

- tion with investigations on combustible gases in mining industry.
- †RI 3444. Measurement of Pressures on Rock Pillars in Underground Mines. I, by Leonard Obert. 1939. 15 pp., 6 figs. Presents a direct and relatively simple method of measuring variation of longitudinal velocity of sound with pressure in rock and gives results for 22 samples of stone, including sandstone, limestone, marble, and granite. (See also RI 3521.)
- †RI 3445. Effect of Acid Treatment Upon the Ultimate Recovery of Oil from Some Limestone Fields of Kansas, by R. E. Helthecker. 1939. 47 pp., 15 figs. Gives effects of acid upon oil reservoirs from old, depleted, or almost depleted fields, individual leases, and groups of wells. Estimates production trends before and after acid treatment. Tabulates and classifies acid-treating records from various acid-service companies operating in Kansas and those from oil companies that treated their own wells. Also includes analyses of water produced with oil for some fields and formations.
- †RI 3446. Accidents in the Petroleum Industry of Oklahoma in 1937 Summarized and Compared with 1923, by C. F. McCarroll. 1939. 19 pp., 4 figs. Tabulates and analyzes pertinent statistical information, including distribution, causes, and costs of accidents in petroleum industry of Oklahoma in 1937; compares record with that of 1923 for purpose of gaging effectiveness of industry's safety activities. (See also TP 620.)
- RI 3447. Bit Gage v. Drilling Speed, by McHenry Mosier and Wing G. Agnew. 1939. 4 pp. Gives results of drilling tests conducted by Bureau of Mines at Mount Weather testing adit; tests show that drilling speed is increased by use of smaller gage bits.
- RI 3448. Classification and Tabling of Table Middlings at the Colta Coal Washery, Flat Creek, Ala., by B. W. Gandrud, G. D. Coe, and H. J. Hager. 1939. 13 pp., 5 figs. Report of investigation to reduce washery losses of marketable coal made in cooperation with Alabama Byproducts Corporation and University of Alabama. Describes practice at Colta washery, preparation of middlings for retabbling, and table tests on classifier overflow; compares plant and laboratory tests.
- RI 3449. A Washability Study of the Woodstock Coal Bed at Klondyke Mine, West Blocton, Ala., by B. W. Gandrud and G. D. Coe. 1939. 12 pp., 11 figs. One of series of investigations on washability of Alabama coal as indicated by float-and-sink tests conducted by Bureau of Mines in cooperation with University of Alabama and Alabama coal producers. Describes coal bed; method of sampling; and screen-sizing, float-and-sink, and flakiness tests.
- RI 3450. A Washability Study of the Black Creek Coal Bed at Yolande No. 6, Rockcastle, Ala., by B. W. Gandrud, G. D. Coe, and J. C. Mead. 1939. 12 pp., 12 figs. Third report on washability of Black Creek coal. Describes slope; method of sampling; screen-sizing, float-and-sink, and flakiness tests; and forms of sulfur in samples. (See also RI 3083 and 3165.)
- RI 3451. Expansion of Coal During Coking, by H. S. Auvil, J. D. Davis, and J. T. McCartney. 1939. 21 pp., 11 figs. Gives results of coking tests to determine expansion of coal in slot-type oven with movable wall and in sole-heated oven.
- RI 3452. Studies of Roof Movement in Coal Mines. 2. Crucible Mine of the Crucible Fuel Co., by E. R. Matze and H. P. Greenwald. 1939. 19 pp., 23 figs. Second in series of reports on roof movement in coal mines. Investigation conducted in mine where all coal is loaded by hand, with consequent slower movement of rib lines, under cooperative agreement with Crucible Fuel Co. (See also RI 3355, 3506, and 3562.)
- RI 3453. Relative Air Dustiness During Cycle of Operations at Mount Weather Testing Adit, by John A. Johnson and Wing G. Agnew. 1939. 7 pp., 2 figs. Gives results of an investigation in which samples of atmospheric dust were collected during a complete cycle of mining operations at or near face of Mount Weather testing adit for purpose of comparing amounts of dust raised by such operations. (For description of adit see RI 3439.)
- RI 3454. Annual Report of the Explosives Division, Fiscal Year 1938, by Wilbert J. Huff. 1939. 41 pp., 21 figs. Describes work done by Explosives Division during fiscal year, including investigations of flammability of gases and vapors, study of kinetics and mechanism of gaseous explosions, research on use of explosives underground and on internal-combustion engines, and chemical and physical tests of explosives and blasting devices.
- †RI 3455. Cooperative Fuel Research Motor-Gasoline Survey, Winter 1938-39, compiled by E. C. Lane. 1939. 30 pp., 1 fig. Seventh in series of reports published pursuant to cooperative agreement between Bureau of Mines and Cooperative Fuel Research Committee. Presents analyses of samples of motor gasoline collected in a number of typical cities.
- †RI 3456. Reservoir Characteristics of the Eunice Oil Field, Lea County, N. Mex., by C. C. Anderson, H. H. Hinson, and H. J. Schroeder. 1939. 15 pp., 16 figs. Reviews development of Eunice oil field; describes strata drilled, general structure of field, and cross sections of Eunice reservoir; shows graphically areal extent of major porous zones; and gives results of "top oil pay," initial well-potential, and water-encroachment studies, and porosity and permeability data.
- RI 3457. Friability, Slacking Characteristics, and Low-Temperature Carbonization Assays of Subbituminous Coals of the Denver (Colo.) Region, by V. F. Parry and John B. Goodman. 1939. 12 pp., 3 figs. Describes tests on 14 representative coals of region and includes data on physical characteristics and chemical composition. In addition, appendix supplies information on mines from which samples were taken.
- RI 3458. Washability Studies of the America and Pratt Coal Beds at Gorgas, Ala., by B. W. Gandrud and G. D. Coe. 1939. 12 pp., 19 figs. One of series of washability studies made by Bureau of Mines in cooperation with University of Alabama and coal producers of Alabama to obtain technical and commercially important data from productive coal beds of State. Report consists of screen-sizing and sink-and-float data.
- †RI 3459. National Safety Competition of 1938, by W. W. Adams and T. D. Lawrence. 1939. 33 pp., 1 fig. Gives results of fourteenth annual accident-prevention competition conducted by Bureau of Mines during calendar year 1938; 345 mines and quarries participated in contest.
- RI 3460. Ocular Photocell for the Rapid Determination of Projected Area of Opaque Particles, by George T. Faust and S. R. B. Cooke. 1939. 14 pp., 3 figs. Discusses method of obtaining data from which to set up hypothetical screen scale used in an investigation on preparation of pulverized coal for fuel conducted by Bureau of Mines in cooperation with University of Alabama.
- RI 3461. Time-Study Analyses. Progress Report 1. Quarry Shovel Loading, by J. R. Thoenen and E. J. Lintner. 1939. 24 pp., 1 fig. First in series of reports to be published by Bureau on time studies in quarries in an endeavor to reduce production cost by increasing efficiency in internal plant processes. This paper discusses process of loading stone at quarry face by power shovels. (See also RI 3467 and 3502.)
- RI 3462. Notes on Large-Scale Tests of the Explosibility of Coal Dusts Made in the United States and

†Out of print.

Reports of Investigations

Great Britain, by H. P. Greenwald. 1939. 9 pp., 4 figs. Shows to what extent correlation of divergent results obtained in large-scale tests of explosibility of coal dusts made in the United States and Great Britain has been achieved.

RI 3463. Ignition of Firedamp by Explosives, by Bernard Lewis and Guenther von Elbe. 1939. 11 pp., 3 figs. Discusses role of temperature, chain carriers, and diluent gas in ignition of methane and air. Provides basis for description of reactions in zone of contact between firedamp atmosphere and detonation products from explosives.

RI 3464. Recent Research by the Bureau of Mines on the Ignition of Firedamp by Explosives, by S. L. Gerhard, J. C. Holtz, and Wilbert J. Huff. 1939. 12 pp., 9 figs. Describes some results of recent research on causes of ignition of firedamp by explosives.

RI 3465. Methods of Rock-Dusting American Coal Mines, by J. J. Forbes. 1939. 22 pp. Gives pertinent facts concerning rock-dusting practices in the United States.

RI 3466. Oxidation of Carbon Monoxide and Hydrogen by Bacteria, by G. W. Jones and G. S. Scott. 1939. 10 pp., 8 figs. Gives results of experiments to determine causes of disappearance of hydrogen and carbon monoxide from gases leaking into manholes in Boston, Mass., and vicinity.

RI 3467. Time-Study Analyses. Progress Report 2. Quarry Haulage, by J. R. Thoenen and E. J. Lintner. 1939. 26 pp., 9 figs. Discusses methods used in transporting rock from loading shovel to crusher at 21 quarries. Second in series of time studies of various processes employed in production of crushed stone. (See also RI 3461 and 3502.)

RI 3468. Chemical Considerations Relating to Fires in Anthracite Refuse, by G. W. Jones and G. S. Scott. 1939. 13 pp., 3 figs. Applies laboratory results of investigation of causes, behavior, and control of anthracite mine fires to problem of fires in refuse banks and suggests ways of decreasing possibility of such fires.

RI 3469R. Progress Reports—Metallurgical Division. 32. Ore-Dressing Studies. Properties of Suspension Mediums for Float-and-Sink Concentration, by F. D. DeVaney and S. M. Shelton. 1940. 24 pp., 18 figs. (Revision of RI 3469.) Reviews properties of suspensions and problems presented in float-and-sink ore concentration in suspension mediums. (See also RI 3239, 3333, and 3437.)

RI 3470. Annual Report of the Mining Division, Fiscal Year 1939, by Chas. F. Jackson. 1939. 28 pp., 4 figs. Reviews work done during fiscal year by seven sections of Mining Division: Metal-mining methods, metal-mining research, nonmetal mining, coal mining, mineral industry survey, mine ventilation, and electrical-mechanical.

†RI 3471. Active List of Permissible Explosives and Blasting Devices Approved Prior to June 30, 1939. 1939. 25 pp. Emphasizes Bureau of Mines requirements regarding stemming and includes details as to permissible conditions governing use of nine models of blasting devices.

RI 3472. Reduction of Fly-Ash Emission from Chimneys, by J. F. Barkley. 1939. 10 pp., 38 figs. Discusses composition of fly ash, amount and sizing of fly-ash emissions, fly-ash reduction, methods of separating fly ash from products of combustion, and choice of fly-ash equipment.

†RI 3473. Annual Report of the Nonmetals Division, Fiscal Year 1939, by Oliver C. Ralston and others. 1939. 40 pp., 2 figs. Reviews work done by Nonmetals Division during fiscal year, including electrothermal research, investigation of American clays for production of sanitaryware and whiteware, coal-washing investigations, production of filter aids from

Pacific Northwest diatomite, concentration of feldspar ores, milling and dressing iron-bearing sandstones, beneficiation of kyanite and tests on kyanite refractories, calcination and hydration of lime, production of lightweight aggregate from slate-quarry and mill wastes, utilization of opaline silica for production of silica brick, study of combination of silica and lime, manufacture and testing of refractories from Pacific Northwest olivine, concentration of spodumene, study of cracking of steel by boiler water, electrostatic separation of minerals, study of flotation and agglomerating processes, mineral separation by heavy suspensions, measurement of consistency, plasticity, workability, and cohesion of mineral suspensions, optical investigations, and determination of carbon in minerals.

RI 3474. Properties of a Petroleum-Reservoir Liquid and Its Residua, with Applications of the Data to Production Problems, by C. Kenneth Eilerts, R. Vincent Smith, and Alton B. Cook. 1939. 47 pp., 15 figs. Describes methods developed for determining properties of reservoir fluid that are of particular significance to production practice; gives details of equipment and procedure; and presents data on typical reservoir fluid.

†RI 3475. Hazard of Mercury Vapor in Analytical Petroleum Laboratories, by C. F. McCarroll. 1939. 16 pp., 2 figs. Gives results of work done under cooperative agreement between Bureau of Mines and State of Oklahoma in determining how vapor from spilled mercury in analytical laboratories constitutes a health hazard and points out how this hazard may be overcome.

†RI 3476. Properties of Louisiana Crude Oils. II. Additional Analyses, by E. L. Garton. 1939. 85 pp. Fourth report giving analyses of Louisiana crude oil; covers analyses of 72 additional samples from 45 fields in 23 parishes in State. Gives brief field history, together with production data for each field represented by an analysis, and includes a discussion of analyses based upon types of oil found. (See also RI 3253 and 4034.)

†RI 3477. Progress Reports—Metallurgical Division. 33. Manganese and Its Alloys, by R. S. Dean, C. Travis Anderson, Cresap Moss, and P. M. Ambrose. 1939. 47 pp., 32 figs. Revised as RI 3580.

†RI 3478. Dust Produced by Drilling When Water Is Sprayed on the Outside of the Drill Steel, by John A. Johnson and Wing G. Agnew. 1939. 6 pp. Gives results of tests at Mount Weather testing adit, Bureau of Mines, on effectiveness of spraying water on outside of drill steel as compared with standard wet-drilling practice.

†RI 3479. Review of Cutler's Rule of Well Spacing, by H. C. Miller and R. V. Higgins. 1939. 23 pp., 1 fig. Restates Cutler's rule of well spacing and points out meaning and possible limitations of rule more definitely than was done in original bulletin (B 228); shows wherein increased understanding of oil-reservoir mechanics and technical progress in development and production practices in the last 15 years have in a measure nullified some of Cutler's earlier conclusions based upon data then available.

†RI 3480. Progress Reports—Metallurgical Division. 34. Annual Report of the Metallurgical Division, Fiscal Year 1939, by R. S. Dean. 1940. 98 pp., 26 figs. Reviews work done during fiscal year by following sections comprising Metallurgical Division: Metallurgical fundamentals, special studies, electrometallurgical, ore-dressing, nonferrous metallurgy, precious-metals, metallurgy of copper, blast-furnace studies, and metallurgy of steel.

RI 3481. Bureau of Mines—A. P. I. Pressure Core Barrel (Progress Report on Its Design and Development), by D. B. Taliaferro and R. E. Heithecker. 1939. 20 pp., 6 figs. Describes cooperative work by

†Out of print.

- Bureau of Mines and American Petroleum Institute in designing and constructing pressure core barrel that will cut and seal specimens of rock comprising producing formations, with naturally contained reservoir fluids intact.
- †RI 3482. Correlation of Analysis of Coal with Products of Carbonization in Externally Heated Retorts, by V. F. Parry. 1939. 37 pp., 16 figs. Correlates proximate analysis and oxygen content of coal with products obtained on carbonization in laboratory-scale equipment to detect general trends significant in commercial practice.
- †RI 3483. Progress Reports—Metallurgical Division. 35. Electrometallurgical Investigations. Recovery of Nickel, Copper, and Precious Metals from Domestic Ores by a Combined Electrothermal and Electrolytic Method, by J. Koster, R. G. Knickerbocker, O. C. Garst, T. E. Evans, and W. E. Cody, 1939. 28 pp., 16 figs. Gives results of investigation of methods for recovering nickel, copper, and precious metals from ores of Bunkerville district, Clark County, Nev., conducted in 1938. (Other progress reports of electrometallurgical series are RI 3322, 3406, 3438, 3491, and 3500.)
- †RI 3484. Progress Reports—Metallurgical Division. 36. Ore-Testing Studies, 1938-39 (Primarily Ore Dressing), by A. L. Engel and S. M. Shelton. 1940. 34 pp., 10 figs. Describes ore-testing projects on nine manganese ores, either low-grade or complex; lead carbonate ore from Nevada; antimony ore, talc ores, and chromite ore from California; anorthosite feldspar from Minnesota; crude white lead and sphalerite-barite ore from Missouri; fluorspar mill tailings from Illinois; silica sand from Ohio; and copper ores from Colorado. (Other progress reports of ore-testing series are RI 3328, 3370, 3425, 3515, 3564, 3569, 3628, and 3629.)
- †RI 3485. Survey of Fuel Consumption at Refineries in 1938, by G. R. Hopkins. 1939. 6 pp., 1 fig. Annual review of fuel consumption. Notes especially that average heat units required to refine a barrel of crude oil rose from 562,000 B. t. u. in 1937 to 567,000 B. t. u. in 1938.
- RI 3486. Survey of Crude Oils of the Producing Fields of Arkansas, by O. C. Blade and George C. Branner. 1940. 40 pp. Discusses producing fields of Arkansas and characteristics of samples of crude oil obtained from them. Gives analyses of 45 samples, taken from 25 fields in 6 counties, representing crude oils produced from Nacatoch, Buckrange or Graves, Meakin, Third Zone, Travis Peak, Red Beds, Tokio-Woodbine, Trinity, Morgan, Mitchell, and Jones sands and Smackover, Glen Rose, and Upper and Lower Gloyd limestone formations.
- RI 3487. Tests on the Effect of Acid Mine Waters on Various Cements, by R. D. Leitch and J. G. Calverley. 1940. 7 pp. Describes preparation of cements and tests for tensile strength by immersion of small slabs in high-acid mine water; gives results of such tests.
- RI 3488. Use of Respiratory Protective Devices Under Abnormal Air Pressure, by F. E. Griffith and H. H. Schrenk. 1940. 9 pp. Describes use of oxygen breathing apparatus and gas masks under pressure.
- RI 3489. Explosibility of Semianthracite, Low-Volatile Bituminous Coals, and Medium-Volatile Bituminous-Coal Dusts, by E. P. Greenwald. 1940. 11 pp., 3 figs. Sets forth briefly experimental evidence on explosibility of coal dusts containing 8 to 31 percent volatile matter on a dry, mineral-matter-free basis.
- RI 3490 Annual Report of the Explosives Division, Fiscal Year 1939, by Wilbert J. Huff. 1940. 36 pp., 9 figs. Describes work done by Explosives Division during fiscal year, including investigations of flammability of gases and vapors, study of kinetics and mechanism of gaseous explosions, research on use of explosives and internal-combustion engines underground, and chemical and physical tests of explosives.
- †RI 3491. Progress Reports—Metallurgical Division. 37. Electrometallurgical Investigations. Electrolytic Recovery of Antimony from Antimonial Gold Ores, by J. Koster and M. B. Royer. 1940. 23 pp., 3 figs. Gives results of investigation undertaken to recover commercial-grade antimony metal from domestic ores containing antimony associated with gold. Antimony is a strategic metal that does not occur abundantly in the United States. (Other progress reports of electrometallurgical series are RI 3322, 3406, 3438, 3483, and 3500.)
- †RI 3492. Cooperative Fuel Research Motor-Gasoline Survey, Summer 1939, compiled by E. C. Lane. 1940. 30 pp., 2 figs. Eighth in series of reports on properties of commercial motor fuels; survey was made in accordance with cooperative agreement between Cooperative Fuel Research Committee and Bureau of Mines.
- RI 3493. Application of Well-Test Data to the Study of Specific Gas-Production Problem, by M. A. Schellhardt, E. J. Dewees, and W. H. Barlow. 1940. 22 pp., 15 figs. Illustrates particularly value of subsurface-temperature data in study of subsurface leakage from gas wells.
- †RI 3494. Flocculation as an Aid in the Clarification of Coal Washery Water, by H. F. Yancey, R. E. Zane, Walter Wood, and J. T. Cannarella. 1940. 13 pp., 6 figs. Gives results of investigation to evaluate effectiveness of various flocculants for settling coal slimes and impurities common in raw coal.
- RI 3495. The Eykometer. A New Device for Measurement of the Yield Point of Clay Suspensions and Oil-Well Drilling Muds, by A. George Stern. 1940. 20 pp., 12 figs. Describes tests on a series of 14 muds, which showed that solidifying strength or yield value can be measured reproducibly in apparatus termed an "eykometer."
- RI 3496. Ventilation of Manholes. 4. Effect of Vertical Ducts in Combination with Openings in Manhole Covers on the Natural Ventilation, by G. W. Jones, W. E. Miller, and John Campbell. 1940. 7 pp., 2 figs. Gives results of investigation conducted by Bureau of Mines in cooperation with Boston Edison Co. and Boston Consolidated Gas Co., of Boston, Mass., to determine efficiency of vertical ventilation ducts when used by themselves and in conjunction with ventilated manhole covers. (See also RI 3307, 3343, and 3412.)
- RI 3497. Permissible Electrically Operated Pumps, by L. C. Hsley, E. J. Gleim, and H. B. Brunot. 1940. 23 pp., 5 figs. Gives detailed information as to safety features of 24 mine pumps approved as permissible by Bureau of Mines before October 1, 1939.
- RI 3498. Hydrogenation and Petrography of Some Low-Rank Coals from the Western United States, by A. Eisner, G. C. Sprunk, Loyal Clarke, M. L. Fein, C. H. Fisher, and H. H. Storch. 1940. 21 pp., 5 figs. Gives results of study of hydrogenation characteristics of low-rank western coals in discontinuous converters. These coals constitute a large potential source of liquid fuels and organic chemicals when petroleum supply fails to meet demand.
- RI 3499. Combustibility of Coke in Air, by R. E. Zane and H. F. Yancey. 1940. 8 pp., 2 figs. Describes workable method for evaluating reactivity or combustibility of coke, in which sample is weighed as it burns; loss in weight and time is indicated by balance and clock arrangement.
- RI 3500. Progress Reports—Metallurgical Division. 38. Electrometallurgical Investigations. Electrolytic

†Out of print.

Reports of Investigations

- Method for the Production of Calcium Boride, by J. Koster, R. G. Knickerbocker, and A. L. Fox. 1940. 21 pp., 5 figs. Discusses development of process for electrolytic production of low-cost calcium boride and shows how obstacles to successful application to commercial production may be overcome. (Other progress reports of electrometallurgical series are RI 3322, 3406, 3438, 3483, and 3491.)
- RI 3501. Annual Report of the Petroleum and Natural-Gas Division, Fiscal Year 1939, by R. A. Cattell and others. 1940. 41 pp., 2 figs. Reviews work done by Petroleum and Natural-Gas Division during fiscal year, including studies of oil and natural-gas production methods and related transportation, petroleum chemistry and refining, and special chemical and engineering problems; outlines process used in helium plant and gives production and uses of helium.
- †RI 3502. Time-Study Analyses. Progress Report 3. Quarry Drilling, by J. R. Thoenen and E. J. Lintner. 1940. 19 pp., 4 figs. Third in series of time studies of various processes employed in production of crushed stone. Summarizes time studies of primary drilling at a group of quarries. (See also RI 3461 and 3467.)
- RI 3503. A Polarizing Comparison-Microscope for Use in Petrographic Measurements, by George T. Faust. 1940. 7 pp., 11 figs. Considers application of polarizing comparison-microscope to problems directly concerned with mineral dressing where it is desirable to compare analogous products; suggests new uses in various related fields.
- RI 3504. Phenomena Observed During Prolonged Oxidation of Anthracite, by G. S. Scott and G. W. Jones. 1940. 8 pp., 6 figs. Gives results of investigation into causes, behavior, and control of anthracite-mine fires to determine correlation between temperature of oxidation and gaseous oxidation products evolved at temperatures between 100° and 350° C.
- RI 3505. Relationship of Ash-Fusion Temperatures of Coal and Coke, by D. A. Reynolds. 1940. 6 pp. Analyzes fusion temperatures of ash of 46 coals and their corresponding cokes.
- †RI 3506. Studies of Roof Movement in Coal Mines. 3. Gibson Mine of the Hillman Coal & Coke Co., by E. R. Maize, Edward Thomas, and H. P. Greenwald. 1940. 9 pp., 19 figs. Third in series of reports on convergence of roof and floor in coal mines and resultant subsidence of surface. Deals with mine in which conditions approximate those in Crucible mine, except that distance between room centers is considerably less and pillars are narrower in consequence. Studies were made under steep hillside of stream valley. (See also RI 3355, 3452, and 3562.)
- RI 3507. Gaseous Products from Explosives. I. Some Factors Affecting Test Results, by John C. Holtz. 1940. 14 pp. Describes modified procedure for determining gaseous products from explosives and gives results of tests on whole cartridges of 60-percent-strength, low-freezing gelatin dynamite.
- RI 3508. Diesel Engines Underground. I. Composition of Exhaust Gas from Engines in Proper Mechanical Condition, by John C. Holtz, L. B. Berger, M. A. Elliott, and H. H. Schrenk. 1940. 48 pp., 10 figs. Discusses performance of Diesel engines underground at various fuel-air ratios; composition and volume of exhaust gas; temperature of exhaust gas as related to hazard of ignition of flammable atmospheres by hot engine surfaces; ventilation required for Diesel engines underground; chemical aspects of combustion in Diesel engine; and relationship of concentration of nitrogen oxides to fuel-air ratio. (See also RI 3541, 3584, 3700, 3718, and 4032.)
- RI 3509. Stemming in Metal Mines. Progress Report 1, by John A. Johnson, Wing G. Agnew, and McHenry Mosier. 1940. 27 pp., 8 figs. Describes test procedure and analyzes results of studies of dusts taken from 59 rounds blasted in Mount Weather testing adit of Bureau of Mines. (See also RI 3528, 3612, 3646, 3673, 3693, and 3725.)
- RI 3510. Cushioned Blasting. I. Orienting Studies, by A. R. T. Denues. 1940. 25 pp., 2 figs. Records results of some initial orienting phases of investigation of cushioned blasting being conducted by Bureau of Mines. Includes review of pertinent literature and results of some preliminary tests relating to hazards of explosions of firedamp. (See also RI 3674.)
- †RI 3511. Explosive Properties of Cyclopropane: Prevention of Explosions by Dilution with Inert Gases, by G. W. Jones, R. E. Kennedy, and G. J. Thomas. 1940. 17 pp., 5 figs. Gives results of experiments to determine value of inert gases, nitrogen, carbon, and helium, in eliminating explosion hazards of cyclopropane-air and cyclopropane-oxygen mixtures. Includes tables and graphs from which limits of flammability of complex mixtures containing cyclopropane and combustible and inert gases may be calculated.
- RI 3512. Contributions to the Art of Smelting Lead Products, by Virgil Miller, R. Bainbridge, and R. Ellison. 1940. 12 pp. Presents results of various changes in smelting practice at Trail, B. C. Supplements previous series of papers on subject of smelting in lead blast furnace handling zinciferous charges.
- RI 3513. Concentration of Manganosiderite Ore from Leadville, Colo., by F. D. DeVaney and S. M. Shelton. 1940. 6 pp. Gives results of tests on sample of Colorado manganosiderite ore obtained by Mining Division and tested by ore-dressing sections of Metallurgical Division. Concludes that manganosiderite can be separated from sulfides and siliceous gangue by flotation and that concentrates after calcination should be suitable for manufacture of spiegeleisen.
- RI 3514. Equilibrium Cell for Investigating Properties of Fluids from Petroleum and Natural-Gas Reservoirs, with a Section on Hypothetical Phase Relations of Natural Hydrocarbon Mixtures, by C. Kenneth Eilerts, R. Vincent Smith, and R. C. Wright. 1940. 30 pp., 11 figs. Describes cell and accessories, calibrations, and experimental procedure and summarizes results of experiments. Cell was constructed at Bureau of Mines Petroleum Experiment Station, Bartlesville, Okla.
- RI 3515. Progress Reports—Metallurgical Division. 39. Ore-Testing Studies (Primarily Precious Metals), by Edmund S. Leaver, Jesse A. Woolf, and A. P. Towne. 1940. 76 pp. Gives results of tests to determine best treatment methods for gold ores from Washington, Montana, California, Alabama, and Nevada; gold-silver ore from Nevada; gold-silver-copper ore from Nevada; and lead-silver-gold ore from Nevada. (Other progress reports of ore-testing series are RI 3328, 3370, 3425, 3484, 3564, 3569, 3628, and 3629.)
- RI 3516. Darkening Light-Color Soils with Coal-Mine Waste, by S. J. Broderick. 1940. 6 pp., 1 fig. Describes work by Bureau of Mines in Alabama to show effect of using coal-mine waste as darkening agent in growing gladiolus.
- RI 3517. Determination of Total Water-Soluble Chlorides in Petroleum, by J. W. Horne and Lloyd F. Christianson. 1940. 16 pp. Presents method used by Bureau of Mines for quantitatively extracting water-soluble chloride salts from petroleum and discusses important details attendant on success of method, such as homogeneity in dispersion of salt crystals, emulsified brine and other impurities in oil sample, complete solution of salts, and total extraction and titration of all aqueous phase.
- RI 3518. An Experimental Study of the Ignition of Firedamp-Air Mixtures by Explosives, by Etienne Audibert, Director, Station d'Essais, Comité Central des Houillères, Senlis, France. 1940. 6 pp., 4 figs.

†Out of print.

- Gives results of experiments designed to show effect of principal factors involved in conditions of firing explosives in firedamp-air mixtures upon ignition.
- RI 3519. Underground Transportation of Coal. Progress Report I, by Albert L. Toenges and Frank A. Jones. 1940. 62 pp., 15 figs. Reports results of a study of various underground transportation systems now in use and describes several systems of transportation utilizing rail haulage. (See also RI 3577.)
- RI 3520. Quantitative Analysis by X-Ray Diffraction. I. Determination of Quartz, by James W. Ballard, H. I. Oshry, and H. H. Schrenk. 1940. 10 pp., 6 figs. Preliminary report on quantitative determination of quartz by X-ray diffraction method, which is considered particularly applicable to industrial-hygiene studies. Reviews briefly methods for determining free silica. Outlines principles of X-ray diffraction method, describes X-ray apparatus and analytical procedure, and gives results of tests.
- RI 3521. Measurement of Pressures on Rock Pillars in Underground Mines. II, by Leonard Obert. 1940. 11 pp., 9 figs. Presents method of measuring velocity of sound in rock mine pillars in situ and describes apparatus required to make such measurements. (See also RI 3444.)
- †RI 3522. Staining of Clay Minerals as a Rapid Means of Identification in Natural and Beneficiated Products, with a General Discussion on Staining Technique, by George T. Faust. 1940. 21 pp. Discusses staining technique, artificial pleochroism of clay minerals, special problems in dealing with bentonites, and detection of clay minerals in natural and beneficiated products.
- RI 3523. Differential Grinding of Alabama Iron Ores for Gravity Concentration, by Will H. Coghill and Philip H. Delano. 1940. 6 pp. Differential grinding of two samples of Alabama red iron ores for gravity concentration has disclosed interesting new facts on particle-size reduction.
- RI 3524. Cooperative Fuel Research Motor-Gasoline Survey, Winter 1939-40, compiled by E. C. Lane. 1940. 29 pp., 2 figs. Ninth in series of reports on properties of commercial motor fuels; presents analytical data for 2,033 samples, representing products of approximately 80 companies. Survey was made in accordance with cooperative agreement between Cooperative Fuel Research Committee and Bureau of Mines.
- RI 3525. Progress Reports—Metallurgical Division. 40. Beneficiation of Boron Minerals. Beneficiation of Boron Minerals by Flotation as Boric Acid, by R. G. Knickerbocker and F. K. Shelton. Production of Calcium Borate from Colemanite by Carbonic Acid Leach, by R. G. Knickerbocker, A. L. Fox, and L. A. Yerkes. 1940. 18 pp., 7 figs. Gives results of two investigations of boron minerals by experiment station at Boulder City, Nev. One process describes formation of boric acid from boron minerals and separation from gangue by flotation; second describes production of calcium borate from colemanite in hope of obtaining cheap source of boric oxide.
- RI 3526. National Safety Competition of 1939, by W. W. Adams and T. D. Lawrence. 1940. 36 pp. Gives results of safety contest and names winners among anthracite, bituminous-coal, metal, nonmetallic-mineral, and open-cut mines and among quarries. Reviews data on competition since 1925.
- RI 3527. Diesel Locomotives in Gassy Mine Workings of Belgium, by Ad. Breyre and J. Fripiat. 1940. 17 pp., 12 figs. Describes testing of locomotives in gassy atmosphere; lists fundamental principles governing construction of Diesel locomotives for use in gassy mines, as regards safety; and summarizes most-important regulations applying to use of locomotives in mines.
- RI 3528. Stemming in Metal Mines. Progress Report 2, by John A. Johnson, Wing G. Agnew, and McHenry Mosier. 1940. 39 pp., 2 figs. Second in series pertaining to investigation of stemming at Mount Weather testing adit of Bureau of Mines. Discusses effect of stemming on gases generated by blasting, describes test procedure, and analyzes results from blasting 61 standard rounds. (See also RI 3509, 3612, 3646, 3673, 3693, and 3725.)
- RI 3529. Tests of Salt as a Substitute for Rock Dust in Prevention of Coal-Dust Explosions in Mines, by H. P. Greenwald, H. C. Howarth, and Irving Hartmann. 1940. 16 pp., 5 figs. Describes and analyzes results of single-entry and double-entry mine explosion tests in which various proportions of coal dust, limestone dust, and pulverized salt were used for dusting entries to prevent propagation of flame. Also gives results of tests to determine extent of absorption of moisture by mixtures of salt, limestone, and coal dust.
- RI 3530. A Twenty Years' Survey of the Use of Sheathed Explosives in Belgium, by Ad. Breyre. 1940. 10 pp., 10 figs. Reviews development in Belgium of use of sheathed explosives, shows how various difficulties presented in their manufacture have been overcome gradually, and describes types of sheathing that have survived. Also mentions different forms of sheathing adopted by other large countries, such as Great Britain and Germany.
- RI 3531. Air Flow at Discharge of Fan Pipe Lines in Mines. I. 10-Inch Line in Development End, by G. E. McElroy. 1940. 14 pp., 8 figs. Presents and discusses results of initial series of tests of general investigation designed to yield definite laws and design data for discharge of fan pipe lines in mines. Gives preliminary data on effect of velocity of discharge, size and shape of pipe, and adjacent walls on air-flow distribution. (See also RI 3730.)
- RI 3532. Analyses of Some Illinois Crude Oils, by H. M. Smith. 1940. 27 pp., 1 fig. Discusses briefly characteristics of samples of oil from new fields discovered in Illinois, points out interesting relationship between geographic occurrence and sulfur content, and gives analyses of 42 samples of petroleum.
- †RI 3533. Active List of Permissible Explosives and Blasting Devices Approved Prior to June 30, 1940. 24 pp. Gives characteristics of 195 permissible explosives and blasting devices approved before June 30, 1940, and outlines conditions under which explosive or blasting device is permissible.
- RI 3534. Study of Brine-Disposal Systems in Illinois Oil Fields, by Sam S. Taylor, W. C. Holliman, and C. J. Wilhelm. 1940. 20 pp., 3 figs. Presents results of survey of brine-disposal systems in Illinois and describes in detail three subsurface disposal systems.
- RI 3535. A Method for Determining the Water Content of Oil Sands, by D. B. Talianferro and G. B. Spencer. 1940. 11 pp., 1 fig. Describes apparatus and method used by Bureau of Mines, which is an adaptation of A. S. T. M. method of determining water content of petroleum products. Method can be used to determine oil content of sand cores, as well as water content, and is accurate, simple, and inexpensive. Paper includes bibliography.
- †RI 3536. Annual Report of the Mining Division, Fiscal Year 1940, by Chas. F. Jackson and others. 1940. 25 pp., 1 fig. Reviews work done during fiscal year by following sections comprising Mining Division: Strategic-minerals examination, metal-mining methods, strategic-mineral projects, metal-mining research, nonmetal mining, coal mining, mine ventilation, and electrical-mechanical.
- RI 3537. Annual Report of the Explosives Division, Fiscal Year 1940, by Wilbert J. Huff. 1940. 38 pp., 17 figs. Describes work done by Explosives Division during fiscal year, including investigations of flammability of gases and vapors; gases and explosions

†Out of print.

