramlette, and F. A. Melton, in a study of

the Cretaceous rocks that crop out around the Black Hills, did reconnaissance mapping in a strip from 6 to 18 miles wide along the southern border of the State from R. 52 E. to R. 62 E., in Powder River and Carter counties. T. W. Stanton and C. E. Dobbin, in company with W. W. Rubey, examined Cretaceous exposures in southern Carter County. J. T. Pardee mapped the glacial features in the Lincoln (Blackfoot) Valley, western Montana, and made reconnaissance examinations in the Beaverhead and Bighole River basins and in the Gallatin Valley. He also made a detailed examination of phosphate land near Philipsburg, examined several townships in the Madison Range, and made a geologic reconnaissance in Madison and Gallatin counties to bring up to date the work of D. Dale Condit on the Three Forks-Yellowstone Park area. C. D. Avery spent some time looking over the results of oil exploration at Baker, Glendive, and other places in eastern Montana. S. H. Cathcart continued work in the Jardine-Crevasse district. C. E. Dobbin studied the Fox Hills, Lance, Fort Union, and Wasatch formations in southeastern Montana and northeastern Wyoming.

Office.—Frank Reeves revised his paper on the structure of the Bearpaw Mountains, which was published in the American Journal of Science; wrote an article on the shallow folding and faulting in the Bearpaw faulted belt for the American Journal of Science; completed a report on the geology of the Cat Creek and Devils Basin oil fields and adjacent areas; and compiled map and illustrations for a general report on the Bearpaw Mountains. Frank Reeves and W. T. Thom, jr., compiled data on coal in Fergus and Blaine Counties for land classification. A. A. Baker prepared three reports on the northward extension of the Sheridan coal field, a short report on the oil prospects, a general report and individual township reports on the geology and coal resources for the land-classification branch, and a final report for publication on the geology and coal resources of the area. Mr. Baker also prepared coal-classification data for areas in Fergus County. K. C. Heald submitted a report on the Ingomar dome. W. W. Rubey, in connection with work on the Black Hills rim project, prepared land-classification data on some areas in southern Carter County. A paper on *Lithothamnum? ellisianum*, n. sp., from the Ellis Jurassic formation of Montana, was written by M. I. Goldman and M. A. Howe for outside publication. J. T. Pardee prepared reports on the classification of phosphate lands in the Madison Range and Philipsburg areas. He is revising and bringing up to date the report of D. Dale Condit and Elmer Finch on the geography and geology of the Three Forks-Yellowstone Park area, Montana. The chapter on coal in western Montana was revised by W. T. Thom, jr. Mr. Thom and C. E. Dobbin assembled data for their report on coal in Garfield, McCone, and Richland counties. Mr. Thom also prepared an article on United States Geological Survey work in Montana for 1924, which was transmitted for publication in the annual oil edition of the Great Falls Leader. C. E. Dobbin compiled stratigraphic data on the Cretaceous-Eocene transition beds in Montana and Wyoming. S. H. Carthcart prepared a report on the Jardine-Crevasse district and revised his part of the report on the Little Rocky Mountains. R. S. Knappen completed a report on the geology and oil prospects of the northern part of the Big Horn Basin. G. H. Girty studied Carboniferous invertebrates of the State; J. B. Reeside, jr., reported on Jurassic and Cretaceous fossils collected by R. S. Knappen and by W. W. Rubey and party in the western Black Hills and adjoining areas. W. C. Alden completed a professional paper on the glacial geology and physiography of the plains of eastern Montana. C. S. Ross prepared a paper on nephelite-hauynite alnotite from Winnett, for publication in the American Journal of Science.

NEVADA

Field.—H. G. Ferguson and S. H. Cathcart, assisted by W. F. Foshag, James Mansfield, and H. H. Chen, continued work on the Tonopah and Hawthorne quadrangles, Nev. T. W. Stanton studied the Mesozoic of the Humboldt Range and in cooperation with Mr. Ferguson the Mesozoic of the Hawthorne and Tonopah quadrangles. L. G. Westgate and J. L. Gillson completed a study of the Pioche mining district. D. F. Hewett carried on field studies in the Ivanpah quadrangle, Nevada-California, completing the work in the northeast quarter and most of that in the northwest quarter. He conferred in the field with G. F. Loughlin, W. C. Mendenhall, and L. F. Noble and studied the geology of the Searchlight district.

Office.—D. F. Hewett continued the preparation of a report on the Goodsprings mining district. He also prepared a paper on supergene silica and jarosite in southern Nevada for the Petrologic Society. Edwin Kirk studied Devonian fossils collected by Mr. Hewett. He also studied Ordovician, Silurian, and Devonian fossils sent in by Mr. Westgate. L. G. Westgate and J. L. Gillson continued work on the Pioche report. Mr. Gillson wrote a paper for unofficial publication on the borate mineral szaibelyite, found in Pioche. S. H. Cathcart and H. G. Ferguson continued work on a report on the Hawthorne and Tonopah quadrangles. Mr. Ferguson prepared a paper on western Nevada ore deposits. T. W. Stanton reported on Cretaceous, Jurassic, and Triassic invertebrates, and Edwin Kirk reported on Cambrian and Ordovician fossils from the Tonopah and Hawthorne quadrangles. W. H. Dall reported on Neocene fossils for W. F. Foshag. F. H. Knowlton prepared a paper describing a new species of *Potamogeton* from the Esmeralda formation. G. H. Girty reported on Carboniferous and Triassic fossils from Nevada. C. R. Longwell submitted a report on the geology of the Muddy Mountains.

Publications.—Bulletins 750–E, 762.

NEW ENGLAND

Arthur Keith completed the manuscript for a handbook of New England geography and collected data pertaining to earthquakes in New England.

NEW MEXICO

Field.—N. H. Darton obtained data for the geologic map of New Mexico and with J. B. Reeside, jr., made a reconnaissance examination of the Permian of the Guadalupe Mountains of southeastern New Mexico and western Texas. F. L. Hess briefly examined uranium deposits in the White Signal district, south of Tyrone, pegmatites at Petaca and Harding, and a molybdenum deposit at Questa. H. G. Ferguson revisited Mogollon and did geologic field work. D. F. Hewett examined manganese deposits near Socorro. W. W. Boyer did field work in the Artesia oil district, examined coal outcrops in the Sierra Blanca and La Ventana coal fields, and examined geologic structure in the Bloomfield, Mesa, and Aztec districts, San Juan County, for land classification.

Office.—N. H. Darton prepared a new draft of the geologic map of New Mexico and transmitted the State topographic map on a scale of 1:100,000. He also revised his report on the "Red Beds" of New Mexico and prepared a report concerning the new topographic and geologic maps of New Mexico for presentation to the American Association for the Advancement of Science. G. W. Stose did some editorial work on the geologic map of the State. H. G. Ferguson completed his report on the Mogollon district. M. N. Short assisted on this report and did petrographic work on sulphide ores from Mogollon. W. W. Boyer prepared a report and map on the Artesia oil district for the land-classification and water-resources branches. Mr. Boyer and J. B. Reeside, jr., wrote a press notice, "Prospects for oil and gas in and near the Barker Creek dome, Colorado and New Mexico," and Mr. Boyer prepared land-classification data covering coal cases in that district. A short paper was prepared by F. L. Hess on oolites for W. T. Lee's monograph on the Carlsbad Caverns, to be published by the National Geographic Society. H. W. Hoots wrote a paper on the geology of a portion of western Texas and southeastern New Mexico, with special reference to salt and potash. G. H. Girty studied Carboniferous fossils and also the Lake Valley fossil fauna. Edwin Kirk prepared and revised Ordovician and Devonian faunal lists for N. H. Darton for use in publications on New Mexico. W. H. Dall reported on Pleistocene fossils.

Publications.—Professional Paper 134.

NEW YORK

Field.—L. M. Prindle studied talc deposits in the vicinity of Gouverneur, N. Y. Mrs. E. B. Knopf made a reconnaissance investigation of the pre-Cambrian and Paleozoic section on the north flank of the Fishkill Mountains and studied the Paleozoic sections near Poughkeepsie and between Brewster and Holmes.

Office.—L. M. Prindle worked on the Taconic geologic folio and studied talc deposits of New York. W. H. Dall reported on Pleistocene fossils from Long Island, and R. D. Mesler worked on collections of Ordovician fossils.

NORTH CAROLINA

Field.—Lands in Cherokee County, N. C., were examined by Charles Butts for the Forest Service. W. C. Mansfield studied the Great Lake well No. 2, about 5 miles west of Havelock, in cooperation with the State Survey. He also collected Tertiary fossils on Neuse and Trent rivers and in the vicinity of Croatan; Quaternary fossils 10 miles from Beaufort; and Tertiary fossils at Greenville, Tarboro, and Halifax. C. S. Ross in a general reconnaissance of metalliferous deposits of the eastern United States visited mines at Sparta and Kings Mountain.

Office.—C. S. Ross began a report on the Ore Knob copper mine. L. W. Stephenson began a paper on additions to the invertebrate fauna of the Upper Cretaceous of the Carolinas and prepared plate explanations and made minor revisions for L. C. Kellum's paper on the paleontology and stratigraphy of the Castle Hayne and Trent marls. W. C. Mansfield studied Quaternary and Tertiary fossils from North Carolina. E. W. Berry wrote a paper on Pleistocene plants from North Carolina for Survey publication.

NORTH DAKOTA

C. H. Dane analyzed field notes and maps of the New Salem lignite field, N. Dak., to determine the geologic structure of the Fort Union formation.

OHIO

Field.—E. F. Burchard visited several localities in Ohio in connection with Mineral Resources work on cement. E. O. Ulrich spent one day in southwestern Ohio with Professor Shideler and Doctor Austin, the local authorities on the Richmond formations and faunas, and visited a number of their best sections.

Office.—Frank Leverett brought his field notes on Ohio into harmony with the topographic maps that have appeared since the field examination was made. G. H. Girty reported on Carboniferous fossils.

OKLAHOMA

Field.—K. C. Heald, P. V. Roundy, and W. W. Rubey attended the Osage Indian oil-lease sales at Pawhuska, at the request of the Commissioner of Indian Affairs. The Director, W. C. Mendenhall, David White, W. T. Thom, jr., C. N. Gould, of the Oklahoma Geological Survey, and Frank Buttram, of the State Board of Regents, conferred in Tulsa relative to cooperative projects to be undertaken in Oklahoma. H. D. Miser conferred with Oklahoma geologists with reference to obtaining data for the geologic map of Oklahoma and, in company with other geologists, did geologic mapping near Okmulgee and Shawnee. W. T. Thom, jr., collected data for a subsurface structure map of the northeastern part of the State, addressed meetings of the Okmulgee Geological Society and the Tulsa Geological Society, reviewed the areal geology between Okmulgee and Weleetka with Okmulgee geologists, and visited the Cushing, Tonkawa, Braman, Blackwell, and Newkirk oil pools. Mr. Thom, assisted by A. M. Farrell, was in charge of the Survey exhibit at the International Petroleum Exposition in Tulsa. R. D. Mesler collected fossils in the vicinity of Marble City.

Office.—The compilation of the manuscript copy of the geologic map of Oklahoma was completed by H. D. Miser. This work was done through the cooperation of the United States Geological Survey, the geologists of Oklahoma represented by Sidney Powers, the oil companies of Oklahoma through the National Research Council, and the Oklahoma Geological Survey. Mr. Miser and M. G. Wilmarth read critically the manuscript of a report by C. N. Gould on the rock formations of Oklahoma, for publication by the State Survey. Mr. Miser prepared a note on the temperature of Oklahoma's deepest well for publication in the Bulletin of the American Association of Petroleum Geologists. W. T. Thom, jr., assisted by A. A. Baker, C. H. Dane, O. C. Postley, and A. M. Farrell, under the cooperative auspices of the Federal and State surveys, prepared a contour map showing the subsurface structure of northeastern Oklahoma. Mr. Thom presented a short paper on this map to the American Association of Petroleum Geologists and prepared one also for the Oklahoma Geological Survey. K. C. Heald compiled data on the Americus limestone of Kansas and the Foraker limestone of Oklahoma to aid in the determination of

their equivalency. Mr. Heald also wrote a report on oil lands in the Red River district, Oklahoma-Texas, and transmitted it to the land-classification branch. P. V. Roundy prepared data to be used in connection with the December sale of Osage leases and a report to the superintendent of the Osage Agency. He also examined well cuttings and outcrop material from Oklahoma. A. F. Melcher, under the direction of the National Research Council and in cooperation with the Oklahoma Geological Survey, studied pore space of Cromwell oil sands. H. D. Miser and C. S. Ross prepared an article on the volcanic rocks in the Upper Cretaceous of southeastern Oklahoma and southwestern Arkansas, for publication in the American Journal of Science, and began an official report on the same subject. C. E. Siebenthal prepared a descriptive circular accompanying a contour map of the surface of the beds underlying the Cherokee shale in a portion of the Picher district, showing the relation of ore bodies to the subshale topography. G. H. Girty studied and reported on Carboniferous fossils, prepared reports on the Morrow and Wapahucka faunas, and continued work on a report on the Moorefield fauna and the Mayes and "sub-Batesville" faunas. W. H. Dall reported on fossils from the State.

Publications.—Bulletin 759; structure map of northeastern Oklahoma; Press Notice 1107, on contour map of the surface of the beds underlying the Cherokee shale in a portion of the Picher district.

OREGON

Field.—C. P. Ross examined the Cornucopia district, Wallowa Mountains, Oreg., for a report to be issued by the State.

Office.—C. P. Ross prepared data on the Cornucopia district for incorporation in a report to be issued by the State on the Wallowa Mountains region. He prepared a paper for publication in the Pan-American Geologist on Tertiary planation in eastern Oregon and central Idaho, and also one on the same subject for presentation to the American Association for the Advancement of Science.

PENNSYLVANIA

Field.—David White addressed the Board of Commerce of Bradford, Pa., and the oil operators of the region on the problems of the Bradford sand. A. F. Melcher procured samples of oil sands, collected data on production of oil wells producing from water drive, consulted with oil companies relative to the study of texture and production of the Bradford sand, and gave advice concerning the taking of diamond-drill cores through the Bradford sand. W. B. Lang, in connection with porosity studies, visited Bradford, Oil City, and Titusville. W. T. Thom, jr., and M. R. Campbell made a field trip to study semianthracite in Lykens Valley and collected samples for study, and Mr. Thom visited coal mines and oil and gas fields near Pittsburgh and Oil City. Charles Butts carried on geologic work in the Tyrone quadrangle. A. I. Jonas did some field work on the geologic structure in the McCalls Ferry quadrangle, collected data for the cooperative geologic State map, and collected economic data in Lancaster County. G. W. Stose made field investigations in the Allentown, Slatington, Doylestown, Quakertown, Boyertown, Reading, Lebanon, Lancaster, and Middleton quadrangles.

Office.—E. B. Knopf and A. I. Jonas completed the report on the geology of the Quarryville and McCalls Ferry quadrangles, and Miss Jonas prepared a report on the New Holland quadrangle which was transmitted to the State geologist. A. F. Melcher began a report on the study of the pore space of the Bradford oil sand. A press notice on the porosity of the Bradford oil sand near Custer and its relations to the production of oil was prepared by A. F. Melcher, W. W. Rubey, and A. A. Baker. Charles Butts revised the text of the Hollidaysburg-Huntington folio, which was transmitted for publication, and revised the map and text of the Bellefonte folio by E. S. Moore. He also began the preparation of a map and report on the Tyrone quadrangle. G. W. Stose and A. I. Jonas prepared a paper on the Triassic sediments and basaltic lava north of Lebanon for the Geological Society of America and for the American Association for the Advancement of Science. Mr. Stose also worked on the Paleozoic geology of the Quakertown and Doylestown quadrangles. Messrs. Stose and Butts and Miss Jonas worked on a cooperative revision of the geologic map of Pennsylvania by the Federal and State geological surveys. Mr. Stose revised the West Chester-Coatesville folio, of which

he is joint author with Florence Bascom. David White prepared a paper on the prehistoric fossils of Pennsylvania for the Pennsylvania State Forestry Association. G. H. Girty worked on a report on the Pocono fauna and studied collections of other Carboniferous fossils. Frank Leverett brought his field notes on Pennsylvania into harmony with the topographic maps that have appeared since the field work was carried on.

Publication.—Press Notice 1008, "The porosity of the Bradford oil sand near Custer City, Pa., and its relation to the production of oil."

PORTO RICO

G. R. Mansfield examined borings from the Guajataca reservoir, Porto Rico.

SOUTH CAROLINA

L. W. Stephenson began the preparation of a paper on additions to the invertebrate fauna of the Upper Cretaceous of the Carolinas. C. W. Cooke reviewed the mapping of Eocene-Cretaceous-crystalline boundaries in Aiken and Edgefield counties, S. C.

SOUTH DAKOTA

Field.—F. L. Hess examined gold-arsenic mines and pegmatite near Keystone, S. Dak., and in the Black Hills. T. W. Stanton, J. B. Reeside, jr., W. W. Rubey, M. N. Bramlette, and F. A. Melton made stratigraphic studies of the Cretaceous and Carboniferous rocks in the northern and eastern parts of the Black Hills and collected fossils.

Office.—K. C. Heald inspected and described drill cuttings from South Dakota. T. W. Stanton reported on Cretaceous invertebrates, and F. H. Knowlton on Lakota plants. G. H. Girty studied and reported on Carboniferous fossils from the State. J. B. Reeside, jr., reported on collections of fossils made by W. W. Rubey and party in the Cretaceous rocks of the Black Hills and adjoining areas.

Publications.—Bulletin 765, Geologic Folio 219.

TENNESSEE

Field.—E. F. Burchard examined iron ore deposits at Napier, Lewis County, Tenn. Charles Butts examined tracts of lands in Monroe County, for the Forest Service. C. S. Ross visited mines of the Tennessee Copper Co., Ocoee Copper Co., and Ducktown Copper, Sulphur & Iron Co., at Ducktown. E. W. Berry spent some time in field work on the Coastal Plain, in cooperation with the Tennessee Geological Survey.

Office.—E. F. Burchard completed a cooperative report on brown iron ores of the western Highland Rim, to be published by the Tennessee Geological Survey. G. H. Girty studied Carboniferous fossils, and E. W. Berry worked on collections of fossil plants from Tennessee. Charles Butts revised a report on the Crossville quadrangle for the State Geological Survey and prepared for the Forest Service a report on several tracts of forest land in Monroe County. H. D. Miser began a report on the Waynesboro quadrangle.

TEXAS

Field.—W. B. Lang continued field work in the potash area of western Texas, visiting wells that were being drilled and collecting samples of well cuttings. T. W. Stanton studied the Mesozoic of western Texas in company with Mr. Lang. W. C. Mendenhall spent 10 days with Mr. Lang and Mr. Stephenson. Julia Gardner made field studies of the Eocene formations north of Brazos River in connection with the preparation of her monograph on the Eocene of Texas. Her studies on the Midway formation are being made in cooperation with the Texas Bureau of Economic Geology and Technology. Miss Gardner also inspected fossil collections from Brazos County for the Agricultural and Mechanical College at College Station. L. W. Stephenson held conferences with petroleum geologists in Houston, Dallas, Austin, Corsicana, Greenville, Texarkana, and New Boston in connection with the compilation of the new cooperative geologic map of the State. Considerable field work was done in connection with this map. Mr. Stephenson did field work in connection with the preparation of a paper on the stratigraphy of the

Gulf (Upper Cretaceous) of the Texas Coastal Plain, and, with Sidney Powers, he examined Cretaceous outcrops at the Brooks salt dome, Smith County. N. H. Darton and J. B. Reeside, jr., made a reconnaissance to gather data pertaining to the Permian of the Guadalupe Mountains of southeastern New Mexico and western Texas. M. I. Goldman visited Houston and the Big Creek salt dome, Fort Bend County, in connection with his studies of salt-dome cap rocks. T. W. Stanton made a field study of the stratigraphy and paleontology of the Lower Cretaceous (Comanche series) in the high plains region from Sweetwater to Fort Stockton and from Lamesa to Sanderson, also in the southeastern part of the Burnet quadrangle. He held a conference at Austin with the geologists of the Bureau of Economic Geology and Technology.

Office.—L. W. Stephenson and N. H. Darton compiled data for the geologic map of Texas. M. I. Goldman made a laboratory study of salt-dome cap rocks. He wrote a paper on this subject for publication in the Bulletin of the American Association of Petroleum Geologists. K. C. Heald prepared a report on oil lands in the Red River district, Okla.-Tex., for transmission to the land-classification branch. H. D. Miser examined drill cuttings from a well at Silver City. Julia Gardner completed a paper on a new species of *Argyrotheca* from the Butler salt dome, determined fossils from the Eocene of northeast Texas, in this connection studying the Aldrich collection in Johns Hopkins University, and prepared a short paper on the fauna from the Midway of the Butler dome, Freestone County. M. N. Short made an investigation of potash salts from wells in Texas. G. R. Mansfield wrote a press notice on potash in the Cowden well, Crane County. W. B. Lang was in Washington for several months for conferences and studies relative to developments in the western Texas potash field. He submitted a paper for Survey publication on potash investigations in 1924. H. W. Hoots completed a paper on the geology of a portion of western Texas and southeastern New Mexico, with special reference to salt and potash. L. W. Stephenson read and revised portions of A. C. Trowbridge's report on the lower Rio Grande region, and Julia Gardner prepared illustrative material for the report. Mr. Stephenson made progress on a report on the stratigraphy of the Gulf series (Upper Cretaceous) of Texas. G. H. Girty studied the Hueco fauna of the Cornudas Mountains. P. V. Roundy studied outcrop material from Texas in connection with his studies in micropaleontology. M. I. Goldman prepared a report on the petrography of the contact of the Ordovician and Mississippian in San Saba County in connection with the study of the paleontology of the Mississippian by G. H. Girty and P. V. Roundy.

Publication.—Map of oil and gas fields of Texas.

UTAH

Field.—E. M. Spieker, assisted by D. J. Fisher, continued the study of the Wasatch Plateau, Utah, mapping areas west and north of Huntington and Price, and on the completion of this work they began a study of the stratigraphy and structure of the northern part of the San Rafael Swell, giving special attention to oil possibilities. Later this work was continued by James Gilluly, assisted by D. J. Fisher, C. H. Dane, and E. T. McKnight. Mr. Spieker examined and classified for their phosphate content lands near Provo, and J. T. Pardee made similar examinations of several sections of land near Huntsville. J. B. Reeside, jr., studied several stratigraphic sections in the Wasatch Plateau region and the San Rafael Swell. D. J. Fisher began the examination of coal lands along the Book Cliffs southeast of Sunnyside. G. I. Finlay, assisted by C. H. Dane, completed a reconnaissance examination for land classification in the Four Corners area of Arizona and Utah. Mr. Dane examined the area immediately around Cisco. James Gilluly and Mr. Dane classified lands in several townships near Crescent. F. L. Hess spent a few days in field work on rare metals and, with V. C. Heikes, visited the arsenic deposits at Gold Hill. G. F. Loughlin also made a brief visit to this district with a view to a detailed survey of it in the future. Mr. Loughlin visited iron mines and gypsum quarries near Cedar City and examined potash prospects near Marysvale for land classification. F. E. Matthes accompanied the congressional subcommittee on appropriations for the Department of the Interior through Zion National Park. E. F. Burchard examined iron-ore deposits in the Iron Springs district. W. H. Bradley and C. E. Erdmann examined oil-shale lands in west-

ern Millard County, in Beaver County, and in the eastern part of the State for land classification. They also visited oil prospects in Beaver County and classified coal lands near Cedar City and Kanarraville. C. D. Avery visited the Chalk Creek, Spring Creek, and Coalville oil fields. W. C. Alden extended his study of glacial geology and physiography in southwestern Wyoming into northeastern Utah. T. B. Nolan worked in the Salduro Marsh for the purpose of delimiting potash leasing land in cooperation with the General Land Office and Bureau of Mines.

Office.—F. C. Calkins continued work on a report on the general geology of the Cottonwood district. H. D. Miser wrote a paper on erosion in San Juan Canyon, for presentation before the Geological Society of America, and it was also given at the joint meeting of the Washington Academy of Sciences and the Geological Society of Washington. E. M. Spieker revised his report on the Salina Canyon coal area, which was transmitted for publication. Mr. Spieker and A. A. Baker completed a report on the Wasatch coal field. A paper by Mr. Spieker and J. B. Reeside, jr., on Cretaceous and Tertiary formations of the Wasatch Plateau was completed for publication by the Geological Society of America. Messrs. Spieker and Baker completed for the land-classification branch a report and map covering the Horse Canyon district of the Book Cliffs coal field; also a report on phosphate in secs. 20, 21, 28, and 29, T. 7 S., R. 5 E., Salt Lake base and meridian. J. T. Pardee prepared a report on phosphate lands north of Salt Lake for the land-classification branch. James Gilluly, assisted by C. H. Dane, began a report on the San Rafael Swell and prepared a report on the northern part of this region for the land-classification branch. C. H. Dane and James Gilluly wrote a report on the Cisco dome and Crescent anticline. G. R. Mansfield prepared a report for the land-classification branch on two tracts of land for which patent was sought. He also spent some time in conferences with members of the Survey, Bureau of Mines, and General Land Office, to delimit leasing areas in the potash land in the Salduro Marsh. W. B. Lang's report on potash investigations in 1924 included a little information relative to potash investigations in Utah. G. H. Girty studied Carboniferous invertebrates. J. B. Reeside, jr., revised his report on the geology along Green River, Wyoming and Utah, for inclusion in a paper by R. R. Wooley for unofficial publication. He also studied collections of fossils made by E. M. Spieker and James Gilluly in the San Rafael Swell, examined and reported on Jurassic and Cretaceous fossils collected in southeastern Utah by H. E. Gregory, and compiled data on variations in Cretaceous sandstones in southern Utah for R. C. Moore. G. I. Finlay and C. H. Dane prepared a report on the Four Corners area, Arizona and Utah, for the land-classification branch. L. F. Noble wrote a paper on the section of the Kaibab limestone at Buckskin Gulch. G. F. Loughlin prepared a land-classification report on alunite claims near Marysvale.

Publication.—Bulletin 751–D.

VERMONT

Field.—Arthur Keith, with A. C. Swinnerton, did field work in the Castleton quadrangle, Vt. Mr. Keith also mapped the structure and stratigraphy in the St. Albans quadrangle. L. M. Prindle did field work in the Pawlet, Greylock, and Berlin quadrangles and studied talc deposits in the vicinity of Johnson, Waterbury, Rochester, and Chester. Messrs. Keith and Prindle studied the stratigraphy and structure of the Vermont slate belt and the Cambrian stratigraphy of northwestern Vermont.

Office.—Arthur Keith made a study of Vermont stratigraphy preparatory to field work. L. M. Prindle studied material bearing on the geology of the talc deposits of Vermont and New York and did some work on the Taconic geologic folio.

VIRGINIA

Field.—C. S. Ross visited a pyrite mine at Monerate, Va., in connection with the reconnaissance of metalliferous deposits of the eastern United States.

Office.—M. R. Campbell completed a cooperative report on the Valley coal fields of Virginia and transmitted it to the State geologist for publication. W. C. Mansfield continued work on a report on the Miocene stratigraphy of Virginia. He also began a paper on the climatic conditions indicated by the molluscan fauna of the Chesapeake group of Maryland and Virginia.

WASHINGTON

Field.—E. F. Burchard, accompanied by O. P. Jenkins, of the Washington Division of Geology, inspected iron-ore deposits in Washington.

Office.—F. H. Knowlton studied the fossil flora of the Puget group of Washington and began a report on this subject. He revised his manuscript on the flora of the Latah formation, and Edward Sampson prepared some notes on the volcanic rocks near Spokane, for incorporation in this report. J. T. Pardee and Kirk Bryan prepared a paper on the geology of the Latah formation in relation to the lavas of Columbia Plateau near Spokane, for presentation to the American Association for the Advancement of Science. F. C. Calkins made a petrographic study of cores from the Latah-Texas well for the Engineers' Club of Spokane. T. W. Stanton reported on Lower Cretaceous fossils and also on Triassic and Cretaceous invertebrates from San Juan, Spieden, and Sucia islands. W. H. Dall reported on Eocene fossils. F. E. Matthes revised a pamphlet on the glaciers of Mount Rainier, at the request of the National Park Service.

WEST VIRGINIA

G. H. Girty studied Carboniferous invertebrate fossils from West Virginia. Frank Leverett brought his field notes on West Virginia into harmony with the topographic maps that have appeared since the field work was carried on.

WISCONSIN

Field.—E. O. Ulrich did stratigraphic work on the Cambrian and younger rocks of south-central and western Wisconsin in cooperation with the State Survey.

Office.—Edwin Kirk prepared and studied for comparison with western Silurian faunas fossils furnished by E. O. Ulrich from the Mayville formation of Wisconsin.

WYOMING

Field.—W. W. Rubey, M. N. Bramlette, F. A. Melton, T. W. Stanton, J. B. Reeside, jr., and C. E. Dobbin collected and studied fossils from the Pennsylvanian and Cretaceous formations of the Black Hills in Wyoming, Montana, and South Dakota. Mr. Rubey mapped and measured stratigraphic sections in the Upper Cretaceous from Moorcroft north to the Montana State line and made further studies in the Rocky Ford oil district. Mr. Dobbin, assisted by H. F. Clark, made a reconnaissance reexamination of coal lands in the Gillette (Upper Belle Fourche) and Pumpkin Butte coal fields, to obtain data for the revision of a report previously prepared by V. H. Barnett. Mr. Dobbin also studied recent coal-mine developments in the Hanna Basin, to revise a report by C. F. Bowen, and completed a study of the Fox Hills, Lance, Fort Union, and Wasatch formations in southeastern Montana and northwestern Wyoming. A. J. Collier, C. D. Avery, and E. T. McKnight determined the structure of the Strom and Rex Lake domes, in Albany County, and the Pass Creek, Lake Valley, Hatfield, and Miller Hill domes, in Carbon County. Messrs. Collier and McKnight examined coal lands in southwestern Carbon County, mapped in some detail the structure of the Buffalo Basin anticline and the Crooks Gap anticline, in Fremont County, and examined the Horsetrack and Pacific Springs anticlines, Fremont County, and the Lost Creek, Pickett Lake, and Wilmington anticlines, Sweetwater County. Mr. Avery collected oil-well data in the Big Piney, Labarge, and Fossil oil fields and at Cheyenne. T. W. Stanton and J. B. Reeside, jr., reviewed the Cretaceous and Tertiary sections at many localities near the Union Pacific Railroad from Black Buttes on the west to Rock River on the east. Mr. Stanton also accompanied C. E. Dobbin and W. W. Rubey during their review of the Cretaceous-Eocene transition formations in the Powder River basin. W. H. Bradley classified coal land in a township in Baxter Basin, south of Rock Springs. W. C. Alden made a study of the glacial geology and physiography of eastern Wyoming, including Laramie, Platte, Converse, Natrona, and Albany counties, and of western Wyoming from Jackson Hole and the Wind River Mountains south to Rock Springs. Edwin Kirk studied the Ordovician of the Wind River Range. J. T. Pardee examined phosphate lands in western Teton County.

Office.—Editorial work on the Wyoming geologic map was done by G. W. Stose. W. W. Rubey, W. T. Thom., jr., and C. E. Dobbin prepared corrections for the map. G. R. Mansfield wrote a report for the land-classification branch on phosphate lands in the Teton Basin. J. D. Sears completed his report on the geology of the Baxter Basin gas field, Sweetwater County. W. W. Rubey prepared a press notice concerning the Rocky Point-Stroner anticline, accompanied by a sketch structure map, and continued work on his report on the Rocky Ford oil district and also on a general report on the Black Hills Rim project. J. T. Pardee made land-classification reports on phosphate lands in western Teton County. J. B. Reeside, jr., revised his report on the geology along Green River, Wyoming and Utah, for inclusion in a paper by R. R. Wooley for unofficial publication. C. E. Dobbin completed a report on the Gillette coal field, of which he is a joint author with V. H. Barnett and which contains a chapter on the Minturn district by W. T. Thom, jr. Mr. Dobbin compiled stratigraphic data on the Cretaceous-Eocene transition beds in Wyoming and completed his part of a report on the Pumpkin Butte coal field, by C. H. Wegemann, R. W. Howell, and C. E. Dobbin. F. L. Hess prepared a report on the platinum deposits near Centennial, Albany County. W. C. Alden began a report on the glacial geology and physiography of Wyoming and submitted papers on this subject to the American Association for the Advancement of Science and the Geological Society of Washington. W. H. Bradley's report on shore phases of the Green River formation in northern Sweetwater County was completed. A. J. Collier wrote a press notice on Rex Lake and other domes west of Laramie; a press notice and a land-classification report on oil and gas prospects of the Miller Hill-Lake Valley anticline, Carbon County; a press notice on the gas field in Buffalo Basin, Fremont County; and reports on the Spring Creek dome and anticlines in the western part of the Great Divide Basin, Fremont and Sweetwater counties, and on a coal-prospecting permit in western Carbon County for the land-classification branch. D. F. Hewett revised his report on the geology and mineral resources of the Oregon Basin, Meeteetse, and Grass Creek Basin quadrangles, which was transmitted for publication. J. B. Eby prepared a press notice relative to the Baggs anticline, Sweetwater County. Edwin Kirk reported on Cambrian fossils and arranged Ordovician collections of fossils from the Lander region; G. H. Girty studied Carboniferous fossils from Yellowstone Park and the Black Hills; T. W. Stanton reported on Eocene invertebrates from Campbell County; W. H. Dall reported on Neocene fossils; F. H. Knowlton reported on fossil wood and plants from the Black Hills and from Buffalo Basin; and J. B. Reeside, jr., studied Cretaceous fossils collected at the Rex dome, examined collections of Jurassic and Cretaceous fossils from the western Black Hills and adjoining areas, revised faunal lists for a paper on the Belle Fourche coal field by V. H. Barnett, made up a collection of Mesozoic fossils for exchange, and examined part of a collection of Cretaceous fossils from eastern Wyoming. W. T. Lee revised his report on the correlation of formations in eastern Colorado and central Wyoming, which was critically reviewed by H. D. Miser.

Publications.—Geologic map of Wyoming; Professional Paper 132–F; Bulletins 756, 751–G, 764; Press Notices 17915, on the Rocky Point plunging anticline; 1545, on the gas field in Buffalo Basin, Fremont County; 17875, on the Lost Soldier-Ferris district; 14, on the prospects for oil in the Rex Lake and other domes west of Laramie; 18092, on the prospects for oil or gas in an anticline near Baggs; and 483, on oil and gas in the Miller Hill-Lake Valley anticline, Carbon County.

OTHER COUNTRIES

T. W. Stanton reported on Cretaceous invertebrates from western Africa for C. F. Bowen. W. H. Dall reported on fossil material from western Africa for C. W. Washburne.

K. C. Heald tested bituminous limestone from the vicinity of Bir Ali, Arabia, at the request of the State Department.

J. B. Reeside, jr., studied and made a report on a collection of Cretaceous fossils from Argentina for F. H. Lahee; and W. H. Dall reported on Tertiary fossils for Prof. Bailey Willis.

F. L. Hess, with E. P. Henderson, prepared a paper for outside publication on polycrase from Brazil.

W. H. Dall reported on Tertiary fossils from British Columbia sent by the Victoria Colonial Museum, British Columbia; on fossiliferous material dredged off the Grand Banks and vicinity for the Peabody Museum, Yale University; and on petropods of the Canadian Arctic expedition sent by the Victoria Memorial Museum of Ottawa. E. O. Ulrich, assisted by R. D. Mesler, studied fossils obtained between the lowest Canadian graptolite zones and the top of what Mr. Ulrich proposes to call the Ozarkian zone in British Columbia; and T. W. Stanton prepared a report on some Cretaceous fossils from Alberta and examined Paleozoic fossils from Britsh Columbia, for the Geological Survey of Canada.

Edwin Kirk wrote the first draft of a paper on a new Devonian pelecypod genus from China, and W. H. Dall reported on fossils from northeastern China.

J. B. Reeside, jr., prepared a report with illustrations on a collection of Cretaceous invertebrates from eastern Ecuador.

Edwin Kirk worked on a short paper on an old collection of fossils from Ellesmereland.

W. H. Dall reported on fossils from the Fiji Islands sent by the Marist Seminary at Brookland, D. C.; also on fossil collections from British Guiana, Japan, Mexico, Nicaragua, and the Island of Papua.

W. C. Mansfield prepared a premilinary report on Tertiary fossils from Panama.

R. D. Mesler worked up for comparison and for biologic study collections of fossils from Sweden made by E. O. Ulrich in 1922, and Mr. Ulrich studied these collections. W. H. Dall reported on fossils for the Swedish Riks Museum.

W. H. Dall furnished data on fossils from Uruguay to Doctor Felippone, of Montevideo, and on material sent by Dr. H. von Ihering.

W. H. Dall reported on fossils from the Dominican Republic sent by C. J. Maury, of Cornell University, also on fossil collections from Cuba and Trinidad, and named a series of specimens from Watling Island. W. C. Mansfield corrected proof of his paper on the Miocene gastropods and scaphopods of Trinidad. W. P. Woodring prepared an article on *Arca patricia* Sowerby, a Miocene fossil from the Dominican Republic, for publication in Science; a paper on Quaternary reef caps of the Republic of Haiti, for presentation to the American Association for the Advancement of Science; and a paper on Miocene mollusks from Bowden, Jamaica, for the Carnegie Institution of Washington.

DIVISION OF MINERAL RESOURCES

The general organization of the division of mineral resources during the year was unchanged. J. P. Dunlop was transferred to the field May 1, 1925, with headquarters at Joplin, Mo. The clerical staff was reduced by four transfers and one resignation. During the year the division employed eight clerks on temporary appointments in the Washington office and one in the San Francisco office.

Cooperation with the State geological surveys of Alabama, Florida, Georgia, Illinois, Iowa, Maryland, Michigan, Missouri, New Jersey, New York, North Carolina, Virginia, Washington, and Wisconsin was continued during the year. Cooperation with other Federal bureaus included the furnishing of some statistical data to the Bureau of Mines and the completion for the Bureau of the Census of work in connection with the canvass of consumption of mine timber and the census of manufactures from the previous year. Contact with other Government agencies was maintained through the regular attendance of the Survey's representative on the Economic Liaison Committee.

The metals section limited its work chiefly to the routine of collecting and publishing statistical matter relating to the mine, smelter, and refinery output of metals and to performing a small amount of

work in cooperation with the Senate Commission on Gold and Silver Inquiry. The nonmetals section was also engaged almost entirely in routine statistical inquiries and compilations. The coal section, in addition to compiling the annual statistical reports, prepared and issued a weekly report on coal and coke, maintained contact with the Department of Commerce in its studies of special features of the coal industry, and prepared reports on the commercial stocks of coal September 1, 1924, in cooperation with the Bureau of the Census, and June 1, 1925, independently. The work of the interdepartmental committee on coal statistics was completed early in December, and its report was placed in the hands of the Secretaries of Interior, Commerce, and Labor, through the heads of the bureaus interested. At the request of the American Statistical Association, a paper entitled "Mineral resources for the future population" was written by F. G. Tryon and Miss Lida Mann and read before the Association December 29. The coal section also prepared for the printer the manuscript of the report of the United States Coal Commission. The petroleum and natural gas section, besides preparing its routine annual and monthly statements on petroleum, compiled for the Federal Oil Conservation Board tables showing supply and demand for crude petroleum in 1920–1924, issued a map of the oil and gas fields of Texas, and began to compile new oil and gas maps of Oklahoma and Wyoming. The section of foreign mineral reserves was engaged chiefly in completing a world atlas on fuel reserves and in collecting and compiling information on the production of minerals in foreign countries.

In the San Francisco office the demand for statistical work required all the time of the geologist in charge, J. M. Hill, and necessitated the employment of additional temporary clerical help for about two and one-half months. Mr. Hill also began a geologic report on the Randsburg district and prepared a statement on the effects of the drought on placer mining in California in 1924. V. C. Heikes, statistician in charge of the Salt Lake City office, devoted most of his time to routine work. He also functioned as the Survey's specialist on arsenic and contributed to interbureau and interdepartmental discussion of the arsenic situation. C. N. Gerry, of the Salt Lake City office, devoted some time, both in the field and in the office, to the work of collecting old production records for the Wood River district, Idaho, from 1881 to 1906 as an aid to geologic study of metalliferous resources and as a beginning of a history of mining in Idaho. C. W. Henderson, in charge of the Denver office, besides directing the regular annual statistical inquiries, devoted a large part of his time to liaison work between the Survey and cooperating State officers of the Colorado Metal Mines Fund. He also completed revision and proof reading of his professional paper on the history of mining in Colorado.