Reports of Investigations

in underground conduits; causes, behavior, and control of mine fires; use of explosives underground; hazards in use of Diesel locomotives in mines; cushioned blasting; and kinetics and mechanism of gaseous explosions. Reviews chemical and physical tests of explosives. Also includes bibliography of papers and reports published or prepared for publication during fiscal year 1940.

†RI 3538. Annual Report of the Nonmetals Division, Fiscal Year 1940, by Oliver C. Ralston and John C. Conley. 1940. 47 pp., 19 figs. Reports work done by Nonmetals Division during fiscal year, including electrothermal and optical research; investigations of coal, clay, and Pacific Northwest olivine; equations and quadrant charts for determining heat balances of kilns; studies of intercrystalline cracking of boiler steels, mineral dressing, and chemical reactions of pozzolanic materials; bleaching iron-stained tripoli; development of new commercial minerals; kyanite bulletin; and new laboratory tricks.

RI 3539. Shrinkage of Coke, by H. S. Auvil, J. D. Davis, and J. T. McCartney. 1940. 17 pp., 12 figs. Gives results of shrinkage measurements on 500° C. cokes from coals covering range in rank of those ordinarily used for coke making.

†RI 3540. Measurements of Compressibility of Consolidated Oil-Bearing Sandstones, by Charles B. Carpenter and George B. Spencer. 1940. 20 pp., 5 figs. After tests of oil-bearing sandstone rocks authors conclude that compressibility thereof is not of sufficient magnitude to have appreciable influence on estimates of reservoir content and ultimate recovery or on fluid and energy relationships of petroleum reservoirs.

RI 3541. Diesel Engines Underground. II. Effect of Adding Exhaust Gas to Intake Air, by L. B. Berger, M. A. Elliott, John C. Holtz, and H. H. Schrenk. 1940. 18 pp., 4 figs. Describes studies showing effect of mixing hot exhaust gases with intake air of a four-stroke-cycle Diesel engine. (See also RI 3508, 3584, 3700, 3713, and 4032.)

†RI 3542. House Movement Induced by Mechanical Agitation and Quarry Blasting. Progress Report 3, by J. R. Thoenen, S. L. Windes, and Andrew T. Ireland. 1940. 36 pp., 15 figs. Records results of tests with mechanical vibrator on structures of various types and their correlation with tests from quarry blasts. (See also RI 3319, 3353, 3407, and 3431.)

RI 3543. Use of Rock Dust in Bituminous-Coal Mines, by W. W. Adams. 1940. 11 pp. Statements and figures are intended to show extent to which rock dust has been and is being employed in bituminous-coal mines of the United States; they do not show relationship between rock-dusted mines and non-rock-dusted mines due to use of rock dust. Use of rock dust is result and not cause of safety-mindedness and efficiency by operating officials.

RI 3544. A Study of Timber Decay in the Crucible Mine of the Crucible Fuel Co., by E. R. Maize, T. C. Scheffer, and H. P. Greenwald. 1941. 17 pp., 3 figs. Presents results of study to determine effect of rock dust on timber decay and concludes that variations in species of wood mask any difference in decay resulting solely from rock dusting. (See also RI 3710.)

RI 3545. Progress Reports—Metallurgical Division. 41. Matte Smelting of Manganese, by C. E. Wood, E. P. Barrett, and P. R. Porath. 1940. 15 pp., 4 figs. Summarizes data obtained in laboratory investigation of matte smelting of manganese. Tests showed that mixture of low-grade manganiferous ore, sulfur-bearing materials, reducing agent, and fluxes may

be smelted and three products obtained—high-grade manganese-iron matte, crude-iron metal, and slag.

RI 3546. Effect of Particle Size on the Rate of Oxidation of Anthracite, by G. S. Scott and G. W. Jones. 1941. 15 pp., 13 figs. Gives results of tests designed to show relative initial rates of oxidation of various fine sizes of fresh anthracite in range of 4- to 200-mesh and of tests with low-temperature oxidation on each size of anthracite at temperatures of 150° to 350° intervals.

†RI 3547. Progress Reports—Metallurgical Division. 42. Annual Report of the Metallurgical Division, Fiscal Year 1940, by R. S. Dean. 1941. 68 pp., 24 figs. Reviews work done during fiscal year by Office of Chief Engineer and following sections of Metallurgical Division: Blast-furnace studies, electrometallurgical, metallurgical fundamentals, metallurgy of copper, metallurgy of steel, nonferrous metallurgy, ore-dressing, rare and precious metals, and Pullman unit. Also reviews work completed in conjunction with ore-testing and strategic-minerals programs.

†RI 3548. Activated Carbon from Coal Refuse for Water Purification, by S. J. Broderick and E. S. Hertzog. 1941. 27 pp., 2 figs. Describes preparation of activated carbon or char from high-coal fraction of coal refuse and evaluates these chars to determine their suitability for removing tastes and odors from municipal water supplies. Work was done in cooperation with University of Alabama.

†RI 3549. Measuring Particle-Size Distribution and Colloid Content of Oil-Well Drilling Fluids, by George L. Gates. 1941. 21 pp., 8 figs. Describes in detail method of particle-size determination generally employed outside oil industry, as modified for use in analysis of oil-well drilling mud fluids; explains theory of method and describes apparatus, test procedure, and method of calculating test results. Laboratory investigations indicated that method is simple, inexpensive, and relatively accurate and provides a satisfactory basis for classifying muds and clays used in preparing drilling fluids.

†RI 3550. Cooperative Fuel Research Motor-Gasoline Survey, Summer 1940, by E. C. Lane. 1941. 29 pp., 2 figs. Tenth in series of reports on properties of commercial motor fuels; presents analytical data for 1,712 samples, representing products of approximately 80 companies. Survey was made in accordance with cooperative agreement between Cooperative Fuel Research Committee and Bureau of Mines.

RI 3551. Beehive and Byproduct Coking in Washington, by Joseph Daniels. 1941. 77 pp., 29 figs. Presents results of investigations of coking coals and of byproduct coking practice in State of Washington; data collected since 1915 as part of investigation conducted primarily to determine feasibility of establishing an iron and steel industry in Pacific Northwest.

RI 3552. Form of Sulfur Occurrence in Blast-Furnace Slag, by Allan E. Martin, George Glockler, and C. E. Wood. 1941. 14 pp., 5 figs. Presents data on three sulfides most important in iron smelting—ferrous sulfide, manganous sulfide, and calcium sulfide. Their tendency to form colloids in molten blast-furnace slag was determined by examination of quenched samples with an ultramicroscope.

RI 3553. Progress Reports—Metallurgical Division. 43. Cationic Reagents in the Flotation of Silica from Gypsum Ores, by J. Bruce Clemmer and F. D. DeVaney. 1941. 12 pp., 2 figs. Mentions importance of gypsum in industry and describes tests made to determine merit of certain cationic reagents for flotation of silica and discoloring impurities from gypsum ores.

RI 3554. Survey of Fuel Consumption at Refineries in 1939, by G. R. Hopkins. 1941. 5 pp., 2 figs.

†Out of print.

- RI 3555. Use of Subaudible Noises for Prediction of Rock Bursts, by Leonard Obert. 1941. 4 pp. Study of subaudible noises in Ahmeek copper mine, Michigan, disclosed that such disturbances, amplified by vibration microphones, could be used for predicting rock bursts. Investigation is part of comprehensive program of research being carried out by Bureau of Mines on problems resulting from pressure in underground mines. (See also RI 3654.)
- RI 3556. Role of Clay and Other Minerals in Oil-Well Drilling Fluids, by A. George Stern. 1941. 88 pp., 30 figs. Contains information that is of particular interest to nonmetallic-mineral industry and may prove useful to petroleum production and exploitation men. Points out necessity for carefully controlled mud characteristics; discusses testing of mud, drilling-mud problems in important oil-field areas of the United States, and various minerals and chemicals used in preparing drilling fluids; and outlines methods for preparing and handling clay to be used for drilling mud.
- RI 3557. Performance of Subbituminous Coal in a Typical Underfeed Domestic Stoker, by V. F. Parry and R. D. Segur. 1941. 18 pp., 2 figs. Gives results of performance tests of two sizes of subbituminous coal in modern domestic stoker; object of investigation was to determine efficient methods of operation, to study relationship of size and range in size to performance in small stokers, and to ascertain changes necessary in design of retorts to improve combustion of subbituminous coal and lignite.
- RI 3558. Froth Flotation and Agglomerate Tabling of Micaceous Minerals, by James E. Norman and R. G. O'Meara. 1941. 14 pp. Describes in detail flotation and agglomerate tabling of various micaceous minerals—muscovite, biotite, lepidolite, and vermiculite. Work was conducted in cooperation with University of Alabama.
- RI 3559. Carbonaceous Cation Exchangers from Coal and Coal Refuse, by S. J. Broderick and Dale Bogard. 1941. 17 pp., 2 figs. Deals with preparation and testing of carbonaceous exchangers made from coal refuse and a good grade of Alabama coal; possibility of using such exchangers as water softeners prompted the study. Work was done in cooperation with University of Alabama.
- RI 3560. Progress Reports—Metallurgical Division. 44. Microscopic Studies. Physical Characteristics of Some Low-Grade Manganese Ores, by R. E. Head. 1941. 12 pp., 2 figs. Presents results of microscopic studies of samples of low-grade manganese ores originating in Utah and other Western States. Object of work was to obtain information concerning mode of occurrence of manganese and its association with other minerals that would be valuable in processing low-grade ores.
- †RI 3561. Alunite Resources of the United States, by J. R. Thoenen. 1941. 48 pp. Covers survey of known alunite deposits in Arizona, California, Colorado, Nevada, Utah, and Washington. Alunite is important as possible source of alumina for manufacturing metallic aluminum and of potash.
- RI 3562. Studies of Roof Movement in Coal Mines. 4. Study of Subsidence of a Highway Caused by Mining Coal Beneath, by E. R. Maize, Edward Thomas, and H. P. Greenwald. 1941. 11 pp., 7 figs. Discusses factors affecting subsidence of Pennsylvania Highway 88 over Crucible and Nemaquin mines. (See also RI 3355, 3452, and 3506.)
- RI 3563. Drainage Characteristics of Alabama Coal, by B. W. Gandrud and G. D. Coe. 1941. 27 pp., 30 figs. Reports results of study to evaluate as nearly as possible relative influence of certain factors on rate of drainage of coal and to determine whether drainage characteristics of coals from different beds or from different mines on same bed differ materially.
- A satisfactory laboratory method for evaluating drainage characteristics of coals was developed during this study.
- RI 3564. Progress Reports—Metallurgical Division. 45. Ore-Testing Studies, 1939-40, by A. L. Engel and S. M. Shelton. 1941. 29 pp., 12 figs. Presents results of tests on ores (other than those of precious metals) from various mining districts in Arizona, Arkansas, Colorado, Idaho, Missouri, Nevada, and North Carolina. Testing program includes study of composition, physical characteristics, and melting qualities of samples. (Other progress reports of ore-testing series are RI 3328, 3370, 3425, 3484, 3515, 3569, 3628, and 3629.)
- †RI 3565. Limits of Inflammability of Butadiene in Air, by G. W. Jones and R. E. Kennedy. 1941. 4 pp., 2 figs. Describes apparatus and test procedure in determining limits of inflammability of butadiene in air at laboratory temperatures and pressures and gives analyses of test mixtures. This combustible gas is used in one process for making synthetic rubber, a product that may play an important role in program of national defense.
- RI 3566. Comparison of Manganese Steel with Carbon Steel for Detachable-Bit Drill Rods, by Wing G. Agnew. 1941. 8 pp., 1 fig. Gives results of tests to determine relative durability of manganese-steel drill rods and carbon-steel drill rods for use with detachable bits. Results indicate that manganese-steel rods gave 50 percent longer service than carbon-steel rods and that failure was due mainly to breakage in shanks.
- RI 3567. Ignition Temperatures of Acetylene-Air and Acetylene-Oxygen Mixtures, by G. W. Jones and W. E. Miller. 1941. 5 pp., 2 figs. Describes experimental apparatus and test procedure for determining ignition temperatures of acetylene both in air and oxygen. Results indicate that minimum ignition temperatures of acetylene-air and acetylene-oxygen mixtures are lower than those reported in the literature.
- RI 3568. Asphalts from Some Wyoming and Other Asphalt-Bearing Crude Oils, by K. E. Stanfield. 1941. 53 pp., 16 figs. Presents data obtained in study of asphaltic fractions of some Wyoming black oils compared with those of several commercially important asphalt-bearing crude oils from Arkansas, California, and Mexico. Continuation of study undertaken by Bureau of Mines in cooperation with University of Wyoming.
- RI 3569. Progress Reports—Metallurgical Division. 46. Ore-Testing Studies (Primarily Precious Metals), by Edmund S. Leaver, Jesse A. Woolf, and A. P. Towne. 1941. 85 pp. Gives results of ore testing to furnish information as to method of treatment that will give optimum economic recovery of valuable minerals or metals. Results are reported in such manner as to aid competent metallurgist familiar with local conditions in developing practical flow sheet or in assisting mill operator to correct conditions known to be responsible for losses. (Other progress reports of ore-testing series are RI 3328, 3370, 3425, 3484, 3515, 3564, 3628, and 3629.)
- RI 3570. Progress Reports—Metallurgical Division. 47. Mineral Physics Studies. Ferromagnetic Properties of Hematite, by Earl T. Hayes. 1941. 29 pp., 8 figs. Continuation of work of Metallurgical Division to ascertain and apply knowledge of mineral physics to process metallurgy. Establishes ferromagnetism of hematite; extends use of Gouy-type magnetic balance to measure hysteresis constants of weakly ferromagnetic materials. (See also RI 3223, 3263, and 3400.)
- RI 3571. Carbonaceous Cation and Anion Exchangers in Water Treatment, by S. J. Broderick. 1941. 14 pp. Collects and reviews available information on carbonaceous exchangers employed in treatment of

†Out of print.

- water. Work was done in cooperation with University of Alabama.
- RI 3572. Constancy of B. t. u. Value of "Pure" Coal, by J. F. Barkley and L. R. Burdick. 1941. 10 pp., 4 figs. Describes results of study undertaken to determine possible limitations of accuracies in hypothesis that moisture- and ash-free coal from same seam—and surely from same mine—is a constant.
- †RI 3573. Use of Brine in a Kansas Field for Secondary Recovery of Oil, by C. J. Wilhelm, Sam S. Taylor, W. C. Holliman, and E. O. Owens. 1941. 31 pp., 9 figs. Represents work done under cooperative agreement between Bureau of Mines and Kansas State Board of Health. Describes in detail flood project in eastern Kansas undertaken to determine whether brine, when handled properly, can be used effectively in flooding oil from partly depleted formations; also includes analysis of all known conditions influencing flooding.
- RI 3574. Exploration and Sampling of Domestic Deposits of Strategic Minerals by the Mining Division, Bureau of Mines. Report of progress as of May 1, 1941, by the Mining Division Staff. 1941. 7 pp. Reports work accomplished and summarizes progress made on exploratory operations begun on August 10, 1939, in seven different areas, on deposits of sub-commercial or marginal-grade strategic minerals.
- RI 3575. Progress Report: Experiments on Strength of Small Pillars of Coal in the Pittsburgh Bed, by H. P. Greenwald, H. C. Howarth, and Irving Hartmann. 1941. 6 pp., 3 figs. Gives results of tests on five pillars of coal in Experimental mine, Bureau of Mines. Data obtained permit extension of conclusions reached in TP 605.
- RI 3576. Cooperative Fuel Research Motor-Gasoline Survey, Winter 1940-41, by E. C. Lane. 1941. 29 pp., 2 figs. Eleventh in series of reports on properties of commercial motor fuels; presents analytical data for 2,020 samples, representing products of approximately 120 companies. Survey was made in accordance with cooperative agreement between Cooperative Fuel Research Committee and Bureau of Mines.
- †RI 3577. Underground Transportation of Coal. Progress Report 2, by Albert L. Toenges, Frank A. Jones, and Edward Thomas. 1941. 56 pp., 14 figs. Second in series describing transportation systems employed in mechanized mines. Discusses chiefly rubber-tired gathering, as well as animal, conveyor, and other systems of rail gathering. (See also RI 3519.)
- †RI 3578. Softening Water with Nonmetallic Minerals, by S. J. Broderick. 1941. 18 pp. Emphasizes importance of nonmetallic minerals in water softening and describes briefly where and how many of these minerals are used in purifying and softening water.
- †RI 3579. Petroleum-Engineering Study of the Anahuac Field, Chambers County, Tex., by Charles B. Carpenter and H. J. Schroeder. 1941. 37 pp., 15 figs. Gives results of petroleum-engineering study of Anahuac field, which was made to increase accuracy of existing methods of estimating reserves in petroleum reservoirs by applying data collected during development of an oil field. Scientific aids include coring; electric logging; micropaleontology; determinations of porosity, permeability of oil-bearing sands, and their connate water content; subsurface sampling of reservoir oil; and depth-pressure measurements.
- RI 3580. Progress Reports—Metallurgical Division. 48. Electrolytic Manganese and Its Alloys, by R. S. Dean. 1941. 58 pp., 26 figs. (Revision of RI 3477; includes reprint of Electrolytic Manganese, RI 3406.) Contains results of studies on potential value of various manganese alloys.
- RI 3581. National Safety Competition of 1940, by W. W. Adams and T. D. Lawrence. 1941. 38 pp., 3 figs. Gives results and awards of sixteenth annual National Safety Competition.
- RI 3582. Progress Reports—Metallurgical Division. 49. Ferromanganese-Grade Concentrates from the Cuyuna Range, by S. M. Shelton and M. M. Fine. 1941. 14 pp., 4 figs. Gives results of laboratory tests and small-scale pilot-plant operations on sample of Merritt ore (Minnesota) treated by jigging, tabling, flotation, and magnetic roasting and separation. Primary object of investigation was to recover as much manganese as possible in product meeting analytical specifications for ferromanganese-grade ore; secondary object was to recover as much additional manganese as possible in product low in silica and suitable for ferruginous manganese or spiegel ore.
- †RI 3583. Active List of Permissible Explosives and Blasting Devices Approved Prior to June 30, 1941, prepared by J. E. Tiffany and Z. C. Gaugler. 1941. 23 pp. Gives characteristics of 189 permissible explosives and blasting devices approved before June 30, 1941, and outlines conditions under which explosive or blasting device is permissible.
- RI 3584. Diesel Engines Underground. III. Effect on Exhaust-Gas Composition of Operating Engines in Mixtures of Normal Air and Natural Gas, by Martin A. Elliott, John C. Holtz, L. E. Berger, and H. H. Schrenk. 1941. 50 pp., 18 figs. Effect on exhaust-gas composition of adding natural gas to intake of two commercial Diesel engines was determined at different speeds and power outputs within normal operating range of each engine to simulate conditions that might exist if Diesel locomotives were operated in atmospheres containing methane or other hydrocarbon gas. Study was limited to mixtures of natural gas and normal air in which concentrations of natural gas ranged from 0.2 to 4.7 percent by volume. Concentrations generally were below lower inflammable limit under ordinary conditions of pressure and temperature. (See also RI 3508, 3541, 3700, 3713, and 4032.)
- RI 3585. Carbon Monoxide and Particulate Matter in Air of Holland Tunnel and Metropolitan New York, by W. P. Yant, Edward Levy, R. R. Sayers, Carlton E. Brown, C. E. Traubert, H. W. Frevert, and K. L. Marshall. 1941. 69 pp., 28 figs. Describes results of study made by Bureau of Mines in cooperation with Port of New York Authority, main purpose of which was to obtain information on dissemination of carbon monoxide and particulate matter into surrounding atmosphere by mechanically ventilated tunnels.
- RI 3586. Preliminary Report on the Flotation of Bauxite, by J. B. Clemmer, B. H. Clemmons, and R. H. Stacy. 1941. 26 pp., Summarizes results of laboratory study to determine feasibility of beneficiating various bauxites by flotation.
- RI 3587. Storage of Subbituminous Coal in Bins, by V. F. Parry and John B. Goodman. 1941. 10 pp., 4 figs. Gives results of tests on 3-ton sample of subbituminous coal stored under various conditions for 180 days and outlines best conditions for storing such fuels.
- RI 3588. Effect of Changes in Moisture and Temperature on Mine Roof. 1. Report on Strata Overlying the Pittsburgh Coal Bed, by Irving Hartmann and H. P. Greenwald. 1941. 40 pp., 22 figs. Reviews theories of causes for disintegration of mine roof and describes test equipment and tests to determine effects of changes in temperature and humidity on roof during warm months. These cause disintegration of roof and falls of rock. Paper also discusses effectiveness of protective coatings to prevent access of air to roof strata.
- RI 3589. Inflammability of Ether-Oxygen-Helium Mixtures: Their Application in Anesthesia, by G. W. Jones, R. E. Kennedy, and G. J. Thomas. 1941. 15 pp., 3 figs. Reports results of cooperative investiga-

†Out of print.

- tion by Bureau of Mines, St. Francis Hospital, Pittsburgh, Pa., and committee under direction of Department of Anesthesia and Industrial Hygiene, School of Medicine, University of Pittsburgh. Object of study was elimination of explosion hazards of ether-oxygen anesthetic mixtures by addition of helium.
- RI 3590. Temperatures of Natural-Gas Pipe Lines and Seasonal Variations of Underground Temperatures, by W. M. Deaton and E. M. Frost, Jr. 1941. 6 pp., 23 figs. Reports results of pipe-line-temperature survey in connection with investigation of gas hydrates. Shows relationship of underground temperatures at depths at which pipe lines ordinarily are buried to prevailing atmospheric conditions. Work was done in cooperation with American Gas Association.
- †RI 3591. Determination of Types of Sulfur Compounds in Petroleum Distillates, by John S. Ball. 1941. 60 pp., 3 figs. Gives results of tests conducted by Bureau of Mines in cooperation with University of Wyoming to determine types of sulfur compounds in petroleum distillates and describes system of analysis finally evolved.
- RI 3592. Analyses of Crude Oils from Some Fields of Oklahoma. II. Southern Oklahoma, by E. L. Garton. 1941. 27 pp., 4 figs. Continuation of study of Oklahoma crude oils being made by Bureau of Mines in cooperation with State of Oklahoma. Gives analyses of 27 samples obtained from 21 fields in northern part of State and discusses physical and chemical characteristics of these crude oils. (See also RI 3442 and 3802.)
- RI 3593. Permissible Blasting Units, by L. C. Hsley and A. B. Hooker. 1941. 14 pp., 5 figs. Covers test requirements and procedure as applied to tested permissible blasting units and gives brief description and tabulated details of 17 single-shot and two 10-shot units, which comprise present permissible equipment of this type.
- RI 3594. Safe Opening and Determination of Construction of Detonators, by R. L. Grant and A. B. Coates. 1941. 16 pp., 5 figs. Defines, classifies, and discusses detonators generally. Reviews methods of sampling for determination of construction, describes hazardous operations of opening detonators and of preparing specimens for constructional examination, and recounts Bureau of Mines procedures for opening detonators and determining construction. Also includes typical results for Bureau's standard No. 6 electric detonator, which is used in routine test work.
- †RI 3595. A Laboratory Study of Water Encroachment in Oil-Filled Sand Columns, by Frank G. Miller. 1941. 32 pp., 6 figs. Describes experiments performed primarily to establish correlation between rate of edgewater encroachment and recovery of oil, one phase of extensive fundamental laboratory investigation of water encroachment in oil sands undertaken by Bureau of Mines.
- RI 3596. Annual Report of the Mining Division, Fiscal Year 1941, by Chas. F. Jackson. 1941. 47 pp., 11 figs. Annual report of work done during fiscal year by following sections of Mining Division: Strategic-minerals examination, strategic-mineral projects, special projects, special investigations, metal-mining methods, mineral industry survey, metal-mining research, nonmetal mining, coal mining, electrical-mechanical, and mine ventilation.
- RI 3597. Limits of Inflammability of Acrylonitrile in Air, by G. W. Jones, R. E. Kennedy, and G. S. Scott. 1941. 6 pp., 2 figs. Describes apparatus and procedure for determining limits of inflammability of acrylonitrile in air. This combustible liquid is used in large quantities in one process for making synthetic rubber.
- †RI 3598. Bauxite Resources of the United States, by J. R. Thoenen and Ernest F. Burchard. 1941. 42 pp., 1 fig. Describes domestic bauxite deposits in detail, by regions and States, and discusses mining methods, utilization, and reserves. Includes detailed section on geology. Results represent joint work of Geological Survey and Bureau of Mines.
- RI 3599. Report of the Nonmetals Division, Fiscal Year 1941, by Oliver C. Ralston and A. George Stern. 1941. 33 pp., 18 figs. Reports progress of electro-technical research, studies of intercrystalline cracking of boiler steels, coal investigations, optical studies, research on mineral dressing and beneficiation, and studies on utilization of minerals.
- †RI 3600. Progress Reports—Metallurgical Division. 50. Annual Report of the Metallurgical Division, Fiscal Year 1941, by R. S. Dean. 1942. 70 pp., 20 figs. Reviews work done during fiscal year by Office of Chief Engineer and following sections of Metallurgical Division: Blast-furnace studies, electrometallurgical, metallurgical fundamentals, metallurgy of copper, metallurgy of steel, ore-dressing, and precious-metals. Also gives status of manganese pilot plants.
- RI 3601. Selection of Coals for Coke Making, by Joseph D. Davis. 1942. 29 pp., 23 figs. Discusses chemical and physical characteristics desired in coke, reviews test methods for determining suitability of coals for making coke—chemical analysis, petrographic analysis, direct determination of coke-making property, plastic properties, and determination of expansion of coal during coking—and summarizes results.
- RI 3602. Annual Report of the Explosives Division, Fiscal Year 1941, by Wilbert J. Huff. 1942. 36 pp., 25 figs. Contains chapters on flammability of gases and vapors; gases and explosions in underground conduits; causes, behavior, and control of mine fires; hazards in use of Diesel locomotives in mines; liquid-oxygen explosives; methods for determining poisonous gases from explosives; mechanism of ignition of firedamp by explosives; cushioned blasting; stemming of Cardox; chemical and physical tests of explosives; and general work. Includes bibliography.
- †RI 3603. Subsurface-Disposal of Oil Field Brines in Oklahoma, by Sam S. Taylor and E. O. Owens. 1942. 54 pp., 5 figs. Discusses effect on chemical characteristics of brines flowing relatively long distances through gathering systems and describes construction and operation of three disposal systems. Includes data on chemical and corrosive characteristics of brines before, during, and after treatment or conditioning for injection into subsurface formations. Work was done in cooperation with State of Oklahoma.
- RI 3604. Investigations During 1938, 1939, and 1940 of Combustibles in Manholes in Boston, Mass., by G. W. Jones, T. H. Haines, T. F. Smith, and W. J. Huff. 1942. 33 pp., 1 fig. Gives results of survey conducted by Bureau of Mines in cooperation with Edison Electric Illuminating Co. of Boston and Boston Consolidated Gas Co. for purpose of identifying and eliminating combustible hazards in manholes in Boston and surrounding territory. Summarizes results of all tests made since survey was begun in 1929. (See also RI 3109, 3192, 3213, 3260, 3305, 3321, 3375, and 3433.)
- †RI 3605. Practical Fire Sensitivity of Liquid-Oxygen Explosives Treated with Fire Retardants, by A. R. T. Denues. 1941. 6 pp. Numerous tests showed that small and large cartridges of treated LOX, tested in the open, are virtually immune to practical igniting agents and to many agents of greater violence. Results corroborate and extend work described in B 429. They emphasize fact that a treated explosive remains an explosive and possesses inherent ignitibility.

†Out of print.

Reports of Investigations

- RI 3606. Manganese Investigations—Metallurgical Division. 1. Ore-Dressing Studies of Manganese Ores. Concentration of Manganese Ore from the Drum Mountain District, Utah, by S. R. Zimmerley, J. D. Vincent, and C. E. Schack. 1942. 12 pp. First of series of reports covering investigations relating to treatment of domestic manganese ores. Shows amenability of Drum Mountain ore to concentration by ore-dressing methods and percentage of ferrograde manganese that can be recovered.
- †RI 3607. Survey of Fuel Consumption at Refineries in 1940, by G. R. Hopkins. 1942. 6 pp., 2 figs. Annual review of consumption of fuel at gasoline refineries, by districts. Notes that average heat consumed per barrel of crude processed in the United States rose from 555,000 B. t. u. in 1939 to 579,000 B. t. u. in 1940.
- †RI 3608. Manganese Investigations—Metallurgical Division. 4. Ore-Dressing Studies of Manganese Ores. Concentration of Manganese-Bearing Ore from the Dobbins Mine, Cartersville, Ga., by T. L. Johnston, M. M. Fine, and S. M. Shelton. 1942. 32 pp. Assuming that ore from mine would be represented by an average of two samples, recovery of manganese as ferrograde nonmagnetic concentrates would be approximately 50 percent of total, as indicated by laboratory tests. Sintering of concentrates would be necessary to meet size requirements.
- RI 3609. Manganese Investigations—Metallurgical Division. 2. Hydrometallurgical Studies of Manganese Ores. Recovery of Manganese from Chamberlain Nodules by the Reyerson Modification of the Sulfur Dioxide Leaching Process, by C. E. Wood, C. L. Wallfred, E. P. Barrett, L. J. Reader, S. I. Ginsberg, W. F. Wyman, and R. L. Evans. 1942. 30 pp., 8 figs. Leaching of Chamberlain nodules with sulfur dioxide and air was investigated on laboratory scale with three types of equipment—gas-washer absorber, wooden drum, and spray leacher. Spray leacher gave highest recovery of manganese, and tests indicated that 85-percent recovery could be obtained in an extraction period of 2 to 3 hours if a 10- to 15-percent manganous sulfate solution was produced.
- RI 3610. Beneficiation of Alunite, by Alton Gabriel and John Dasher. 1942. 20 pp., 9 figs. Describes domestic alunite deposits and discusses need for petrographic and beneficiation studies.
- RI 3611. Cooperative Fuel Research Motor-Gasoline Survey, Summer 1941, by E. C. Lane. 1942. 31 pp., 2 figs. Twelfth in series of reports on properties of commercial motor fuels; presents analytical data for 1,857 samples, representing products of approximately 135 companies. Survey was made in accordance with cooperative agreement between Cooperative Fuel Research Committee and Bureau of Mines.
- †RI 3612. Stemming in Metal Mines. Progress Report 3. Relative Advantages and Disadvantages of Different Types of Stemming and No Stemming When Used with 60-Percent Ammonia Gelatin Dynamite at the Mount Weather Testing Adit, by John A. Johnson, Wing G. Agnew, and McHenry Mosier. 1942. 16 pp., 3 figs. Amplifies and clarifies some phases of previous progress reports on use or omission of stemming. (See also RI 3509, 3528, 3646, 3673, 3693, and 3725.)
- †RI 3613. Manganese Investigations—Metallurgical Division. 3. Ore-Dressing Studies of Manganese Ores. Concentration of Manganese Nodules from Chamberlain, S. Dak., by F. D. DeVaney, S. M. Shelton, and F. D. Lamb. 1942. 21 pp., 1 fig. Describes ore body and samples and gives results of various methods of separating nodules from shale.
- †RI 3614. Manganese Investigations—Metallurgical Division. 5. Ore-Dressing Studies of Manganese Ores. Beneficiation of Manganese Wad Ores from the Chinn Property, Batesville, Ark., by S. M. Shelton, M. M. Fine, and J. D. Bardill. 1942. 18 pp. Describes preliminary tests and experimental procedure and gives test results by two methods and small pilot-plant results.
- †RI 3615. Analysis of Power Consumption at Coal Mines. 1. Preliminary Study, by F. A. Jones, E. Thomas, E. R. Maize, and A. L. Toenges. 1942. 20 pp., 13 figs. Presents results of an initial study of actual power requirements of various machines employed in production of coal under operating conditions in modern coal mines. Study was initiated to analyze and eliminate, where possible, hazards, excessive use of power, and high maintenance cost resulting from power losses. (See also RI 3683.)
- †RI 3616. Biennial Report of Petroleum and Natural-Gas Division, Fiscal Years 1940 and 1941, by R. A. Cattell, G. B. Shea, and others. 1942. 57 pp., 10 figs. Résumé of activities of Petroleum and Natural-Gas Division in carrying out its objectives of increased conservation and better utilization of petroleum, natural gas, and related resources through coordinated program of research and fact finding. Work includes research on oil and gas development and production methods, petroleum chemistry and refining, and pipe-line transportation; special chemical and engineering problems; helium operations; special assignments executed for other Government agencies; and visual-education activities.
- †RI 3617. Methanol Poisoning. I. Exposure of Dogs to 450 to 500 p. p. m. Methanol Vapor in Air, by R. R. Sayers, W. P. Yant, H. H. Schrenk, John Chornyak, S. J. Pearce, F. A. Patty, and J. G. Linn. 1942. 10 pp., 2 figs. First of series of reports dealing with results of comprehensive investigation of methanol poisoning conducted by Bureau of Mines, Carbide & Carbon Chemicals Corporation, Du Pont Ammonia Corporation, and Commercial Solvents Corporation. Data include observations for symptoms and unusual behavior, laboratory findings, and ophthalmoscopic examinations and pathology of dogs exposed to methanol vapor in air 8 hours daily, 7 days a week, for approximately 1 year.
- †RI 3618. Review of the Heaving-Shale Problem in the Gulf Coast Region, by Gustav Wade. 1942. 64 pp., 1 fig. Tendency of incompetent shales to disintegrate in water is generally accepted as primary cause of heaving. Chemical treatment of water muds was adopted to reduce hydrous disintegration. Best results have been attained with drilling muds containing sodium nitrate-sodium chloride brines and muds containing sodium silicate and brines of sodium and potassium chlorides.
- †RI 3619. Improved Method of Determining Benzene in Medium-Temperature Light Oils, by L. P. Rockenbach and D. A. Reynolds. 1942. 5 pp., 1 fig. Describes method and gives results of tests to show effect of temperature and of ratio of acid to oil on determination of benzene.
- †RI 3620. Manganese Investigations—Metallurgical Division. 6. Ore-Dressing Studies of Manganese Ores. Concentration of Manganese Ores from the Little Florida Mountains, Luna County, N. Mex., by F. D. DeVaney, M. M. Fine, and S. M. Shelton. 1942. 9 pp. Describes treatment of sample of low-grade ore by two ore-dressing procedures and gives recoveries of manganese by both methods.
- RI 3621. Variations in Oxygen Condition Between Individual Cartridges and Between Cases of Permissible Explosives, by A. P. Rowles, with A. R. T. Denues. 1942. 29 pp. Presents original data developed by Crawford and Murphy (who suggested marked variation in oxygen condition in permissible explosives) as well as results of a simplified statistical analysis of these data. Tests were made with three permissible explosives purchased in open market.

†Out of print.