The final proof of Parts I and II of Mineral Resources of the United States for 1922 has been sent to the Government Printing Office. Of the report for 1923, 58 chapters had been published at the end of the year, 1 was transmitted in June, and 3 are still in preparation. The preliminary summary of mineral production in 1924 was transmitted by the division March 31, and final page proof was

received May 23 and retransmitted June 27. Two chapters for 1924 have been published.

After the promulgation of the Executive order of June 4 transferring the division of mineral resources to the Department of Commerce arrangements for the transfer were perfected so that the division could be incorporated on July 1 as a part of the Bureau of Mines without interruption of work.

DIVISION OF CHEMICAL AND PHYSICAL RESEARCH

The personnel of the division of chemical and physical research on July 1, 1924, consisted of 7 chemists, 2 physicists, 2 laboratory aids, 1 clerk, 1 laboratory assistant, and 1 laborer. George Steiger was in charge of the division and supervised the work of the chemical laboratory, and C. E. Van Orstrand supervised the work of the physical laboratory. A. F. Melcher, geophysicist, resigned February 28, 1925, and P. G. Nutting was appointed March 16 to fill the vacancy. The most important change in the personnel of the division came through the retirement of F. W. Clarke December 31, 1924. Professor Clarke had been connected with the chemical work of the Geological Survey since 1883, and for 33 years of that time he was chief chemist. The outstanding feature of his work was his ability to marshal chemical data so that they could be readily used by the geologist. He is probably best known for his researches into the composition of the natural silicates and the general composition of the earth's crust, for his gathering from an enormous volume of literature in many languages the essential facts of geochemistry and putting them together in related form in a book that has run into several editions, for his tabulation of data on the constants of nature, and for his philosophical speculations regarding the chemical composition and physical condition of the earth's interior.

The funds available for chemical and physical work consisted of an appropriation of $40,000 plus $3,817 from the appropriation for salaries, less $3,850 expended in the search for potash in the desert region of the Southwest.

WORK IN CHEMISTRY

For the official work of the Survey 1,077 quantitative analyses were made and 209 mineral specimens were examined and the minerals determined, the determinations including a careful study of their properties. In addition 3,191 specimens sent to the Survey by outside persons were identified. On June 30, 1925, 434 samples were awaiting quantitative analysis and 19 specimens awaiting identification.

F. W. Clarke read final proof of his two publications, "The data of geochemistry" and "The composition of river and lake waters of the United States."

W. T. Schaller made a field study of the lithium minerals and of an unusually deep pink muscovite in New Mexico and, with the assistance of E. S. Larsen, an exhaustive field study of the lithium pegmatites of southern California. Mr. Schaller read a paper before the National Academy of Sciences and prepared an article for publication on the origin of lithium pegmatites of California. He investigated the field relations of the new silver ore argentojarosite at Dividend, Utah, and studied the hydration of autunite.

R. C. Wells continued the study of the formation of metallic ores, prepared a paper on the reactions between ferrous salts and cuprous salts, which appeared in the American Journal of Science, wrote a book review for the

Journal of the American Chemical Society, and served as a member of the National Research Council's committee on the determination of geologic time. He also made tests for rare elements in numerous samples of petroleum coke and prepared a preliminary note, "Observations on the minor constituents of petroleum," which was published in Economic Geology.

George Steiger prepared a report of the work done during the year in the chemical analysis of sedimentary deposits for the committee on sedimentation of the National Research Council and served as a member of that committee. He also wrote a supplemental chapter for the treatise on sedimentation which is being compiled by W. H. Twenhofel.

E. T. Erickson made an investigation of part of a cargo of fish from a vessel that had been sunk in sea water for three years, which showed that organic compounds had been formed that yielded petroleum products upon simple distillation. This work was the basis of a paper prepared for publication by Mr. Erickson entitled "Geochemical relationships of animal life and organic matter in marine sediments as a source of petroleum." He also wrote a paper describing the chemical nature of ichthyol and continued his experimental work on the Green River oil shale.

R. K. Bailey made analyses of salts from a number of new wells that indicate that the area in which potash salts that compare favorably with those found in European deposits may occur is much larger than had been previously known. One of the most promising of these wells is in the southeastern part of Crane County, Tex. The potash-rich strata encountered in this well lie closer to the surface than those found in any of the other wells so far examined. Salts taken from the 894-foot level contained 6.24 per cent of potash (K_2O); other potash-rich strata occur at the 945 and 1,065 foot levels. A sample of carnallite containing the equivalent of 16.7 per cent of K_2O was received in the laboratory and said to have come from the Crescent Eagle well, near Thompson, Utah. It was reported that a very large quantity of the salt was taken from this well at the 3,150-foot level. A salt said to have come from the same well at 3,910 to 3,917 feet contained the equivalent of 49.05 per cent of K_2O. Mr. Bailey analyzed during May and June 70 samples from the Salduro Marsh region, Utah, as an aid to the classification of the land for its potash content.

E. P. Henderson spent most of his time in identifying mineral specimens for the general public.

J. G. Fairchild made analyses of two series of phosphate rocks for land classification, one from Montana and the other from Florida, made numerous quantitative analyses for geologists, and analyzed a series of samples of sediments taken from the bottom of the Atlantic Ocean between Maine and the Bahamas.

WORK IN PHYSICS

The application of physics in the study of geologic problems is being recognized as of fundamental importance in the fields of both theoretical and economic geology. Survey physicists are conducting researches in only a very few of the fields that are available for investigation.

Prior to his resignation A. F. Melcher made a special study of the porosity of the Bradford oil sand. Determinations on a core of the sand obtained near Custer City, Pa., showed a porosity of about 15 per cent between the depths of 1,238 and 1,282 feet. The results were summarized in a press notice on the porosity of the sand and its relation to the production of oil. Working under the direction of Mr. Melcher and the National Research Council, G. H. Hanson made a special study of the porosity of the cap rock in the Cromwell field, Okla.

P. G. Nutting continued the work of Mr. Melcher on the structure of oil sand in its relation to oil storage, migration, and recovery and prepared a paper entitled "Forces in the system oil-water-sand," dealing chiefly with the displacement of petroleum from oil sands by means of water and water solutions. A solution has been found that is inexpensive and in the laboratory gives a very clean, rapid drive of certain types of petroleum from oil sands. Further work is being done on methods of driving applicable to conditions existing in the Ohio, Oklahoma, and Texas oil fields.

C. R. Randall assisted in the routine observations and computations involved in the laboratory work until January 1, when he was transferred to the Bureau of Standards.

C. E. Van Orstrand cooperated with G. B. Richardson in the computation of petroleum production curves. The results of the computations are given in Mr. Richardson's paper, "Ratio of peak production to estimated total production in certain oil fields," and the theory involved was published in a paper on the empirical representation of certain production curves by Mr. Van Orstrand. Two reports were prepared for Prof. W. H. Twenhofel, chairman of the committee on sedimentation of the National Research Countil, entitled "Some recent contributions by physicists that have a bearing on problems of sedimentation" and "Note on a possible method of representing the distribution of diameters of grains of sand." A short paper incidental to the work of the laboratory was published under the title "Note on certain practical problems which require the use of extended values of mathematical functions." Mr. Van Orstrand made temperature tests in deep well No. 1842 of the Peoples Natural Gas Co., near Long Bridge, Westmoreland County, Pa. This well has reached a depth of more than 7,700 feet and is the deepest well in the world. Temperature tests made by him in the oil fields at Coalinga, Calif., and Warm Springs, Ferris Dome, Lost Soldier, and Salt Creek, Wyo., point to the important conclusion that the highest temperatures in these fields are found at or near the crests of the anticlines. W. T. Thom, jr., has made a special study of the Salt Creek data in his paper, "The relations of earth temperature to anticlinal folds," and has emphasized the importance of utilizing temperature tests in prospecting for oil and other mineral deposits.

Advice and assistance were given to Gordon Taylor on the modification of the Nutting portable seismometer for field work in locating geologic structural features.

ALASKAN BRANCH

PERSONNEL AND EXPENDITURES

On July 1, 1924, the personnel of the Alaskan branch consisted of 1 chief Alaskan geologist, 6 geologists, 3 associate geologists, 1 junior geologist, 4 topographic engineers, 1 assistant topographer, 1 draftsman, and 3 clerks; on June 30, 1925, it consisted of 1 chief Alaskan geologist, 4 geologists, 3 associate geologists, 1 assistant geologist, 3 topographic engineers, 1 draftsman, and 2 clerks.

The funds available for the fiscal year 1925 included an appropriation of $75,000 for the investigation of Alaskan mineral resources, carried in the Interior Department bill, available June 5, 1924, and $72,000, carried in the Interior Department appropriation act for the year 1926, available March 3, 1925. In addition, funds amounting to $75,000 were made available to the Survey by transfer from the Navy Department for the continuation of the investigation of Naval Petroleum Reserve No. 4, in northern Alaska. Two of these appropriations were legally available and expended during the fiscal year 1924; all three were available for expenses during the fiscal year 1925; and the balances of the Navy funds and the regular 1926 appropriation are available for expenditures during the fiscal year 1926. An allotment of $3,800 was made available in the early part of the season of 1924 for the classification of Alaska public lands and was devoted to surveys of petroleum lands. The amount expended in starting field parties in advance of the beginning of the fiscal year in the field season 1924 practically offset the amount used to start parties at the end of the fiscal year 1925 to begin work for the field season 1925; and except for the work for the Navy Department the funds used for the fiscal year were about $75,000.

The following table shows the approximate allotment for salaries and field and office expenses for the fiscal year 1925:

Expenditures from funds directly appropriated for Survey Alaska work

Branch administration	$3,850
Other technical salaries	21,750
Branch clerical and drafting salaries	5,400
Services rendered by other Survey units, including editing, office duplicating-machine service, accounting, etc.	7,000
Office expenses, stationery, telegrams, photography, etc.	2,000
Field expenses	28,000
Airplane mapping by Navy Department	7,000
	75,000

The items in the table for "Other technical salaries," "Field expenses," and "Airplane mapping" and $1,500 of the item for clerical salaries have been allotted for the different kinds of surveys and investigations in progress during the fiscal year 1925, as follows:

General investigations	$3,750
Geologic surveys	33,400
Topographic surveys	19,150
Statistics of mineral production	1,950
	58,250

In the foregoing table it has been impossible to determine accurately the distribution of expense between geologic and topographic surveys, for two parties were engaged in work of both kinds.

Approximate distribution of work by geographic divisions for the fiscal year 1925

General investigations	$3,750
Southeastern Alaska	16,750
Prince William Sound	8,300
Matanuska region	5,150
Southwestern Alaska	9,775
McKinley region	3,150
Nixon Fork region	6,800
Upper Yukon	2,625
Statistics of mineral production (including $1,500 for clerical salaries)	1,950
	58,250

An analysis of the $75,000 transferred to the Geological Survey by the Department of the Navy is as follows:

Allocation of funds for surveys in Naval Petroleum Reserve No. 4, northern Alaska

Administration	$2,500
Other technical salaries	17,100
Clerical and drafting salaries	3,300
Services rendered by other Survey units, including editing, accounting, instruments, etc	2,900
Office expenses, including stationery, photography, telegrams, etc	900
Field expenses	36,000
Allotted to work in progress for fiscal year, 1926	11,000
Balance for contingencies	1,300
	75,000

Areas surveyed by Geological Survey in Alaska, 1898–1925, in square miles

Fiscal year	Areas covered by geologic surveys			Areas covered by topographic surveys		
	Exploratory (scale 1:625,000 or 1:1,000,000)	Reconnaissance (scale 1:250,000)	Detailed (scale 1:62,500)	Exploratory (scale 1:625,000 or 1:1,000,000)	Reconnaissance (scale 1:250,000; 200-foot contours)	Detailed (scale 1:62,500; 25, 50, or 100-foot contours)
1898–1924	73,200	123,665	5,657	51,680	163,430	3,936
1925	4,300	18,590	190	4,300	17,470	130
	77,500	142,255	5,847	55,980	180,900	4,066
Percentage of total area of Alaska	39			41		

WORK OF THE YEAR

The heading "General investigations" in the preceding tables comprises a study of the broader aspects of the general geologic history of Alaska, to which several detailed investigations have contributed and in the course of which Alfred H. Brooks, who carried on this work, visited southeastern Alaska, Prince William Sound, and the country adjacent to the Alaska Railroad; an office study of the fossil flora of the Tertiary rocks of Alaska, to which Arthur Hollick devoted about three months; paleontologic studies which, through the courtesy of the geologic branch, were carried on mainly by the specialists of that branch and which were of importance in investigating and correctly interpreting certain coal and mineral deposits; additional work by James McCormick on revision of the "Geographic dictionary of Alaska," a valuable report published in 1906 which has been out of stock for many years; and a petrographic study of some rocks and mineral specimens from Alaska by M. N. Short, of the geologic branch.

Among the paleontologic studies referred to above may be mentioned the determination by T. W. Stanton of invertebrate fossils from Mesozoic rocks collected by various parties in different parts of Alaska, the determination by F. H. Knowlton of Mesozoic plants, by Edwin Kirk of Ordovician, Silurian, and Devonian invertebrates, by G. H. Girty of Carboniferous invertebrates, by J. B. Reeside, jr., of fossils from Prince William Sound, and by W. H. Dall of Tertiary invertebrates.

The publications of the year consisted of a report on the progress of investigations in Alaska in 1922 (Bulletin 755), a report on the Point Barrow region, northern Alaska (Bulletin 772), a report on the Aniakchak Crater, Alaska Peninsula (Professional Paper 132–J), three chapters of the report on progress of investigations in Alaska in 1923 (Bulletins 773–A to 773–C), two topographic maps covering parts of the Alaska Railroad route, and a revised edition of the base map of Alaska. Brief notices of these publications appear elsewhere in this volume.

Eleven parties, including 11 geologists, 4 topographic engineers, 1 topographic aid, and 25 auxiliaries, were dispatched to Alaska in 1924. Of these parties 6 were engaged in purely geologic work, 1 in purely topographic work, and 4 in combined geologic and topographic work.

Alfred H. Brooks, chief Alaskan geologist, died suddenly November 22, 1924; S. R. Capps served as acting chief Alaskan geologist until April 30, 1925, when Philip S. Smith was designated to take charge of the branch. Miss Lucy M. Graves devoted most of her time to administering the clerical work and was in charge of the branch during the absence of the chief and the senior Alaskan geologists. Miss Erma C. Nichols devoted about two-thirds of her time to the collection and coordination of the mineral statistics of Alaska.

Five projects were undertaken in southeastern Alaska, two of which were executed during the field season of 1924 and the others during the field season of 1925. In 1924 A. F. Buddington continued studies of the geology and mineral resources of the Ketchikan and Wrangell regions and collected much new

information regarding the general geology of southeastern Alaska in relation to the ore deposits.

In the same year R. M. Wilson continued detailed topographic mapping of the Hyder district, which had been started during the preceding fiscal year by E. S. Rickard, who had been injured in the course of field duty.

In 1925 Mr. Buddington was detailed to map the geology of unsurveyed areas in the southwestern part of the Ketchikan region and then to make detailed geologic surveys in the Hyder district.

R. K. Lynt in 1925 did topographic mapping in the Ketchikan district and then joined surveyors from the General Land Office to make a detailed topographic map in the vicinity of Wrangell Narrows.

Arrangements have been made with the Bureau of Aeronautics of the Navy Department for airplane photographing of the islands of southeastern Alaska, with a view to expediting topographic mapping and facilitating determination of the geology and mineral resources of probably 18,000 square miles of territory that is difficult to survey by other methods. The Alaskan branch allotted $7,000 for this work, under the fortifications act, and the work will be done by the Navy Department as soon as preparations can be completed.

In the Prince William Sound region F. H. Moffit continued during the field seasons of 1924 and 1925 a study of the ore deposits and related geology of the western part of the sound and investigated mining developments in portions of the Copper River basin.

S. R. Capps, with K. K. Landes as geologic assistant, spent the field season of 1924 in the upper Matanuska region, mapping and determining the geologic history of the coal-bearing rocks. Late in the fiscal year, in the spring of 1925, Mr. Landes was assigned to complete the mapping of an area between Matanuska and Knik rivers.

W. R. Smith, during the field season of 1924, carried on geologic mapping in the Cold Bay region, where indications favorable for the accumulation of oil pools have been reported. In 1925 he left Washington to serve as geologist in explorations in Naval Petroleum Reserve No. 4.

In 1924 R. H. Sargent, with J. S. Brown, geologist, made topographic and geologic surveys in the Nixon Fork region of the Kuskokwim. In the field season of 1925 Mr. Sargent, with R. S. Knappen, geologist, conducted surveys westward from Cold Bay to Chignik, Alaska Peninsula.

A party in charge of S. R. Capps, in the field season of 1925, made geologic surveys in the country adjacent to Mount McKinley and investigated the mineral resources of portions of the Kantishna and Chulitna districts.

J. B. Mertie, jr., for all of the fiscal year until April, 1925, was engaged in work connected with surveys of Naval Petroleum Reserve No. 4. In May, 1925, he left Washington to conduct geologic investigations along Yukon River near the international boundary and to correlate previous geologic investigations in this region.

All the above-described projects that were started late in the fiscal year will be continued into the fiscal year 1926.

Geologic and topographic surveys made in Naval Petroleum Reserve No. 4 for the Department of the Navy were continued in 1924 by the dispatch in January of two parties, in charge of Philip S. Smith, with J. B. Mertie, jr., geologist, and Gerald FitzGerald and R. K. Lynt, topographers. These parties went overland and carried on surveys in unmapped areas in the southern and eastern parts of the reserve. During the open season of 1924 W. T. Foran, geologist, and O. L. Wix, topographer, went by sea to Wainwright and surveyed a strip of country in the western and southern parts of the reserve. All these parties returned to Washington in the fall.

In February, 1925, a party in charge of Gerald FitzGerald, topographer, with W. R. Smith, geologist, was sent into the southern part of the reserve north of Noatak River to make topographic and geologic surveys.

FUTURE WORK

Systematic investigations of the geology and mineral resources of Alaska have been carried on for more than a quarter of a century. Practically all this work was organized, administered, and largely participated in by Alfred H. Brooks, late chief Alaskan geologist, who, through his understanding of the problems of the mineral industry in a frontier country and broad technical knowledge was responsible for the application of sound scientific principles to the development

of the Territory's mineral resources. Although the work of the Geological Survey in Alaska has been instrumental in furnishing a basis on which the mineral and other industries might proceed with assurance as to soundness of the information furnished, it has covered only a little more than a third of the Territory with maps and reports that are at least of exploratory standard. Of the remaining 350,000 square miles, nearly 200,000 should be surveyed as soon as funds and personnel are available. Areas that are of special importance at this time are southeastern Alaska, which, in addition to containing minerals of commercial value, contains enormous water-power resources that will be of value in developing the mineral and forest product industries; areas in the general vicinity of the Alaska Railroad, the development of the resources of which should contribute directly or indirectly to the success of that Government enterprise; and a belt of mountain area from 100 to 300 miles wide, stretching from the international boundary to the Arctic Ocean on the west, which is largely unsurveyed and in which there are indications of valuable mineral deposits. There is also need for comprehensive studies and reports on the larger problems relating to the different mineral resources of the Territory, as well as for compilation and correlation of all available geologic information relative to southeastern Alaska; and the accumulation of data regarding much of the Territory has now reached a stage where the compilation of a general geologic map of Alaska is warranted.

TOPOGRAPHIC BRANCH

ORGANIZATION

The organization of the topographic branch at the end of the year is shown below. The Rocky Mountain division was abolished December 31, 1924, and the limits of the Atlantic, Central, and Pacific divisions are shown on Plate I.

Chief topographic engineer, C. H. Birdseye.
Atlantic division, division engineer in charge, Glenn S. Smith. (In the absence of Mr. Birdseye Mr. Smith acted as chief topographic engineer.)
Central division, division engineer in charge, W. H. Herron.
Pacific division, division engineer in charge, T. G. Gerdine.
Computing section, engineer in charge, E. M. Douglas.
Section of inspection and editing, engineer in charge, W. M. Beaman.
Section of cartography, engineer in charge, A. F. Hassan.
Map information office, engineer in charge, J. H. Wheat.
Section of relief maps, engineer in charge, J. H. Renshawe.
Section of photographic mapping, engineer in charge, T. P. Pendleton.