- RI 3622. Damage from Air Blast. Progress Report 1, by S. L. Windes. 1942. 18 pp., 18 figs. Summarizes Bureau of Mines initial work of 1940 and 1941 in measurement of destructive air blasts caused by detonation of high explosives. Information obtained not only aids in solution of air-blast problem for peacetime industries but is directly applicable to immediate wartime problem of damage from high-explosive bombs. (See also RI 3708.)
- †RI 3623. Manganese Investigations—Metallurgical Division. 10. Ore-Dressing Studies of Manganese Ores. Concentration of Manganese-Bearing Ore from the Interstate Manganese Co., Johnson County, Tenn., by T. L. Johnston, S. M. Shelton, M. M. Fine, and W. A. Calhoun. 1942. 13 pp. Laboratory investigation of sample of manganese ore from Interstate Manganese Co. showed that ferromanganese-grade concentrates can be made by flotation of crude ore or by combined treatment of log-washed ore.
- RI 3624. Manganese Investigations—Metallurgical Division. 9. Ore-Dressing Studies of Manganese Ores. Concentration of Manganiferous Iron Ore from the Armour No. 1 Mine, Ironton, Minn., by M. M. Fine, S. M. Shelton, and J. B. Zadra. 1942. 13 pp. Laboratory investigation of brown ore from Armour No. 1 mine, Ironton, Minn., showed that flotation of crude ore plus roasting and magnetic separation of flotation concentrates was successful in producing ferromanganese-grade concentrates. About 44 percent of total manganese was recovered.
- †RI 3625. Manganese Investigations—Metallurgical Division. 8. Pyrometallurgical Studies of Manganese Ores. Sintering or Nodulizing of Ferrograde Manganese Mill Products and Fine Ores for Smelting Purposes, by Virgil Miller, F. B. Petermann, J. A. Pike, and R. G. Peterson. 1942. 14 pp., 1 fig. Presents data on amenability of various fine ores and mill products to sintering process.
- †RI 3626. Manganese Investigations—Metallurgical Division. 7. Hydrometallurgical Studies of Manganese Ores. Nitrogen Dioxide Process for Recovery of Manganese from Ores, by R. S. Dean, A. L. Fox, and A. E. Back. 1942. 30 pp., 7 figs. New process developed for hydrometallurgical recovery of manganese dioxide from low-grade manganese ore is based upon NO₂ leaching of ore and decomposition of manganous nitrate solution thus obtained. Thorough laboratory-scale tests of Cuyuna Merritt ores indicate that process is now suitable for pilot-plant experimentation.
- RI 3627. Progress Reports—Metallurgical Division. 51. Cinnabar-Reduction Plants of the Southwestern Arkansas Quicksilver District, by S. M. Shelton and W. A. Calhoun. 1942. 24 pp., 8 figs. Reports results of investigation of furnace operations in southwestern Arkansas undertaken by Bureau of Mines at request of mercury producers to overcome losses of important quantities of metal.
- †RI 3628. Progress Reports—Metallurgical Division. 52. Ore-Testing Studies of the Ore-Dressing Section, Fiscal Year 1941, by A. L. Engel and S. M. Shelton. 1942. 36 pp., 13 figs. Gives results of testing manganese ores from New Mexico, Utah, Arkansas, and Missouri; vanadium ores from Arizona; zinc cherts from Wisconsin; zinc jig concentrates from Missouri; mercury (cinnabar) ore from Arkansas; pyritic coal-mine waste from Illinois; lead ore from Idaho; iron-ore log-washer tailings from Alabama; strontium ore from Washington; and titanium ore and magnesite ore from Texas. (Other progress reports of ore-testing series are RI 3328, 3370, 3425, 3484, 3515, 3564, 3569, and 3629.)
- †RI 3629. Progress Reports—Metallurgical Division. 53. Ore-Testing Studies of the Precious Metals Section, by Edmund S. Leaver, Jesse A. Woolf, and A. P. Towne. 1942. 155 pp. Presents results obtained in testing gold ores or tailings from California, Georgia, Idaho, Nevada, North Carolina, Oregon, and Utah; gold-silver ores or tailings from Colorado, Nevada, and Wyoming; and complete base-metal ores containing gold and silver from California, Colorado, and Idaho. Complicated methods of treatment involving special types of washings for the calcine with cyanidation or chlorination of washed residue were required in some instances. (See also RI 3628.)
- †RI 3630. Limits of Inflammability and Ignition Temperature of Styrene in Air, by G. W. Jones, G. S. Scott, and W. E. Miller. 1942. 5 pp., 3 figs. Describes apparatus and procedure for determining limits of inflammability and ignition temperature of styrene in air. This combustible liquid is used extensively in manufacture of synthetic rubber.
- †RI 3631. Methods of Allaying Dust in Underground Mining Operations, by C. Watson Owings. 1942. 38 pp. Discusses results of study of methods for allaying dust in coal and metal mines and indicates possible means of reducing concentrations of dust in such mines.
- †RI 3632. Manganese Investigations—Metallurgical Division. 13. Ore-Dressing Studies of Manganese Ores. Concentration of Manganese-Bearing Ore from the Mayfield Property, Van Horn, Tex., by J. B. Zadra, M. M. Fine, S. M. Shelton, and T. L. Johnston. 1942. 18 pp. Laboratory investigation of manganese ore indicated that ferromanganese-grade concentrates can be recovered by flotation, gravity concentration, air tabling, and high-intensity magnetic separation. Each method recovered a high percentage of manganese in low-silicate concentrates diluted excessively with barium. Sintering of concentrates improved grade. Impure barium byproduct can be recovered.
- RI 3633. Manganese Investigations—Metallurgical Division. 12. Ore-Dressing Studies of Manganese Ores. Concentration of Manganese-Bearing Ore from the Stange Mine, Bland County, Va., by S. M. Shelton, M. M. Fine, J. B. Zadra, and R. B. Fisher. 1942. 14 pp. One of series of reports covering investigations of methods of recovering manganese from domestic sources.
- †RI 3634. Oil-Reservoir Behavior Based Upon Pressure-Production Data, by H. C. Miller. 1942. 36 pp., 3 figs. Summarizes results of study to determine relationship between cumulative decline of reservoir pressure and corresponding cumulative recovery of oil in water-drive reservoirs in which oil is saturated with gas. Logarithmic charts of relationship provide new tool for analyzing reservoir performance.
- RI 3635. Progress Reports—Metallurgical Division. 54. Magnesium by Electrothermic Reduction, by H. A. Doerner, W. Floyd Holbrook, E. Don Dilling, and Dwight L. Harris. 1942. 47 pp., 28 figs. Describes experimental work that led to development of process employing liquid hydrocarbons for shock-cooling magnesium vapor and gives results of preliminary operation of continuous, small-scale pilot plant. Magnesium is recovered by redistillation of condensate obtained on shock-cooling magnesium vapor from reduction furnace. (See also RI 3806.)
- RI 3636. Progress Reports—Metallurgical Division. 55. Dry Differential Grinding Tests of Carnotite Ores, by S. M. Shelton and A. L. Engel. 1942. 32 pp. Discusses dry enrichment of carnotite ores to the point that they may be shipped from the desert regions in which they occur to central points where marketable commodities may be produced.
- RI 3637. Manganese Investigations—Metallurgical Division. 11. Ore-Dressing Studies of Manganese Ores. Concentration of Manganese-Bearing Ore from the Bynum Property, Walnut Grove, Ala., by T. L. John-

†Out of print.

Reports of Investigations

- ston, M. M. Fine, and S. M. Shelton. 1942. 10 pp. Gives results of flotation, gravity and agglomerate table, air-table, and sintering tests on samples of crude ore. None of these methods reduced phosphorus in ore to ferrograde limits.
- RI 3638. Some Photometric Instruments Used in X-Ray Diffraction and Spectrographic Methods of Analysis, by James W. Ballard, Howard I. Oshry, and H. H. Schrenk. 1942. 13 pp., 9 figs. Describes in detail recording microphotometer and three non-recording densitometers for measuring lines on X-ray film or petrographic plates, discusses their application in laboratory, and enumerates essential features of instruments.
- †RI 3639. Determination by the Dropping-Mercury-Electrode Procedure of Lead, Cadmium, and Zinc in Samples Collected in Industrial-Hygiene Studies, by Florence L. Felcht, H. H. Schrenk, and Carlton E. Brown. 1942. 20 pp., 4 figs. Describes dropping-mercury electrode, its use in analysis, and procedure of Health Division of Bureau of Mines in determining lead, cadmium, and zinc. Use of device is based upon fact that kind and amount of electro-reducible and electro-oxidizable constituents in solution can be determined from current-voltage relationships revealed by this electrode or electrolytic device.
- RI 3640. Limits of Inflammability and Ignition Temperatures of Nicotine in Air, by G. W. Jones, G. S. Scott, and W. E. Miller. 1942. 5 pp., 3 figs. Describes apparatus and procedure for determining limits of inflammability and ignition temperatures of nicotine in air. This combustible liquid can be oxidized to nicotinic acid, which is a component of vitamin B complex now used to fortify white flour and other foods deficient in these vitamins.
- RI 3641. Effects of Carbonaceous Blasting Accessories on Gaseous Products from Explosives, by John C. Holtz and E. J. Murphy. 1942. 24 pp., 4 figs. Discusses changes in composition of gaseous products from explosives due to use of two stemming devices or "blasting plugs," an impregnated cottonlike material suggested for stemming, and a wooden detonator shield or safety primer in comparative experiments with modified C-J apparatus in which explosives with three widely different oxygen balances were used. Also discusses practical significance of increased hazard from carbon monoxide.
- †RI 3642. Specific Volumes and Phase-Boundary Properties of Separator-Gas and Liquid-Hydrocarbon Mixtures, by C. Kenneth Ellerts and R. Vincent Smith. 1942. 57 pp., 21 figs. Samples of gas and liquid taken from separator at combination well under conditions of steady flow were recombined in laboratory in proportions of measured gas : liquid ratio and in other proportions to obtain mixtures for studying physical properties at pressures and temperatures characteristic of production from natural reservoirs. Particular attention was given to determination of phase state of mixtures. Experimental data obtained provide information for evaluating phase-boundary properties of mixtures in terms of pressure, temperature, and composition.
- RI 3643. Permissible Methane Detectors, by L. C. Hsley and A. B. Hooker. 1942. 10 pp., 4 figs. Covers investigation of detectors since January 1, 1937, including present permissibility requirements as to design and performance and brief description of each detector. Accurate knowledge of amount of methane being given off at face workings is essential to safe mine operation.
- †RI 3644. Expansion of Coal During Coking, by James T. McCartney and Joseph D. Davis. 1942. 23 pp., 19 figs. Gives results of testing several borderline coals for expansion properties in vertical-slot oven with one movable side and in sole-heated oven.
- RI 3645. Correlation of Certain Properties of Oil-Well Drilling-Mud Fluids with Particle-Size Distribution, by George L. Gates and C. P. Bowie. 1942. 22 pp., 8 figs. Gives theory of mud-sheath building and particle-size distribution, describes wall-building apparatus and its operation, and presents results of tests to control properties of drilling-mud fluids.
- †RI 3646. Stemming in Metal Mines. Progress Report 4. Firing Through Stemming, by Wing G. Agnew, John A. Johnson, and McHenry Mosier. 1942. 4 pp. Covers investigation of length of stemming material through which a primer will fire and detonate charge of dynamite, such as missed hole. (See also RI 3500, 3526, 3612, 3673, 3693, and 3725.)
- RI 3647. Manganese Investigations—Metallurgical Division. 16. Ore-Dressing Studies of Manganese Ores. Benefication of Oxide Manganese Ores from Las Vegas Wash, Nev., by S. R. Zimmerley, C. H. Schack, and F. E. Thackwell. 1942. 25 pp. Gives details and laboratory results of successful concentration of various grades of ore by flotation to ferrograde manganese products by rejection of siliceous gangue. Also discusses factors involved in successful use of cationic reagents and other pertinent data.
- †RI 3648. Limits of Inflammability and Ignition Temperature of Ethyl Mercaptan in Air, by G. W. Jones, R. E. Kennedy, and W. E. Miller. 1942. 6 pp., 1 fig. Limits of inflammability of ethyl mercaptan in dry air at laboratory temperatures and pressures were found to be 2.80 percent for lower and 18.2 percent for upper limit. Ignition temperatures were 299° C. in air and 261° C. in oxygen. Ethyl mercaptan is an odorant introduced into odorless fuel gases to permit detection of leakage.
- †RI 3649. Manganese Investigations—Metallurgical Division. 14. Hydrometallurgical Studies of Manganese Ores. Laboratory Experiments on Sulfur Dioxide-Sulfuric Acid Leaching of Black and Brown Manganiferous Iron Ores of the Cuyuna Range of Minnesota, by C. Travis Anderson. 1942. 38 pp., 10 figs. Typical samples of Cuyuna brown and black ores were leached with sulfur dioxide to obtain an extraction of at least 80 percent of manganese and a solution low enough in iron and phosphorus to yield, when treated further, a sinter meeting specifications for Grade A manganese ore.
- RI 3650. Physical Properties of Cokes from Bureau of Mines—American Gas Association Tests at 800° and 900° C., by D. A. Reynolds and C. R. Holmes. 1942. 14 pp., 2 figs. Summarizes physical properties of BM-AGA test cokes from 25 coals carbonized at 800° C. and 43 coals carbonized at 900° C. in 13- and 18-inch retorts; also compares rates of carbonization and properties of cokes from both sizes of retorts and four ranks of coal.
- †RI 3651. Manganese Investigations—Metallurgical Division. 15. Hydrometallurgical Studies of Manganese Ores. Electrodeposition of Manganese, by David Schlain. 1942. 28 pp., 4 figs. Purpose of investigation was to study characteristics of high-acid electrolytic manganese cell with idea of fitting it into one of flow sheets being worked out by Bureau of Mines for recovering manganese from low-grade domestic ores. Paper gives results of tests to determine practicability of leaching manganese matte with spent electrolyte from low-acid cell and using resulting solution in electrolytic cell.
- †RI 3652. Manganese Investigations—Metallurgical Division. 17. Ore-Dressing Studies of Manganese Ores. Concentration of Wad Ore from the Ayedalotte Property, Batesville, Ark., by S. M. Shelton, M. M. Fine, and R. B. Fisher. 1942. 17 pp. Gives results of investigations designed to solve problem of obtaining domestic supply of manganese. Laboratory batch tests and pilot-plant operations showed possibility of producing ore approaching ferromanganese grade from two samples of wad ore from Ayedalotte mine.

†Out of print.

- †RI 3653. National Safety Competition of 1941, by W. W. Adams and T. D. Lawrence. 1942. 43 pp. To promote safety in mineral industries trophies are presented to winners in six groups of mines and quarries. Paper lists awards for seventeenth annual competition.
- †RI 3654. Use of Subaudible Noises for the Prediction of Rock Bursts. II, by Leonard Obert and Wilbur Duvall. 1942. 22 pp., 9 figs. Gives results of tests at Ahmeek mine, Michigan, to determine nature of subaudible noises as means of predicting rock bursts; describes preliminary investigations at three other deep mines; and reviews certain phases of earlier investigations that bear directly on problem. (See also RI 3555.)
- RI 3655. Size Consist, Chemical Analysis, and Physical Properties of 2½-Inch Subbituminous Slack from the Denver (Colo.) Region, by V. F. Parry and W. S. Landers. 1942. 30 pp., 9 figs. Summarizes results of studies on physical and chemical properties of slack coal from Northern Colorado field; normal slack from 19 mines that produce 75 percent of coal from district 16 was used in investigation. Information was obtained on size consist, ash distribution, bulk density, friability, slacking, heating value, and proximate and ultimate analyses.
- RI 3656. Hazards Due to Electric Shock Transmitted Across Discharge Spray of Compressed Carbon Dioxide, by R. L. Grant. 1942. 7 pp., 4 figs. Results indicate that if carbon dioxide is used in attempt to extinguish coal-mine fire near live electrical conductor, such as trolley wire, carrying voltage up to 880 volts a. c. or 240 volts d. c., no current will be conducted across gap between conductor and carbon dioxide container while spray of carbon dioxide is being directed onto fire.
- †RI 3657. Productivity of Oil Wells and Inherent Influence of Gas: Oil Ratios and Water Saturation, by R. V. Higgins. 1942. 50 pp., 11 figs. Presents results of study to determine influence of gas: oil ratios and water saturation on decline in productivity indexes of oil wells; discusses changes occurring over long periods in gas: oil ratios and water saturation in sand surrounding well and analyzes their influence. Application of field data and their correlation with evaluation of well performance will aid petroleum engineers to recover maximum quantities of oil from underground reservoirs.
- RI 3658. Progress Reports—Metallurgical. 56. Possible Substitutes for Nickel in the Present 5-Cent Coin, by C. Travis Anderson. 1942. 6 pp., 7 figs. Bureau of Mines was asked to suggest possible substitutes for nickel used in 5-cent coin. Investigation of series of alloys in manganese-silver-copper system disclosed an area of suitable alloys in ternary diagram for system that fulfills requirements of resistivity, color, density, and reasonable resistance to corrosion. About 450 tons of nickel thus could be released annually for military use.
- RI 3659. Manganese Investigations—Metallurgical. 18. Pyrometallurgical Studies of Manganese Ores. Smelting of Manganese Oxide, Carbonate, or Silicate Ores with Copper and Iron Sulfides, by R. G. Knickerbocker and Virgil Miller. 1942. 23 pp., 7 figs. Discusses development of two-step matte-smelting process in which principal difference between Betts process and Bureau of Mines process is control of reducing condition in raw matte-smelting step, so that low-melting-point, lower-grade manganese-iron or manganese-copper-iron matte is produced.
- RI 3660. Crude Oils of New Mexico, by E. C. Lane. 1942. 30 pp. Reviews briefly New Mexico's history as petroleum producer, tabulates production and information concerning discovery of crude-oil fields, and summarizes data showing sources and characteristics of 50 crude-oil samples from representative fields of State. Also includes analyses of samples.
- RI 3661. Progress Reports—Metallurgical. 57. Silver-Recovery Studies. Some Factors Affecting Flotation of the Silver-Bearing Minerals Tennantite and Enargite, by E. S. Leaver, J. A. Woolf, and A. P. Towne. 1942. 23 pp. Emphasizes certain factors that should be considered in treatment of ore containing silver-bearing minerals of complex sulfide type. Also contains information as to recovery of gold as well as some nonferrous base-metal sulfides. (See also RI 3275 and 3436.)
- RI 3662. Lamellar Grading of Powdered Mica, by Foster Fraas and Oliver C. Ralston. 1942. 7 pp., 1 fig. Presents graphical method showing distribution of relative quantities of mica per given range of plate thickness and compares different methods of grading mica.
- RI 3663. Graphical Correlation of Recovery and Product Composition in Separation Processes, by Foster Fraas. 1942. 4 pp., 2 figs. Describes graphical method for correlating cumulative recovery and cumulative composition of concentrate in separations by electrostatic and flotation methods. When data are plotted on probability-probability coordinates, straight-line relationships and critical points not present on Cartesian coordinate plot appear.
- RI 3664. Annual Report of the Mining Division, Fiscal Year 1942, by Chas. F. Jackson. 1942. 51 pp., 9 figs. Reviews work done during fiscal year by following sections of Mining Division: Metal-mining methods, strategic-mineral examination, mineral industry survey, western strategic-mineral projects, eastern strategic-mineral projects, nonmetal mining, metal-mining research, coal mining, mine ventilation, and electrical-mechanical. Work was oriented entirely to war program by applying apparatus and technique previously developed in research directly to war problems as well as by intensified search for an exploration of deposits of minerals necessary in war. Examination and exploration of ore deposits were centered mainly on ores designated as strategic by Army and Navy Munitions Board.
- RI 3665. Active List of Permissible Explosives and Blasting Devices Approved Prior to June 30, 1942, prepared by J. E. Tiffany and Z. C. Gaugler. 1942. 25 pp. Includes 194 brand names of permissible explosives and blasting devices now on active list.
- †RI 3666. Inflammability of Trichloroethylene-Oxygen-Nitrogen Mixtures, by G. W. Jones and G. S. Scott. 1942. 5 pp., 1 fig. Trichloroethylene, usually considered noninflammable, recently has been proposed for use in anesthesia on assumption that it does not produce inflammable mixtures with oxygen and nitrous oxide. Tests show that, although it does not produce inflammable mixtures with air, it does when air is enriched with oxygen and in the presence of pure oxygen has rather wide limits of inflammability.
- RI 3667. Contact Potential in Electrostatic Separation, by Foster Fraas and Oliver C. Ralston. 1942. 17 pp., 2 figs. Describes apparatus that separates particles of minerals electrostatically after charging by intimate contact or horizontal vibrating plates. Separations include benzoic acid-pretreated ulexite-bentonite on plates of CuS and celluloid, H₂F₂-pretreated gypsum-siliceous gangue on celluloid, brucite-calcite on magnesium, and phosphate-pebble quartz on aluminum.
- †RI 3668. Mineral Dressing of Oregon Beach Sands. Concentration of Chromite, Zircon, Garnet, and Ilmenite, by John Dasher, Foster Fraas, and Alton Gabriel. 1942. 19 pp., 1 fig. Chromite concentrates containing more than 40 percent Cr₂O₃ can be produced from all samples of beach sand tested. These concentrates are not very satisfactory for chemical use and are of little use for chrome refractories.

†Out of print.

Reports of Investigations

- Milling steps should include cleaning, classification, hydraulic tabling, drying, and electrostatic and in some instances magnetic separation. Magnetic separation of electrostatic rejects will produce salable zircon concentrate and garnet concentrate that may be salable. Separation of an ilmenite concentrate is not possible.
- RI 3669. Annual Report of the Explosives Division, Fiscal Year 1942, by Wilbert J. Huff. 1942. 43 pp., 27 figs. Contains chapters on flammability of gases and vapors; gases and explosions in underground conduits; investigation of causes, behavior, and control of mine fires; investigation of hazards in use of Diesel locomotives; investigation of liquid-oxygen explosives; methods for determining poisonous gases from explosives; mechanism of ignition of firedamp by explosives; cushioned blasting; stemming of Cardox; explosives control; chemical and physical tests on explosives and blasting devices; chemical studies; and general work.
- RI 3670. Moisture Losses in Sampling Coal, by H. M. Cooper, N. H. Snyder, and R. F. Abernathy. 1942. 14 pp. Gives results of experiments made with special moisture samples taken at 21 mines; compares moisture content of samples with that of regular tippie sample and shows loss from consecutive crushings.
- RI 3671. Carbonization of Bevier-Bed Coal from Kansas and Production of Blue Water Gas from the Resulting Coke, by W. W. Odell. 1942. 21 pp. Series of tests was made on coal from strip mine in Bevier bed near Pittsburg, Kans., to determine behavior and usefulness of high-sulfur, high-volatile coking coal in manufacture of coke and subsequent generation of water gas. Tests established that coke can be made from this coal either in Curran-Knowles or Koppers oven. Because of properties of coke ash, coke cannot be recommended for use in making water gas in generators having mechanical grates.
- †RI 3672. Extinguishing Magnesium Fires with Hard Pitch Derived from Coal Tar, by H. R. Brown, Irving Hartmann, and John Nagy. 1942. 17 pp., 4 figs. Describes small-scale magnesium-fire laboratory tests, large-scale tests with pitch on factory-type fires, and tests of pitch on magnesium incendiary bombs; outlines proper methods of application to fires under various conditions and of removal after fire has been extinguished; and discusses sources, characteristics, and limitations of suitable pitch derived from coal tar and of petroleum asphalt. Also lists producers of pitch. Advantages of pitch are its effectiveness, nonabrasiveness, availability, and low cost.
- RI 3673. Stemming in Metal Mines. Progress Report 5. Comparison of Dust and Gases Produced from Blasting Charges of Dynamite in Drill Holes, in Bombs, and in Mud-Cap Shots, by John A. Johnson and Wing G. Agnew. 1942. 10 pp. One of series pertaining to investigation on use of stemming in metal mines being conducted by Bureau of Mines at Mount Weather testing adit. Compares amounts of dust and gases produced from blasting four standard test rounds with no stemming, five bomb shots, and two mud-cap or adobe shots. (See also RI 3509, 3528, 3612, 3646, 3693, and 3725.)
- RI 3674. Cushioned Blasting. II. Preliminary Studies of Gallery Testing, by A. R. T. Denuet. 1943. 37 pp., 7 figs. Records results of investigation of various means employed to reduce intensity of application of energy from actions of explosions in boreholes. Results seem to establish that gallery testing can contribute significantly to estimates of practical effects in cushioned blasting on ignition hazards in coal mines. (See also RI 3510.)
- †RI 3675. Report of the Nonmetals Division, Fiscal Year 1942, by O. C. Ralston and A. George Stern. 1942. 39 pp., 15 figs. One of series summarizing accomplishments of Nonmetals Division during each fiscal year. Work included extraction of alumina from clay and low-grade bauxites; production of potassium carbonate from wyomingite and trona; optical and thermal studies; mineral dressing and beneficiation; testing of clays and refractories; study of intercrystalline cracking of boiler steels; and coal investigations.
- †RI 3676. Exploration for War Minerals (Through Fiscal Year 1942), by McHenry Mowler and A. C. Johnson. 1943. 44 pp., 6 figs. Summarizes exploration projects on antimony, chromite, manganese, mercury, nickel, tin, tungsten, iron, bauxite, and clay; describes methods used for excavating material. Includes list of all publications on subject from July 1, 1939, to June 30, 1942.
- RI 3677. An Electrostatic Separator for Fine Powders, by Foster Fraas and Oliver C. Ralston. 1942. 7 pp., 2 figs. Describes separator that consists of nozzle for dispersing and electrifying fine mixed powders in air suspension and set of electrodes for separation. Nozzle has internal, sinuous passageway and aperture shape of slit; electrodes are open-structure grids, which permit passage of separated air-suspended components.
- RI 3678. Use of Wetting Agents in Reducing Dust Produced by Wet Drilling in Basalt, by John A. Johnson. 1943. 27 pp., 2 figs. Results of wet-drilling tests with two wetting agents show that use of these agents materially reduces quantity of dust produced as against use of water alone.
- RI 3679. Smelting of Vanadium-Bearing Titaniferous Sinter in an Experimental Blast Furnace, by C. E. Wood, T. L. Joseph, and S. S. Cole. 1943. 24 pp., 5 figs. Recovery in metal of 87.3 percent of the vanadium was obtained in operating experimental blast furnace on burdens composed of iron ore and titaniferous sinter containing 11.1 percent TiO₂ and 0.26 percent vanadium. Results show oxides of vanadium are reduced readily under blast-furnace conditions.
- RI 3680. Trends in the Use of Energy in the Western States, with Particular Reference to Coal, by V. F. Parry. 1943. 44 pp., 17 figs. Lists major physical and chemical properties of solid fuel mined in the West. Gives brief résumé of present knowledge of hydrogenating western coal to make gasoline and of carbonizing such coal for manufacture of metallurgical coke.
- †RI 3681. Manganese Investigations. 19. Studies in the Electrodeposition of Manganese, by F. W. Woodman and J. H. Jacobs. 1943. 26 pp., 4 figs. Describes operation of the Bureau's electrolytic manganese pilot plant at Boulder City, Nev., particularly the construction of the electrolytic cells and the composition of the anodes and cathodes.
- †RI 3682. Hard and Soft Kaolins of Georgia, by T. A. Klinefelter, R. G. O'Meara, G. C. Truesdell, and Sidney Gottlieb. 1943. 20 pp., 4 figs. Compares hard and soft kaolins as to physical and chemical properties. Concludes that hard grades can be beneficiated to same grade as soft by one of several types of milling but that, until soft deposits are depleted further, it may not be worth while to handle hard kaolins because of extra expense involved. Prepared in cooperation with the University of Alabama.
- RI 3683. Analysis of the Use of Electricity at Coal Mines. Progress Report 2, by F. A. Jones, E. Thomas, A. L. Toenges, E. R. Maize, and J. N. Scudder. 1943. 25 pp., 9 figs. Analyzes energy requirements and characteristics of various machines used in production of coal at one underground mine and losses in distribution of energy to such machines. First in series was RI 3615.

†Out of print.

- RI 3684. Manganese Investigations. 20. Ore-Dressing Studies of Eastern Manganese Ores. Concentration of Manganese-Bearing Ore from the Barytes Mining Co., Cartersville District, Cartersville, Ga., by W. A. Calhoun, T. L. Johnston, M. M. Fine, and S. M. Shelton. 1943. 11 pp. Laboratory investigation of this low-grade manganese ore showed that ferromanganese-grade concentrates could be made by three methods of ore dressing, but over-all recovery was comparatively low.
- RI 3685. Electrical Transducer Circuit for Use with Capacity Pick-Up Devices, by E. V. Potter. 1943. 7 pp., 5 figs. Describes form of transducer with characteristics giving it many advantages over other types of electrostatic devices; simplicity, flexibility, sensitivity, and freedom from shielding requirements make it device that should be useful to investigators studying mechanical vibrations.
- RI 3686. Application of Carbon Tetrachloride-Type Fire-Extinguisher Liquid to Burning Magnesium Chips and Magnesium Incendiary Bombs, by S. J. Pearce, Leopold Scheffan, H. H. Schrenk, G. E. Ferguson, and H. R. Brown. 1943. 18 pp., 17 figs. Use of carbon tetrachloride fire-extinguisher liquid on burning magnesium incendiary bombs is not recommended; phosgene, chlorine, and vapors of extinguisher liquid were found in all fire-test atmospheres, carbon monoxide in all but one, and hydrogen chloride in all but three.
- RI 3687. Determination of Oxides of Nitrogen by the Phenoldisulfonic Acid Method, by Robert L. Beatty, L. B. Berger, and H. H. Schrenk. 1943. 17 pp., 6 figs. Describes method for determining toxic oxides of nitrogen in air and other gaseous mixtures and reviews work of others in this field. As oxides of nitrogen are present in gases evolved in use of explosives and in many industrial operations, they constitute a health hazard to exposed persons.
- †RI 3688. Analyses of Crude Oil from Some Fields in Kansas, by E. C. Lane and E. L. Garton. 1943. 95 pp. Gives Hempel analyses and other data on 174 samples from Kansas fields.
- RI 3689. Use of Manganese Alloys for Electrical Condenser Plates, by E. V. Potter and Ralph W. Huber. 1943. 9 pp., 2 figs. Tests showed that use of manganese-copper alloys for electrical condenser plates offers definite improvements in reduction sensitivity of such plates to vibrations.
- RI 3690. Thermoelectric Tester for Checking the Composition of Metals, by B. A. Rogers, K. Wentzel, J. P. Riott, and R. B. Corbett. 1943. 6 pp., 4 figs. Although using thermoelectric character of metals as means of distinguishing among them is relatively old, practical application of method depends on use of apparatus on which readings may be made quickly.
- RI 3691. Prevention of Butadiene-Air Explosions by Addition of Nitrogen and Carbon Dioxide, by G. W. Jones and R. E. Kennedy. 1943. 11 pp., 4 figs. Gives results of numerous experiments to establish limits of flammability of butadiene-air mixtures to which various proportions of nitrogen and carbon dioxide were added.
- †RI 3692. The Burning Rate of Natural Graphite, by Glen Dale Coe. 1943. 9 pp., 5 figs. Shows that presence of gangue minerals in concentrate greatly reduced burning rate of each graphite tested, the reduction differing for various graphites. Prepared in cooperation with the University of Alabama.
- †RI 3693. Stemming in Metal Mines. Progress Report 6. Relative Advantages and Disadvantages of Different Types of Stemming and No Stemming When Used with 40-Percent Ammonia Gelatin Dynamite at the Mount Weather Testing Adit, by John A. Johnson and Wing G. Agnew. 1943. 38 pp., 2 figs. States that sand proved to be most efficient stemming, but produced 34 percent more dust than no stemming; that rounds blasted in tough-breaking rock produced more dust and less fine rock than rounds in average-breaking rock; and that rounds using incombustible blasting plugs produced most carbon dioxide, and limestone screenings least. (See also RI 3509, 3528, 3612, 3646, 3673, and 3725.)
- RI 3694R. Some Refractory Properties of Washington Chromite, by Hewitt Wilson, Kenneth G. Skinner, and Thomas L. Hurst. 1947. 25 pp., 22 figs. (Revised.) Studies of Pacific Northwest chromite reveal that most promising deposits in Washington State are in Twin Sisters Mountains, although mining costs would be high. Tests indicate that secondary minerals affect fusion, shrinkage, porosity, strength, and color of chromites. Prepared in cooperation with College of Mines, University of Washington.
- RI 3695. Comparative Yields of Light Oil, Tar, and Constituents from Carbonization Tests at 800°, 900°, and 1,000° C., by C. R. Holmes, J. E. Wilson, and J. D. Davis. 1943. 12 pp., 4 figs. Tests indicated that, in general, increasing carbonizing temperature increases yields of light oil, benzene, naphthalene, and anthracene, but at same time yields of toluene, tar acids, and ammonium sulfate decline.
- †RI 3696. Structural Features of Typical American Commercial Detonators, by R. L. Grant. 1943. 30 pp., 7 figs. Reviews developments in American commercial detonators and classifies types according to their structure. Defines strengths of different grades and describes tests used to determine them.
- RI 3697. A Simple Device for Detecting Small Concentrations of Organic Halide Gases in the Atmosphere, by G. W. Jones and R. E. Kennedy. 1943. 10 pp., 2 figs. Describes simple tester for detecting low concentrations of halide gases in atmosphere, so constructed that tests may be made by aspirating suspected atmosphere through it, by suspending it in atmosphere, or by swinging it in atmosphere to be tested.
- RI 3698. Work of the Safety Division, Fiscal Year 1942. 1943. 140 pp., 12 figs. Summarizes work of Safety Division in numerous fields of mine safety, including training in first aid and mine rescue, training of coal-mine inspectors and explosives investigators, petroleum-education work, and assistance at and investigation of coal-mine explosions and fires.
- †RI 3699. Analyses of Crude Oils from Some Fields of Texas, by E. C. Lane. 1943. 52 pp. Gives Hempel analyses and other data on 90 samples from Texas fields.
- RI 3700. Diesel Engines Underground. IV. Effect on Composition of Exhaust Gas of Variables Influencing Fuel Injection, by John C. Holtz, L. B. Berger, M. A. Elliott, and H. H. Schrenk. 1943. 24 pp., 3 figs. Tests showed that exhaust-gas composition was not affected significantly by removing one set of injection valves and installing a different set of valves in proper mechanical condition or by purposely altering opening pressure of an injection valve and then readjusting it to proper opening pressure and re-installing it in engine. (See also RI 3508, 3541, 3584, 3713, and 4032.)
- †RI 3701. Evaporation Losses of Aviation Gasoline in Standing Storage, by Peter Grandone. 1943. 19 pp., 9 figs. The results of evaporation-loss studies described in this report represent data obtained in an investigation of the storage of approximately 150,000 barrels of blended aviation gasoline and of approximately 200,000 barrels of two special blending stocks for aviation gasoline.
- †RI 3702. An Automatic Frequency-Controlled Oscillator and Amplifier for Driving Mechanical Vibrators, by E. V. Potter. 1943. 10 pp., 12 figs. Oscillator has following characteristics: Driving frequency will

†Out of print.