PERSONNEL

The technical force was increased by the appointment of 6 junior engineers, 18 apprentice engineering field aids, 1 senior photographer, and 1 minor map printer, and the reinstatement or transfer of 4 associate engineers, 1 assistant engineer, and 1 chief engineering field aid. In addition, 1 technical field assistant was employed. The force was reduced by 1 death, 27 resignations, 1 transfer, and 4 retirements. With these changes the corps now includes 1 chief topographic engineer, 3 senior engineers in charge of divisions, 13 engineers, 69 associate engineers, 22 assistant engineers, 17 junior engineers, 16 chief engineering field aids, 11 senior engineering field aids, 2 assistant engineering field aids, 19 apprentice engineering field aids, 1 senior photographer, 14 engineering draftsmen of various grades, and 1 field assistant, a total of 189. During the year 1 associate engineer, 4 assistant engineers, 8 junior engineers, 2 chief engineering field aids, 7 senior engineering field aids, 2 assistant engineering field aids, and 17 apprentice engineering field aids were on furlough for the whole or a part of the year. The clerical force

comprises 16 clerks of various grades, one of whom is a per diem employee, and 1 messenger.

At the end of the year J. H. Renshawe, engineer in charge of the section of relief maps, was retired on account of age. Mr. Renshawe was one of the original members of the Survey, having been appointed July 8, 1879. His work on relief maps was unique and set a new standard.

PUBLICATIONS

The published work of the topographic branch for the fiscal year consisted of 75 new standard topographic maps, 4 new editions of topographic maps, 42 river plans and profiles, 1 contour State map (New Mexico), 1 new edition of a State map (Wyoming), 1 sheet of standard map symbols (Board of Surveys and Maps), advance photolithographic prints of 93 new topographic maps now in process of engraving, and 88 photolithographs of new topographic maps for which publication has not yet been otherwise provided. Additional publications were shaded relief editions of standard topographic maps of 2 quadrangles in Pennsylvania and 2 in West Virginia.

Bulletin 766, giving the results of spirit leveling in California, was published in 54 separate parts during the year. Parts B, Triangulation, and C, Traverse, of a new bulletin to be entitled "Topographic instructions of the United States Geological Survey" were transmitted for publication.

APPROPRIATIONS

The Federal appropriations for topographic surveys for the fiscal year 1925 were as follows:

Topographic surveys	$500,000.00
Salaries, scientific assistants	11,108.33
Special funds for military mapping (contributed by War Department)	14,975.99
	526,084.32

COOPERATION

Cooperation has been maintained in 21 States and 1 Territory, which contributed the following amounts:

Alabama	$9,393.21	Oregon	$4,192.88
California	78,113.21	Pennsylvania	33,563.87
Colorado	9,511.27	Tennessee	4,225.31
Connecticut	500.00	Texas	95,646.26
Hawaii	19,463.08	Utah	9,534.19
Illinois	47,843.11	Vermont	2,471.48
Iowa	1,299.43	Virginia	11,175.50
Kentucky	4,350.96	Washington	4,828.95
Maine	4,997.69	West Virginia	4,996.04
Missouri	24,470.51	Wisconsin	14,443.10
New Hampshire	12,970.48		
New York	14,945.46		412,935.99

In addition, base-map work was executed for other Federal organizations at the following cost: For the Appalachian Park Commission, $231.50; for the General Land Office, $53.33; for the National Park Service, $849.78; for the Federal Board of Vocational Education, $41.66—a total of $1,176.27.

The total amount expended from all sources for the work of the topographic branch was $940,196.58.

SUMMARY OF RESULTS

The condition of topographic surveys to June 30, 1925, distinguished as to scale and date, is shown on Plate I.

As shown in the following table, the new area mapped was 17,323 square miles, making the total area surveyed to date in the continental United States, exclusive of Alaska, 1,265,385 square miles, or 41.8 per cent of the entire country. In addition, 529 square miles of resurvey was completed, making a total area of surveys during the year 17,852 square miles. River surveys amounting to 857 linear miles were also made.

In connection with these surveys 7,128 linear miles of primary levels were run, making 312,103 miles of primary and precise levels run since the authorization of this work by Congress in 1896. In the course of this work 1,860 permanent bench marks were established.

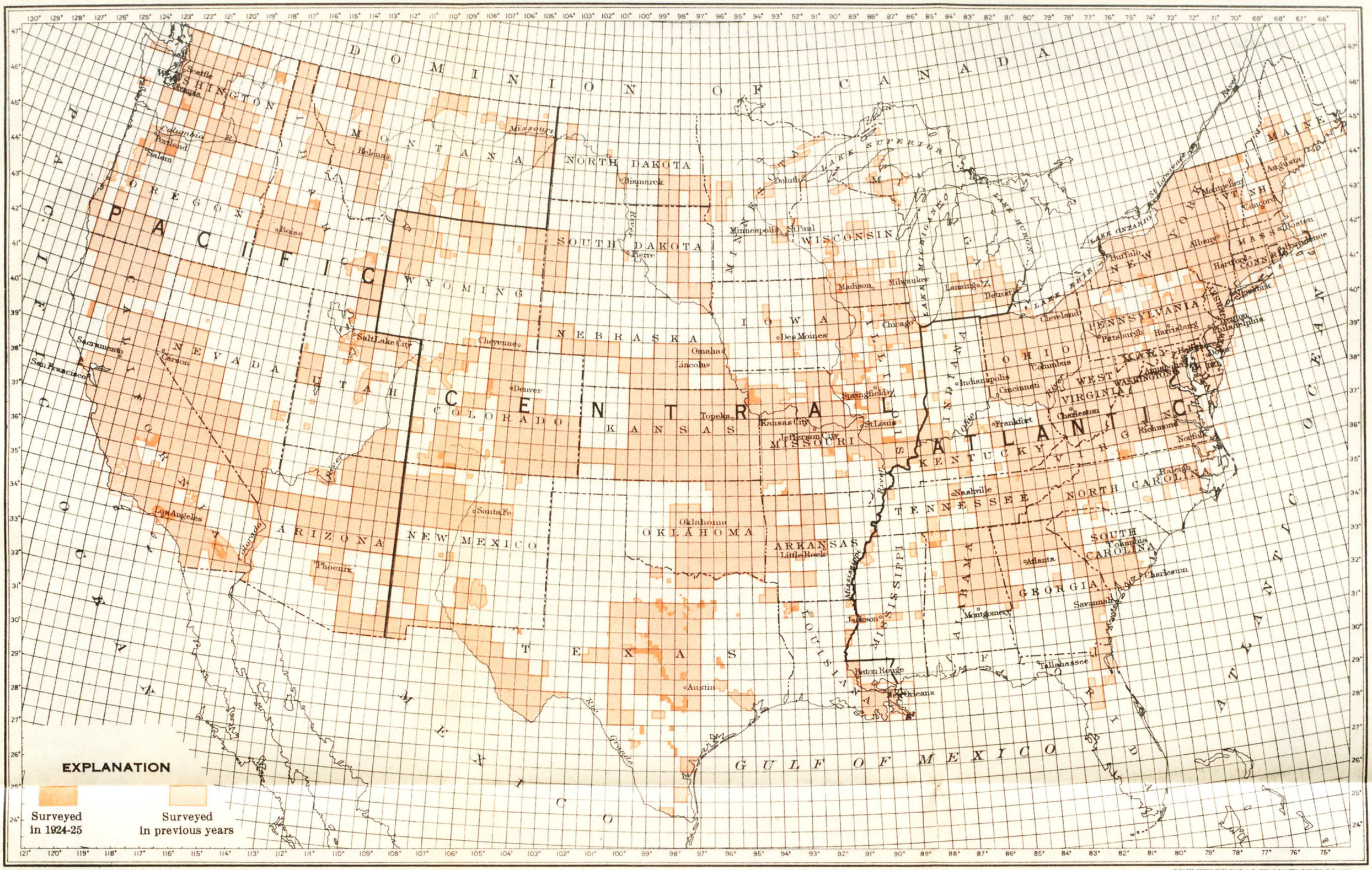
Triangulation stations to the number of 113 were occupied, and 88 were permanently marked.

Primary traverse lines aggregating 4,429 miles were run, in connection with which 1,109 permanent marks were set.

In addition, 481 square miles of topographic mapping was completed in Hawaii, and 42 miles of primary levels were run and 12 permanent bench marks established.

Present condition of topographic surveys of the United States and new area surveyed July 1, 1924, to June 30, 1925

State	New area mapped July 1, 1924, to June 30, 1925	Total area mapped to June 30, 1925	Percentage of total area of State mapped to June 30, 1925	State	New area mapped July 1, 1924, to June 30, 1925	Total area mapped to June 30, 1925	Percentage of total area of State mapped to June 30, 1925
	Sq. miles	*Sq. miles*			*Sq. miles*	*Sq. miles*	
Alabama	523	20,157	38.7	New Jersey	----------	8,224	100.0
Arizona	----------	55,580	48.7	New Mexico	----------	40,412	32.9
Arkansas	----------	21,494	40.3	New York	489	49,245	100.0
California	1,737	123,651	78.1	North Carolina	87	19,003	36.2
Colorado	936	53,695	51.6	North Dakota	----------	10,017	14.1
Connecticut	----------	4,965	100.0	Ohio	----------	41,040	100.0
Delaware	----------	2,370	100.0	Oklahoma	----------	39,908	57.0
District of Columbia	----------	70	100.0	Oregon	1,145	28,560	29.5
Florida	----------	4,716	8.0	Pennsylvania	1,198	32,638	72.3
Georgia	----------	24,835	41.9	Rhode Island	----------	1,248	100.0
Idaho	577	29,299	34.7	South Carolina	----------	13,737	44.3
Illinois	2,048	26,892	47.4	South Dakota	----------	19,243	24.8
Indiana	17	3,644	10.0	Tennessee	112	21,799	51.8
Iowa	50	12,583	22.4	Texas	3,721	84,242	31.6
Kansas	----------	64,159	78.0	Utah	624	18,428	21.6
Kentucky	194	20,723	51.0	Vermont	415	6,657	69.6
Louisiana	----------	8,810	18.2	Virginia	456	37,124	87.0
Maine	203	11,643	35.2	Washington	873	34,142	49.3
Maryland	----------	12,327	100.0	West Virginia	----------	24,170	100.0
Massachusetts	----------	8,266	100.0	Wisconsin	477	16,447	29.3
Michigan	----------	11,153	19.2	Wyoming	----------	30,102	30.7
Minnesota	----------	7,354	8.7				
Mississippi	----------	3,881	8.3	Total continental United States (exclusive of Alaska)	17,323	1,265,385	41.8
Missouri	1,178	42,385	61.0				
Montana	----------	41,590	28.5				
Nebraska	----------	27,117	35.0				
Nevada	----------	41,141	37.5				
New Hampshire	263	4,498	48.1	Hawaii	481	4,152	64.3



AREAS COVERED BY TOPOGRAPHIC SURVEYS MADE BY UNITED STATES GEOLOGICAL SURVEY PRIOR TO JULY 1, 1925

AND TERRITORY COVERED BY DIVISIONS OF TOPOGRAPHIC BRANCH

Scale $\frac{1}{14000000}$

100 0 100 200 300 400 500 Miles

ENGINEER REPRODUCTION PLANT, U. S. ARMY, WASHINGTON BARRACKS, D. C. 6-30-25

GENERAL OFFICE WORK

Computations for vertical and horizontal control were made, and the results were copied and cataloged by the computing section. The section of relief maps completed shaded relief maps of Connecticut, Massachusetts, New York, and Rhode Island; a special map of portions of New York, New Jersey, and Connecticut; and special maps of the Needle Mountains and Santa Maria Lake, Colorado; and of parts of Maine, New Hampshire, New Mexico, Pennsylvania, Tennessee, and Vermont. The map information office was engaged in indexing and cataloging the map data available in the several Federal departments and a number of non-Federal organizations and in furnishing miscellaneous map information to the public.

SECTION OF INSPECTION AND EDITING OF TOPOGRAPHIC MAPS

The section of inspection and editing of topographic maps continued to supervise the office preparation of all topographic maps and to inspect and edit them before reproduction. It also edited a number of maps submitted by other Survey branches and Government bureaus, including a new sheet of standard map symbols printed by the Geological Survey for the Board of Surveys and Maps.

The number of topographic maps in progress in the topographic branch (exclusive of those being engraved and printed) ranged from 246 in August to 300 in January; the monthly average was 272. An average of 21 employees were engaged in this section for the year, including an average of 3 temporarily assigned for drafting.

James McCormick spent 10 months of the year in work for the United States Geographic Board and in other special investigations and 2 months in revising the "Geographic dictionary of Alaska."

The work of this section is described further under "Publication branch" (p. 85).

SECTION OF PHOTOGRAPHIC MAPPING

The use of aerial photographs in topographic mapping greatly increased during the year, owing to the development of satisfactory methods of compilation. This work was undertaken in cooperation with the Air Service of the United States Army and the Bureau of Aeronautics of the United States Navy. Base maps for original surveys of 25 quadrangles in Texas, 3 in Missouri, 2 in Illinois, and 2 small areas in Indiana and Arizona were prepared. Base maps were also compiled for the resurvey of 42 quadrangles in Texas, 1 quadrangle in New York, and 6 quadrangles and a special area in Illinois. A revision of maps of 3 quadrangles in Texas was completed, a woodland sheet for the Indian Head quadrangle, Va.-Md., was prepared, and work on 5 quadrangles in Illinois, Tennessee, and New York was begun.

SECTION OF CARTOGRAPHY

The compilation of the new wall map of the United States was continued, 50 per cent being completed. Other map projects included the final corrections for sheet K–18 of the international map

and the revision of the maps of Alabama, Virginia, and Florida. Air-route maps for the Air Service of the United States Army were completed in sections, as follows: From New Orleans, La., to Beaumont, Tex.; from Iowa City, Iowa, to Omaha, Nebr.; and from Omaha to North Platte, Nebr. The results of surveys of streams in Colorado and Idaho were assembled and redrafted, and several quadrangle maps were inked. The compilation of the map of California was completed in pencil, and the road map of Illinois was further revised for the State and transmitted for printing. An Albers projection for the wall map of the United States was constructed on metal for use in the engraving of the map. Plate proofs of 23 quadrangle maps were corrected and submitted for the printing of enlarged maps for use in the regional planning of New York City and environs. Graphs were prepared for the Federal Board for Vocational Education, and maps of the Texas-Oklahoma boundary line were prepared for printing.

ATLANTIC DIVISION

FIELD WORK

Alabama.—In cooperation with the State geologist of Alabama the survey of the Gravelly Springs and Tuscumbia quadrangles was completed and that of the Barton quadrangle was begun, 523 square miles being mapped (scale 1:62,500, contour interval 20 feet). For the control of these areas 73 miles of primary levels were run and 16 permanent bench marks established, and 69 miles of primary traverse were run and 5 permanent marks set.

Indiana.—In cooperation with the Culver Military Academy the survey of a special area in the vicinity of Culver, Ind., was completed for the War Department, 17 square miles being surveyed (scale 1:20,000, contour interval 20 feet).

Kentucky.—In cooperation with the State Geological Survey of Kentucky the survey of the Cub Run, Scottsville, and Waddy quadrangles was completed and that of the Taylorsville quadrangle was begun, 194 square miles being surveyed (scale 1:62,500, contour interval 20 feet). A part of the mapping of the Cave in Rock quadrangle was revised.

Maine.—In cooperation with the Maine State Water Power Commission the survey of the Dead River quadrangle was begun, and that of the Pierce Pond quadrangle was continued, 203 square miles being surveyed (scale 1:62,500, contour interval 20 feet). For control, 140 miles of primary levels were run and 28 permanent bench marks established.

New Hampshire.—In cooperation with the Governor of New Hampshire the survey of the Concord quadrangle was completed, and that of the Boscawen quadrangle was begun, 263 square miles being mapped (scale 1:62,500, contour interval 20 feet). For control in New Hampshire 430 miles of primary levels were run and 102 permanent bench marks established, and 26 triangulation stations were occupied and 17 triangulation stations permanently marked.

New York.—In cooperation with the New York State engineer the survey of the Deposit, Greenwood, Wellsville, and Woodhull quadrangles and the New York portion of the Starrucca quadrangle was completed, 489 square miles being surveyed (scale 1:62,500, contour interval 20 feet). The resurvey of the Albany, Troy, and Schenectady quadrangles was begun, 78 square miles being mapped (scale 1:62,500, contour interval 20 feet). For the control of these areas 199 miles of primary levels were run and 51 permanent bench marks established.

Ohio.—The resurvey of the Delaware quadrangle was completed, 187 square miles being surveyed (scale 1:62,500, contour interval 10 feet).

Pennsylvania.—In cooperation with the Pennsylvania Department of Forests and Waters, Topographic and Geologic Survey, the survey of the Bradford, Brookville, Center Hall, Lewistown, and Menno quadrangles and the Pennsylvania portion of the Bushkill quadrangle was completed, and that of the Bloss-

burg, Eagles Mere, Hawley, Mifflintown, and Sideling Hill quadrangles was begun, 1,198 square miles being surveyed (scale 1:62,500, contour interval 20 feet). For control, 585 miles of primary levels were run and 150 permanent bench marks established, and 137 miles of primary traverse were run and 39 permanent marks set.

Tennessee.—In cooperation with the Tennessee State Highway Department the survey of the La Follette-Jellico highway project was completed, and that of the Waverly-Camden highway project was begun, 36 square miles being mapped (scale 1:24,000, contour intervals 10 and 20 feet). In addition, the survey of the Tennessee portion of the Byrdstown quadrangle was completed, 76 square miles being surveyed (scale 1:62,500, contour interval 20 feet). For control, 182 miles of primary levels were run and 73 permanent bench marks established, and 80 miles of primary traverse were run and 24 permanent marks set. In cooperation with the Tennessee State geologist 27 miles of primary levels were run and 8 permanent bench marks established, and 77 miles of primary traverse were run and 22 permanent marks set in the Tompkinsville quadrangle.

Vermont.—In cooperation with the State geologist of Vermont the survey of the Randolph quadrangle was completed, and that of the Underhill quadrangle was begun, 195 square miles being surveyed (scale 1:62,500, contour interval 20 feet). The survey of the Island Pond quadrangle was completed for the War Department, 220 square miles being mapped (scale 1:62,500, contour interval 20 feet). For control, 230 miles of primary levels were run and 57 permanent bench marks established.

Virginia.—In cooperation with the State geologist of Virginia the survey of the Draper and Martinsville quadrangles was completed, and that of the Rocky Mount quadrangle was begun, 543 square miles being surveyed (scale 1:62,500, contour interval 20 feet). Of this area 87 square miles is in North Carolina. For the control of the Critz quadrangle 71 miles of primary levels were run and 24 permanent bench marks established, and 27 miles of primary traverse were run and 7 permanent marks set.

West Virginia.—In cooperation with the State geologist of West Virginia the revision of the mapping of 15 quadrangles was completed.

OFFICE WORK

The drafting of 26 sheets was completed and that of 5 sheets begun. Primary-level circuits were adjusted for 49 quadrangles. Geographic positions were computed for 29 quadrangles.

CENTRAL DIVISION

FIELD WORK

Colorado.—In cooperation with the State engineer of Colorado the survey of the Fraser and Montezuma quadrangles was completed, 441 square miles being surveyed (scale 1:62,500, contour interval 50 feet); and that of the Pagosa Springs quadrangle was completed, 330 square miles being surveyed (scale 1:125,000, contour interval 100 feet). In addition, the survey of the Mount Harris quadrangle was completed and that of the Pagoda No. 4, Rabbit Ears Peak No. 2, and Rabbit Eears Peak No. 3 quadrangles was begun, 165 square miles being mapped (scale 1:62,500, contour interval 50 feet). The resurvey of the Ignacio quadrangle was begun, 185 square miles being mapped (scale 1:125,000, contour interval 100 feet). For control, 150 miles of primary levels were run and 29 permanent bench marks established, and 14 triangulation stations were occupied and 22 triangulation stations permanently marked.

Illinois.—In cooperation with the Department of Registration and Education of Illinois the survey of the Beardstown, Duquoin, Griggsville, McHenry, Paxton, Pinckneyville, Pittsfield, Roodhouse, Waverly, and Winchester quadrangles was completed, and that of the Brighton, Chandlerville, Galesburg, Gibson City, Manito, Pearl, and Streator quadrangles was begun, 2,048 square miles being surveyed (scale 1:62,500, contour intervals 10 and 20 feet). The resurvey of Camp Grant and vicinity was completed, 57 square miles being surveyed (scale 1:20,000, contour interval 10 feet). The resurvey of the Des Plaines No. 1 and Riverside No. 1 quadrangles, in connection with the resurvey of Chicago and vicinity, was begun, 22 square miles being surveyed

(scale 1:24,000, contour interval 5 feet). A part of the mapping of the Liberty quadrangle was revised. For control, 1,038 miles of primary levels were run and 328 permanent bench marks established, and 1,430 miles of primary traverse were run and 365 permanent marks set.

Iowa.—In cooperation with the Iowa State Geological Survey the survey of the Albia quadrangle was continued, 50 square miles being surveyed (scale 1:62,500, contour interval 20 feet). For control, 8 miles of primary levels were run and 1 permanent bench mark established.

Missouri.—In cooperation with the State geologist of Missouri the survey of the Alton, Bolckow, Bonfils, Dearborn, Edge Hill, Maitland, Meramec Springs, St. Joseph, and Sugar Lake quadrangles was completed, and that of the Exchange, Shell Knob, and Skidmore quadrangles was begun, 1,126 square miles being surveyed (scale 1:62,500, contour interval 20 feet). The survey of the Current River project was completed, 52 square miles being surveyed (scale 1:12,000, contour interval 20 feet). This work was so performed that its results may be incorporated into the regular map of the Exchange quadrangle, of which the area surveyed is a part. For control, 340 miles of primary levels were run and 93 permanent bench marks established, and 443 miles of primary traverse were run and 120 permanent marks set.

Texas.—In cooperation with the Texas State Board of Water Engineers the survey of the Ballinger 3–d, 4–c; Breckenridge 1–a, 1–b, 1–d; Brady 1–a, 1–b, 2–a, 2–b; Brownwood 3–b, 3–d, 4–c; Burnet 2–c, 3–b, 3–d; Coleman 1–a; Cotulla 2–a, 2–b; Dallas 2–b; Eden 1–a; Fort Worth 1–a; Georgetown 4–a, 4–b, 4–c, 4–d; Graham 4–c, 4–d; Granbury 4–a; Hunter 3; Iola 2; McKinney 3–c; Marquez 1, 4; New Braunfels 1, 4; Oakville 2 and 4; Orla 2–b; Palo Pinto 2–c, 2–d, 4–b; Pearsall 1–b, 1–c; San Marcos 1–d, 3–c, 3–d, 4–a, 4–c; San Saba 1–b, 1–c, 1–d, 2–a, 2–b, 4–a; Smithsons Valley 1, 2; Sunset 4–d; Tordia 1; and Weatherford 1–a quadrangles was completed, and that of the Mathis 2, Mathis 3, and San Roque Lake 1–a quadrangles was begun, 3,481 square miles being surveyed (scale 1:62,500, contour intervals 10 and 20 feet). Surveys of parts of reservoir sites falling outside of completed regular quadrangles amount to an additional 178 square miles. A special survey covering 62 square miles in Tarrant County was completed, for which the county bore the entire expense. For control, 2,555 miles of primary levels were run and 609 permanent bench marks established, and 1,812 miles of primary traverse were run and 426 permanent marks set. Eight triangulation stations were occupied and 8 triangulation stations marked.

Wisconsin.—In cooperation with the State geologist of Wisconsin the survey of the Black River Falls, Blair, Gays Mills, Stoddard, and Wauzeka quadrangles was completed, the survey of the Osseo quadrangle was continued, and that of the Boaz quadrangle was begun, 477 square miles being surveyed (scale 1:62,500, contour interval 20 feet). A part of the mapping of the Waukon quadrangle was revised. For control, 164 miles of primary levels were run and 23 permanent bench marks established, and 355 miles of primary traverse were run and 101 permanent marks set.

OFFICE WORK

The drafting of 88 sheets was completed and that of 31 sheets was begun. Primary-level circuits were adjusted for 95 quadrangles. Geographic positions were computed for 143 quadrangles.

PACIFIC DIVISION

FIELD WORK

California.—In cooperation with the California Department of Public Works the survey of the Exeter, Klink, Lemon Cove, Lethent, No. 35, No. 37, Paige, Remnoy, Tulare, and Visalia quadrangles was completed, 535 square miles being mapped (scale 1:31,680, contour interval 5 feet). In cooperation with Los Angeles County the survey of the Altadena, Burbank, Chatsworth, Covina, Dry Canyon, Duarte, Glendale, Glendora, La Crescenta, La Habra, La Verne, Los Angeles, Mount Lowe, Pacoima, Point Vicente, Puente, Sierra Madre, Sunland, Sylmar, Topango Canyon, and Zelzah quadrangles was completed, and that of the Claremont, La Brea, Reseda, and San Pedro Hills quadrangles was begun, 638 square miles being mapped (scale 1:24,000, contour interval

5 feet). In cooperation with the East Bay Municipal Utility District the survey of the Covelo and Laytonville No. 4 quadrangles was completed, and that of the Ukiah No. 1 was begun, 262 square miles being mapped (scale 1:62,500, contour interval 50 feet). The survey of the Salton Sea project was completed for the land-classification branch, 284 square miles being mapped (scale 1:62,500, contour interval 10 feet). A plan and profile survey of Eel River, also for the land-classification branch, was begun, 18 square miles being mapped (scale 1:31,680, contour intervals 5 and 25 feet), and 10 linear miles of river being traversed. For control, 624 miles of primary levels were run and 159 permanent bench marks established, and 47 triangulation stations were occupied and 29 triangulation stations permanently marked. At the request of the National Park Service 31 miles of primary levels were run and 27 permanent bench marks established for the control of the Lassen Peak quadrangle.

Hawaii.—In cooperation with the Territory of Hawaii the survey of the Haleakala NE.¼, NW.¼, Hamo, Hana, Kailua NE.¼, NW.¼, SE.¼, SW.¼, Kauhako NE.¼, NW.¼, SE.¼, SW.¼, and Koolau SE.¼, SW.¼ quadrangles was completed, and that of the Hoopuloa NE.¼ quadrangle was begun, 481 square miles being surveyed (scale 1:31,680, contour interval 50 feet). For the control of these areas 42 miles of primary levels were run and 12 permanent bench marks established.

Idaho.—At the request of the Forest Service the survey of the Casto quadrangle was continued, 275 square miles being surveyed (scale 1:125,000, contour interval 100 feet.) The survey of the Ammon and Hell Creek quadrangles was completed for the geologic branch, 267 square miles being surveyed (scale 1:62,500, contour interval 50 feet). Plan and profile surveys of Clearwater River and Salmon River were completed, 487 miles of river being traversed and mapped. A plan and profile survey of Payette River was begun, 35 square miles being mapped (scale 1:31,680, contour interval 20 feet), and 130 linear miles of river being traversed. This work was done for the land-classification branch. For control, 146 miles of primary levels were run and 45 permanent bench marks established.

Oregon.—In cooperation with the State engineer of Oregon the survey of the McMinnville quadrangle was completed, 210 square miles being mapped (scale 1:62,500, contour interval 25 feet). The survey of the Mount Hood quadrangle was completed for the Forest Service, and that of the Mitchell quadrangle was completed for the geologic branch, 920 square miles being mapped (scale 1:125,000, contour interval 100 feet). A plan and profile survey of Umpqua River and its tributaries was completed and that of the South Fork of Coquille River and Siletz River was begun for the land-classification branch, 118 linear miles of river being traversed. In connection with these surveys maps of reservoir sites covering 15 square miles (11 square miles, scale 1:12,000; 4 square miles, 1:31,680; contour interval 10 feet) were made, and several dam sites were surveyed. For control, 20 miles of primary levels were run and 5 permanent bench marks established, and 14 triangulation stations were occupied and 9 triangulation stations marked.

Utah.—In cooperation with Box Elder, Salt Lake, Tooele, Utah, and Weber counties, Utah, and the United States Bureau of Reclamation the survey of these counties was continued, 283 square miles being mapped (scales 1:62,500 and 1:24,000, contour interval 5 feet). The survey of the Fort Douglas quadrangle was continued for the Forest Service, 270 square miles being mapped (scale 1:125,000, contour interval 100 feet). At the request of the geologic branch, 71 square miles of the Gold Hill quadrangle was mapped (scale 1:24,000, contour interval 25 feet). A plan and profile survey of Duchesne River and its tributaries was completed and that of San Rafael River was begun for the land-classification branch, 112 linear miles of river being traversed. For control, 116 miles of primary levels were run and 33 permanent bench marks established. In cooperation with the Department of Military Science and the Department of Geology of the University of Utah 4 triangulation stations were occupied and 3 triangulation stations permanently marked for the control of a special area in the vicinity of Fort Douglas.

Washington.—In cooperation with the Washington State Department of Conservation and Development the survey of the Chewelah quadrangle was continued, 390 square miles being mapped (scale 1:125,000, contour interval

100 feet). The survey of the Mount Rainier quadrangle was completed for the Forest Service, 469 square miles being mapped (scale 1:125,000, contour interval 100 feet). A plan and profile survey of Stilaguamish River was begun for the land-classification branch, 14 square miles being surveyed (scale 1:31,680, contour intervals 10 and 25 feet). In connection with this work several dam sites were surveyed.

OFFICE WORK

The drafting of 50 sheets was completed and that of 21 sheets was begun. Primary-level circuits were adjusted for 105 quadrangles. Geographic positions were computed for 47 quadrangles.

WATER-RESOURCES BRANCH

ORGANIZATION

The work of the water-resources branch was conducted under the supervision of N. C. Grover, chief hydraulic engineer, and is organized in five divisions:

Division of surface water, John C. Hoyt, hydraulic engineer, in charge.
Division of ground water, O. E. Meinzer, geologist, in charge.
Division of quality of water, W. D. Collins, chemist, in charge.
Division of power resources, A. H. Horton, hydraulic engineer, in charge.
Division of land-classification investigations, N. C. Grover, chief hydraulic engineer, in charge.

PERSONNEL

During the year the technical force was reduced 17 and was increased 10, a net decrease of 7. At the end of the year the force consisted of 1 chief hydraulic engineer, 1 senior hydraulic engineer, 34 hydraulic engineers, 3 associate hydraulic engineers, 10 engineers, 1 associate engineer, 26 assistant engineers, 32 junior engineers, 3 geologists, 1 associate geologist, 3 assistant geologists, 2 chemists, and 1 assistant chemist, a total of 118. Of this number 3 hydraulic engineers, 2 engineers, 2 assistant engineers, 3 junior engineers, and 1 assistant geologist were employed occasionally.

In the clerical force there were 8 separations and 2 accessions, and at the end of the year the force numbered 27. Of this number 3 have been employed only at times.

ALLOTMENTS

The appropriation for gaging streams was $170,000. In addition $16,722.74 of the appropriation for the adjustment of field salaries and $75,233.02 of the appropriation for the classification of lands was expended for field work by the water-resources branch. Of the total appropriations 60 per cent was allotted to work in public-land States. The cooperative funds made available by State allotments have been increased in some States and decreased in others, and the changes have necessitated corresponding adjustments of this work. The amount of these funds available for the year was $313,815.07. With repayments for services rendered other branches of the Government—$34,004.52—the total expenditures for work under the administration of this branch were $603,954.15.

Allotments of funds for gaging streams, 1924–25

Administration, general	$18,149.16
Branch administration	12,925.00
Inspection	500.00
Computations	17,160.00
	48,734.16
Surface water:	
Maine	600.00
New Hampshire	1,500.00
Vermont	500.00
Massachusetts	2,500.00
Connecticut	400.00
New Jersey	2,900.00
New York	4,500.00
Middle Atlantic States	3,600.00
North Carolina	3,600.00
Tennessee	2,900.00
Ohio	2,900.00
Texas	4,300.00
Wisconsin	3,250.00
Minnesota	250.00
Iowa	2,000.00
Illinois	1,500.00
Missouri	3,600.00
Surface water—Continued.	
Kansas	$3,300.00
Colorado, Wyoming, and New Mexico	5,500.00
Montana	4,300.00
North Dakota	300.00
Utah	4,300.00
Nevada	2,500.00
Idaho (Boise)	3,200.00
Idaho (Idaho Falls)	1,100.00
Oregon	4,300.00
Washington	4,300.00
California	4,500.00
Arizona	3,300.00
Hawaii	4,500.00
	86,200.00
Ground water	9,700.00
Quality of water	14,400.00
Power resources	7,700.00
General supplies	500.00
Books for library	150.00
Contingent	2,615.84
Grand total	170,000.00

COOPERATION

Work in the branch is largely conducted in cooperation with Federal bureaus; State, county, municipal, and other governmental agencies; and permittees and licensees of the Federal Power Commission. A major part of this cooperation is set forth below.

States.—The following amounts were expended by States from cooperative allotments. In addition, several State agencies cooperated by furnishing office quarters and occasional services in field and office.

Alabama		$60.00
Arizona:		
Stream gaging	$10,000.00	
Colorado River	7,000.00	
		17,000.00
California:		
State	21,535.26	
County and city	10,299.31	
		31,834.57
Colorado:		
State	1,500.00	
Municipal	370.00	
		1,870.00
Hawaii		24,334.25
Idaho State Department of Reclamation:		
Outside of upper Snake River basin	13,970.66	
Upper Snake River basin	2,824.87	
		16,795.53
Illinois:		
State	4,239.29	
Municipal	60.00	
		4,299.29

Iowa:		
State Highway Commission	$2,385.80	
State Geological Survey	499.97	
		$2,885.77
Kansas:		
State	4,895.69	
Municipal	60.00	
		4,955.69
Maine		5,278.28
Maryland		84.38
Massachusetts		3,196.95
Minnesota		554.70
Missouri:		
State	9,291.54	
Municipal	180.00	
		9,471.54
Montana		6,003.47
Nevada		2,596.10
New Hampshire		1,160.99
New Jersey:		
Stream gaging	11,089.40	
Ground water	6,559.82	
		17,649.22
New York		15,492.00
North Carolina		9,693.83
North Dakota		500.00
Ohio		25,133.57
Oregon:		
State	6,452.01	
Municipal	1,482.17	
		7,934.18
Tennessee		3,881.48
Texas		72,238.34
Utah		5,815.29
Virginia		4,138.02
Washington:		
State	5,761.62	
Municipal	1,729.81	
		7,491.43
West Virginia:		
State	496.83	
Municipal	53.08	
		549.91
Wisconsin		6,161.02
Wyoming		4,755.27
		313,815.07

The work done under cooperative agreements with the States has been restricted to studies of stream flow, except in Arizona, New Jersey, and North Dakota, where ground-water investigations also have been made. (See pp. 70–71.)

Bureau of Reclamation.—The measurement of streams that are to furnish water to reclamation projects under construction was continued in cooperation with the Bureau of Reclamation. The field work was done by Survey engineers, who were employed where the measurements were made, and the cost was met by the Bureau of Reclamation through transfer of funds. Geologic investigations of reservoir sites or ground-water supplies were made for the Bureau of Reclamation in California, Oregon, and Washington. (See pp. 70–71.)

Office of Indian Affairs.—In accordance with authorization by the Office of Indian Affairs, stream gaging was continued in the Fort Hall, Yakima, Colville, Klamath, Wind River Diminished, Western Shoshone, Walker River, and Uinta Indian reservations and for a short time in the Crow Indian Reservation. Some stream gaging was also done in the Blackfeet and Fort Peck Indian reservations.

National Park Service.—Streams in the Yosemite and Yellowstone national parks were measured during the year at stations maintained in cooperation with the National Park Service.

Forest Service.—A study of stream flow in the Angeles National Forest, in southern California, was continued in cooperation with the Forest Service.

Weather Bureau.—Stream gaging has been done on Colorado River in Arizona in cooperation with the Weather Bureau.

Federal Power Commission.—Projects of the Federal Power Commission in Arizona, Colorado, and Oregon were examined, and the examination of one in Utah is in progress. The operation of 10 licensees of the commission in California, 1 in Arizona, 3 in Idaho, 5 in Oregon, 1 in Idaho-Oregon, 1 in Nevada, and 5 in Washington were supervised by the Geological Survey, as well as the operations of 2 permittees of the commission in Arizona, 3 in Idaho, 2 in Oregon, 1 in Utah-Wyoming, 1 in New Mexico, and 1 in Montana. All stream gaging by permittees of the commission is done in cooperation with the Geological Survey. Such cooperative stream gaging is in progress in Alabama, Arizona, Arkansas, California, Colorado, Florida, Georgia, Idaho, Illinois, Indiana, Kentucky, Michigan, Minnesota, Missouri, Montana, New Mexico, New York, North Carolina, Oregon, Pennsylvania, South Carolina, Utah, Washington, West Virginia, Wisconsin, and Wyoming.

Office of the Chief of Engineers.—Stream gaging has been done in the basins of Tennessee and Cumberland rivers in cooperation with the Office of the Chief of Engineers.

PUBLICATIONS

The publications of the year prepared by the water-resources branch comprised 18 reports and 8 separate chapters. Titles and brief summaries of these publications are given elsewhere in this report. At the end of the year 21 other reports were in press and 9 manuscripts were awaiting editorial work.

DIVISION OF SURFACE WATER

ORGANIZATION

The work of the division of surface water consists primarily of the measurement of the flow of rivers, but it includes also special investigations of conditions affecting stream flow and the utilization of the streams. In carrying on the work the United States is divided into 23 districts, including Hawaii. The district offices and engineers in charge are as follows:

New England: C. H. Pierce, Customhouse, Boston, Mass.
New York: A. W. Harrington, Journal Building, Albany, N. Y.

New Jersey: O. W. Hartwell, Statehouse, Trenton, N. J.
Middle Atlantic: A. H. Horton, Washington, D. C.; suboffice, care of University of Virginia, Charlottesville, Va.
South Atlantic: E. D. Burchard, Jackson Building, Asheville, N. C.
Tennessee: W. R. King, Municipal Building, Chattanooga, Tenn.
Ohio: Lasley Lee, Brown Hall, Ohio State University, Columbus, Ohio.
Wisconsin-Minnesota: S. B. Soulé, Capitol Building, Madison, Wis.
Illinois: H. E. Grosbach, Transportation Building, Chicago, Ill.
Iowa: J. B. Spiegel, State Highway Commission Building, Ames, Iowa.
Kansas: H. B. Kinnison, Federal Building, Topeka, Kans.
Missouri: H. C. Beckman, Rolla, Mo.
Montana-North Dakota: W. A. Lamb, Federal Building, Helena, Mont.
Colorado-Wyoming: Robert Follansbee, Post Office Building, Denver, Colo.
Utah-Nevada: A. B. Purton, Federal Building, Salt Lake City, Utah.
Idaho: C. G. Paulsen, Federal Building, Boise, Idaho.
Snake River basin: G. C. Baldwin, Federal Building, Idaho Falls, Idaho.
Washington: G. L. Parker, Federal Building, Tacoma, Wash.
Oregon: F. F. Henshaw, Post Office Building, Portland, Oreg.
California: H. D. McGlashan, Customhouse, San Francisco, Calif.; suboffice, Federal Building, Los Angeles, Calif.
Arizona: W. E. Dickinson, care of University of Arizona, Tucson, Ariz.
Hawaii: Max Carson, Capitol Building, Honolulu, Hawaii.
Texas: C. E. Ellsworth, Capitol Building, Austin, Tex.

CHARACTER AND METHOD OF WORK

Field investigations necessary to the work are made from the district offices, where the results are examined and corrected, if correction is necessary, to insure their accuracy and completeness. At selected gaging stations the volume of water carried by the streams is measured and records of stage and other data are collected from which the daily flow of the streams is computed. The data thus collected are transmitted from the district offices to Washington, where they are reviewed in the computing section and prepared for publication. By this review the records obtained in different parts of the country are brought to a uniform standard, and standardization is further effected through annual conferences of the engineers.

At the end of the year 1,715 gaging stations were being maintained, including 73 in Hawaii; 286 stations were discontinued and 328 new stations established during the year. Records for about 142 additional stations were received, ready for publication, from Government bureaus and private persons, and a number of Government and State organizations and individuals cooperated in the maintenance of the regular gaging stations.