Reports of Investigations

- remain within a few tenths of a cycle of resonant frequency of vibrating member; control will be effective even though variations in driving power and acoustical load cause wide variations in amplitude of vibrator motion; motion of vibrator can be maintained even under loading conditions that do not allow automatic control to function effectively.
- RI 3703. Survey of Fuel Consumption at Refineries in 1941, by G. R. Hopkins. 1943. 2 pp., 2 figs. States that average heat requirements per barrel of crude refined rose from 579,000 B. t. u. in 1940 to 584,000 B. t. u. in 1941.
- RI 3704. Contrasts in Grinding Characteristics of Mineral Products, by Glen Dale Coe and Will H. Coghill. 1943. 11 pp., 4 figs. Grinding characteristics of anthracite, bituminous coal, cement clinker, chalcocopyrite, chert, kaolin, limestone, mica, quartz, rutile, siderite, sphalerite, taconite, talc, topaz, and zircon are recorded in terms of net horse-power-hours required to grind 1 ton to specified top limiting size. Prepared in cooperation with the University of Alabama.
- RI 3705. Effects of Sheaths on Gaseous Products from Permissible Explosives, by E. J. Murphy, A. P. Rowles, and John C. Holtz, with A. R. T. Denues. 1943. 41 pp., 16 figs. Comparative tests in Bichel gage developed effects of sheaths on gaseous products from two permissible explosives in cartridges of two diameters each; and similar tests under confinement in Crawshaw-Jones apparatus used five permissible explosives, with seven sheaths and three methods of loading. (See also RI 4220.)
- †RI 3706. Some Tools and Methods Used in Cleaning Oil Wells in California, by G. B. Shea. 1943. 39 pp., 8 figs. Shows that application of systematic clean-out methods when need is indicated makes it possible to obtain better understanding of characteristics of wells and thereby obtain maximum recovery.
- RI 3707. Briquetting Subbituminous Coal, by V. F. Parry and John B. Goodman. 1943. 37 pp., 28 figs. Describes laboratory investigations on briquetting of subbituminous coal and results of work to determine whether briquetting properties can be improved by steam drying just before briquetting. Includes studies of raw, steam-dried, and air-dried coals.
- †RI 3708. Damage from Air Blast. Progress Report 2, by S. L. Windes. 1943. 50 pp., 37 figs. Enumerates improvements over equipment used in Report 1 (RI 3622), explains calibrating devices used, and presents results of field investigations utilizing improved equipment to test effects of air blast on a frame residence.
- †RI 3709. Determination of Tungsten in Low-Grade Ores, by H. E. Peterson and W. L. Anderson. 1943. 15 pp. Presents three methods for analysis proved on numerous tungsten-bearing ores of various types. Contains discussion of accuracy attained by careful use of these procedures and of sources of error.
- †RI 3710. A Study of Decay of Mine Timber, Part 2, by James N. Scudder, Henry E. DeKay, Jr., and Albert L. Toenges. 1943. 14 pp., 13 figs. In consequence of complaint that rock dust accelerated decay of mine timber, investigations in Crucible and Isabella mines indicated that rock dust had no such effect; in fact, 63 percent of non-rock-dusted specimens suffered a greater loss in crushing strength than rock-dusted specimens. (See also RI 3544.)
- †RI 3711. Increased Pig-Iron Output Through Improved Coke, by L. D. Schmidt, W. C. Schroeder, and A. C. Fieldner. 1943. 58 pp., 6 figs. Reports on problems connected with coke production or use that appear to constitute major limitations on rate of pig-iron production; discusses qualities required in coke to give maximum production of iron as means of attaining these qualities by modifications of ordinary practices at mines and plants. Prepared in cooperation with the Office of Solid Fuels Coordinator for War.
- RI 3712. Analysis of Oil Production in the Near-Depleted Mexia-Powell Fault-Line Fields of Texas, by H. B. Hill and R. K. Guthrie. 1943. 83 pp., 30 figs. Gives history of development, description of reservoir, and oil production of five Mexia-Powell fault-line fields—Mexia, Wortham, Currie, Richland, and Powell. Is of historical value as record, because by January 1, 1942, fields probably had yielded at least 97 percent of their ultimately recoverable oil.
- †RI 3713. Diesel Engines Underground. V. Effect of Sulfur Content of Fuel on Composition of Exhaust Gas, by L. B. Berger, M. A. Elliott, John C. Holtz, and H. H. Schrenk. 1943. 13 pp. Presents results of tests conducted with high-sulfur fuel to determine effect on exhaust-gas composition of operation with such fuel. All sulfur in this fuel appeared in exhaust gas as sulfur dioxide and sulfur trioxide. (See also RI 3508, 3541, 3584, 3700, and 4032.)
- †RI 3714. Some Information from an Investigation on Methods of Confining Cardox Blasting Devices in Boreholes in Certain Coal Mines, by F. E. Griffith and C. H. Seeling. 1943. 13 pp., 12 figs. Describes Cardox devices, lists permissibility requirements, and discusses tests of Cardox blasting practices.
- †RI 3715. Engineering Study of the Rodessa Oil Field in Louisiana, Texas, and Arkansas, by H. B. Hill and R. K. Guthrie. 1943. 126 pp., 68 figs. Development and exploitation of Rodessa field in three States afforded unusual opportunity to study in detail geology and producing characteristics of reservoir on flank of long, broad, anticlinal fault structure in which oil-producing formations contained large volumes of gas in gas caps and in solution in oil.
- RI 3716. Cooperative Fuel-Research Motor-Gasoline Survey, Winter 1942-43, by A. J. Kraemer and O. C. Blade. 1943. 28 pp. Continues semiannual series of analyses of motor gasoline from 20 typical localities, prepared in cooperation with Cooperative Fuel Research Committee of the Cooperative Research Council.
- RI 3717. Byproduct Coke-Oven Tests of Washington Coals, by H. F. Yancey, Joseph Daniels, E. R. McMillan, and M. R. Geer. 1943. 46 pp., 12 figs. Describes investigation and tests to explore possibilities of installing Curran-Knowles byproduct coking plant in Puget Sound area of Washington to utilize Roslyn, McKay, and Wilkeson coals. Prepared in cooperation with the University of Washington, College of Mines.
- RI 3718. Some Small Coal Jigs for Mechanical Cleaning of Coal at Truck Mines and Other Low-Tonnage Operations, by B. W. Gandrud and G. T. Bator. 1943. 17 pp., 14 figs. Results of performance study of small coal jigs at truck mine near Birmingham, Ala. Performance was found to compare favorably with that of standard 40- to 50-ton-per-hour single-cell jigs. In some sections, truck mines supply considerable coking coal, and use of small, inexpensive jig washers might increase pig-iron production by improving quality of coke. Prepared in cooperation with the University of Alabama.
- RI 3719. Survey of Subsurface Brine-Disposal Systems in Western Kansas Oil Fields, by Peter Grandone and Ludwig Schmidt. 1943. 20 pp., 1 fig. Reports on survey of current practices of handling oil-field brines and types of systems used for their subsurface disposal in Western Kansas; conducted in cooperation with Kansas State Board of Health.
- RI 3720. Magnolia Oil Field, Columbia County, Ark. Part I, Petroleum-Engineering Study, by Charles B. Carpenter and H. J. Schroeder. Part II, Derivation and Application of Material-Balance Equations, by Alton B. Cook. 1943. 115 pp., 22 figs. Part I

†Out of print.

- describes typical "water-drive" field developed in conformity with good engineering principles and operated efficiently. Part II gives equations representing balance of reservoir material. Prepared in cooperation with the Arkansas Oil and Gas Commission.
- †RI 3721. Aniline Points of Hydrocarbons, by John S. Ball. 1943. 49 pp., 4 figs. As result of survey of literature and critical selection of values, table of critical solution temperatures in aniline and aniline points for a large number of hydrocarbons has been prepared. Bibliography included. Prepared in cooperation with the University of Wyoming.
- RI 3722. Inflammability and Explosibility of Metal Powders, by Irving Hartmann, John Nagy, and Hylton R. Brown. 1943. 44 pp., 6 figs. Gives results of tests of 53 powder samples comprising 14 different metals and 2 alloys to determine minimum ignition temperature and minimum energy needed for ignition of dispersions in air and quiescent layers, relative inflammability with two sources of ignition, minimum concentration required in dispersion in air to permit ignition, reduction in oxygen content of air needed to prevent ignition, and effect of humid atmosphere.
- RI 3723. National Safety Competition of 1942, by W. W. Adams and T. D. Lawrence. 1943. 44 pp. Gives results of annual competition among mining establishments in various categories to win trophy entitled "Sentinels of Safety."
- RI 3724. Cooperative Investigation of the Effect of Furnace Type and Atmosphere on the Fusibility of Coal Ash, by H. M. Cooper and R. F. Abernethy. 1943. 43 pp. Gives results of investigations of fusibility of 9 coal-ash samples made in 16 laboratories that provided 23 different furnace-type and furnace-atmosphere combinations.
- RI 3725. Stemming in Metal Mines. Progress Report 7, by Wing G. Agnew. 1943. 19 pp., 2 figs. Under conditions at Mount Weather (Va.) Testing Adit, blasting a group of rounds with no stemming proved only 72 percent as efficient as when two cartridges of sand stemming were used per hole with 40-percent gelatin dynamite. Shows possibility of monetary saving in blasting. (See also RI 3509, 3528, 3612, 3646, 3673, and 3693.)
- RI 3726. Effect of Acids and Alkalies Upon Carbonization Products of Coal, by R. E. Brewer. 1943. 20 pp. Reviews effect of acids and alkalies, when used in various concentrations either in aqueous solution or in dry state, at different temperatures and pressures, and in presence or absence of air, on carbonization products of different types of coal.
- RI 3727. Inflammability of Methylene Chloride-Oxygen-Nitrogen Mixtures, by G. W. Jones, R. E. Kennedy, and F. E. Scott. 1943. 7 pp., 4 figs. Gives tests to determine inflammable range of methylene chloride (used extensively as refrigerant in air conditioning, as intermediate in organic synthesis, and as solvent for cellulose acetate and other materials) in air enriched with oxygen and in pure oxygen.
- RI 3728. History of Water Flooding of Oil Sands in Oklahoma, by D. B. Taliaferro and David M. Logan. 1943. 182 pp., 54 figs. Gives detailed information regarding all water-flooding projects in Oklahoma; includes such data as volume of oil produced monthly, volume of water injected monthly, spacing of wells, number of injection wells and oil wells, and other pertinent information. Prepared in cooperation with State of Oklahoma. (See also RI 3761, 3777, 3778, 3783, 3792, and 3818.)
- RI 3729. Effects of Desulfurization on the Lead Susceptibility of Distillates from Some Crude Oils from Texas, New Mexico, and Oklahoma, by Boyd Guthrie and M. C. Simmons. 1943. 16 pp., 2 figs. This report presents results of current investigations of several "high-sulfur" Texas, New Mexico, and Oklahoma crude oils and gives some basic information on certain sulfur compounds, especially their identification in straight-run distillates, their depressing effects upon the octane numbers of leaded fuels, the benefits obtained by their partial and complete removal, and some of the processes being used to effect their removal.
- RI 3730. Air Flow at Discharge of Fan-Pipe Lines in Mines. II. Effect of Size and Shape of Pipe and of Adjacent Walls on Velocity and Entrainment Ratios, by G. E. McElroy. 1943. 30 pp., 12 figs. Presents results of second series of experiments on discharge of air from fan-pipe lines in mine openings and compares results of both series on jet discharges into large, open spaces. (See also RI 3531.)
- RI 3731. Coke from Low-Ash Appalachian Coals for Carbon Electrodes in Aluminum Industry, by W. A. Selvig, W. H. Ode, and F. H. Gibson, with a chapter on Comparison of Results Obtained by Trent Process for Cleaning Coal with Those by Float-and-Sink Methods, by Joseph D. Davis. 1943. 22 pp. If coke made from coal could be produced to meet specifications of aluminum industry, coal used for coking must be unusually low in mineral impurities. Float-and-sink studies were made on low-ash coals to determine how pure a coke could be produced; further reduction of ash content by acid leaching also was investigated.
- RI 3732. Application of the Rosin-Rammler Law to the "Missing Sizes" in Screened Coal, by G. S. Scott. 1943. 9 pp., 8 figs. Applies Rosin-Rammler law to solving problem of changes in sizing characteristics in screened coals if screens of different-size openings from those employed had been used.
- RI 3733. Tests of the Heliopore Coal-Carbonization Power-Plant Process, by A. C. Fieldner, J. D. Davis, V. F. Parry, L. D. Schmidt, J. L. Elder, J. B. Goodman, W. S. Landers, and E. W. Goodwin. 1943. 36 pp., 36 figs. Gives results of tests performed under Congressional authorization; device is intended to save and apply engine exhaust heat. Tests produced data that should be of value in further development of continuous retorts for coal carbonization; however, they indicate that heat economies obtained by utilizing engine exhaust gas will not justify any appreciable investment in special equipment.
- †RI 3734. Grounding Electrical Equipment in and about Coal Mines, by F. E. Griffith and E. J. Gleim. 1943. 15 pp., 1 fig. Gives results of tests in mines having direct-current loading and shortwall mining machines to study methods of grounding that will afford protection from shock.
- †RI 3735. National Motor-Gasoline Survey, Summer 1943, by A. J. Kraemer and O. C. Blade. 1943. 28 pp. Semiannual series of analyses of motor gasoline from various typical localities, prepared in cooperation with the Coordinating Fuel Research Committee of the Coordinating Research Council.
- †RI 3736. Active List of Permissible Explosives and Devices Approved Previous to June 30, 1943, by J. E. Tiffany and Z. C. Gaugier. 1943. 23 pp. List includes permissible explosives (gelatinous and nongelatinous) and permissible blasting devices.
- †RI 3737. Thermal Analysis of Clay Minerals and Acid Extraction of Alumina from Clays by Joseph A. Pask and Ben Davies. 1943. 28 pp., 4 figs. Chemical and thermal analyses of a number of known clay minerals made to determine characteristics by which they may be identified. Available or acid-soluble alumina content and percentage extraction determined by method developed by Bureau of Mines. Identical tests made on selected samples from clay deposits in Pacific Northwest. Pressure-digestion

†Out of print.

- method used on several samples, with good success. Prepared in cooperation with the University of Washington, College of Mines.
- †RI 3738. Modern Beehive Coke-Oven Practice. 1. Preliminary Report, by G. S. Scott, J. A. Kelley, E. L. Fish, and L. D. Schmidt. 1943. 14 pp., 7 figs. Gives results of Bureau of Mines tests to assist operators to improve yield and quality of coke, and thereby increase output of iron. As about 20 years have elapsed since any considerable amount of coke has been made in beehive ovens, former skilled operators are largely lacking; moreover, coal supplied to ovens has not been as good as formerly.
- RI 3739. Precision of the Volatile-Matter Determination for Anthracite, Low-Temperature Coke, and Subbituminous Coal, by W. A. Selvig. 1943. 6 pp. Describes results of investigation made at request of Committee on Coal and Coke of American Society for Testing Materials to procure additional information regarding errors of volatile-matter determination for anthracite, low-temperature coke, and subbituminous coal.
- RI 3740. Beneficiation of Del Monte (Calif.) Sand, by John Dasher, Robert R. Rough, and Frank L. Bacon. 1943. 10 pp., 4 figs. Gives methods of removing objectionable impurities (largely oxides of iron and aluminum) from West coast sand that otherwise would be suitable for use in glass-container industry.
- RI 3741. Limits of Inflammability and Ignition Temperatures of Acetic Anhydride, by G. W. Jones, F. E. Scott, and G. S. Scott. 1943. 5 pp., 2 figs. Acetic anhydride, used in preparing a number of organic chemicals and in manufacturing photographic film and artificial silk, is most important acetylating agent for industrial uses; limits of inflammability, flash point, and ignition temperatures were determined.
- RI 3742. Control of Sulfur and Ash in Mine-Run Metallurgical Coal. Report 1, by Henry E. DeKay, Jr., Louis A. Turnbull, James N. Scudder, and Albert L. Toenges. 1943. 28 pp., 18 figs. Preliminary survey of coal and coke plants has shown that appreciable increase in pig-iron production would result if furnaces were supplied with more uniform coke. Mines selected for this study are successfully producing coke of uniform sulfur and ash content; introduction of some method or practice at other mines might make possible use of coal for metallurgical processes that could not be employed otherwise.
- †RI 3743. Control of Bulk Density of the Coal Charge in Byproduct Coke Ovens, by William Seymour and L. D. Schmidt. 1943. 13 pp., 11 figs. Study shows that excessively high bulk densities could result in dangerous expansion, pushing difficulties, and non-uniform operation. Effect of moisture is pronounced; but use of oil to control bulk density seems desirable. Oil also helps to prevent coal from freezing, eliminates dust, and causes coal to flow more freely from larry car. Prepared in cooperation with the Office of Solid Fuels Administrator for War.
- †RI 3744. Analyses of Crude Oils from Some West Texas Fields, by Boyd Guthrie. 1944. 45 pp. As refiners are being forced to consider West Texas oils as charging stock, owing to shortage of available supply of Mid-Continent crude, detailed analyses are presented giving information concerning characteristics of 43 samples of such oils representing a number of fields.
- †RI 3745. Studies on Explosives and Explosions. Fiscal Year 1943, by Wilbert J. Huff. 1944. 49 pp., 7 figs. Reviews studies by Bureau of Mines Explosives Division on flammability of gases and vapors; hazards in the use of Diesel engines; explosives-control investigations under Federal Explosives Act; research and developments relating to war; ignitibility of black powder; toxic gases from explosives; cushioned blasting; liquid-oxygen explosives; permissible explosives. Describes work for other Government agencies. Includes bibliography.
- RI 3746. Precipitation of Copper from an Acid Mine Water, by F. S. Wartman and A. H. Roberson. 1944. 16 pp., 5 figs. Includes study of precipitation of copper upon metallic iron and of limestone, sulfites, and sulfides as precipitants. Last three were unsuccessful.
- RI 3747. Equilibria in the Reduction of Chromic Oxide by Carbon and Their Relation to the Decarburization of Chromium and Ferrochrome, by F. S. Boericke. 1944. 34 pp., 2 figs. Thermodynamic values of carbides of chromium were studied in the following steps: (1) All carbides of chromium mentioned in literature were prepared in reasonably pure form; (2) low-temperature specific heats were measured and entropies of carbides evaluated; (3) high-temperature heat contents of carbides were measured; (4) equilibria were determined in the several reaction steps involved in passing from chromic oxide to pure chromium by means of carbon reduction.
- RI 3748. Low-Temperature Distillation Yields of Primary Tar and Light Oil from Coals of Various Ranks and Types, by W. H. Ode and W. A. Selvig. 1944. 10 pp., 5 figs. Low-temperature yields of primary tar and light oils are shown to be related to chemical analyses of the coals. The quantity of tar and light oils can be correlated with hydrogen content and with volatile matter reduced by an amount equal to 1.3 times oxygen content.
- RI 3749. Coal Carbonization: Carbonizing Properties of Medium-Volatile Coals of Different Types, by D. A. Reynolds and J. D. Davis. 1944. 8 pp., 1 fig. Carbonizing properties of four medium-volatile coals (three bright and one predominantly splint) were determined by various methods, including BM-AGA test. Bright coals developed large internal gas pressures during carbonization at high and low temperatures, whereas corresponding pressures for splint coal were negligible. Bright coals had higher agglutinating values and yielded stronger coke.
- RI 3750. Periodic Pincer to Control Flow of Wet Ore Pulp Through an Orifice, by G. Dale Coe and Will H. Coghill. 1944. 6 pp., 4 figs. Describes device that insures constant and controlled flow of pulp through orifice. Known as a "periodic pincer," device controls flow by periodic opening and closing of collapsible rubber tubing terminating in an oversize orifice. Oversize prevents choke-up. Device is applicable in both commercial and laboratory work.
- RI 3751. Inflammability and Explosibility of Powders Used in the Plastics Industry, by Irving Hartmann and John Nagy. 1944. 38 pp., 17 figs. Gives results of study of explosive and flammable characteristics of powders used in plastics industry to reduce dust-explosion hazard and provide technical information for committee of National Fire Protection Association which has been preparing a safety code for the industry. Laboratory explosibility tests were made on 57 powder samples, comprising 31 synthetic and natural resins, 15 molding powders, 4 ingredients of synthetic resins, and 7 fillers for molding compounds.
- RI 3752. Safety Blasting Practices in a New York Quarry, by Norman King and Allen D. Look. 1944. 9 pp., 6 figs. In consequence of a study that followed a serious quarry accident, New York Trap Rock Corporation has introduced various safety measures with regard to handling and use of explosives, with excellent results.
- †RI 3753. Apparatus for Determining the Minimum Energies for Electric Spark Ignition of Flammable Gases and Vapors, by P. G. Guest. 1944. 16 pp., 10 figs. Describes construction and operation of apparatus for determining energies required for electric spark ignition of wide variety of explosive mixtures of gases and vapors.

†Out of print.

- RI 3754. Observations on the Use of Cyclohexylamine in Steam-Heating Systems, by A. A. Berk. 1944. 42 pp., 9 figs. Severe corrosion in Government-operated steam-heating plants, especially at Army camps, has led to use of amine treatment, almost exclusively cyclohexylamine, which is expensive. Process is being investigated with hope of increasing its effectiveness and reducing cost.
- †RI 3755. Explosions in Medium-Pressure Acetylene Generators, by G. W. Jones, G. S. Scott, R. E. Kennedy, and W. J. Huff. 1944. 20 pp., 7 figs. In consequence of explosions in generators furnishing acetylene for welding, Bureau of Mines made a field and laboratory investigation. Laboratory work showed that there was no difference in explosive properties of acetylenes tested. Paper gives data on ignitibility of acetylene-air mixtures and recommendations for minimizing danger in operating generators.
- RI 3756. Ground-Resistance Measurements of Drill-Hole Casings, by F. E. Griffith and E. J. Gleim. 1944. 7 pp., 1 fig. Conclusion reached in this investigation was that, if findings are representative, permanent and effective grounding of drill-hole casings is automatically assured at installation without making connections to ground electrodes.
- RI 3757. Technical and Economic Study of Packaged Fuel, by V. F. Parry. 1944. 45 pp., 21 figs. Reviews study of packaged-fuel industry in 1941. Presents results of study of over 30 representative plants to gather technical and economic data of different types of processes used to make packaged coal in Central States. Includes classification of processes, photographs of typical operations, designs of different plants, analysis of manufacturing costs, and study of physical and chemical properties of fuel cubes.
- RI 3758. National Motor-Gasoline Survey, Winter 1943-44, by O. C. Blade. 1944. 28 pp., 1 fig. Data cover 770 samples of regular-price gasoline, including 286 items and 94 brands; 537 samples of premium-price gasoline, including 236 items and 72 brands; and 49 samples of third-grade gasoline, including 31 items and 18 brands. Samples were taken in a wide selection of representative cities. Work was done in cooperation with Coordinating Fuel Research Committee of the Coordinating Research Council.
- RI 3759. Domestic Storage of Subbituminous Lump Coal and Its Performance in a Hand-Fired Furnace, by W. S. Landers and V. F. Parry. 1944. 17 pp., 5 figs. Subbituminous lump coal, investigation revealed, can be stored successfully if care is exercised. When stored in a closed bin no significant slacking or degradation occurs, no hazards arise, and overall indicated efficiencies of about 65 to 69 percent can be attained under practical firing conditions in the average home.
- †RI 3760. Work of the Survey of Carbonizing Properties of American Coals, by J. D. Davis and D. A. Reynolds. 1944. 17 pp. Gives source and analyses of last 20 coals to be tested, thereby supplementing information in TP 637, which describes first 66 coals of Bureau of Mines—American Gas Association series. Discusses work on coals of McAlester and Hartshorne beds, Oklahoma, in connection with possible use of such coals for new Texas steel plants. Also describes study of western coals and of blends of eastern coals with anthracite, as well as packing tests of Lower Sunnyside (Utah) coal.
- RI 3761. History of Water Flooding of Oil Sands in Kansas, by Peter Grandone. 1944. 146 pp., 52 figs. Injection of water into partly depleted oil-bearing formations as means of supplying additional energy to flow oil wells is recognized by petroleum industry as effective method for increasing recovery of oil. Report describes history and effects of water flooding in Kansas. Work was done in cooperation with Kansas State Board of Health. (See also RI 3728, 3777, 3778, 3783, 3792, and 3818.)
- †RI 3762. An Apparatus for Differential Thermal Analysis, by Louis H. Berkelhamer. 1944. 17 pp., 9 figs. Gives design, accompanied by construction details, of apparatus used to study minerals by method of differential thermal analysis. This method has come to fore as outstanding means of studying constituents of various substances, particularly clays, soils, and miscellaneous hydrous materials. Work was done in cooperation with University of Alabama.
- †RI 3763. Differential Thermal Analysis of Quartz, by Louis H. Berkelhamer. 1944. 18 pp., 8 figs. Quartz is readily detected by means of a differential thermal analysis procedure, which is described. This form of analysis is a relatively simple, rapid, inexpensive procedure requiring ordinary skill; it has the advantage of eliminating personal error from an analysis. Work was done in cooperation with University of Alabama.
- †RI 3764. Applications of Thermal Analysis to Clays and Aluminous Minerals, by Sidney Speil. 1944. 36 pp., 22 figs. Essential step in process is determination of temperature at which any thermal reactions take place in sample being studied and magnitude of these thermal effects. Method is applied in this paper to various clays, bauxites, and aluminous minerals. Work was done in cooperation with Tennessee Valley Authority.
- †RI 3765. Ore-Testing Studies on Gold and Gold-Silver Deposits, by J. A. Woolf and A. P. Towne. 1944. 63 pp. Describes 11 ore-testing projects conducted during fiscal year 1942 on gold and gold-silver ores from California, Nevada, Oregon, Idaho, and Washington. Although greater part of work consisted of standard tests, some flotation concentrates constituted individual research problems.
- †RI 3766. Comparison of Fine-Series, Square-Mesh-Wire Test Sieves of Different Countries, by R. E. Brewer. 1944. 5 pp. Table presented compares standard sieve-scale fine series used in Great Britain, the United States, Germany, and France. Comparison shows relationship between units of measurement and should prove useful in analyzing and testing powdered materials.
- †RI 3767. Application of the Back-Pressure Method for Determining Absolute Open Flows of Large Gas Wells, by M. A. Schellhardt. 1944. 13 pp., 6 figs. Discusses limitations imposed on range of back-pressure data obtainable at many large gas wells by relationship between their delivery capacities and that of equipment, such as heaters, meters, and separators installed to handle gas deliveries produced by routine delivery operations.
- RI 3768. Salvage of Coal from Mine Refuse in the Pittsburgh District, by Thomas Fraser, J. A. Kelley, and H. G. Graham. 1944. 23 pp., 3 figs., 11 data sheets. Discusses possibilities of recovering coal from Pittsburgh-bed refuse coming from falls of roof, clean-up of roadways and working places, and hand-picking rejects. As total production of such material in field is increasing, subject has economic interest. Worksheets giving float-and-sink data and yield curves are included.
- †RI 3769. Precision Jigging as a Substitute for Laboratory Sink-Float, by G. Dale Coe and Will H. Coghill. 1944. 7 pp., 2 figs. Describes method of appraisal of materials for gravity concentration that replaces much of tedious sink-float fractionation formerly employed; consists of jigging sized charge 10 minutes in plunger jig with removable basket.
- †RI 3770. The Preparation and Properties of Metal Carbides, with Critical Comment as to Their Sig-

†Out of print.

Reports of Investigations

- nificance in the Fischer-Tropsch Synthesis, by L. J. E. Hofer. 1944. 39 pp. Survey of literature to determine methods most suited for preparation of carbides of iron, cobalt, and nickel and to determine importance of such carbides in Fischer-Tropsch synthesis.
- RI 3771. The National Safety Competition of 1943, by W. W. Adams and T. D. Lawrence. 1944. 41 pp. Gives analysis of data upon which awards in 1943 competition were based. Enrollment covered 388 mines and quarries, representing over 142 million man-hours of work. Classes are: Anthracite mines, bituminous-coal mines, metal mines, nonmetallic mineral mines, open-cut mines, and quarries.
- †RI 3772. Thermal Expansion of Pressure Samples of Hydrocarbon Liquids from Gas-Condensate Wells, by R. Vincent Smith, M. A. Schellhardt, and E. J. Dewees. 1944. 23 pp., 17 figs. Fluids produced from many so-called gas-condensate-type reservoirs have become important source of hydrocarbons vital to war. Because recovery operations in such fields present problems not common to ordinary gas-producing operations, properties of fluids recoverable from reservoirs of that type were studied by Bureau engineers for several years; in cooperation with American Gas Association. Paper presents results.
- †RI 3773. A Method for Surveying Drill Holes by Oriented Drill Rods, by L. A. Dahners and C. J. Cohen. 1944. 6 pp., 2 figs. Describes method for surveying drill holes by lowering etch tube as only equipment. Particular advantage is that surveys can be made in magnetic country rock.
- †RI 3774. The Composition and Properties of Molding Sands. Part 1. The Nature of the A. F. A. Clay Fraction Removed from Natural Molding Sands, by Louis H. Berkelhamer. 1944. 58 pp., 9 figs., 22 data sheets. Presents study of more exact nature of what is considered the bond in natural molding sands. Work covered 22 samples of sands in commercial use for both ferrous and nonferrous founding and represented deposits in nine States, Canada, and Scotland. Work done in cooperation with University of Alabama.
- †RI 3775. A Study of Summer Air Conditioning with Water Sprays to Prevent Roof Falls at the Beech Bottom Coal Mine, West Virginia, by Edward L. Fish, Louis A. Turnbull, and Albert L. Toenges. Appendix by Irving Hartmann. 1944. 20 pp., 21 figs. Gives results of a study of air-conditioning system installed at Beech Bottom mine, Brooke County, W. Va., to reduce roof falls caused by variations in temperature and moisture content of intake air. Lists physical properties of roof shales and reports results of laboratory tests on these rocks to determine effect of changes of temperature and moisture.
- †RI 3776. Energies and Equilibria in the Decomposition of Nitrates of Manganese, Magnesium, Calcium, Barium, and Aluminum and Reactions of Nitrogen Peroxide, by K. K. Kelley. 1944. 33 pp. Energies and equilibria over a range of temperatures are evaluated from measurements of heats of formation, specific heats, heat contents, and entropies for following reactions: (1) Thermal decomposition, nitric acid-forming, and polymerization reactions of nitrogen peroxide; (2) thermal decomposition reactions of nitrates of manganese, calcium, barium, and aluminum; and (3) dehydration reactions of nitrates of magnesium, calcium, and aluminum.
- RI 3777. Wartime Application of Air-Gas Injection and Oil-Well Reconditioning in the Appalachian Region, by Sam S. Taylor. 1944. 38 pp. Deals with comparatively simple application of some of engineering principles involved in evaluation, installation, and operation of air- or gas-injection projects and well clean-out and repair methods to increase production rates of oil wells in partly depleted pools during the war. (See also RI 3728, 3761, 3778, 3792, and 3818.)
- RI 3778. Water Flooding of Oil Sands in Illinois, by D. B. Tallafarro, C. M. Keithly, and Thomas Jennings. 1944. 23 pp., 12 figs. Describes methods of development and operation and gives results of controlled water injection into Illinois oil sands. (See also RI 3777.)
- RI 3779. Horizontal Drilling for Oil in Pennsylvania, a Preliminary Report, by C. W. Elder, Jr. 1944. 68 pp., 14 figs. Describes method of horizontal drilling in oil-producing formation underlying a 400-acre tract, approximately square plot of land, in Franklin Heavy oil field, Sugar Creek township, Venango County, Pa. Method consists of sinking shaft to bottom of shallow oil sand, excavating a chamber in the sand, and drilling holes in a general horizontal plane outward from chamber in a pattern similar to spokes of a wheel.
- RI 3780. Midget Microprojector for Dust Determinations, by Carlton E. Brown. 1944. 14 pp., 2 figs. Describes construction and application of small microprojector that is easy to use in making determinations of dust in atmosphere.
- RI 3781. A Vibrating Screen Surface for the Removal of Flat and Elongated Pieces from Crushed Stone, by Lloyd H. Banning and Frank D. Lamb. 1944. 5 pp., 3 figs. Describes simple vibrating screen devised to remove undesirable pieces from crushed stone and yield a product acceptable to industry.
- RI 3782. Studies of the Effect of Humidity on the Sensitivity and Dispersion of Black Powder, by Raymond H. Moore, with Wilbert J. Huff. 1944. 18 pp., 11 figs. When black powder—used widely in the mining industries and by the armed forces—contains a small amount of moisture, it is more sensitive and ignites more quickly, according to the results of the Bureau tests at the Eastern Experiment Station at College Park, Md. Study described in this report was undertaken in response to many requests for information on safe use and handling of black powder. In addition to detailed facts about effect of moisture on powder, report shows that fine-grained powders are ignited more readily than coarse-grained ones; that black powder is relatively insensitive to friction; and that black powder should be kept cool.
- †RI 3783. Air and Gas Injection in the Oil Fields of Illinois, by C. M. Keithly and Thomas Jennings. 1944. 60 pp., 20 figs. Information on 99 air- and gas-injection projects in Illinois stripper oil fields is given in this publication, and 4 projects are described in detail. Oil production on projects comprising almost 14,000 acres in these fields has increased nearly 30 percent due to injections. (See also RI 3728, 3761, 3777, 3778, 3792, and 3818.)
- RI 3784. Moose Creek District of Matanuska Coal Fields, Alaska, by G. A. Apell. 1944. 36 pp., 22 figs. Exploratory work by Bureau of Mines in Alaska has added 2,375,500 tons of coal, of which 1,656,700 tons are recoverable, to reserves of bituminous coal in the Matanuska area, and additional core drilling may disclose further workable deposits. Newly charted coal is high-volatile B bituminous and is suitable for domestic and commercial uses.
- †RI 3785. Colorimetric Determination of Low Concentrations of Carbon Monoxide by Use of a Palladium Chloride-Phosphomolybdic Acid-Acetone Reagent, by B. D. Polis, L. B. Berger, and H. H. Schrenk. 1944. 13 pp., 5 figs. Describes a new method for determining low concentrations of carbon monoxide in air and in certain other gaseous mixtures. Method is based upon production of "molybdenum blue" by reaction of carbon monoxide with a reagent containing palladium chloride, phosphomolybdic acid, and acetone.

†Out of print.