Gaging stations and cooperating parties for the year ended June 30, 1925

State or Territory	Geological Survey alone	Bureau of Reclamation	Forest Service	Indian Office	Army engineers	Weather Bureau	Other Federal bureaus	State cooperation	Municipal cooperation	Private persons	Counted more than once	Maintained at end of year	Established during year	Discontinued during year	Regular gagings during year	Miscellaneous gagings during year
Alabama	----	----	----	----	2	1	----	-------	1	11	2	13	4	-----	45	4
Arizona	----	2	----	1	----	3	3	36	4	3	16	36	7	-----	893	44
Arkansas	----	----	----	----	----	----	----	-------	-----	2	----	2	1	1	18	------
California	----	----	20	1	----	----	5	207	51	93	168	209	15	24	3,224	708
Colorado	----	2	2	----	----	----	----	29	3	6	10	32	2	7	80	3
Connecticut	----	----	----	----	----	----	----	-------	-----	2	-----	2	-----	1	5	------
Florida	----	----	----	----	----	----	----	-------	-----	1	-----	1	-----	-----	5	------
Georgia	----	----	----	----	----	----	----	-------	-----	3	----	3	1	-----	27	2
Idaho	----	8	5	11	----	2	----	112	3	206	99	248	124	120	2,039	274
Illinois	----	----	----	----	2	2	----	29	1	1	6	29	1	1	62	3
Iowa	----	----	----	----	----	6	----	23	-----	6	8	27	-----	1	83	3
Kansas	----	----	----	----	----	4	----	30	1	9	14	30	-----	2	216	1
Kentucky	----	----	----	----	10	1	----	-------	-----	13	11	13	8	1	78	------
Louisiana	----	----	----	----	----	----	----	-------	-----	3	----	3	-----	-----	6	1
Maine	----	----	----	----	----	----	----	17	-----	5	5	17	1	-----	115	------
Maryland	2	----	----	----	----	----	----	2	2	3	3	6	4	2	41	5
Massachusetts	----	----	----	----	----	----	----	18	-----	1	1	18	-----	-----	108	1
Michigan	----	----	----	----	----	----	----	-------	-----	2	-----	2	1	-----	15	------
Minnesota	----	----	----	----	2	----	----	6	-----	6	-----	14	3	-----	36	4
Missouri	----	----	----	----	----	1	----	55	-----	13	14	55	2	2	349	9
Montana	6	22	2	----	----	----	15	35	-----	5	14	71	3	35	307	5
Nevada	----	----	----	3	----	----	----	22	4	7	14	22	3	6	102	14
New Hampshire	----	----	----	----	----	----	----	15	-----	11	11	15	1	1	102	1
New Jersey	----	----	----	----	----	1	----	36	5	8	14	36	-----	1	240	105
New Mexico	----	1	----	----	----	----	----	-------	-----	-----	----	1	-----	-----	3	5
New York	----	----	----	----	1	----	----	70	2	35	38	70	17	5	496	9
North Carolina	----	----	----	----	1	1	----	45	3	10	13	47	32	16	193	16
North Dakota	----	----	----	----	----	----	----	9	-----	-----	----	9	3	2	19	------
Ohio	----	----	----	----	4	5	----	45	8	7	2	67	5	4	479	19
Oklahoma	----	----	----	----	----	----	----	-------	-----	6	----	6	1	-----	19	------
Oregon	----	2	1	5	----	8	----	82	25	39	75	87	6	7	515	68
South Carolina	----	----	----	----	----	----	----	-------	-----	1	----	1	-----	-----	-------	------
Tennessee	----	----	----	----	38	11	----	43	-----	8	57	43	2	2	272	19
Texas	----	----	----	----	----	11	5	148	13	18	47	148	28	3	1,407	462
Utah	----	1	----	5	----	----	1	51	2	20	29	51	2	-----	117	7
Vermont	----	----	----	----	----	----	----	-------	-----	7	----	7	-----	-----	15	5
Virginia	----	----	----	----	7	1	----	34	1	4	13	34	34	14	88	------
Washington	2	----	4	8	----	----	2	47	25	24	47	65	8	6	462	44
West Virginia	----	----	----	----	5	----	----	6	1	10	3	19	-----	1	19	7
Wisconsin	----	----	----	----	3	----	----	43	-----	10	13	43	3	-----	178	27
Wyoming	1	6	----	5	----	1	6	22	-----	4	5	40	4	19	154	------
Hawaii	----	----	----	----	----	----	----	73	3	15	18	73	2	2	311	182
	11	44	34	39	75	59	37	1,390	158	638	770	1,715	328	286	12,943	2,057

PUBLICATIONS

For convenience and uniformity in publications, the United States has been divided into 12 primary drainage basins, and the results of stream measurements are published annually in a series of progress reports that correspond to these 12 divisions; the records for the twelfth division are published in three papers. In addition to the progress reports, special reports on hydraulic subjects have been completed for publication during the year.

DIVISION OF GROUND WATER

GENERAL FEATURES

The division of ground water investigates the waters that lie below the surface—their occurrence, quantity, quality, and head; their recovery through wells and springs; and their utilization for domes-

tic, industrial, irrigation, and public supplies and at watering places for livestock and desert travelers. Each year surveys are made of selected areas where problems of water supply are urgent, and the results are generally published in water-supply papers that include maps showing the ground-water conditions. The investigations relating to quality of water are made in cooperation with the division of quality of water. Projects involving large expenditures for drilling wells to develop water supplies are considered each year by the several departments of the United States Government, and the ground-water division is called upon to furnish information and advice on many of these projects.

A hydraulic laboratory, in charge of Mrs. N. D. Stearns, is maintained for determining the mechanical composition, porosity, moisture equivalent, and permeability of water-bearing materials. A paper describing the methods used and giving the results of about 100 tests of water-bearing materials was practically completed by Mrs. Stearns.

During the year O. E. Meinzer completed his paper entitled "Large springs in the United States" and wrote a paper on plants as indicators of ground water. He also made progress on his paper on the origin, discharge, and quantity of ground water in the United States. Mrs. Stearns began a study of the thermal springs of the United States and partly prepared a paper on this subject. All these reports are to be published as water-supply papers.

In January, 1925, Mr. Meinzer delivered two lectures on ground water at the annual meeting of the North Dakota Well Drillers Association in Fargo, N. Dak.

Mr. Bryan was furloughed for several weeks to make a study, for the National Geographic Society, of the geology in the vicinity of the ruins of Pueblo Bonito, in Chaco Canyon, N. Mex. Mr. Meinzer was furloughed in February, 1925, to make a geologic study of reservoir sites in Cuba.

Cooperation with the committee on physiography was continued through Mr. Meinzer, who serves on that committee. Several manuscripts were examined for the geologic branch with respect to their treatment of ground water.

WORK OF THE YEAR BY STATES

Arizona.—Progress was made on a report on the geology and water resources of San Pedro Valley, Ariz., by Kirk Bryan, of the Geological Survey, and G. E. P. Smith, of the Arizona Agricultural Experiment Station.

Arkansas.—Studies of the temperature and mineral composition of the water of Hot Springs National Park, Ark., were continued by Mr. Bryan in cooperation with W. D. Collins.

California.—Water levels were measured in selected wells in southern California, as in previous years, under the direction of F. C. Ebert. An investigation relating to an additional water supply from wells for the Mare Island Navy Yard was made by B. C. Renick, and a report thereon was sent to the commandant of the navy yard. A dam site for a salt-water barrier in the lower reaches of Sacramento and San Joaquin rivers was examined by Mr. Bryan, and a report on this subject was submitted to the Bureau of Reclamation.

Delaware.—A brief study of the new well and municipal water supply at Laurel, Del., was made by Mr. Meinzer and D. G. Thompson.

Hawaii.—Field work was completed by H. T. Stearns in the Kau district, Island of Hawaii, and progress was made on a report on the geology and

ground-water conditions in that district by Messrs. Stearns and Clark. Several short articles were also prepared by Mr. Stearns on the volcanic and ground-water conditions in the Hawaiian Islands and in other volcanic areas which he visited in his trip around the world.

Idaho.—Observations were continued in the Mud Lake basin, Idaho, through cooperation with C. G. Paulsen, district engineer. Progress was made on the final report on the Mud Lake basin by Mr. Stearns. A report by A. M. Piper on the geology and water resources of the Bruneau River basin, Owyhee County, was published as Pamphlet 11 of the Idaho Bureau of Mines and Geology.

Louisiana.—An examination was made by B. C. Renick, in June, 1925, in regard to a water supply from wells for the town of Colfax, La.

Maryland.—A brief examination was made by Messrs. Meinzer and Thompson concerning a new ground-water supply for the city of Salisbury, Md.

Michigan.—A preliminary examination was made by Mr. Meinzer of a proposed ground-water supply for Saginaw, Mich., and a brief manuscript report to the city engineer was made by him in conjunction with D. H. Maury and W. C. Hoad, consulting engineers.

Montana.—A report on ground water in Big Horn County, Mont., was practically completed by G. M. Hall, who also made some progress on a similar report for Fergus County. A report on ground water in central and southern Rosebud County was prepared by Mr. Renick. A brief examination was made for the United States Forest Service by Mr. Bryan relating to additional ground-water supplies for stock in the Helena National Forest.

New Jersey.—The investigation of the quantities of ground water available for public and industrial supplies in New Jersey was continued during the year in cooperation with the State Department of Conservation and Development. The work has been in charge of Mr. Thompson, who was assisted by E. W. Downs. Special attention was given to the conditions in the Atlantic City and Asbury Park regions. A report on the work of the two years ending June 30, 1925, was practically completed by Mr. Thompson.

New Mexico.—A survey of the ground-water conditions in a part of Sandoval County, N. Mex., was completed by Mr. Renick, and a mimeographed bulletin on the area was made public. A water-supply paper on this area is being prepared by Mr. Renick. A survey of ground-water conditions on State lands in Socorro and Torrance counties was started by Mr. Bryan in June, 1925.

North Dakota.—Progress was made by Howard E. Simpson, water geologist of the State Geological Survey, on his report on the ground-water resources of North Dakota.

Oregon.—Field work was completed by Messrs. Bryan and Renick on the geology of the dam site and tunnel lines of the Owyhee project of the United States Bureau of Reclamation, Oreg., and a report thereon was nearly completed.

South Carolina.—Progress was made on a report on the ground water in the Coastal Plain of South Carolina, by C. W. Cooke, of the geologic branch.

Texas.—A report on the Tertiary and Quaternary geology of the lower Rio Grande region, including a ground-water study, has been nearly completed by A. C. Trowbridge, of the geologic branch.

Utah.—An intensive study of the intake and discharge of ground water in the Escalante Desert, Utah, was begun by W. N. White.

Virginia.—A study of the water in Ordovician limestone and shale near Woodstock, Va., in the Shenandoah Valley, was made by Mr. Hall, who prepared a report thereon for publication. A study was also made by Mr. Hall in regard to an improved ground-water supply for the oyster industry on Chincoteague Island, and a manuscript report on this subject was made available to the people of that island.

Washington.—Geologic examinations were made by Mr. Bryan on the Cle Elum Lake and Kittitas projects of the Bureau of Reclamation.

Wyoming.—The ground-water conditions at Gillette, Wyo., were examined by Mr. Bryan, and a manuscript report on a water supply for that town was submitted to the mayor. Eight samples of water-bearing material from the vicinity of Jackson Lake were tested in the hydrologic laboratory in connection with a study of seepage gains and losses that was made by T. R. Newell.

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DIVISION OF QUALITY OF WATER

During the year the division of quality of water analyzed 364 samples of water and continued studies of methods of analysis. Analytical work was completed for a report on Pecos River, Tex., and was practically completed for studies of quality of the ground and surface waters in Florida and Rhode Island and surface waters in New Jersey. Analyses were made for ground-water reports on the Cuba area, N. Mex. (20), Camas County, Idaho (7), and Woodstock, Va. (6). Careful analyses were made of four samples from Hot Springs, Ark., in connection with studies of the temperature of the springs. Analyses were made of samples from four places where pipes have been buried in connection with a comprehensive study of soil corrosion that is being conducted by several cooperating organizations whose headquarters are at the Bureau of Standards. Water-Supply Papers 560–B and 560–C were published. (See p. 13.) The report on production of mineral waters in 1923 was prepared for the division of mineral resources. A report on relations between quality of water and industrial development in the United States was transmitted for publication as a water-supply paper. A report on the chemical character of water in Florida was practically completed.

DIVISION OF POWER RESOURCES

The work of the division of power resources during the year comprised the preparation of monthly reports of the production of electricity and consumption of fuel by public-utility power plants, and of a report on the developed water power of the United States.

The monthly reports are based on reports submitted by public-utility companies. About 4,000 power plants, each having a monthly output of 10,000 kilowatt-hours or more, are requested to submit reports of their production of electricity and consumption of fuel.

The total capacity of the generators in these plants in January, 1925, was about 19,400,000 kilowatts. Reports received represent about 95 per cent of the total generating capacity of these plants. Each report is published about 30 days after the end of the last month included in it. The following tables show the power and fuel statistics for the calendar years 1919 to 1924:

Electricity produced at public-utility power plants in the United States, 1919–1924

Year	Total		Water power			Fuel power		
	Kilowatt-hours	Change from previous year (per cent)	Kilowatt-hours	Per cent of total	Change from previous year (per cent)	Kilowatt-hours	Per cent of total	Change from previous year (per cent)
1919	38,921,000,000	----------	14,606,000,000	37.5	----------	24,315,000,000	62.5	----------
1920	43,555,000,000	+11.9	16,150,000,000	37.1	+10.6	27,405,000,000	62.9	+12.7
1921	40,976,000,000	−5.9	14,971,000,000	36.5	−7.3	26,005,000,000	63.5	−5.1
1922	47,659,000,000	+16.3	17,206,000,000	36.1	+14.9	30,453,000,000	63.9	+17.1
1923	55,674,000,000	+16.8	19,348,000,000	34.8	+12.4	36,327,000,000	65.2	+19.3
1924	59,014,000,000	+6.0	19,969,000,000	33.8	+3.2	39,044,000,000	66.2	+7.5

Fuel consumed in the production of power at public-utility plants in the United States, 1919–1924

Year	Coal		Fuel oil		Gas	
	Short tons	Change from previous year (per cent)	Barrels	Change from previous year (per cent)	M cubic feet	Change from previous year (per cent)
1919	35, 100, 000		11, 050, 000		21, 406, 000	
1920	37, 124, 000	+5. 8	13, 123, 000	+18. 8	24, 702, 000	+15. 4
1921	31, 585, 000	−14. 9	12, 045, 000	−8. 2	23, 722, 000	−4. 0
1922	34, 179, 000	+8. 3	13, 197, 000	+9. 6	27, 172, 000	+14. 5
1923	38, 954, 000	+14. 0	14, 679, 000	+11. 2	31, 433, 000	+15. 7
1924	37, 556, 000	−3. 6	16, 630, 000	+13. 3	48, 443, 000	+54. 1

Reports on the stock of coal held by electric public-utility power plants were made for inclusion in a report on commercial stocks of coal undertaken by the Bureau of the Census, Department of Commerce, and the Geological Survey on September 1, 1924, and by the Geological Survey alone on June 1, 1925.

DIVISION OF LAND-CLASSIFICATION INVESTIGATIONS

The division of land-classification investigations performed certain technical work required for the classification of public lands with respect to their water resources. The work is done mainly by the use of funds allotted by the land-classification branch, by men from both branches who are sent to the field in summer and spend the winter in the office in preparing reports. The work comprises the examination of public lands for designation under the enlarged and stock-raising homestead laws and the examination of streams and neighboring lands for the classification of public lands with respect to their value for water power or irrigation.

ENLARGED AND STOCK-RAISING HOMESTEADS

The work of examining individual tracts of land for classification under the enlarged and stock-raising homestead laws and of making general reconnaissance examinations was continued during the year, the general examinations being made more especially in the northern Great Plains region and also in the States of Colorado, Idaho, Utah, and Washington. During the summer of 1924 examination was made of all lands included in applications pending at the beginning of the year in Arizona, Colorado, California, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Utah, and Washington, and of most of the lands included in such applications in Wyoming.

An economic study of irrigation in the Casa Grande Valley, Ariz., was made for use in the designation of lands for classification under the homestead laws.

A brief examination of the grazing capacity of lands in Nevada was made for the purpose of supplementing information at hand for the classification of lands under the ground-water reclamation act.

During the field season of 1924 work was begun early in June and by the end of the month had been completed in North Dakota and was in progress in California, Colorado, Montana, Oregon, South Dakota, Utah, and Wyoming.

POWER AND IRRIGATION

Arizona.—To supplement the survey of Colorado River made in the autumn of 1923, an examination and survey was made of promising dam sites in that stretch of the river beginning about 10 miles above Pierces Ferry and ending with the El Dorado dam site, in the lower end of Black Canyon, Ariz., a distance of about 100 miles. Work was completed on the manuscript of a report begun

the previous year on the potential water power and storage capacities of the dam sites on Colorado River below the mouth of the Green. This report will be published as Water-Supply Paper 556, "Water power and flood control of Colorado River below Green River, Utah." At the request of the Federal Power Commission an examination of a project to develop power on Hassayampa River was made, and a report giving its results was prepared.

Colorado.—Reconnaissance surveys of the power value of streams tributary to the Colorado, including Blue, Dolores, Eagle, Roaring Fork, San Miguel, and Taylor rivers, begun in June, 1924, were completed in September. Manuscript reports containing results of these surveys have been prepared and have been opened or will be opened for public inspection in the Survey offices in Washington, D. C., and Denver, Colo. Work has been continued on a report on the utilization of Colorado River in Colorado and Utah to the mouth of Green River. An investigation of the water-power resources of the upper San Juan River is now in progress. At the request of the Federal Power Commission an examination and a report were made on a project to develop power on Grape Creek. An examination and report were also made for the commission regarding the trespass of a hydroelectric plant upon lands in T. 3 S., R. 7 W. sixth principal meridian.

Idaho.—The selection by a hydraulic engineer of dam and reservoir sites along Clearwater River, Idaho, and its forks for special survey by a topographic party and an investigation of the power value of the stream and adjacent lands was completed in October. A report on the power resources of the Clearwater River basin is now in progress. A reconnaissance examination was made in the Payette River basin for the purpose of planning river and reservoir surveys to be started in the summer of 1924 by a topographic party. A summary report on the power resources of Snake River between Huntington, Oreg., and Lewiston, Idaho, was published as Water-Supply Paper 520–C.

Montana.—A report on water power and irrigation in the Madison River basin, Mont., based on an investigation made in the summer of 1923, was published as Water-Supply Paper 560–A.

Oregon.—Power investigations begun in the previous year of Umpqua River, Oreg., and its important tributaries in connection with river and dam-site surveys have been completed, and a report on the power resources, including the classification of lands, is in progress. Similar investigations were made on the Middle and South forks of Coquille River. The report of this work is also in progress. An office study of the water supply of streams in east and south-central Oregon has been carried on during the year. At the request of the Federal Power Commission an examination and a report were made on projects to develop power on Crooked River and on springs in the canyon of Crooked River.

Utah.—An examination of power sites together with the supervision of river and dam-site surveys in the Uinta Basin, Utah, begun in June, 1924, was completed early in the year, and reports for office use on the power value of lands in the basin are in progress. Reports have been made for office use on the power value of certain lands withdrawn as administration sites; also on the irrigability of certain lands relinquished from or included in canceled Carey Act segregation lists. Work has been continued on a report, to be published as a water-supply paper, on the utilization of Green River in Wyoming, Colorado, and Utah. A report on the water powers of the Great Salt Lake basin was published in October as Water-Supply Paper 517. An examination of the power value of the canyon section of San Rafael River and the supervision of plan and profile surveys of that part of the river are now in progress.

Washington.—Work has been started on river surveys and power investigations of streams draining the Olympic Range, Wash. At the request of the Federal Power Commission an examination and a report were made on the power value of certain lands along Sultan River in T. 29 N., R. 8 E.

LAND-CLASSIFICATION BRANCH

ORGANIZATION AND PERSONNEL

At the end of the fiscal year the organization and technical personnel of the land-classification branch were as follows:

Chief, Herman Stabler.
Assistant chief, John D. Northrop.
Chief clerk, Elsie Patterson.

Division of mineral classification: J. D. Northrop, geologist, chief; C. D. Avery and W. W. Boyer, geologists; G. W. Holland, attorney.

Division of hydrographic classification: W. G. Hoyt, hydraulic engineer, chief. Power section: B. E. Jones, hydraulic engineer, chief; J. G. Mathers and N. J. Tubbs, hydraulic engineers; R. O. Helland, classifier. Irrigation section: J. F. Deeds, hydraulic engineer, chief; C. E. Nordeen, hydraulic engineer.

Division of homestead classification: A. E. Aldous, classifier, chief; L. R. Brooks, Depue Falck, E. R. Greenslet, W. L. Hopper, G. M. Kerr, R. E. Morgan, J. Q. Peterson, and O. D. Stanton, classifiers.

In addition, two hydraulic engineers, R. W. Davenport and D. J. Guy, were detailed from the branch for duty with the Federal Power Commission.

During the fiscal year there were 9 additions to the force and 7 separations. At its end the staff numbered 48, including the clerical force and employees detailed to the Federal Power Commission.

SCOPE AND CHARACTER OF THE WORK

During the year the land-classification branch performed the duties of the Geological Survey relating to "the classification of public lands" with which the Director of the Survey is charged by law. The field of its work is coextensive with the public domain of the United States, including Alaska.