- †RI 3786. Spot Test for the Separation of Aluminum Bronze from Manganese Bronze, by R. B. Corbett. 1944. 3 pp., 2 figs. Describes a simple test to distinguish aluminum bronze from manganese bronze by spraying a cleaned surface with 12 N sulfuric acid solution. If metal is manganese bronze, a purple spot appears, and if it is aluminum bronze, spot is greenish yellow. This test can be used to advantage by handlers of scrap metal.
- RI 3787. Prevention of Benzene-Air Explosions by Addition of Nitrogen and Carbon Dioxide, by G. W. Jones. 1944. 20 pp., 4 figs. Describes safe handling of benzene vapor in manufacture of explosives and in the solvent industry by addition of correct amounts of certain inert gases—carbon dioxide and nitrogen. Research is part of a series of experiments to determine flammability and explosibility of various industrial gases and dusts.
- †RI 3788. Filter-Paper Method for Obtaining Dust-Concentration Results Comparable to Impinger Results, by Carlton E. Brown. 1944. 20 pp., 9 figs. Describes a new filter-paper method for obtaining samples of air for dust analysis in health surveys. Device recovers dust from air by drawing atmosphere through a filter paper, instead of through liquid as in "impinger" method long used for obtaining dust samples for scientific study.
- RI 3789. Classification and Tabling of Birmingham (Ala.) Red Iron Ores with Recommendations for Added Recovery, by Will H. Coghill, G. Dale Coe, and Homer N. McDonald. 1945. 18 pp., 8 figs. Tests showed how classification of table tailings can increase recovery of desirable portions of ore. In an extended period of testing on coarse tables in one concentrator, the classifier equipped with a "periodic pincer," a new device developed in Bureau's laboratories, never failed to yield nearly as large a quantity of equal-grade concentrate to that produced by table. Work done in cooperation with University of Alabama.
- †RI 3790. Sponge Iron, a Progress Report, by R. S. Dean. 1945. 29 pp., 1 fig. Demonstrates that sponge-iron process is, in fact, a "direct-iron" process if reduction of iron oxide is carried on at a high enough temperature so that particles of metal will weld together instead of remaining porous. Report further shows that, in general, direct iron may be obtained: 1, By purifying ore carefully before it is reduced to sponge iron with gas or solid fuel; 2, by reducing ore or concentrate and then purifying resultant sponge iron; 3, by reducing ore to metal under such conditions that its impurities are carried off in slag.
- †RI 3791. Geophysical Survey of Arkansas Bauxite Region, Pulaski, Saline, Lonoke, White, Grant, Hot Spring, and Clark Counties, by J. R. Thoenen, M. C. Malamphy, and J. L. Vallely. 1945. 49 pp., 20 figs. Preceding a drilling program in which Bureau marked out several million tons of bauxite and clays, geophysical survey described in this publication covered about 1,400 square miles of central Arkansas bauxite belt and enabled engineers to eliminate many areas where there was little likelihood of finding bauxite. Methods and results of geophysical survey, which began a few months after Pearl Harbor, are described in detail.
- †RI 3792. Water Flooding of the McClosky Limestone in Clay City Oil Field, Clay County, Ill., by C. H. Riggs. 1945. 20 pp., 15 figs. More than 87,000 barrels of oil were obtained from 41 wells in 20 months by first intentional water flooding of an oil-producing limestone in Illinois. Describes water-flooding program and includes a discussion of development, production, and reservoir conditions in the Clay City field. (See also RI 3728, 3761, 3777, 3778, 3783, and 3818.)
- RI 3793. Effect of Lubricating Agents in a Diamond-Drilling-Bit Coolant and Cuttings-Removal Medium, by Albert E. Long and Wing G. Agnew. 1945. 5 pp. Tests at Mount Weather (Va.) Testing Adit showed that clear water was best bit coolant and cuttings-removal medium for diamond drilling. Bit wear was excessive when lubricating agents were used, and most footage per bit was obtained when drilling with clear water in normal manner.
- RI 3794. Studies on Explosives and Explosions, Fiscal Year 1944, by Wilbert J. Huff. 1945. 35 pp., 13 figs. Summarizes investigations by Explosives Division, Bureau of Mines, during fiscal year 1944. Studies on Diesel mine locomotives when used in confined spaces, as in underground workings, are also included. Data on limits of flammability and ignition temperatures for a number of organic substances (including methylene chloride-oxygen-nitrogen mixtures and acetic anhydride) are given. Explosibility of acetylene has been investigated at some length. Further information was obtained on explosion hazards of combustible anesthetics. On June 30, 1944, the active list of permissible explosives tested by the division included 174 explosives; 9 blasting devices have also been approved as permissible.
- RI 3795. Preparation Tests of Lignite from a Deposit Near Toledo, Lewis County, Wash., by H. F. Yancey and M. R. Geer, 1945, 14 pp., 2 figs. Strip mining offers attractive means of augmenting coal production because it requires less manpower and less time for development. Any coal property amenable to stripping warrants examination. Bureau of Mines examined one such property—a lignite deposit near Toledo, Wash. Hand-picking and washing tests showed that a coal containing about 33 percent moisture and 12 to 17 percent ash could be produced, and that such a coal could be used as low-cost fuel in a suitably equipped boiler plant near the mine. However, the low calorific value of the coal makes it unsuitable for shipment to more distant consumers. Work done in cooperation with University of Washington.
- RI 3796. National Motor-Gasoline Survey, Summer 1944, by O. C. Blade. 1945. 28 pp., 2 figs., 26 tables. Semiannual survey of properties of gasolines sold at service stations in 21 localities, well-distributed throughout the country. Present report presents analytical data for 894 samples, representing product of approximately 90 companies. Gasolines are listed as regular-price, premium-price, and third-grade. Work done in cooperation with Coordinating Fuel Research Committee of Coordinating Research Council, Inc.
- RI 3797. Microseismic Method of Predicting Rock Failure in Underground Mining. Part 1. General Method, by Leonard Obert and Wilbur Duvall. 1945. 7 pp., 3 figs. Describes general microseismic method, gives facts upon which it is based, discusses testing procedures, and shows how data obtained are recorded and analyzed. (See also RI 3803.)
- †RI 3798. Inflammability of Natural Gas: Effect of Pressure Upon the Limits, by G. W. Jones and R. E. Kennedy. 1945. 13 pp., 4 figs. Studies inflammability of natural gas over a range of pressures to which it may be subjected in injecting gas into old oil formations with object of stimulating recovery. Information covers gases from about 15 States.
- RI 3799. Beneficiation of Iron Ores by Flotation. Part 1. Anionic Flotation of Silica from Calcareous Red Iron Ores of the Birmingham District, Alabama, by J. Bruce Clemmer, B. H. Clemmons, Carl Rampacek, M. F. Williams, Jr., and R. H. Stacy. 1945. 42 pp., 4 figs. Laboratory pilot-plant tests demonstrated

†Out of print.

Reports of Investigations

- that caustic-metaphosphate method of flotation could be used under continuous operating conditions. Pilot-plant tests of several typical calcareous red ores showed that classification and tabling of these ores, moderately ground, supplemented by desliming and flotation, would yield a 90- to 95-percent recovery of iron in composite concentrates of substantially self-fluxing composition. Work done in cooperation with University of Alabama.
- RI 3800. Study of Firing Failure in Massive Talc, by Howard F. Carl. 1945. 9 pp., 4 figs. Information on firing or heating properties of high- and low-grade block talc is given in this report to assist talc industry in recovering larger percentages of crack-free fired products from limited supply of raw materials. Talc samples from three States and two foreign countries were studied for composition, texture, grain size, and structure, and their behavior under firing conditions in an electric furnace was observed.
- †RI 3801. Summary of Bureau of Mines Exploration Projects on Deposits of Raw Material Resources for Steel Production, by C. E. Julihn and L. B. Moon. 1945. 35 pp. Seeking additional raw materials of steel, Bureau of Mines explored 187 mineral deposits containing chromium, iron, manganese, cobalt, nickel, fluor spar, tungsten, vanadium, or coal during fiscal years 1940-44 and marked out several million tons of ore. Covers exploration, tonnage and grade of ores upon which mining operations might be based, and metallurgical processing believed most suitable for their utilization.
- †RI 3802. Analyses of Crude Oils from Some Fields of Oklahoma. III. Additional Analysis, by O. C. Blade. 1945. 139 pp. Presents analyses of 248 samples from 153 oil fields in Oklahoma. Samples described are largely from areas and formations not covered in previous published reports, and analyses are presented individually and collectively in tables. Work done in cooperation with State of Oklahoma and American Association of Petroleum Geologists, and report includes list of all published Bureau of Mines Hempel analyses of Oklahoma crudes, as well as bibliography in chronological order. (See also RI 3442 and 3592.)
- †RI 3803. The Microseismic Method of Predicting Rock Failure in Underground Mining. Part II. Laboratory Experiments, by Leonard Obert and Wilbur Duvall. 1945. 14 pp., 11 figs. Gives the results of a number of laboratory experiments designed to give information on origin of microseisms (small-scale seismic disturbances) and presents microseismic properties of various mine rocks. (See also RI 3797.)
- †RI 3804. Survey of the Suitability of Domestic Talc for High-Frequency Insulators, by Theron A. Klinefelter, Sidney Speil, and Sidney Gottlieb. 1945. 58 pp., 2 figs. Describes results of a survey to find new domestic sources and expand known deposits of talc suitable for making steatite radio and electronic equipment for the Army and Navy. Work done in cooperation with Geological Survey. Survey proved that United States had adequate reserves of talc for steatite insulators without depending upon imports or using lower grades of domestic talc. Field and laboratory testing methods are described in detail, with results in tabular form and charts showing laboratory procedure and flow sheets.
- †RI 3805. Electrolysis of Magnesium into Liquid Cathodes from MgO-Carbon Suspensions in Molten Chlorides, by Burke Cartwright, Lloyd R. Michels, and S. F. Ravitz. 1945. 19 pp., 1 fig. Bureau of Mines made a pilot-plant investigation of the electrolysis of suspensions of MgO and carbon from chloride melts, in which it was found that although current efficiencies of 60 to 70 percent were obtainable, the formation of sludges containing MgO, carbon, and magnesium seriously interfered with operation of the cell. Use of a molten-metal cathode in direct electrolysis of MgO-carbon suspensions appeared to offer possibilities of decreasing difficulties caused by sludge formation, of simplifying cell design, and of increasing the current efficiency and was therefore investigated by Bureau of Mines.
- †RI 3806. Studies in Redistillation of Carbothermic Magnesium, by H. A. Doerner, W. F. Holbrook, E. Don Dilling, Dwight L. Harris, James W. Pennington, Wm. F. Hergert, Lloyd R. Michels, Cyrus L. Blodgett, and Ernest A. Reigel. 1945. 53 pp., 25 figs. Combines four reports summarizing Bureau of Mines research in magnesium-production processes and disclosing several advances in technology. Work done in cooperation with State College of Washington at Pullman, Wash. Principal paper deals with distillation of magnesium in an internally heated electrical furnace similar to that developed for electrothermic reduction of zinc. The three other papers discuss supplementary investigations on final removal of hydrocarbon from oil sludge, briquetting, and development of a suitable refractory for magnesium distillation furnace. Initial steps of thermal reduction process have been described in an earlier publication. (See also RI 3635.)
- †RI 3807. Control of Bulk Densities in Coke Ovens: Studies on Coal Used at Three Byproduct Coke Plants, by W. S. Landers, L. D. Schmidt, and Wm. Seymour. 1945. 22 pp., 19 figs. Variations in bulk density of coal used in byproduct-coke ovens are reduced by addition of small quantities of oil to coal according to this paper, which gives results of tests on samples of coke-oven charges from several operating plants which were having difficulties because of the lack of adequate control. Known as "dropped-coal method," the new procedure is described in detail.
- †RI 3808. Utilization of Anthracite Fines in the Manufacture of Byproduct Coke, by Wm. Seymour and L. D. Schmidt. 1945. 23 pp., 11 figs. Issued as a preliminary report to help relieve wartime fuel shortage, this paper describes how some byproduct-coke plants are mixing fine anthracite with bituminous coal to manufacture coke and shows that other plants are conducting experiments thereon. Twenty-one byproduct-coke plants were surveyed by Bureau engineers who reported in detail on tests and operations at plants and recommended continuance of experiments. A shortage of low-volatile coking coal and a surplus of anthracite fines are conditions described as favorable for making coke of this type.
- †RI 3809. Effect of Pressure on Ignition Temperature of Acetylene and Acetylene-Air Mixtures, by G. W. Jones and R. E. Kennedy. 1945. 6 pp., 4 figs. Gives results of an investigation made to determine effects of pressure on ignition temperature of pure acetylene and of acetylene containing varying percentages of air.
- †RI 3810. Magnetic Survey of the Florida Peninsula, by F. W. Lee, J. H. Swartz, and S. J. Hemberger. 1945. 49 pp., 9 figs. A magnetic survey of the Florida peninsula by Bureau of Mines—first such examination to cover almost an entire State—has proved usefulness of this type of geophysical investigation as a basis for mineral and petroleum exploration over large areas. Advantages are described as speed, economy, and large amount of information obtained about the geology and subsurface bedrock topography of a region. The Bureau crew made 2,300 observations with a vertical Askania magnetic variometer, one each mile along 16 "traverses" or irregularly parallel routes across the peninsula, in an area of some 50,000 square miles. Describes techniques employed and contains tables of magnetic

†Out of print.

- observations, charts of traverses, and a magnetic relief map of peninsula.
- RI 3811. A Rapid Method for Determining Surface Moisture in Coal, by L. D. Schmidt and Wm. Seymour. 1945. 11 pp., 10 figs. Describes a rapid method for determining surface moisture of coal, developed by Bureau engineers at Central Experiment Station, Pittsburgh, Pa. A measured sample of coal is placed in a solvent such as alcohol and surface moisture dissolved. Solvent then is filtered from coal and its moisture content determined by measuring dilution of solvent by its change in specific gravity.
- †RI 3812. Low-Gravity Float-and-Sink Separations of Bituminous-Coal Samples, by Thomas Fraser, William L. Crentz, H. M. Cooper, R. F. Abernethy, and O. T. Barrett. 1945. 11 pp., 12 figs. Presents results of detailed float-and-sink studies of possibilities of producing an exceptionally low ash product from coal mined at Bruceston, Pa., from the Pittsburgh bed. Project was initiated to determine adaptability of certain Pittsburgh-bed coals in the synthetic-liquid-fuels research work of the Bureau.
- RI 3813. Equilibrium in the Reduction of Ferrous Chromite by Hydrogen and Energy Requirements in the Selective Reduction of Iron in Chromite, by F. S. Boericke and W. M. Bangert. 1945. 19 pp., 1 fig. Deals with preparation of substantially pure ferrous chromite, apparatus and method for studying equilibria in selective hydrogen-reduction reaction, derivation of heat and free energy of formation of ferrous chromite from equilibrium data, and some applications of thermodynamic values to selective reduction of chromite by other reducing agents, particularly solid carbon and methane.
- †RI 3814. Magnetometer Surveys on Black Sands of the Oregon Coast, by E. L. Stephenson. 1945. 18 pp., 8 figs. Describes a series of magnetometer surveys on deposits of black sand along the coast of southwestern Oregon, made by the Division of Geophysical Exploration of the Bureau of Mines in cooperation with the Oregon Department of Geology and Mineral Industries in 1942. The purpose of the surveys was to determine the efficacy of magnetic methods in tracing and outlining known deposits and in prospecting for new ones.
- RI 3815. Utilization of Three Kids Manganese Ore in the Production of Electrolytic Manganese. I. Mining and Electrolytic Reduction of Ore from Three Kids Manganese Mine, Clark County, Nev., by Glenn L. Allen, J. H. Jacobs, and J. W. Hunter. II. Acceptability of Electrolytic Manganese to the Steel Industry, by R. T. C. Rasmussen and F. Sillers, Jr. 1945. 78 pp., 11 figs. Electrolytic manganese production from low-grade domestic ores now is a fully developed and economically feasible manufacturing technique, and at the Boulder City, Nev., Experiment Station 3 years of processing the Three Kids ore has shown it to be commercially suitable for treatment by the Bureau's process. Reserves at this mine are described as 1,225,000 tons of 19-percent manganese ore which can be mined by low-cost, open-pit methods, and 1,879,000 tons of 10.6-percent manganese ore which can be mined by the usual underground methods. Cooperative tests have been undertaken with 34 different steel plants to determine the acceptability and possible advantages of using electrolytic manganese in steel instead of the usual ferromanganese. In no case has it been found impossible or even undesirable to use electrolytic manganese, and tests indicated its superiority in manufacture of stainless steel.
- †RI 3816. Effects of Boron in Steel, by R. B. Corbett and A. J. Williams, Jr. 1945. 21 pp., 6 figs. Metallurgical experiments described in this report show that boron increases hardenability of steel and is an adequate substitute in certain cases for some of more common but scarcer alloys, such as chromium, nickel, and manganese. Results of Bureau's work confirm actual experience of steel industry during past few years, since boron has been used in increasingly larger amounts for steel-making as a substitute for some of the hard-to-get alloying elements.
- RI 3817. Effect of Variables in Chemical Beneficiation of Chromite Ores, by F. S. Boericke and W. M. Bangert. 1945. 26 pp., 4 figs. Describes certain phases in Bureau's experimental program to produce virtually pure chromite from low-grade domestic ores through utilization of a chemical process to remove excess iron. Describes experimental procedure employed and results obtained in course of more than 100 small-scale experiments in chemical reduction of excess iron content of domestic chromite.
- †RI 3818. Gas Injection into the McClosky Limestone in the Griffin and New Harmony Oil Fields, Indiana and Illinois, by C. H. Riggs. 1945. 28 pp., 17 figs. Injections of gas into McClosky limestone formation of Griffin and New Harmony oil fields in Indiana and Illinois have resulted in an encouraging increase of oil production from 37 wells of that area according to engineering survey described in this report. About 85,000 barrels of oil were obtained in 2 years by injecting 500,000,000 cubic feet of excess gas through 7 converted wells in limestone reservoirs. This survey is another in a series published recently to stimulate interest in secondary recovery of petroleum and it includes a discussion of the development, production, and reservoir conditions in the Griffin and New Harmony fields and the estimated oil gained from the wells. (See also RI 3728, 3761, 3777, 3778, 3783, and 3792.)
- †RI 3819. Reduction of Iron Ore in Clay and Steel Containers (Saggers), by J. P. Walker. 1945. 30 pp. Records the results of first set of Bureau of Mines experiments on manufacture of brickyard or sagger sponge iron, which has been made in Sweden commercially since 1912 in a pottery plant. Use of ceramic saggers is least satisfactory feature of brickyard sponge iron, because such saggers readily crack and become useless. Steel saggers have advantage of strength, but must be used at relatively low temperatures to prevent scaling. For most rapid reduction of iron ores in containers heated through the bottom the charge should be shallow; cooling after metalization should be as rapid as possible.
- RI 3820. National Motor-Gasoline Survey, Winter 1944-45, by O. C. Blade. 1945. 27 pp., 2 figs. This report on properties of motor fuels sold through service stations in United States is a continuation of a series made by Bureau of Mines in cooperation with Coordinating Fuel Research Committee of Coordinating Research Council. Presents analytical data for 1,499 samples, representing products of approximately 105 companies. As in previous surveys, companies covered by survey include both large and small suppliers. Conforming to former reports, data cover three groups of samples—regular-price, premium-price, and third-grade gasolines.
- †RI 3821. Size of Smallest Dust Particles Revealed by Various Microscopic Systems, by Carlton E. Brown and Florence L. Feicht. 1945. 11 pp., 3 figs. Presents information on approximate size of smallest dry or unmounted silica, limestone, and bituminous-coal dust particles revealed by various microscopic systems. Some of microscopic systems are commonly used in determinations on unhygienic dust collected from industrial atmospheres.
- RI 3822. Production of Sponge Iron in a Shale-Brick Plant, by Donald W. Ross. 1945. 27 pp., 2 figs. Describes another investigation of manufacture of brickyard sponge iron. It was found that sponge iron in formed masses to duplicate two types made

†Out of print.

Reports of Investigations

- in a Swedish ceramic plant can be produced by carbon reduction in a common shale-brick plant without alteration of the plant. Magnetites, hematites, limonites, and other materials containing iron oxide, such as mill scale, can readily be reduced to sponge iron in tunnel kilns or down-draft kilns built to operate at temperatures up to 1,150° C. (2,102° F.).
- RI 3823. Construction and Operation of the Dearborn Magnesium Pilot Plant, by C. E. Wood, E. Don Dilling, J. W. Pennington, M. J. Spendlove, Wm. F. Hergert, and H. A. Doerner. 1945. 26 pp., 5 figs. In 1936 Bureau of Mines began a study of various methods for producing magnesium metal from magnesite ores, and the development of a continuous process resulted from a study of basic principles involved in reduction of magnesium oxide by carbon. In May 1939 a small pilot plant was operated, and Ford Motor Co., Dearborn, Mich., later began a study of this process on a larger scale. Describes further research on magnesium by the Bureau in cooperation with Ford Motor Co.
- †RI 3824. Determination of Metallic Iron and Oxygen in Sponge Iron, by J. P. Morris. 1945. 31 pp., 4 figs. Discusses determination of degree of reduction attained in manufacturing process for producing sponge iron. Four methods of determining metallic iron and oxygen discussed are mercuric chloride method, copper sulfate method, hydrogen-reduction method, and hydrogen-evolution method. In these analyses specially prepared tests samples of known composition were used, and each method was evaluated under controlled conditions.
- RI 3825. The Industrial Utilization of a Sand-Clay Mixture from Falls and Robertson Counties, Tex., by E. C. Hoeman, R. C. Redfield, and W. C. Stoecker. 1945. 30 pp., 4 figs. Potential industrial uses of raw materials from a sand-clay deposit near Waco, Tex., are discussed in this report based on an investigation made in cooperation with Bureau of Industrial Chemistry and Bureau of Economic Geology of University of Texas. Industrial uses include foundry molding sand in steel plants, furnace parts and linings, and structural brick, and with further treatment, in manufacture of plate and window glass, as a water purifier, an abrasive in burnishing chinaware and polishing glass, and a mineral filler for rubber, linoleum, and paint.
- †RI 3826. Effect of Pressure on the Explosibility of Acetylene-Water Vapor, Acetylene-Air, and Acetylene-Hydrocarbon Mixtures, by G. W. Jones, R. E. Kennedy, I. Spolan, and W. J. Huff. 1945. 17 pp., 5 figs. Information on explosibility and ease of ignition of acetylene is important in connection with studies by Bureau of Mines and others seeking causes of explosions in medium-pressure acetylene generators. It was found that presence of 15 or more percent of air in acetylene renders mixtures more liable to explosions than is pure acetylene, and when acetylene contains 25 percent of air, such mixtures can be exploded at atmospheric pressure. As water-vapor content of acetylene-air mixtures is increased, pressures required to give explosive conditions also increase. Most dangerous mixtures are those that contain no water vapor. Addition of a hydrocarbon gas, such as natural gas, propane, or butane, helps to stabilize acetylene and therefore offers a means of preventing explosions in medium-pressure acetylene generators.
- †RI 3827. Determination of the Size Distribution of Fine Coal Particles by the Electron Microscope, by J. T. McCartney. 1945. 11 pp., 4 figs. Determination of size distribution of fine coal particles, an important factor in many practical processes utilizing pulverized coal, has been investigated by Bureau of Mines, and results should be of value in future development of such processes and in crushing and fracture of coal. Describes procedure followed in an electron microscope analysis of pulverized material, coal samples used in experiment, Rosin-Rammler law, surface area factors, and general observations.
- RI 3828. Use of Salts to Allay Dust on Shuttle-Car Roadways in Coal Mines, by Edward Thomas and Irving Hartmann. 1945. 15 pp., 6 figs. Flaked calcium chloride or unrefined, granular sodium chloride applied to shuttle-car roadways in normally humid coal mines allays dust effectively. When these salts are properly used and maintained, loose material in the roadway is thoroughly wetted and consolidated, providing a good pavement for traffic. It is emphasized that it is still necessary to combat explosion hazard of coal dust that clings to roof, rib, and timber surfaces by rock dusting.
- RI 3829. Electrolytic Manganese in Stainless-Steel Test at Rustless Iron and Steel Corp. and Universal-Cyclops Steel Corp., by R. T. C. Rasmussen. 1945. 35 pp. Cooperative tests with two steel mills have disclosed that pure electrolytic manganese, produced from low-grade domestic ores in a Bureau of Mines pilot plant at Boulder City, Nev., has definite advantages as a substitute for low-carbon ferromanganese in manufacture of stainless steel. In describing tests at Rustless and Universal-Cyclops mills, this paper states that electrolytic manganese was found to offer operating advantages because of its purity and physical form. (See also RI 3830, 3911, and 4078.)
- RI 3830. Electrolytic Manganese in Acid-Steel Tests at Atlas Steel Casting Co. and the Detroit Steel Casting Co., by R. T. C. Rasmussen. 1945. 20 pp. This is second report describing commercial-scale tests on use of pure electrolytic manganese. When electrolytic manganese produced in a Bureau pilot plant at Boulder City, Nev., was substituted for usual imported ferromanganese in full-scale commercial heats of steel at cooperating plants, it proved satisfactory and carbon steels obtained had slightly better physical properties. In both plants, efficiencies attained with electrolytic manganese additions were at least as high as those normally attained with ferromanganese, and substitution was satisfactory in grades of steel tested. (See also RI 3829, 3911, and 4078.)
- RI 3831. Improved Laboratory Concentration Table, by Will H. Coghill, G. T. Adams, and H. S. Hardman. 1945. 3 pp., 3 figs. Essentially unimproved for nearly half a century, ore-concentration testing tables for laboratories have six defects that can be corrected. Defects encountered and corrected are position of water launder, jamming of drawbar when deck was tilted, accumulation of a dry bank of ore on lower concentrate corner, a flimsy substructure or "backbone," a stroke too short for correlation with plant work, and a poor tilting mechanism. This report based on work done in cooperation with University of Alabama describes an improved table which overcomes these defects.
- †RI 3832. A Study of Certain Factors in the Hydro-metallurgy and Electrodeposition of Cobalt, by F. K. Shelton, R. E. Churchward, J. C. Stahl, and G. F. Livingston. 1945. 43 pp., 10 figs. Reports further developments upon a combined chemical and electrolytic process which will materially facilitate production of cobalt metal from domestic ores. Includes numerous statistical and graphic illustrations of results of recent experiments conducted at Bureau's Boulder City, Nev., Experiment Station, designed primarily to provide a more complete chemical and engineering understanding of different unit process involved in electrowinning of cobalt.

†Out of print.

- †RI 3833. Chlorination of Magnesite, by H. A. Doerner and W. F. Holbrook. 25 pp., 6 figs. A study of processes for producing magnesium metal from magnesite that included a laboratory investigation of chlorination of magnesite at high temperatures was begun in 1936 by Bureau of Mines with cooperation of State College of Washington. Work on chlorination was discontinued and only a brief preliminary report of chlorination experiments has been published. Presents a more complete report of that unfinished investigation.
- †RI 3834. Beneficiation of Montana Chromite Concentrates by Roasting and Leaching, by R. R. Lloyd, O. C. Garst, W. T. Rawles, J. Schlocker, E. P. Dowling, W. M. Mahan, and C. H. Fuchsman. 1946. 37 pp., 2 figs. Describes in detail a process developed by Bureau for beneficiation of chromite concentrates from Montana's extensive low-grade chromite ore deposits. Known as a "roasting and leaching" process, it involves heating chromite with carbon in a rotary kiln to reduce ore's iron content to a semi-metallic state. Summarizes Bureau's preliminary investigations and presents results of pilot-plant operations at Boulder City, Nev.
- RI 3835. Heat Contents Above 25° C. of Seven Manganese-Copper Alloys, by B. F. Naylor. 1946. 13 pp., 3 figs. Heat-content data of seven manganese-copper alloys, varying in composition from 25 to 90 percent manganese, are reported in this paper as a part of investigation conducted by Bureau on physical properties of electrolytic manganese and its alloys. Heat contents of alloys above 25° C. were determined within a temperature range of 450° to 850° C. Two sets of measurements were made, one for alloys quenched from 850° C. and cold-worked, other after heat-aging alloys at measurement temperature long enough to attain phase-equilibrium. Describes method, materials, and results.
- †RI 3836. Metallurgical Treatment of Cobalt Ores from the Goodsprings Mining District, Nevada, by E. Keith Shelton. 1946. 34 pp., 7 figs. Describes recent metallurgical research in recovery of pure cobalt metal from oxidized cobalt ores of Goodsprings, Nev., mining district. Productivity of cobalt-ore samples was investigated, and all ore samples were subjected to metallurgical treatments, including leaching, flotation, and electrowinning processes.
- †RI 3837. Concentration of Oxide Manganese Ores from Clallam County, Wash. (Madeline, Lake View, and Victory Claims), by T. F. Mitchell and Walter J. Long. 1945. 6 pp., 1 fig. Describes results of pilot-plant and laboratory investigations of concentration of oxide manganese ores from three Clallam County, Wash., ore samples.
- RI 3838. Rapid Specific-Gravity Method for Estimating the Iron Content of Birmingham, Ala., Red Ores, by I. L. Feld, G. D. Coe, and Will H. Coghill. 1946. 6 pp., 3 figs. Describes a short-cut method of assaying red-ore products from the Birmingham, Ala., district, developed by Bureau to speed work of determining iron content of mill samples of iron ore and to simplify process. Rapid determination, use of simple, inexpensive, and easily available apparatus, and a simple technique are principal advantages of method. Work done in cooperation with University of Alabama.
- †RI 3839. Mining and Concentration of Missouri Valley Manganese at Chamberlain, S. Dak., by Leon W. Dupuy, W. A. Calhoun, and R. T. C. Rasmussen. 1946. 103 pp., 41 figs. By adapting equipment designed for other uses, Bureau has made progress in finding low-cost methods of mining and concentrating submarginal-grade ores of one of Nation's largest manganese reserves—the Missouri River Valley deposits near Chamberlain, S. Dak. Tractor-drawn Carryall of the excavating and earthmoving industry was found ideal for mining weathered shale, and conical rolls of clay-working industry were used effectively to separate nodules from shale.
- RI 3840. Washability Characteristics and Washing of Coals from the Matanuska Field of Alaska, by M. R. Geer and F. H. Yancey. 1946. 17 pp., 7 figs. To save shipping space and help increase coal production in Alaska, Bureau investigated coal-preparation problems and practices at two major mines in the Matanuska field, where low quality of coal makes treatment a vital factor in meeting fuel demands in that area. Includes specific-gravity analyses of coal from Eska mine, data on examinations of 3-inch lump and slack coal from Evan Jones mine, and results obtained in washing coals of both mines. Work done in cooperation with College of Mines, University of Washington.
- †RI 3841. Manufacture of Sponge Iron in Periodic Brick Kilns, by Kenneth M. Smith and S. E. Burton. 1945. 38 pp., 26 figs. Describes successful commercial-scale production of good-quality sponge iron in the United States, demonstrating that periodic brick kilns can be used advantageously without alteration. Based on a Bureau sponge-iron project at Stark Brick Co., at Canton, Ohio, 468 tons of sponge iron comparable in quality to that made in famous Swedish kilns were produced. Construction, charging, and firing of saggars, types of ore reduced, and a description of pertinent cost data for commercial production of sponge iron in periodic kilns are included.
- †RI 3842. Concentration of Manganese Ores from Gila, Greenlee, and Graham Counties, Ariz., by G. M. Potter, A. O. Ipsen, and R. R. Wells. 1946. 12 pp. Describes laboratory and pilot-plant investigations of concentration of manganese ores from Gila, Greenlee, and Graham Counties, Ariz., a part of an intensive research program directed at increasing domestic utilization of low-grade western manganese ores.
- RI 3843. Suggested Methods for Installing Dust-Allaying Equipment in Bituminous-Coal Mines, by C. W. Owings. 1945. 31 pp., 27 figs. Coal dust is an ever-present coal-mine explosion hazard, and persons forced to breathe large quantities may be more subject to respiratory infection than those working in less dusty atmospheres. Coal dust should be allayed at its source, and this report gives in detail a suggested arrangement of dust-allaying equipment.
- RI 3844. Performance of a Hydraulic Classifier Designed to Incorporate Four Hitherto Neglected Principles, by Will H. Coghill, G. D. Coe, and I. L. Feld. 1945. 13 pp., 16 figs. Although the principles of hydraulic classification for preparing feeds to concentration tables have always been recognized as sound, the literature shows a neglect of research as a guide in the design of classifiers. Gives results of a recent research, including details of the design, results of preliminary research, and final testing. Work done in cooperation with University of Alabama.
- †RI 3845. Pilot-Plant Investigations, Preparation of Alumina from Potassium Alum, by C. T. Baroch, A. W. Hackwood, and R. G. Knickerbocker. 1946. 28 pp., 2 figs. Explains comparatively simple and practicable process for preparation of alumina—source of aluminum metal—from potassium alum. Development of process is another step in Bureau program to make the United States as independent as possible of foreign sources of mineral raw materials. Two major steps of new process are dehydration of alum and thermal decomposition of dried alum. Four different procedures for dehydrating alum were investigated, and two methods for thermal decomposition of dehydrated alum were tested.
- RI 3846. Evaluation of Some Binders for Use in Pelletizing Slimes, by T. A. Klinefelter. 1946. 13 pp., 8 figs. Certain representative and commercially used

†Out of print.

Reports of Investigations

- binders were mixed with slurries of iron-ore slimes and table concentrates and processed in a manner similar to pelletizing. Specimens were cured and given various heat treatments to determine relative strengths and resistance to slaking in water and disintegration with handling. Best results for all general purposes were obtained from combinations of bentonite with either a corn flour or a starch. Work done in cooperation with University of Alabama.
- †RI 3847. Selective Reduction of Iron in Chromite by Methane-Hydrogen and Similar Gas Mixtures, by F. S. Boericke. 1946. 14 pp. Recent experiments in the selective reduction of iron in chromite by methane-hydrogen and similar gas mixtures. Chromite-ore samples taken from Benbow and Davis properties in Montana were reduced continuously by hydrogen-methane mixtures under various controlled conditions, and iron in the chromite was subsequently removed by acid leaching. Paper compares effectiveness of solid carbon with that of gaseous reductants in selective reduction of iron in chromite and stresses comparative advantages of each reducing agent.
- RI 3848. Production of Lithium Chloride from Spodumene by a Lime-Gypsum Roast Process, by W. M. Sternberg, Earl T. Hayes, and F. P. Williams. 1946. 10 pp. Lithium chloride of very high purity can be produced from spodumene with a recovery of 85 to 90 percent of lithium. During spring and summer of 1942 a study was made in the Salt Lake City laboratory of Bureau on recovery of lithium from spodumene. Process finally developed involves roasting spodumene with limestone and gypsum, and essential features are given.
- RI 3849. Burning Bituminous and Subbituminous Coals on an Anthracite, Ash-Removal-Type, Domestic Stoker, by H. F. Yancey and K. A. Johnson. 1945. 14 pp., 1 fig. Tests have shown that certain types of bituminous and subbituminous coals may be burned efficiently in underfeed anthracite stokers of ash-removal type. Best results obtained by Bureau of Mines were with noncaking bituminous and subbituminous coals which form clinkers only at high temperatures. Coals with lower ash-fusion temperatures also were burned with high efficiency with a stoker installed in a common type of hot-water boiler. Includes detailed results of burning trials, descriptions of the testing procedure and equipment, and other data.
- RI 3850. Stench Warning Tests, Lake Superior District Mines, by F. E. Cash and Ernest W. Johnson. 1945. 23 pp. The effectiveness of stench warnings as signals of emergency conditions requiring prompt evacuation of a mine has again been demonstrated in a series of tests conducted in underground metal mines of the Lake Superior district. Twelve tests were made in 10 representative metal mines in the area, and in all but one of the experimental studies, stench liquid (usually ethyl mercaptan) was injected into the compressed-air system. This provided a satisfactory warning. Presents individual synopses of the information obtained in each test as well as descriptions of the physical conditions prevailing in mines included in the study.
- RI 3851. Continuous Hydraulic Classification: Constitution of the Teeter Column Throughout Its Depth, by G. Dale Coe, I. L. Feld, M. F. Williams, Jr., and Will H. Coghill. 1946. 8 pp., 7 figs. During past several years the Southern Experiment Station of the Bureau of Mines, with the cooperation of the University of Alabama, has given attention to hydraulic classification; this report discusses passage of material through a teeter column and its emergence as a classified product.
- †RI 3852. Sensitivity of Explosives to Initiation by Electrostatic Discharges, by F. W. Brown, D. J. Kusler, and F. C. Gibson. 1946. 8 pp., 11 figs. Enough static electricity can be generated in human body or in ungrounded equipment and structures to detonate half a dozen different kinds of explosives, such as those used in coal and metal mines. Sensitivity of explosives to static electricity has been studied by the Bureau for several years, but little could be disclosed during the war because of the secret nature of the work.
- †RI 3853. Examination of the Wah Wah Lead-Zinc Mine, Beaver County, Utah, by Robert L. Jones and W. Clifford Dunham. 1946. 14 pp., 8 figs. Describes examination of this property and gives results obtained by diamond drilling, sampling, and underground mining.
- †RI 3854. Exploration of Gallinas Fluorspar Deposits, Lincoln County, N. Mex., by J. H. Soulé, 1946. 25 pp., 7 figs. Gives account of the exploration work in February and April 1943, undertaken because of possible importance of newly discovered deposits and of old mine workings showing fluorite-bearing material.
- RI 3855. Exploration of the Hog Creek Corundum Mine, Towns County, Ga., by T. J. Ballard. 1946. 3 pp., 1 fig. Part of Bureau's Nation-wide wartime strategic mineral program was exploration of a reported corundum deposit at the Hog Creek mine in Towns County, Ga., which failed to uncover any important quantities of this valuable abrasive material.
- RI 3856. Exploration of Stiner and Bunch Hollow Zinc Properties, Powell River Area, Union and Claiborne Counties, Tenn., by Richard L. Sayrs. 1946. 4 pp., 5 figs. Gives results of diamond-drilling two zinc properties in Tennessee.
- RI 3857. Exploration of the Mecklenburg County, Va., Tungsten Area, by Ben E. Argyle. 1946. 5 pp., 3 figs. Describes exploration work on mineralized zone extending into Virginia from Hamme, Vance County, N. C., tungsten deposits and gives results obtained by trenching, test pitting, and diamond drilling Taylor vein.
- †RI 3858. Exploration of the Piedmont Manganese Belt, McCormick County, S. C., and Wilkes County, Ga., by William A. Beck. 1946. 5 pp., 1 map. Describes manganese exploration project undertaken in 1944.
- RI 3859. Investigation of the McLeod Glass-Sand Pits, Wheeler County, Ga., by W. C. Hudson. 1946. 3 pp., 1 fig. Describes investigation of the McLeod sand pits; presents a chemical and sizing analysis of the sands.
- RI 3860. Examination and Treatment of Industrial Magnesium Foundry Wastes, by O. C. Garst. 1946. 36 pp., 4 figs. Utilization of foundry wastes investigated, and efficient methods for recovering large percentages of magnesium from fine dusts and from the skimmings and leavings of melting and refining pots developed. Data on tests in treating melting-pot drosses and foundry dusts, flow sheets, and related information are included.
- RI 3861. Diamond Drilling of Potash Reserves in Eddy County, N. Mex., by Walter R. Storms. 1946. 11 pp., 4 figs. Describes exploration of potash in New Mexico from surface with vertical drill holes. Bibliography included.
- RI 3862. Pilot-Plant Production of Electrolytic Manganese from Chamberlain, S. Dak., Nodules, by J. H. Jacobs and J. W. Hunter. 1946. 14 pp. Electrolytic manganese metal can be made successfully from the low-grade nodular ore found in the Nation's largest manganese deposits near Chamberlain, S. Dak. After developing methods for mining and separating manganese nodules from the shale in which they occur, Bureau processed approximately 355 tons of the nodules in its 1-ton-a-day electrolytic manganese

†Out of print

- pilot plant at Boulder City, Nev., in a continuous 3-month operation. Pilot-plant operations and advantages and disadvantages of using the Chamberlain ore are described.
- RI 3863. A Study of Anodes for Electrolytic Manganese, by David Schlain, John D. Prater, and Beatrice Lukens. 1946. 20 pp., 5 figs. Electrolytic manganese process developed by Bureau of Mines involves electrolysis of a solution of manganese sulfate and ammonium sulfate in a diaphragm-type cell. Metallic manganese is deposited on cathodes, and sulfuric acid is produced at anodes. Study was confined to lead alloys, as they appear to be most promising materials for use as insoluble anodes in a sulfuric acid electrolyte. Results of tests on anodes made of various lead alloys given.
- †RI 3864. Thermodynamic Properties of Ilmenite and Selective Reduction of Iron in Ilmenite, by C. H. Shomate, B. F. Naylor, and F. S. Boericke. 1946. 19 pp., 2 figs. Discusses the low-temperature specific heats, high-temperature heat contents, hydrogen-reduction equilibria, and heat and free energy of formation of ilmenite, and selective reduction of iron in ilmenite.
- †RI 3865. Investigation of the Miami-West Palm Beach Belt of Silica Sand in Florida, by W. C. Hudson. 1946. 5 pp., 1 fig. Discloses that silica sand suitable for production of high-quality glass is available in Miami-West Palm Beach area. Unwashed and sizing analyses of glass-sand samples are presented.
- †RI 3866. Recovery of Cobalt from Manganese Ores in the Production of Electrolytic Manganese. 1. Cobalt Content of Manganese Ores, by David Schlain. 2. Separation and Electrodeposition of Manganese and Cobalt from Manganese Electrolytes, by J. H. Jacobs, F. K. Shelton, and R. G. Knickerbocker. 18 pp., 1 fig. Describes recent metallurgical research in recovery of cobalt from cobalt-rich manganese ores and presents data on location of domestic manganese deposits and cobalt content, with descriptions of laboratory techniques employed.
- RI 3867. Report on the Investigation of the Fire at the Liquefaction, Storage, and Regasification Plant of the East Ohio Gas Co., Cleveland, Ohio, October 20, 1944, by M. A. Elliott, C. W. Seibel, F. W. Brown, E. T. Artz, and L. B. Berger. 1946. 44 pp., 49 figs. A discussion of possible causes of this disaster, with illustrations showing damage, recommendations made as result of Bureau's investigation of fire, and a bibliography are included. Fire and explosion occurred as result of failure of insulated cylindrical tank in which liquefied natural gas was stored. Explosion damaged sewer system and some street paving, and intense fire in the vicinity of the plant caused great loss of life and property.
- †RI 3868. Flood-Prevention Projects at Pennsylvania Anthracite Mines. A Preliminary Study, by S. H. Ash and James Westfield. 1946. 25 pp., 23 figs. In recommending a cooperative flood-prevention program in Pennsylvania anthracite fields, points out that encroachment of mine water is chief factor threatening to curtail production and cut short the life of the anthracite industry. Four small flood-prevention projects on which the Bureau collaborated with various anthracite companies in 1945 are described.
- RI 3869. Recovery and Utilization of Oil from Oil-Field Emulsion, by Joseph W. Horne, J. Wade Watkins, and Arthur Matzick. 1946. 16 pp., 18 figs. A procedure for recovering a refinable oil from weathered tank-bottom settlings has been developed in laboratories of the Bureau and used in a field pilot plant. These heavy emulsion settlings, generally regarded by the industry as waste material, consist essentially of a "water-in-oil" emulsion containing a considerable volume of congealed "paraffin." Purpose of study was to develop procedures to recover "clean oil" from oil-field "tank-bottom settlings" in tanks and in open-air retaining pits, and method used with some degree of success in open pits is reviewed. Work done in cooperation with The Cities Service Oil Co. and Bareco Oil Co. of Oklahoma and Kansas State Board of Health.
- †RI 3870. Exploration of Silver Hollow, Newbauer, and Coleman Iron Deposits, Franklin and Crawford Counties, Mo., by Kenneth L. Kreamalmeyer. 1945. 10 pp., 4 figs. Describes investigation of three Missouri iron-ore deposits of the filled-sink type. The properties were explored by churn-drill and trench sampling.
- †RI 3871. Extinction of Gasoline Flames by Inert Gases, by G. W. Jones and W. R. Gilliland. 1946. 14 pp., 3 figs. Trichloromonofluoromethane—better known commercially as Freon-11, a refrigerant commonly used in air-cooling systems—can be used effectively to extinguish gasoline fires and prevent explosions. Six inert gases and their effects on three different types of gasoline were studied. Results are presented graphically so that explosion hazards of any given combination of the gases may be determined without resorting to laborious calculations. Work done in cooperation with Mine Safety Appliances Co., Pittsburgh, Pa.
- RI 3872. Effect of Impurities on the Electrodeposition of Manganese, by David Schlain, John D. Prater, and Beatrice Lukens. 1946. 18 pp. Cobalt, nickel, copper, zinc, iron, arsenic, lead, vanadium, magnesium, and dithionate were the impurities studied and reported.
- RI 3873. Exploration at the Chlne Mine, Cabarrus County, N. C., by William A. Beck. 1946. 4 pp., 1 fig. Account of exploration on copper-gold prospect is given.
- RI 3874. The Recovery of Metal and Other Valuable Products from Aluminum Dross, by O. C. Garst, F. Fraas, W. M. Mahan, D. D. Blue, and L. Fink. 1946. 43 pp., 1 fig. Bureau of Mines scientists conducted this research in production of alumina and other valuable byproducts from aluminum dross as a part of an over-all program for increasing national reserves of strategic minerals. Specimens of aluminum dross were subjected to a variety of metallurgical treatments, which included mechanical beneficiation of aluminum dross by grinding, screening, and washing method, recovery of metal by melting, production of aluminum from the metallic particles separated from the dross by ore-dressing methods, and chemical treatment of partly demetallized aluminum dross for recovery of alumina, ammonia, methane, and abrasive-grade corundum.
- RI 3875. Mine Rescue Life-Line Telephone Assemblies, by J. J. Forbes, F. E. Griffith, F. E. Cash, and Max S. Petersen. 1946. 11 pp., 13 figs. Surface officials directing operations after mine disasters and rescue or fire-fighting crews working underground can communicate with each other instantly by means of a new, portable, batteryless telephone described in this report. Another portable telephone operated by batteries and employing an ordinary hand-transmitter set also is described.
- RI 3876. Survey of Tin in California, by R. H. Bedford and F. T. Johnson. 1946. 14 pp., 2 figs. Describes an investigation that failed to disclose enough tin in any deposit in California to warrant development of a mine.
- RI 3877. Exploration of the Bear Lodge Fluorite Property, Crook County, Wyo., by W. C. Dunham. 1946. 7 pp., 5 figs. Discusses surface trenching, test pitting, shaft sinking, and drifting at shallow depth on Bear Lodge, Wyo., fluorite property.
- RI 3878. Exploration of Eagle Mountain Fluorspar Deposits, Hudspeth County, Tex., by William E. Dennis. 1946. 11 pp., 3 figs. Describes exploration of eight

†Out of print.

Reports of Investigations

Eagle Mountain fluorspar deposits. Presents results of metallurgical testing.

- RI 3879. Electronic Chronoscope for Measuring Velocities of Detonation of Explosives, by C. R. Nise-wanger and F. W. Brown. 1946. 18 pp., 9 figs. Gives details of electronic chronoscope capable of measuring speed of detonation of explosives to within one-millionth of a second. Instrument, invented by Bureau of Mines employees, is portable, simple, and rugged and can be used for either laboratory or field measurements.
- RI 3880. Exploration of the Packard Fluorspar Property, Gila County, Ariz., by Joseph B. Cummings. 1946. 7 pp., 6 figs. Describes exploration of fluorspar on Packard property, Gila County, Ariz., by stripping overburden, trenching, test-pitting, tunneling, sampling, and topographic mapping.
- RI 3881. Limits of Inflammability and Ignition Temperatures of Naphthalene, by G. W. Jones and G. S. Scott. 1946. 5 pp., 1 fig. Discusses limits of inflammability and ignition temperatures of naphthalene and includes a description of the apparatus used for determining ignition temperatures of combustible vapors.
- RI 3882. Physical and Combustion Characteristics of Packaged Fuel Containing Anthracite Fines, by L. D. Schmidt, W. E. Reid, William Seymour, and J. W. Myers. 1946. 35 pp., 25 figs. Packaged coal has a broader future because of possible use of surplus anthracite "fines" along with bituminous coal for making the fuel blocks, according to this report on the characteristics of this type of fuel. Bureau of Mines investigated processing of fuel cubes or coal blocks from straight anthracite fines and from blends of anthracite and bituminous coals at the Central Experiment Station, Pittsburgh, Pa. Tests were made to determine the handling and storage resistance of fuel blocks and their burning properties under conditions similar to those in domestic heating equipment.
- RI 3883. National Motor-Gasoline Survey, Summer 1945, by O. C. Blade. 1946. 34 pp., 3 figs. Properties of motor fuels sold through service stations in the United States. Report continues a series of investigations by Bureau of Mines in cooperation with Coordinating Fuel Research Committee of Coordinating Research Council. Presents analytical data for 1,821 samples, representing products of approximately 75 large and small companies.
- RI 3884. Exploration of the Big Four Zinc-Silver Mine, Summit County, Colo., by R. B. McCulloch and W. P. Huleatt. 1946. 7 pp., 4 figs. Describes examination of eight diamond-drill cores from this property.
- †RI 3885. Exploration of Red Mountain Chromite Deposits, Kenai Peninsula, Alaska, by F. A. Rutledge. 1946. 26 pp., 24 figs. Describes trenching, diamond drilling, and sampling on Red Mountain chromite deposits in Alaska discovered before World War I and considered one of the largest known deposits of high-grade chromite in North America.
- RI 3886. Small-Scale Tests of Selective Reduction of Iron in Titaniferous Iron Ores, by R. J. O'Dea. 1946. 19 pp. Discusses the results of selective reduction by carbon of iron in three titaniferous iron ores of Albany County, Wyo. Includes tables on reduction test runs and discussion of test methods and materials.
- RI 3887. Observations on the Use of a Diesel Freight Locomotive Through a Railway Tunnel, by L. B. Berger and L. H. McGuire. 1946. 20 pp., 5 figs. Tests by Bureau of Mines in Cascade tunnel of the Great Northern Railway Co. demonstrate that exhaust gases liberated by a Diesel locomotive do not seriously contaminate the tunnel air.
- RI 3888. Routine Quantitative Analysis by X-Ray Diffraction. 1. Photometric Procedure. 2. Analytical Method, by James W. Ballard and H. H. Schrenk. 1946. 10 pp., 6 figs. Presents in detail some of more essential problems in application of X-ray diffraction to routine quantitative analysis. Photometric measurements are discussed in connection with line intensities and choice of X-ray film. The internal standard method, successfully used in spectrographic analysis, is applied.
- †RI 3889. A Study of Fault Determinations by Geophysical Methods in the Fluorspar Areas of Western Kentucky, by F. W. Lee and S. J. Hemberger. 1946. 27 pp., 23 figs. Results of geophysical field investigation undertaken in mining areas in vicinity of Marion, Crittenden County, Ky. Part I deals with fundamentals of application of electrical ground-resistivity measurements; part II gives results and analyses, field data applying techniques, and modifications when applied to four separate districts; and part III shows combined results of fault patterns determined from geophysical measurements.
- RI 3890. Automatic Water Heating, Utilizing Subbituminous Coal, by V. F. Parry, W. S. Landers, and J. B. Goodman. 1946. 11 pp., 9 figs. Describes new stoker-fired heater capable of supplying hot water automatically for at least 30 days at a cost of less than \$1 a month. New water-heating system is a product of several years of intensive Bureau research in use of low-rank coals in domestic appliances and is designed primarily to utilize subbituminous fuels. Although heating system was designed to consume low-rank fuels, general features of double-tank system can be employed for either gas or liquid fuels.
- †RI 3891. Standardized Tests for Determining the Physical Properties of Mine Rock, by Leonard Obert, S. L. Windes, and Wilbur I. Duvall. 1946. 67 pp., 19 figs. Fifteen physical tests adapted to, or developed for, determination of physical properties of mine rock. Bibliography included.
- †RI 3892. Studies on the Flotation of Spodumene from the Edison Mine, Keystone, S. Dak., by Gerald A. Munson and K. L. Erickson. 1946. 8 pp., 1 fig. Tests on flotation of spodumene from Edison mine, Keystone, S. Dak., and results are given.
- †RI 3893. Concentration of Fluorite from Metals Reserve Company Stock Piles, by M. M. Fine, W. A. Calhoun, and R. G. O'Meara. 1946. 13 pp., 3 figs. Part of wartime work of the Bureau of Mines was metallurgical service extended to other Government agencies engaged in purchasing and stock-piling some of more critical and strategic materials. Samples of fluorite from several stock piles of Metals Reserve Company were tested by Bureau, and results are given.
- RI 3894. Exploration of Tailing Ponds in the Russellville, Ala., Brown-Ore District, by Andrew Brown. 1946. 31 pp., 8 figs. Describes drilling operations conducted in four large tailing ponds in this property to obtain samples of brown iron ore. All ore specimens were analyzed for iron content and the results are given. Bibliography included.
- †RI 3895. Exploration of the Blue Metal Corundum Property, Douglas County, Nev., by E. O. Binyon. 1946. 7 pp., 3 figs. Intensive exploration project undertaken to discover new sources of corundum. (See also RI 4298.)
- †RI 3896. Exploration of the El Dorado Copper Mine, El Dorado County, Calif., by R. H. Bedford. 1946. 5 pp., 5 figs. Embodies complete factual data obtained by exploration of the El Dorado copper mine.
- RI 3897. Helium Tracer Studies in the Elk Hills, Calif., Field, by E. M. Frost, Jr. 1946. 6 pp., 8 figs. Use of helium in tracing migrations of hydrocarbon fluids in underground structures is one of the most remarkable advancements in recent years in petroleum and

†Out of print.

- natural-gas industry and has been declared highly successful by the Bureau of Mines after a series of tests in the Elk Hills Field, Naval Petroleum Reserve No. 1.
- RI 3898. Exploration of the Avon Mica District, Latah County, Idaho, by Glenn C. Reed. 1946. 23 pp., 7 figs. Intensive exploratory project undertaken by Bureau of Mines in 1943 to discover new deposits of this mica.
- †RI 3899. Improved Apparatus and Procedure for the Determination of Helium in Natural Gas, by E. M. Frost, Jr. 1946. 16 pp., 7 figs. Describes highly sensitive apparatus capable of quickly and precisely detecting helium in natural gas.
- †RI 3900. Exploration of the Magnet Cove Rutile Co. Property, Magnet Cove Area, Hot Spring County, Ark., by Robert V. Spencer. 1946. 23 pp., 9 figs. Examination and preliminary exploration of property described.
- †RI 3901. Gasification of Lignite and Subbituminous Coal Progress Report for 1944. I. Carbonization and Gasification of Lignite in Laboratory Retorts. II. Gasification of Lignite in Glover-West Retorts. III. Gasification of Lignite Char Briquets in a Water-Gas Machine. IV. Gasification of Subbituminous Coal and Lignite in the Golden, Colo., Pilot Plant, by V. F. Parry, D. C. Gernes, J. B. Goodman, E. O. Wagner, A. W. Koth, W. L. Patty, and E. C. Yeager. 1946. 59 pp., 17 figs. Results from small pilot plant constructed at Golden, Colo., to gasify lignite in externally heated metal retort and their relation to design of larger unit are summarized in this report, as well as results of other investigations on lignite gasification by Bureau of Mines during 1944. Work done in cooperation with University of North Dakota and Colorado School of Mines.
- †RI 3902. Investigation of the Lost River Tin deposit, Seward Peninsula, Alaska, by H. E. Heide. 1946. 57 pp., 44 figs. An investigation of Lost River lode tin mine from 1942 to 1944 is described. Bibliography included.
- †RI 3903. Exploration of the White Eagle Fluorspar Mine, Cooks Peak Mining District, Grant County, N. Mex., by John H. Soule. 1946. 5 pp., 3 figs. Describes Bureau of Mines examination of this property by diamond drilling.
- RI 3904. Exploration of Grey Eagle, Grandview, and Royal John Claims, Grant and Sierra Counties, N. Mex., by Robert S. Hill. 1946. 31 pp., 7 figs. Describes exploratory work by Bureau of Mines at the three mines by diamond-drill holes from the surface and from underground workings.
- †RI 3905. Mica and Beryl Examination and Exploration in Cleburne, Randolph, Clay, Coosa, Chilton, Tallapoosa, and Lee Counties, Ala., by the staff, Mining Branch, Tuscaloosa Division, Alabama. 1946. 119 pp., 15 figs. An examination by Bureau of Mines of more than 100 mines in Alabama during World War II indicated presence of large deposits of good-quality mica but very little minable beryl. Prospecting and mining methods, mining and preparation costs, and peacetime potentialities of the Alabama mica area are discussed, and detailed information, including charts and diamond-drill-hole tables, is presented on each property examined. Bibliography included.
- RI 3906. History of Water Flooding of Oil Sands in North Texas, by Peter Grandone, D. A. Jessup, and D. B. Talliaferro. 1946. 117 pp., 49 figs. More than a million barrels of oil have been recovered since 1936 by water-injection methods from partly depleted oil-bearing formations in eight counties of Texas without drawing on new reserves, according to this publication tracing the history of water flooding as a method of oil recovery in North Texas. Thirty-eight water-flooding projects were undertaken in the first 8 years in 1,970 acres in North Texas. (See also RI 4250.)
- RI 3907. Wartime Progress in Coke Production, by William Seymour. 1946. 13 pp., 1 fig. Presents a review of technological advances which enabled by-product-coke industry to meet unprecedented military and industrial requirements for metallurgical coke during World War II. Discusses methods of determining suitability of a coal for coke production, coal handling and preparation at byproduct-coke plants, recent improvements in design of coke ovens, and coke handling. Includes an average analysis of byproduct coke produced in the United States between 1942 and 1944.
- RI 3908. Extinction of Propane and Butane Flames by Dichlorodifluoromethane, by G. W. Jones and F. E. Scott. 1946. 8 pp., 2 figs. Dichlorodifluoromethane has been found very efficient as a quenching agent for methane flames. Volume of propane that can be added to dichlorodifluoromethane without creating an explosion hazard when mixed with air in any proportions and volume of butane that can be added under similar conditions are discussed.
- RI 3909. Concentration of Bauxite for Milling in the 50-Ton Bureau of Mines Pilot Plant, Bauxite, Ark., by S. M. Runke and R. G. O'Meara. 1946. 25 pp., 1 fig. Bureau has carried on an extensive research program at Rolla, Mo., laboratory for beneficiation of low-grade Arkansas bauxites by ore-dressing methods. A 50-ton pilot mill was designed and constructed at Bauxite, Ark., by Bureau to continue investigation on a semicommercial scale. Plant was built to reduce experimental work to practice and to obtain operating data that cannot be determined by laboratory or small-scale continuous testing. Paper summarizes results obtained in laboratory testing of representative samples of 10 stock piles and results of small-scale continuous testing of the composite sample of stock piles in gravity-flotation pilot plant at Rolla.
- RI 3910. Active List of Permissible Explosives and Blasting Devices Approved Previous to December 31, 1945, prepared by J. E. Tiffany and Z. C. Gaugler. 1946. 20 pp. Contains complete active list of permissible explosives (gelatinous and nongelatinous) and permissible blasting devices approved to December 31, 1945. (See supplement to RI 3910.)
- Supplement to RI 3910. Supplement to Active List of Permissible Explosives and Blasting Devices Approved Previous to December 31, 1945, prepared by J. E. Tiffany and Z. C. Gaugler. 1947. 1 p. Contains amendments to RI 3910, Active List of Permissible Explosives and Blasting Devices Approved Previous to December 31, 1945.
- RI 3911. Electrolytic Manganese in Low-Carbon Steel Tests at the Stanley Works, Bridgeport, Conn., by F. Sillers, Jr., and R. T. O. Rasmussen. 1946. 18 pp. Third report by the Bureau of Mines in cooperation with industry to establish value of electrolytic manganese in manufacture of ferrous and nonferrous alloys. (See also RI 3829, 3830, and 4078.)
- RI 3912. Exploration of the New Dale Rundell Zinc Mine, Mifflin District, Iowa County, Wis., by Francis C. Lincoln. 1946. 8 pp., 1 fig. Exploration of the New Dale Rundell zinc mine is part of a general study of the zinc deposits of southwestern Wisconsin.
- †RI 3913. Exploration of Spirit Mountain Nickel Prospect Canyon Creek, Lower Copper River Region, Alaska, by Harold C. Pierce. 1946. 8 pp., 3 figs. Because samples from Spirit Mountain nickel prospect were sufficiently encouraging to justify more extensive exploration, a program of surface trenching, systematic sampling, and detailed mapping of the property was adopted and directed by a Bureau engineer in 1945. Report gives data obtained in the course of the investigation and contains several

†Out of print.

Reports of Investigations

maps of Spirit Mountain prospect and the surrounding area.

- RI 3914. Exploration of the Copper Butte Mine, Mineral Creek Mining District, Pinal County, Ariz., by Harlow D. Phelps. 1946. 34 pp., 7 figs. Describes the Bureau's work on this property by diamond drilling during 1944 and 1945.
- RI 3915. Storage of Subbituminous Slack Coal in Open Pits, by John B. Goodman, V. F. Parry, and W. S. Landers. 1946. 37 pp., 16 figs. Six methods of storing coal were investigated by the Bureau, and dry, open-pit method proved to be the most satisfactory for other than very large consumers. Based on studies made at subbituminous coal-storage sites of the Great Western Sugar Co.; contains details of coal-storing techniques, with gas analyses, changes in physical and chemical properties, temperature tables, pit-construction data, and several illustrations.
- RI 3916. Tests of Bituminous-Anthracite Mixtures, on Industrial Stokers, by J. F. Barkley, L. R. Burdick, and R. Wiggers. 1946. 16 pp., 7 figs. During fuel shortage, as a part of a program to find uses for a surplus of anthracite fines, Bureau of Mines conducted field tests of bituminous slack and anthracite barley mixtures on industrial stokers, disclosing that such mixtures are not only feasible but usually improve fuel-bed characteristics.
- RI 3917. Pilot-Plant Investigations, Matte Smelting of Chamberlain, S. Dak., Manganese Ore, by D. R. Torgeson, T. E. Evans, J. L. Morning, F. W. Wessel, and R. G. Knickerbocker, 1946. 47 pp., 7 figs. Pilot-plant work reported demonstrated that a modified two-step matte-smelting process is practical and can produce waste slags, containing less than 3 percent manganese in primary smelt. Active pilot-plant investigations extended over a period of approximately 3 years, during which 115 tons of Chamberlain concentrates and 55 tons of Artillery Peak mill concentrates were processed.
- †RI 3918. Exploration of the Shanton Iron-Ore Property, Albany County, Wyo., by Eugene Frey. 1946. 5 pp., 4 figs. Reviews the exploration of property in 1942, 1943, and 1944 and gives assay results obtained from jackhammer-hole drilling.
- RI 3919. Magnetic Reconnaissance in North-Central Minnesota in 1945, by Ellsworth Y. Dougherty and Edward F. Fitzhugh, Jr. 1946. 7 pp., 10 figs. During the summer of 1945 the Bureau carried out approximately 200 miles of reconnaissance magnetic surveys in north-central Minnesota. Corrected instrument readings obtained in this survey are presented.
- †RI 3920. The Metallurgical Research Program of the Bureau of Mines Relating to Iron and Steel, by R. S. Dean. 1946. 17 pp. Summarizes work of Bureau of Mines in metallurgical research for past 15 years and indicates its future plan. Discusses iron-ore concentration, production of pure manganese, chromium, and cobalt from low-grade ores by electrolytic processes, production of ferronickel and ferromanganese from domestic ores, and development of many special alloys to use the new products effectively. Includes bibliography of papers and patents by the Bureau staff on each of these subjects.
- †RI 3921. Exploration of the Elk Mountain Mica Deposit, San Miguel County, N. Mex., by Ray J. Holmquist. 1946. 7 pp., 5 figs. An account of exploration work at this mica deposit in 1943.
- RI 3922. Tri-State Zinc-Lead Ore Reserves, by Otto Ruhl. 1946. 7 pp., 1 fig. Zinc-lead ores reserves of the Tri-State district of Kansas, Oklahoma, and Missouri are estimated at 50,735,500 tons of minable ore, valued at \$170,935,275, according to this report, a revision of an unpublished estimate made in 1944. Although only 6,569,000 tons of new reserves

were added in the Tri-State district in 1944 and 1945, 16,587,000 tons were mined.

- RI 3923. Control of Gelation in Extraction of Alumina from Lime-Soda-Clay Sinters, by Guy Ervin, Jr., Delwin D. Blue, and John E. Conley. 1946. 16 pp., 4 figs. Describes investigation of major variables in the sintering and extraction steps of lime-soda-sinter process for production of alumina from clay and other aluminous materials from standpoint of effect on gelation of slurries during extraction as well as on degree of extraction of soda and alumina.
- †RI 3924. Effect of Relief Vents on Reduction of Pressures Developed by Dust Explosions, by Irving Hartmann and John Nagy. 1946. 22 pp., 19 figs. To assist manufacturers in designing industrial safety equipment to prevent heavy losses resulting from explosions of dusts, Bureau has conducted tests on effectiveness of various types of pressure-relief vents built into walls and roofs. This report establishes a mathematical relationship between maximum explosion pressures and size of free relief-vent areas; describes testing equipment and test procedures; and discusses effectiveness of vents sealed by heavy paper diaphragms and hinged panels.
- RI 3925. Sponge-Iron Experiments at Longview, Tex., by Whitman E. Brown. 1946. 58 pp., 25 figs. Madaras sponge-iron process in a semicommercial-scale plant at Longview, Tex., was investigated by Bureau in seeking further information for industry on difficult problems of reducing domestic iron ores. Data compiled from logs of tests on gas re-forming and 30 completed reduction tests, theoretical calculations of the chemistry of the solid-gaseous reactions, and cost estimates for rebuilding the Madaras plant to increase its capacity to 100 tons of sponge iron a day are included.
- RI 3926. Exploration of Glass Buttes Mercury Deposit, Lake County, Oreg., by Glenn C. Reed. 1946. 4 pp., 3 figs. Description of Bureau's inspection of prospect openings on this Oregon deposit in August 1945.
- †RI 3927. Exploration of Georgia and South Carolina Sillimanite Deposits, by W. C. Hudson. 1946. 44 pp., 16 figs. Deals with diamond drilling by Bureau of Mines to determine value of sillimanite deposits in sillimanite belt extending from Talbot County, Ga., to Spartanburg County, S. C. Drill holes were sunk on Norman, A. P. Green, Beam, and Pearson-Scott tracts.
- RI 3928. Exploration of the Mount Hope Mine, Burka County, Nev., by E. J. Matson. 1946. 7 pp., 16 figs. Gives results of core drilling lead-zinc ore supervised by Bureau.
- RI 3929. A Test to Determine the Lime Abstraction of Iron Ores, by Ellis S. Hertzog. 1946. 10 pp., 3 figs. Describes work undertaken to develop a method for determining lime-abstraction capacities of iron ores and of minerals commonly associated with them.
- RI 3930. Exploration of Vanadium Region of Western Colorado and Eastern Utah, by W. P. Huleatt, Scott W. Hazen, Jr., and William M. Traver, Jr., 1946. 30 pp., 40 figs. In 1943 Bureau of Mines conducted extensive core-drilling project to investigate vanadium and uranium ores in western Colorado and eastern Utah—Nation's major sources of these strategic metals. Eight hundred and ninety-five core-drill holes were drilled on 46 properties in region.
- RI 3931. Pilot-Plant Production of Electrolytic Manganese from Manganese Ores from Metals Reserve Stock Piles at Deming, N. Mex., Cushman, Ark., and Phillipsburg, Mont., by J. H. Jacobs and H. C. Fuller. 1946. 19 pp. Gives results obtained from processing manganese ores from Metals Reserve stock piles.
- †RI 3932. Preliminary Exploration of Bi-Metallic Molybdenum Deposit, Okanogan County, Wash., by R.

†Out of print.