The results of the work of the land-classification branch are utilized mainly in the preparation of orders for the withdrawal from entry, restoration to entry, classification, and designation of the public lands, of informative and advisory reports, and of recommendations for appropriate action concerning public lands, made chiefly to the General Land Office, the Secretary of the Interior, the Office of Indian Affairs, and the Federal Power Commission.

FUNDS

The current appropriation of $280,000 for land classification prior to June 30, 1925, is the same as the appropriation for the preceding year but still $20,000 below the appropriation available during the year ending June 30, 1922.

CORRESPONDENCE

During the year 14,993 letters and petitions were received by the land-classification branch. In addition 7,500 copies of miscellaneous correspondence were sent to the branch for its information and filing. The miscellaneous correspondence was made up largely of letters from the General Land Office to its local officers and of reports on the character of lands by its inspectors and examiners, copies of decisions rendered by the Department of the Interior, and copies of withdrawals and restorations recommended by the Bureau of Reclamation. Within the same period 12,636 letters were prepared by the branch. These figures show an average of 49 incoming letters and of 41 outgoing letters for each working day of the year, and an increase over the preceding year of between 8 and 9 per cent in volume of work.

SUMMARY OF CASES

The information supplied concerning land classification is furnished either in reports made in response to specific requests for action on cases presented or in the form of broad areal classifications. The following table, which gives a summary of the cases presented and acted on during the year, shows that reports were made on nearly 15,000 specific requests. The mere number of cases disposed of, however, is not a true index to the magnitude of the work done, for some cases require only a few minutes' consideration, whereas others require exhaustive study and research, extending over days or weeks, and some necessitate field investigations. The terms "gain" and "loss" in the table signify, respectively, decrease and increase in the number of cases pending.

General summary of cases involving land classification

Class of cases	Record for fiscal year 1924–25						Record since receipt of first case	
	Pending July 1, 1924	Received during fiscal year	Total	Acted on during fiscal year	Pending June 30, 1925	Gain or loss during fiscal year	Received	Acted on
General Land Office requests:								
General	229	1,186	1,415	1,280	135	+94		
Oil development		990	990	867	123	−123	990	867
Applications for classification as to mineral							3	3
Coal	9	6	15	12	3	+6	762	759
Oil	177	1,079	1,256	1,172	84	+93	4,352	4,268
Phosphate	2	2	4	4		+2	35	35
Applications for mineral permits	1,207	5,337	6,544	6,241	303	+904	32,673	32,370
Applications for mineral leases	20	144	164	150	14	+6	851	837
Applications for patent, potassium	1	51	52	52		+1	68	68
Federal Power Commission cases:								
Preliminary permits	1	5	6	3	3	−2	51	48
Licenses	1		1		1		12	11
Determinations under section 24		27	27	20	7	−7	88	81
Applications for reclassification as to water resources	7	4	11	8	3	+4	638	635
Applications for rights of way	32	186	218	189	29	+3	5,621	5,592
Irrigation project reports	4	9	13	7	6	−2	889	883
Applications under enlarged-homestead acts	341	486	827	632	195	+146	55,393	55,198
Applications under stock-raising homestead act	1,837	3,303	5,140	3,711	1,429	+408	112,585	111,156
Applications under ground-water reclamation act	37	52	89	62	27	+10	804	777
Indian Office requests for information	1	5	6	5	1		9,495	9,494
Cases in national forests		6	6	6			299	299
	3,906	12,878	16,784	14,421	2,363	+1,543		

DIVISION OF MINERAL CLASSIFICATION

The work of the division of mineral classification involves the withdrawal, classification, and restoration of public lands according to their mineral character; the solution of geologic and economic problems arising in connection with the leasing of mineral lands; and the preparation of reports concerning the mineral character of specific lands for the information and guidance of other Government bureaus charged with the administration of the public-land and Indian land laws.

The approval of the potash-land leasing act in October, 1917, and of the general mineral-land leasing act in February, 1920, opened to disposition the deposits of coal, oil, gas, phosphate, oil shale, sodium, and potash in some 50,000,000 acres that were then embraced in outstanding mineral-land withdrawals, but it did not obviate the necessity for the classification of these lands and their restoration to the public domain. To this unfinished task the mineral division is devoting as much energy as is permitted by the limitations imposed by small personnel, inadequate geologic information, and pressure of more urgent work. The results accomplished in the fiscal year include a net decrease of 509,729 acres in the total area of outstanding coal withdrawals, with a net increase of 159,040 acres in the total area classified as coal land; a net decrease of 55,418 acres in the total area of outstanding petroleum withdrawals, with a net increase of 25,640 acres in the total area classified as oil and gas land; and a net decrease of 334,941 acres in the total area of outstanding phosphate withdrawals, with a net increase of 4,690 acres in the total area classified as phosphate land. Oil-shale withdrawals were increased to the extent of 27,880 acres, in part at the request of the Department of the Navy, and the total area of classified oil-shale land was reduced 800 acres on evidence of nonshale character disclosed by detailed investigations of specific tracts by the field service of the General Land Office.

The gross areas already classified as valuable for mineral and those remaining withdrawn at the end of the fiscal year for certain minerals under the act of June 25, 1910, are shown in the following table:

Summary of outstanding mineral withdrawals and classifications June 30, 1925, in acres

State	Coal		Oil		Oil shale		Phosphate		Potash (withdrawn)
	Withdrawn	Classified as coal land	Withdrawn	Classified as oil land	Withdrawn	Classified as oil-shale land	Withdrawn	Classified as phosphate land	
Alaska		56,993							
Arizona	139,415		230,400						
Arkansas		61,160							
California	17,603	8,720	1,178,392						90,518
Colorado	4,241,477	3,174,422	218,997		64,560	952,239			
Florida							84,362	120	
Idaho	4,761	4,603					396,612	268,299	
Louisiana			466,990	4,191					
Montana	8,160,273	8,418,643	1,350,426	67,651			279,944	3,833	
Nevada	83,673				123				39,422
New Mexico	5,157,782	568,084							
North Dakota	5,954,364	11,178,286	84,894						
Oregon	4,361	18,887							
South Dakota		250,093							
Utah	4,056,520	1,252,589	1,870,627		91,464	2,704,235	301,945	160	
Washington	691,801	141,444							
Wyoming	2,347,039	6,740,907	545,737			460,103	992,969	25,293	
	30,859,069	31,874,831	5,946,463	71,842	156,147	4,116,577	2,055,832	297,705	129,940

The contributions made to the administration of the mineral-land leasing laws with respect to coal involve the determination whether a prospecting permit or a lease should be issued, and, if a lease is

required, the establishment of a leasing unit consistent in area and content of coal with the mining operation to be undertaken and the recommendation of appropriate stipulations as to royalty, minimum investment, and minimum annual production. Those made with respect to oil and gas involve the definition of the "known geologic structure" of producing oil or gas fields as the primary distinction between leasing and prospecting areas, the determination of the structural relations of lands embraced in prospecting permit applications, and the classification of all tracts included in such applications that are involved in unperfected entries under the nonmineral-land laws. During 1924 their scope was extended to include determinations of the status and effect of drilling on or near lands involved in oil and gas prospecting permits as the basis for appropriate action on permit extensions, relinquishments, and cancellations. Similar types of service involving decisions based on geologic evidence are rendered in the administration of the potash-land leasing law and of the sections of the general mineral-land leasing law pertaining to phosphate, oil shale, and sodium.

The following table summarizes the results of the year's work to the extent that they involve the consideration of specific applications for permit or lease rights under the leasing laws:

Applications received, acted on, and pending under the mineral-leasing acts, fiscal year 1924–25

Mineral	Permits			Leases			Patents		
	Received	Acted on	Pending	Received	Acted on	Pending	Received	Acted on	Pending
Oil and gas	5,041	6,000	212	27	27	1			
Coal	149	170	15	110	114	12			
Phosphate				1	3				
Sodium	17	16	1	2	2				
Potassium	130	55	75	4	3	1	51	52	
Oil shale					1				

Aside from that summarized above the work done under the leasing laws was restricted almost entirely to the designation of boundaries of the "known geologic structure" of producing oil and gas fields—that is, the designation of lands that are subject to lease only as distinguished from those on which prospecting permits may be granted. The results include definitions of the Wheeler Ridge field, Calif.; the Garmesa field, Colo.; the Elk Basin field, Mont.; the East, Middle, and West Red River fields, Okla.; the Cisco and Virgin River fields, Utah; the Black Mountain, Lamb, East and West Warm Springs, Elk Basin, and North, Middle, and South Baxter Basin fields, Wyo.; two extensions of the Buena Vista Hills fields, Calif.; and one extension of the Elk Basin field, Wyo.; a revision of the outstanding definition of the McKittrick field, Calif.; and cancellation of the definition of the Dry Piney field, Wyo., promulgated in 1920.

Reports made in response to requests of the General Land Office and the Office of Indian Affairs for information concerning the mineral character of specific lands have been kept essentially current.

The broader phases of the work done include the planning and financing of field surveys, both reconnaissance and detailed, which were made by the geologic, topographic, and Alaskan branches.

The larger items of field work thus undertaken during the year to meet the specific needs of the land-classification branch and financed in whole or in part by allotments from funds appropriated for the classification of lands include (1) general geologic investigations in Routt and Moffatt counties, Colo., in the western part of the Wasatch Plateau, Utah, and in the Alaska Peninsula, Alaska; (2) coal investigations in Blaine and Fergus counties, Mont., and in the Tongue River-Sheridan district, on the Montana-Wyoming boundary; in the Book Cliffs of eastern Utah; in Mesa County, Colo.; and in the White Oaks field, N. Mex.; (3) oil and gas investigations in the Elk Hills, Wheeler Ridge, Poso Creek, and Ventura County regions and on San Nicolas Island, off the coast of Santa Barbara County, Calif.; in northeastern Colorado; in the Artesia and Bloomfield-Aztec districts, N. Mex.; in the San Rafael Swell, Cisco, and Thompson districts, Utah; in the Laramie Basin, Dry Piney, and Black Hills districts, Wyo.; in the Lake Charles, Urania, Cotton Valley, and Homer districts, La.; and in the Red River district, Okla.; (4) oil-shale investigations in the Uinta Basin, Utah; (5) phosphate investigations in southwestern Montana; (6) potash investigations in the Marysvale and Salduro desert regions, Utah; and (7) miscellaneous investigations of individual cases in other parts of the public domain.

DIVISION OF HYDROGRAPHIC CLASSIFICATION

POWER SECTION

The work of the power section consists primarily in obtaining and making available for use in the administration of the public-land laws information as to the water-power resources of the public lands. The specific problems on which reports are made ordinarily involve the ascertainment of the potential power resources of areas that are or may be subject to disposal under public-land law. An endeavor is made to determine the proper administrative action by which the possibility of developing power may be preserved with minimum interference with agricultural, transportation, or other interests. In the course of this work a review of all power reserves is carried on, in order that all land having primary value for the development of power, and only such land, shall be reserved for that purpose. The extent of this task is indicated by the fact that areas aggregating more than 5,000,000 acres are now included in power reserves whose use will be required for the development of about 15,000,000 continuous horsepower.

In order that this information may be made substantially complete, areas not thoroughly surveyed are designated for examination by the field branches of the Survey. The larger items of field work done to obtain information for power classification undertaken and in progress during the year at the request of the land-classification branch and financed by allotments from funds appropriated for the classification of lands include (1) plan and profile surveys and

power-site investigations on Clearwater and Payette rivers and their principal tributaries in Idaho; on Coquille, Umpqua, and Siletz rivers and their principal tributaries in Oregon; on San Rafael River and on streams in the Uinta River basin, Utah; and on Eel River in California; (2) detailed studies of the possibilities of developing power on Colorado River and its tributaries, including Blue, Dolores, Eagle, Roaring Fork, San Miguel, and Taylor rivers in Colorado and San Juan River in Colorado, New Mexico, and Utah; and (3) studies leading to the preparation of reports for publication on water utilization on Green River, upper Colorado River, and Colorado River below the mouth of the Green.

The information obtained is indexed and incorporated in an inventory of water resources, which, when complete, will enable the Survey to give competent advice on short notice as to the manner in which each tract of public land having value for power can be best used in connection with the development of water power and as to the relation of such use to other posssible uses of the tract. Copies of many of the reports made on the power possibilities of the streams examined have been placed in the district offices of the Survey for public inspection, and notices of the availability of the reports have been sent to the press.

The work done in the section is briefly summarized in the following tables showing power-site reserves, outstanding water resources, and agricultural withdrawals and classifications, and in the table on page 76, giving a general summary of cases involving land classification.

Pursuant to the instructions of the Secretary of the Interior dated August 24, 1916 (45 L. D. 326), permittees under the act of February 15, 1901 (31 Stat. 790), and grantees under the act of March 4, 1911 (36 Stat. 1253), to whom rights have been granted by the Secretary since January 1, 1913, were called upon for detailed reports of the operation or development of their power systems during the calendar year 1924. The total installation of the reporting companies is 1,740,000 kilowatts, of which 1,320,000 kilowatts is installed at hydraulic plants. The total energy generated amounted to 6,100,000,000 kilowatt-hours, of which nearly 5,000,000 kilowatt-hours was generated by water power.

Power output of permittees and grantees, 1916–1924

Year	Number reporting	Kilowatt-hours	Increase or decrease	
			Kilowatt-hours	Per cent
1916	26	1,200,000,000		
1917	32	2,000,000,000	+800,000,000	+67
1918	51	3,200,000,000	+1,200,000,000	+60
1919	57	3,100,000,000	−100,000,000	−3
1920	56	4,200,000,000	+1,100,000,000	+35
1921	59	3,725,000,000	−475,000,000	−11
1922	59	4,947,000,000	+1,222,000,000	+33
1923		5,910,000,000	+963,000,000	+19
1924		6,100,000,000	+164,000,000	+3

Power-site reserves, in acres

[Includes all areas reserved or classified as valuable for power purposes and withheld subject to disposal only under the Federal water-power act of June 10, 1920 (41 Stat. 1063). Designations, classifications, and other types of reserves are included in the total areas without distinction]

State	Reserved prior to July 1, 1924	Eliminated prior to July 1, 1924	Reserves outstanding prior to July 1, 1924	Reserved during fiscal year	Eliminated during fiscal year	Reserves outstanding June 30, 1925
Alabama	749		749	36		785
Alaska	168,508	520	167,988	42,712		210,700
Arizona	1,163,163	113,194	1,049,969	100,632		1,150,601
Arkansas	28,551		28,551			28,551
California	995,354	19,259	976,095	38,146	6,323	1,007,918
Colorado	353,509	55,133	298,376	126,125	15,376	409,125
Florida	486		486			486
Idaho	450,879	184,220	266,659	515	2,000	265,174
Michigan	1,240		1,240			1,240
Minnesota	12,889	532	12,357	400		12,757
Montana	299,632	84,802	214,830	3,035	8,977	208,888
Nebraska	761		761			761
Nevada	300,750	480	300,270			300,270
New Mexico	215,181	7,633	207,548	55,697		263,245
Oregon	552,485	85,248	467,237	25,208	400	492,045
South Dakota	12		12			12
Utah	591,718	123,040	468,678	79,677	74	548,281
Washington	201,388	50,207	151,181	47,644	2,603	196,222
Wisconsin	1,096	226	870	114		984
Wyoming	222,395	73,408	148,987	148		149,135
	5,560,746	797,902	4,762,844	520,089	35,753	5,247,180

Summary of outstanding water-resources withdrawals and classifications June 30, 1925, in acres

State	Power reserves					Reservoir withdrawals	Public water withdrawals	Ground water reclamation designations
	Withdrawals	Classifications	Designations [a]	Miscellaneous	Total			
Alabama	120	190		475	785			
Alaska	93,415	43,005		74,280	210,700			
Arizona	395,283	37,182	528,245	189,891	1,150,601	23,040	14,796	
Arkansas	22,354	1,590		4,607	28,551			
California	291,980	84,526		631,412	1,007,918	1,160	167,511	
Colorado	237,184	136,853		35,088	409,125	1,728	1,660	
Florida				486	486			
Idaho	210,936	47,229		7,009	265,174		12,355	
Michigan	1,240				1,240			
Minnesota	12,309			448	12,757			
Montana	132,544	53,379		22,965	208,888	9,080	7,457	
Nebraska	761				761			
Nevada	27,492	27,786		244,992	300,270		10,086	1,550,420
New Mexico	120,084		143,161		263,245		8,316	
North Dakota						1,569		
Oklahoma								
Oregon	394,815	24,356	15,891	56,983	492,045	10,619	17,781	
South Dakota				12	12		240	
Utah	445,008	81,017		22,256	548,281	80	33,350	
Washington	97,751	49,961		48,510	196,222	35,943	920	
Wisconsin				984	984			
Wyoming	82,829	25,621		40,685	149,135	1,714	80,665	
	2,566,105	612,695	687,297	1,381,083	5,247,180	84,933	355,137	1,550,420

[a] Designated and not otherwise withdrawn for power purposes.

IRRIGATION SECTION

The work of the irrigation section includes the classification of lands under the enlarged and stock-raising homestead laws as non-irrigable; the classification of lands under the Nevada ground-water reclamation act as nontimbered and not known to be susceptible of

successful irrigation; the preparation of reports on the sufficiency of the water supply and general feasibility of irrigation projects that require some form of Federal approval in connection with the administration of public-land laws; and the initiation of withdrawal of lands for reservoir sites. Applications for classification are disposed of according to the results of examination made by the field branches of the Survey and information gathered from other sources showing water supply and adaptability to irrigation. Many applications involve the classification of large areas, and such broad classifications serve to govern action on new applications for the classification of land in the same areas. Thus broad field studies are planned in critical areas for execution by the field branches and financed by allotments from the funds appropriated for the classification of lands. During the year such studies were in progress in Casa Grande Valley, Ariz.; Salton Sink basin, Calif.; and Escalante Valley, Utah. Additional field studies were undertaken in scattered small tracts throughout the public-land States.

During the year the area of land designated under the Nevada ground-water reclamation act as a result of the work of the section was increased from 1,425,060 to 1,550,420 acres. On the basis of general field studies, withdrawals creating reservoir site No. 8 on Grape Creek, Colo., and reservoir site No. 27 on Red Rock River, Mont., were canceled. These withdrawals, embracing a total area of 11,530 acres, were created under the act of October 2, 1888 (25 Stat. 527), on the basis of a selection made by the Director of the Geological Survey February 27, 1891. Other results of the work are shown briefly in the tables relating to enlarged and stock-raising homestead designations and general summary of cases.

Summary of enlarged-homestead designations, in acres

[Areas classified as arid and nonirrigable, residence by entrymen required (acts of Feb. 19, 1909 (35 Stat, 639), applicable to Arizona, Colorado, Montana, Nevada, New Mexico, Oregon, Utah, Washington. Wyoming; June 17, 1910 (36 Stat. 531), applicable to Idaho; June 13, 1912 (37 Stat. 132), applicable to California, North Dakota; Mar. 3, 1915 (38 Stat. 953). applicable to Kansas; Mar. 4, 1915 (38 Stat. 1163), applicable to South Dakota). Areas classified as arid, nonirrigable, and lacking domestic water supply, residence by entrymen not required (acts of Feb. 19, 1909 (35 Stat. 639), applicable to Utah; June 17, 1910 (36 Stat. 531), applicable to Idaho)]

State	Designations prior to July 1, 1924	Cancellations prior to July 1, 1924	Designations outstanding prior to July 1, 1924	Designations during fiscal year	Cancellations during fiscal year	Designations outstanding June 30, 1925
Arizona	31,346,649	5,409,594	25,937,055	54,015	20,160	25,970,910
California	13,179,774	238,453	12,941,321	7,559		12,948,880
Colorado	33,396,086	184,988	33,211,098	184,635	10,520	33,385,213
Idaho:						
Total	13,541,228	458,125	13,083,103	62,610	[a] 2,760	13,142,953
Nonresidence	569,627	4,233	565,394	3,120		568,514
Kansas	646,034		646,034	1,880		647,914
Montana	53,304,955	245,728	53,059,227	40,250		53,099,477
Nevada	50,120,150	3,564,797	46,555,353			46,555,353
New Mexico	43,717,245	227,732	43,489,513	8,980		43,498,493
North Dakota	12,271,105	3,848	12,267,257	2,907		12,270,164
Oregon	21,254,734	989,462	20,265,272	1,590	440	20,266,422
South Dakota	16,330,588	348,170	15,982,418	3,223		15,985,641
Utah:						
Total	11,332,240	392,215	10,940,025	83,394	[b] 16,394	11,007,025
Nonresidence	1,624,380	22,800	1,601,580	15,714	5,480	1,611,814
Washington	6,635,400	251,842	6,383,558	11,192		6,394,750
Wyoming	29,338,407	161,764	29,176,643	72,634		29,249,277
	336,414,595	12,476,718	323,937,877	534,869	50,274	324,422,472

[a] Previously designated under secs. 1–5, now designated under sec. 6.
[b] Includes 6,874 acres previously designated under secs. 1–5, now designated under sec. 6.