- H. Storch. 1946. 6 pp., 2 figs. Presents information obtained from a trench exploration project during June 1945.
- RI 3933. Exploration of the Jewell Tunnel Zinc Property, Chaffee County, Colo., by Edward W. Ames. 1946. 12 pp., 3 figs. Mine was reopened and systematically sampled by Bureau in 1944 and 1945.
- RI 3934. Exploration of Coal Deposits of the Point Barrow and Wainwright Areas, Northern Alaska, by Robert S. Sanford and Harold C. Pierce. 1946. 17 pp., 5 figs. Because this area has suffered a severe fuel shortage during past winters, Bureau undertook to explore coal deposits in vicinity. Results show that enough coal to supply local needs for many years is available at Meade River.
- RI 3935. Control of Bulk Densities in Coke Ovens: Studies on Precision and Application of Various Testing Methods, by H. S. Auvil, L. D. Schmidt, and H. G. Graham. 1946. 21 pp., 8 figs. Information on relative merits and limitations of three methods of testing bulk density of coking coals is presented. This report consists of four major sections, covering general aspects of bulk density control; character of the coals studied; testing methods, their reproducibility or precision, and factors influencing the results; and relation between results of tests and full-scale oven operations.
- RI 3936. Blending Properties of Low- and Medium-Volatile Coals as Determined in the BM-AGA Apparatus, by D. A. Reynolds and J. D. Davis. 1946. 20 pp., 8 figs. Analyzes results of Bureau of Mines-American Gas Association (BM-AGA) tests of coking coals of different ranks that have been blended for carbonization in a survey of the carbonizing properties of American coals. Effects of blending upon the quality of coke and yields of carbonization products obtained at 900° C. in 18-inch cylindrical retort are discussed. Twelve low-volatile, 8 medium-volatile, and 26 high-volatile coals were included in study.
- †RI 3937. Exploration of the Stoddard Fluorite Mine, Cheshire County, N. H., by J. D. Bardill. 1946. 6 pp., 4 figs. Describes fluorite-bearing veins in Cheshire County and gives results of tests made from samples.
- †RI 3938. Magnesia from Olivine, by E. A. Gee, Charles E. McCarthy, Frank S. Riordan, Jr., and Morton T. Pawel. 1946. 33 pp., 9 figs. Describes process studies on extraction of magnesia. Includes tentative cost estimates for construction of a commercial plant to extract magnesia from olivine, schematic flow sheet, laboratory and reagent data, and material balance for process.
- RI 3939. Exploration of the Moffet-Johnston Copper Property, Madison County, Mont., by Robert N. Roby. 1946. 12 pp., 6 figs. Discusses exploration at copper deposit during May and June 1943.
- †RI 3940. Exploration of Argentiferous Lead-Copper Deposits of the Slana District, Alaska, by Robert L. Thorne. 1946. 9 pp., 4 figs. Gives results of four examinations made during June, July, and August 1945 in 200-square-mile area immediately northwest of Slana. Shows analyses of samples taken at Indian group prospect, West Fork Indian Creek prospect, Silver Creek prospect, and Mineral Point prospect.
- RI 3941. Exploration for Zinc and Lead Ore, Phelps Lease, Jasper County, Mo., by Louis C. Brichta. 1946. 44 pp., 2 figs. Describes exploration for zinc and lead on the Phelps lease by churn drilling.
- †RI 3942. Exploration of the Copper-Sulfur Deposit, Khayyam and Stumble-On Properties, Prince of Wales Island, Alaska, by Earl L. Fosse. 1946. 8 pp., 5 figs. In searching for new reserves of copper and sulfur, Bureau analyzed samples from mineral deposits at these two mines in 1945. Results are described.
- RI 3943. Exploration for Fluorite, Crittenden and Livingston Counties, Ky. Part 1. Moore Hill Fault Vein, Crittenden and Livingston Counties, Ky., by Xavier B. Starnes. Part 2. Hickory Cane and K-K Fluorspar Properties, Crittenden County, Ky., by Robert O. Hickman. 1946. 44 pp., 16 figs. Gives account of core drilling by Bureau from 1943 to 1945.
- †RI 3944. Exploration of Mountain View Tungsten Deposit, Hyder, Alaska, by Aner W. Erickson. 1946. 10 pp., 7 figs. Property was examined by the Bureau in 1944, and samples were analyzed for tungstic oxide, gold, and silver.
- †RI 3945. Exploration of the Riley Tungsten Mine, Humboldt County, Nev., by George H. Holmes, Jr. 1946. 7 pp., 16 figs. Describes Bureau's examination of property and results obtained by diamond drilling. In 1945 Bureau completed 15 diamond-drill holes on Riley tungsten property, comprising 60 acres on east slope of Osgood Range.
- †RI 3946. Exploration of Bishop Cap Fluorspar Project, Dona Ana County, N. Mex., by Forest J. Sur. 1946. 7 pp., 6 figs. Gives results of trenching and sampling fluorspar deposits in Organ Mountains during 1945.
- †RI 3947. Exploration of the Gray and Bautsch Lead and Zinc Deposits, Jo Daviess County, Ill., by Paul Zinner and Francis Church Lincoln. 1946. 28 pp., 5 figs. Describes Bureau's exploration of property by churn and core drilling.
- †RI 3948. Exploration of the Defense Zinc Property, Iowa County, Wis., by Francis Church Lincoln. 1946. 7 pp., 1 fig. Study conducted as part of general investigation of zinc-producing areas in southwestern Wisconsin.
- †RI 3949. Exploration of the Gold, Silver, Lead, and Zinc Properties, Eureka Corporation, Eureka County, Nev., by E. O. Binyon. 1946. 18 pp., 6 figs. Three vertical diamond-drill holes were completed, totaling 4,577 feet. Ore was encountered in all three, and analyses are presented.
- RI 3950. Exploration of a Nickel-Copper-Cobalt Deposit at Funter Bay, Admiralty Island, Alaska, by Stephen P. Holt and Joel M. Moss. 1946. 15 pp., 7 figs. Bureau of Mines mapped area both topographically and geologically, cut 95 feet of channel samples in Mertie Lode adit of Admiralty-Alaska Gold Mining Co., and made a transit control survey of a 3,000- by 1,000-foot area. A 300-pound sample sent to the Bureau's laboratory at Rolla, Mo., for beneficiation tests was treated by magnetic separation, bulk flotation, and selective flotation of copper and nickel minerals.
- RI 3951. Exploration of Leasing Block No. 28 in the Nenana Coal Field, Alaska, by H. Marstrander, G. A. Apell, F. A. Rutledge, and J. H. Hulbert. 1946. 21 pp., 6 figs. Exploration by Bureau of Mines and Geological Survey in Healy Valley indicated 143,680,000 tons of coal in leasing block 28 and 188,700,000 tons in area west of this block—largest known reserves of subbituminous coal accessible to Alaska Railroad. Carbonizing and briquetting tests of coal were also made.
- †RI 3952. Exploration of the Jumbo Basin Iron Deposit, Prince of Wales Island, Southeastern Alaska, by W. S. Wright and E. L. Fosse. 1946. 9 pp., 10 figs. Preliminary examination of Jumbo magnetite deposit was made during September 1943, while a more detailed examination, which consisted essentially of mapping and sampling, was made during June, July, and August 1944.
- †RI 3953. Exploration for Fluorite, Krausse Estate Property, Crittenden County, Ky., by Xavier B. Starnes. 1946. 15 pp., 3 figs. Describes in detail Bureau's findings in core drilling this property, site in 1835 of first lead-silver mining in western Kentucky and now part of district that has produced about 80 percent of fluorspar mined in the United States.

†Out of print.

Reports of Investigations

- †RI 3954. Exploration of the Crowell Fluorspar Mine, Nye County, Nev., by Robert W. Geehan. 1946. 9 pp., 10 figs. Bureau of Mines drove 12 holes, totaling 3,661 feet, to test for extensions of known ore bodies in Crowell mine. Metallurgical tests of samples were conducted at Bureau's Salt Lake City Station.
- RI 3955. Exploration of the Brown Iron Ores, Churchwell and Robinette Tracts, Western Highland Rim District, Wayne County, Tenn., by A. H. Warner and G. A. Morrison. 1946. 18 pp., 4 figs. As part of a study of iron resources of Appalachian area, Bureau in 1945 churn-drilled 667 feet, sunk 12 test shafts, and collected 194 samples for study.
- †RI 3956. Exploration of Poor Man Iron Deposit, Kasaan Peninsula, Prince of Wales Island, Southeastern Alaska, by S. P. Holt and Robert S. Sanford. 1946. 8 pp., 9 figs. Describes investigation of iron deposit on property and gives results.
- †RI 3957. Exploration of Chamberlain-Barnardville Iron Deposits, Roane County, Tenn., by Patrick D. McMaster. 1946. 19 pp., 13 figs. Presents results of investigation for additional iron-ore reserves by Bureau of Mines on this property in 1944.
- †RI 3958. Exploration of the Mohawk Zinc Prospect, Pima County, Ariz., by P. S. Haury. 1946. 10 pp., 8 figs. Deals with diamond-drilling operations between April and September 1945 to determine value of zinc deposits on property.
- RI 3959. National Motor-Gasoline Survey, Winter 1945-46, by O. C. Blade and O. R. Sponsler. 1946. 39 pp., 3 figs. American motorists during winter of 1945-46 received best premium and regular-grade motor fuels in respect to octane ratings ever sold in service stations. The 1945-46 winter survey of motor fuels of the country was the 19th in a series inaugurated by Bureau of Mines in 1936 in cooperation with Coordinating Fuel Research Committee of Coordinating Research Council.
- †RI 3960. Exploration of Lookout Mountain and Sand Mountain Coal Deposits, Dade and Walker Counties, Ga., by John R. Troxell. 1946. 10 pp., 6 figs. In searching for new coal reserves, Bureau drilled 8 holes on Lookout Mountain and 14 holes on Sand Mountain from January to April 1945.
- †RI 3961. Exploration of the Bourbon Magnetic Anomaly, Crawford County, Mo., by W. D. McMillan. 1946. 9 pp., 8 figs. Investigating a mineral deposit indicated by a magnetic survey, engineers drilled four holes, found iron ore at 1,600 to 2,000 feet, and analyzed samples at Bureau's laboratory, Rolla, Mo.
- †RI 3962. Exploration of Silver Eagle Zinc Deposit, Hudspeth County, Texas, by W. E. Dennis. 1946. 4 pp., 4 figs. Recounts sampling, core-drilling, and trenching operations by Bureau between October 1943 and March 1944 on this zinc-bearing property.
- †RI 3963. Exploration of Barite in Hot Springs County, Ark., by Robert B. McElwaine. 1946. 21 pp., 3 figs. Describes some results of investigation of barite in Arkansas. With barite much in demand by oil industry for drilling mud, Bureau completed 10 diamond-drill holes in Magnet Cove barite area in 1945.
- †RI 3964. Exploration of the Brutch Sulfur Deposits, Hot Springs County, Wyo., by Forrest H. Majors. 1946. 15 pp., 5 figs. Describes Bureau's exploration of a Wyoming sulfur deposit, which involved rehabilitation and sampling of old workings, sinking test pits and shafts, and trenching operations.
- †RI 3965. A Method for the Spectrochemical Determination of Germanium, Tin, and Lead in Ore Samples, by Graham W. Marks and H. Tracy Hall. 1946. 38 pp., 24 figs. Explains theory of total-energy method, which makes use of the direct-current arc, describes principle of spectrograph, and presents detailed data on all tests conducted.
- RI 3966. Inflammability of Gasoline Vapor-Air Mixtures at Low Pressures, by G. W. Jones and I. Spolan. 1946. 5 pp., 2 figs. Reviews test of gasoline vapor-air mixtures at atmospheric and reduced pressures and gives results.
- †RI 3967. Exploration of Sedanka Zinc Deposits, Sedanka Island, Alaska, by B. S. Webber, J. M. Moss, and F. A. Rutledge. 1946. 15 pp., 4 figs. Bureau of Mines examined Sedanka zinc deposit in June 1945, using a unique method of trenching and stripping overburden made possible by steep topography.
- †RI 3968. Exploration of Iron Mountain Titaniferous Magnetite Deposits, Albany County, Wyo., by Eugene Frey. 1946. 37 pp., 14 figs. This iron deposit in southeastern Wyoming was investigated in 1943 and 1944. One hundred and three jackhammer-drill holes and 17 diamond-drill holes were made.
- †RI 3969. Exploration of Contact Manganese Mine, Grant County, N. Mex., by Paul L. Russell. 1946. 5 pp., 2 figs. Relates trenching, shaft sinking, cross-cutting, and sampling by Bureau during February and March 1943.
- †RI 3970. Exploration of O'Jack Mining Co. Zinc and Lead Deposits, Jasper County, Mo., by Louis C. Brichta. 1946. 39 pp., 2 figs. While high-grade ore was being mined, Bureau of Mines was asked to explore deposit with object of developing a reserve of lower-grade ore that could be mined by open-pit methods. Twenty-two churn-drill holes were sunk, and logs thereon are given.
- †RI 3971. Exploration of Barite Deposits in Montgomery County, Ark., by Robert B. McElwaine. 1946. 24 pp., 10 figs. In 1944 War Production Board recommended that Bureau of Mines attempt to prove existence of large reserve tonnage of barite in Magnet Cove area and search for new deposits. Bureau explored newly reported barite deposits in southern Montgomery County, Ark., completing eight diamond core-drill holes and 1,336 linear feet of surface trenching.
- RI 3972. Exploration of Alunite Deposits, Marysvale, Piute County, Utah, by John H. Hild. 1946. 74 pp., 20 figs. During 1942, Bureau investigators explored alunite deposits near Marysvale, Utah, to increase domestic reserves of alunite—a potential source of aluminum and potash. Work included geologic and topographic mapping, diamond drilling, bulldozer and hand trenching, sinking test pits, rehabilitation of old workings, sampling alunite exposures, and constructing and repairing roads.
- †RI 3973. Exploration of the Queen Mary Copper Project, Missoula County, Mont., by Wilder H. Brinton. 1946. 4 pp., 2 figs. Bureau excavated (with angle-dozers) 10 trenches whose combined length was 602 feet. Ore minerals found included chalcopyrite, bornite, azurite, malachite, and specular hematite. Samples of core and sludge and trench samples were assayed in Bureau laboratory at Reno, Nev.
- †RI 3974. Exploration of the Cherokee Iron Deposits, Cherokee County, N. C., by Almon F. Robertson. 1946. 31 pp., 17 figs. Bureau investigated brown-iron deposits on eight properties in Cherokee County during 1944 and 1945. Work involved trenching, test pitting, sampling, and core drilling.
- RI 3975. Exploration of the Reward (Vekol) Zinc Deposit, Pinal County, Ariz., by Thomas C. Denton and P. S. Haury. 1946. 42 pp., 16 figs. Investigating a zinc belt 2,700 feet long, Bureau diamond-drilled 14 holes in 1942 and 1943 and tested bulk sample of sulfide ore at Salt Lake City Station.
- RI 3976. Preparation of Manganese Electrolyte from Manganese Mattes and Pure Oxides, by David Schlaun. 1946. 11 pp., 7 figs. Investigation demonstrated that virtually all manganese can be extracted from manganese mattes by leaching with spent electrolyte, and resulting solution can be purified and electrolyzed in the usual way to produce metallic

†Out of print.

- manganese of normal quality at normal current efficiency. Report is based on work at Bureau's Boulder City, Nev., plant.
- †RI 3977. Method of Assaying Oil Shale by a Modified Fischer Retort, by K. E. Stanfield and I. C. Frost. 1946. 11 pp., 5 figs. Presents method of assaying oil shale that utilizes a modification of Fischer cast-aluminum retort, commonly used for low-temperature coal carbonization. Shows effects of different experimental conditions upon oil yields by Fischer retort and compares oil yields by modified Fischer retort with those obtained by conventional Bureau of Mines assay method. Work done in cooperation with University of Wyoming.
- †RI 3978. Exploration of Cape Mountain Lode-Tin Deposits, Seward Peninsula, Alaska, by Harold E. Heide, Wilford S. Wright, and Robert S. Sanford. 1946. 16 pp., 8 figs. In searching for new reserves of tin, Bureau excavated 21 trenches totaling 3,690 feet and analyzed numerous samples from old Bartell mine workings in 1943 and 1944.
- †RI 3979. Exploration of Southern Cross Iron Deposits, Deer Lodge County, Mont., by N. L. Wimmeler. 1946. 14 pp., 2 figs. In 1944 Bureau supervised diamond core-drilling operations on 16 holes covering 3,240 feet. Samples were sent to Bureau laboratory at Salt Lake City, Utah, for beneficiation tests.
- †RI 3980. Pilot-Plant Production of High-Grade Magnetite Concentrates, Cranberry, N. C., by Frank D. Lamb and D. A. Woodard. 1946. 7 pp., 3 figs. Early in 1944 North Carolina and Tennessee were surveyed in a search for a readily available source of high-grade iron ore for use in production of sponge iron at Bureau experimental laboratory, Salisbury, N. C. Good-grade ore was found near Cranberry, N. C., and a 40-ton-a-day pilot mill built to produce a concentrate of 70 or more percent iron for direct-reduction tests at Salisbury. Flow sheet for a proposed 100-ton mill, estimated to cost \$80,344, is included.
- †RI 3981. Exploration of Choteau Titaniferous Magnetite Deposit, Teton County, Mont., by N. L. Wimmeler. 1946. 12 pp., 3 figs. In 1945 Bureau made 76 diamond-drill holes on property. Titaniferous magnetite-bearing material containing 30 percent or more iron was encountered in 33 holes.
- †RI 3982. Exploration of New Planet Iron Deposit, Yuma County, Ariz., by Joseph B. Cummings. 1946. 37 pp., 11 figs. Describes Bureau's exploration of this iron deposit by channel sampling and churn and diamond drilling. Twelve churn-drill holes and 10 diamond-drill holes were sunk.
- †RI 3983. Colorimetric Phosphate Tests for Boiler Waters Containing Tannin, by L. Goldman and R. N. Love. 1946. 11 pp., 2 figs. Describes three methods employing colorimetric phosphate test for boiler waters containing tannin and gives results.
- RI 3984. Drilling and Sampling with a Wagon Drill, by John H. Soule. 1947. 7 pp., 5 figs. Describes a device with a suction hose that draws ore cuttings out of a drill hole while drill is in operation and deposits samples in a convenient hopper for examination and later analysis. Known as a vacuum sample collector, device was used by Bureau engineers in conjunction with a wagon drill on several New Mexico mineral deposits. Complete descriptions of equipment and procedures, including drawings and photographs of the wagon drill and sample collector, are given.
- †RI 3985. Exploration of the Minarets Iron Deposit, Madera County, Calif., by C. L. Severy. 1946. 12 pp., 8 figs. After a reconnaissance survey of deposit in September 1944, Bureau sank two diamond-drill holes, a total of 1,056 feet. Analyses of ore samples obtained are given.
- †RI 3986. Exploration of Harding Tantalum-Lithium Deposits, Taos County, N. Mex., by John H. Soule. 1946. 10 pp., 6 figs. Bureau sank 39 diamond-drill holes, a total of 4,371 feet, between May and November 1943. Sampling and milling details are included.
- †RI 3987. Exploration of Fluorite Ridge Fluorspar District, Luna County, N. Mex., by Paul L. Russell. 1947. 7 pp., 6 figs. Bureau proposed to determine, if possible, the extension of the ore body at the Greenleaf No. 1 mine, by surface trenches. Fourteen trenches were excavated, totaling 468 feet in length, north of the Greenleaf No. 1 shaft.
- †RI 3988. Lincoln County Iron Deposits, New Mexico, by M. J. Sheridan. 1947. 19 pp., 24 figs. In January 1943 Bureau of Mines inaugurated a program of trenching, test pitting, and sampling in Lincoln County to help increase western iron-ore production. Twenty-five mines and prospects were investigated in the course of the study.
- †RI 3989. An Investigation of a Laboratory Test for Determination of the Free-Swelling Index of Coal, by W. A. Selvig and W. H. Ode. 1946. 8 pp., 3 figs. Revised as RI 4238.
- †RI 3990. McCoy Iron Deposit, Lander County, Nev., by Victor E. Kral. 1947. 5 pp., 2 figs. Following a magnetometer survey on the McCoy iron deposit, a trenching and drilling program was carried out by the Bureau in August 1944. Bureau drilled two holes to a total depth of 92 feet and excavated 120 feet of trenches.
- RI 3991. Sampling the Fox and Mills Tailing Piles, Lafayette County, Wis., by G. A. Apell. 1947. 7 pp., 5 figs. During April 1945 Bureau sampled and measured the Fox and Mills tailing piles near Hazel Green, Lafayette County, southwestern Wisconsin.
- †RI 3992. Clark Fork Lead-Zinc District, Bonner County, Idaho, by S. H. Lorain. 1946. 10 pp., 6 figs. Presents data obtained from investigation of Clark Fork lead-zinc district started during the summer of 1944.
- †RI 3993. Drum Mountain Manganese Project, Juab County, Utah, by W. H. King. 1947. 9 pp., 5 figs. Manganese deposits of the Drum Mountain area were investigated as two separate projects. The first was begun in 1940 and completed in 1941, and the second in 1945. During the 1941 project 34 holes ranging in depth from 77 to 357 feet were drilled for a total of 7,261 feet. On the 1945 project 7 holes were completed for a total of 2,237 feet.
- †RI 3994. Pilot-Plant Investigations—Production of Sponge Iron with Producer Gas, by D. R. Torgeson, T. E. Evans, and R. G. Knickerbocker. 1946. 42 pp., 11 figs. Results of work at Bureau experiment station at Boulder City show that sponge iron may be produced in a multiple-hearth furnace by reduction with a low-quality gas under certain conditions. Describes equipment used and results achieved in six pilot-plant operating campaigns over a period of 8 months.
- †RI 3995. Terlingua Mercury Deposit, Brewster and Presidio Counties, Tex., by A. M. Evans and W. M. Traver, Jr. 1947. 10 pp. Bureau explored the Terlingua mercury deposit in 1943. Results of investigation are presented.
- †RI 3996. Fluorite on the Lee Mine Property, Hardin County, Ill., by O. M. Bishop. 1947. 10 pp., 1 fig. In 1944 and 1945 Bureau diamond-drilled five holes to explore Lee vein at depths ranging from 296 feet to 355 feet.
- †RI 3997. Ellis Manganese Deposit, Sierra County, N. Mex., by Paul L. Russell. 1947. 4 pp., 4 figs. Deposit first was examined in March 1941. Tests showed that a satisfactory concentrate could be produced, and in 1942 systematic sampling of the deposit was undertaken as part of a general survey of the New Mexico manganese districts.

†Out of print.

Reports of Investigations

- †RI 3998. Johnny Bull-Silver Knight Lead-Zinc Property, Cerbat Mountains, Mohave County, Ariz., by Stanton L. Tainter. 1947. 14 pp., 3 figs. A program of diamond drilling at the Johnny Bull-Silver Knight property was started in September 1943 and completed in December 1943. Eight holes, aggregating 2,979.5 feet, were drilled.
- †RI 3999. Little Pittsburg Lead-Zinc Mine, Shoshone County, Idaho, by J. A. Herdlick. 1947. 8 pp., 7 figs. Bureau explored the Little Pittsburg mine in 1945. Four diamond core-drill holes were drilled.
- †RI 4000. Phelps Stokes Iron Deposit, Nye County, Nev., by Victor E. Kral. 1947. 6 pp., 3 figs. In 1944 the Bureau examined the Phelps Stokes iron deposit by means of 643 feet of diamond drilling and 445 feet of trenching. Drilling operations disclosed the existence of good-grade magnetite ore.
- †RI 4001. Chromiferous Sand Deposits in the Coos Bay Area, Coos County, Oreg., by Robert J. Hundhausen. 1947. 13 pp., 6 figs. In 1943 Bureau investigated two chromite-bearing black-sand deposits in the Coos Bay area by diamond-drilling and hand-auger methods. Descriptions of the metallurgical techniques employed to separate sand products from waste materials with results of laboratory tests on composite samplings are included.
- †RI 4002. Magnetic Surveys, Dannemora Magnetite District, Clinton County, N. Y., by John D. Bardill. 1947. 7 pp., 2 figs. During 1944 Bureau engineers explored the Dannemora magnetite deposits by geophysical methods and by diamond drilling. Results of survey are presented.
- †RI 4003. Magnetic Surveys, Redford-Clayburg Magnetite District, Saranac and Black Brook, Clinton County, N. Y., by John D. Bardill. 1947. 6 pp., 1 fig. Gives a detailed description of Bureau's geophysical exploration of these magnetite-bearing properties.
- †RI 4004. A Method for Determining Simultaneously the Oil and Water Saturations of Oil Sands, by Cleo Griffith Rall and D. B. Talliaferro. 1946. 16 pp., 2 figs. Simultaneous determination of the oil and water saturations of oil-field cores has been made possible by apparatus developed by Bureau for petroleum industry. Report contains illustrations of apparatus and method of operation. Work done in cooperation with State of Oklahoma.
- †RI 4005. Modarelli Iron Deposit, Eureka County, Nev., by Victor E. Kral. 1947. 7 pp., 2 figs. Bureau engineers, in May and June 1945, investigated this property by making 77 small side-hill cuts, cleaning out 5 old pits, and sampling all excavations and outcrops. Topographic maps of development and analyses of ore samples obtained are included.
- †RI 4006. Old Reliable Copper Mine, Pinal County, Ariz., by Thomas C. Denton. 1947. 9 pp., 7 figs. Describes a series of Bureau examinations in which check samples were taken between October 1942 and November 1943, and presents results of small-scale laboratory ore tests and assays conducted by Inspiration Copper Co., University of Arizona, and Bureau of Mines.
- †RI 4007. Aravaipa Lead-Zinc Deposits, Graham County, Ariz., by Thomas C. Denton. 1947. 14 pp., 7 figs. In 1943 Bureau mapped and sampled the Head Center and Iron Cap claims. Includes numerous charts, analyses of samples, and four diamond-drill hole logs.
- †RI 4008. Magnetic Surveys, Russian Station Magnetite District, Clinton County, N. Y., by John D. Bardill. 1948. 7 pp., 2 figs. To determine extent of Russian Station magnetite deposits, Bureau investigators, between October 1944 and July 1945, conducted a detailed magnetic exploration of this area, employing dip needles and dial compasses. Analyses of ore samples collected during investigation are included.
- †RI 4009. Texas Mica and Feldspar Co., Culberson and Hudspeth Counties, Tex., by Stephen P. Holt and John A. Bowsler. 1947. 7 pp., 3 figs. In 1944 Bureau made trenches and took samples from mica deposits in Culberson and Hudspeth Counties, Tex. Samples tested at Bureau's laboratory at Rolla, Mo., indicated that a muscovite-mica concentrate suitable for the roofing trade, a low-iron feldspar concentrate, and a clean quartz tailing could be recovered.
- †RI 4010. Jones Iron Deposit, Socorro County, N. Mex., by R. M. Grantham and J. H. Soule. 1947. 4 pp., 4 figs. Bureau engineers explored this property in 1942. Fifty-eight trenches were excavated, 50 of which were channel-sampled, with a total of 281 samples. Two old shafts, one crosscut, and one adit also were sampled.
- †RI 4011. Columbia River Magnetite Sands, Clatsop County, Oreg., and Pacific County, Wash., Hammond and McGowan deposits, by James V. Kelly. 1947. 7 pp., 3 figs. Bureau engineers investigated several magnetite-bearing sand deposits near the mouth of the Columbia River in Oregon and Washington. From June to August 1944 Bureau completed 161 hand auger holes in the Hammond and McGowan areas. Considerable additional drilling was done to determine possible existence of other magnetite-bearing sand deposits.
- †RI 4012. Blackbird Cobalt Deposits, Lemhi County, Idaho, by G. C. Reed and J. A. Herdlick. 1947. 14 pp., 26 figs. In 1942 and 1943 Bureau engineers explored the Blackbird cobalt district by diamond drilling and trenching. Numerous topographic and assay maps are included.
- †RI 4013. Apex Copper Property, Coconino County, Ariz., by Stanton L. Tainter. 1947. 23 pp., 8 figs. Bureau engineers explored the Apex copper property in 1944 by churn-drilling 152 holes, totaling 3,756 feet. Analyses of ore samplings are included.
- †RI 4014. Valery Fluorspar Deposit, Pershing County, Nev., by Victor E. Kral. 1947. 8 pp., 3 figs. In 1945 Bureau made trenches, cuts, and shaft sinkings and prospected with short drill holes on this fluorspar property. Tests at Bureau's laboratory at Salt Lake City, Utah, indicated that some of the fluorite was recoverable at metallurgical grade.
- †RI 4015. Sullivan Copper Mine, Cochise County, Ariz., by Charles A. Kumke. 1947. 4 pp., 3 figs. Describes trenching operations conducted by the Bureau in 1944 and presents analyses of ore samples taken from the property.
- †RI 4016. Amargosa (Esperanza) Molybdenum-Copper Property, Pima County, Ariz., by Stanton L. Tainter. 1947. 15 pp., 3 figs. Between March and June 1944 Bureau investigators core-drilled three holes, aggregating 1,500 feet, at this Pima County development. Logs of drilling operations are included.
- †RI 4017. United States Fluorspar Co. Property, Sierra County, N. Mex., by M. J. Sheridan. 1947. 15 pp., 10 figs. Bureau supervised sampling for fluorite on this property, followed by a program of trenching, diamond drilling, and metallurgical testing. Results of this investigation, made in 1943-44, numerous charts, and tabulated data are given.
- †RI 4018. Celestite Deposits, Brown, Nolan, Fisher, and Coke Counties, Tex., by W. E. Dennis, M. M. Fine, and R. G. O'Meara. 1947. 16 pp., 16 figs. Celestite deposits were explored in 4 counties of Texas by test pitting and sampling. Results of 300 samples analyzed at the Bureau's laboratory in Rolla, Mo., are given.
- †RI 4019. Secondary-Recovery Practices and Oil Reserves in the Eastern Part of the Delaware-Childers Field, Nowata County, Okla., by Kenneth H. Johnston and C. H. Riggs. 1946. 50 pp., 30 figs. Bureau of Mines has sought to stimulate interest in improvement of secondary-recovery practices by publishing

†Out of print.

- a series of reports containing compilations of historical and engineering data that relate to many important areas under secondary-recovery development in the United States. This report continues series. Results of this study should be valuable to operators in this and similar fields who are confronted with development and operation of secondary-recovery projects. Work done in cooperation with State of Oklahoma.
- †RI 4020. Gila Fluorspar District, Grant County, N. Mex., by Paul L. Russell. 1947. 5 pp., 9 figs. To estimate ore reserves that might be available to supply a 300-ton mill under construction at Gila, N. Mex., seven fluorspar veins were trenced and sampled by Bureau in 1943. Veins were irregular in thickness and mineralization and contained both coarse- and fine-grained fluorspar.
- †RI 4021. Manganese Products Corp.'s Morgan Group, Dona Ana County, N. Mex., by Paul L. Russell, 1947. 4 pp., 2 figs. In 1944 Bureau took 72 lode and 116 placer samples on this property in a search for new reserves of manganese. Samples tested at Bureau's laboratory at Rolla, Mo., indicated that presence of barium in the ore prevented recovery of a high-grade, salable manganese.
- †RI 4022. Capitan Iron Deposits, Lincoln County, N. Mex., by John H. Soulé. 1947. 8 pp., 7 figs. In 1944 Bureau conducted an exploratory project on this property. Work consisted of 179 wagon-drill holes, totaling 3,490 feet, and 4 test pits to verify results obtained by wagon drilling. Magnetic concentration tests on two composite ore samplings taken from the property indicate that both samples can be concentrated to a high-grade product with good recovery of iron in the samples.
- †RI 4023. Zonia Copper Mine, Yavapai County, Ariz., by Charles A. Kunkle. 1947. 6 pp., 8 figs. In 1942 Bureau investigated this property by diamond drilling and trenching. Eleven holes, totaling 2,960 feet, were drilled, and seven new trenches were excavated for a total length of 1,795 feet. Of the old trenches, two were lengthened and two were deepened.
- †RI 4024. Iron Mountain Beryllium Deposits, Sierra and Socorro Counties, N. Mex., by Walter R. Storms. 1947. 13 pp., 12 figs. Bureau examined this property in 1942 and 1943. Investigation comprised 5,065 feet of trenching, 974 feet of diamond drilling, and 669 feet of underground exploration by adits, shafts, and raises.
- †RI 4025. Segerstrom-Helzer Iron Property, Pershing County, Nev., by Victor E. Kral. 1947. 8 pp., 4 figs. In 1944 and 1945 Bureau examined this property by diamond drilling.
- †RI 4026. Stauber Copper Mine, Guadalupe County, N. Mex., by Ray J. Holmquist. 1947. 7 pp., 1 fig. Bureau examined this property in 1943. Eleven test pits, totaling 229.5 feet, were excavated.
- †RI 4027. Crow Branch Lead-Zinc Diggings and Vicinity, Grant County, Wis., by Francis Church Lincoln. 1947. 5 pp., 1 fig. In 1944 Bureau made 12 churn-drill holes on this property and analyzed samples.
- †RI 4028. Last Chance Zinc Mine, Grant County, Wis., by Francis Church Lincoln. 1947. 5 pp., 1 fig. During September 1944. Bureau examined the Last Chance zinc mine, near Arthur, Grant County, Wis. Three hundred and twenty-eight feet of drilling were completed. The five churn-drill holes completed did not extend the limits of the ore discovered below or beyond mine face by the operators.
- †RI 4029. Atwood Copper Group, Lordsburg District, Hidalgo County, N. Mex., by Morgan G. Huntington. 1947. 9 pp., 15 figs. In 1942 and 1943 Bureau conducted a program of core drilling, trenching, and sampling at Atwood and Henry Clay mines. Reopening of Henry Clay shaft was abandoned because of hazardous conditions. Core assays are included.
- †RI 4030. Coking-Coal Deposits on Lookout Mountain, DeKalb and Cherokee Counties, Ala., by Don M. Coulter. 1947. 89 pp., 8 figs. Bituminous coal from Upper Cliff No. 1 seam on Lookout Mountain, in DeKalb and Cherokee Counties, Ala., is suitable for byproduct-oven coking whether used alone or blended with a high-volatile coal. Bureau analyses of carbonizing properties of this coal disclosed that agglutinating value, fixed carbon, and B. t. u. values are high, while volatile matter, ash, and sulfur content are low. Included are detailed analyses of Upper Cliff No. 1 coal, results of tests on a few other coals in the vicinity, and detailed log hole descriptions of Bureau drilling in the two Alabama counties.
- †RI 4031. Studies on Explosives and Explosions, Fiscal Year 1945, by Wilbert J. Huff. 1946. 57 pp., 32 figs. Describes studies by Explosives Division in fiscal year 1945 on flammability of gases and vapors, investigation of hazards in using Diesel engines underground, explosives control (including research on properties of materials that may be involved in accidents in transportation, manufacture, and use of high explosives), explosives research, chemical and physical tests on explosives, and storage of explosives.
- RI 4032. Diesel Engines Underground. VI. Use of Diesel Locomotives in Construction of the Delaware Aqueduct: Effect of Exhaust Gases Upon Quality of Tunnel Air, by L. B. Berger, M. A. Elliott, John C. Holtz, and H. H. Schrenk. 1947. 26 pp., 3 figs. Deals primarily with observations on quality of tunnel air as affected by use of Diesel locomotives. Also describes use of Diesel locomotives in construction of some of tunnels of Delaware Aqueduct. (See also RI 3508, 3541, 3584, 3700, and 3713.)
- RI 4033. Use of Scrapers and Other Light Earth-Moving Equipment in Bituminous-Coal Strip Mining, by Louis A. Turnbull, Joseph J. Shields, James J. Dowd, Edward L. Fish, and Albert L. Toenges. 1947. 37 pp., 25 figs. Discusses methods and economic considerations involved in use of scrapers and light excavating equipment in bituminous-coal strip mining.
- RI 4034. Properties of Louisiana Crude Oils. III. Additional Analyses, by O. C. Blade and E. L. Garton. 1946. 50 pp. Supplementing previously published information on physical properties of crude oils of Louisiana, a major oil-producing State, this is fifth in a series of detailed reports and gives analyses of 82 crude-oil samples from 64 fields of the State. A year-by-year production table is included, with discovery dates and yields of principal oil fields of Louisiana. (See also RI 3253 and 3476.)
- †RI 4035. Iron Mountain Tungsten Deposits, Sierra County, N. Mex., by Walter R. Storms. 1947. 5 pp., 7 figs. Bureau examined this property in 1943. One hundred and sixty-nine cubic yards of alluvium were stripped, 423 linear feet of trenches were dug, and 293 samples were taken.
- †RI 4036. The Farmer Zinc-Lead Prospect, Stevens County, Wash., by G. C. Reed and R. M. Gammell. 1947. 7 pp., 3 figs. In 1945 Bureau investigated the Farmer zinc-lead prospect. Twenty-one surface and underground channel samples were collected.
- †RI 4037. Apache Mica Mine, Rio Arriba, N. Mex., by Ray J. Holmquist. 1947. 5 pp., 2 figs. Bureau reopened and examined the Apache mica mine in 1944.
- †RI 4038. Bull Run Copper Prospects, Silver Bow County, Mont., by R. N. Roby. 1947. 5 pp., 2 figs. In 1944 and 1945 Bureau investigated this property by diamond drilling. Analyses of 18 samples are given.
- †RI 4039. Bear Trap Corundum Deposit, Madison County, Mont., by John B. Hopkins and John Taber. 1947. 6 pp., 2 figs. In 1944 and 1945 Bureau engineers examined the Bear Trap corundum deposit. Two thousand linear feet of bulldozer trenches and 95 feet

†Out of print.