DIVISION OF HOMESTEAD CLASSIFICATION

The provisions of the stock-raising homestead law are applicable to lands the surface of which is chiefly valuable for grazing and raising forage crops, does not contain merchantable timber, is not susceptible of irrigation from any known source of water supply, and is of such a character that 640 acres is reasonably required for the support of a family.

The division of homestead classification acts on petitions for classification of lands under this act except as to the nonirrigability of the land, which is determined by the irrigation section in the division of hydrographic classification. The work of the division is performed on the basis of records available to the Survey and data obtained through field studies which are planned by the division and financed with funds appropriated for the classification of lands. Usually the field studies are planned for the purpose of obtaining data needed in order to classify lands involved in pending applications for stock-raising homesteads, but where practicable the scope of the field studies includes broad regional investigations to obtain information for action on future cases. The number of individual cases received and acted upon is shown in the general summary of cases.

Under instructions of the Secretary of the Interior the division is cooperating with the Department of Agriculture in preparing a report on the agriculture and the utilization of land in the northern Great Plains region and completed four atlas sheets showing land classification in that region during the year.

The following summary of stock-raising homestead designations shows in detail other features of the progress of the work of this division, which has been kept substantially current throughout the year.

Summary of stock-raising homestead designations, in acres

[Areas classified as nonirrigable, nontimbered, chiefly valuable for grazing and raising forage crops, and of such character that 640 acres is reasonably required for the support of a family. Act of Dec. 29, 1916 (39 Stat. 862)]

State	Designations prior to July 1, 1924	Cancellations prior to July 1, 1924	Designations outstanding prior to July 1, 1924	Designations during fiscal year	Cancellations during fiscal year	Designations outstanding June 30, 1925
Arizona	13,867,422	832,200	13,035,222	28,961	19,520	13,044,663
Arkansas	1,120		1,120			1,120
California	7,619,863		7,619,863	100,529	760	7,719,632
Colorado	7,948,205	9,240	7,938,965	203,835	9,480	8,133,320
Florida				480	480	
Idaho	5,146,021	1,774	5,144,247	116,661		5,269,908
Kansas	109,299		109,299	4,200		113,499
Michigan	3,451		3,451			3,451
Montana	14,821,256	17,081	14,804,175	202,030		15,006,205
Nebraska	162,034		162,034	21,460		183,494
Nevada	470,940	2,800	468,140	27,608		495,748
New Mexico	30,999,526	600	30,998,926	140,228	36	31,139,118
North Dakota	363,185		363,185	1,670		364,855
Oklahoma	73,201		73,201	3,059		76,260
Oregon	6,143,253	2,408	6,140,845	73,159	80	6,213,924
South Dakota	6,454,674	550	6,454,124	14,240		6,468,364
Utah	1,177,230	880	1,176,350	173,357		1,349,707
Washington	648,083	1,134	646,949	25,662		672,611
Wyoming	19,651,230	5,014	19,646,216	162,758	40	19,808,934
	115,659,993	873,681	114,786,312	1,299,897	30,396	116,055,813

The work of this division includes also the reservation and restoration of tracts valuable for watering stock. During the year the additions to public water reserves embraced 370 acres in Arizona, 180 acres in California, 275 acres in Idaho, 160 acres in Montana, 1,830 acres in Oregon, and 240 acres in Utah, and the cancellations of such reserves included 220 acres in Arizona, 40 acres in California, 80 acres in Colorado, 375 acres in Utah, and 840 acres in Wyoming. The areas remaining reserved as public watering places at the end of the year are shown in the table of outstanding water-resources and agricultural withdrawals and classifications.

PUBLICATION BRANCH

DIVISION OF BOOK PUBLICATION

SECTION OF TEXTS

During the year 20,372 pages of manuscript were edited and prepared for printing, and proof sheets comprising 2,052 galley proofs and 15,011 page proofs were read and corrected. Indexes were prepared for 46 publications, covering 9,689 pages. Copy and proof or stencils for 535 pages of multigraph and mimeograph matter were read. The book publications of the year are listed and abstracted on pages 6–14.

At the end of the fiscal year five persons were employed in this section. The water-resources branch has continued to render special assistance in preparing copy and reading proof.

On June 30, 1925, G. M. Wood, who was appointed in 1889 and had been editor since July 1, 1908, was retired on account of age. The Geological Survey's editorial work under Mr. Wood has been widely recognized as being on a plane unattained elsewhere in the Government service.

SECTION OF ILLUSTRATIONS

The number of drawings prepared was 3,099, including 133 maps, 993 sections and diagrams, 437 photographs, and 1,536 paleontologic drawings; 132 miscellaneous jobs were also done by the section. The illustrations transmitted to accompany manuscripts numbered 948, to be reproduced by chromolithography, photolithography, halftone, zinc etching, and cuts already engraved. The number of proofs received and examined was 749. At the end of the year material for illustrating 30 reports was on hand. The section now consists of eight employees.

DIVISION OF MAP EDITING

SECTION OF GEOLOGIC EDITING OF MAPS AND ILLUSTRATIONS

During the year the Central Black Hills folio (No. 219) and the geologic map of Wyoming were completed and published. The geologic map of Arizona was also completed and printed under the direction and supervision of this section but published by the State Geological Survey. The Gillespie-Mount Olive (Ill.) and Bessemer-Vandiver (Ala.) folios were prepared for publication, and the maps of the former were engraved and made ready for transfer to stone.

The Gaffney-Kings Mountain (N. C.-S. C.), Hollidaysburg-Huntingdon (Pa.), and Montevallo-Columbiana (Ala.) folios were also received for publication during the year, and their preparation was well advanced. The geologic map of New Mexico was prepared for publication and photolithographed, and color work is in progress. The geologic map of Oklahoma was drawn and a preliminary photolithograph made, but it has not yet reached the publication stage. Compilation of the geologic map of Texas progressed slowly. Compilation of the geologic maps of Pennsylvania and Arkansas for publication by the respective State surveys was begun, and that of Pennsylvania was well advanced. Illustrations for 40 other reports of the Survey were critically examined and edited. Maps, sections, and other illustrations for geologic folios and reports were also drawn in the section.

SECTION OF INSPECTION AND EDITING OF TOPOGRAPHIC MAPS

During the year 58 topographic maps were edited and transmitted for engraving, 169 published topographic maps were edited for reprint, 63 plan and profile river-survey sheets were edited for photolithography, 2 miscellaneous maps were edited for engraving or photolithography, and 190 maps were edited as illustrations for Survey reports, a total of 482 maps edited. First, second, combined, and woodland proofs of engravings for new topographic maps and reprints numbering 459 and proofs of maps reproduced by photolithography numbering 235 were read. At the end of the year 66 new topographic maps were in process of engraving and printing. Index maps for 16 State circulars were revised and proofs corrected. (See also "Topographic branch," p. 59.)

DIVISION OF DISTRIBUTION

During the year the division received 184 new books and pamphlets, 2 reprinted books and pamphets, 1 new geologic folio, 3 new geologic maps, 128 new or revised topographic and other maps, and 158 reprinted topographic and other maps. The total units of all publications received numbered 512,994 books and pamphlets, 2,970 geologic folios, 3,770 geologic maps, and 765,323 topographic and other maps, a grand total of 1,285,057.

The division distributed 650,842 books, 10,027 folios, and 729,154 maps, a total of 1,390,023, of which 603,711 maps and 8,305 folios were sold. The sum received and deposited in the Treasury from the sale of publications was $42,305.62, including $39,797.68 for topographic and geologic maps and $2,507.94 for geologic folios. In addition, $1,124.45 was paid by other establishments of the Federal Government for maps or folios furnished by request. The total receipts, therefore, were $43,430.07. The division received and answered 94,104 letters.

At the end of the year the division comprised 16 employees.

DIVISION OF ENGRAVING AND PRINTING

At the end of the fiscal year the division of engraving and printing comprised 99 employees.

TOPOGRAPHIC MAPS AND GEOLOGIC FOLIOS

During the fiscal year 82 new topographic maps were engraved and printed, including 5 revised maps; also the new sheet of standard symbols. Forty-four new maps and a new edition of the Wyoming 1:500,000 scale map were photolithographed and printed, making a total of 128 new maps printed and delivered. Corrections were engraved on the plates for 143 maps. Reprint editions of 150 topographic maps and photolithographed editions of 8 corrected State and other maps were delivered. In addition 28 new topographic maps were engraved but had not been printed by June 30, and the engraving for 10 more new topographic maps was nearly completed. Of new and reprinted maps, 286 different editions, amounting to 765,323 copies, were delivered. Two new geologic folios were printed, in editions amounting to 2,970 copies. Extra maps of these folios, numbering 3,770 copies, were also delivered.

OTHER GOVERNMENT MAP PRINTING

A large amount of work was done for the Government Printing Office, Office of the Secretary of the Interior, Bureau of Mines, Bureau of Reclamation, Bureau of Education, National Park Service, Office of Indian Affairs, General Land Office, Bureau of Public Roads, Bureau of Agricultural Economics, Forest Service, Agricultural Extension Service, Weather Bureau, Bureau of Standards, Bureau of Lighthouses, Bureau of American Ethnology, Internal Revenue Bureau, Department of Labor, Department of State, War Department, Navy Department, Post Office Department, Treasury Department, Department of Commerce, Interstate Commerce Commission, Federal Power Commission, International Boundary Commission, Commission of Fine Arts, Alaska Railroad, Public Buildings Commission, Federal Trade Commission, Civil Service Commission, Commission of Gold and Silver Inquiry, Federal Board for Vocational Education, Veterans' Bureau, War Finance Corporation, and the District of Columbia Engineer Department. This work done for other branches of the Survey and the Government included many reprints, and the charges for it amounted to about $135,342, for which the appropriation for engraving and printing geologic maps was reimbursed by transfer of credit on the books of the Treasury Department. Work amounting to $12,241.91 was done for various State surveys, and payment was effected by transferring employees from Federal to State pay rolls. Transfer impressions numbering 278 were made during the year, including 104 furnished to contracting lithographic printers on requisition of the Government Printing Office, 141 furnished to private firms, 8 furnished to the Connecticut State Highway Commission, and 25 furnished to the War Department. Other miscellaneous work was done for the Williams-Webb Co., A. Hoen & Co., the Bartlett-Orr Press, Joseph Hyde Pratt, the Pennsylvania Department of Forests and Waters, Walter Gilliss, and the City of St. Louis. The amount turned over to miscellaneous receipts from this work was $300.80.

Of contract and miscellaneous work of all kinds 2,955,326 copies were printed. Including topographic maps and geologic folios, a grand total of 3,727,389 copies were printed and delivered.

PHOTOGRAPHIC LABORATORY

The output of the photographic laboratory consisted of 12,435 negatives (5.407 wet, of which 4,276 were for photolithographs, 188 paper, 1,938 dry, and 4,902 field negatives developed), 756 lantern slides, 78,958 prints (52,745 maps and diagrams, 22,830 photographs for illustrations, and 3,383 rectigraphs), 3,951 zinc plates, 202 zinc etchings, 86 celluloid prints, 130 lantern slides colored, 15 bromide prints colored, and 728 prints mounted.

ADMINISTRATIVE BRANCH

Col. Henry C. Rizer, chief clerk, retired at the end of February, and John J. Madigan was appointed to the position.

EXECUTIVE DIVISION

The work of the executive division was of the same general character as during the fiscal year 1924, although the duplicating section was transferred to the Secretary's office in connection with the consolidation of duplicating work in the department in February.

During the year 130,666 pieces of mail, of which 2,598 were registered, were opened and referred; besides 1,500 letters and cards received in connection with revisions of mailing lists. In addition, 180,766 letters were received direct by the other divisions, making a total of 322,932, a decrease of 7 per cent compared with 1924. Of the letters opened in this division 20,151 contained $32,475.82 remitted for Survey publications. The number of ordinary letters mailed through the division was 87,594, of registered letters and packages 13,369, and of form letters, etc. (addressograph section), 660,000. In addition, 251,428 pieces of mail were sent direct from other divisions. The total number of outgoing pieces of mail for the Geological Survey was 912,391.

During the year 2,710 pieces of freight and express were handled, 1,370 outgoing and 1,340 incoming.

The roll of Secretary's appointees numbered 834 at the end of the fiscal year, 94 less than at the end of 1924. The total number of changes in personnel was 601, which included 76 appointments, 170 separations, and 455 miscellaneous changes.

During the calendar year 17,635 days of annual leave and 3,900 days of sick leave were granted—75 per cent of the amount of annual leave and about 12 per cent of the amount of sick leave it would have been possible to grant. Leave without pay and furloughs amounted to 3,118 days.

The clerical personnel of the division at the end of the year numbered 13, including 3 assigned to the consolidated duplicating section. This is a reduction of 17, 9 of whom were transferred through the consolidation of the duplicating work under the Secretary's office. In addition, there were 2 general laborers, 1 chief messenger, and 10 messengers.

DIVISION OF SCIENTIFIC AND TECHNICAL EQUIPMENT

The division of scientific and technical equipment received 1,054 requisitions during the year, of which 1,005 were completed. The

work consisted of the repair of numerous instruments, inspection and repair of electric motors, fans, etc., cabinet work of many kinds, and miscellaneous manufacturing and repair work incident to engineering and scientific research.

LIBRARY

The accessions to the library numbered 13,618 books, pamphlets, and periodicals and 597 maps. The recorded loans were 6,830 books and 233 maps, not including those used by 13,026 readers who consulted the library in person. Some of the loans were made to libraries and institutions in Washington and other cities. The catalog was increased by the addition of 4,436 cards. In accordance with the cooperative cataloging arrangement 504 title entries were furnished to the Library of Congress for printing.

The correspondence, consisting of 1,991 letters written and 2,076 received, largely concerned the exchange of publications; this correspondence involved the translation of many letters in foreign languages. Foreign articles and letters translated for other divisions of the Survey numbered 243. There were 626 books collated and prepared for binding, and 324 newly bound books accessioned and labeled.

Cooperation was continued in the compilation of a union list of serials available in the libraries of the United States, to be published under the auspices of the American Library Association.

The preparation of the bibliography of North American geology for the years 1923 and 1924 was continued.

DIVISION OF ACCOUNTS

Condensed statements covering the expenditures from Federal funds during the year are given on the following pages. The amounts expended by States for cooperative work are set forth in the reports of the field branches.

GEORGE OTIS SMITH,
Director, Geological Survey.

Amounts appropriated for and expended by the United States Geological Survey pertaining to the fiscal year ended June 30, 1925[a]

Appropriation	Funds available					Expenditures			Balance
	Amount of appropriation	Repayments on account of work performed			Total	Disbursements	Outstanding liabilities	Total	
		For other Government establishments		For other Geological Survey units					
		Made	To be made						
Salaries	$54,760.00			$100.00	$54,860.00	$54,625.99		$54,625.99	$234.01
Topographic surveys	501,480.00	$17,604.46	$2,179.09	21,990.35	543,253.90	537,393.69	$3,360.42	540,754.11	2,499.79
Geologic surveys	335,562.00	1,177.95	638.56	411.30	337,789.81	332,859.50	3,511.38	336,370.88	1,418.93
Chemical and physical researches	40,000.00				40,000.00	39,470.02	403.02	39,873.04	126.96
Preparation of illustrations	18,000.00	13.33			18,013.33	17,988.87		17,988.87	24.46
Mineral Resources of the United States	127,940.00	154.92		175.00	128,269.92	126,812.23	686.19	127,498.42	771.50
Mineral resources of Alaska	75,000.00	136.27			75,136.27	57,865.97	16,065.71	73,931.68	1,204.59
Gaging streams	191,135.00	28,266.12	5,738.40	2.95	225,142.47	218,409.96	911.31	219,321.27	5,821.20
Geologic maps of the United States	110,000.00	94,798.78	13,387.77	22,732.75	240,919.30	234,822.70	4,409.98	239,232.68	1,686.62
Classification of lands	281,546.00	1,179.34	25.24	250.46	283,001.04	277,450.97	4,162.82	281,613.79	1,387.25
	[b]1,735,423.00	143,331.17	21,969.06	45,662.81	[c]1,946,386.04	[c]1,897,699.90	33,510.83	[cd]1,931,210.73	15,175.31

[a] In addition to these appropriations, items of $110,000 for printing and binding Survey publications and $10,000 for miscellaneous printing and binding were contained in the appropriation act, but the accounts for these items were not kept in the Geological Survey. There was also an allotment of $4,944.75 for miscellaneous supplies from the appropriation for contingent expenses of the Interior Department.

[b] Included in this amount is $28,941 appropriated for adjustment of field salaries.

[c] Included in this amount is $45,662.81 covering work performed by Survey units for other Survey units, necessarily reported in combining totals, but otherwise a duplication.

[d] Of this total, $5,959.68 is in the hands of special disbursing agents and therefore has not been included in the classification of expenditures, as no vouchers covering disbursements have been received.

Classification of expenditures by the United States Geological Survey pertaining to the fiscal year ended June 30, 1925

Object of expenditure	Geological Survey salaries	Topographic surveys	Geologic surveys	Chemical and physical researches	Preparation of illustrations	Mineral resources of the United States	Mineral resources of Alaska	Gaging streams	Geologic maps of the United States	Classification of lands	Total
Personal services	$54,625.99	$401,689.87	$292,590.23	$34,882.85	$17,716.25	$121,147.92	$45,288.72	$186,603.61	$183,063.75	$219,225.41	$1,556,834.60
Stationery and office supplies		2,334.53	606.19	61.30		185.80	212.24	1,462.88	33,692.72	638.27	39,193.93
Scientific and educational supplies		333.60	935.36	1,499.68	16.61	21.24	83.38	227.13		263.86	3,380.86
Sundry supplies		2,470.22	1,344.78	39.31		16.09	163.18	768.07	6,816.25	773.55	12,391.45
Subsistence and care of animals and storage and care of vehicles		1,444.10	699.04			12.00					2,155.14
Telegraph service		599.60	201.20	2.90	.25	969.15	95.01	194.57	4.47	76.03	2,143.18
Telephone service		133.80	13.23	2.90		205.04		397.48		155.40	907.85
Other communication service		13.75	.50					8.00		6.15	28.40
Travel expenses		65,925.06	18,436.83	978.82		3,132.95	8,841.57	11,440.05	69.74	32,012.56	140,837.58
Attendance at meetings		54.74	1,641.33			36.91		288.39			2,021.37
Hire, maintenance, operation, and repair of horse-drawn and motor-propelled passenger-carrying vehicles		6,529.73	1,953.51			206.66	67.00	2,671.17		5,837.00	17,265.07
Transportation of things		26,072.89	3,869.06	542.69	.79	256.30	2,634.05	1,563.16	24.59	8,013.72	42,977.25
Lithographing, engraving, and engrossing		1,260.18	1,566.85	16.48	148.81	179.65	86.73	921.93	4.68	1,603.91	5,789.22
Stenographic work, typewriting, and duplicating work, etc. (job work)		13.30	13.50			40.00		1.22		46.30	114.32
Photographing and making photographs and prints		810.29	4,423.78	225.65	104.96	119.38	7,445.97	755.26		2,035.71	15,921.00
Rents		10.00	11.50				5.00	1,980.00			2,006.50
Repairs and alterations		25.14	57.44				16.16	158.35	1,082.50	49.59	1,389.18
Special and miscellaneous current expenses		9,266.08	4,093.59	697.19	1.20	831.34	829.63	1,003.83	6,591.73	4,676.02	27,990.61
Purchase of passenger-carrying vehicles		1,895.00	990.00					3,894.16		2,760.75	9,539.91
Furniture, furnishings, and fixtures		712.63	239.83	25.00			992.82	1,161.99		192.34	3,324.61
Educational and scientific equipment		1,071.91	1,823.90	898.27		137.99	335.81	2,686.72	75.83	178.63	7,209.06
Livestock		93.00					792.00			40.00	925.00
Other equipment		17,994.69	859.23				82.73	1,133.30	7,806.42	3,028.59	30,904.96
	54,625.99	540,754.11	336,370.88	39,873.04	17,988.87	127,498.42	67,972.00	219,321.27	239,232.68	281,613.79	1,925,251.05

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