Reports of Investigations

- of hand trenches were excavated. A 57-foot adit was driven, and a 15-foot winze was sunk from adit. Altogether, 46 channel samples were taken.
- RI 4040. Beneficiation of New England Beryllium Ores, by Frank D. Lamb. 1947. 9 pp. Bureau metallurgists conducted intensive studies of methods of extracting beryllium from low-grade ores found in the New England area. Results of tests show that the ores are amenable to flotation only after desliming and vigorous surface conditioning with a suitable agent such as caustic soda, trisodium phosphate, or hydrofluoric acid.
- † RI 4041. Diamond Drilling and Diamond Bit Investigation. Part 1. Drilling Tests in Uniform Granite, by Leonard Obert, Wing G. Agnew, Alton Gabriel, Felix Chayes, and Albert Long. 1947. 18 pp., 12 figs. Describes series of tests performed to determine most advantageous operating conditions for drilling uniform granite with cast-set bits. (See also RI 4233.)
- RI 4042. Corundum Hill Mine, Macon County, N. C., by T. J. Ballard. 1947. 10 pp., 3 figs. In 1944 and 1945 Bureau made a surface survey of main Corundum Hill area and prospected, to a limited extent, the corundum occurrences in the peridotite bodies northeast of Corundum Hill. Several small corundum veins and pockets were found.
- RI 4043. Anderson Zinc-Lead Prospect, Stevens County, Wash., by S. H. Lorain and R. M. Gammell. 1947. 5 pp., 3 figs. In 1944 and 1945 Bureau diamond-drilled 6 holes, totaling 1,214 feet, and completed 1,000 linear feet of angle-dozer trenching on the Anderson prospect. Tests were made to determine amenability of ore to concentration.
- RI 4044. Peerless Lead-Zinc Mine, Grant County, N. Mex., by John H. Soulé. 1947. 8 pp., 7 figs. In 1946 Bureau diamond-drilled 2,423 feet on untested parts of this property. No new ore bodies were found, but zinc mineralization was noted about 1,800 feet below surface.
- RI 4045. Central Texas (Llano) Iron Deposits, Llano and Mason Counties, Tex., by A. M. Evans. 1947. 16 pp., 5 figs. In 1944 Bureau explored Iron Mountain and Bader iron-ore deposits in Llano County and Gamble deposit in Mason County, Tex. Twelve holes were diamond-drilled on Iron Mountain deposit, 5 holes on Bader deposit, and 7 holes on Gamble deposit.
- RI 4046. Copper King Mine, Taos County, N. Mex., by Ray J. Holmquist. 1947. 4 pp., 1 fig. In 1943 Bureau opened Copper King mine and cut 95 channel samples. In addition, two discovery pits on a copper-bearing outcrop about 700 feet west of mine portal were cleaned out and sampled.
- RI 4047. Coughlin and Galena Level Zinc Mines Area, Lafayette County, Wis., by M. Howard Berliner. 1947. 10 pp., 2 figs. In 1943 Bureau explored area between Coughlin and Galena Level mines in Lafayette County, Wis. Twenty-one churn-drill holes, comprising 1,572 feet of drilling, were completed.
- RI 4048. Fluorite and Zinc on the J. J. Shelby and H. McGuire Properties, Pope County, Ill., by O. M. Bishop. 1947. 9 pp., 1 fig. In 1944 and 1945 Bureau drilled three diamond-drill holes for a total inclined depth of 1,592 feet. Examination of core failed to show any economic minerals other than traces of fluorite and minute quantities of sphalerite.
- RI 4049. Fluorite in the Mineral Ridge-Clay Lick Fault System, Livingston County, Ky., by Neal M. Muir. 1947. 29 pp., 3 figs. During 1945 Bureau engineers explored the Mineral Ridge property by diamond-drilling 12 holes, totaling 3,637.1 feet. An additional hole with a depth of 359 feet was drilled on Ray Jennings property on southwestern extension of Mineral Ridge fault. Logs of drilling preparations are given.
- † RI 4050. Bozeman Corundum Deposit, Gallatin County, Mont., by Robert D. O'Brien and John Taber. 1947. 4 pp., 4 figs. Bureau explored Bozeman corundum deposit in 1944, work consisting of excavating 34 trenches that had a combined length of 4,065 linear feet. Three caved adits also were reopened for inspection and sampling. All corundum exposures were sampled by cutting 3- by 6-inch channels across outcrop. Fifty-five samples were cut from 50 exposures of corundum-bearing pegmatite.
- RI 4051. Iron Deposits of Buckhorn Mountain, Meyers Creek Mining District, Okanogan County, Wash., by S. W. Zoldok, John W. Cole, and E. Y. Dougherty. 1947. 22 pp., 5 figs. In 1945 Bureau explored Okanogan County iron deposits by diamond drilling. One hundred and ninety-three core samples were analyzed. Results of analyses with logs of drilling operations are given.
- RI 4052. Buck Creek Corundum, Clay County, N. C., by T. J. Ballard. 1947. 34 pp., 5 figs. Between September 1943 and February 1945 Bureau explored Buck Creek area by trenching, sinking shafts, and opening old drifts. Summary of work completed by Bureau, as well as results of beneficiation tests on ore samples collected during investigation, is included.
- RI 4053. Huckleberry Spar Mine, Catron County, N. Mex., by Forest J. Sur. 1947. 11 pp., 5 figs. In 1944 Bureau explored this fluorite deposit by a combination of underground crosscutting, surface test pitting, and wagon drilling.
- RI 4054. Special Studies of Reservoir Oils in Naval Petroleum Reserve No. 1, Elk Hills Field, Calif., by Alton B. Cook and G. B. Shea. 1947. 60 pp., 31 figs. This report is a representative review of physical properties of reservoir oils in the partly depleted shallow zone of Elk Hills field. Includes material-balance calculations relative to one of oil horizons in shallow zone, detailed charts, graphs, and laboratory determinations and presents procedures employed in obtaining and recombining casing-head gas samples with subsurface oil samples.
- RI 4055. Fluorite and Zinc on the Eva Tanguay Property, Crittenden County, Ark., by X. B. Starnes. 1947. 16 pp., 2 figs. In 1944 and 1945 Bureau explored Eva Tanguay property by core drilling. Eight holes, totaling 3,137.5 feet of drilling, were completed. Logs of holes drilled are included.
- RI 4056. Alice Zinc Mine, Ozark County, Mo., by A. B. Needham and K. L. Kreamalmeyer. 1947. 17 pp., 4 figs. In 1945 and 1946 Bureau completed seven churn-drill holes on Ozark County property to determine quality of zinc sulfide ore available at Alice mine. Topographic maps of property, with analyses of ore samples obtained during investigation, are included.
- RI 4057. Control of Sulfur Content of Sponge Iron Produced in Rotary Kilns, by R. C. Buehl, E. P. Shoub, and J. P. Blott. 1947. 102 pp., 13 figs. Sponge iron has been defined as the metallic product formed by reduction of iron ore or other iron oxides at temperatures below fusion point of iron. Describes pilot-plant tests on reduction of iron ore in rotary kiln, performed at Johnstown, Pa., and laboratory tests run in connection with this project at Bureau's Central Experiment Station, Pittsburgh, Pa.
- RI 4058. Churn-Drill Performance, by J. R. Thoenen and E. J. Lintner. 1947. 48 pp., 58 figs. Presents findings of a series of tests conducted at various quarries to evaluate various factors affecting churn-drill performance. Factors examined included drillability of rock, weight of drill tools, length of stroke, number of strokes per minute, diameter of bit, amount of drilling water added periodically, and specific gravity of drilling sludge. Numerous charts and interpretative data on tests conducted are included.

†Out of print.

- RI 4059. Reduction of Magnesium Chloride by Calcium Carbide, by Lloyd R. Michels, Burke Cartwright, and S. F. Ravitz. 1947. 8 pp. Investigating new ways to produce magnesium metal, Bureau conducted a series of tests involving reduction of magnesium chloride by calcium carbide. Magnesium chloride was rapidly and virtually completely reduced to magnesium by calcium carbide at 750° C. or higher.
- RI 4060. Sulfur in Petroleum. II. Boiling Points, Freezing Points, Densities, and Refractive Indices of Some Sulfur Compounds, by William E. Haines, Welton J. Wenger, R. Vernon Helm, and John S. Ball. 1946. 42 pp. Lists boiling points, freezing points, densities, and refractive indices of more than 300 sulfur compounds and discusses nomenclature of sulfur compounds in petroleum. Work done in cooperation with University of Wyoming. Part I. Sulfur in Petroleum: Nomenclature of the Sulfur Compounds in Petroleum, appears in Chemical and Engineering News, vol. 24, 1946, pp. 2765-2769.
- RI 4061. Technique of Surveying Diamond-Drill Holes with the Wright Radiolite Bore-Hole-Surveying Instrument, by James W. Townsend and William H. King. 1947. 7 pp., 6 figs. Describes technique developed by Bureau of Mines for using instrument, which originated at Homestake mine, Lead, S. Dak. It was found advantageous to devise a standard practice of operation, covering preparation and care of film, exposure time, development of film, and determination of dip and strike from film impressions.
- RI 4062. A Simple Device for Measurement of Angles of Azimuth and Deviation from the Horizontal on Glass Tubes Used for Surveying Diamond-Drill Holes, by James W. Townsend. 1947. 3 pp., 4 figs. Describes a simple device that has been developed for measuring angles of deviation from the horizontal as recorded on a glass tube by acid etching. Device has facilities, also, for measuring angle between the long axis of the ellipse and north-south reference points established by a Maas compass or from an established axial lamina on tube, which was oriented to a specific direction in the hole by rod alignment.
- RI 4063. National Motor-Gasoline Survey, Summer 1946, by O. C. Blade. 1946. 37 pp., 3 figs. Twentieth in a series, results of 1946 summer survey are based on analyses of 3,011 individual samples collected from service stations of large and small cities in 21 marketing areas throughout country. Samples, representing 113 major and minor companies, were obtained from 233 cities in 40 States and District of Columbia. Data given on gravity, sulfur content, Reid vapor pressure, research octane number, and distillation figures for premium-price and regular-grade motor fuels, and for a few third-grade samples of gasoline. Survey was made in cooperation with Coordinating Fuel Research Committee of Coordinating Research Council.
- †RI 4064. Metallurgical Research Program of the Bureau of Mines Relating to the Nonferrous Metals, by R. S. Dean and B. Sikes. 1947. 22 pp., 10 figs. Reviews metallurgical research of Bureau of Mines on nonferrous metals, including several pioneer developments now finding more widespread use in industry. Includes brief résumé and bibliography on ore dressing, natural-gas reduction of zinc, Scotch hearth smelting of lead, production of electrolytic antimony, recovery of nickel from nickel-chromium-iron ore, production of aluminum and magnesium and their alloys, ductile titanium, electrolytic cobalt, chromium, and manganese and their alloys, recovery of vanadium, and production of ductile zirconium.
- †RI 4065. Mercury Deposits of Southwestern Alaska, by Burr S. Webber, Stuart C. Bjorklund, Franklin A. Rutledge, Bruce I. Thomas, and Wilford S. Wright. 1947. 57 pp., 28 figs. Describes results of Bureau of Mines exploratory work of 10 mercury projects in southwestern Alaska. In 1942 and 1943 Bureau, working in conjunction with Federal Geological Survey, added 600,000 tons of ore containing equivalent of 37,000 flasks to national estimate of mercury-ore reserves. Descriptions and histories of deposits examined by Bureau engineers are included.
- RI 4066. Bessemer Iron Project, San Bernardino County, Calif., by F. J. Wiebelt. 1947. 13 pp., 13 figs. Exploration of Bessemer property by Bureau, between 1942 and 1945, included magnetometer survey and diamond drilling. Beneficiation tests on ore samplings taken from property were conducted. Results of drilling operations and metallurgical tests are given.
- RI 4067. Apparatus for Determining the Reactivity of Calcium Carbide and Acetylene-Water Vapor Mixtures, by G. W. Jones, G. S. Scott, R. E. Kennedy, and I. Spolan. 1947. 15 pp., 14 figs. In studies made by Bureau to determine causes of explosions in medium-pressure acetylene generators, it was shown that when these are operated at elevated temperatures acetylene liberated in an acetylene generator carries enough water vapor to heat certain types of carbides to a high temperature, when acetylene-water vapor mixtures are passed through the carbide. Contains results of further work carried out to develop an apparatus to show the heating effects of reactivity of various types of carbides in contact with acetylene-water vapor mixtures.
- †RI 4068. Catron and Sierra Counties Tin Deposits, N. Mex., by M. E. Volin, P. L. Russell, F. L. C. Price, and D. H. Mullen. 1947. 60 pp., 25 figs. Between 1939 and 1943 Bureau engineers examined Taylor Creek mining district properties by excavating more than 320 test pits, digging 71 trenches, and collecting 1,188 samples of ore. Presents results of metallurgical tests conducted at Bureau's Rolla, Mo., laboratory and describes mineralogical character of various tin deposits and general geology of Taylor Creek mining district. Other sections of report deal with property and ownership, physical features and climate, and history of area.
- RI 4069. Recovery of Alumina from Kaolin by the Lime-Soda Sinter Process, by Frank J. Cservenyak. 1947. 59 pp., 19 figs. Describes the use of lime-soda sinter process. Bureau investigations of high-alumina clay deposits in Aiken County, S. C., have proved presence of 10,000,000 tons of kaolin with an alumina content of at least 33 percent. Results of sintering and leaching tests made on South Carolina kaolin showed that 86 to 89 percent of alumina content could be recovered by lime-soda sinter process. Capital investment for a commercial plant capable of producing 1,000 tons of calcined alumina per day and employing 1,148 persons is estimated at \$23,000,000. (See also B 465 and RI 4132 and 4299.)
- RI 4070. Comparative Study of Magnetic Surveys of Worcester County, Md., Made on the Ground and from Airplane Observations, by Hugo E. Kuehn and Guy E. Dent. 1947. 23 pp., 8 figs. In June 1945 a field survey was made of Worcester County, Md., for ascertaining information about basement structure in this county and with a view of fixing, if possible, most desirable method of procedure for making corrections to observational data to allow for diurnal variation in measured vertical component of earth's magnetic field. Discusses magnetic survey of vertical magnetic intensity made on ground and magnetic survey of total magnetic intensity made from airplane.
- RI 4071. Beneficiation of Western Beryl Ores, by H. D. Snedden and H. L. Gibbs. 1947. 18 pp. Describes procedures developed at Intermountain Experiment Station, Salt Lake City, Utah, for concentrating

†Out of print.

Reports of Investigations

low-grade western beryl ores. Three metallurgical technics were used by Bureau in concentrating beryl: Coarse gravity sink-and-float separation, agglomeration tabling, and fatty-acid flotation.

RI 4072. Ophir Hill Consolidated Lead-Zinc Mine, Tooele County, Utah, by Frank L. Wideman. 1947. 13 pp., 20 figs. Describes Bureau of Mines exploratory work at Ophir Hill mine, which consisted of drilling 165 core-drill holes from underground stations; total distance drilled was 8,537 feet. Analyses of all cores are given.

RI 4073. Steeple Rock Zinc-Lead District, Grant County, N. Mex., by P. L. Russell. 1947. 12 pp., 8 figs. Steeple Rock district and Carlisle mine, in particular, were studied to determine what could be done to increase production of zinc, lead, and copper in this district. Eight holes were drilled from deepest level in mine, and six holes were drilled from surface in other mines of district. Diamond-drill data and analyses of channel samples are given.

RI 4074. San Antonio Canyon Lead-Zinc Deposits, Presidio County, Tex., by William E. Dennis. 1947. 12 pp., 2 figs. In 1943 and 1944 the Bureau explored lead-zinc deposits by diamond drilling and sampling. Logs of drilling operations are presented.

RI 4075. Daisy Fluorite Mine, Rosiclare Lead & Fluorspar Mining Co., Hardin County, Ill., by Neal M. Muir. 1947. 16 pp., 11 figs. Describes Bureau program of drilling holes to test veins at various depths below lower workings to determine probable extent of fluorspar bodies in depth.

RI 4076. Iron Deposits, Iron County, Utah, by W. E. Young. 1947. 102 pp., 32 figs. Describes exploratory work in southwestern Utah. Work comprised geological and topographic mapping, geophysical prospecting with a magnetometer, diamond drilling, trenching and test pitting, sampling ore exposures and old workings, and constructing and repairing roads. Numerous maps of areas prospected as well as complete logs of drill holes are included. (See also RI 4388.)

RI 4077. Sulfur Dioxide Leaching Tests on Various Western Manganese Ores, by W. F. Wyman and S. F. Ravitz. 1947. 12 pp. Bureau of Mines has investigated amenability of low-grade manganese ores from Arizona, Arkansas, California, Colorado, Idaho, Minnesota, Montana, Nevada, Utah, Washington, and Wyoming to sulfur dioxide leaching. Most western oxide manganese ores can be leached successfully by this process.

RI 4078. Electrolytic Manganese in Stainless Steel. Tests at the Timken Roller Bearing Co., Canton, Ohio, by F. Sillers, Jr., and R. T. C. Rasmussen. 1947. 17 pp. Fourth report of investigations dealing with cooperative tests between Bureau of Mines and industry on use of electrolytic manganese in steelmaking. Results were: (1) Efficiency of recovery of manganese with electrolytic product is slightly higher than with low-carbon ferromanganese; (2) electrolytic manganese, because of its freedom from carbon, was considered advantageous in melting type 347 steel (18-0 plus columbium); (3) electrolytic manganese did not result in any change in hot workability, etch quality, surface condition, or performance of steel; (4) electrolytic manganese is easier to handle and store than ferromanganese, and furnace additions can be calculated more accurately. (See also RI 3829, 3830, and 3911.)

†RI 4079. Beneficiation of Chromite Ores from Western United States, by J. V. Batty, T. F. Mitchell, R. Havens, and R. R. Wells. 1947. 26 pp. In general, western chrome ores investigated by Bureau were amenable to beneficiation by ore-dressing methods of concentration. However, occurrences of chromium as impure chromite or chromium spinel prevented pro-

duction of high-grade chrome concentrates low in iron content.

RI 4080. Beneficiation of Oxide Tin Ores from States of Zacatecas and Guanajuato, Mexico, by W. G. Sandell, L. C. Bauerle, and K. C. Dean. 1947. 10 pp. El Naranjo and Sierra Fria oxide tin ores were not readily amenable to concentration by ore-dressing methods; but low-grade La Frontera ore responded to gravity methods and high-grade El Naranjo and Sierra Fria ores were readily amenable to treatment by sulfide volatilization, using a modification of Waelz process.

†RI 4081. High Alumina-Iron Laterite Deposits, Columbia County, Oreg., by James V. Kelly. 1947. 51 pp., 8 figs. In 1945 Bureau explored alumina-iron laterite deposits near St. Helens by drilling and sampling. Complete logs of drilling operations, with analyses of ore samples collected during investigation, are included.

†RI 4082. Use of Molten Lead as a Quenching Medium in Carbothermic Production of Magnesium, by P. P. Zapponi and M. J. Spendlove. 1947. 4 pp., 1 fig. In small-scale exploratory tests on use of molten lead for quenching magnesium-carbon monoxide vapors formed by carbothermic reduction of magnesium oxide, approximately two-thirds of magnesium was recovered as a lead alloy containing up to 1 percent magnesium. Results indicate that use of lead as a quenching medium is promising.

RI 4083. Zinc Deposits of the Tennyson District, Grant County, Wis., by G. A. Apell. 1947. 13 pp., 2 figs. Zinc deposit of considerable interest is indicated by Bureau's drilling in Tennyson village. Of 18 holes drilled in Tennyson, 7 encountered important thicknesses of high-grade zinc and lead mineralization.

†RI 4084. Niggerhead Manganese Deposit, Socorro County, N. Mex., by Paul L. Russell and Willis A. Calhoun. 1947. 7 pp., 4 figs. Exploratory work by Bureau consisted of trenching, test pitting, drifting, and crosscutting, as part of program to determine extent of deposit, grade of material, and possibility of concentration.

RI 4085. Winchester Zinc Deposit, Newton County, Mo., by Homer J. Ballinger. 1947. 82 pp., 5 figs. Logs of 28 privately drilled holes had indicated a substantial tonnage of zinc without delimiting deposit; because of this, additional drilling seemed justified, so Bureau of Mines completed 6,353 feet of churn drilling in 17 holes in an attempt to obtain more accurate information. Twelve holes penetrated minable ore, extending length of known deposit and materially increasing estimated tonnage. Includes 76 pages of drill logs.

RI 4086. Hartville Iron District, Platte County, Wyo., by Eugene Frey. 1947. 3 pp., 16 figs. Bureau conducted geophysical investigation to determine some technique that could be used in prospecting for iron. Magnetometer surveys included Good Fortune mine and six grid areas in Hartville district, which were found to be magnetically low. Gravity-meter survey followed, but only four of eight grids were completed. Illustrations show work in detail.

RI 4087. J. D. Price Fluorite Deposit, Crittenden County, Ky., by Xavier B. Starnes. 1947. 8 pp., 1 fig. Bureau explored property by core-drilling three holes. Logs of holes are given.

RI 4088. Copper Deposits of Douglas County, Wis., by M. Clair Smith. 1947. 7 pp., 2 figs. More readily accessible exposures were investigated to determine character, continuity, and extent of mineralization. Within area examined native copper occurs sporadically as irregular grains and small masses in more fragmental portions of amygdaloid.

RI 4089. Good Fortune Iron Mine, Platte County, Wyo., by Eugene Frey. 1947. 7 pp., 3 figs. This deposit, which forms a portion of Hartville iron range, was investigated in June 1944 under strategic minerals

†Out of print.

- program. The mine consists of 10 claims, covering about 688 acres. All old workings were made accessible for Bureau of Mines sampling program; 99 channel samples were cut; and a general survey was made. Gives results of sampling, with percentage of iron shown.
- RI 4090. Winskell-Andrews-Lyne Zinc Deposits, Lafayette County, Wis., by M. O. Renwick and Paul Zinner. 1947. 5 pp., 2 figs. Churn drilling by Bureau of Mines supplemented a previous drilling program conducted by Vinegar Hill Zinc Co. Sphalerite and galena are principal ore minerals. During fall of 1943 Bureau drilled seven 6-inch churn-drill holes on Winskell property, aggregating 1,627 feet. Results encouraged Cuba Mining Co. to develop Andrews mine.
- RI 4091. Blue Bell Fluorite Deposits, Beaver County, Utah, by Eugene Frey. 1947. 11 pp., 4 figs. In August and November 1944 Bureau of Mines examined this deposit and set up an underground project, which was begun in February 1945 and completed in June 1946. Ore consists chiefly of massive fluorite with minor amounts of quartz. In metallurgical tests, metallurgical-grade fluorspar was produced by gravity methods, but fluorite recovery was low. Ore was readily amenable to production of acid-grade spar by fatty-acid flotation followed by grinding to 48-mesh.
- RI 4092. Investigation of Bubble-Hearth Process for Production of Sponge Iron, by E. P. Barrett, C. E. Wood, V. Miller, W. E. Brown, P. R. Porath, and C. Prasky. 1947. 15 pp., 6 figs. Results show that bubble-hearth process is not a workable method for treating iron ores; that movement of ore through bubble-hearth furnace depends on ore being fluid; that no ore tested without addition agents could be maintained in fluid state when almost complete deoxidation had been obtained; that addition of 0.5 percent lime to minus 65-mesh Alan Wood magnetite superconcentrate permitted fluidization over entire range of deoxidation; and that ores other than minus 65-percent Alan Wood magnetite superconcentrate could not be fluidized, even though addition agents were used.
- RI 4093. Apache Iron Deposit, Navajo County, Ariz., by Lincoln A. Stewart. 1947. 87 pp., 19 figs. Two drilling campaigns have been carried out at Apache—in 1942-43 and 1944-45. Describes results of drilling, gives longitudinal sections of trenches, includes about 60 pages of drill logs, and gives results of sponge-iron tests on ore at Laramie, Wyo.
- †RI 4094. Buena Vista Iron Deposit, Churchill County, Nev., by Victor E. Kral. 1947. 5 pp., 4 figs. Describes diamond drilling on deposit in spring of 1945. Trenches and small pits were also excavated, and channel samples taken. Work was confined to Iron Mountain claim, where principal magnetite deposit is located, confined to an area about 460 feet long and 240 feet wide. Includes plans and vertical sections.
- RI 4095. Extinction of Isobutane Flames by Carbon Dioxide and Nitrogen, by G. W. Jones and G. S. Scott. 1947. 9 pp., 2 figs. Report describes apparatus used, methods of conducting tests, and results obtained relative to use of nitrogen and carbon dioxide in preventing isobutane-air explosions. Results are presented graphically so that user may determine hazards of mixtures without laborious computations.
- †RI 4096. Use of Sponge Iron in Steel Production, by R. C. Buehl, M. B. Royer, and J. P. Blott. 1947. 74 pp., 4 figs. Describes tests on conversion of sponge iron to steel, made at numerous cooperating steel plants with sponge iron produced at several Bureau of Mines projects.
- †RI 4097. Arizona Manganese-Silver Ores, by T. M. Romslo and S. F. Ravitz. 1947. 13 pp., 1 fig. Describes results of work on Tombstone district, Salvadore mine, Sheep Tanks mine, and Reymert mine ores. Salvador and Tombstone ores are not amenable to direct cyanidation or flotation for recovery of silver. However, 90 percent of the manganese can be recovered as ferrograde product by dithionate process of sulfur dioxide leaching, and 80 to 90 percent of the silver can be recovered from residue by cyanidation or flotation. Manganese can be recovered from Sheep Tanks and Reymert ores by dithionate process, but recovery of silver by cyanidation or flotation is poor.
- †RI 4098. Diamond Drilling of Potash Reserves in Eddy County, N. Mex., by Walter E. Storms. 1947. 108 pp., 13 figs. Investigation of United States Potash Reserve in Eddy County, N. Mex., by Bureau has disclosed more than 9 million tons of minable potash ore. Investigation was begun in February 1944. During following 8 months, 16 holes, totaling 12,889.5 feet, were drilled. Successful milling tests were conducted on ore samples at Bureau's laboratory at Rolla, Mo.
- RI 4099. Lake Valley Manganese Deposits, Sierra County, N. Mex., by G. A. Apell, S. W. Hazen, and E. G. Howe. 1947. 9 pp., 31 figs. Bureau's work in this locality included channel sampling and churn drilling. In all, 212 channels were cut and 839 samples taken; and 35 churn-drill holes, totaling over 3,100 feet, were drilled, 159 samples being taken. Illustrations comprise numerous assay plats of various areas drilled.
- RI 4100. Arizona Asbestos Deposits, Gila County, Ariz., by Lincoln A. Stewart and P. S. Hauray. 1947. 28 pp., 27 figs. As Arizona asbestos mines are only sources on American continents of iron-free chrysotile asbestos that meets Navy specifications for asbestos fiber for use in covering electrical cables, study of asbestos mines scattered over 25 townships in Gila County is of unusual interest. Movable ore was developed at two prospects; and 1,494 linear feet of drifting were done, three open-cuts were made, and 609 linear feet of channel samples were cut.
- RI 4101. Examination of Zinc-Lead Mines in the Walapai Mining District, Mohave County, Ariz., by P. S. Hauray. 1947. 43 pp., 17 figs. Collects information on over 30 mines examined during 1943, formerly issued in confidential war minerals reports. Additional verification work on production was done in 1946 to bring information up to date. Illustrations show sections and elevations of various mines. Analyses of samples are included.
- RI 4102. Badu Feldspar Deposit, Llano County, Tex., by George W. Huseman and W. D. McMillan. 1947. 11 pp., 5 figs. This paper, prepared in cooperation with Department of Ceramic Engineering, University of Texas, presents results of core-drilling a pegmatite dike in the Llano region of central Texas in 1946. In addition to drilling, work included mapping, sampling ore, and sinking of test pits. Metallurgical tests of ore were made at Rolla, Mo., laboratories of Bureau of Mines.
- RI 4103. Argentena Zinc-Lead Mine, Clark County, Nev., by Robert W. Geehan. 1947. 8 pp., 8 figs. In 1946 Bureau of Mines core-drilled 12 holes, totaling 1,902 feet, in Argentena mine.
- †RI 4104. Investigation of Coal Deposits in the Coal Creek District, Gunnison County, Colo. Progress Report 1, by Albert L. Toenges, Louis A. Turnbull, J. D. Davis, and D. A. Reynolds. 1947. 20 pp., 1 fig. Diamond-drilling 18 holes on coal deposits in Coal Creek district, Gunnison County, Colo., Bureau discovered 3 minable coal beds varying in thickness from 3 feet 9 inches to 14 feet 10 inches. A preliminary estimate of reserves indicated 65,000,000 tons of coking coal and 35,000,000 tons of noncoking coal, a total of 100,000,000 tons of coal, of which 70 to 80

†Out of print.

Reports of Investigations

- percent was considered recoverable. Carbonizing tests made by Bureau disclosed that cokes from these coal beds were of metallurgical grade.
- RI 4105. Powder-Powered Tools: The Firedamp Safety of Devices for Splicing Cables and Punching Rails, by A. R. T. Denues, 1947. 11 pp., 2 figs. Studies indicate that if tools cited are employed in a normal functional manner and under conditions outlined, there is little danger of ignition of firedamp. A total of 83 gallery tests of a powder-powered cable splicer, including 33 tests under drastic conditions, and a total of 60 gallery tests of a powder-powered rail punch were made without igniting 8-percent mixtures of natural gas and air.
- †RI 4106. Northgate Fluorspar, Jackson County, Colo., by John D. Warne, 1947. 23 pp., 15 figs. Describes examination of deposits in Northgate area between 1944 and 1946, including Fluorspar, Fluorine, and Camp Creek mines. Gives results of trenching, photographs of work in progress, and analyses of samples collected.
- RI 4107. Pearl Lead-Zinc Deposit, Jasper County, Mo., by Homer J. Ballinger, 1947. 16 pp., 2 figs. Bureau of Mines churn-drilled 10 holes, totaling 1,933 feet, in summer of 1946. Logs of holes are given.
- RI 4108. San Manuel Copper Deposit, Pinal County, Ariz., by Thomas L. Chapman, 1947. 93 pp., 7 figs. In November 1943 Bureau began drilling operations on this deposit, completing project in February 1945. A total of 15,884 feet of holes was drilled. Contains detailed information on 21 drill holes and various metallurgical tests made.
- †RI 4109. Flood-Prevention Projects at Pennsylvania Anthracite Mines. Progress Report for 1945, by S. H. Ash, W. E. Cassap, James Westfield, W. L. Eaton, W. M. Romtscher, E. J. Podgorski, and L. H. Johnson, 1947. 64 pp., 28 figs. Discusses anthracite reserves of Pennsylvania, underground water pools, barrier pillars, "buried valley" of Susquehanna River, mining subsidence and backfilling, and protective methods utilized to prevent corrosion of equipment by acid mine water.
- RI 4110. Ward Copper Deposit, Seward Peninsula, Alaska, by W. S. Wright, 1947. 4 pp., 3 figs. Describes preliminary sampling and assaying operations conducted by Bureau in 1946 to determine existence of copper deposits on Seward Peninsula.
- RI 4111. Concentration of Manganese Ores from Lincoln County, Nev., by B. K. Shibley, W. W. Agey, and A. O. Ipsen, 1947. 19 pp. Bureau engineer examined samples of low-grade manganese ore from six properties in vicinity of Pioche and from one property near Callente, in Lincoln County. Results of concentration tests showed that only two samples of Pioche ores were amenable to conventional ore-dressing methods.
- RI 4112. Bush-Hutchins Ilmenite, Roanoke County, Va., by R. C. Hickman, 1947. 5 pp., 4 figs. Bureau engineers explored Bush-Hutchins property by geophysical methods and by drilling four holes, totaling 822 feet. Results of drilling operations conducted in 1946 are given.
- RI 4113. Gallatin Corundum Deposit, Gallatin County, Mont., by Robert D. O'Brien, 1947. 9 pp., 4 figs. In 1943 and 1944 Bureau engineers explored corundum deposit by extensive trenching. Data obtained during metallurgical tests on samples taken from property are given.
- RI 4114. Virginia Marl Deposits, New Kent County, Va., by R. C. Hickman, 1947. 4 pp., 3 figs. In February 1946 Bureau engineers investigated marl deposits in New Kent County, Va. Nine holes, totaling 425 feet, were drilled.
- RI 4115. Rusk Iron Deposits, Cherokee County, Tex., by A. M. Evans and J. H. Soulé, 1947. 15 pp., 6 figs. Describes examination of iron-ore mines in vicinity of Rusk, Tex., undertaken at request of Office of Production Management. Tracts examined were Pryor Mountain, Banks and Cherokee, J. P. Acker, and Citizens State Bank. Sketches of these four tracts are included as illustrations, with results of sampling and analysis.
- RI 4116. Pyrites, Mineral, Louisa County, Va., by R. C. Hickman, 1947. 3 pp., 3 figs. After a geophysical survey of Armenius-Boyd Smith and Allah Cooper areas, Bureau drilled a 400-foot vertical hole on Boyd Smith property. No samples of ore were submitted for analysis because of low content of pyrite.
- †RI 4117. Beneficiation of Western Manganese Ores, by C. H. Schack and H. G. Poole, 1947. 38 pp. Describes beneficiation tests conducted by Bureau on ore samples from 12 States. Western manganese ores, ranging in grade from 4 to 47 percent manganese, were used in tests. Samples were taken from manganese deposits in Arizona, California, Colorado, Idaho, Montana, Nevada, Oregon, Utah, Washington, Wyoming, South Dakota, and New Mexico, and all testing was done in Bureau's laboratory at Salt Lake City, Utah. Each ore was tested by gravity and flotation methods, and frequently all known ore-dressing methods or combinations of such methods were tried. Contains detailed information on the manganese ore samples and test results.
- RI 4118. Alexander-Barber Sillimanite Properties, Spartanburg County, S. C., by R. C. Hickman, 1947. 5 pp., 3 figs. In 1945 and 1946 Bureau engineers explored Spartanburg County properties for sillimanite by drilling seven holes, totaling about 399 feet.
- RI 4119. Sultan Zinc-Lead Mine, Clark County, Nev., by Robert W. Geehan, 1947. 8 pp., 8 figs. In January 1945 the Sultan zinc-lead mine was examined by an engineer of the Bureau, and in April 1946 a contract was let. Project was designed to test favorable areas for continuations and faulted segments of ore bodies known on surface and in mine. Between April and June 1946 there was a total of 392 feet of drifting and crosscutting, and one 77-foot raise was driven.
- RI 4120. Rio Grande Copper Deposit, Elko County, Nev., by E. J. Matson, 1947. 6 pp., 8 figs. Discusses exploration of Rio Grande copper deposit. Between October 1944 and February 1945 two diamond-drill holes, totaling 942 feet, were drilled, and between February and September 1946 four churn-drill holes, totaling 1,808 feet, were drilled. One hole indicated a 5-foot section with possible copper content of 1.25 percent.
- RI 4121. Investigation of the Mount Eielson Zinc-Lead Deposits, Mount McKinley National Park, Alaska, by Neal M. Muir, Bruce I. Thomas, and Robert S. Sanford, 1947. 13 pp., 5 figs. Mount Eielson zinc-lead deposits were examined by Bureau in 1943. Twenty-three channel samples were cut in surface trenches and pits, and three grab samples were taken from surface of talus slopes below outcrops.
- †RI 4122. Electric Smelting of Low-Grade Nickel Ores, by S. F. Ravitz, 1947. 39 pp., 4 figs., 25 tables. Two of largest known deposits of nickel ore in United States are Cle Elum deposit in central Washington and Riddle deposit in southwestern Oregon. On basis of exploratory work, ore reserves in Cle Elum district are estimated in excess of 5,500,000 tons, while reserves in Riddle deposit are estimated at 6,000,000 tons. Descriptions of detailed operations and estimates of energy and reducing agent requirements for several possible smelting procedures are included.
- RI 4123. Pilot-Mill Concentration of Las Vegas Wash Manganese Ore, Boulder City, Nev., by S. R. Zimmermanley and C. H. Schack, 1947. 31 pp., 4 figs. Describes some metallurgical work at Bureau's pilot-mill concentrator at Boulder City, Nev. Designed as

†Out of print.